PROPOSED STACKED TOWNHOUSE DEVELOPMENT
6633 MCLEOD ROAD, NIAGARA FALLS

FUNCTIONAL SERVICING DESIGN BRIEF
NEW STORM, SANITARY AND WATER SERVICES

REV 0 – August 17, 2022

PREPARED BY:

HALLEX ENGINEERING LTD.

HALLEX PROJECT #220326

HALLEX NIAGARA
4999 VICTORIA AVENUE
NIAGARA FALLS, ON L2E 4C9

HALLEX HAMILTON
745 SOUTH SERVICE ROAD, UNIT 205
STONEY CREEK, ON L8E 5Z2

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1. INTRODUCTION

The proposed 18-unit stacked townhouse development consists of the demolition of the existing 1-storey residential dwelling and detached garage complete with asphalt parking areas. The proposed development consists of the construction of a 3-storey building, asphalt laneway, asphalt parking areas and grass areas. The subject development is located at 6633 McLeod Road, which is East of the Dorchester Road and McLeod Road intersection in the City of Niagara Falls, ON.

The purpose of the service assessment is to determine the functional sizing of the proposed storm, sanitary and water services in addition to the post-development flows from the site to determine the impact on the existing municipal infrastructure.

2. EXISTING MUNICIPAL INFRASTRUCTURE

2.1 EXISTING SITE DRAINAGE

The existing site currently drains from the North side to the South side of the property via overland flow as shown in **Figure 1** – NPCA Watershed Map – Existing Site Contours. The overland flow drains to the existing sewer at McLeod Road.

