February 27, 2025

Knox United Church
92 Northumberland Street
Ayr, ON N0B 1E0

Attention: Mike Schmidt

Dear Mr. Schmidt,

Re: Preliminary Servicing and Stormwater Management Letter
92 Northumberland Street, Ayr
Township of North Dumfries

This letter has been prepared for the above-noted project, in support of a zone change application.

This 0.88-hectare site is located on Northumberland Street north of downtown Ayr, opposite Hall Street. The existing site consists of a church building with a parking lot and is zoned "Z.13": Institutional. It is bounded by existing residences to the north and south, Northumberland Street to the east, and the Nith River valley land zoned "Z.12" to the west. The site location is shown in Figure 1 below.

Figure 1: Site Location

The proposed development is a 4-storey residential building consisting of 33 affordable housing apartments, with a combined institutional and residential parking lot between the existing church and the new building, as shown on the attached Preliminary Site Plan (Attachment 1). The development is proposed to be rezoned to "Z.5/5a": Urban Residential. The Grand River Conservation Authority (GRCA) regulation limit extends into the development area at the rear of the property.

Sanitary Servicing

The primary objective with respect to sanitary servicing is that a sanitary sewer system servicing the site can be constructed as per MECP and Region of Waterloo (SSMS) standards. The development will outlet into existing infrastructure in Northumberland Street, therefore it will be necessary to demonstrate that the existing sewers have capacity for this development.

As shown on the Conceptual Site Servicing and Grading Plan (Attachment 2), a 525mm diameter sanitary trunk sewer exists in front of the site along Northumberland Street. The location of the existing church's sanitary service will be verified, but will be maintained. Based on the proposed development, peak flows were determined by applying peaking factors to the average day demand of 275L/capita/day as specified by SSMS design guidelines. The site is assumed to have a density of 1.77 people per unit, according to the current version of the Region of Waterloo's Water and Wastewater Monitoring Report. Refer to the attached sanitary design sheet (attachment 3).

Type of Flow	Density (ppu)	Total Units	Population	Peak Flow (L/s)
Apartment	1.77	33	59	**1.0**

Table 1: Sanitary Flows

Table 1 shows that the development generates a peak (wet weather) flow of 1.0 L/s from the site. This peak flow represents 19% of the capacity of a 100mm diameter sanitary service, or 3% of a 200mm diameter service. Flows from the existing church are not expected to impact the proposed sanitary size. Available existing sanitary capacity along Northumberland Street shall be confirmed by the Region.

Water Servicing

There are two objectives regarding water servicing: provide domestic water supply as per MECP and Region of Waterloo (SSMS) requirements, and ensure that an adequate firefighting water supply is available as per the Ontario Building Code and other Regional requirements (specifically, FUS fireflow calculations).

There is a 250 diameter watermain on Northumberland Street. An existing fire hydrant is located on the north corner of Northumberland Street and Hall Street, directly across from the entrance to the site. The size and location of the existing church building's service will be confirmed.

The Region of Waterloo has provided pressure information for junction JCT_10021 located at Northumberland Street and Hall Street (Attachment 4). It shows at this location, the system is

able to provide a firefighting flow of 250 L/s. This information will be used to demonstrate that the proposed internal water system will be able to provide fire protection as per FUS guidelines above the minimum required pressure.

Required firefighting flows can be calculated using OBC methodology, which yields a maximum value of 150 L/s, or the more conservative FUS calculations, which could reach 750 L/s. Typically, FUS flows are several times larger than OBC flows for the same building size.

The firefighting demand of the proposed building per FUS guidelines has been calculated as 195 L/s, which is less than the available fire flow of 250 L/s confirmed from the Region. This assumes that the building will not be sprinklered, which will be confirmed at a future time.

The proposed development will generate a base domestic water demand of 0.15 L/s for the design population of 59 people at a base demand of 225 L/cap/day. The domestic flow is negligible compared to the required fire flow for the site.

