349 Danforth Avenue, Ottawa
Assessment of Adequacy of Public Services

Project # CW-03-20

Prepared for:

Frank Porcari

337 Sunnyside Ave., Suite 101

Ottawa, ON, K1S 0R9

By:

Arch-Nova Design Inc.

October 2020

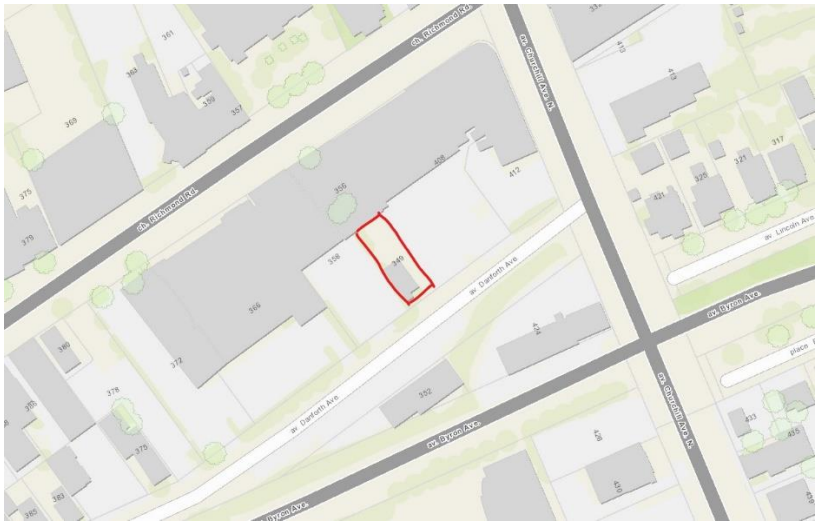
Table of Contents

1. Introduction

The subject property is located at 349 Danforth Avenue, Ottawa. The proposed work comprises of a mixed use 3-storey+basement building. For the purpose of this report the site is considered to run north-south. Danforth Avenue is extending east-west between Churchill Avenue on its east end and Roosevelt Avenue on its west end.

Currently the property is used as a residential lot with a single house which is scheduled for demolition. The rest of the lot is a driveway and a parking at rear of the property. On the east side of the property is separated with construction curbs from adjacent property, large parking lot. The property on the north is a commercial building. On the west side there is another parking lot.

The area is serviced by municipal water 150 mm, 225 mm sanitary sewer and 375 mm storm sewer. The sidewalk in front of the property is at elevation between 68.87 and 69.04 m. a.s.l.



349 Danforth Avenue, Ottawa: Location

2. Public Services Capacity

This section of the report will analyze existing municipal services and the potential impact of the proposed building at 349 Danforth Avenue on the existing service capacity.

2.1 Water Supply

Existing building is supplied from 150 mm pipe and calculated consumption is 0.16 l/sec for the peak period.

Fire hydrant is located east from the property at distance of 7.50 m, which is sufficient for use of this hydrant by fire department and its vehicles and it provides fire protection for the site.

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	280 L/d/P
Residential Maximum Daily Demand	9.5 x Average Daily *
Residential Maximum Hourly	1.5 x Maximum Daily *
Commercial Demand	2.5 L / m2 /d
Commercial Maximum Daily Demand	1.5 x Average Daily
Commercial Maximum Hourly	1.8 x Maximum Daily
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During Peak Hourly Demand operating pressure must remain within	275kPa and 552kPa
During fire flow operating pressure must not drop below	140kPa
* Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.	

Table 1: Water Supply Design Criteria

[1]The following are boundary conditions, HGL, for hydraulic analysis at 349 Danforth Avenue (zone 1W) assumed to be connected to the 150 mm on Danforth Avenue.

Minimum HGL = 108.0 m

[1] City of Ottawa boundary condition information is based on current operation of the city water distribution system (also see Appendix A for complete correspondence information)

Maximum HGL = 114.8 m

Max Day (0.61 L/s) + Fire Flow (105.0 L/s) = 101.0 m, the estimated ground elevation is 69.0 m.

The consumption is expected to be **60.42 l/min (1.01 L/sec)** for peak period. The fire flow for residential spaces was estimated to be 3,210 l/min (53.51 l/sec)[2]. The City staff provided information on available flow of 105.0 l/sec at 20psi and 69.0 m a.s.l. With fire hydrant at distance of 7.5 m and available fire flow, the proposed building will be sufficiently protected from fire.

Fire flow calculated in accordance with Fire Underwriters Survey guideline is 9,000 l/min (150 l/sec) and it cannot be achieved so OBC calculation is recommended as the minimum required and sufficient.

Calculation in Table 1 presents the City of Ottawa design criteria based on MOE Guidelines.

2.2 Sanitary Sewer

Sanitary sewer outflow for the current building is 0.06 l/sec (wet weather peak flow). The lateral is connected to sanitary sewer 225 mm.

The estimated outflow for the new building is **0.26 l/sec** (peak flow + wet weather).

Existing municipal sewer 225 mm has a capacity of 2.89 l/sec for 0.46% slope and 20% full. For additional 0.20 l/sec the increase will be 6.9 %. The capacity at 80% full is 32.25 l/sec where the additional inflow makes 0.6%.

[2] OBC SectionA.3.2.5.7, Table 2.