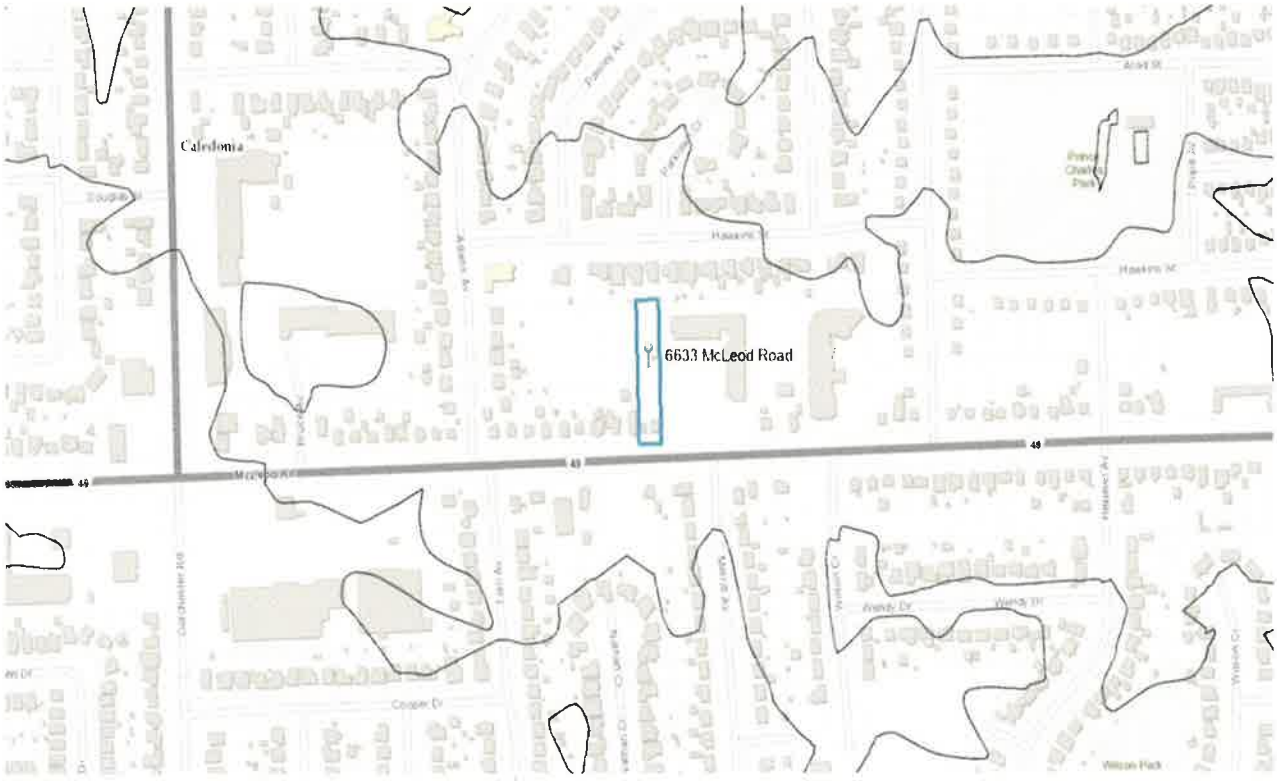


Figure 1 – NPCA Watershed Map – Existing Site Contours

2.2 STORM SEWER

The existing site is currently not serviced with a storm connection, the subject site drains via overland flow to McLeod Road. The existing storm infrastructure within McLeod Road consists of a 1200mm municipal storm sewer which drains Westerly towards Dorchester Road.

2.3 SANITARY SEWER

The existing site is currently serviced with a sanitary lateral connection; however, the size and location of the existing sanitary lateral is unknown. The existing sanitary infrastructure at McLeod Road consists of a 525mm municipal sanitary sewer and a 600mm combined sewer which drains Westerly towards Dorchester Road.

2.4 WATERMAIN

The existing site is currently serviced with a water service connection to McLeod Road; however, the size and location of the existing water service is unknown. The existing watermain infrastructure at McLeod Road consists of a 300mm municipal watermain.

3. STORM SEWER/DRAINAGE SYSTEM

3.1 PRE-DEVELOPMENT SITE FLOW

The total drainage area for the subject development is 0.225 hectares with an existing runoff coefficient of 0.32 based on the existing roof, asphalt and grass surfaces. The catchment area plan for the pre-development site condition is provided on Hallex Sketch CSK1, attached.

Utilizing the rationale method (Q = CiA/360) and the minimum recommended time of concentration of 10 minutes, the allowable peak flow for the pre-development site is as follows:

Storm Event	Pre-Development Storm Flow
5-year Storm	16.9 L/s

These flows are calculated using the City of Niagara Falls intensity-duration-frequency curves. The pre-development flows for the proposed development are provided in Exhibit #1 for the five -year storm at the end of the design brief, attached.

3.2 POST-DEVELOPMENT SITE FLOW

The proposed development includes the 18-unit building, asphalt laneway and parking areas and grass areas. The grading for the site will ensure drainage through the proposed storm sewer for storm water quantity and quality controls. The total drainage for the site consists of 0.225 hectares with a calculated runoff coefficient of 0.72 based on the proposed roof, asphalt and grass surfaces.

The proposed storm sewer for the site will then discharge to the existing 1200mm municipal storm sewer at McLeod Road. The catchment area plan for the post-development site condition is provided on Hallex Sketch CSK2, attached.

Utilizing the rationale method (Q = CiA/360) and the minimum recommended time of concentration of 10 minutes, the calculated peak flow for the post-development site is as follows:

	Post-Development
Storm Event	**Storm Flow**
5-year Storm	37.8 L/s

These flows are calculated using the City of Niagara Falls intensity-duration-frequency curves. The post-development flows for the proposed development are provided in Exhibit #2 for the five -year storm at the end of the design brief, attached.

3.3 STORMWATER QUANTITY CONTROL

The post-development storm water runoff for the subject site will increase by 20.9 L/s for the five-year storm. As such, storm water detention will be required for the proposed development.

Stormwater quantity controls for the site can be achieved by utilizing an orifice plate within a manhole prior to discharging to the existing 1200mm municipal storm sewer at McLeod Road.

The orifice plate will ensure the post development runoff is controlled to the pre-development runoff rate for the five-year storm event. The resulting 36 m^3 volume generated for the five-year storm event, can be stored within a proposed underground storage chamber system or a storm sewer system consisting of oversized storm sewers, catch basins / manholes prior to discharging to the existing 1200mm municipal storm sewer at McLeod Road.