An internal hydrant is required, as the straight-line distance between the closest existing municipal hydrant and the proposed building exceeds the OBC maximum of 90 metres. The Conceptual Site Servicing and Grading Plan shows the proposed watermains. Metering requirements will be confirmed with the Region in the detailed design stage, with the expectation that a single meter in the chamber near Northumberland Street will be the ultimate configuration.

For the estimated firefighting flow of 195 L/s and a maximum design velocity of 5 m/s, a 250mm diameter water service would be required; a standard 150mm diameter water service yields a velocity of 11 m/s. If the building has a sprinkler system, the required firefighting flow will be substantially less than estimated, and a 150mm diameter water service will likely be adequate. Since the watermain in the street is 250mm diameter, it would be possible to have a 250mm diameter service.

Storm Servicing

The primary objective with respect to storm servicing is that a storm sewer system servicing the site can be constructed as per MECP, Region of Waterloo (SSMS), and Township of North Dumfries standards. On-site stormwater management features shall be reviewed in conjunction with the storm servicing to ensure discharge targets can be met.

There is an existing 375mm concrete storm sewer along Northumberland Street that drains to the south. The existing servicing from the church (if any) will be investigated at a future time.

The proposed storm sewer system for the development will consist of inlet structures, storm sewers, parking lot ponding, and both rooftop and underground storage to capture, attenuate, and convey runoff from the developed portion of the site. It will discharge south towards the Nith River valley.

Coordination with the geotechnical engineer, and further/future consultation with the GRCA, will be necessary to ensure that the proposed storm sewer outlet design meets all agency requirements.

Stormwater Management

The portion of the site consisting of the existing church building drains towards the existing storm sewer in Northumberland Street; this drainage area is not proposed to be altered.

As the portion of the site proposed to be developed will be highly impervious, unattenuated post-development flows would exceed pre-development flows. Thus, peak flow attenuation is required. The proposed stormwater management plan is to match post-development peak flows to pre-development levels for all required storm events draining towards the Nith River. A combination of rooftop storage and parking lot ponding will be sufficient to manage minor storm events (2-year and 5-year). If required by approval agencies, underground and/or parking lot ponding storage can be incorporated to attenuate flows from the major storm event (100-year). Nearby developments draining towards the river have historically not been required to attenuate the 100-year runoff. Stormwater management modelling will be completed during the site plan approval process.

An oil/grit separator is proposed to provide an enhanced level of quality control. The layout of these features is illustrated on the attached conceptual plan. Water balance (infiltration measures) will be considered once a geotechnical report is completed and necessary soil and groundwater information is known.

Utilities

The following utility companies are required to confirm their ability to service the development:

- GrandBridge Energy
- Enbridge Gas
- Bell Canada
- Rogers Cable

Grading and Drainage

Runoff from the existing church area at the front of the site drains to Northumberland Street. The runoff from the rest of the site currently drains from northeast to southwest, directly towards the Nith River at the rear. This overall drainage pattern will be maintained.

Drainage from the proposed development is proposed to be directed into the parking area where it will undergo stormwater quantity and quality control. Both the outflow and an overflow will be directed towards the Nith River to the south. Retaining wall(s) may be considered to the south of the parking area to maximize the parking lot ponding area, if needed. Existing property line elevations will be maintained, to maintain existing drainage patterns external to the site.

Erosion and Sediment Control

Construction activities can cause erosion of native soils, and deposition of sediment on other properties or in receiving watercourses. To avoid these problems siltation control measures such as silt fences and mud mats is utilized.

Conclusions and Recommendations

It is our opinion that adequate services are available and can support the proposed development as it is described in this letter.

The proposed sanitary service can convey the site's peak flows to the 525mm diameter sanitary sewer on Northumberland Street. Adequate downstream receiving capacity should be confirmed by the Region.

Provision of a watermain into the site to an internal hydrant will provide adequate flow as per Region guidelines for firefighting supply. Details will be confirmed through the site plan approval stage.

