UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

File: 24035

FUNCTIONAL SERVICING REPORT

222 Gate Street, Niagara-on-the-Lake
March 2025

INTRODUCTION

Upper Canada Consultants has been retained to undertake and provide a Functional Servicing Report to address the servicing needs and requirements as part of a Zoning By-law Amendment submission for the proposed development. The project site is located at the above noted address, situated south of Queen Street, north of Johnson Street, and west of Victoria Street. The development site was historically developed with a single-family dwelling.

The proposed development site is approximately 0.08 hectares and shall consist of a 2-storey,18 suite hotel and associated underground parking garage. The owners of the proposed development site are also owners of the adjacent rear (easterly) parcel and subsequent 124 on Queen Hotel and Spa development. It is the intention of the owner to merge the properties into one parcel as the 222 Gate Street hotel will be an extension of the 124 on Queen Hotel and Spa. The underground parking garage on the new building will be connected to the underground parking garage currently occupying the adjacent rear (easterly) lot that is accessed via Victoria Street.

The objectives of this study are as follows:

1. Identify domestic and fire protection water service needs for the site;
2. Identify sanitary servicing needs for the site; and,
3. Identify stormwater management needs for the site.

WATER SERVICING

There is an existing 200mm diameter watermain located on the east side of Gate Street fronting the development site. It is proposed to connect a 150mm diameter water service to provide both domestic and fire water supply for the proposed development. Although the parking garage as part of the new building will be connected to the adjacent rear parking garage, the water systems for the 222 Gate Street property will remain entirely separate.

The nearest municipal hydrants are located at the following locations:

- South corner of the intersection of Queen Street and Gate Street
- South corner of the intersection of Gate Street and Johnson Street

A preliminary calculation has been conducted (Appendix A) to determine the minimum fire flow requirement per the Fire Underwriters Survey (2020). The calculation utilizes factors such as: Type of Construction, Area, Combustibility of Contents, etc. to determine the minimum flow rate required for this type of building. At this time, the calculations conservatively assume no sprinklers will be required, and the building will be construction with ordinary construction methods. The calculation has concluded a minimum fire flow of 159 L/s will be required. It should be noted that this value is an estimation and may change based on future iterations of the proposed development strategy.

Utilizing hydrant flow data provided by the Town of Niagara-on-the-Lake for the previously noted hydrants, a Fire Flow Calculation Sheet was also completed to determine the expected available flow rates during a fire event at 20 psi. The calculation has concluded that flow rates of 216 L/s and 229 L/s will be available at the hydrants at the intersections of Johnson Street and Queen Street respectively. Therefore, it is expected that the existing municipal watermain system will have sufficient capacity for the proposed development.

SANITARY SERVICING

There is an existing 200mm diameter AC sanitary sewer fronting the proposed development site conveying flows southerly on Gate Street. The proposed development will discharge sanitary flows to the existing sewer via 200mm diameter service.

A calculation (Appendix B) has been conducted to determine the peak sanitary flows from the proposed building and their effects on the immediate downstream sanitary sewer fronting the site. The analysis utilizes a peak unit sewage flow rate of 225 L/bed space/day as well as a Peaking Factor of 2.0 per the MECP Design Criteria. The analysis has determined that the proposed development will discharge a total peak flow rate of 0.21L/s to the existing sanitary sewer system. It is expected that this will be an acceptable addition to the capacity of the municipal system.

STORMWATER MANAGEMENT PLAN

The following is a summary of the Stormwater Management Plan for the proposed development site.

The criteria provided by the Town of Niagara-on-the-Lake and Region of Niagara for this development includes the requirement to control future development stormwater flows to allowable levels for up to and including the 5-year design storm event and improve stormwater quality levels to MECP Normal Protection (70% TSS removal) levels prior to discharge from the site.

Existing Conditions

Using topographical information, it has been determined that all stormwater from the site has historically been directed westerly towards the Gate Street road allowance. Stormwater flows then enter the municipal 375mm diameter Gate Street storm sewer via catch basins and discharge

directly to the One Mile Creek outlet located at the north corner of the intersection of Gate Street and Johnson Street.

Per the 'One Mile Creek – Floodplain Mapping' study conducted by the NPCA (July, 2004), One Mile Creek has an overall subwatershed of approximately 272.5ha in size extending from East and West Line to its' ultimate Lake Ontario outlet located just north of Niagara Boulevard. The Gate Street stormwater outlet is located well within the lower half of the drainage shed for this watercourse.

