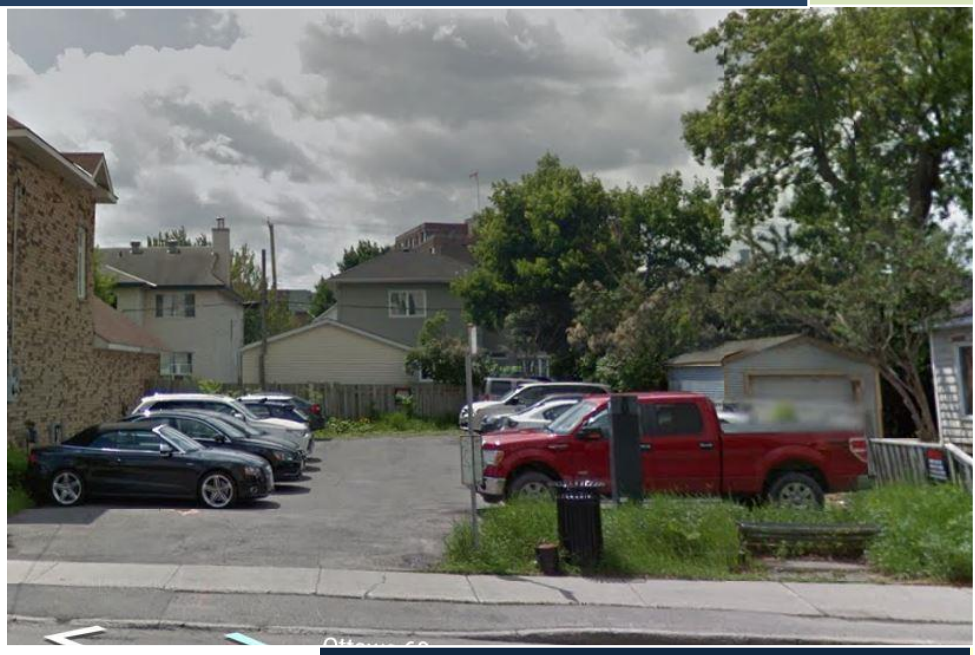
18 McArthur Avenue Ottawa
Assessment of Adequacy of Public Services



Project # CW-04-16

Prepared for:

Takyan Consulting

By:

Arch-Nova Design Inc.

April 2016

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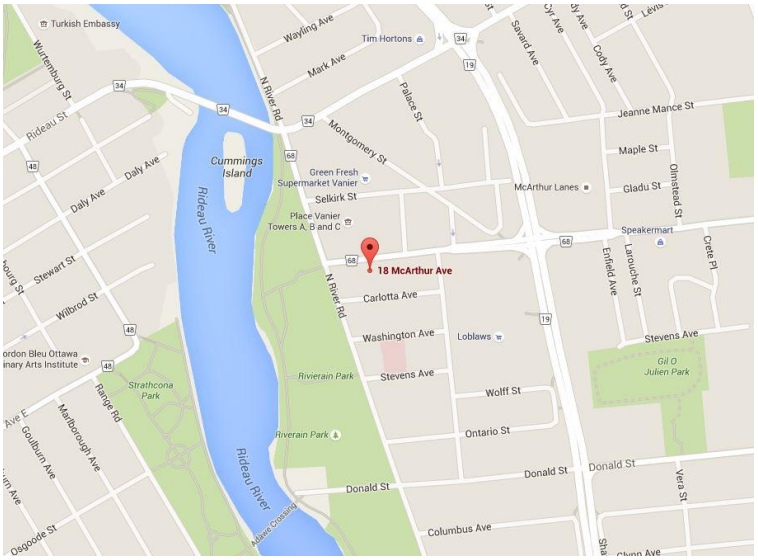
1. Introduction

The subject property is located at 18 McArthur Avenue, Ottawa. The proposed work comprises of a 3-storey+basement apartment building. For the purpose of this report the site is considered to run east-west.

Currently the property is used as a parking lot. A small grass area is located on the south side of the property. Adjacent properties are residential.

The area is serviced by municipal water, sanitary and storm water systems.



18 McArthur 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 18 McArthur Avenue on the existing service capacity.

2.1 Water Supply

[1]The following are boundary conditions, HGL, for a hydraulic analysis at 18 McArthur Avenue, connecting to the 152 mm watermain:

Max Day + FF = 108 m assuming a fire flow of 95 L/s

Minimum HGL = 109.6 m

Maximum HGL = 118.4 m, the estimated ground elevation is 56.10 m, the maximum pressure is estimated to be 80.3 psi which is more than 80 psi.