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/cap/day
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-01)	0.8
Commercial Space	28,000 L/ha/day
Infiltration and Inflow Allowance	0.33L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	Q =(1/n)AR2/3S1/2
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012 & Infrastructure Technical Bulletins 2018	

Table 2: Wastewater Design Criteria

Detailed calculation of pre and post development flow is presented in Appendix A.

2.3 Site Stormwater Services

Current building and the rest of surface of the lot at 349 Danforth Avenue represent a typical urban site. All stormwater runoff is under uncontrolled condition. For the purpose of protecting the municipal sewer system the City of Ottawa requires that the predevelopment 5-year runoff coefficient should be in range of C=0.4 so the newly developed site must store certain amount of water.

The proposed new building and area of the lot will increase the runoff TO C=0.76 and this will require the stormwater retention on site in order to match the predevelopment runoff condition.

Proposed stormwater retention will prevent increase of stormwater inflow into the system. Detailed calculation is provided in Appendix

A. The stormwater storage is proposed on the new building's flat roof. Total storage required for the 100 year event is 8.94 m^3.

The foundation drain (weeping tiles) is connected to the stormwater 375 manhole on the street. Also it is bypassed to the sump in the basement before the backflow prevention valve (to be installed on the lateral) in case of high level and surcharge in the system. The pump water out to surface and further to street catch basins. The reason for this solution is in very shallow stormwater recipient pipe (375 mm).

The ground floor balcony is proposed to be drained through a drain and a lateral (100 mm) underneath the building and connected to the foundation drain. Alternative solution (confined space for installation) is to connect the drain to the sump.

Two roof scuppers with ICD control plates will be drained toward the front of the property. Both roof drains will provide maximum of 0.75 l/sec each.

3. Conclusion and Recommendation

3.1 Water Supply

The water supply demand calculation is based on the fire flow requirement for residential buildings; it is be 3,210 l/min (53.51 l/sec). The City provided information that required flow is available at 108.0 m of HGL. The building roof is at elevation of 79.0 m which leaves 32.0 psi of residual pressure at minimum pressure.

3.2 Sanitary Sewer

Existing municipal sewer 225 mm has a capacity of 2.89 l/sec for 0.46% slope and 20% full. For additional 0.20 l/sec the increase will be 6.9 %. The capacity at 80% full is 32.25 l/sec where the additional inflow makes 0.6%.

Addition of new building should not overcharge existing system.

3.3 Stormwater

Currently all runoff is directed toward the street and catch basins. The proposed grading plan also directs all runoff toward the street. The proposed new building and area will store excess of water in order to match the predevelopment runoff.

The proposed new building and area of the lot will increase the runoff TO c=0.76 and this will require the stormwater retention on site in order to match the predevelopment runoff condition.

Proposed stormwater retention will prevent increase of stormwater inflow into the system. Detailed calculation is provided in Appendix A. The stormwater storage is proposed on the new building's flat roof. Total storage required for the 100 year event is 8.94 m^3.

The new development will not increase the runoff from the site so there will be on impact on the receiving system.

Prepared by:

Zoran Mrdja, P.Eng.

Professional Engineers Ontario

Authorized by Professional Engineers of Ontario to provide professional services to public

October 2020

Appendix A: Calculations

Water Supply Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	350 L/d/P
Residential Maximum Daily Demand	9.5 x Average Daily *
Residential Maximum Hourly	1.5 x Maximum Daily *
Commercial Demand	2.5 L / m2 /d
Commercial Maximum Daily Demand	1.5 x Average Daily
Commercial Maximum Hourly	1.8 x Maximum Daily
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
must remain within	275kPa and 552kPa (40-80 psi; 28-56m)
During fire flow operating pressure must not drop below	140kPa (20 psi; 14 m)
* Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.	

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	0	0
Semi-detached	2.7		0
Townhouse	2.7		0
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4	0	0
2 Bedroom	2.1	5	11
3 Bedroom	3.1	3	9
4 Bedroom	4.2	0	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	20	5.54	3.85	52.67	36.58	79.00	54.86

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	Unit Rate		Units	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Commercial floor space	2.5	$L/m^2/d$	0	0.00	0.00	0.00	0.00	0.00	0.00
Office	75.0	$L/9.3m^2/d$	0	0.00	0.00	0.00	0.00	0.00	0.00
Restaurant*	125.0	L/seat/d							
Industrial -Light	35,000.0	L/gross ha/d							
Industrial -Heavy	55,000.0	L/gross ha/d							
Total I/C/I Demand				0.00	0.00	0.00	0.00	0.00	0.00

Total Demand	5.54	3.85	52.67	36.58	79.00	54.86

* Estimated number of seats at 1seat per $9.3m^2$

Water Demand and Boundary Conditions

Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] (kPa)
Average Daily Demand	3.85	
Max Day + Fire Flow	8,036.58	
Peak Hour	54.86	

[1)] Water demand calculation per Water Supply Guidelines. See Appendix B for detailed calculations.

[2)] Boundary conditions supplied by the City of Ottawa. See Appendix B for correspondence with the City.

Wastewater Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/cap/day
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-0	0.8
Commercial Space	28,000 L/ha/day
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = (1/n)AR^{2/3}S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012.	