Using the Storm Drainage Area Plan for the existing Gate Street Storm Sewer System provided by the Town of Niagara-on-the-Lake, a storm sewer design sheet has been created to determine the available capacities within the sewer system as the original was not available within the town records. Figure 1 in Appendix C outlines the recreated drainage areas based on the historic Drainage Area Plan. A Weighted Impervious Calculation Sheet has concluded that the original drainage areas resulted in a total area of 0.92 hectares at an overall Runoff Coefficient of 0.66 discharging to the Gate Street storm sewer system. This resulted in a maximum total capacity of approximately 80%.

Proposed Conditions

The current development strategy will result in the vast majority of the property developed with the proposed hotel building and a terrace occupying the frontage onto Gate Street. It is expected that the building will discharge stormwater flows to the existing storm sewer system on Gate Street.

Per the Weighted Impervious Calculation Sheet in Appendix C, the proposed development will increase the overall Runoff Coefficient of the Gate Street storm sewer system from 0.66 to 0.71 for the same overall drainage area. As shown in the Storm Sewer Design Sheet, this will increase peak flows on Gate Street from approximately 148L/s to 159L/s to occupy 86% of the capacity of the existing Gate Street storm sewer system during the 5 year design storm event. Therefore, the existing municipal storm sewer system will have adequate capacity for the proposed development.

An analysis has been completed to compare the increase in flows to peak stormwater flows experienced within One Mile Creek immediately downstream of the site. The 'One Mile Creek – Floodplain Mapping' study completed by the NPCA utilized a peak stormwater flow value of approximately $8.93m^3/s$ at a cross section located just downstream of the existing outlet (XS 1602.851). The 100 Year Peak Stormwater Flow Analysis located on the Storm Sewer Design Sheet in Appendix C outlines an increase of 18.5L/s under proposed conditions. This represents only 0.2% of the peak flows within the One Mile Creek system during a major storm event.

Due to the Gate Street outlets' location relative to the upstream limit, as well as the extremely minor increase in peak stormwater flows, the proposed development will have a negligible effect on peak stormwater flows within the downstream One Mile Creek. Therefore, it is expected that stormwater quantity controls will not be required for this site and no adverse effects will result to downstream infrastructure as a result of the proposed development.

A storm sewer service will be constructed to the proposed building to provide an outlet for stormwater flows from the proposed development site.

Major overland flows greater than the 5-year event will continue to discharge directly to Gate Street as under existing conditions.

As the entire site will be developed with rooftop or landscape area, no significant source of Total Suspended Solids (TSS) will be occupy the site. Therefore, no additional quality control measures are expected to be required for this development.
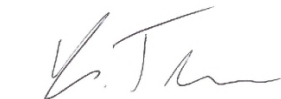
CONCLUSIONS AND RECOMMENDATIONS

Therefore, based on the above comments and design calculations provided for this site, the following summarizes the servicing for this site.

1. The existing 200mm diameter watermain will have sufficient capacity to provide both domestic and fire protection water supply.

2. The existing 200mm diameter municipal sanitary sewer will have adequate capacity for the proposed development.

3. Stormwater quantity controls will not be required prior to discharge directly to the Gate Street storm sewer system.

4. The site extreme stormwater overland route is to Gate Street and ultimately One Mile Creek.

5. The development will consist of solely non-significant sources of Total Suspended Solids (TSS) and therefore further quality controls will not be required.

Based on the above and the accompanying calculations, there exists adequate municipal servicing for this development. We trust the above comments and enclosed calculations are satisfactory for approval. If you have any questions or require additional information, please do not hesitate to contact our office.

Yours very truly,

Kurt Tiessen, P.Eng.
March 4, 2025
Encl.

LICENSED PROFESSIONAL ENGINEER
K. N. TIESSEN
100581347
PROVINCE OF ONTARIO

APPENDICES

APPENDIX A

Hydrant Flow Test Data
Fire Flow Calculation Sheets
Fire Underwriters Survey Calculations

FIRE FLOW CALCULATION SHEET

Project: 222 Gate Street
Project Number: 24035
Date: November 11, 2024
Prepared By: Kurt Tiessen, P.Eng.
Reviewed By: Jason Schooley, P.Eng.

