374 McArthur Avenue, Ottawa
Assessment of Adequacy of Public Services

Project # CW-01-20R

City Application # D07-12-20-0129

Prepared for:

Castle Heights Residences

By:

Arch-Nova Design Inc.

July 2021

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1. Introduction

The subject property is located at 374 McArthur Avenue, Ottawa. The proposed work comprises of a 6-storey+groundfloor garage apartment building with total of 64 apartments and a garage for 17 vehicles on the ground floor. For the purpose of this report the site is considered to run north-south. McArthur Avenue is extending east-west.

Currently the property is used as a residential lot with a single house and it is scheduled for demolition. The rest of the lot is a backyard on the south and west of the property and a driveway along the house's west side. Adjacent properties on the east and west are condominium building. South side (backyard) is adjacent to backyards of houses along Brant Street.

The area is serviced by municipal water (400 mm, 300 mm sanitary sewer and 525 mm storm sewer. The sidewalk in front of the property is at elevation between 60.98 and 61.06 m. a.s.l.

374 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 374 McArthur Avenue on the existing service capacity.

2.1 Water Supply

Existing building is supplied from 400 mm pipe and calculate consumption is 0.16 l/sec for the peak period.

Fire hydrant is located at intersection of McArthur Avenue and Brandt Street at distance of 44.1 m, which is sufficient for use of this hydrant by fire department and its vehicles. This hydrant 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 374 McArthur Avenue (zone 1W) assumed to be connected to the 400 mm on McArthur Avenue.

Minimum HGL = 107.8 m

Maximum HGL = 118.5 m; The maximum pressure is estimated to be more than 80 psi.[2]

[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] City of Ottawa: boundary conditions 12.05.2020

Max Day (4.62 L/s) + Fire Flow (383 L/s) = 108.0 m, the estimated ground elevation is 59.2 m.

The consumption is expected to be **285 l/min (4.62 L/sec)** for peak period. The fire flow for was estimated to be 23,000 l/min (383 l/sec)[3]. The City staff confirmed the required flow availability. With fire hydrant at distance of 44.1 m and available fire flow, the proposed building will be sufficiently protected from fire.

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 300 mm.

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

The estimated outflow for the new building is **1.42 l/sec** (peak flow + wet weather).

[3] OBC SectionA.3.2.5.7, Table 2.

Existing municipal sewer 300 mm has a capacity of 18.35 l/sec for 0.8% slope and 30% full. For increase of 1.38 l/sec the increase will be 6%. The capacity at 80% full is 91.6 l/sec.

Detailed calculation of water and sanitary flow is presented in Appendix A.

2.3 Site Stormwater Services

Current building and the rest of surface of the lot at 374 McArthur 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 2-year runoff coefficient should be in range of C=0.5 so the newly developed site must store certain amount of water.

The proposed new building and area of the lot will increase the runoff from 0.5 to 0.75 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 20.75 m^3.

The foundation drain (weeping tiles) is connected to the lateral over back flow prevention valve as well as to the sump pump in the basement which will pump water out to surface and further to street catch basins. The reason for this solution is in the stormwater pipe susceptible to surcharge at events like 2-year storm.

Backyard is proposed to be drained over land to the front. Two roof drains will be connected through inside of the building to the lateral. Both roof drains will provide maximum of 2.80 l/sec each and will be a single point for controlled outflow.

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 23,000 l/min (383 l/sec). The City provided information

that required flow is available at 107.8 m of HGL. The building roof is at elevation of 83.2 m which leaves 24.0 psi of residual pressure at maximum HGL of pressure.

3.2 Sanitary Sewer

Existing municipal sewer 300 mm has a capacity of 18.35 l/sec for 0.8% slope and 30% full. For increase of 1.3 5 l/sec the increase will be 6%. The capacity at 80% full is 91.6 l/sec.

Addition of new building should not overcharge existing system.

3.3 Stormwater

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

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

The City's engineers informed the consultant that the storm system along McArthur Avenue experiences a surcharge at even 2-year events so a recommendation is to install a back flow prevention valve on the stormwater lateral as well as the sump pump at the lower level of the underground garage.

In conclusion, existing municipal water, sanitary and storm services have sufficient capacity to provide water and collect sanitary and storm water from the new development.

Prepared by:
Zoran Mrdja, P.Eng.

July 2021

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

Appendix A: Calculations

Water Supply Design Criteria

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
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.	

374 McArthur Avenue, Ottawa
New

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	0
1 Bedroom	1.4	39	55
2 Bedroom	2.1	23	48
3 Bedroom	3.1	0	0
4 Bedroom	4.2	0	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/sec	m^3/d	L/sec	m^3/d	L/sec
Total Domestic Demand	103	28.81	0.33	273.71	3.17	410.57	4.75

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/sec	m^3/d	L/sec	m^3/d	L/sec
Commercial floor space	2.5	$L/m^2/d$	75	0.19	0.002	0.28	0.00	0.51	0.01
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				0.19	0.00	0.28	0.00	0.51	0.01

Total Demand	29.00	0.34	273.99	3.17	411.08	4.76

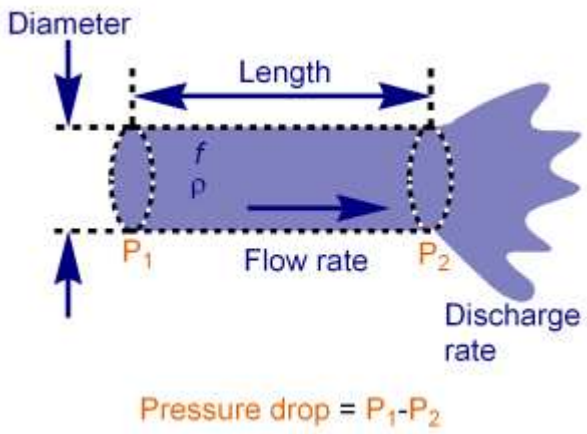
* Estimated number of seats at 1seat per $9.3m^2$

MyCT
Main
Forum

Darcy-Weisbach formula

Pressure drop in a circular pipe.

374 McArthur, Ottawa, ON apartment building



the calc

The equation states that the pressure loss $\Delta P=fL\rho V^2/2D$ (where L and D are th pipe length and diameter, ρ is the fluid density, V is the average velocity through the pipe, and f is the Darcy friction factor). Head loss is also available through the unit menus.

Pipe diameter:	100	mm
Pipe length:	20	m
Velocity:	.6	m/s
Discharge rate:	4.76	liter/s
Darcy friction factor:	0.15	
Density:	998	kg/m³
Pressure drop:	0.0538920	bar

Calculate!

Add

notes

Only *either* the velocity *or* the discharge rate needs to be entered. The Darcy friction factor f is also known as the "flow coefficient" λ or the Moody friction factor, and is 4x the Fanning friction factor. It is dependant on many factors such as the pipe material, shape, and fluid velocity. Therefore, it must be known or calculated for each specific use. For laminar flow in a circular pipe, it is 64/Re. Other calcs designed for specific conditions are available, which do not have the need for a known value of f.

Water Demand and Boundary Conditions

Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] (m)
Average Daily Demand	0.34	*
Max Day + Fire Flow	21,003.17	*
Peak Hour	4.76	*

[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.

* City to provide

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.	

374 McArthur Avenue, Ottawa
New

Sanitary Sewer Post Development Outflow

Site Area	**0.1171 ha**
Extraneous Flow Allowances	
Infiltration / Inflow	**0.03864 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	0
1 Bedroom	1.4	39	54.6
2 Bedroom	2.1	23	48.3
3 Bedroom	3.1	0	0
4 Bedroom	4.2	0	0
Total Population			**103**
Average Domestic Flow			**0.33 L/s**
Peaking Factor			**4.1**
Peak Domestic Flow			**1.35 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Commercial	28,000 L/gross ha/d	0.1	0.03
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			**0.03**
Peak Institutional / Commercial Flow*			**0.03**
Peak Industrial Flow**			**0.00**
Peak I/C/I Flow			**0.0324**

Total Estimated Average Dry Weather Flow Rate	**0.37**
Total Estimated Peak Dry Weather Flow Rate	**1.39**
Total Estimated Peak Wet Weather Flow Rate	**1.42**

Ottawa TechBulletin ISTB-2018-01 Section 4.4.1 Page 4.5
**Use Apendix 4B diagram

Manning Formula Uniform Pipe Flow at Given Slope and Depth

374 McArthur Avenue, Ottawa

Inputs:

Pipe Diameter, d_o	200.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	1.5000	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	13.0000	%

Results:

Flow, Q	1.5725	l/s
Velocity, v	0.6552	m/s
Velocity head, hv	0.0219	m
Flow Area, A	0.0024	m^2
Wetted Perimeter, P	0.1475	m
Hydraulic Radius	0.0163	m
Top Width, T	0.1345	m
Froude Number, F	1.57	
Shear Stress (tractive force), τ	3.8243	N/m^2

Fire Flow Calculation Ontario Building Code 2006 (Appendix A)

Project: 374 McArthur Avenue, Ottawa

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Date: **July 13, 2021**
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)	28.40	26,135.42
Building Width	18.53	
Building Length	49.67	

Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coefficient S_{tot}*
North	46.00	0	1.5
East	2.50	0.5	
South	50.00	0	
West	12.00	0	

Total Volume of Water Required Q**	**627,250.11**
Minimum Required Fire Flow (L/min) ***	**20,908.34**
Minimum Required Fire Flow (L/sec)	**348.5**

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_____) ***
2. Nearest fire hydrant distance _____ m;

374 McArthur Avenue, Ottawa
New

FUS Fire Flow Calculations

Project: 374 McArthur Avenue, Ottawa

Calculations Based on 1999 Publication "Water Supply for Public

Fire Protection " by Fire Underwriters' Survey (FUS)

Fire Flow Calculation #: 1

Date: July 13, 2021 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):			6	6	Storeys	
3	Enter Ground Floor Area of One Unit	Enter Ground Floor Area (A) of One Unit Only :						
		Measurement Units	Square Feet (ft2)	0.000	Square Metres (m2)	5995	Area in Square Meters (m2)	
			Square Metres (m2)	821				
			Hectares (ha)	0				
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						17,034
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	-2,555
			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	0.30	Complete Automatic Sprinkler Protection	0.00	N/A	0
			None	0				
5.3	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	45<	0	0.40	m	6,814
			East Side	0-3 m	0.25			
			South Side	30.1-45 m	0			
			West Side	10.1-20 m	0.15			
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						21,000
		Total Required Fire Flow (above) in L/s:						350
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						2520