3.4 STORMWATER QUALITY CONTROL

Stormwater quality controls for the site can be achieved by utilizing a Hydrostorm HS4 prior to draining to the existing 1200mm municipal storm sewer at McLeod Road. This will achieve a total suspended solids removal of at least 88% based on the above post-development site conditions. This value is greater than the required 'Normal' treatment of 70% as indicated in the MOE Stormwater Management Planning and Design Manual, dated March 2003 (refer to Chapter 3: Environmental Design Criteria, Section 3.3.1.1. Level of Protection).

4. SANITARY SEWER SYSTEM

Given the site is to be completely redeveloped for the proposed 18-unit stacked townhouse development, all existing sanitary laterals are to be located, capped and abandoned as required at the municipal sanitary sewer. A new sanitary lateral shall be proposed to connect to the existing 525mm diameter municipal sanitary sewer at McLeod Road.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The 18-unit stacked townhouse development consists of 12 one-bedroom townhouse units and 6 two-bedroom townhouse units. Each townhouse is assumed to have a maximum of 2 persons per bedroom.
- The existing fixtures and the number of existing plumbing fixtures indicated in Exhibit #3 were provided by the owner and must be field verified prior to construction.
- The plumbing fixtures and the number of plumbing fixtures indicated in Exhibit #4 are assumed and may not represent the final building plumbing design.

The peak pre-development drainage rate for the existing residential dwelling is determined to be 95.6 L/min based on the existing fixtures and fixture units shown in Exhibit #3 attached. Table 7.4.10.5 in the Ontario Building Code is used to determine probable peak drainage rates for the total fixture units. The wastewater generation for the existing residential dwelling is determined to be 1600 L/day using Table 8.2.1.3A of the Ontario Building Code as shown in Exhibit #3, attached.

The peak post-development drainage rate for the proposed 18-unit stacked townhouse development is determined to be 325.9 L/min based on the fixtures and fixture units shown in Exhibit #4 attached. Table 7.4.10.5 in the Ontario Building Code is used to determine probable peak drainage rates for the total fixture units. The wastewater generation for the proposed 18-unit stacked townhouse development is determined to be 13200 L/day using Table 8.2.1.3A of the Ontario Building Code as shown in Exhibit #4, attached.

Based on the above, Hallex recommends a minimum 200mm diameter sanitary sewer @ 1.0% in order to service the townhouse block complete with a minimum 100 diameter sanitary lateral @ 2.0% to service each stack of townhouse units. The proposed 200mm diameter sanitary sewer shall convey flows from the subject site to the existing 525mm diameter municipal sanitary sewer at McLeod Road.

5. WATER DISTRIBUTION SYSTEM

Given the site is to be completely redeveloped for the proposed 18-unit stacked townhouse development, all existing water services are to be located, capped and abandoned as required at the municipal watermain. A new water service shall be proposed to connect to the existing 300mm diameter municipal watermain at McLeod Road.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The 18-unit stacked townhouse development consists of 12 one-bedroom townhouse units and 6 two-bedroom townhouse units.
- The existing fixtures and the number of existing plumbing fixtures indicated in Exhibit #5 were provided by the owner and must be field verified prior to construction.
- The plumbing fixtures and the number of plumbing fixtures indicated in Exhibit #6 are assumed and may not represent the final building plumbing design.
- The Townhouse block is assumed to be of wood-frame construction and will not have sprinklers installed throughout the building.

The pre-development domestic water demand for the existing residential dwelling is determined to be 80.3 L/min based on the existing fixtures and fixture units shown in Exhibit #5 attached. Table 7.4.10.5 in the Ontario Building Code is used to determine water demands for the total fixture units.

The post-development domestic water demand for the proposed development is determined to be 292.7 L/min based on the fixtures and fixture units shown in Exhibit #6 attached. Table 7.4.10.5 in the Ontario Building Code is used to determine water demands for the total fixture units.