Flow Test Provided by: Town of Niagara-on-the-Lake
Hydrant Location: South corner of intersection of Gate and Johnson

FLOW TEST RESULTS

TEST	PRESSURE (psi)	FLOW RATE (USGPM)	FLOW RATE (L/s)	$Q^{1.852}$	PRESSURE (m)
STATIC	74	0	0	0	52.04
RESIDUAL 1	65	1300	82.02	3503.89	45.71

PROJECTED FIRE FLOW $y = -0.0018x + 52.037$

(Chart: Pressure (m) vs Q^1.852 (L/s))

FIRE FLOW FORMULA (y = ax + b)

a =   -0.0018
b =   52.037

FIRE FLOW AT A SPECIFIED PRESSURE

Pressure =   20 psi
Pressure =   14.06 m
$Q^{1.852}$ =   21096.11
Flow, Q =   **216.21** L/s
Flow, Q =   3427.06 USGPM
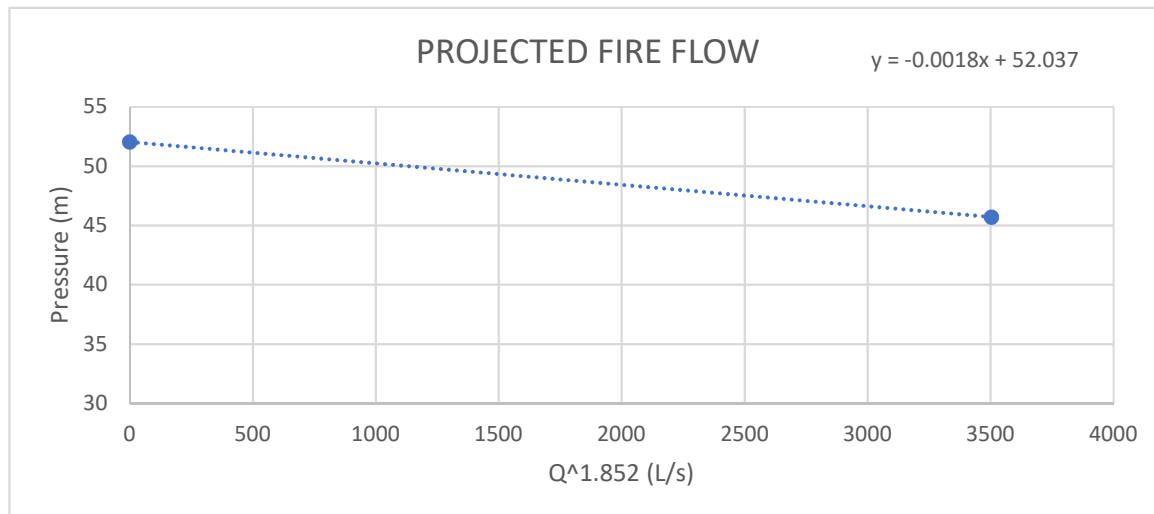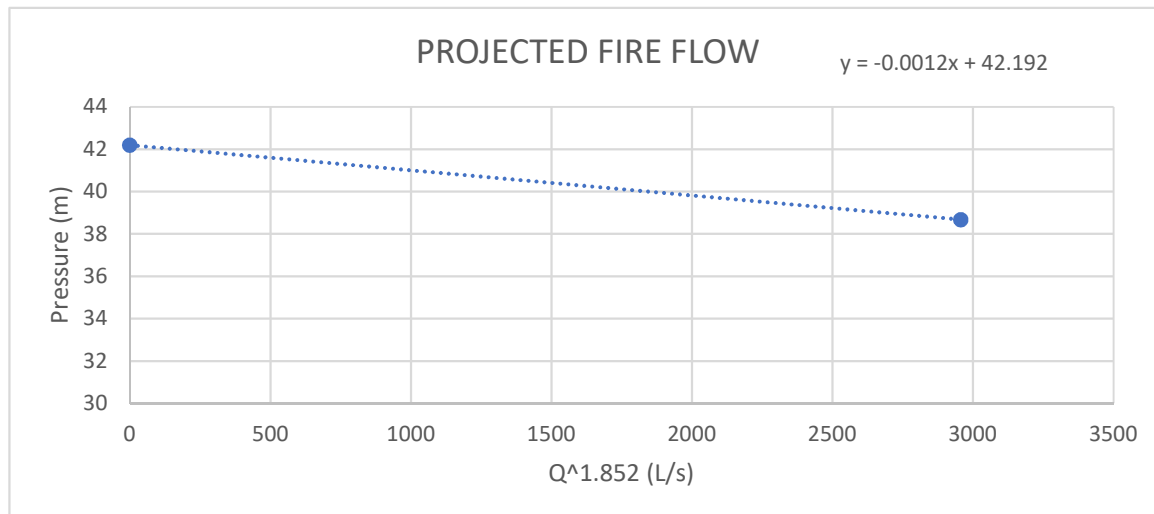
FIRE FLOW CALCULATION SHEET

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Flow Test Provided by: Town of Niagara-on-the-Lake
Hydrant Location: South corner of intersection of Gate and Queen

FLOW TEST RESULTS

TEST	PRESSURE (psi)	FLOW RATE (USGPM)	FLOW RATE (L/s)	$Q^{1.852}$	PRESSURE (m)
STATIC	60	0	0	0	42.19
RESIDUAL 1	55	1186	74.82	2956.19	38.68

PROJECTED FIRE FLOW $y = -0.0012x + 42.192$

FIRE FLOW FORMULA (y = ax + b)

a =   -0.0012
b =   42.19

FIRE FLOW AT A SPECIFIED PRESSURE

Pressure =   20 psi
Pressure =   14.06 m
$Q^{1.852}$ =   23438.33
Flow, Q =   228.86 L/s
Flow, Q =   3627.53 USGPM

Fire Underwriters Survey

Water Supply for Public Fire Protection (2020) Calculations

222 GATE STREET, NIAGARA-ON-THE-LAKE

Required Fire Flow in Litres per Minute	F=	9,520	(L/m)
		158.67	(L/s)
		2,515	(USgmp)

Type of Construction

Ordinary Construction (brick or other masonry walls, combustible floor and interior).	C=	1.00

Total Floor Area in square metres	A=	503.1	(m2)

Total Number of Floors		2

2. Combustibility of Contents *(may not reduce fire flow demand below 2,000 L/min)*

Limited Combustible	=	-15%

3. Sprinkler Systems

Is there a complete automatic sprinkler protection system per NFPA (Yes/No).	No	0%
Water supply standard for both system and fire department hose lines (Yes/No).	No	0%
Is system fully monitored (Yes/No).	No	0%

Total Sprinker Reduction to Overall Fire Flow Demand	0%

4. Spacial Separation of Neighbouring Structures (within 45 metres)

Location of Building:

BUILDING NAME		
Distance to Nearest Building to the North	19.7 m	15%
Distance to Nearest Building to the South	9.4 m	20%
Distance to Nearest Building to the East	10.1 m	15%
Distance to Nearest Building to the West	26.0 m	10%

Total Spacial Separation to Adjacent Structures	60%

Additions

Is roof wood shingles or shakes (Yes/No).	No

APPENDIX B

Sanitary Sewer Calculation Sheet

UPPER CANADA CONSULTANTS
3-30 HANNOVER DRIVE
ST.CATHARINES, ONTARIO
L2W 1A3

DESIGN FLOWS		SEWER DESIGN	
PEAKING FACTOR:	2.0 MINIMUM 1.5 PER MECP DESIGN CRITERIA	PIPE ROUGHNESS:	0.013 FOR MANNING'S EQUATION
INFILTRATION RATE:	0.286 L / s / ha (M.O.E FLOW ALLOWANCE IS BETWEEN 0.10 & 0.28 L	PIPE SIZES:	1.016 IMPERIAL EQUIVALENT FACTOR
HOTELS	225.0 L/DAY/BED SPACE (ASSUME 2 SPACES PER ROOM, MECP)	PERCENT FULL:	TOTAL PEAK FLOW / CAPACITY

MUNICIPALITY: TOWN OF NIAGARA-ON-THE-LAKE
PROJECT : 222 GATE STREET   **SANITARY SEWER DESIGN SHEET**
PROJECT NO: 24035

LOCATION			AREA		POPULATION		ACCUMULATED PEAK FLOW				DESIGN FLOW					
Location and Description	From M.H	To M.H.	Increment (hectares)	Accumulated (hectares)	Number of Units	Total Population Served	Peaking Factor	Flow (L/s)	Infiltration Flow L/s	Total Peak Flow (L/s)	Pipe Diameter (mm)	Pipe Length (m)	Pipe Slope (%)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Percent Full
222 GATE STREET	HOTEL	EX SEWER	0.08	0.08	18	36	2.00	0.19	0.02	0.21	200	10.0	1.00	1.06	34.22	0.6%
GATE STREET	EX MH	EX MH		0.08				0.19	0.02	0.21	200	59.6	0.84	0.97	31.36	0.7%

APPENDIX C

Figure 1 – Overall Storm Drainage Area Plan
Weighted Impervious Calculation Sheet
Storm Sewer Calculation Sheet

GATE STREET

QUEEN STREET

JOHNSON STREET

ONE MILE CREEK

EX
0.92
0.66

FUT
0.92
0.71

EX BLDG

PROPOSED DEVELOPMENT SITE

CB

CB
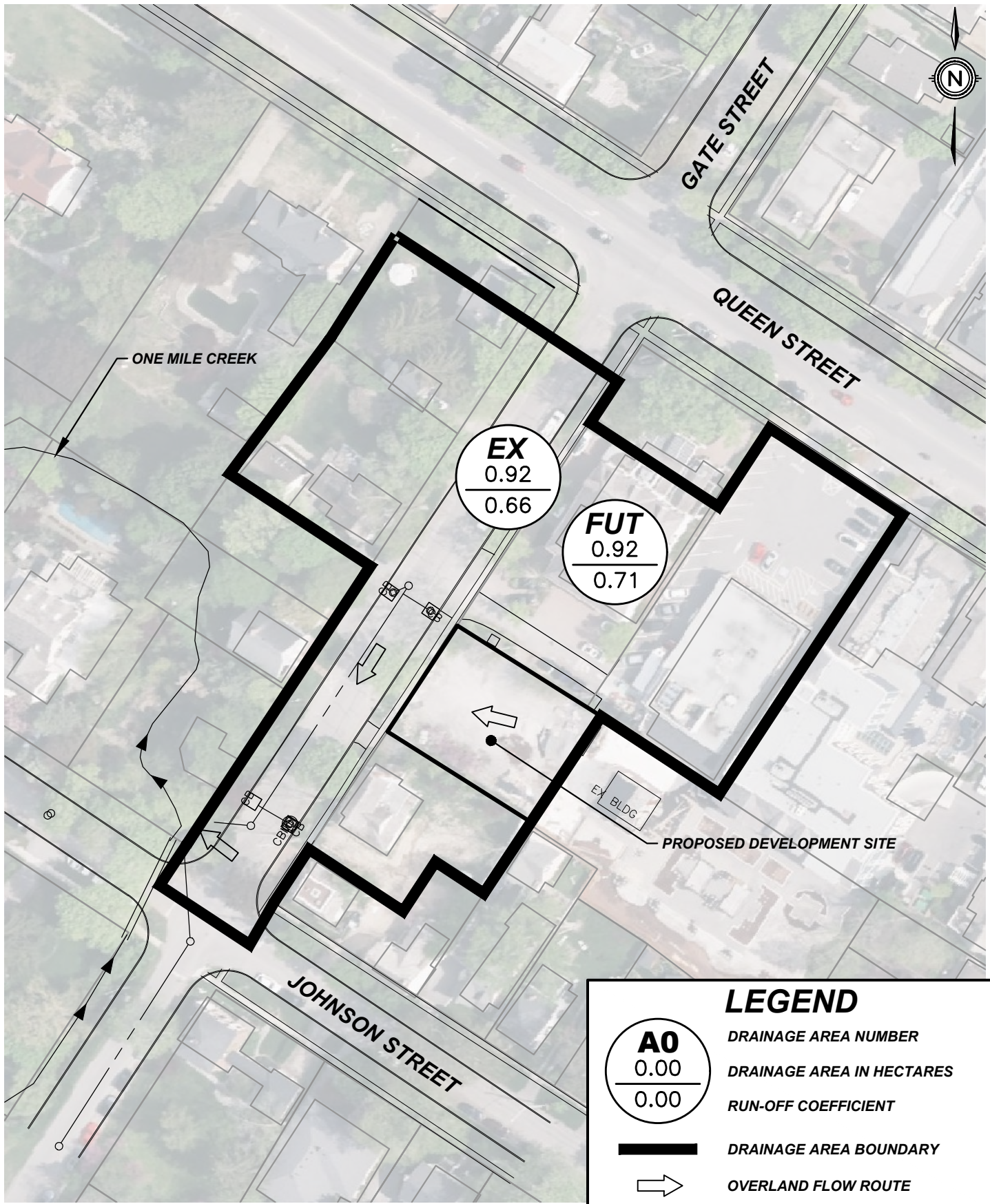
LEGEND

A0
0.00
0.00

DRAINAGE AREA NUMBER

DRAINAGE AREA IN HECTARES

RUN-OFF COEFFICIENT

DRAINAGE AREA BOUNDARY

OVERLAND FLOW ROUTE

N

UPPER CANADA
CONSULTANTS
ENGINEERS / PLANNERS

124 ON QUEEN
TOWN OF NIAGARA-ON-THE-LAKE
OVERALL DRAINAGE AREA PLAN

DATE	2024−11−11
SCALE	1:1000 m
REF No.	*24035*
DWG No.	*FIGURE 1*

Weighted Imperviousness Percentage Calculation Worksheet

Project Name:	124 on Queen
Project Number:	24035
Date:	November 2024
Person:	K.Tiessen

EX - EXISTING CONDITIONS

	Footprint	Runoff Coefficient	Effective Impervious Area
Residential	3311.7 m^2	0.40	1324.7 m^2
Roadway	2615.6 m^2	0.70	1830.9 m^2
Commercial	3309.9 m^2	0.90	2978.9 m^2
TOTAL CATCHMENT IMPERVIOUS AREAS			6,135 m^2
TOTAL CATCHMENT AREA			9,237 m^2
		EFFECTIVE RUNOFF COEFFICIENT	**0.66**

PROP - PROPOSED CONDITIONS

	Footprint	Runoff Coefficient	Effective Impervious Area
124 on Queen	796.0 m^2	0.90	716.4 m^2
Residential	2515.7 m^2	0.40	1006.3 m^2
Roadway	2615.6 m^2	0.70	1830.9 m^2
Commercial	3309.9 m^2	0.90	2978.9 m^2
TOTAL CATCHMENT IMPERVIOUS AREAS			6,533 m^2
TOTAL CATCHMENT AREA			9,237 m^2
		EFFECTIVE RUNOFF COEFFICIENT	**0.71**

UPPER CANADA CONSULTANTS
3-30 HANNOVER DRIVE
ST. CATHARINES, ON L2W 1A3

STORM SEWER DESIGN

MUNICIPALITY:	TOWN OF NIAGARA-ON-THE-LAKE		5 YEAR	100 YEAR	
PROJECT:	124 ON QUEEN	A =	664.00	980.00	mm/hr
UCC PROJECT NO.:	24035	B =	4.70	3.70	minutes
		C =	0.744	0.732	

PIPE ROUGHNESS = 0.013
PIPE CONVERSION FACTOR = 1.016

DESCRIPTION			STORMWATER ANALYSIS										STORM SEWER DESIGN					
LOCATION	FROM MH	TO MH	AREA (ha)	ACCUMLTD AREA (ha)	RUNOFF COEFFICNT	A*R	ACCUMLTD A*R	T of C (min.)	PIPE TIME (min.)	T of C (sum)	INTENSITY (mm/hr)	FLOW (L/s)	LENGTH (m)	DIAMETER (mm)	SLOPE (%)	CAPACITY (L/s)	VELOCITY (m/s)	PERCENT FULL
5 YEAR ANALYSIS																		
EXISTING																		
GATE STREET	EX MH	EX MH	0.92	0.92	0.66	0.609	0.609	10.00	0.55	10.55	89.9	151.9	55.1	375	1.09	191.04	1.7	79.5%
	EX MH	OUTLET		0.92			0.609	10.55	0.05	10.60	87.5	147.9	8.2	375	2.7	299.56	2.6	49.4%
FUTURE																		
GATE STREET	EX MH	EX MH	0.92	0.92	0.71	0.655	0.655	10.00	0.55	10.55	89.9	163.4	55.1	375	1.09	191.04	1.7	85.6%
	EX MH	OUTLET		0.92			0.655	10.55	0.05	10.60	87.5	159.1	8.2	375	2.7	299.56	2.6	53.1%
100 YEAR ANALYSIS																		
EXISTING			0.92		0.66	0.609	0.609	10.00			144.3	243.8						
FUTURE			0.92		0.71	0.655	0.655	10.00			144.3	262.3						