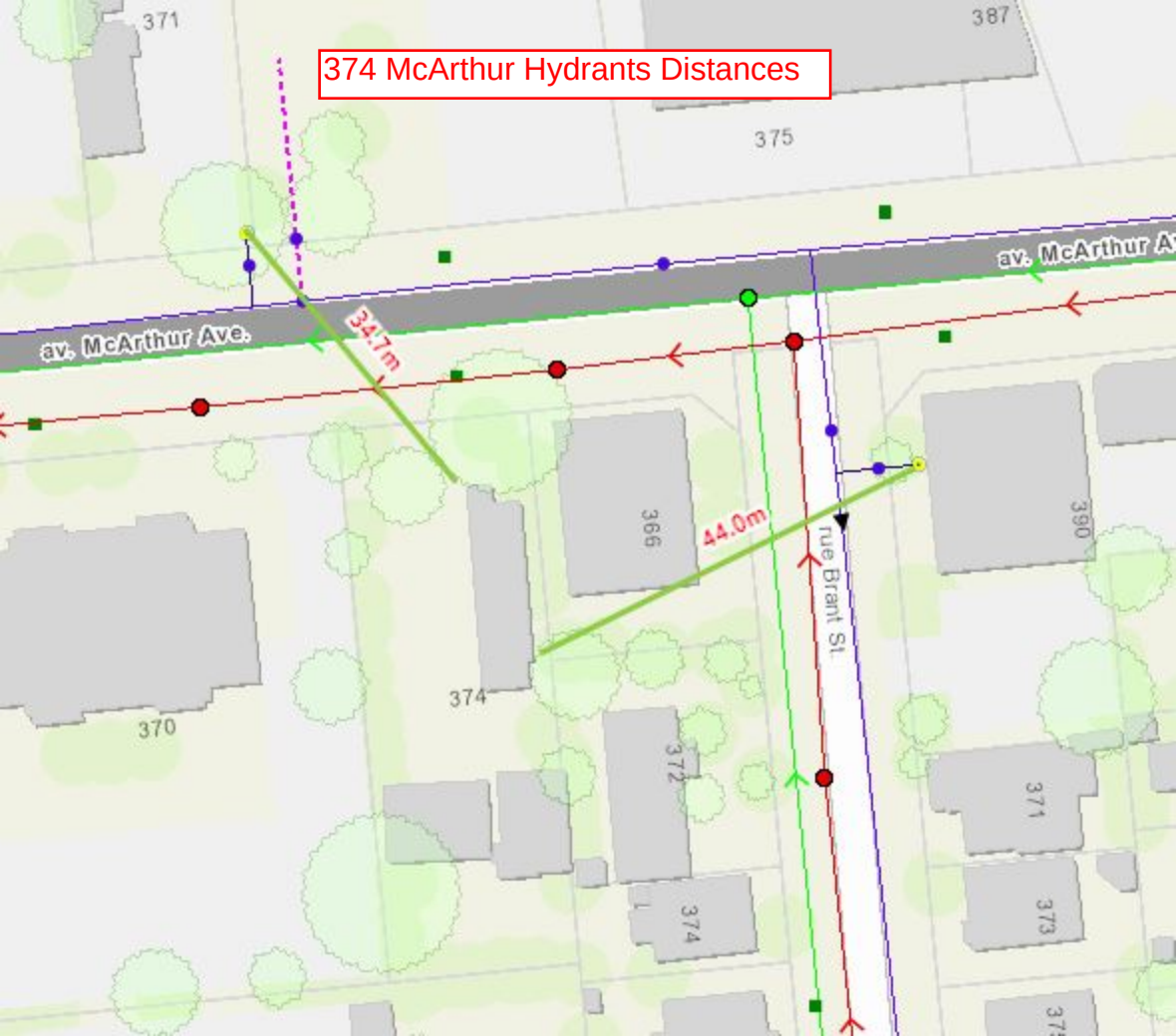
Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline

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.


FUS Separation Distances
50.2m
10.1m
3.6m
155.2m


374 McArthur Hydrants Distances
371
387
375
av. McArthur Ave.
av. McArthur Av
34.7m
44.0m
366
390
rue Brant St.
374
370
372
371
374
373

Project Number: CW-01-20 374 McArthur Ave., Ottawa

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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	0.11720	100.0%	0.50	0.059
TOTAL		0.1172	100.0%		0.059
Weighted C =					0.50

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

$Q_{2pre} = (2.78)*(C)*(I_5)*(A)$
$Q_{2pre} =$ 2.78 x 0.50 x 76.8 x 0.1172
$Q_{2pre} =$ 12.51 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100pre} =$ 2.78 x 0.63 x 178.6 x 0.1172
$Q_{100pre} =$ 36.37 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)
Landscape	A1	0.0471	100.0%	0.70	0.033
TOTAL		0.0471	100.0%		0.033
Weighted C =					0.70

$Q_{2post} = (2.78)*(C)*(I_5)*(A)$
$Q_{2post} =$ 2.78 x 0.70 x 76.8 x 0.0471
$Q_{2post} =$ 7.04 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100post} =$ 2.78 x 0.70 x 178.6 x 0.0471
$Q_{100post} =$ 16.37 L/s

Project Number: CW-01-20 374 McArthur Ave., Ottawa

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PRE-DEVELOPMENT

The pre-development time of concentration is 10 minutes

where:

$I_2 =$ 732.951 / (Tc + 6.199) $^{0.810}$

$I_2 =$ **76.8 mm/hr**

$I_{100} =$ 1735.688 / (Tc + 6.014) $^{0.820}$

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

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Site	A1	0.00000	0.0%	0.95	0.000
			0.0%	0.95	0.000
			0.0%	0.70	0.000
TOTAL		0.0000	0.0%		0.000
Weighted C =					0.50

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

$Q_{2pre} = (2.78)*(C)*(I_2)*(A)$

$Q_{2pre} =$ 2.78 x 0.50 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 0.50 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) $^{0.810}$

$I_2 =$ **76.8 mm/hr**

$I_{100} =$ 1735.688 / (Tc + 6.014) $^{0.820}$

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

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Building	A2	0.0701	100.0%	0.95	0.067
TOTAL		0.07009	0.0%		0.067
Weighted C =					0.95

$Q_{2post} = (2.78)*(C)*(I_2)*(A)$

$Q_{2post} =$ 2.78 x 0.95 x 76.8 x 0.0701

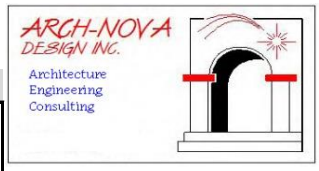
$Q_{2post} =$ 14.22 L/s

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

$Q_{100post} =$ 2.78 x 0.95 x 178.6 x 0.0701

$Q_{100post} =$ 33.06 L/s

ALLOWABLE RUNOFF



Predevelopment Runoff:		
Uncontrolled Runoff		
2-year	12.51	l/sec
100-year	36.37	l/sec
Controlled Runoff:		
2-year	0.00	l/sec
100-year	0.00	l/sec

Postdevelopment Runoff:		
Uncontrolled Runoff		
2-year	7.04	l/sec
100-year	16.37	l/sec
Controlled Runoff:		
2-year	14.22	l/sec
100-year	33.06	l/sec

Controlled allowable runoff		
Controlled Runoff:		
2-year	**5.47**	**l/sec**

Comment:

Storage Volumes (2-Year Storm)

Project: 384 Frank St.

Tc = 10 (mins)
C_{AVG} = 0.95 (dimmensionless)
Area = 0.0701 (hectares)
Storm = 2 (year)
Release Rate = 5.47 (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	2.7	5.47		
11	73	13.5	5.47	8.07	5.33
21	50	9.3	5.47	3.87	4.88
31	39	7.3	5.47	1.78	3.31
41	32	6.0	5.47	0.51	1.25
51	28	5.1	5.47	-0.35	-1.08
61	24	4.5	5.47	-0.98	-3.59
71	22	4.0	5.47	-1.46	-6.21
81	20	3.6	5.47	-1.83	-8.92
91	18	3.3	5.47	-2.14	-11.69
101	17	3.1	5.47	-2.39	-14.51
111	15	2.9	5.47	-2.61	-17.38
121	14	2.7	5.47	-2.79	-20.28
131	14	2.5	5.47	-2.95	-23.20
141	13	2.4	5.47	-3.09	-26.15
151	12	2.3	5.47	-3.21	-29.13
161	12	2.1	5.47	-3.32	-32.12
171	11	2.0	5.47	-3.42	-35.13
181	11	2.0	5.47	-3.51	-38.15
191	10	1.9	5.47	-3.59	-41.18
201	10	1.8	5.47	-3.67	-44.23
211	9	1.7	5.47	-3.73	-47.28
221	9	1.7	5.47	-3.80	-50.35
231	9	1.6	5.47	-3.85	-53.42
241	8	1.6	5.47	-3.91	-56.50
251	8	1.5	5.47	-3.96	-59.59
261	8	1.5	5.47	-4.00	-62.69
271	7.7	1.4	5.47	-4.05	-65.79

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} = 0.95 (dimmensionless)
Area = 0.0701 (hectares)
Storm = 100 (year)
Release Rate = 5.47 (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	6.5	5.47		
11	170	31.5	5.47	25.98	17.15
21	116	21.5	5.47	16.06	20.23
31	90	16.6	5.47	11.16	20.75
41	74	13.7	5.47	8.20	20.16
51	63	11.7	5.47	6.20	18.96
61	55	10.2	5.47	4.75	17.38
71	49	9.1	5.47	3.65	15.54
81	45	8.3	5.47	2.78	13.51
91	41	7.5	5.47	2.07	11.33
101	38	7.0	5.47	1.49	9.04
111	35	6.5	5.47	1.00	6.66
121	33	6.1	5.47	0.58	4.20
131	31	5.7	5.47	0.21	1.68
141	29	5.4	5.47	-0.10	-0.89
151	27	5.1	5.47	-0.39	-3.50
161	26	4.8	5.47	-0.64	-6.16
171	25	4.6	5.47	-0.86	-8.85
181	24	4.4	5.47	-1.07	-11.57
191	23	4.2	5.47	-1.25	-14.33
201	22	4.1	5.47	-1.42	-17.10
211	21	3.9	5.47	-1.57	-19.90
221	20	3.8	5.47	-1.71	-22.72
231	20	3.6	5.47	-1.84	-25.55
241	19	3.5	5.47	-1.96	-28.41
251	18	3.4	5.47	-2.08	-31.28
261	18	3.3	5.47	-2.18	-34.16
271	17	3.2	5.47	-2.28	-37.06

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 = 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

ARCH-NOVA DESIGN INC.
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Storage Requirements

2-year **5.33 m^3**

100-year **20.75 m^3**

Surface Type	ID	Area (m^2)	Percent of total Area	Required Storage 2 year	Required Storage 100 year	Max Allowed Drain Outflow l/s	Max Allowed Drain Outflow GPM
Roof	**D1**	284.50	50.0%	2.66	10.38	2.74	43.36
Roof	**D2**	284.50	50.0%	2.66	10.38	2.74	43.36
TOTAL		569.00	100.0%	5.33	20.75	5.47	86.72

Stage-Storage

Roof (Drain D1 & D2)		
Depth m	**Area** m^2	**Volume** m^3
0.050	100.0	1.67
0.075	**215.0**	**5.38**
0.08	**450.0**	**12.00**
0.1105	**569.0**	**20.96**

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

.