Using the calculations provided in the Fire Underwriters Survey – 1999 Water Supply for Public Fire Protection, the minimum water supply flow rate for fire protection is determined to be 10000 L/min for the building based on the above assumptions as shown in Exhibit #7, attached. There is one existing municipal fire hydrants located near the site. The hydrant is located approximately 20 meters from the Southwest corner of the site on the South side of McLeod Road.

Based on the above, Hallex recommends a minimum 50mm diameter water service to be installed to provide water supply from the proposed townhouse block to the existing 300mm diameter municipal watermain at McLeod Road.

6. CONCLUSION

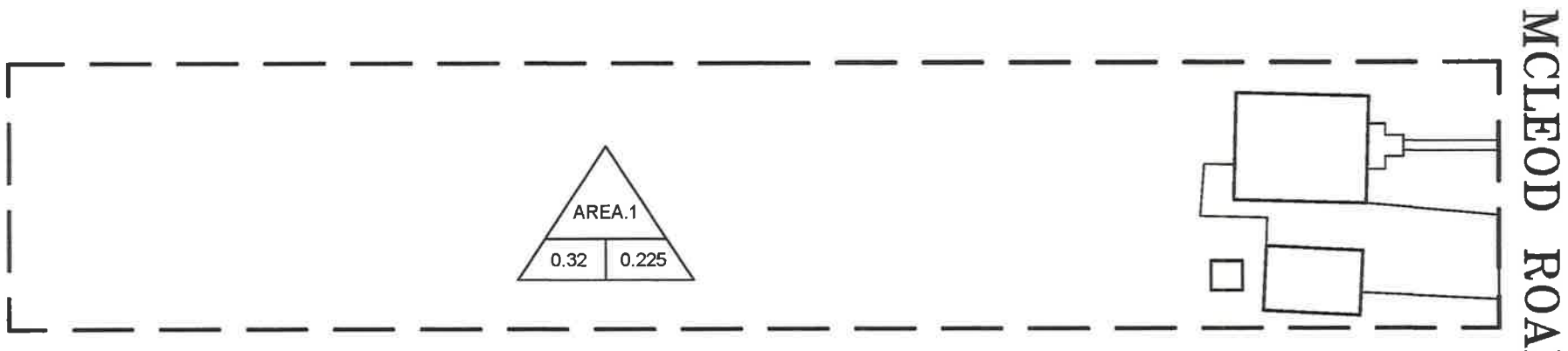
The aforementioned calculations and recommendations for the storm, sanitary and water services are based on the current design for the site as of writing this report. A final sealed report, complete with updates to the recommendations made in this report, may be required based on the final site design.

We trust this report meets your approval. Please contact the undersigned should you have any questions or comments.

