

Functional Servicing Report for
143 Columbia Street W.
143 Columbia Street West, City of Waterloo

November 03, 2021
Revised August 10, 2023

Project Reference Number 20-261



K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS

85 McINTYRE DRIVE, KITCHENER, ONTARIO N2R 1H6
TELEPHONE (519) 748-1199 FAX (519) 748-6100

Table of Contents

Introduction.....	1
Background Information.....	1
Sanitary Servicing.....	1
Water Servicing	2
Stormwater Servicing	2
Conclusions.....	3

Appendices

Appendix A – Sanitary Sewer Design Sheet

Appendix B – Water Demand and Fire Flow Requirement Calculations

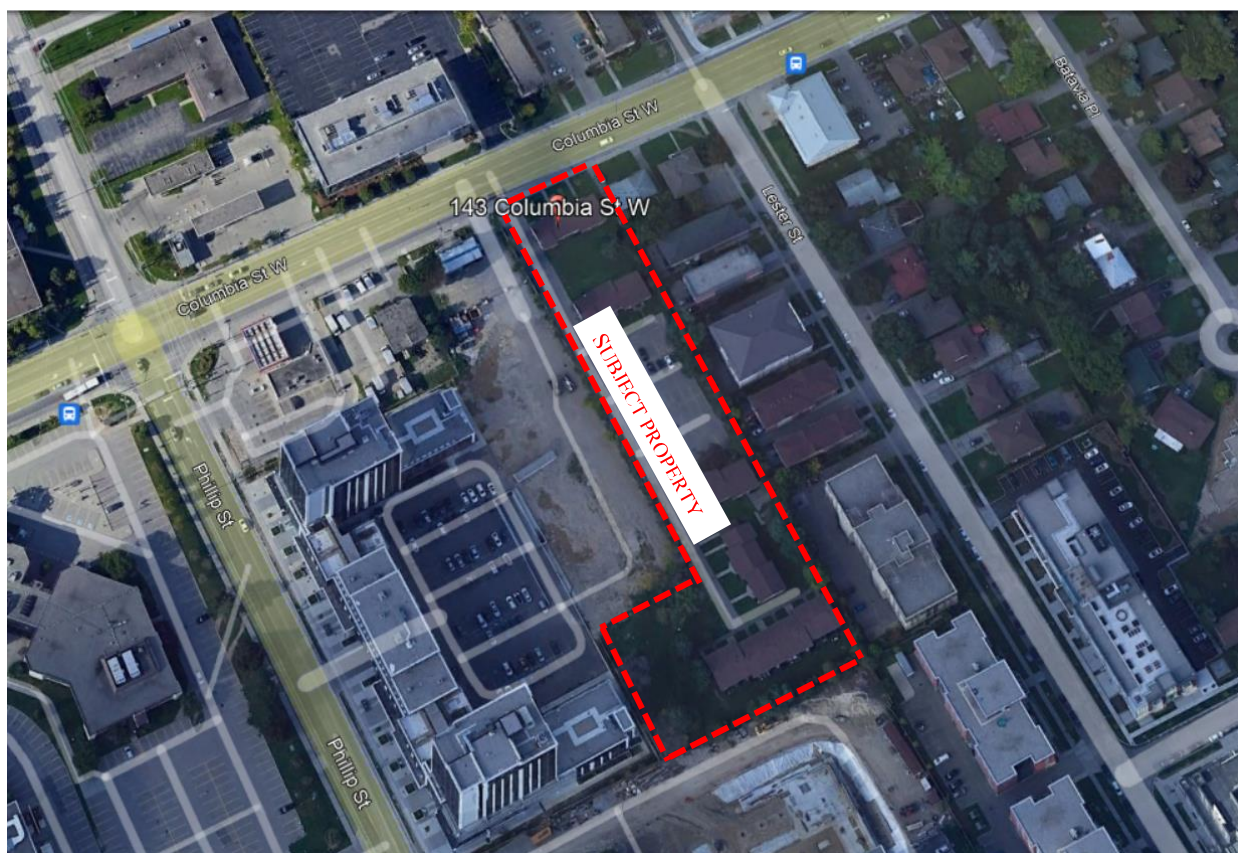
Introduction

This report will review the functional servicing for the proposed development at 143 Columbia Street West, City of Waterloo, Ontario.