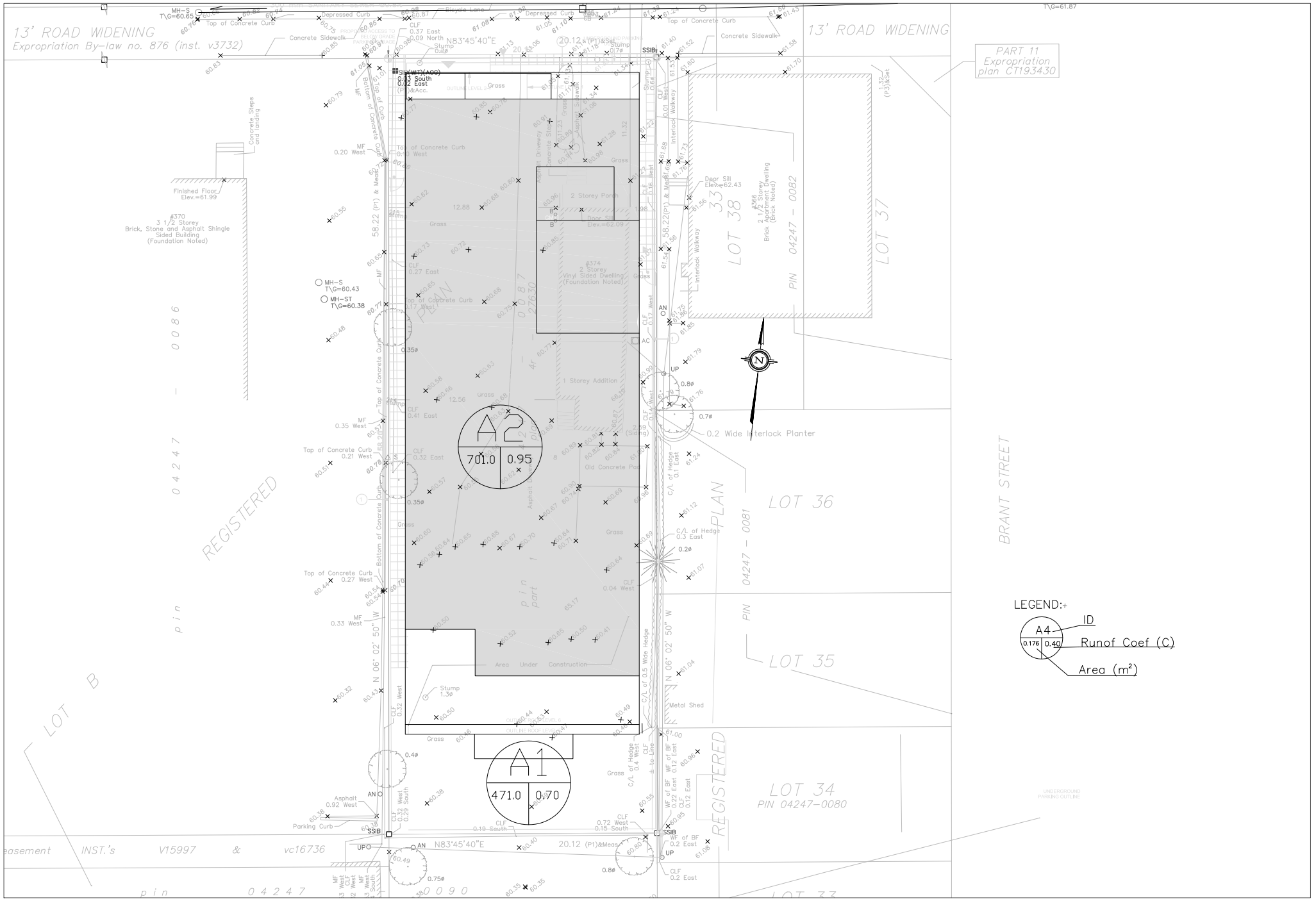
Notes:

Roof drains with controlled flow to be specified by manufacturer using the allowable flow rates presented in this chart

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting

374 McARTHUR AVE., OTTAWA
SWM PREDEVELOPMENT

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



374 McARTHUR 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: zoran@archnova.ca
Sent: June 3, 2020 12:31 PM
To: zoran@archnova.ca
Subject: FW: 374 McArthur
Attachments: HGL_2yr_5yr.png

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: June 1, 2020 9:36 AM
To: zoran@archnova.ca
Cc: Paul Robinson <probinson@probinsonconsulting.com>; Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: 374 McArthur

Good morning Mr. Mrdja.

Please find provided information from our WRD for your use and resources in regard to this site:

Although we don't usually give out remaining capacity info and committed capacity because of the complexity of the system in the downtown core, because of how it be mis-interpreted (dry weather vs wet weather) and also because this information is always in flux. We usually check the impact of the proposed development in the model with respect to flooding issues and then simply let them know if development can proceed.

Further to above, please find the 2 and 5-year HGL downstream of the site to the outfall. It appears direction as a "2 year" release rate would be appropriate. (see attached).

Please also see below the previously provided information as well.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Infrastructure and Economic Development Department | Direction générale de la planification de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1

(613) 580 2424 Ext. | Poste 33017
Int. Mail Code | Code de Courrier Interne 01-14
shawn.wessel@ottawa.ca

Please consider the environment before printing this email

*****Please note that, while my work hours may be affected by the current situation, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.*****

From: Wessel, Shawn
Sent: May 13, 2020 11:41 AM
To: zoran@archnova.ca
Cc: Paul Robinson <probinson@probinsonconsulting.com>; Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: 374 McArthur

Good morning again Mr. Mrdja.

After consulting with Mr. Tousignant again and in regards to SWM, it has been determined that due to the size of your site and with the proposed building occupying the majority of the site, you are to control the roof to 2 year event and allow surrounding property to drain overland to the ROW. Furthermore, we understand that draining the rear site to the ROW would likely require a rear yard CB (CB lead min. 200 mm dia. for PVC pipe and standard CB or 250 mm dia. for corrugated rear yard HDPE pipe, as per City Guidelines and Detail Drawings S30 & S31). We understand this area in the rear is quite small and coupled with the difficulty to achieve the required release rate for the site and further to response from Water Resources Dept., we will not concern ourselves with this small amount and you are permitted to focus controls on roof top of building.

Water Resource Dept. comments are as follows:

The City enters the allowable flows into the models if we feel it is required (i.e. if there are flooding issues in the area or if the flow is significant). In this particular case, the proposed guideline flows will not cause an issue.

Note that there is flexibility on the sanitary flows because re-development often leads to more persons per hectare and thus makes it impossible to maintain existing flows. On the storm system however, we do not have such leeway and therefore impose SWM due to an increase in imperviousness. The storm system in the core of the City was designed with a 1960's 2 year IDF curve, which is less than today's 2 year IDF curve, making the system undersized by today's standard. Our guidelines seek to create capacity and/or alleviate existing surcharge issues in the system when re-development occurs. This is why we in impose SWM on properties where none existed before.

Please note though, that in some cases the lot is so small that some flexibility must be allowed. In the case of 374 McArthur, the 0.11 ha property would have release rate of only 11 L/s, which can be considered low and difficult to achieve.

I hope this clarifies your inquiries and concerns and please note that we review each site on a “case-by-case” basis and due to the constraints for this particular site, we are providing some flexibility in the SWM criteria.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d’infrastructures

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shawn.wessel@ottawa.ca

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From: zoran@archnova.ca <zoran@archnova.ca>
Sent: May 12, 2020 9:00 PM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Cc: Paul Robinson <probinson@probinsonconsulting.com>; Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: 374 McArthur

This is still good if they can run our input (boundary conditions) for sewer and storm sewer in the model then. We need to have limits established so we know what building size can be supported by the infrastructure. It is a critical information and can lead the entire design in different direction.

Regards,

ZM

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: May 12, 2020 5:09 PM
To: zoran@archnova.ca
Subject: RE: 374 McArthur

Good evening Mr. Mrdja.

The response from our Water Resource and Asset Mgmt. Depts., including Mr. Eric Tousignant, P.Eng. and Mr. Hiran Sandanayake, P.Eng., in regard to your request, is as follows:

Asset Management does not give out remaining and/or committed capacity information because of the complexity of the system in the downtown core (free flow capacity vs surcharged capacity) and because this information is always in flux.
We usually check the impact of the proposed development in the model with respect to flooding issues and then simply let the proponent know if development can proceed with the proposed flows.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

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shawn.wessel@ottawa.ca

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From: zoran@archnova.ca <zoran@archnova.ca>
Sent: May 12, 2020 12:54 PM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Subject: RE: 374 McArthur

Thank you,

ZM

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: May 12, 2020 12:48 PM
To: zoran@archnova.ca
Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>; 'Paul Robinson' <probinson@probinsonconsulting.com>
Subject: RE: 374 McArthur

Thank you for your email and inquiry Mr. Mrdja.

I have passed on your request for information to Water Resources Dept. for a response and will get back to you once I hear from them.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

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shawn.wessel@ottawa.ca

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From: zoran@archnova.ca <zoran@archnova.ca>
Sent: May 12, 2020 12:20 PM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>; 'Paul Robinson' <probinson@probinsonconsulting.com>
Subject: RE: 374 McArthur

Thank you for the information. For SWM and sanitary sewer we would need to know what is residual capacity in the system as well as what would be committed capacity. I believe Hiran Sandanayake can help with his model output.

Regards,

Zoran

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: May 11, 2020 5:20 PM
To: Zoran Mrdja <zoran@archnova.ca>
Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>; Paul Robinson <probinson@probinsonconsulting.com>
Subject: 374 McArthur

Good afternoon Mr. Mrdja.

Please find boundary conditions for this site.

The following are boundary conditions, HGL, for hydraulic analysis at 374 McArthur (zone 1W) assumed to be connected to the 406mm on McArthur (see attached PDF for location).

Minimum HGL = 107.8m

Maximum HGL = 118.5m. *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.*

MaxDay + FireFlow (383L/s) = 108.0m

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.

For SWM, I have been told that this system is tight (capacity) and to control to the lesser of C=0.5 or existing for a 2 year event.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