The stormwater management plan includes an oil/grit separator, rooftop storage, and potentially parking lot ponding and/or underground storage to attenuate various storm events to match pre-development peak flow rates.

Water balance (infiltration features) will be considered once a geotechnical report is completed.

Additional grading, servicing, and stormwater management details will be provided in the detailed design phase.

Approval agencies shall review and approve this document as a suitable approach to a preliminary design configuration and re-zoning approval.

Yours very truly,

MERITECH ENGINEERING

Digitally signed
by Xiaochen Cai
Date:
2025.02.27
11:54:52-05'00'

Xiaochen Cai
CAD Designer

Chris H. Togeretz, P.Eng.
Manager, Design Services

XCC/

Enclosures:
Attachment 1 - Site Plan
Attachment 2 - Conceptual Site Servicing and Grading Plan
Attachment 3 - Sanitary Sewer Design Sheet
Attachment 4 - Region of Waterloo letter: water modeling results
Attachment 5 - FUS Fire Flow Calculation

cc

Attachment 1

1 SITE PLAN
1 : 250

SITE DATA

92 Northumberland St, Ayr, ON N0B 1E0

DATA		REQUIRED		PROVIDED
ZONING [BY-LAW 689-83]		Z.13	Z.5/5a	
LOT AREA (m²)				8,785.6 (m²)
SETBACKS	FRONT YARD (m)	--	7.5 (m)	EXISTING
	INTERIOR SIDE YARD (m)	4.5 (m) OR 1/2 HEIGHT	1.2m (1S) 2.4m (2S+)	4.5 (m)
	INTERIOR SIDE YARD (m)	4.5 (m) OR 1/2 HEIGHT	1.2m (1S) 2.4m (2S+)	EXISTING
	REAR YARD (m)	7.5 (m)	7.5 (m)	5.0 (m) TAKEN FROM TOP OF SLOPE SETBACK

BUILDING DATA

DATA	REQUIRED		PROVIDED
TOTAL DENSITY (# of units)	--		33 (units)
EXISTING BUILDING AREA (m²)	--		853.6 (m²)
BUILDING AREA (m²)	--		617.3 (m²)
GROSS FLOOR AREA (m²)	--		2,469.2 (m²)
GROSS CONSTRUCTION AREA (m²)	--		3086.6 (m²)
NUMBER OF STOREYS	3 MAX	3 MAX	4
BUILDING HEIGHT (m)	13.5 (m) MAX.	12 (m) MAX.	12 (m)
AMENITY AREA (m²)	--	--	59.1 (m²)

LOT COVERAGE DATA

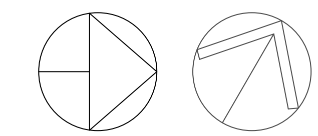
DATA	REQUIRED	PROVIDED
LANDSCAPE AREA (%)	-- (%)	50.0 (%)
LANDSCAPE AREA (m²)	-- (m²)	4,391.3 (m²)
ASPHALT AREA (%)	-- (%)	33.3 (%)
ASPHALT AREA (m²)	-- (m²)	2,922.3 (m²)
BUILDING AREA - PROPOSED. (%)	50 (%) MAX (Z13)	7.0 (%)
BUILDING AREA (m²)	-- (m²)	617.3 (m²)
BUILDING AREA - EXISTING (%)	50 (%) MAX (Z13)	9.7 (%)
BUILDING AREA (m²)	-- (m²)	853.7 (m²)

VEHICLE PARKING DATA

DATA	REQUIRED	PROVIDED
RESIDENTIAL PARKING	1.5 per unit = 49	21
BARRIER FREE PARKING	--	4 (INCLUDED)
INSTITUTIONAL PARKING	8 per 100 (m²) = 68.3	65
	TOTAL	86