Background Information

The subject property includes block 143 on Columbia Street West in City of Waterloo. The 0.8 ha property is located on the south side of Columbia Street West. The site is currently occupied by five (5) apartment buildings. There is a paved parking lot in the middle of the property, and landscaping fills the remainder of the property land. The ground surface has a gentle slope from south to north. The proposed 25 story buildings will replace the existing buildings. The subject property is bounded by Columbia Street West to the north, existing residential buildings to the east, existing asphalt path and property lands to the west, and property lands to the south. The site location is shown below.

Figure 1- Site Location



Sanitary Servicing

There is an existing 250 mm diameter sanitary sewer, which runs along the front property line on Columbia Street West.

The proposed development consists of three (3) - 25 story buildings. The wastewater flows from the proposed development are calculated using 2019-Region of Waterloo's Design Guidelines

and City of Waterloo-Development Engineering Manual Part 7 guidelines. The peak sanitary flow including infiltration was calculated using the population density estimate of 1.76 persons per unit (apartments), an average flow of 275 L/c/d, peak factors according to Harmon formula, and an inflow and infiltration allowance of 0.25 L/s/ha.

The total peak flow from the proposed development was calculated to be 16.04 L/s. The wastewater of all buildings will be drained to 250 mm sanitary laterals. The proposed 200 mm diameter sanitary sewer will finally convey the collected wastewater to Manhole MH1A at the front of the property borderline on Columbia Street West.

The sanitary sewer design sheet for the proposed development is included in Appendix A.

Water Servicing

There is an existing 300 mm diameter watermain in Columbia Street West. A new 150mm diameter water service will be extended from the existing watermain to the buildings. The water service will provide for fire suppression and domestic water supply to the buildings.

The residential water demand was calculated based on historic information. The specific usage rate is 225 L/c/d as outlined in the Region's "Water Supply and Distribution Optimization Master Plan, 2015"

Residential Average Day Demand = 225 L/c/d
Residential Maximum Day Demand = 7.45 L/s

The commercial daily water demand was calculated based on Ministry of the Environment - Ontario Design Guidelines for Drinking-Water Systems 2008 - 3.4.3 Commercial and Institutional Water Demands.

Commercial Average Day Demand = 0.13 L/s

The Fire Flow was calculated using Ontario Building Code 3.2.5.7 Municipal Fire Flow Analysis. Total liters per minute required in the municipal water system is 9000 L/min at 20.3 Psi, which is less than total available water of 21977.34 L/min at 20.3 Psi in the municipal water system.

Detailed Calculations are included in Appendix B.

Stormwater Servicing

The proposed development consists of three (3) - 25 story buildings and parking lots. The east areas of buildings A and B will drain to proposed catchbasin CB1, and catchbasin manhole CBMH1. The southeast area of Building B will drain to the proposed catchbasin CB2. The south backyard will drain to the proposed catchbasin CB3. The parking and promenade areas between buildings A and B will drain to CBMH2. The promenade areas between buildings B and C will drain to catchbasin manhole CBMH4. The parking area between Buildings B and C will drain to catchbasin CB2. The northwest area of Building A will directly drain to Columbia Street West. All rooftop storages, catchbasins, manholes, and catchbasin manholes will be drained to the

proposed storm sewer located west of buildings A and B and finally to manhole MH1 in Columbia Street West.

The catchbasin manhole CBMH1 is equipped with 150 mm control orifice and catchbasin CB2 is equipped with a 75 mm orifice for quantity control of the outflow to the storm sewer system of Columbia Street West.

The catchbasin manhole CBMH1 and catchbasin CB2 will discharge to the oil grit separator OGS1 which drains to catchbasin manhole CBMH2. The OGS structure will provide quality control prior to draining to MH1 in Columbia Street West.

The proposed stormwater management will result in a reduction in flows compared to the existing conditions.

There is an existing 750mm diameter Storm sewer in Columbia Street West.

Table 1: Peak Discharge Rates from Subject Property

Design Storm	Existing Condition			Proposed Condition		
	<i>Total to Columbia Street West (m³/sec)</i>	<i>Total to Phillip Street (m³/sec)</i>	<i>Total to Municipal Sewer System (m³/sec)</i>	<i>Total to Columbia Street West (m³/sec)</i>	<i>Total to Phillip Street (m³/sec)</i>	<i>Total to Municipal Sewer System (m³/sec)</i>
5 year	0.097	0.006	0.103	0.092	0.00	0.092
100 year	0.195	0.028	0.210	0.158	0.00	0.158

Full details of the stormwater management plan are included in the Stormwater Management Report prepared by K. Smart Associates Limited under a separate cover.