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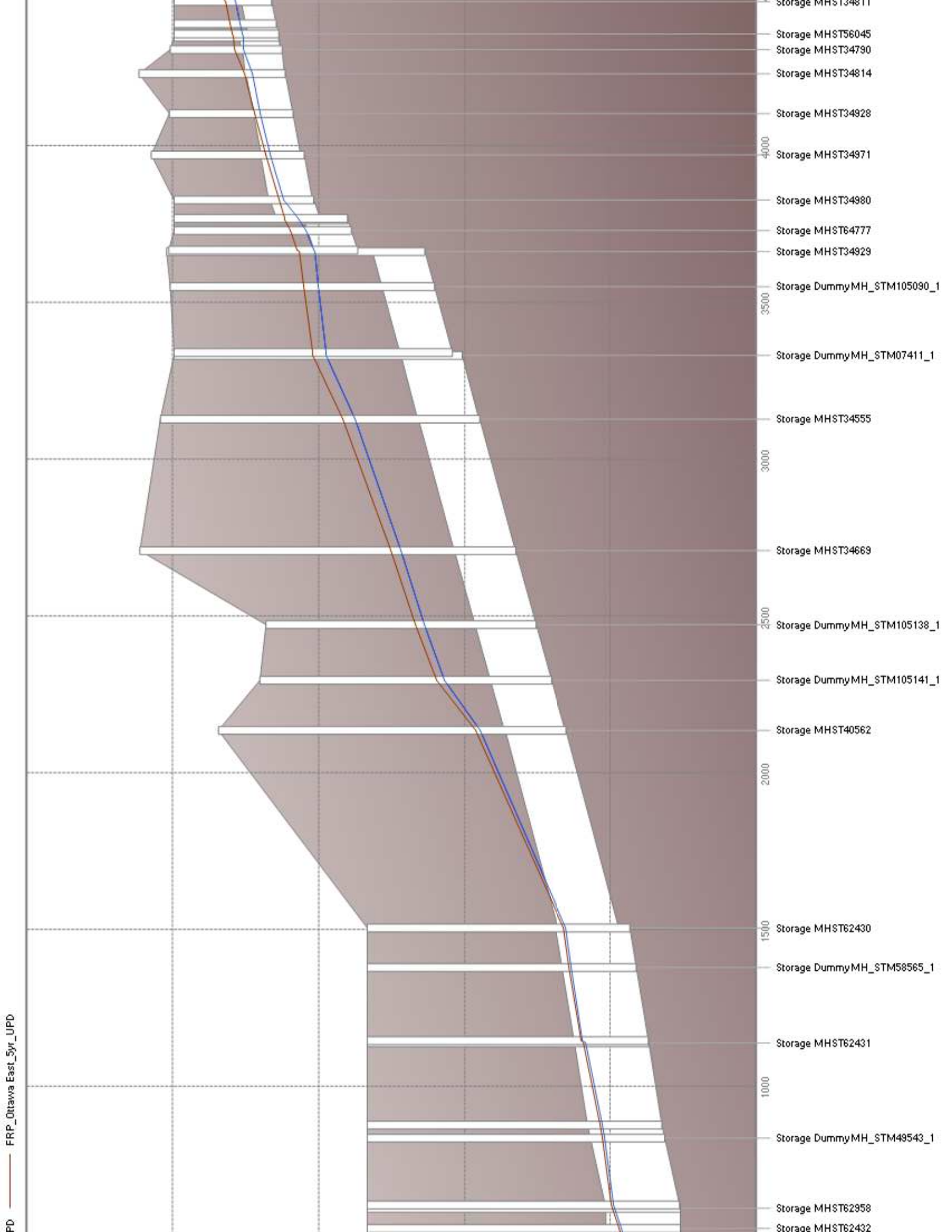
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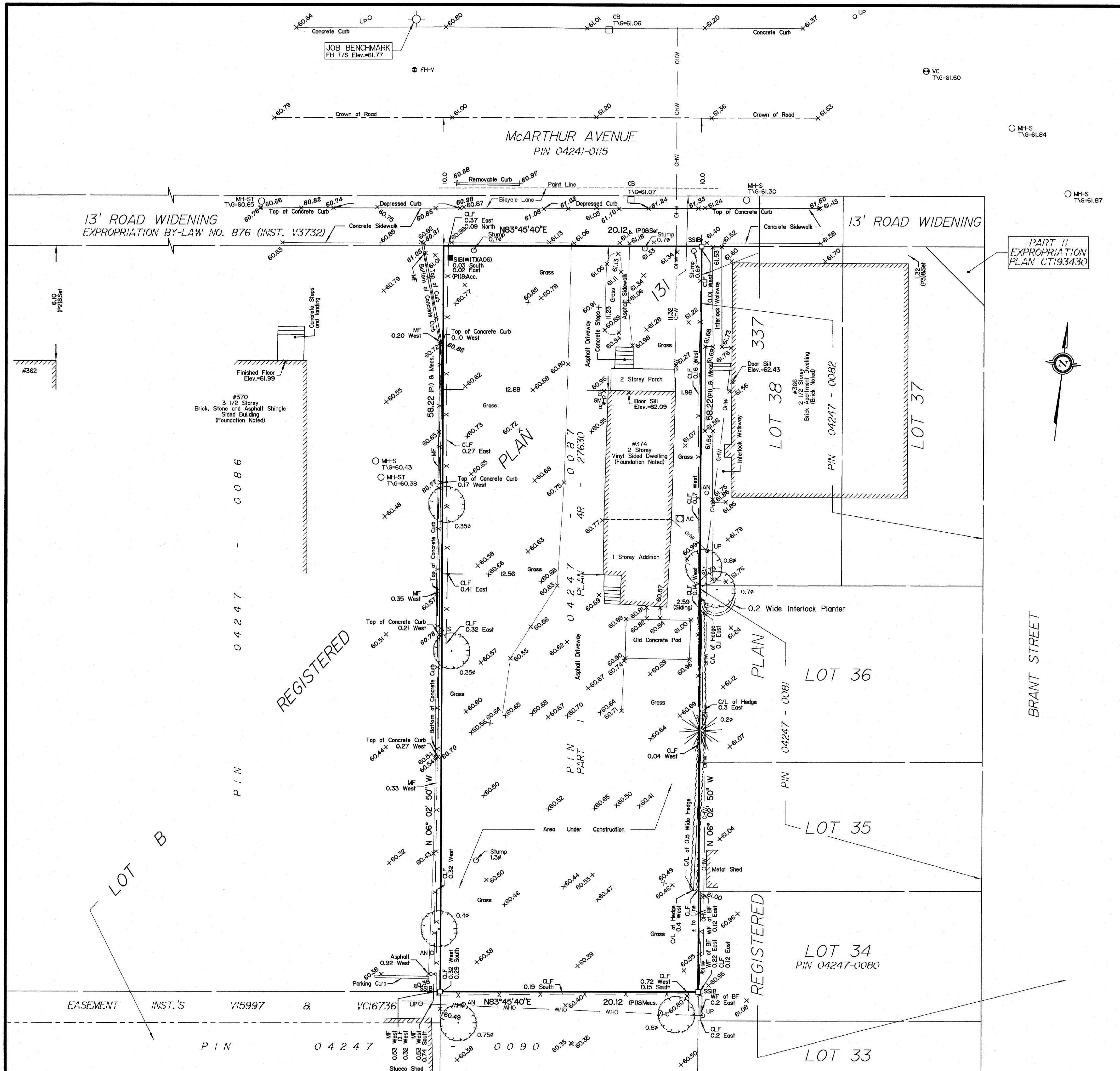


Y:\2020\20195-20\FINAL\20195-20 PtLtB PL131T D F.dwg

TOPOGRAPHIC PLAN OF SURVEY OF

PART OF LOT B
REGISTERED PLAN 131
CITY OF OTTAWA

Prepared by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 200

8.0 6.0 4.0 2.0 0 4 8 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on the 10th day of March, 2020.

March 31/20
Date

V. Andrew Shelp
Ontario Land Surveyor

Notes & Legend

—□—	Denotes	Survey Monument Planted
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
(PI)	"	Plan 4R-27630
(P2)	"	(AOG) Plan October 3,1995
(P3)	"	(AOG) Plan January 24, 1996
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(WIT)	"	Witness
Acc.	"	Accepted
○ MH-ST	"	Maintenance Hole (Storm Sewer)
○ MH-S	"	Maintenance Hole (Sanitary)
VC	"	Valve Chamber (Watermain)
○ UP	"	Utility Pole
○ AN	"	Anchor
—— OHW ——	"	Overhead Wires
□ CB	"	Catch Basin
FH	"	Fire Hydrant
T/G	"	Top of Grate
T/S	"	Top of Spindle
GM	"	Gas Meter
	"	Deciduous Tree
	"	Coniferous Tree
○ B	"	Bollard
△ S	"	Sign
CLF	"	Chain Link Fence
MF	"	Metal Fence
BF	"	Board Fence
AC	"	Air Conditioner
Ø	"	Diameter
+ 65.00	"	Location of Elevations
+ 65.00	"	Top of Concrete Curb Elevation
C/L	"	Centreline
WF	"	West face
———	"	Property Line

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2121816
THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29 (3).

Bearings are grid bearings, derived from the southerly limit of McArthur Road shown to be N83°45'40"E and are referred to the Central Meridian of Zone 9 of the Ontario Coordinate System, Longitude 76°30' West (MTM NAD-83).

SITE AREA = 1171 m²

ELEVATION NOTES

1. Elevations shown are referred to geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 20195-20 PtLtB PL131T D F | FS

1. GENERAL

1.1 USE BAR SCALE TO CONFIRM ACTUAL PLOT SCALE. EXISTING AND NEW ELEVATIONS AND INVERTS SHOWN ARE GEODETIC AND ARE IN METERS.
1.2 EXISTING ELEVATIONS AND LOCATIONS, INVERTS AND SIZES OF EXISTING SERVICES ARE NOT NECESSARILY SHOWN ON PLAN AND THOSE SHOWN ARE DERIVED FROM AVAILABLE INFORMATION AND MUST BE CONFIRMED ON SITE BEFORE COMMENCING CONSTRUCTION. REPORT ANY DIFFERENCES TO ENGINEER.
1.3 SITE BOUNDARIES AND EXISTING GRADES AND OTHER FEATURES DERIVED FROM TOPOGRAPHIC SURVEY PREPARED BY ANNIS O'SULLIVAN, VOLLEBEKK LTD JOB No. SURVEY McArthur.
1.4 REFER TO ARCHITECTURAL / LANDSCAPE SITE PLANS FOR EXACT LOCATIONS OF BUILDINGS, PAVED AREAS SIDEWALKS ETC.
1.5 REFERENCE THE LATEST REVISION AND ALL ADDENDUMS OF THE GEOTECHNICAL INVESTIGATION BY LRL ASSOCIATES LTD. FILE No.: 140805. SITE PREPARATION INCLUDING BUILDING SUB-GRADE PREPARATION AND PAVEMENT SUB-GRADE PREPARATION AND CONSTRUCTION OF THE PAVEMENT STRUCTURE AND EXCAVATION AND BACKFILLING SHALL CONFORM TO THE GEOTECHNICAL INVESTIGATION TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.
1.6 DRAWINGS ARE TO BE READ IN CONJUNCTION WITH STORM WATER MANAGEMENT REPORT No. 14033-SWM & SERVICING BRIEF No. 14033-SB PREPARED BY D. B. GRAY ENGINEERING INC.
1.7 REINSTATE ADJACENT PROPERTIES TO PRE-CONSTRUCTION CONDITIONS.
1.8 REINSTATE CITY PROPERTIES TO CITY STANDARDS AND TO CITY OF OTTAWA'S SATISFACTION.
1.9 ALL RELEVANT WORK SHALL BE DONE IN ACCORDANCE WITH CURRENT CITY STANDARDS AND SPECIFICATIONS.
1.10 ONTARIO PROVINCIAL STANDARDS & SPECIFICATIONS WILL APPLY WHERE NO CITY STANDARDS ARE AVAILABLE.
1.11 ALL PROPOSED RETAINING WALLS SHALL BE SETBACK A MINIMUM 0.15M FROM PROPERTY LINE. ALL PROPOSED RETAINING WALLS GREATER THAN 1.0M IN HEIGHT SHALL BE DESIGN BY A PROFESSIONAL ENGINEER REGISTERED IN ONTARIO.

2. EROSION AND SEDIMENT CONTROL

2.1 THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATER COURSE DURING CONSTRUCTION ACTIVITIES. THIS INCLUDES LIMITING THE AMOUNT OF EXPOSED SOIL, USING SEDIMENT CAPTURE FILTER SOCK INSERTS IN CATCH BASINS AND MANHOLES AND INSTALLING SILT FENCES AND OTHER EFFECTIVE SEDIMENT TRAPS. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2.2 PRIOR TO COMMENCEMENT OF CONSTRUCTION AT ALL MUNICIPAL CATCH BASINS ADJACENT TO THE SITE AND AT ANY MANHOLES OR CATCH BASINS THAT WILL RECEIVE DISCHARGE FROM DE-WATERING OPERATIONS AND ALL NEW CATCH BASINS AS THEY ARE INSTALLED: INSTALL SEDIMENT CAPTURE FILTER SOCK INSERTS (TERRAFIX GEOSYNTHETICS INC SILTSACK OR APPROVED EQUAL). INSPECT AT THE END OF EACH DAY AND AFTER EACH RAINFALL. REMOVE SEDIMENT AS RECOMMENDED BY THE MANUFACTURER. IMMEDIATELY REPAIR OR REPLACE ANY DAMAGED FILTER SOCK INSERTS. DO NOT REMOVE UNTIL CONSTRUCTION IS COMPLETE.
2.3 PRIOR TO COMMENCEMENT OF CONSTRUCTION INSTALL A SILT FENCE BARRIER AS SHOWN ON PLANS. INSPECT ALL SILT FENCES AT THE END OF EACH DAY AND AFTER EACH RAINFALL. REMOVE SEDIMENT DEPOSITS WHEN THE LEVEL OF DEPOSITS REACHES ONE THIRD THE HEIGHT OF THE FENCE. IMMEDIATELY REPAIR OR REPLACE ANY DAMAGED SECTIONS OF FENCE. DO NOT REMOVE ANY SILT FENCES IN ANY PHASE UNTIL CONSTRUCTION IS COMPLETE. AFTER THE REMOVAL OF A SILT FENCE IMMEDIATELY GRADE, PREPARE SURFACE AND SEED.