Sanitary Sewer Post Development Outflow

Site Area	**0.04 ha**
Extraneous Flow Allowances	
Infiltration / Inflow	**0.0132 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	**Pop**
Single Family	3.4	0	0
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4	0	0
2 Bedroom	2.1	5	10.5
3 Bedroom	3.1	3	9.3
4 Bedroom	4.2	0	0
		Total Population	**19.8**
		Average Domestic Flow	**0.06 L/s**
		Peaking Factor	**3.9**
		Peak Domestic Flow	**0.25 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Commercial	28,000 L/gross ha/d	0	0.00
Institutional	28,000 L/gross ha/d	0	0.00
Industrial - Light	35,000 L/gross ha/d	0	0.00
Industrial - Heavy	55,000 L/gross ha/d	0	0.00
		Average I/C/I Flow	**0.00**
		Peak Institutional / Commercial Flow*	**0.00**
		Peak Industrial Flow**	**0.00**
		Peak I/C/I Flow	**0**

Total Estimated Average Dry Weather Flow Rate	**0.06**
Total Estimated Peak Dry Weather Flow Rate	**0.25**
Total Estimated Peak Wet Weather Flow Rate	**0.26**

Ottawa TechBulletin ISTB-2018-01 Section 4.4.1 Page 4.5

**Use Apendix 4B diagram

Fire Flow Calculation Ontario Building Code 2006 (Appendix A)

Project: 349 Danforth Ave, Ottawa

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting

Date: **October 11, 2020**
Data input by: Zoran Mrdja, P.Eng.

Type of Construction	Building Clasification	Water Supply Coefficient (K)
Non-combustable construction, or a heavy timber conforming to article 3.1.4.6	A-2; B1-; B-2; B-3 C; D	16

		Total Building Volume (V)(m3)
Building Height (incl.Basement)	13.28	2,297.33
Building Width	7.95	
Building Length	21.76	

Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coefficient S_{tot}*
North	3.00	0.5	2
East	10.00	0	
South	3.00	0.5	
West	20.00	0	
Total Volume of Water Required Q**		**73,514.68**	
Minimum Required Fire Flow (L/min) ***		**2,450.49**	

Note:

* S_{tot}= 1+(S_{side1}+S_{side2}+S_{side3}+S_{side4})

** V=KVS_{tot}

*** Flow=Q/30 (min) for min. duration of 30 min

Summary:
1. City of Ottawa: available flow 95 l/sec (5,700 l/min) ***
2. Nearest fire hydrant distance 70.2 m;

FUS Fire Flow Calculations

Project:349 Danforth Ave, Ottawa

Calculations Based on 1999 Publication "Water Supply for Public

Fire Protection " by Fire Underwriters' Survey (FUS)

Project Name: 95 Sweetland Avenue, Ottawa Fire Flow Calculation #: 1

Date:April 07, 2019 Building Type/Description/Name: Apartment building

Data input by: Zoran Mrdja, P.Eng.

Table A: Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	Framing Material						
		Coefficient related to type of construction (C)	Wood Frame	1.50	Ordinary Construction	1.00		
			Ordinary construction	1.00				
			Non-combustible construction	0.80				
			Fire resistive construction (< 2 hrs)	0.70				
			Fire resistive construction (> 2 hrs)	0.60				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	Floor Space Area						
		Type of Housing	Single Family	1	Other (Comm, ind)	4	Units	
			Townhouse - indicate # of units	1				
			Other (Comm, Ind, etc.)	1				
2.2	# of Storeys	Number of Floors/ Storeys in the Unit (do not include basement):			3	3	Storeys	
3	Enter Ground Floor Area of One Unit	Enter Ground Floor Area (A) of One Unit Only :			173			
		Measurement Units	Square Feet (ft^2)	0.093	Square Metres (m2)	527	Area in Square Meters (m^2)	
			Square Metres (m^2)	176				
			Hectares (ha)	10000				
4	Obtain Required Fire Flow without Reductions	Required Fire Flow(without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1000L/min						5,049
5	Apply Factors Affecting Burning	Reductions/Increases Due to Factors Affecting Burning						
5.1	Choose Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	-757
			Limited combustible	-0.15				
			Combustible	0.00				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete Automatic Sprinkler Protection	-0.3	None	0.00	N/A	0
			None	0				
5.3	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	0-3 m	0.25	0.75	m	
			East Side	10.1-20 m	0.15			
			South Side	0-3 m	0.25			
			West Side	20.1-30 m	0.1			3,787
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						8,000
		Total Required Fire Flow (above) in L/s:						133
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						960

Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline

Legend	
	Drop down menu - choose option, or enter value.
	No Information, No input required.

Note:

The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline.

Water Supply Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	350 L/d/P
Residential Maximum Daily Demand	9.5 x Average Daily *
Residential Maximum Hourly	1.5 x Maximum Daily *
Commercial Demand	2.5 L / m2 /d
Commercial Maximum Daily Demand	1.5 x Average Daily
Commercial Maximum Hourly	1.8 x Maximum Daily
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
must remain within	275kPa and 552kPa (40-80 psi; 28-56m)
During fire flow operating pressure must not drop below	140kPa (20 psi; 14 m)
* Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.	

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	0	0
Semi-detached	2.7		0
Townhouse	2.7		0
Apartment			0
Bachelor	1.4	1	1
1 Bedroom	1.4	7	10
2 Bedroom	2.1	5	11
3 Bedroom	3.1		0
4 Bedroom	4.2	0	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	22	6.08	4.22	57.72	40.08	86.58	60.13

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Commercial floor space	2.5	$L/m^2/d$	62.15	0.16	0.11	0.23	0.16	0.42	0.29
Office	75.0	$L/9.3m^2/d$	0	0.00	0.00	0.00	0.00	0.00	0.00
Restaurant*	125.0	L/seat/d							
Industrial -Light	35,000.0	L/gross ha/d							
Industrial -Heavy	55,000.0	L/gross ha/d							
Total I/C/I Demand				0.16	0.11	0.23	0.16	0.42	0.29

Total Demand	6.23	4.33	57.96	40.25	87.00	60.42

* Estimated number of seats at 1seat per $9.3m^2$

Water Demand and Boundary Conditions

Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] (kPa)
Average Daily Demand	4.33	
Max Day + Fire Flow	9,040.08	
Peak Hour	60.42	

[1)] Water demand calculation per Water Supply Guidelines. See Appendix B for detailed calculations.

[2)] Boundary conditions supplied by the City of Ottawa. See Appendix B for correspondence with the City.

Wastewater Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/cap/day
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-0	0.8
Commercial Space	28,000 L/ha/day
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = (1/n)AR^{2/3}S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012.	

349 Danforth Ave, Ottawa
New

Sanitary Sewer Post Development Outflow

Site Area	**0.030 ha**
Extraneous Flow Allowances	
Infiltration / Inflow	**0.01002 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	**Pop**
Single Family	3.4	0	0
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4	0	0
2 Bedroom	2.1	5	10.5
3 Bedroom	3.1	3	9.3
4 Bedroom	4.2	0	0
Total Population			**19.8**
Average Domestic Flow			**0.06 L/s**
Peaking Factor			**3.9**
Peak Domestic Flow			**0.25 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Commercial	28,000 L/gross ha/d	0.006215	0.0020
Institutional	28,000 L/gross ha/d	0	0.00
Industrial - Light	35,000 L/gross ha/d	0	0.00
Industrial - Heavy	55,000 L/gross ha/d	0	0.00
Average I/C/I Flow			**0.0020**
Peak Institutional / Commercial Flow*			**0.0020**
Peak Industrial Flow**			**0.0000**
Peak I/C/I Flow			**0.0020**

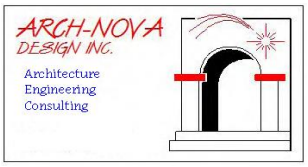
Total Estimated Average Dry Weather Flow Rate	**0.0662**
Total Estimated Peak Dry Weather Flow Rate	**0.2531**
Total Estimated Peak Wet Weather Flow Rate	**0.2631**

Ottawa TechBulletin ISTB-2018-01 Section 4.4.1 Page 4.5

**Use Apendix 4B diagram

Fire Flow Calculation Ontario Building Code 2006 (Appendix A)

Project: 349 Danforth Ave, Ottawa



Date: **October 11, 2020**
Data input by: Zoran Mrdja, P.Eng.

Type of Construction	Building Clasification	Water Supply Coefficient (K)
Non-combustable construction, or a heavy timber conforming to article 3.1.4.6	A-2; B1-; B-2; B-3 C; D	16

		Total Building Volume (V)(m3)
Building Height (incl.Basement)	17.10	4,013.43
Building Width	9.09	
Building Length	25.82	

Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coefficient S_{tot}*
North	3.00	0.5	1.5
East	30.00	0	
South	30.00	0	
West	30.00	0	
	Total Volume of Water Required Q**	**96,322.44**	
	Minimum Required Fire Flow (L/min) ***	**3,210.75**	

Note:

* S_{tot}= 1+(S_{side1}+S_{side2}+S_{side3}+S_{side4})

** V=KVS_{tot}

*** Flow=Q/30 (min) for min. duration of 30 min

Summary:
1. City of Ottawa: available flow 95 l/sec (5,700 l/min) ***
2. Nearest fire hydrant distance 70.2 m;

FUS Fire Flow Calculations

Project: 349 Danforth Ave, Ottawa

Calculations Based on 1999 Publication "Water Supply for Public

Fire Protection " by Fire Underwriters' Survey (FUS)

Project Name: 95 Sweetland Avenue, Ottawa Fire Flow Calculation #: 1

Date:April 07, 2019 Building Type/Description/Name: Apartment building

Data input by: Zoran Mrdja, P.Eng.

Table A: Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
		Framing Material						
1	Choose Frame Used for Construction of Unit	Coefficient related to type of construction (C)	Wood Frame	1.50	Ordinary Construction	1.00		
			Ordinary construction	1.00				
			Non-combustible construction	0.80				
			Fire resistive construction (< 2 hrs)	0.70				
			Fire resistive construction (> 2 hrs)	0.60				
		Floor Space Area						
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	Type of Housing	Single Family	1	Other (Comm, ind)	1	Units	
			Townhouse - indicate # of units	1				
			Other (Comm, Ind, etc.)	1				
2.2	# of Storeys	Number of Floors/ Storeys in the Unit (do not include basement):			3	3	Storeys	
3	Enter Ground Floor Area of One Unit	Enter Ground Floor Area (A) of One Unit Only :			173	758	Area in Square Meters (m^2)	
		Measurement Units	Square Feet (ft^2)	0.093	Square Metres (m2)			
			Square Metres (m^2)	253				
			Hectares (ha)	10000				
4	Obtain Required Fire Flow without Reductions	Required Fire Flow(without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1000L/min						6,055
5	Apply Factors Affecting Burning	Reductions/Increases Due to Factors Affecting Burning						
5.1	Choose Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	-908
			Limited combustible	-0.15				
			Combustible	0.00				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete Automatic Sprinkler Protection	-0.3	None	0.00	N/A	0
			None	0				
5.3	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	0-3 m	0.25	0.60	m	3,633
			East Side	3.1-10 m	0.20			
			South Side	20.1-30 m	0.10			
			West Side	30.1-45 m	0.05			
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						9,000
		Total Required Fire Flow (above) in L/s:						150
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						1080

Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline

Legend	
	Drop down menu - choose option, or enter value.
	No Information, No input required.

Note:

The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline.

Project Number: CW-03-20 349 Danforth Avenue, Ottawa

ARCH-NOVA DESIGN INC.
Architecture Engineering Consulting

PRE-DEVELOPMENT

The pre-development time of concentration is 10 minutes

where:

$I_2 = 732.951 / (Tc + 6.199)^{0.810}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

$I_2 =$ **76.8 mm/hr** $I_{100} =$ **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Site	A1	0.03000	100.0%	0.70	0.021
TOTAL		0.0300	100.0%		0.021
Weighted C =					0.40

C=0.6 used for predevelopment calculation (City of Ottawa requirement)

$Q_{2pre} = (2.78)*(C)*(I_5)*(A)$
$Q_{2pre} =$ 2.78 x 0.40 x 76.8 x 0.0300
$Q_{2pre} =$ 2.56 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100pre} =$ 2.78 x 0.50 x 178.6 x 0.0300
$Q_{100pre} =$ 7.45 L/s

POST-DEVELOPMENT (UNCONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_2 = 732.951 / (Tc + 6.199)^{0.810}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

$I_2 =$ **76.8 mm/hr** $I_{100} =$ **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Area	A1	0.0076	100.0%	0.30	0.002
Building	A2	0.0000	0.0%	0.00	0.000
TOTAL		0.0076	100.0%		0.002
Weighted C =					0.30

$Q_{2post} = (2.78)*(C)*(I_5)*(A)$
$Q_{2post} =$ 2.78 x 0.30 x 76.8 x 0.0076
$Q_{2post} =$ 0.49 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100post} =$ 2.78 x 0.30 x 178.6 x 0.0076
$Q_{100post} =$ 1.13 L/s

Project Number: CW-03-20 349 Danforth Avenue, Ottawa

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting

PRE-DEVELOPMENT

The pre-development time of concentration is 10 minutes

where:

$I_2 = 732.951 / (Tc + 6.199)^{0.810}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

$I_2 =$ **76.8 mm/hr** $I_{100} =$ **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Bus Stop	A1	0.00000	0.0%	0.95	0.000
Parking	A2	0.00000	0.0%	0.95	0.000
Green area	A3	0.00000	0.0%	0.70	0.000
TOTAL		0.0000	0.0%		0.000
Weighted C =					0.60

C=0.6 used for predevelopment calculation (City of Ottawa requirement)

$Q_{2pre} = (2.78)*(C)*(I_5)*(A)$

$Q_{2pre} =$ 2.78 x 0.60 x 76.8 x 0.0000

$Q_{2pre} =$ 0.00 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$

$Q_{100pre} =$ 2.78 x 0.60 x 178.6 x 0.0000

$Q_{100pre} =$ 0.00 L/s

POST-DEVELOPMENT (CONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_2 = 732.951 / (Tc + 6.199)^{0.810}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

$I_2 =$ **76.8 mm/hr** $I_{100} =$ **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Landscape	A1	0.0000	0.0%	0.95	0.000
Building	**A2**	0.02238	100.0%	0.95	0.021
TOTAL		0.02238	0.0%		0.021
Weighted C =					0.95

$Q_{2post} = (2.78)*(C)*(I_5)*(A)$

$Q_{2post} =$ 2.78 x 0.95 x 76.8 x 0.0224

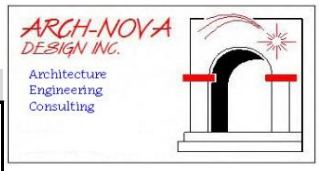
$Q_{2post} =$ 4.54 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$

$Q_{100post} =$ 2.78 x 0.95 x 178.6 x 0.0224

$Q_{100post} =$ 10.56 L/s

ALLOWABLE RUNOFF



Predevelopment Runoff:		
Uncontrolled Runoff		
2-year	2.56	l/sec
100-year	7.45	l/sec
Controlled Runoff:		
2-year	0.00	l/sec
100-year	0.00	l/sec

Postdevelopment Runoff:		
Uncontrolled Runoff		
2-year	0.49	l/sec
100-year	1.13	l/sec
Controlled Runoff:		
2-year	4.54	l/sec
100-year	10.56	l/sec

Controlled allowable runoff		
Controlled Runoff:		
2-year	**1.43**	**l/sec**
100-year	6.32	l/sec

Comment:

Storage Volumes (2-Year Storm)

Project: 349 Danforth Avenue, Ottawa

Tc = 10 (mins)
C_{AVG} = 0.76 (dimmensionless)
Area = 0.0327 (hectares)
Storm = 2 (year)
Release Rate = 1.43 (L/sec)
Time Interval = 10 (mins)

Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
1	148	1.0	1.43		
11	73	5.0	1.43	3.59	2.37
21	50	3.5	1.43	2.03	2.56
31	39	2.7	1.43	1.26	2.34
41	32	2.2	1.43	0.79	1.93
51	28	1.9	1.43	0.47	1.43
61	24	1.7	1.43	0.23	0.86
71	22	1.5	1.43	0.06	0.25
81	20	1.3	1.43	-0.08	-0.40
91	18	1.2	1.43	-0.20	-1.07
101	17	1.1	1.43	-0.29	-1.76
111	15	1.1	1.43	-0.37	-2.46
121	14	1.0	1.43	-0.44	-3.17
131	14	0.9	1.43	-0.50	-3.90
141	13	0.9	1.43	-0.55	-4.64
151	12	0.8	1.43	-0.59	-5.38
161	12	0.8	1.43	-0.63	-6.13
171	11	0.8	1.43	-0.67	-6.88
181	11	0.7	1.43	-0.70	-7.65
191	10	0.7	1.43	-0.73	-8.41
201	10	0.7	1.43	-0.76	-9.18
211	9	0.6	1.43	-0.79	-9.96
221	9	0.6	1.43	-0.81	-10.73
231	9	0.6	1.43	-0.83	-11.51
241	8	0.6	1.43	-0.85	-12.30
251	8	0.6	1.43	-0.87	-13.08
261	8	0.5	1.43	-0.89	-13.87
271	7.7	0.5	1.43	-0.90	-14.66

Notes

1) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.

2) Rainfall Intensity, I = 732.951 / (Tc + 6.199)^0.810 (2 year, City of Ottawa)
3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
5) Storage = Duration x Storage Rate

Storage Volumes (100-Year Storm)

Tc = 10 (mins)
C_{AVG} = 0.76 (dimmensionless)
Area = 0.0327 (hectares)
Storm = 100 (year)
Release Rate = 1.43 (L/sec)
Time Interval = 10 (mins)

Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
1	351	2.4	1.43		
11	170	11.7	1.43	10.23	6.75
21	116	8.0	1.43	6.55	8.25
31	90	6.2	1.43	4.73	8.80
41	74	5.1	1.43	3.64	8.94
51	63	4.3	1.43	2.89	8.86
61	55	3.8	1.43	2.36	8.63
71	49	3.4	1.43	1.95	8.31
81	45	3.1	1.43	1.63	7.91
91	41	2.8	1.43	1.37	7.46
101	38	2.6	1.43	1.15	6.97
111	35	2.4	1.43	0.97	6.45
121	33	2.2	1.43	0.81	5.90
131	31	2.1	1.43	0.68	5.32
141	29	2.0	1.43	0.56	4.73
151	27	1.9	1.43	0.45	4.12
161	26	1.8	1.43	0.36	3.49
171	25	1.7	1.43	0.28	2.85
181	24	1.6	1.43	0.20	2.20
191	23	1.6	1.43	0.13	1.54
201	22	1.5	1.43	0.07	0.87
211	21	1.4	1.43	0.02	0.19
221	20	1.4	1.43	-0.04	-0.49
231	20	1.3	1.43	-0.09	-1.19
241	19	1.3	1.43	-0.13	-1.88
251	18	1.3	1.43	-0.17	-2.59
261	18	1.2	1.43	-0.21	-3.30
271	17	1.2	1.43	-0.25	-4.01

Notes

1) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.

2) Rainfall Intensity, I = 1735.688 / (Tc + 6.014)^0.820 (100 year, City of Ottawa)
3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
5) Storage = Duration x Storage Rate

Storage Requirements

2-year **2.56 m^3**

100-year **8.94 m^3**

Surface Type	ID	Area (ha)	Percent of total Area	Required Storage 5 year	Required Storage 100 year	Max Allowed Drain Outflow l/s	Max Allowed Drain Outflow GPM
Roof	**A1**	0.0087	50.0%	1.28	4.47	0.72	5.67
Roof	**A2**	0.0087	50.0%	1.28	4.47	0.72	5.67
TOTAL		0.0175	100.0%	2.56	8.94	1.43	11.33

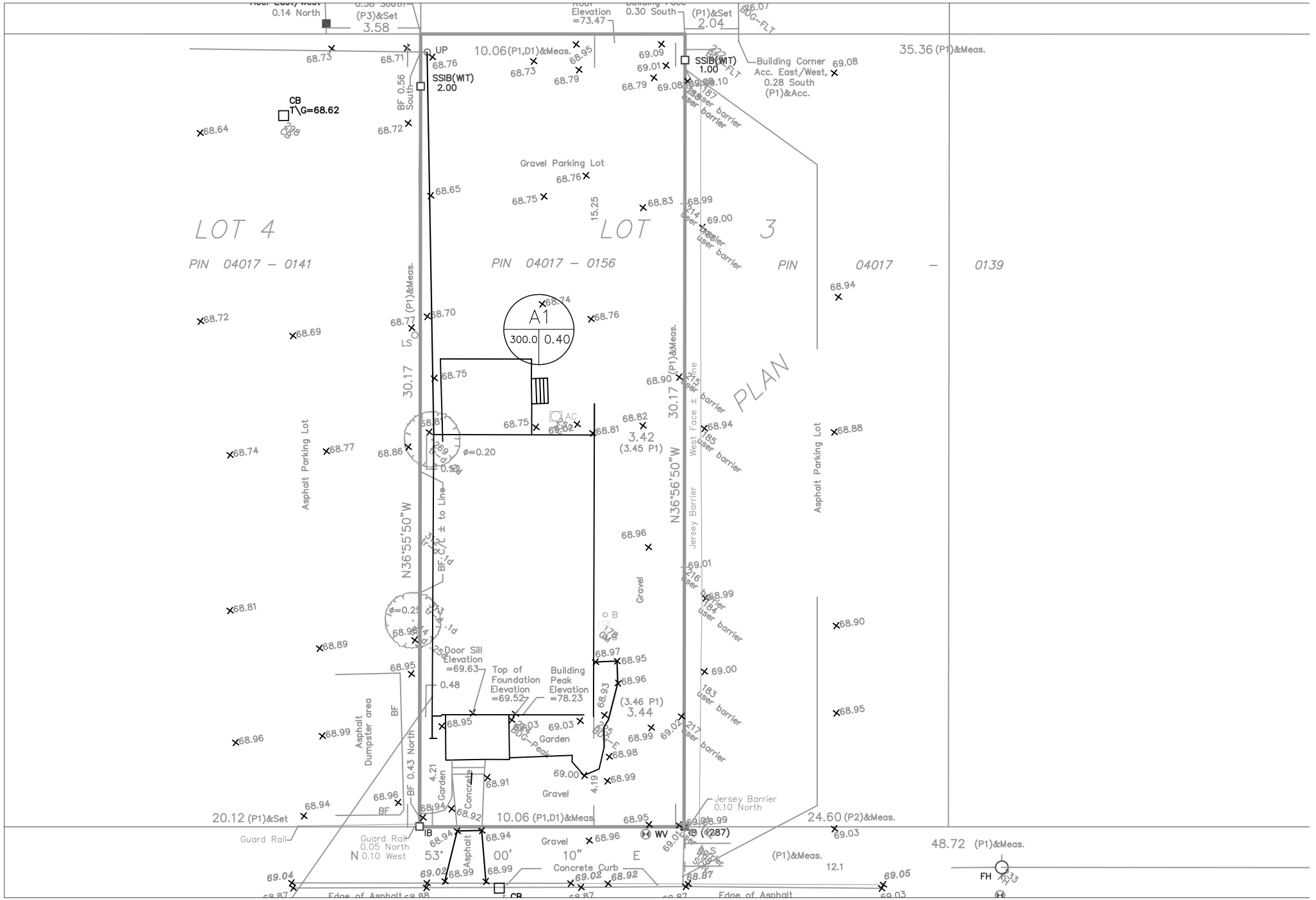
Stage-Storage

Roof A1 (Scupper 1)			**Roof A2 (Scupper 2)**		
Depth m	**Area** m^2	**Volume** m^3	**Depth** m	**Area** m^2	**Volume** m^3
0.020	9.10	0.06	0.020	9.10	0.06
0.030	40.00	0.40	0.030	40.00	0.40
0.06	**65.00**	**1.30**	**0.06**	**65.00**	**1.30**
0.12	**115.00**	**4.60**	**0.12**	**115.00**	**4.60**

Legend:	
data for 2-year event	
data for 100-year event	

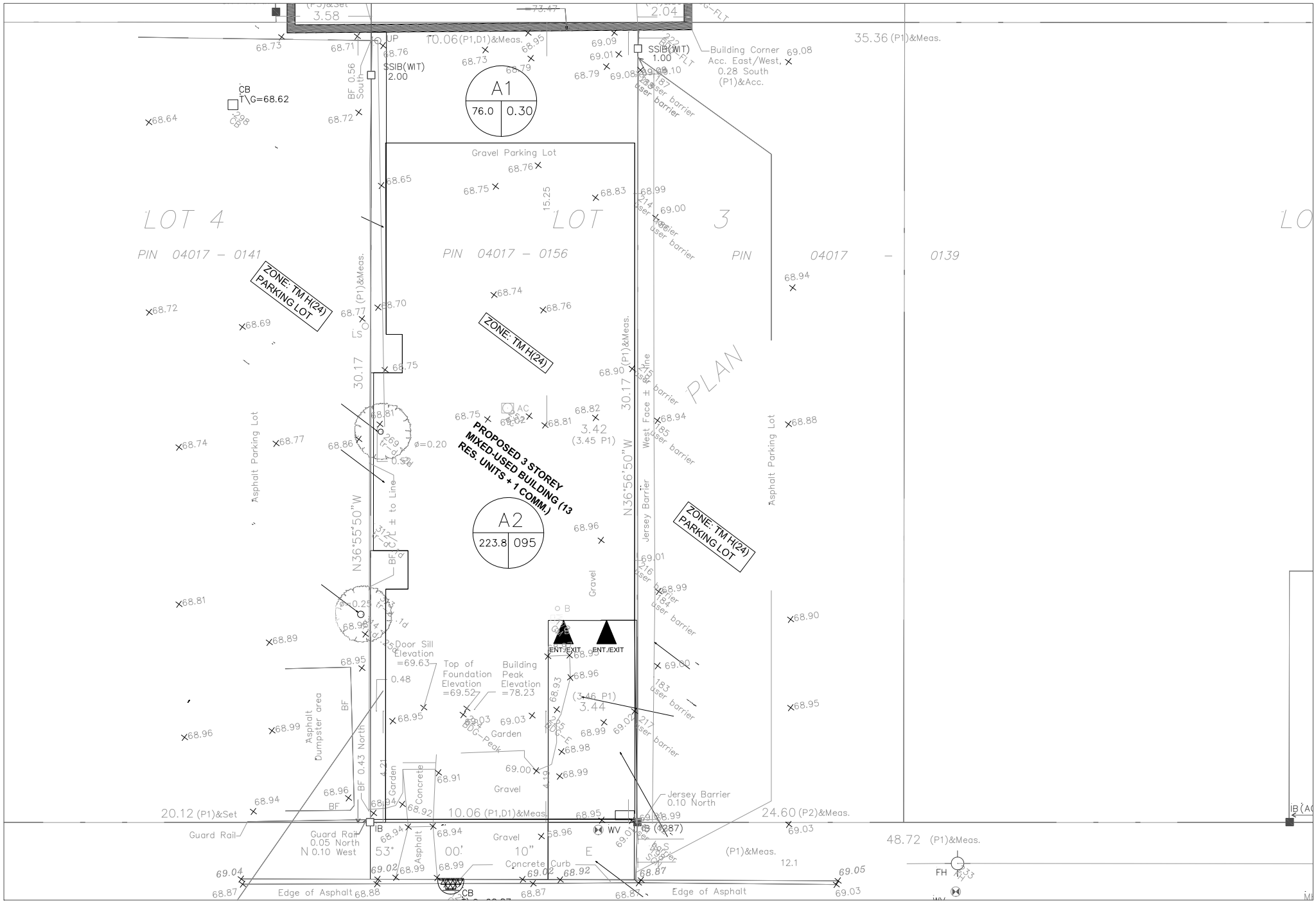
.

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting



349 DANFORTH AVE., OTTAWA
SWM PREDEVELOPMENT

ARCH-NOVA Design Inc.
45 Banner Road NEPEAN ON K2H 8X5
613-702-3403 contact@archnova.ca



349 DANFORTH AVE., OTTAWA
SWM POSTEVELOPMENT

ARCH-NOVA Design Inc.
45 Banner Road NEPEAN ON K2H 8X5
613-702-3403 contact@archnova.ca

Appendix B: Correspondence

zoran@archnova.ca

From: Valic, Jessica <jessica.valic@ottawa.ca>
Sent: July 29, 2020 7:24 AM
To: Zoran@archnova
Subject: RE: 349 Danforth Avenue: boundary conditions

Good Morning Zoran,

The City does not have capacity concerns with either the storm or sanitary systems fronting this development considering the size of the proposed development and modelling was not completed. The proposed sanitary flow is low, and as there is an existing building at this property connected to the sanitary system, the slightly increased sanitary flow from existing is not considered a concern.

Regarding stormwater, controlling to the 2-year storm will be required, as was initially specified. As the proposed building will take up the majority of the site, it is assumed that rooftop storage or subsurface storage of roofwater will be used for control. The remainder of the site would be permitted to drain uncontrolled to the ROW since the runoff generated from these areas would be low and impractical to control.

Please do not hesitate to contact me with any questions/concerns.

Regards,

Jessica Valic, E.I.T.
Project Manager
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 15672
jessica.valic@ottawa.ca

****Please note that due to the current situation, I am working remotely. Email is currently the best way to contact me****

From: Zoran@archnova <zoran@archnova.ca>
Sent: July 20, 2020 3:18 PM
To: Valic, Jessica <jessica.valic@ottawa.ca>
Subject: Re: 349 Danforth Avenue: boundary conditions

Hello Jessica,

Thank you for your quick response. For the sanitary sewer I already sent it to you; please check the pdf file I sent in previous email.
For storm sewer we need current capacity in order to determine max allowable runoff from the site. For your reference please check with Shawn Wessel how we did it for 374 McArthur.

Regards,

Zoran Mrdja
Sent from my iPhone

On 20 Jul 2020, at 14:05, Valic, Jessica <jessica.valic@ottawa.ca> wrote:

Good afternoon Zoran,

Boundary conditions are below.

Could you please supply the storm demand for the proposed development? This value is needed to add into the city sewer model system to determine the sewer capacity.

The following are boundary conditions, HGL, for hydraulic analysis at 349 Danforth (zone 1W) assumed to be connected to the 152mm on Danforth (see attached PDF for location).

Minimum HGL = 108.0m

Maximum HGL = 114.8m

Available flow @ 20psi = 105L/s assuming a ground elevation of 69.0m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Please do not hesitate to contact me with any questions/concerns.

Regards,

Jessica Valic, E.I.T.
Project Manager
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 15672
jessica.valic@ottawa.ca

****Please note that due to the current situation, I am working remotely. Email is currently the best way to contact me****

From: zoran@archnova.ca <zoran@archnova.ca>
Sent: July 14, 2020 6:50 PM
To: Valic, Jessica <jessica.valic@ottawa.ca>
Cc: Turkington, Seana <Seana.Turkington@ottawa.ca>
Subject: 349 Danforth Avenue: boundary conditions

Please could you provide the boundary conditions for the location of 349 Danforth Avenue, Ottawa? The owner is planning to construct a new apartment building at this location. Attached are the water and sewer calculations, the fire flow calculation and the site plan for proposed development.

Type of development: apartment building (basement + 3 stories)

Average daily demand: 0.07 l/s

Maximum daily demand: 0.67 l/s.

Maximum hourly daily demand: 1.01 l/s.
Fire flow: 133 l/sec (FUS)

Also, please could you confirm the residual capacity for municipal sanitary and storm pipes at the site?

Regards,

Zoran Mrdja, P.Eng., FEC
DufkQryd Ghvljq Inf1
613-818-3884

'

'

<349 Danforth July 2020.pdf>

'

'