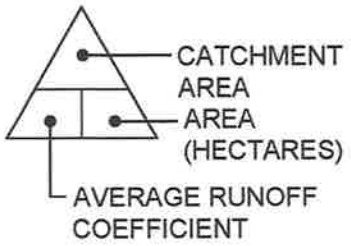
Yours truly,
HALLEX ENGINEERING LTD

Jim Halucha P.Eng
Civil/Structural Engineer

Anthony Infurna, C.Tech, rcji
Civil Designer/Project Coordinator



LEGEND



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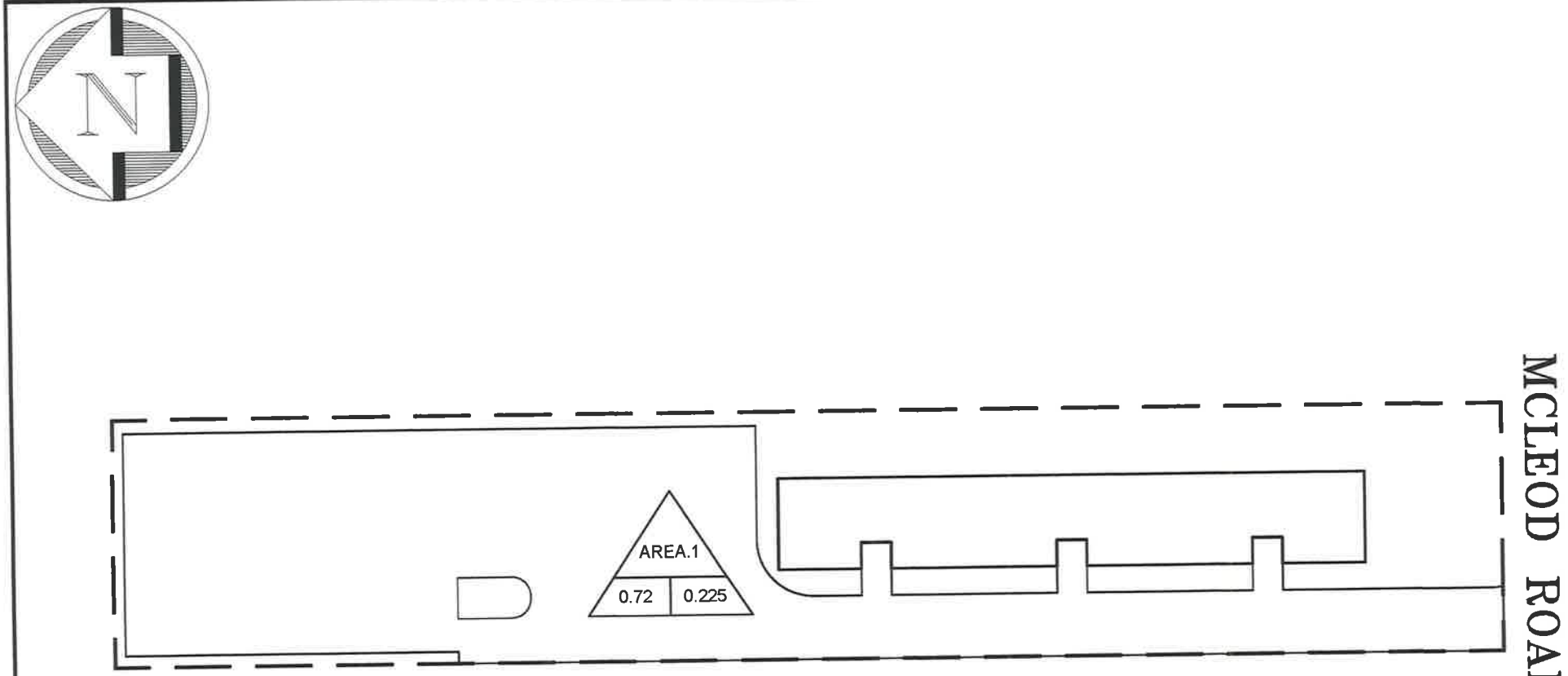
PROJECT:
MCLEOD ROAD STACKED TOWNHOUSES
6633 MCLEOD ROAD, NIAGARA FALLS, ON.

SHEET TITLE:
PRE-DEVELOPMENT CATCHMENT AREA PLAN

DATE: 2022/08/17
SCALE: 1:500
DR. BY: AI
CH. BY: JS/JH

JOB No.: 220326
DWG. CSK1
REV. 0



LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT

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PROJECT:
MCLEOD ROAD STACKED TOWNHOUSES
6633 MCLEOD ROAD, NIAGARA FALLS, ON.

SHEET TITLE:
POST-DEVELOPMENT CATCHMENT AREA PLAN

DATE: 2022/08/17
SCALE: 1:500
DR. BY: AI
CH. BY: JS/JH

JOB No.: 220326
DWG. CSK2
REV. 0

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6633 McLeod Road - Stacked Townhouses
Exhibit #1 - 5 Year Pre - Development Calculations