2.4 CONSTRUCTION IS CONSIDERED COMPLETE WHEN THE FOLLOWING CONDITIONS HAVE BEEN MET:
a. ALL STRUCTURES HAVE BEEN BUILT.
b. ALL HARD SURFACES HAVE BEEN CONSTRUCTED.
c. ALL PROPOSED GRASSED AREAS ARE EITHER SODDED OR HAVE A FULL COVERAGE OF WELL ESTABLISHED TURF AND HAVE HAD A MINIMUM OF ONE FULL GROWING SEASON (MAY 15TH TO SEPTEMBER 15TH).
d. THERE ARE NO AREAS OF EXPOSED EARTH.
e. ALL STOCKPILED MATERIALS HAVE BEEN REMOVED.

2.5 REMOVE EROSION AND SEDIMENT CONTROL MEASURES WHEN CONSTRUCTION IS COMPLETE.

3. GRADING & DRAINAGE

3.1 NEW GRADES TO MATCH EXISTING AT PROPERTY LINE. NO EXCESS DRAINAGE WILL BE DIRECTED TOWARDS THE ADJACENT PROPERTIES DURING AND AFTER CONSTRUCTION. THERE WILL BE NO ALTERATION TO EXISTING GRADE AND DRAINAGE PATTERNS ON PROPERTY LINE.
3.2 ALL AREAS SHALL BE GRADED TO ENSURE ADEQUATE DRAINAGE AWAY FROM BUILDINGS TO CATCH BASINS, SWALES, DITCHES AND OTHER APPROVED DISPOSAL AREAS. GRADES TO BE GRADUAL BETWEEN FINISHED SPOT ELEVATIONS SHOWN ON DRAWINGS TO PREVENT PONDING (OTHER THAN PONDING REQUIRED FOR STORMWATER MANAGEMENT).
3.3 GEOTEXTILE FABRIC: TO OPSS 1860. WOVEN SYNTHETIC FIBRE FABRIC SHALL BE USED IN SILT FENCE BARRIER AND BETWEEN GRATES FRAMES OF CATCH BASINS. NON-WOVEN SYNTHETIC FIBRE FABRIC 1.75mm THICK, 200g/sq.m. SHALL BE USED FOR MATERIAL SEPARATION. GEOTEXTILE (FILTER) FABRIC SHALL BE FREE OF TEARS AND RESISTANT TO DETERIORATION BY ULTRA VIOLET AND HEAT EXPOSURE. PLACE GEOTEXTILE MATERIAL BY UNROLLING ONTO GRADED SURFACE, SMOOTH AND FREE OF TENSION STRESS, FOLDS, WRINKLES AND CREASES. PLACE GEOTEXTILE MATERIAL ON SLOPING SURFACES IN ONE CONTINUOUS LENGTH FROM TOE OF SLOPE TO UPPER EXTENT OF GEOTEXTILE. OVERLAP EACH SUCCESSIVE STRIP OF GEOTEXTILE 600mm OVER PREVIOUSLY LAID STRIP IN DIRECTION OF FLOW. ALTERNATIVELY THE FABRIC MAY BE LAPPED A MINIMUM OF 300mm AND PINNED TOGETHER. PROTECT INSTALLED GEOTEXTILE MATERIAL FROM DISPLACEMENT, DAMAGE OR DETERIORATION BEFORE, DURING AND AFTER PLACEMENT OF MATERIAL LAYERS AFTER INSTALLATION, COVER WITH OVERLYING LAYER WITHIN 4 HOURS OF PLACEMENT. DURING DELIVERY AND STORAGE, PROTECT GEOTEXTILES FROM DIRECT SUNLIGHT, ULTRAVIOLET RAYS, EXCESSIVE HEAT, MUD, DIRT, DUST, DEBRIS AND RODENTS. VEHICULAR TRAFFIC NOT PERMITTED DIRECTLY ON GEOTEXTILE. AVOID PUNCTURING GEOTEXTILE. REPLACE DAMAGED OR DETERIORATED GEOTEXTILE.

4. SITE SERVICES

4.1 CONNECTION TO WATERMAIN BY CITY OF OTTAWA, CONTRACTOR SHALL PROVIDE EXCAVATION, BACKFILL AND REINSTATEMENT. BLANK EXISTING WATER SERVICE CONNECTION AT CITY WATERMAIN BY CITY FORCES.
4.2 WATER METER SHALL BE INSTALLED AS PER CITY OF OTTAWA DWG. No. W31.
4.3 ALL WATER SERVICE MATERIALS AND CONSTRUCTION METHODS TO CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. WATER SERVICE MATERIALS SHALL BE PVC PRESSURE CLASS 150 DR18. PROVIDE THRUST BLOCKS AS PER CITY OF OTTAWA DWG. No. W25.3 & W25.4 AT ALL VALVES, TEES, CAPS, BENDS, REDUCERS AND HYDRANTS OR OTHER FITTINGS WHERE CHANGES OCCUR IN PIPE DIAMETER OR DIRECTION. RESTRAINING AS PER AS PER CITY OF OTTAWA DWG. No 25.5 & 25.6. CATHODIC PROTECTION & ANODE INSTALLATION AS PER CITY OF OTTAWA DWG. No 40, 42, 44 & 47.
4.4 PROVIDE A MINIMUM 2.4 m COVER OVER WATER SERVICE CONNECTION. WHERE THE MINIMUM COVER IS NOT POSSIBLE INSULATE AS PER CITY OF OTTAWA DWG. No. W22.
4.5 WHERE LESS THAN 2.4 m CLEARANCE FROM AN OPEN STRUCTURE (EG. MANHOLES & CATCH BASINS) PLACE INSULATION AROUND WATER SERVICE CONNECTIONS AS PER CITY OF OTTAWA DWG. No. W23.
4.6 THE WATER SERVICE CONNECTION SHALL CROSS ABOVE THE SEWER AS PER CITY OF OTTAWA DRAWING No. W25.2: PROVIDE A MINIMUM 250mm BARRELL TO BARRELL VERTICAL SEPARATION. IF IT IS NOT POSSIBLE FOR THE WATERMAIN TO CROSS ABOVE A SEWER THE WATERMAIN SHALL CROSS BELOW THE SEWER AS PER CITY OF OTTAWA DRAWING No. W25: PROVIDE A MINIMUM 500m BARRELL TO BARRELL VERTICAL SEPARATION AND ENSURE THAT THE WATER PIPE IS CENTERED AT THE POINT OF CROSSING SO JOINTS ARE AS FAR AS POSSIBLE FROM THE SEWER.
4.7 AT THE PROPERTY LINE INSTALL A WATERTIGHT CAP AT ENDS OF EXISTING STORM AND SANITARY SEWERS CONNECTIONS TO BE ABANDONED.
4.8 INSTALL A WATERTIGHT CAP AT ENDS OF EXISTING STORM SEWERS TO BE ABANDONED.
4.9 THE SANITARY BUILDING DRAIN SHALL BE INSTALLED WITH A FULL-PORT BACKWATER VALVE IN EACH DWELLING UNIT AS PER CITY DWG S14.1.
4.10 THE STORM BUILDING DRAIN SHALL BE INSTALLED WITH A BACKWATER VALVE IN EACH DWELLING UNIT (TO CITY OF OTTAWA STANDARDS).
4.11 CONNECT PROPOSED SANITARY SEWER SERVICE CONNECTION TO EXISTING MUNICIPAL SANITARY SEWER AS PER CITY OF OTTAWA DWG No. S11 (RIGID MAIN SEWER) OR S11.1 (FLEXIBLE MAIN SEWER).
4.12 CONNECT PROPOSED STORM SEWER SERVICE CONNECTION TO EXISTING MUNICIPAL STORM SEWER AS PER CITY OF OTTAWA DWG No. S11.
4.13 SEWER MATERIAL SHALL BE PVC. PVC SEWERS SHALL BE SDR-35 (SDR-28 FOR DIAMETERS 150mm OR LESS) AND SHALL CONFORM TO CSA B182.2 AND SHALL HAVE BELL AND SPIGOT JOINTS WITH RUBBER GASKETS.
4.14 MANHOLES & CATCH BASINS:
A. PRECAST MANHOLE UNITS: TO OPSS 1351 WITH BASE SLAB OR MONOLITHIC BASE. TOP SECTIONS ECCENTRIC CONE OR FLAT LAB TOP TYPE WITH OPENING OFFSET FOR VERTICAL LADDER INSTALLATION.
B. MANHOLE STEPS: TO OPSD 405.01
C. ADJUSTING RINGS: TO ASTM C 478M.
ALUMINUM SURFACES IN CONTACT WITH OR CAST INTO CONCRETE SHALL HAVE POLYETHYLENE ANCHOR INSULATING SLEEVES.
D. PRECAST CATCH BASIN SECTIONS: TO OPSS 1351.
E. JOINTS: SHALL BE MADE WATERTIGHT USING BUTYL BASED, FLEXIBLE WATERSTOP/JOINT SEALANT MATERIAL.
F. SANITARY SEWERS: BENCH TO PROVIDE A SMOOTH U-SHAPED CHANNEL TO CITY OF OTTAWA STANDARDS. SLOPE INVERT TO ESTABLISH SEWER GRADE.
G. STORM SEWERS: MANHOLES SHALL HAVE A 300mm SUMP AND CATCH BASINS AND DITCH INLETS SHALL HAVE A 600mm SUMP.
H. FRAMES, GRATES AND COVERS TO OPSS 1850 AND CITY OF OTTAWA STANDARDS. GRATES AND COVERS TO BEAR EVENLY ON FRAMES. PAINTED WITH ONE SHOP COAT OF ASPHALT OR TAR BASE BLACK, ALL JOINTS AND CREVICES SHALL BE THOROUGHLY COATED.
I. GRANULAR BEDDING AND BACKFILL: OPSS GRANULAR A. RE-CYLCLED GRANULAR MATERIALS ARE NOT PERMITTED.
4.15 PROVIDE 150mm PERFORATED SUB-DRAINS C/W FILTER FABRIC SOCK & END PLUG.AT ALL CATCH BASINS AND CATCH BASIN MANHOLES AS INDICATED ON PLANS
4.16 ROOF DRAINS SHALL BE FLOW CONTROL TYPE EACH INSTALLED WITH A WEIR WITH A PARABOLIC SLOTS. EACH SLOT SHALL RELEASE 5 USgpm/inch. ROOF DRAINS SHALL BE INSTALLED AT THE LOW POINTS OF THE ROOF WHICH SHALL BE 150mm LOWER THAN THE PERIMETER OF THE ROOF. SCUPPERS SHALL BE INSTALLED SO THAT THE MAXIMUM DEPTH OF WATER ON THE ROOF CANNOT EXCEED 150mm.
4.17 THE INLET CONTROL DEVICE (LOCATED IN THE OUTLET PIPE OF CATCH BASIN MANHOLE CB/MH-1)
SHALL BE A HYDROVEX VHV-1 VERTICAL VORTEX FLOW REGULATOR AND AND SIZED BY THE MANUFACTURER FOR A DISCHARGE RATE AS INDICATED ON PLAN. PRIOR TO INSTALLATION SUBMIT SHOP DRAWING TO ENGINEER FOR APPROVAL.

5. CONSTRUCTION:

5.1 PRIOR TO COMMENCING WORK:
A. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE AUTHORITIES.
B. SIZE, DEPTH AND LOCATION OF EXISTING UTILITIES AND STRUCTURES AS INDICATED ARE FOR GUIDANCE ONLY. EXISTING UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON PLANS. COMPLETENESS AND ACCURACY ARE NOT GUARANTEED. NOTIFY ALL APPLICABLE OWNERS, UTILITY COMPANIES AND AUTHORITIES HAVING JURISDICTION OF PROPOSED WORK AND LOCATE AND CLEARLY IDENTIFY ALL EXISTING SERVICES, UTILITIES AND STRUCTURES ON AND ADJACENT TO SITE. CONFIRM LOCATIONS OF BURIED SERVICES AND UTILITIES BY CAREFUL TEST EXCAVATIONS AND REPORT ANY DIFFERENCES TO THE ENGINEER.
C. COORDINATE AND SCHEDULE WORK WITH THE AUTHORITIES AND OTHER TRADES.
5.2 MAINTAIN AND PROTECT FROM DAMAGE, SERVICES, UTILITIES AND STRUCTURES ENCOUNTERED.
5.3 PROTECT EXISTING BUILDINGS, TREES AND OTHER PLANTS, LAWNS, FENCING, SERVICE POLES, WIRES, PAVEMENT, SURVEY BENCH MARKS AND MONUMENTS AND OTHER SURFACE FEATURES FROM DAMAGE WHILE WORK IS IN PROGRESS. DO NOT DISTURB SOIL WITHIN BRANCH SPREAD OF TREES OR SHRUBS THAT ARE TO REMAIN.
5.4 PROVIDE TRAFFIC CONTROL AND SAFETY MEASURES INCLUDING ANY NECESSARY PERSONNEL AND THE SUPPLY, INSTALLATION AND REMOVAL OF ALL NECESSARY SIGNAGE AND BARRIERS.
5.5 REMOVE OBSTRUCTIONS, ICE AND SNOW, FROM SURFACES TO BE EXCAVATED.
5.6 CUT PAVEMENT AND / OR SIDEWALK NEATLY ALONG LIMITS OF PROPOSED EXCAVATION IN ORDER THAT SURFACE MAY BREAK EVENLY AND CLEANLY.
5.7 COORDINATE AND PAY FOR GEOTECHNICAL INSPECTIONS OF ANY REQUIRED FILL, SUB-GRADE, PIPE BEDDING AND SURROUND MATERIAL, BACKFILL, SUB-BASE, BASE AND ASPHALT TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT.
5.8 STOCKPILE TOPSOIL ON SITE AS DIRECTED BY CONSULTANT. DO NOT MIX TOPSOIL WITH SUBSOIL. CUT AND FILL AS NECESSARY TO ACHIEVE THE REQUIRED SUB-GRADE ELEVATION. DISPOSE OF SURPLUS AND UNSUITABLE EXCAVATED MATERIAL OFF SITE. FILL MATERIAL AND THE PLACEMENT AND COMPACTION OF THE FILL MATERIAL AS PER THE GEOTECHNICAL REPORT AND TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT. STOCKPILE GRANULAR AND FILL MATERIALS IN MANNER TO PREVENT SEGREGATION AND PROTECT FROM CONTAMINATION.
5.9 EXCAVATION, TRENCHING & BACKFILL:
A. SHORE AND BRACE EXCAVATIONS, PROTECT SLOPES AND BANKS AND PERFORM ALL WORK IN ACCORDANCE WITH OCCUPATIONAL HEALTH AND SAFETY ACT AND OTHER AUTHORITIES HAVING JURISDICTION.
B. KEEP EXCAVATIONS FREE OF WATER WHILE WORK IS IN PROGRESS. PROTECT OPEN EXCAVATIONS AGAINST FLOODING AND DAMAGE DUE TO SURFACE RUN-OFF.
C. EXCAVATION MUST NOT INTERFERE WITH BEARING CAPACITY OF ADJACENT FOUNDATIONS.
D. DO NOT OBSTRUCT FLOW OF SURFACE DRAINAGE OR NATURAL WATERCOURSES.
E. EXCAVATE TO LINES, GRADES, ELEVATIONS AND DIMENSIONS AS INDICATED.
F. EARTH BOTTOMS OF EXCAVATIONS TO BE UNDISTURBED SOIL, LEVEL, FREE FROM LOOSE, SOFT OR ORGANIC MATTER.
G. ALL STRUCTURES WITHIN PAVED AREAS SHALL HAVE 4:1 FROST TAPERS FROM FROST LINE TO SUB-GRADE.
H. CORRECT OVER-EXCAVATION WITH GRANULAR A COMPACTED TO NOT LESS THAN 95% OF CORRECTED MAXIMUM DRY DENSITY.
I. SUB-GRADE AND AREAS TO BE BACKFILLED TO BE FREE FROM DEBRIS, SNOW, ICE, WATER AND FROZEN GROUND.
J. DO NOT USE BACKFILL MATERIAL WHICH IS FROZEN OR CONTAINS ICE, SNOW OR DEBRIS.
K. BEDDING AND SURROUND MATERIAL FOR SEWERS SHALL BE OPSS GRANULAR A. BEDDING AND SURROUND MATERIAL FOR WATERMAIN AND WATER SERVICE CONNECTIONS SHALL BE OPSS GRANULAR A OR OPSS GRANULAR M. RE-CYLCLED GRANULAR MATERIALS ARE NOT PERMITTED.
L. DO NOT USE BEDDING, SURROUND OR BACKFILL MATERIAL WHICH IS FROZEN OR CONTAINS ICE, SNOW OR DEBRIS.
M. PIPE BEDDING SHALL BE 150mm THICK. SHAPE BED TRUE TO GRADE AND TO PROVIDE CONTINUOUS, UNIFORM BEARING SURFACE FOR PIPE.
N. PLACE SURROUND MATERIAL AROUND PIPES TO FULL WIDTH OF TRENCH AND TO 300mm ABOVE PIPES.
O. PLACE BEDDING AND SURROUND MATERIAL IN UNIFORM LAYERS NOT EXCEEDING 150mm COMPACTED THICKNESS. PLACE FILL AND BACKFILL MATERIAL IN UNIFORM LAYERS NOT EXCEEDING 300mm COMPACTED THICKNESS.
P. COMPACT EACH LAYER TO 95% OF CORRECTED DRY DENSITY BEFORE PLACING SUCCEEDING LAYER.
Q. DO NOT BACKFILL AROUND OR OVER CAST-IN-PLACE CONCRETE WITHIN 24 HOURS AFTER PLACING OF CONCRETE.
5.10 PIPES:
A. HANDLE PIPE USING METHODS APPROVED BY MANUFACTURER.
B. LAY, CUT AND JOIN PIPES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
C. USE ONLY FITTINGS AS RECOMMENDED BY PIPE MANUFACTURER.
D. LAY PIPES ON PREPARED BED, TRUE TO LINE AND GRADE AND ENSURE BARREL OF EACH PIPE IS IN CONTACT WITH SHAPED BED THROUGHOUT ITS FULL LENGTH, FREE OF SAGS OR HIGH POINTS.
E. DO NOT EXCEED MAXIMUM JOINT DEFLECTION RECOMMENDED BY PIPE MANUFACTURER.
F. AT RIGID STRUCTURES, INSTALL PIPE JOINTS NOT MORE THAN 1.2m FROM SIDE OF STRUCTURE.
G. WHENEVER WORK IS SUSPENDED, INSTALL REMOVABLE WATERTIGHT BULKHEAD AT OPEN END OF LAST PIPE LAID TO PREVENT ENTRY OF FOREIGN MATERIALS.
H. WHEN STOPPAGE OF WORK OCCURS, BLOCK PIPES TO PREVENT CREEP DURING DOWN TIME. MAKE WATERTIGHT CONNECTIONS TO MANHOLES.
I. USE NON-SHRINK GROUT WHEN SUITABLE GASKETS ARE NOT AVAILABLE.
J. JOINTS SHALL BE STRUCTURALLY SOUND AND WATERTIGHT.
K. MAINTAIN EXISTING SEWAGE FLOWS DURING CONSTRUCTION.
REPAIR OR REPLACE PIPE, PIPE JOINT OR BEDDING FOUND DEFECTIVE.
L. CONDUCT TWO CCTV INSPECTIONS OF SEWERS. FIRST INSPECTION AFTER COMPLETION OF CONSTRUCTION. SECOND INSPECTION IMMEDIATELY PRIOR TO END OF WARRANTY PERIOD. A PAN AND TILT CAMERA SHALL BE USED. REPAIR SEWER LINE AS REQUIRED. SUBMIT REPORTS AND DVDs TO ENGINEER.
5.11 MANHOLES & CATCH BASINS:
A. JOINTS: SHALL BE MADE WATERTIGHT.
B. SET PRECAST CONCRETE BASE ON 150mm MINIMUM OF GRANULAR BEDDING COMPACTED TO 100% CORRECTED MAXIMUM DRY DENSITY.
C. MAKE EACH JOINT WATERTIGHT WITH RUBBER RING GASKETS.
D. PLACE GRANULAR BACKFILL MATERIALS IN A UNIFORM LAYERS TO COMPACTED THICKNESS OF 150mm, COMPACT TO 95% CORRECTED MAXIMUM DRY DENSITY.
E. PLACE FRAME AND COVER ON TOP SECTION TO ELEVATION AS INDICATED. IF ADJUSTMENT REQUIRED USE CONCRETE RINGS TO A MAXIMUM OF 300mm.
F. CLEAN UNITS OF DEBRIS, FOREIGN AND SURPLUS MATERIALS. REMOVE FINS AND SHARP PROJECTIONS. PREVENT DEBRIS FROM ENTERING SYSTEM.
L. PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. SPECIFICALLY, THE LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 407.
5.12 MAINTAIN RECORD DRAWINGS AND RECORD ACCURATELY DEVIATIONS FROM THE ORIGINAL CONTRACT DOCUMENTS CAUSED BY SITE CONDITIONS AND CHANGES MADE BY CHANGE ORDER OR ADDITIONAL INSTRUCTION. UPDATE DAILY AND MAKE AVAILABLE ON-SITE FOR REVIEW THROUGHOUT THE CONSTRUCTION PERIOD AND SUBMIT DRAWINGS TO ENGINEER AT THE END OF CONSTRUCTION. MARK CHANGES IN RED INK. RECORD DRAWINGS SHALL INCLUDE BUT NOT NECESSARILY LIMITED TO CHANGES OF DIMENSION AND DETAIL; CHANGES TO GRADE ELEVATIONS; AND HORIZONTAL AND VERTICAL LOCATIONS OF UNDERGROUND SERVICES, UTILITIES AND APPURTENANCES REFERENCED TO A PERMANENT SURFACE STRUCTURE.
5.13 REINSTATE PAVEMENTS AND SIDEWALKS DISTURBED BY EXCAVATION TO THICKNESS, STRUCTURE AND ELEVATION WHICH EXISTED BEFORE EXCAVATION.
5.14 CLEAN AND REINSTATE AREAS AFFECTED BY THE WORK.