UNIT BREAKDOWN

DATA	PROVIDED	PERCENTAGE
1 BED	9 UNITS	27%
2 BED	24 UNITS	73%
TOTAL	33 UNITS	



No.	Date	Revision

SRM architects+ urban⋆designers

Project No	23046
Issue Date	2025-01-21
Drawn by	CRZ
Checked by	RPH
Plot Date / Time	2025-01-22 10:32:43 AM

92 NORTHUMBERLAND KNOX CHURCH UNITED

SITE PLAN

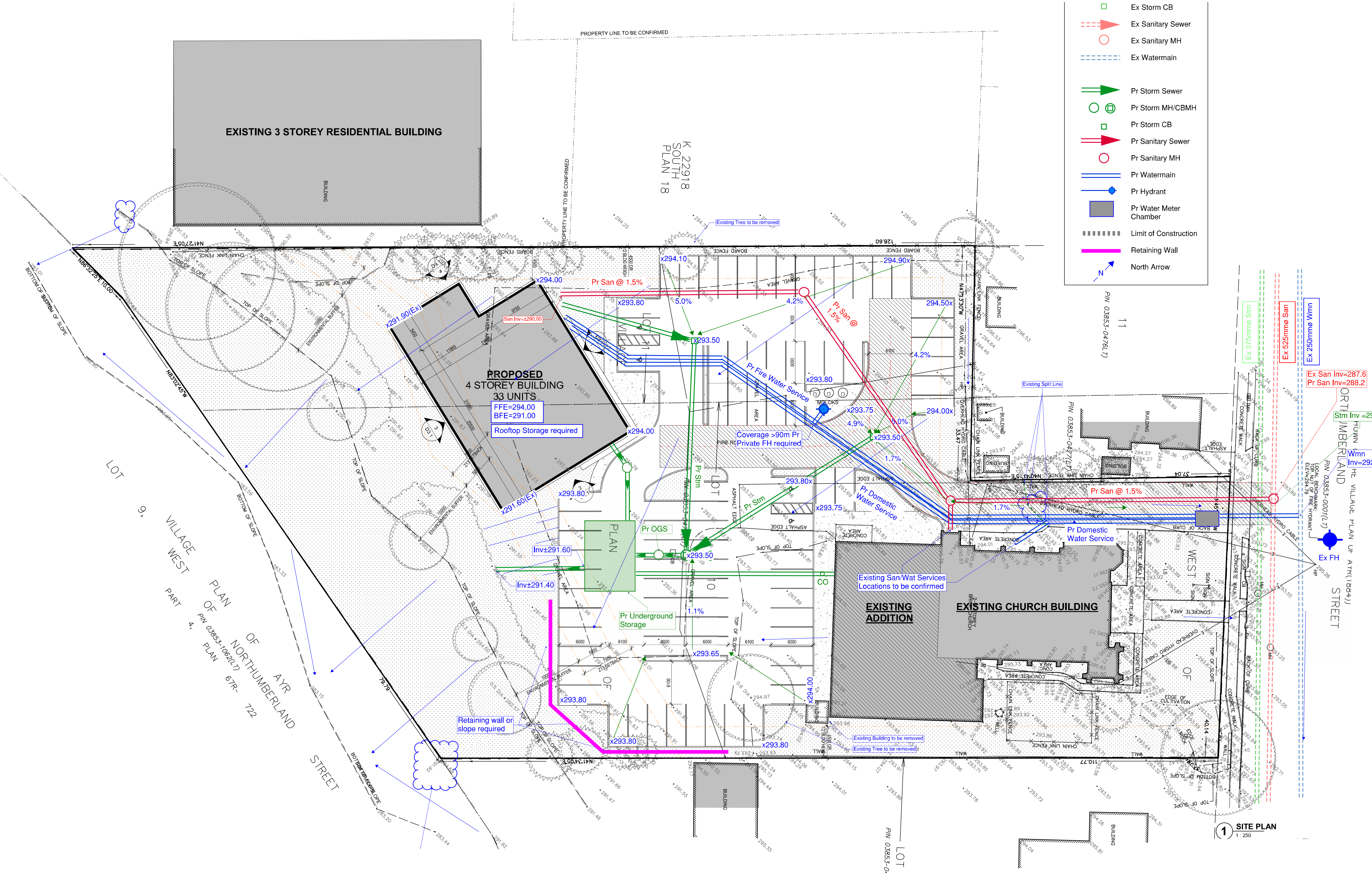
PRELIMINARY

Drawing Scale: As indicated

Status

Drawing No. / Revision No.