2022-08-16
Job: 220326

MUNICIPALITY: **Niagara Falls**

manning's n = 0.013 Conc Pipe
0.013 PVC Pipe
0.024 Corr. Stl Pipe

Rainfall Intensity Values = A= 719.500
B= 6.340
C= 0.769

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Incre-ment	Cum Total	To Upper	In Sectio			Cum Flow	Cum Flow
			(m)	(ha)	(ha)	(min)	(min)	mm/hr	m^3/ha*day	(m^3/d)	(m^3/s)
1	**Area.1**	**Street**	**N/A**	**0.225**	**0.225**	**10.00**	**N/A**	**84**	**60497**	**1461.0**	**0.0169**
Roof	-	-	-	0.012	-	-	-	-	19157.5	229.9	-
Paved	-	-	-	0.012	-	-	-	-	18149.2	217.8	-
Grass	-	-	-	0.201	-	-	-	-	5041.4	1013.3	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Gravel Surface	C =	0.60
Perm. Paver	C =	0.30
Grass Surface	C =	0.25

Velocity Range:

Minimum Velocity = 0.80 m/s
Maximum Velocity = 6.00 m/s

Time of Concentration = 10 min

4999 Victoria Avenue
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HALLEX ENGINEERING LTD.

MUNICIPALITY: **Niagara Falls**

6633 McLeod Road - Stacked Townhouses
Exhibit #2 - 5 Year Post - Development Calculations

2022-08-16
Job: 220326

Rainfall Intensity Values =

A= 719.500
B= 6.340
C= 0.769

manning's n =

0.013 PVC Pipe
0.013 Conc Pipe
0.024 Corr. Stl Pipe
0.035 Grass Swale

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows		Flow Control	Sewer/Channel Design				Invert Elevations	
Pipe	From Node	To Node		Incre-ment	Cum Total	To Upper	In Section			Cum Flow	Cum Flow		Slope	Capacity Full	Velocity Full	*Dia/ Depth	Up-stream	Down-stream
			(m)	(ha)	(ha)	(min)	(min)	mm/hr	m^3/ha*day	(m^3/d)	(m^3/s)	(m^3/s)	(m/m)	(m^3/s)	(m/s)	(m)	(m)	(m)
1	**Area 1**	**Street 1**	**N/A**	**0.225**	**0.225**	**10.00**	**N/A**	**84**	**42348**	**3264.8**	**0.0378**	**0.0378**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Roof	-	-	-	0.033	-	-	-	-	19157.5	632.2	-	-	-	-	-	-	-	-
Paved	-	-	-	0.127	-	-	-	-	18149.2	2304.9	-	-	-	-	-	-	-	-
Grass	-	-	-	0.065	-	-	-	-	5041.4	327.7	-	-	-	-	-	-	-	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Grass Surface	C =	0.25

Velocity Range:

Minimum Velocity =	0.80 m/s
Maximum Velocity =	6.00 m/s

Time of Concentration:

Time of Concentration = 10 min

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6633 McLeod Road, Niagara Falls
Exhibit 3 - Pre-Development Wastewater Generation Rate & Peak Drainage Rate

2022-08-16
Job: 220326

WASTEWATER GENERATION ASSESSMENT

Occupancy	# of Units	Development Statistics	Volume (Table 8.2.1.3. A / B)	Total Daily Volume	Notes
3 Bedroom Dwelling	1	1 dwelling	1600 L/dwelling	1600 L/day	
			Total =	1600 L/day	

Therefore the total calculated sanitary flow from the site is determined to be 1600 L/day.

MAXIMUM PROBABLE DRAINAGE RATE

Fixture	# of Units	# of Plumbing Fixtures	Fixture Units (Table 7.4.9.3.)	Total Sanitary Fixture Units
Bathroom group with flush tank	1	1 fixture	6 FUs	6 FUs
Dishwasher (domestic)	1	1 fixture	1 FUs	1 FUs
Clothes washer (private, domestic)	1	1 fixture	1.5 FUs	1.5 FUs
Sink (domestic)	1	1 fixture	1.5 FUs	1.5 FUs
			Total =	10.0 FUs
			Total Flow =	95.6 L/min

* Existing fixtures were provided by the Owner. Fixtures to be field verified.

Therefore the total calculated peak drainage rate is determined to be 95.6L/min.