6. PAVEMENT

6.1 PAVEMENT STRUCTURE:
LIGHT DUTY PAVEMENT:
50mm HL-3 OR SUPERPAVE 12.5 ASPHALTIC CONCRETE
150mm OPSS GRANULAR A
300mm OPSS GRANULAR B TYPE II
RE-CYLCLED GRANULAR MATERIALS ARE NOT PERMITTED.
HEAVY DUTY PAVEMENT:
40mm HL-3 OR SUPERPAVE 12.5 ASPHALTIC CONCRETE
40mm HL-8 OR SUPERPAVE 19.0 ASPHALTIC CONCRETE
150mm OPSS GRANULAR A
400mm OPSS GRANULAR B TYPE II
RE-CYLCLED GRANULAR MATERIALS ARE NOT PERMITTED.
ASPHALTIC CONCRETE SHALL BE PERFORMANCE GRADE PG58-34
PAVEMENT SUB-GRADE PREPARATION AND CONSTRUCTION OF THE PAVEMENT STRUCTURE SHALL CONFORM TO THE GEOTECHNICAL INVESTIGATION TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.
6.2 SUB-GRADE TO BE FREE FROM DEBRIS, SNOW, ICE, WATER AND FROZEN GROUND. REMOVE ANY ORGANIC OR UNSUITABLE MATERIAL FROM SUB-GRADE. COMPACT SUB-GRADE TO 95%.
6.3 CONSTRUCT GRANULAR BASE AND SUB-BASE TO DEPTH AND GRADE IN AREAS INDICATED.CONSTRUCT A 5H:1V FROST TAPER IN SUB-GRADE SURFACE AS A TRANSITION BETWEEN DIFFERING PAVEMENT STRUCTURES AND BETWEEN PAVEMENT AND CURBS AND SIDEWALKS.
6.4 ENSURE NO FROZEN MATERIAL IS PLACED. PLACE MATERIAL ONLY ON CLEAN UNFROZEN SURFACE, FREE FROM SNOW OR ICE.
6.5 PLACE MATERIAL TO FULL WIDTH IN UNIFORM LAYERS NOT EXCEEDING 150mm COMPACTED THICKNESS. SHAPE EACH LAYER TO SMOOTH CONTOUR AND COMPACT TO SPECIFIED DENSITY BEFORE SUCCEEDING LAYER IS PLACED.
6.6 COMPACT SUB-BASE MATERIAL TO DENSITY OF NOT LESS THAN 98% CORRECTED MAXIMUM DRY DENSITY. FILL OVER-EXCAVATED SUB-GRADE WITH SUB-BASE MATERIAL, COMPACT TO 98%. COMPACT BASE MATERIAL TO DENSITY NOT LESS THAN 100% CORRECTED MAXIMUM DRY DENSITY.
6.7 IN AREAS NOT ACCESSIBLE TO ROLLING EQUIPMENT, COMPACT TO SPECIFIED DENSITY WITH MECHANICAL TAMPERS.
6.8 REPLACE PAVEMENT DISTURBED BY CONSTRUCTION AND REPLACE WITH PAVEMENT STRUCTURE ABOVE.
6.9 WHERE NEW ASPHALT COMES IN CONTACT WITH EXISTING PAVEMENT CUT EXISTING ASPHALT LAYER CLEANLY.
6.10 SHAPE BASE TO SMOOTH CONTOUR AND COMPACT TO NOT LESS THAN 100% CORRECTED MAXIMUM DRY DENSITY BEFORE BEGINNING PAVING OPERATIONS.
6.11 APPLY ASPHALTIC CONCRETE ONLY WHEN BASE OR PREVIOUS COURSE IS DRY AND AIR TEMPERATURE IS ABOVE 5 DEG.C
6.12 ROLL UNTIL ROLLER MARKS ARE ELIMINATED AND COMPACTED TO NOT LESS THAN 95% OF DENSITY. COMPACT WITH HOT TAMPERS IN AREAS INACCESSIBLE TO A ROLLER. BEVEL EDGES ADJACENT TO GRANULAR SURFACES.
6.13 FINISH SURFACE SMOOTH, TRUE TO GRADE.
6.14 KEEP VEHICULAR TRAFFIC AND OTHER LOADS OFF NEWLY PAVED AREAS UNTIL 24 HOURS AFTER PAVING.
6.15 DIVERT UNUSED AND WASTE ASPHALT TO A FACILITY APPROVED FOR ACCEPTING SUCH MATERIALS.
6.16 APPLY TRAFFIC PAINT AS IDENTIFIED ON PLAN. TRAFFIC PAINT: NON-DARKENING, HOMOGENEOUS, UNIFORM AND SMOOTH, FREE FROM SKIN, DIRT AND OTHER FOREIGN PARTICLES. APPLY TO DRY PAVEMENT SURFACE FREE FROM FROST, ICE, DUST, OIL, GREASE AND OTHER FOREIGN MATERIALS. PROTECT PAVEMENT MARKINGS UNTIL DRY.

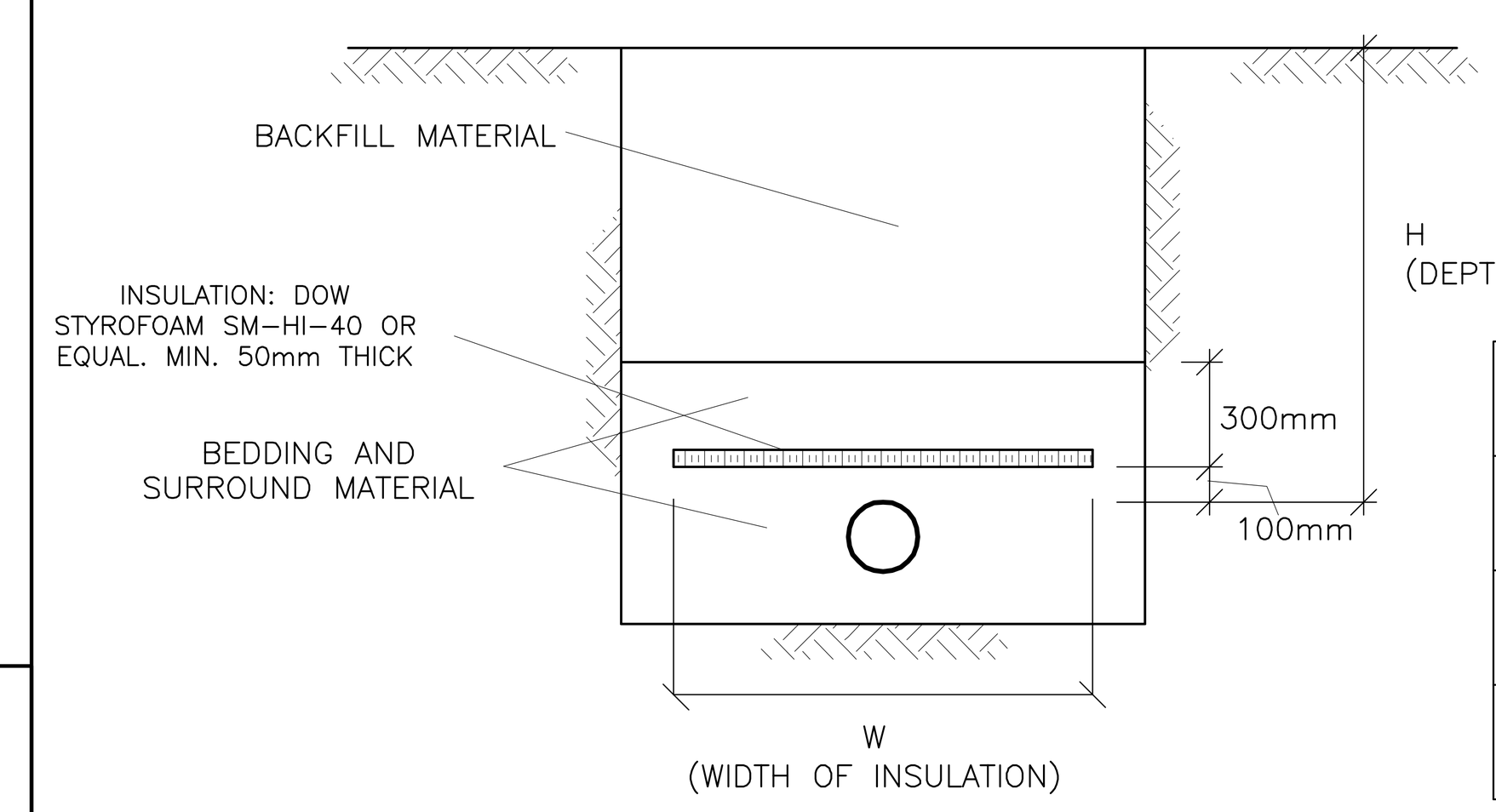
CATCHBASIN & MANHOLE SCHEDULE

REF	TOP	SIZE	TYPE	INVERT AT INLET	INVERT AT OUTLET	NOTES
STORM SEWER						
CB/MH-1	60.90	1200mm	PRE-CAST CONCRETE CATCH BASIN/ MANHOLE	59.30(S)	59.30(N)	TO OPSD 701.010 & CITY OF OTTAWA STANDARDS – FRAMES & COVERS CITY DWG No. S25 & S24.1 OR OPSD 401.010 INSTALL ICD IN OUTLET PIPE
CB/MH-2	60.80	1200mm	PRE-CAST CONCRETE CATCH BASIN/ MANHOLE	59.43(W)	59.43(N)	TO OPSD 701.010 & CITY OF OTTAWA STANDARDS – FRAMES & COVERS CITY DWG No. S25 & S24.1 OR OPSD 401.010
CB/MH-3	60.80	1200mm	PRE-CAST CONCRETE CATCH BASIN/ MANHOLE	–	59.48	TO OPSD 701.010 & CITY OF OTTAWA STANDARDS – FRAMES & COVERS CITY DWG No. S25 & S24.1 OR OPSD 401.010