Conclusions

1. The proposed development will be serviced with a 200mm diameter sanitary service to the existing 250mm diameter sanitary sewer in Columbia Street West.
2. Each 25-story building of the proposed development will be serviced with a 150mm diameter water service connection. The water service will provide for fire suppression and domestic water supply. The water service will connect to the existing 300mm diameter watermain in Columbia Street West.
3. The proposed development will include stormwater management on site to provide quality and quantity control of runoff. The outlets of parking lot ponds will be directed to an OGS unit and finally to the existing 750mm storm sewer in Columbia Street West.

Hossein Moarefi, P.Eng.
K. Smart Associates Limited

K. Smart Associates Limited



APPENDIX A

Sanitary Sewer Design Sheet

143 Columbia Street, Waterloo

SANITARY SEWER DESIGN SHEET

K. Smart Associates Limited
 Project Number: 20-261
 Date: 18-Oct-21
 Designed by: Hossein Moarefi, P. Eng.
 Checked by: David Harsch, P.Eng.

Residential Sewage Flow¹ 0.004 L/s/c (275 L/d/c)
 Density- one bedroom² 1.76 c/unit
 Building A Units: 202 Commercial Floor Area(ha):
 Building B Units: 202 Commercial Floor Area(ha):
 Building C Units: 187 Commercial Floor Area(ha):
 Residential Peaking Factor $1+14/(4+\sqrt{P})$, P = Pop/1000
 Commercial Sewage Flow 0.95 L/s/ha (Core)
 Commercial Peaking Factor 2.5
 Infiltration³ 0.25 L/s/ha

LOCATION						SEWAGE FLOWS							SEWER DESIGN						
Street	From MH	To MH	Total Area (ha)	Comm. Floor Area (ha)	Total Pop.	Res. Peaking Factor	Average Res. Flow (L/s)	Peak Res. Flow (L/s)	Average Comm. Flow (L/s)	Peak Comm. Flow (L/s)	Infiltration (L/s)	Total Peak Flow (L/s)	Mannings 'n'	Pipe Size (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	
	Building C	MH4A	0.32	0	329	4.06	1.316	5.346	0.000	0.000	0.080	5.43	0.013	250	1.00	7.5	59.47	1.211	
	Building B	MH3A	0.26	0.0121	356	4.05	1.422	5.754	0.011	0.029	0.065	5.85	0.013	250	1.00	6.5	59.47	1.211	
	Building A	MH2A	0.22	0.0193	356	4.05	1.422	5.754	0.018	0.046	0.055	5.85	0.013	250	1.00	6.5	59.47	1.211	
	MH4A	MH3A	0.32	0	329	4.06	1.316	5.346	0.000	0.000	0.080	5.43	0.013	200	1.00	28	32.80	1.044	
	MH3A	MH2A	0.58	0.0121	685	3.90	2.739	10.681	0.011	0.029	0.145	10.85	0.013	200	1.00	65	32.80	1.044	
Columbia Street W	MH2A	MH1A	0.8	0.0314	1040	3.79	4.161	15.764	0.030	0.075	0.200	16.04	0.013	200	1.00	58	32.80	1.044	

Notes:

1-Region of Waterloo and Area Municipalities - Design Guidelines and Supplemental Specifications - for Municipal Services - January 2019 (DGSSMS), Part B Design Guidelines - B.3.1.2.1 Residential

2- The City of Waterloo Development Engineering Manual 2013 Design 7.0 - Sanitary Sewers

3-Region of Waterloo and Area Municipalities - Design Guidelines and Supplemental Specifications - for Municipal Services - January 2019 (DGSSMS), Part B Design Guidelines - B.3.1.2.6 Extraneous Flows

APPENDIX B

Water Demand and Fire Flow Requirement Calculations

WATER DEMAND CALCULATIONS

143 Columbia, City of Waterloo

K. Smart Associates Limited	
Project Number:	20-261
Date:	18-Oct-21
Designed by:	Hossein Moarefi, P. Eng.
Checked by:	David Harsch, P.Eng.