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

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	350 L/d/P
[2]Residential Maximum Daily Demand	2.5 x Average Daily
Residential Maximum Hourly	2.2 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 (40-80 psi; 28-56m)
During fire flow operating pressure must not drop below	140kPa (20 psi; 14 m)

Table 1: Water Supply Design Criteria

The consumption is expected to be **116.38 l/min (1.93 L/sec)** for peak period. The fire flow for residential spaces was estimated to be 9,000 l/min

[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)

[2] Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.

(150 l/sec)[3] however, the Fire Underwriters Survey (FUS) calculation[4] provided the following:

a. fire flow: 12,000 l/min

b. available fire flow[5] is 5,700 l/min (95 l/sec) which will require additional fire protection measures including fire separation structures, Siamese fire connection and/or fire extinguishers on each floor.

The table below summarizes the pressure for the designed parameters:

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] (m)
Average Daily Demand	8.17	118.4
Max Day + Fire Flow	5,777.58	109.6
Peak Hour	116.38	

Table 2: Water Demand and Boundary Conditions

[3] OBC SectionA.3.2.5.7, Table 2.
[4] See Appendix A: Calculations
[5] City of Ottawa: Boundary Conditions, April 2016

2.2 Sanitary Sewer

The estimated outflow for the new building is **0.54 l/sec** (peak flow+wet weather).

Design Parameter	Value[6]
Residential Average Apartment	1.8 P/unit
Average Daily Demand	350 L/d/per
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Commercial Space	5L/m2/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

Table 3: Wastewater Design Criteria

Existing municipal sewer 450 mm has a capacity of 54.1 l/sec for 0.45% slope and 30% full or 270 l/sec for 80% full.

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

[6] Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2004.

3. Stormwater

3.1 Existing Site Stormwater Services

Current parking lot is draining toward north and to the street. Small portion of grassed area also drains in the same direction. No other storm water services (i.e. storage, ponds) are on the property.

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Bus Stop	**A1**	0.00275	6.8%	0.95	0.003
Parking	**A2**	0.03047	74.9%	0.95	0.029
Green area	**A3**	0.00746	18.3%	0.70	0.005
TOTAL		0.0407	100.0%		0.037
Weighted C =					0.50

Table 4: Current Drainage Areas

Entire site drains uncontrolled over surface to McArthur Predevelopment C=0.5 is used for the calculation for the post development calculation.

A municipal stormwater service 600 mm is provided on McArthurt Avenue and has capacity of 135 l/sec for slope of 0.6% and 30% full and 671 l/sec for 80% full.

3.2 Proposed Development

The proposed 3-storey building will cover the main part of the property however the flat roof storage is expected to compensate for the pervious areas so the balance between pre and post development run-off is not significantly changed. Also, the main drainage routes, such as the roof drains to the front (McArthur Avenue.) will remain unchanged. There is an increase in impervious surfaces in the area where the existing green area is.

For the purpose of managing the 5 year predevelopment runoff, the uncontrolled postdevelopment runoff was used to determine the controlled runoff from the roof storage. The uncontrolled runoff is calculated to be

2.96 l/sec which leaves 2.93 l/sec for the controlled runoff. The excess of water will be stored on the roof and release under this condition.

Predevelopment Runoff:		
Uncontrolled Runoff		
5-year	5.89	l/sec
100-year	12.63	l/sec
Controlled Runoff:		
5-year	0.00	l/sec
100-year	0.00	l/sec

Postdevelopment Runoff:		
Uncontrolled Runoff		
5-year	2.96	l/sec
100-year	5.08	l/sec
Controlled Runoff:		
5-year	6.41	l/sec
100-year	10.98	l/sec

Controlled allowable runoff		
Controlled Runoff:		
5-year	2.93	l/sec
100-year	7.55	l/sec

Table 5: Uncontrolled and Controlled Runoff Summary

The calculation was based on 10 minutes concentration times For both calculations the runoff coefficient is C=0.5. The roof stage-storage calculation is provided in Appendix A.

The drainage system comprises of weeping tiles around the building and a connection to the storm trunk at McArthur Avenue. Details are presented in the Grading and Site Services Plan.

The patio and green space at the back will be graded to route stormwater toward the fron of the property at McArthur Avenue.

4. Conclusion and Recommendation

4.1 Water Supply

The water supply demand calculation is based on the fire flow requirement for residential buildings; it is 12,000 l/min (200 l/sec). The City personnel provided information that only 5,700 l/min is available under condition of residual 20psi. and calculated a pressure of 109.6 m, FUS calculation requires 12,000 l/min which which will require additional fire protection means such as a separation fire walls, Siamese connections and fire extinguishers at each floor.