WASTEWATER GENERATION ASSESSMENT

Occupancy	# of Units	Development Statistics	Volume (Table 8.2.1.3. A / B)	Total Daily Volume	Notes
Apartments	12	2 persons	275 L/person	6600 L/day	
Apartments	6	4 persons	275 L/person	6600 L/day	
			Total =	13200 L/day	

Therefore the total calculated sanitary flow from the site is determined to be 13200 L/day.

MAXIMUM PROBABLE DRAINAGE RATE

Fixture	# of Units	# of Plumbing Fixtures	Fixture Units (Table 7.4.9.3.)	Total Sanitary Fixture Units	
Bathroom group with flush tank	2	4 fixtures	6 FUs	48 FUs	* Type A Units.
Sink (domestic)	2	6 fixtures	1.5 FUs	18 FUs	* Type A Units.
Dishwasher (domestic)	18	1 fixture	1 FUs	18 FUs	* Combined type A and type B units.
Bathroom group with flush tank	4	4 fixtures	6 FUs	96 FUs	* Type B Units.
Sink (domestic)	4	3 fixtures	1.5 FUs	18 FUs	* Type B Units.
			Total =	198.0 FUs	
			Total Flow =	325.9 L/min	

Therefore the total calculated peak drainage rate is determined to be 325.9L/min.

6633 McLeod Road, Niagara Falls
Exhibit 5 - Pre-Development Water Demand

2022-08-16
Job: 220326

DOMESTIC WATER SUPPLY

Fixture	# of Units	# of Plumbing Fixtures	Fixture Units (Table 7.6.3.2.A.)	Total Water Fixture Units
Bathroom group with flush tank	1	1 fixture	3.6 FUs	3.6 FUs
Dishwasher (domestic)	1	1 fixture	1.4 FUs	1.4 FUs
Clothes washer (private, domestic)	1	1 fixture	1.4 FUs	1.4 FUs
Sink (domestic)	1	1 fixture	2 FUs	2 FUs
			Total =	8.4 FUs
			Total Flow =	80.3 L/min

* Existing fixtures were provided by the Owner. Fixtures to be field verified.

Therefore the maximum domestic water demand is determined to be 80.3 L/min.

DOMESTIC WATER SUPPLY

Fixture	# of Units	# of Plumbing Fixtures	Fixture Units (Table 7.6.3.2.A.)	Total Water Fixture Units	
Bathroom group with flush tank	2	4 fixtures	3.6 FUs	28.8 FUs	* Type A Units.
Sink (domestic)	2	6 fixtures	2 FUs	24 FUs	* Type A Units.
Dishwasher (domestic)	18	1 fixture	1.4 FUs	25.2 FUs	* Combined type A and type B units.
Bathroom group with flush tank	4	4 fixtures	3.6 FUs	57.6 FUs	* Type B Units.
Sink (domestic)	4	3 fixtures	2 FUs	24 FUs	* Type B Units.
			Total =	159.6 FUs	
			Total Flow =	292.7 L/min	

Therefore the maximum domestic water demand is determined to be 292.7 L/min.

FIRE WATER SUPPLY

Building Type: No Fire Protection

Floor Area		Reduct.	
First Floor	333.1 m^2	1.00	333.11665 m^2
Second Floor	333.1 m^2	1.00	333.11665 m^2
Third Floor	333.1 m^2	1.00	333.11665 m^2
			999.34995 m^2

Construction Type: Wood Frame Construction

Construction Coefficient: 1.5

1st Preliminary Fire Flow = 10000 L/min

Fire Hazard: Non-Combustible

Fire Hazard Factor: -0.25

Net Decrease = -2500 L/min

2nd Preliminary Fire Flow = 7500 L/min

Sprinkler System: No System

Sprinkler System Factor: 0.0

No Change = 0 L/min

Separation Factor

North	45+ m	0.00
South	40 m	0.05
West	8 m	0.20
East	30 m	0.10
		0.35

Net Increase = 2625 L/min

FINAL FIRE FLOW = 10000.0 L/min

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey