1 Columbia Street West

Fire Flow Analysis

Project Location:
1 Columbia Street West, Waterloo, ON

Prepared for:
Studio Limina Inc.
180 Shaw Street, Suite 315, Toronto, ON

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

May 30, 2024

MTE File No.: 40459-101

Engineers, Scientists, Surveyors.

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1.0 INTRODUCTION

MTE Consultants Inc. has been retained by Studio Limina Inc to conduct a fire flow analysis for the proposed 7-storey residential building addition located 1 Columbia Street West in Waterloo. The proposed building will be connected to the existing residential building at 1 Columbia Street West through the underground parking structure. The existing municipal hydrant at the south west corner of the Columbia Street West and King Street North intersection will be relied upon.

The purpose of this report is to confirm the available fire flows and residual pressure from the existing 200mm diameter watermain along Columbia Street West.

2.0 WATER DISTRIBUTION

The new building addition will be serviced internally through the existing building. Water is currently brought into the existing building by a 150mm diameter water services off of the 200mm watermain on Columbia Street West. The new building additional will be equipped with sprinklers. A new private hydrant is not proposed since the existing hydrant is within 45m of the proposed fire department connection.

For this design, we have utilized the information obtained from the municipal hydrants located on Columbia Street West. The following table illustrates the results of the testing completed by Northern Sprinkler Design.

Table 2.1 – Results of Flow Tests Completed (May 6, 2024)

Test #	Outlet Inside Diameter (in)	Number of Outlets	Pitot Pressure (psi)		Residual Pressure (psi)	Flow @ Residual (gal/min)
1	n/a	n/a	n/a		68	n/a
2	2.5	1	50		67	1,187
3	2.5	2	32	32	65	1,899

Refer to Appendix A for the information obtained by Northern Sprinkler Design.

3.0 ANALYSIS OF ON-SITE FIRE PROTECTION

The building will be analyzed for fire water supply requirements using the OBC 2012 and FUS 2020. The analysis will determine if the theoretical pressure of the proposed on-site fire hydrant is acceptable for firefighting.

Using the OBC 2012:

- Building Classification: Group C
- Calculate: Q = KVS_{tot} (Table 1 of OBC 2012 Appendix A-3.2.5.7.(3) & Table 2)
  K = water supply coefficient (A-3.2.5.7 Table 1)
  V = volume of building (m^3)
  S_{tot} = 1 + total spatial coefficients

Table 3.1 – Water Demand (OBC)

Building	Building Area (m^2)	Building Volume (m^3)	K	S_{tot}	Q (litres)	Required Minimum Water Supply Flow Rate (litres/min)*
Proposed Addition	4,640	12.992	10	2.0	259,840	6,300

* from Table 2 of OBC 2012 Appendix A-3.2.5.7

Using FUS 2020:

Table 3.2 – Water Demand (FUS)

Building	Construction Coefficient	Area	Required Fire Flow	Occupancy Reduction	Sprinkler Protection	Building Exposure	Required Minimum Water Supply Flow Rate (litres/min)*
Proposed Addition	0.8	4,640	11,989	-15%	-30%	50%	12,000

Max day domestic demand was calculated as 3.37L/s. Therefore, the required minimum water supply flow rate (max day plus fire flow) is 6,502L/min based on Ontario Building Code and 12,202L/min based on FUS.

When subject to the max day plus FUS fire flow, the residual pressure at the proposed hydrant was calculated to be 414.0kPa (60psi) which is greater than the minimum allowable pressure of 140kPa per OBC 2012. Refer to Appendix B for calculations.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the flow tests provided by Northern Sprinkler Design, it can be concluded that the minimum water supply flow rate of 12,202L/min can be delivered to the existing hydrant on the subject site with a residual pressure (at the nozzle of the hydrant) under fire fighting conditions of 414.0kPa, thus meeting the minimum requirements of the Ontario Building Code (2012).

All of which is respectfully submitted,

MTE Consultants Inc.



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Appendix A

Test Flow Results

NORTHERN SPRINKLER DESIGN

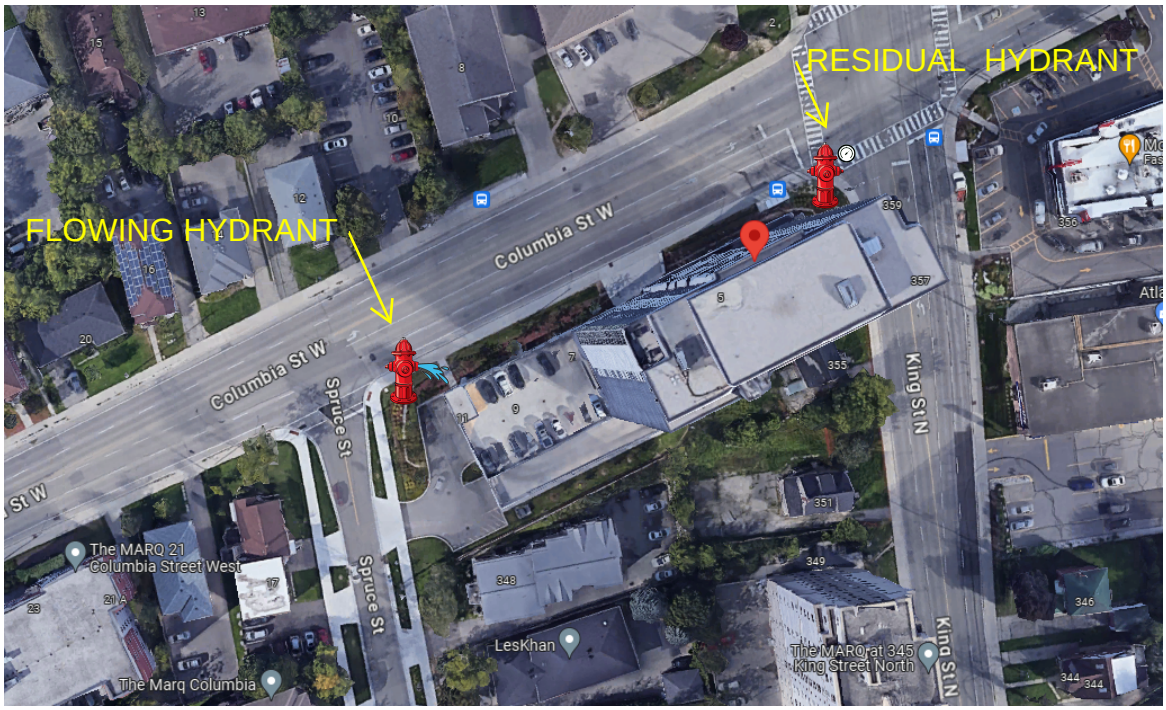
FLOW TEST REPORT

Form SD-003A RevDate: Dec 01, 2021

PROJECT INFORMATION			
Project Name:	1 Columbia St. Flow Test	Design Project #:	2024-NSD-033
Site Address:	1 Columbia St. Flow Test Waterloo ON	Const. Project #:	NA
City Contact:	Mona x30277	Phone #:	519-886-2310
Flow Tester:	**Rob Smith**	Phone #:	**226-376-3053**
Technical Contact:	**Andy Coghlin**	Phone #:	**519-476-0761**

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:
☐ Flow Direction (if the main is dead end)	☐ Site Hydrant(s)	Site:

SITE NOTES

Customer has requested that the hydrant at the corner of Columbia and King to be the residual hydrant.

445 Colborne St. London, ON N6B 2T2 northernsprinklerdesign.com 1-866-798-1154

NORTHERN SPRINKLER DESIGN

FLOW TEST REPORT

Form SD-003A RevDate: Dec 01, 2021

TEST INFORMATION			
Minimum Required Flow:	NA	Min Ports:	2
Personnel Present:	**Rob Smith**	Test Date:	2024-05-06
City / External Company:	Waterloo Utilities	Test Time:	10:30am

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					68
1 Port	2.5	0.9	50	1,187	67
2 Ports	2.5	0.9	32 / 32	1,899	65
3 Ports	2.5	0.9		0	
4 Ports	2.5	0.9		0	
0 Ports	**STATIC RE-CHECK**				68

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

Calculations

1 Columbia Street West

FIRE FLOW DEMANDS

Waterloo, Ontario

Project #: 40459-101

Date: December 5, 2023

Date Printed: 12/8/2023

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 Bedrooms	Population	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 + OBC Fire Flow
				# of people	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*
A	337.80	Modified Ex. Apartment Bldg	392	392																		1.021	1.021	2.807	4.216	0.408	3
B	335.80	Proposed Addition	78	78	4,640	12,992	10	12,992	2.00	259,840	6,300	105	0.80	4,640	11,989	-15%	-30%	50%	12,000	200	200	0.203	0.203	0.559	0.839	0.081	203
TOTALS FOR SITE			**470**	**470**	**4640**	**12992**				**Max Fire Flow =**		**105**						**Max Fire Flow =**		**200**	**200**	**1.22**	**1.22**	**3.37**	**5.05**	**0.49**	**203**

Sum of Maximum Day Flows + Largest Fire Flow (L/s) = 203

Assumptions:

1 All building areas and populations are based on the Site Plan by Studio Limina Inc. Assumed a conservative 1 persons per bedrooms for domestic flow calculations.

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

1 Columbia Street West

FIRE FLOW ANALYSIS

Waterloo, Ontario

Project Number: 40459-101
Date: May 29, 2024
Design By:
File: Q:\40459\101\Dec 2023 submission\Site Fire Flow Analysis.xlsx

CALCULATION OF RESIDUAL PRESSURE AT ON-SITE HYDRANT

1. Boundary Conditions (Based on Fire Flow Test Results):					
	Metric		**Imperial**		
P0 - Starting Pressure	47.82	*m*	68	*psi*	
P1 - Pressure at Q1	45.71	*m*	65	*psi*	
Q1 - From Fire Flow Test	7188	*L/min*	1899	*U.S. gal/min*	
Q2 - Required Flow	12202	*L/min*	3223	*U.S. gal/min*	From: Water Demand calculations by MTE
P-loss 1	2.11	*m*	3	*psi*	
P-loss 2	5.62	*m*	8	*psi*	
P2 - Residual Pressure	**42.20**	***m***	**60**	***psi***	Extrapolated from Fire Flow Test Results