D1.1



DRAWING: 92 Northumberland Street, Ayr
Conceptual Site Servicing and Grading Plan

DRAWN BY: XCC | CHECKED BY: CHT | SCALE: 1:250

FILE NAME: 4392.CP.pdf | DATE: Feb 27, 2025 | Attachment 2

MERITECH

Sanitary Sewer Design Sheet

for

The Region of Waterloo

Project: 4392
File: 92 Northumberland Street
Calc'd by: XCC
Date: 11-Feb-25
Chk'd by: CHT
Date: 25-Feb-25

Pipe Velocities:	0.60	m/s min. (pipe full)	
	3.00	m/s max. (actual flow)	
n=	0.013	all pipe material	
Residential average daily flow (q):	275	L/cap/d	(B.3.1.2.1 from SSMS)
Unit extraneous flow (E):	0.25	L/s/ha	(B.3.1.2.6 from SSMS)

q = average daily per capita flow (L/cap/d)
I = Unit of peak extraneous flow (L/s/ha)
Q(p) = peak population flow (L/s)
Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)

Peaking Factor:
M = 1 + 14/(4+(P/1000)^0.5)
Q(p) = (P/1000)qM/86.4 (L/s)
Q(I) = IA (L/s) ; where A = Area in hectares
Q(d) = Q(p) + Q(I) (L/s)

Manning Equation:
Qcap. = (D/1000)^2.667*(S/100)^0.5/(3.211*n)*1000 (L/s)
D: pipe size (mm)
S: slope (grade) of pipe (%)
n: roughness coeffiecient

Location		Unit Count (ppu)	Residential 0.0032 (L/s/cap)						Infiltration 0.25				Pipe							
		1.77	Individual		Accumulative		Peak	Pop.	Total	Accum	Extran.	Design	Length	Size	Pipe	Slope	Capacity	Velocity		Actual
From	To	Apart.	P (person)	Area (ha)	P (person)	Area (ha)	Factor M	Q(p) (L/s)	Area	Total Area	Q(I) (L/s)	Q(d) (L/s)	L (m)	D (mm)	Mat'l	S (%)	Qcap. (L/s)	V (m/s)	Q(d)/Qcap	Velocity (m/s)
Site																				
Site	Street	33	59	0.88	59	0.88	4.300	0.807	0.880	0.880	0.220	1.027	100.0	100	PVC	1.00%	5.389	0.665	19.1%	0.538

Region of Waterloo

ENGINEERING AND ENVIRONMENTAL SERVICES
Water and Wastewater Services
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www.regionofwaterloo.ca/water

Sarah Kerr
Meritech
1315 Bishop Street North, Cambridge
sarahk@meritech.ca

Date: November 15, 2024

Dear: Sarah Kerr

Re: 92 Northumberland St

Please find the results of the modeling simulations for boundary conditions requested on October 18th, 2024. The results include a figure showing the location of the node from the Region's model. Attached are a series of spreadsheets containing results for Average Day, Maximum Day demands and available fire flows for node JCT_10021 located at Northumberland St and Hall St. The diurnal 24-hour demand distribution accounts for the minimum hour and peak hour peaking factors. The maximum pressure on the average day represents the minimum hour, and the minimum pressure on the maximum day represents the peak hour.

Table 1 – Modeling Results

Node	Elevation (mASL)	Demand		Fire Flow Results	
		Ave Day (L/s)	Max Day (L/s)	Design Flow (L/s)	Design Pressure (m)
JCT_10021	293.0	0.10	0.10	250.1	22.0

A fire flow analysis shows the maximum flow available at a node with an associated design pressure during the maximum day scenario while maintaining the minimum design pressure of 14 m (140 kPa) at all nodes within the pressure zone.

If you have any questions, please contact me

Kevin Dolishny P.Eng.
Senior Engineer, Water Services
c. 226.751.4551
e. kdolishny@regionofwaterloo.ca

Ayr 92 Northumberland St

JCT_10021 Average Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.08	339.64	46.64
01:00 hrs	0.11	342.34	49.34
02:00 hrs	0.16	344.16	51.16
03:00 hrs	0.21	343.02	50.02
04:00 hrs	0.27	342.28	49.28
05:00 hrs	0.40	341.30	48.30
06:00 hrs	0.43	343.57	50.57
07:00 hrs	0.43	342.53	49.53
08:00 hrs	0.38	341.29	48.29
09:00 hrs	0.39	343.18	50.18
10:00 hrs	0.33	342.86	49.86
11:00 hrs	0.28	341.82	48.82
12:00 hrs	0.30	342.85	49.85
13:00 hrs	0.30	344.20	51.20
14:00 hrs	0.31	342.11	49.11
15:00 hrs	0.28	342.55	49.55
16:00 hrs	0.30	343.93	50.93
17:00 hrs	0.33	342.31	49.31
18:00 hrs	0.34	341.17	48.17
19:00 hrs	0.29	342.20	49.20
20:00 hrs	0.24	341.23	48.23
21:00 hrs	0.19	340.37	47.37
22:00 hrs	0.10	339.72	46.72
23:00 hrs	0.10	342.08	49.08
Average Day HGL:		342.20	
Minimum Hour:		344.20	

JCT_10021 Maximum Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.09	345.10	52.10
01:00 hrs	0.12	344.66	51.66
02:00 hrs	0.16	344.15	51.15
03:00 hrs	0.22	343.51	50.51
04:00 hrs	0.28	342.74	49.74
05:00 hrs	0.42	341.72	48.72
06:00 hrs	0.45	342.96	49.96
07:00 hrs	0.45	344.15	51.15
08:00 hrs	0.40	345.26	52.26
09:00 hrs	0.41	344.60	51.60
10:00 hrs	0.35	343.41	50.41
11:00 hrs	0.29	342.34	49.34
12:00 hrs	0.32	341.24	48.24
13:00 hrs	0.32	343.53	50.53
14:00 hrs	0.33	344.83	51.83
15:00 hrs	0.30	346.13	53.13
16:00 hrs	0.32	344.11	51.11
17:00 hrs	0.35	342.94	49.94
18:00 hrs	0.36	341.75	48.75
19:00 hrs	0.31	342.89	49.89
20:00 hrs	0.25	344.36	51.36
21:00 hrs	0.19	345.89	52.89
22:00 hrs	0.11	344.90	51.90
23:00 hrs	0.10	344.40	51.40
Maximum Day HGL:		343.82	
Peak Hour:		341.24	

Ayr 92 Northumberland St

Available Flow (L/s)	Residual Pressure (m)
0.0	49.3
20.0	48.7
40.0	47.7
60.0	46.4
80.0	44.9
100.0	43.1
120.0	41.1
140.0	38.8
160.0	36.3
180.0	33.5
200.0	30.6
220.0	27.3
240.0	23.9
250.1	22.0

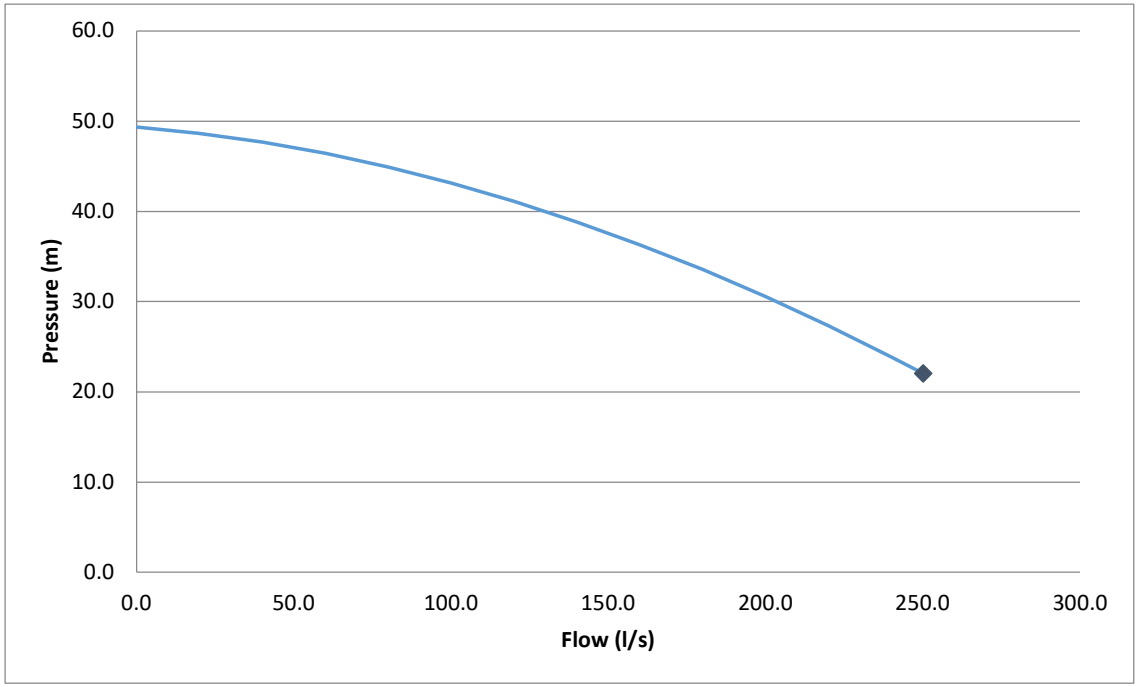
Fire Flow Analysis

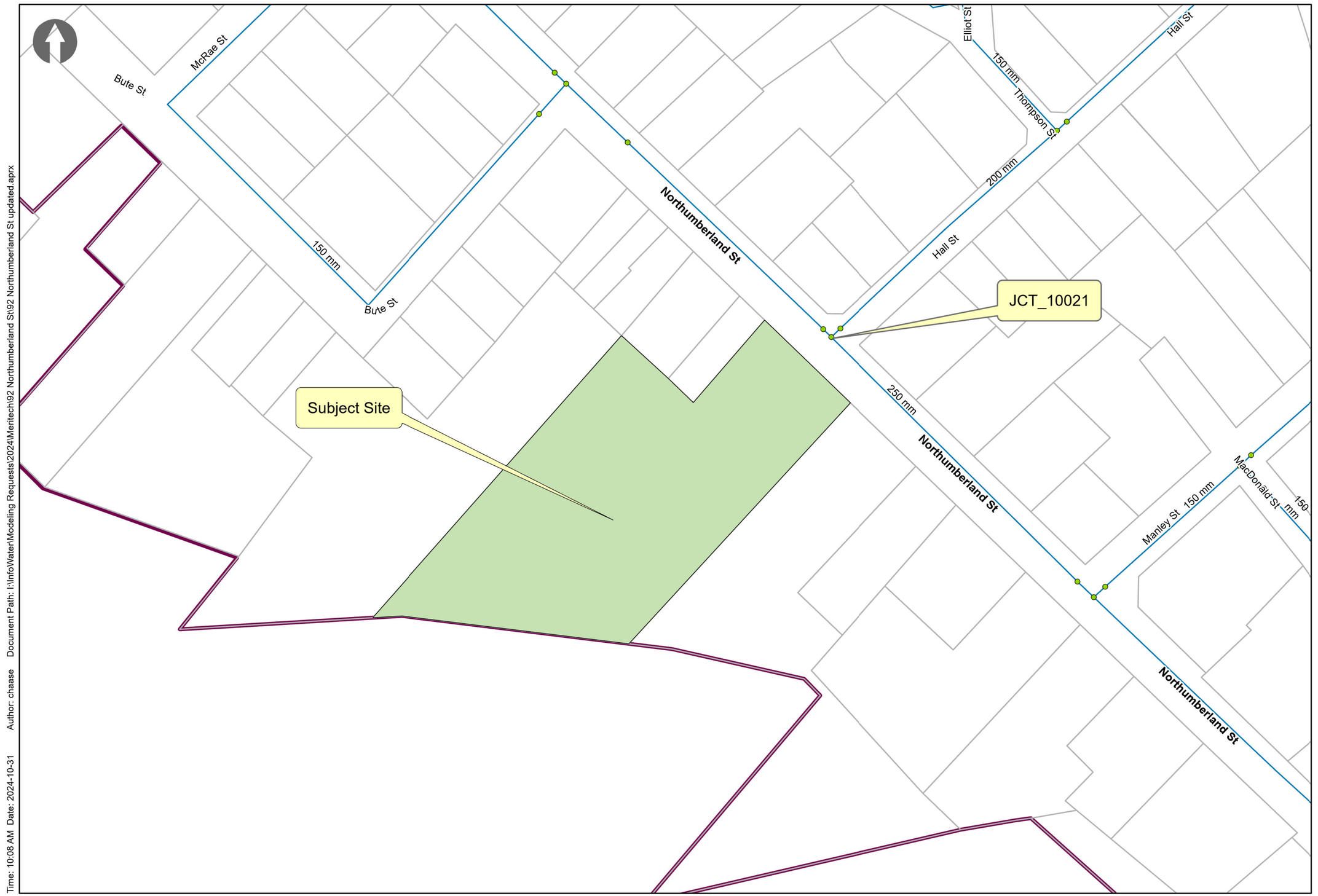
Fire Flow Node:	JCT_10021
Design Flow (L/s):	250.1
Design Pressure (m):	22.0

Design Flow: *The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Design Pressure: *The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Critical Node ID: *The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.*





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Region of Waterloo

ENGINEERING AND
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- Junction
- Pipe
- Subject Site
- Assessment Parcels (MPAC)

92 Northumberland St
Ayr

MERITECH

Fire Flow Calculations

1999 Fire Underwriters Survey (FUS) Method

Project: 92 Northumberland Street
File: 4392
Calculated by: XCC
Date: 11-Feb-25
Checked by: CHT
Date: 25-Feb-25

Pr Building

Buildings require a sufficient amount of water, based on the FUS, for fire fighting purposes.
The required fire flow (L/minute) is expressed by the equation:

where **C =** Coefficient related to the type of construction.
A = Floor area (m²)

$$F = 220 \cdot C \cdot \sqrt{A}$$

A)	**Building structure 'C'**	**=**	1.0
B)	**A (m²)**	**=**	618.00
C)	**# Floors (excl. basement)**		4
D)	**F (L/min)**	**=**	10938
	Rounded	**=**	**11000**

E) Type of occupancy/contents

- ○ Non-Combustible
- ◉ Limited Combustible
- ○ Combustible
- ○ Free Burning
- ○ Rapid Burning

Fire hazard adjustment	**=**	-15%
Adjustment	**=**	**-1650**
F_{adj} (L/min)		**9350**

F) % reduction based on sprinkler system effectiveness **=** 0.00%
Reduction **-** **0**

G)

	Distance to nearest building (m)	% addition
N	53.0	0%
E	33.0	5%
S	99.0	0%
W	8.0	20%

% addition based on building separation	**=**		25%
Addition	**+**	**2338**	

H) **Total Fire Flow**	**=**	11688	L/min
	=	**195**	**L/sec**