4.2 Sanitary Sewer

The existing sanitary sewer 450 mm under 0.45% is expected to provide a flow of of 54.1 l/sec for 0.45% slope and 30% full or 270 l/sec for 80% full. Flow from the new building in rate of 0.54 l/sec for the peak wet weather flow will not overload the pipe. The connection from the site will be by gravity (as presented on the plan).

4.3 Stormwater

The stormwater system (weeping system) of the property will be connected to the existing 600 mm pipe. A municipal stormwater service 600 mm is provided at McArthur Avenue and has capacity of 135 l/sec for slope of 0.6% and 30% full and 671 l/sec for 80% full.

There will be no increase in runoff flow as the onsite storage (roof) is proposed.

Drainage area and a storm calculation sheets (pre and post-development) are shown in Appendix A[7].

[7] Post Development calculation:

There will be an increased volume of 5.31 m^3 which is a result of increased imperviousness. This amount of water will be stored on the roof and released under the predevelopment conditions.

Details are presented in Appendix A.

Based on the information provided by the City of Ottawa, the existing municipal services are adequate and will not be overloaded after the construction of the buildings at 18 McArthur.

Prepared by:

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Zoran Mrdja, P.Eng.

April 2016

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

Appendix A: Calculations

Project Number: CW-04-16 18 McArthur Ave., Ottawa

ARCH-NOVA DESIGN INC.
Architecture Engineering Consulting

PRE-DEVELOPMENT

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 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	0.00275	6.8%	0.95	0.003
Parking	A2	0.03047	74.9%	0.95	0.029
Green area	A3	0.00746	18.3%	0.70	0.005
TOTAL		0.0407	100.0%		0.037
Weighted C =					0.50

0.904141

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$
Q_{5pre} = 2.78 x 0.50 x 104.2 x 0.0407
Q_{5pre} = 5.89 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$
Q_{100pre} = 2.78 x 0.69 x 178.6 x 0.0407
Q_{100pre} = 12.63 L/s

C=0.5 used for predevelopment calculation (City of Ottawa requirement)

POST-DEVELOPMENT (UNCONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Landscape	A1	0.0006	3.3%	0.95	0.001
Landscape	A2	0.0004	2.4%	0.40	0.000
Walkway	A3	0.0029	16.9%	0.70	0.002
Building	A4	0.0000	0.0%	0.00	0.000
Walkway	A5	0.0024	14.1%	0.70	0.002
Walkway	A6	0.0011	6.1%	0.70	0.001
Patio+Bike Rack	A7	0.0024	14.1%	0.70	0.002
Dump Covered	A8	0.0010	5.7%	0.95	0.001
Green area	A9	0.0055	31.9%	0.30	0.002
Walkway	A10	0.0010	5.6%	0.70	0.001
TOTAL		0.0173	100.0%		0.010
Weighted C =					0.59

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$
Q_{5post} = 2.78 x 0.59 x 104.2 x 0.0173
Q_{5post} = 2.96 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100post}$ = 2.78 x 0.59 x 178.6 x 0.0173
$Q_{100post}$ = 5.08 L/s

Project Number: CW-04-16 18 McArthur Ave., Ottawa

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting

PRE-DEVELOPMENT

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 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 =					0.50

C=0.5 used for predevelopment calculation (City of Ottawa requirement)

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$
$Q_{5pre} = 2.78 \times 0.50 \times 104.2 \times 0.0000$
$Q_{5pre} = 0.00$ L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100pre} = 2.78 \times 0.50 \times 178.6 \times 0.0000$
$Q_{100pre} = 0.00$ L/s

POST-DEVELOPMENT (CONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

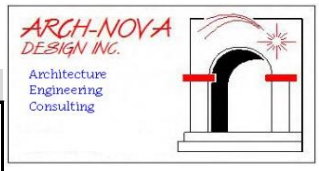
I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Landscape	A1	0.0000	0.0%	0.95	0.000
Landscape	A2	0.0000	0.0%	0.40	0.000
Walkway	A3	0.0000	0.0%	0.70	0.000
Building	**A4**	0.0233	100.0%	0.95	0.022
Walkway	A5	0.0000	0.0%	0.70	0.000
Walkway	A6	0.0000	0.0%	0.70	0.000
Patio+Bike Rack	A7	0.0000	0.0%	0.70	0.000
Dump Covered	A8	0.0000	0.0%	0.95	0.000
Green area	A9	0.0000	0.0%	0.30	0.000
Walkway	A10	0.0000	0.0%	0.70	0.000
TOTAL		0.0233	100.0%		0.022
Weighted C =					0.95

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$
$Q_{5post} = 2.78 \times 0.95 \times 104.2 \times 0.0233$
$Q_{5post} = 6.41$ L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100post} = 2.78 \times 0.95 \times 178.6 \times 0.0233$
$Q_{100post} = 10.98$ L/s

ALLOWABLE RUNOFF



Predevelopment Runoff:		
Uncontrolled Runoff		
5-year	5.89	l/sec
100-year	12.63	l/sec
Controlled Runoff:		
5-year	0.00	l/sec
100-year	0.00	l/sec

Postdevelopment Runoff:		
Uncontrolled Runoff		
5-year	2.96	l/sec
100-year	5.08	l/sec
Controlled Runoff:		
5-year	6.41	l/sec
100-year	10.98	l/sec

Controlled allowable runoff		
Controlled Runoff:		
5-year	2.93	l/sec
100-year	7.55	l/sec

Comment:

Storage Volumes (5-Year Storm)

Project: 18 McArthur Avenue

Tc = 10 (mins)
C_{AVG} = 0.95 (dimmensionless)
Area = 0.0233 (hectares)
Storm = 5 (year)
Release Rate = 2.93 (L/sec)
Time Interval = 5 (mins)

Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
1	204	1.3	2.93		
6	132	4.9	2.93	1.92	0.69
11	99	6.1	2.93	3.17	2.09
16	80	4.9	2.93	2.01	1.93
21	68	4.2	2.93	1.26	1.58
26	59	3.6	2.93	0.72	1.12
31	53	3.2	2.93	0.31	0.58
36	48	2.9	2.93	-0.01	-0.01
41	43	2.7	2.93	-0.26	-0.65
46	40	2.5	2.93	-0.47	-1.31
51	37	2.3	2.93	-0.65	-1.99
56	35	2.1	2.93	-0.80	-2.69
61	33	2.0	2.93	-0.93	-3.41
66	31	1.9	2.93	-1.04	-4.14
71	29	1.8	2.93	-1.14	-4.88
76	28	1.7	2.93	-1.23	-5.63
81	26	1.6	2.93	-1.31	-6.39
86	25	1.5	2.93	-1.39	-7.15
91	24	1.5	2.93	-1.45	-7.92
96	23	1.4	2.93	-1.51	-8.70
101	22	1.4	2.93	-1.56	-9.48
106	21	1.3	2.93	-1.61	-10.27
111	21	1.3	2.93	-1.66	-11.06
116	20	1.2	2.93	-1.70	-11.85
121	19	1.2	2.93	-1.74	-12.65
126	19	1.2	2.93	-1.78	-13.45
131	18	1.1	2.93	-1.81	-14.25
136	18	1.1	2.93	-1.85	-15.06

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 = 998.071 / (Tc + 6.053)^0.814 (5 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)

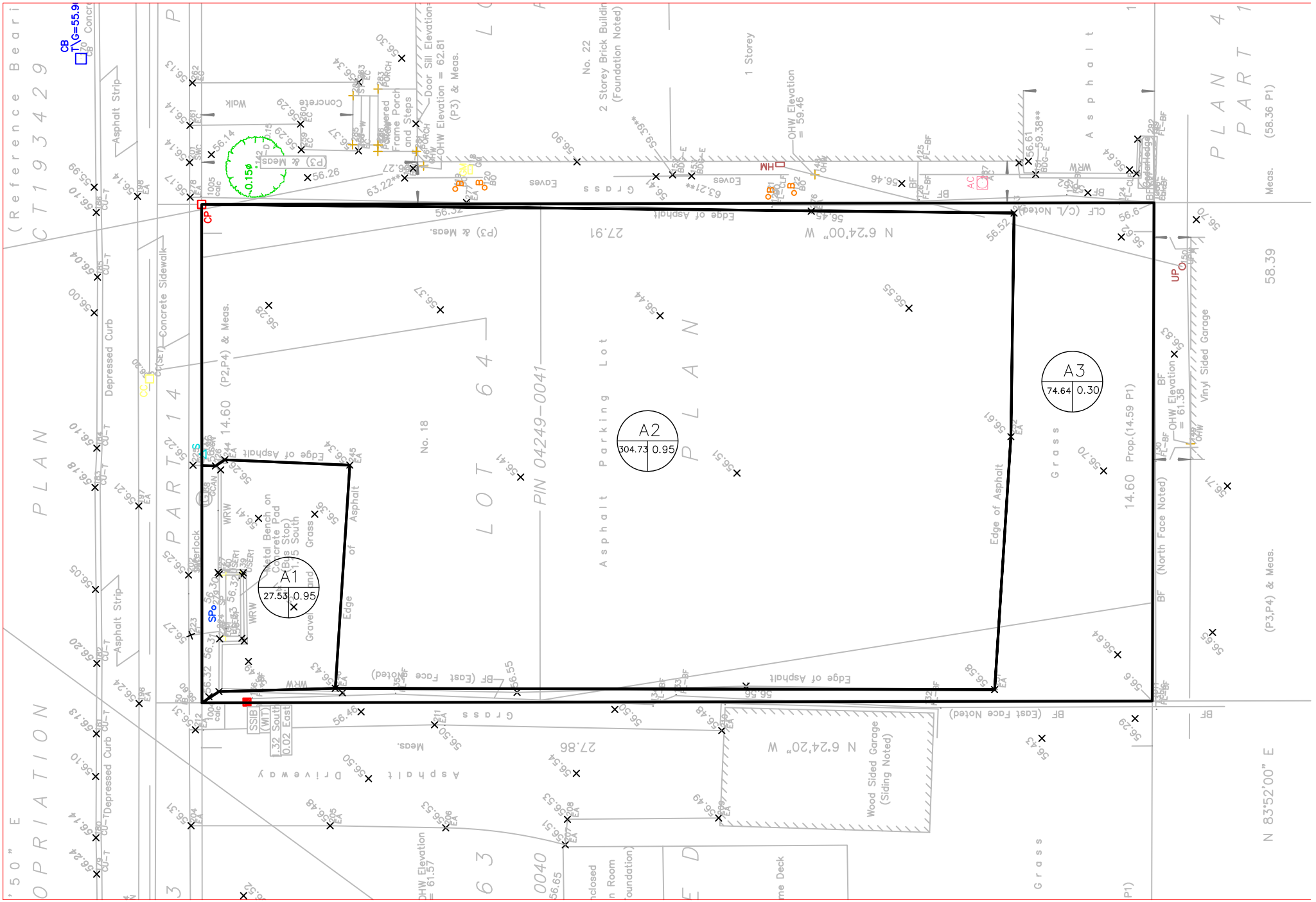
Tc = 10 (mins)
C_{AVG} = 0.95 (dimmensionless)
Area = 0.0233 (hectares)
Storm = 100 (year)
Release Rate = 2.93 (L/sec)
Time Interval = 5 (mins)

Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
1	351	2.2	2.93		
6	226	8.3	2.93	5.40	1.95
11	170	10.4	2.93	7.51	4.96
16	138	8.5	2.93	5.52	5.30
21	116	7.1	2.93	4.22	5.31
26	101	6.2	2.93	3.29	5.13
31	90	5.5	2.93	2.59	4.82
36	81	5.0	2.93	2.05	4.42
41	74	4.5	2.93	1.61	3.95
46	68	4.2	2.93	1.25	3.44
51	63	3.9	2.93	0.94	2.89
56	59	3.6	2.93	0.69	2.30
61	55	3.4	2.93	0.46	1.69
66	52	3.2	2.93	0.27	1.06
71	49	3.0	2.93	0.10	0.41
76	47	2.9	2.93	-0.06	-0.25
81	45	2.7	2.93	-0.19	-0.93
86	43	2.6	2.93	-0.31	-1.62
91	41	2.5	2.93	-0.43	-2.32
96	39	2.4	2.93	-0.53	-3.03
101	38	2.3	2.93	-0.62	-3.75
106	36	2.2	2.93	-0.70	-4.48
111	35	2.1	2.93	-0.78	-5.21
116	34	2.1	2.93	-0.86	-5.95
121	33	2.0	2.93	-0.92	-6.70
126	32	1.9	2.93	-0.99	-7.45
131	31	1.9	2.93	-1.04	-8.20
136	30	1.8	2.93	-1.10	-8.96

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



18 McARTHUR AVE.
SWM PREDEVELOPMENT

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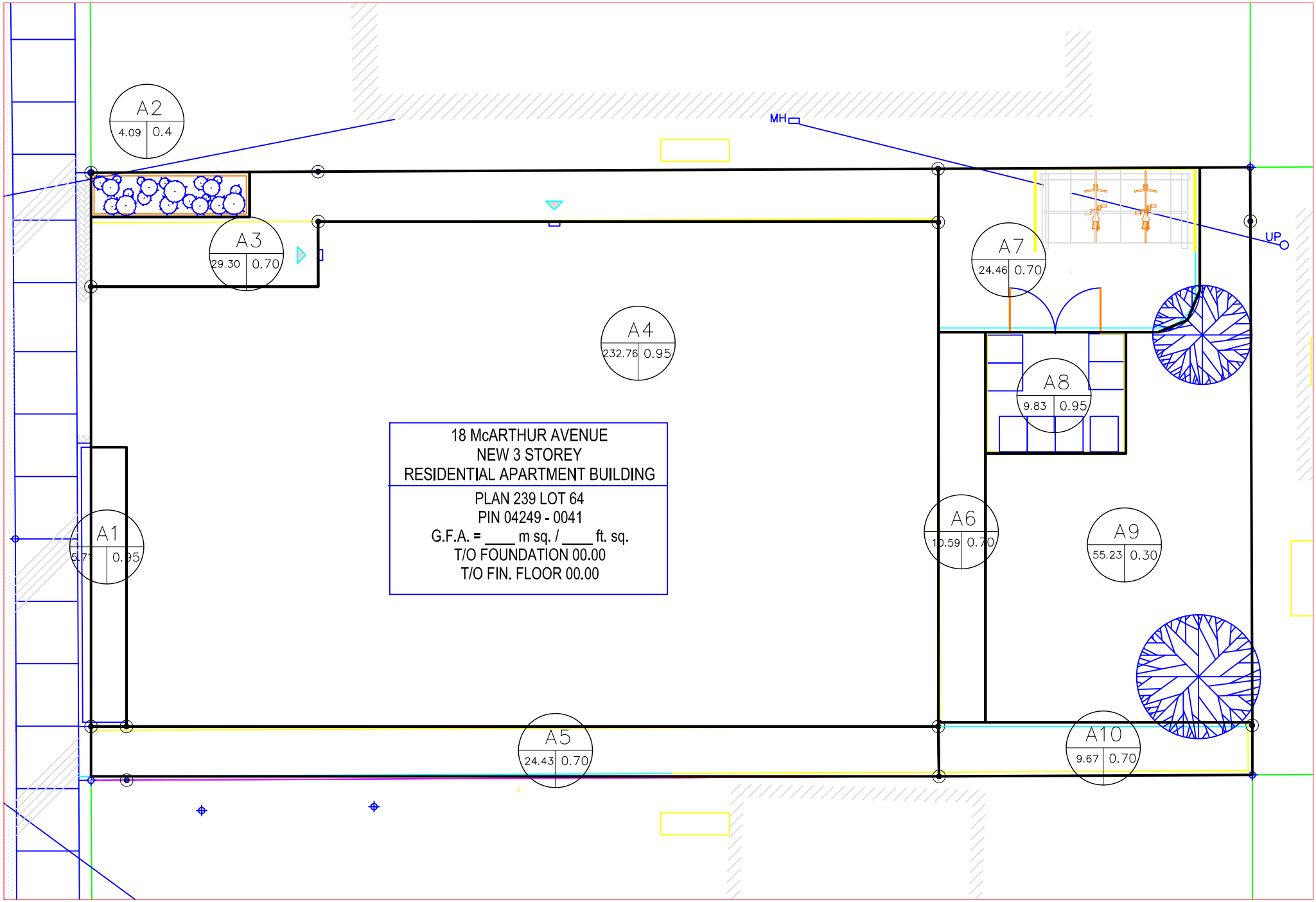

18 McARTHUR AVE.
SWM POSTDEVELOPMENT

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FUS Fire Flow Calculations

Project: 18 McArthur Avenue , Ottawa

Calculations Based on 1999 Publication "Water Supply for Public Fire Protection " by Fire Underwriters' Survey (FUS)
Project Name: 18 McArthur Avenue, Ottawa — Fire Flow Calculation #: 1
Date: March 29, 2016 — 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	m	
			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):			1	1	Storeys	
3	Enter Ground Floor Area of One Unit	Enter Ground Floor Area (A) of One Unit Only :				971	Area in Square Meters (m^2)	
		Measurement Units	Square Feet (ft^2)	0.093	Square Metres (m2)			
			Square Metres (m^2)	1				
			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						6,855
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	Combustible	0.00	N/A	0
			Limited combustible	-0.15				
			Combustible	0				
			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	20.1-30 m	0.10	0.70	m	
			East Side	3.1-10.0 m	0.20			
			South Side	3.1-10.0 m	0.20			
			West Side	3.1-10.0 m	0.20			4,799
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						12,000
		Total Required Fire Flow (above) in L/s:						200
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						1440

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.
The basement of the builidng will be used as a gathering/dining area and it is recommended to be equiped with sprinkler system

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.	

18 McArthur Avenue, Ottawa
New Development

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4		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	0	0
3 Bedroom	3.1		0
4 Bedroom	4.2	8	34

	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	34	11.76	8.17	111.72	77.58	167.58	116.38

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/m2/d	0	0.00	0.00	0.00	0.00	0.00	0.00
Office	75.0	L/9.3m2/d							
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	11.76	8.17	111.72	77.58	167.58	116.38

* 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	8.17	
Max Day + Fire Flow	5,777.58	108
Peak Hour	116.38	108.3

[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	350 L/d/per
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Commercial Space	5L/m2/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 2004.	

18 McArthur Avenue, Ottawa
New Development

Sanitary Sewer Post Development Outflow

Site Area	**0.0405 ha**
Extraneous Flow Allowances	
Infiltration / Inflow	**0.01134 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	**Pop**
Single Family	3.4		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
2 Bedroom	2.1		0
3 Bedroom	3.1		0
4 Bedroom	4.2	8	33.6
Total Population			**33.6**
Average Domestic Flow			**0.14 L/s**
Peaking Factor			**4.00**
Peak Domestic Flow			**0.54 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Commercial floor space	5 L/m2/d		0
Hospitals	900 L/bed/d		
School	70 L/student/d		
Industrial - Light	35,000 L/gross ha/d		
Industrial - Heavy	55,000 L/gross ha/d		
Average I/C/I Flow			**0**
Peak Institutional / Commercial Flow			
Peak Industrial Flow**			
Peak I/C/I Flow			

Total Estimated Average Dry Weather Flow Rate	**0.14**
Total Estimated Peak Dry Weather Flow Rate	**0.54**
Total Estimated Peak Wet Weather Flow Rate	**0.56**

Appendix B: Correspondence

From: Wu, John <John.Wu@ottawa.ca>
Sent: April 6, 2016 9:52 AM
To: gordana@archnova
Subject: RE: 18 McArthur: Boundary Conditions
Attachments: 18 McArthur April 2016.pdf

Here is the result:
The following are boundary conditions, HGL, for hydraulic analysis at 18 McArthur (zone 1E) assumed to be connected to the 152mm on McArthur (see attached PDF for location).
Minimum HGL = 109.6m
Maximum HGL = 118.4m; the maximum pressure is estimated to be more than 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.
Available flow = 95 L/s assuming a residual of 20 psi and a ground elevation of 56.1m

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.

John

From: gordana@archnova [mailto:gordana@archnova.ca]
Sent: Friday, April 01, 2016 12:13 PM
To: Wu, John
Cc: zoran@archnova.ca
Subject: RE: 18 McArthur: Boundary Conditions

Hi John,

Could you please be more specific?
With our other projects it is maximum a week.

Thanks,

Gordana Mrdja, B.Sc.Arch.
Arch-Nova Design Inc.
45 Banner Road
Nepean, ON, K2H 8X5
613-829-5722
gordana@archnova.ca

From: Wu, John [mailto:John.Wu@ottawa.ca]
Sent: Friday, April 1, 2016 11:46 AM
To: gordana@archnova <gordana@archnova.ca>
Subject: RE: 18 McArthur: Boundary Conditions

I don’t know. Maybe in two weeks.

From: gordana@archnova [mailto:gordana@archnova.ca]
Sent: Friday, April 01, 2016 11:44 AM
To: Wu, John
Cc: zoran@archnova.ca
Subject: RE: 18 McArthur: Boundary Conditions

Thank you John on prompt response!

When can we expect it back?
Regards,

Gordana Mrdja, B.Sc.Arch.
Arch-Nova Design Inc.
45 Banner Road
Nepean, ON, K2H 8X5
613-829-5722
gordana@archnova.ca

From: Wu, John [mailto:John.Wu@ottawa.ca]
Sent: Friday, April 1, 2016 11:16 AM
To: gordana@archnova <gordana@archnova.ca>
Subject: RE: 18 McArthur: Boundary Conditions

I was on sick leave, just back today. I will send it out.

John

From: gordana@archnova [mailto:gordana@archnova.ca]
Sent: Friday, April 01, 2016 11:11 AM
To: Wu, John
Cc: zoran@archnova.ca
Subject: FW: 18 McArthur: Boundary Conditions

Good morning John,

Would you please advise when can we expect boundary conditions for the 18 McArthur.
I am forwarding you again attached documents and an email that our engineer Zoran Mrdja has sent to you few days ago (please see below).

I would appreciate a timeline as we need it for project planning.
If you need anything else from us in order to provide us with the boundary conditions, please advise.

Kind regards,

Gordana Mrdja, B.Sc.Arch.

Arch-Nova Design Inc.
45 Banner Road
Nepean, ON, K2H 8X5
613-829-5722
gordana@archnova.ca

From: zoran@archnova [mailto:zoran@archnova.ca]
Sent: March 29, 2016 11:12 PM
To: 'Wu, John' <John.Wu@ottawa.ca>
Subject: 18 McArthur: Boundary Conditions

Hello John,

Please could you provide the boundary conditions for the location of 18 McArthur Avenue. The owner is planning to construct a new apartment building at this location. Attached are the water and sewer calculations, FUS fire flow calculation and the site plan for proposed development.

Type of development: apartment building (basement + 3 story)
Average daily demand: 0.14 l/s
Maximum daily demand: 1.29 l/s.
Maximum hourly daily demand: 1.94 l/s.
Fire flow: 200 l/sec

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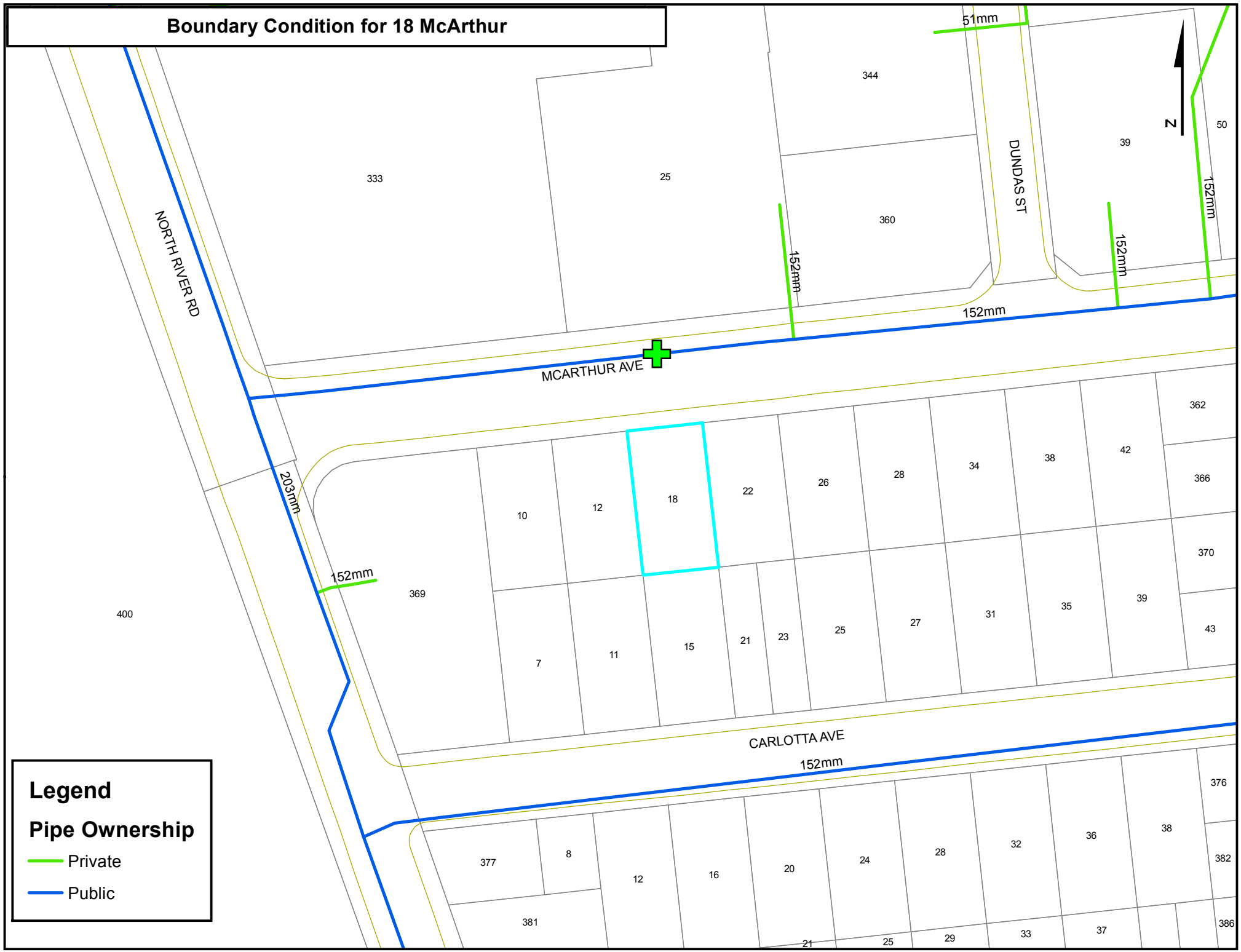
Boundary Condition for 18 McArthur
NORTH RIVER RD
MCARTHUR AVE
DUNDAS ST
CARLOTTA AVE
203mm
152mm
51mm
N
333
25
344
360
39
50
400
369
10
12
18
22
26
28
34
38
42
362
366
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38
376
382
381
386
21
25
29
33
37
Legend
Pipe Ownership
Private
Public