Residential	
Number of units	591
Population density	1.76 persons per unit
Residential ¹ Average Daily Demand:	225 L/c/d
Residential Peaking Factor:	2.75
Max. Daily Water Demand:	7.449 L/s

Commercial	
Commercial area	0.4 ha
Commercial Average Daily Demand ¹ :	28 m ³ /ha/d
Average Daily Water Demand:	0.130 L/s

Notes:

- 1- 2019 DGSSMS - Region of Waterloo and Area Municipalities - Design Guidelines and Supplemental Specifications for Municipal Services - January 2019 - B.2.2.2 Domestic
- 2- Ministry of the Environment - Ontario Design Guidelines for Drinking-Water Systems 2008 - 3.4.3 Commercial and Institutional Water Demands

ONTARIO BUILDING CODE 3.2.5.7 MUNICIPAL FIRE FLOW ANALYSIS REPORT

- 1.01 BUILDING NAME: **143 Columbia Inc.**
- 1.02 ADDRESS: **143 Columbia Street, Waterloo**
- 1.03 ATTACHMENTS:
- Y** N SITE PLAN C/W REQUIRED FIRE HYDRANT LOCATIONS (OBC 3.2.5.7 (2), 3.2.5.16 (1), 3.2.5.16 (2) AND THE WATER FLOW TEST AND RESIDUAL HYDRANT LOCATIONS.
- Y** N WATER FLOW TEST (FLOW AND RESIDUAL DATA C/W GRAPH.)
- 1.04 BUILDING CODE CLASSIFICATION: **C, A2, F3** TYPE OF CONSTRUCTION: O.B.C 3.2.2# **42, 57 & 73**
- 1.05 BUILDING AREA IN SQUARE METERS = **750m²**
- 1.06 BUILDING VOLUME IN CUBIC METRES = **52,571.029 m³**
- Y** N BUILDING WILL HAVE 100% SPRINKLER PROTECTION IN ACCORDANCE WITH THE ONTARIO BUILDING CODE AND REFERENCED N.F.P.A STANDARDS. ENGINEERED SPRINKLER DRAWINGS AND HYDRAULIC CALCULATIONS WILL BE SUBMITTED UNDER SEPARATE COVER TO THE BUILDING DEPARTMENT FOR APPROVAL WHEN COMPLETED. **(FIRE FLOW ANALYSIS NOT REQUIRED)**
- Y** N PRIVATE FIRE HYDRANT(S) AND SPRINKLER SYSTEM(S) TO BE CONNECTED TO THE MUNICIPAL WATER SYSTEM AND CALCULATED WITH A DEMAND LESS THAN THAT AVAILABLE.
- Y** N PRIVATE FIRE HYDRANT(S) AND SPRINKLER SYSTEM(S) WILL BE CONNECTED TO AN INDEPENDENT WATER SOURCE FROM THE MUNICIPAL SYSTEM.
- 1.07 CALCULATION: $Q = K \times V \times Stot$ (Q=MINIMUM SUPPLY OF WATER IN LITRES, K=WATER SUPPLY COEFFICIENT FROM TABLE 1, V=TOTAL BUILDING VOLUME IN CUBIC METRES, Stot=TOTAL SPATIAL COEFFICIENT VALUES FROM PROPERTY LINE EXPOSURES ON ALL SIDES AS OBTAINED FROM FORMULA: $Stot = 1.0 + (SIDE1 + SIDE2 + SIDE3 + SIDE4)$ MINIMUM=1 MAXIMUM=2.0
 $Q = K @ 12 \times V @ 52,571.029m^3 \times Stot @ 1.8 = 1,135,534.226$ LITRES
 $Stot = 1 + S1 (.5) + S2 (.15) + S3 (.0) + S4 (.15) = (1.8)$
- 1.08 TOTAL LITRES PER MINUTE REQUIRED IN THE MUNICIPAL WATER SYSTEM AS PER TABLE 2 = **9,000** LITRES PER MINUTE AT 140 KPA (20.3PSI).
- 1.09 TOTAL LITRES PER MINUTE AVAILABLE IN THE MUNICIPAL WATER SYSTEM = (5,805.80gpm) **21,977.34** LITRES PER MINUTE AT 140KPA (20.3PSI).
- 1.10 TOTAL STORED LITRES REQUIRED ON SITE IF NOT SUFFICIENT MUNICIPAL WATER = ...
1.8 – 1.9 - LITRES x 30 MINUTES = ... LITRES.

COMPLETED BY: **Jeff Hayhurst** (print).....(Signature) DATE: Nov. 2, 21