WATER SERVICE PROFILE TABLE

WATERMAIN MATERIAL:
150mm PVC PRESSURE CLASS 150 DR18

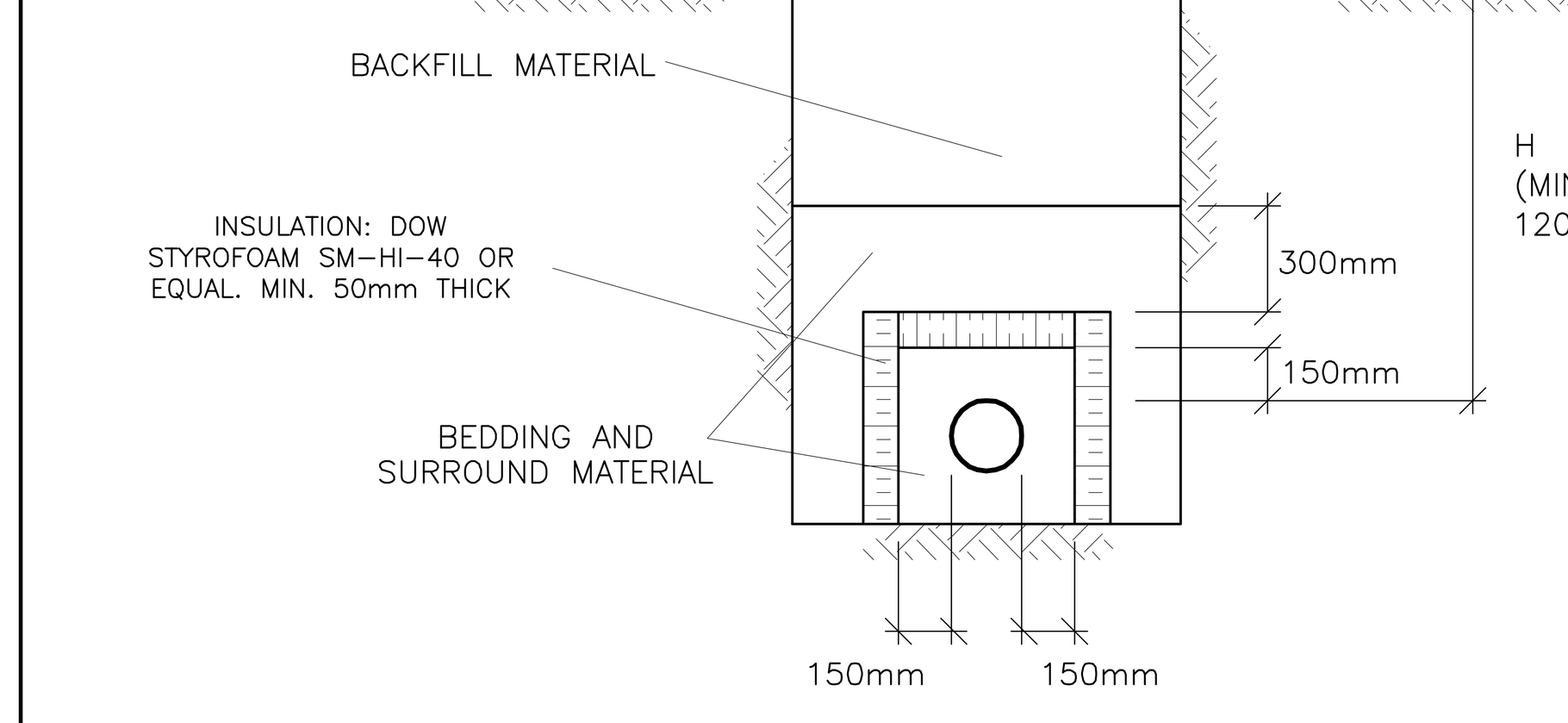
STATION	DESCRIPTION	GRADE ELEV.	TOP OF PIPE	DEPTH OF COVER	COMMENTS
A+00.0	TVS CONNECTION TO 400mm MUNICPIAL WATERMAIN	±61.00	±58.85	±2.15	INSULATE AS PER CITY DWG W22 FROM 0+00.0 TO 0+06.0
A+04.5	–	±61.08	±58.86	±2.22	CROSSING 525 ST TOP 58.46 U/S WM 58.71 – ±250mm CLEARANCE (MIN. 250mm REQUIRED) CROSSING AS PER CITY DWG W25.2 INSULATE AS PER CITY DWG W22
A+10.1	–	±60.94	±58.20	±2.74	CROSSING 300 SAN INV ±58.70 ±500mm CLEARANCE (MIN. 500mm REQUIRED) CROSSING AS PER CITY DWG W25
A+10.7	–	±60.92	±58.20	±2.72	BOTTOM OF CURB
A+13.7	150mm VALVE & VALVE BOX TO CITY OF OTTAWA STANDARDS	60.99	58.59	2.40	ON PROPERTY LINE
A+17.6	–	61.05	58.42	2.63	CROSSING 150 SAN INV 58.92 500mm CLEARANCE (MIN. 500mm REQUIRED) CROSSING AS PER CITY DWG W25
A+20.2	–	61.09	58.68	2.41	CROSSING 150 ST INV 59.43 750mm CLEARANCE (MIN. 500mm REQUIRED)
A+23.2	45 DEG BEND TO CITY OF OTTAWA STANDARDS	61.08	58.68	2.40	–
A+24.7	–	61.12	58.68	2.44	ENTRY INTO BUILDING



H (DEPTH OF COVER)	INSULATION THICKNESS	W (WIDTH OF INSULATION)
1200 TO 1800mm	50mm	1200mm + DIAMETER OF PIPE
900 TO 1200mm	75mm	1800mm + DIAMETER OF PIPE
600 TO 900mm	100mm	2400mm + DIAMETER OF PIPE

INSULATE SEWER AS INDICATED AND WHERE DEPTH OF COVER COVER IS LESS THAN 2000mm.

INSULATION OF SEWERS IN SHALLOW TRENCHES
N.T.S.



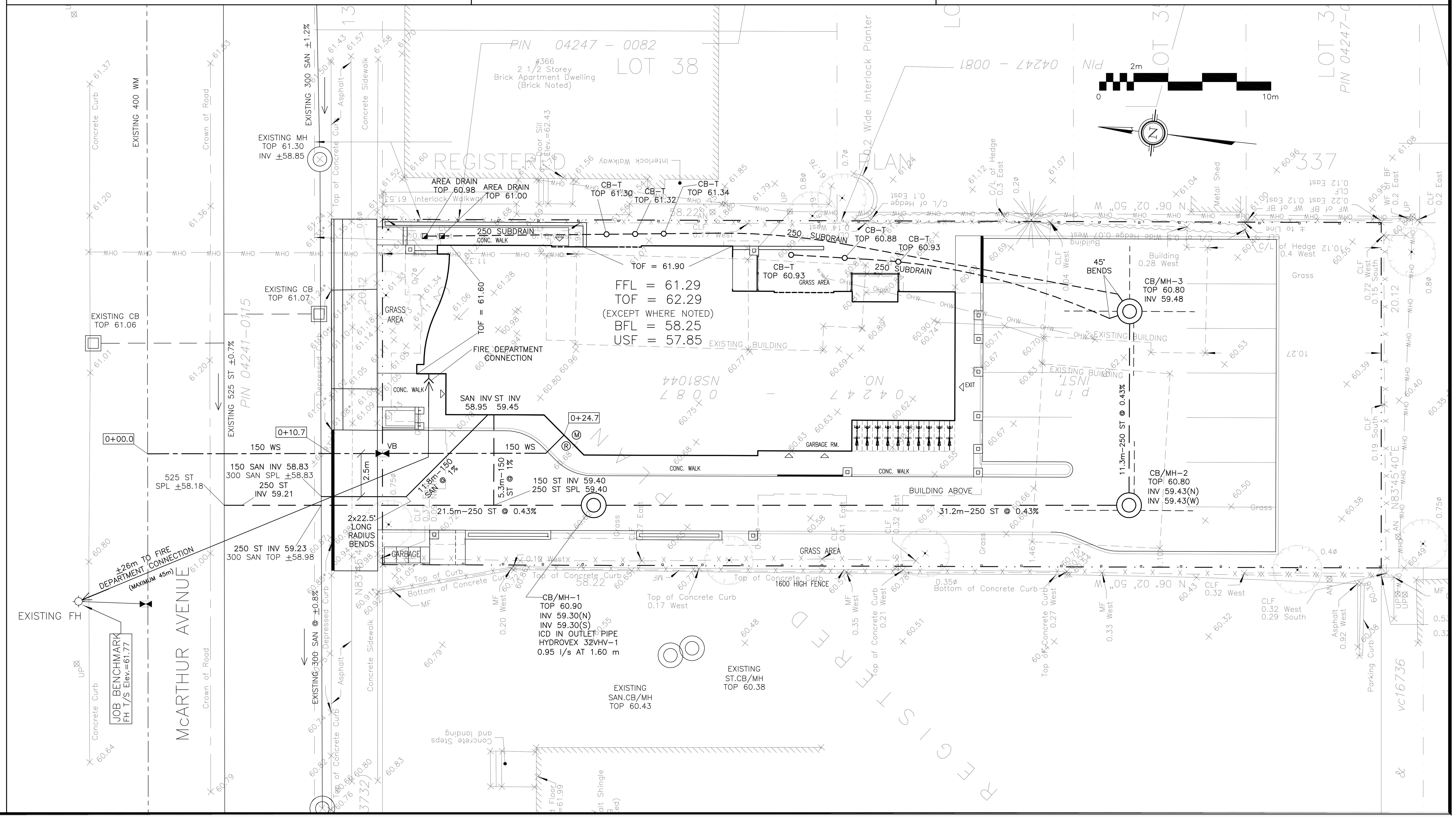
H (DEPTH OF COVER)	INSULATION THICKNESS
1800 TO 2400mm	50mm
1500 TO 1800mm	75mm
1200 TO 1500mm	100mm

INSULATE WATERMAIN AS INDICATED AND WHERE DEPTH OF COVER COVER IS LESS THAN 2400mm. PROVIDE A MINIMUM 1200mm COVER.

INSULATION OF WATERMAINS & WATER SERVICE CONNECTIONS IN SHALLOW TRENCHES
AND AS PER CITY OF OTTAWA DRAWING No. W22
N.T.S.

DRAWING LEGEND

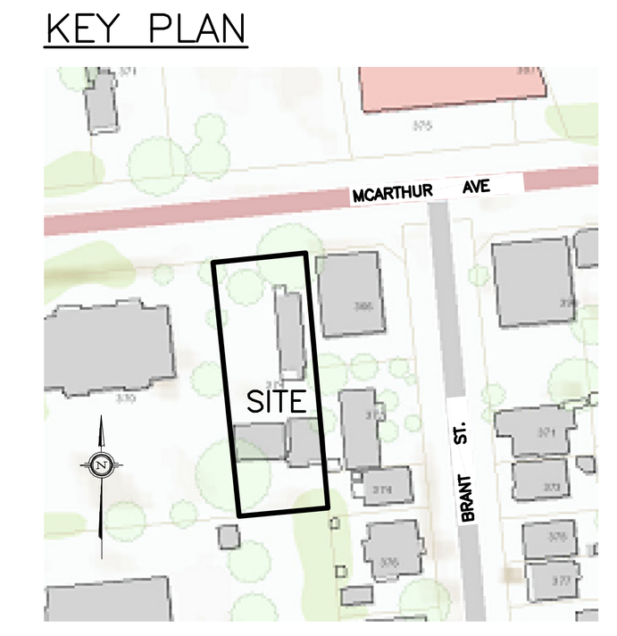
- CB CATCH BASIN
- MH MANHOLE
- CB/MH CATCH BASIN/MANHOLE
- SUBDRAINS AT CB/MH
- SUBDRAINS AT CB
- WATER SERVICE / WATERMAIN
- SANITARY SEWER
- STORM SEWER
- CURB STOP & STAND POST
- VALVE & VALVE BOX
- FIRE HYDRANT
- WATER METER
- REMOTE METER WATER READOUT
- UPO UTILITY POLE
- EXISTING GRADE ELEVATION
- + 93.79 PROPOSED GRADE ELEVATION
- LIGHT DUTY PAVEMENT
- HEAVY DUTY PAVEMENT
- 0.5% SLOPE OF GRADE
- SWALE/DITCH (CENTERLINE)
- 150mm CURB / DEPRESSED CURB
- SILT FENCE BARRIER
- PROPERTY LINE
- FFL FIRST FLOOR ELEVATION
- USF UNDERSIDE OF FOOTING ELEVATION



APPROVED ☐ REFUSED ☐
DATE ____________

Don Herweyer, MCIP, RPP, Acting Manager, Development Review, Urban Services

KEY PLAN



No.	Date	REVISION
4	JUL 20-15	RE-ISSUED FOR APPROVAL
3	JUL 3-15	ISSUED FOR CLIENT REVIEW
2	APR 20-15	ISSUED FOR APPROVAL
1	APR 10-15	ISSUED FOR CLIENT REVIEW

D. B. GRAY ENGINEERING INC.
Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains
700 Long Point Circle
Ottawa, Ontario K1T 4E9
Tel: 613-425-8044
dbgray@rogers.com

Project
PROPOSED APARTMENT COMPLEX
374 McArthur Avenue
OTTAWA, ONTARIO

Drawing Title
SITE SERVICING PLAN AND NOTES

Engineer's Seal
LICENSED PROFESSIONAL ENGINEER
D.B. GRAY
17016502
JUL 20-15
PROVINCE OF ONTARIO
NOT VALID UNLESS SIGNED & DATED

Drawn	D.B.G.
Hor. Scale	1:100
Vert. Scale	
Date	MAR 9 -15
Job	14033

Drawing No.
C-1
of 3

D07-12-15-0081

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☐ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- ☐ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).
- ☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- ☐ Proposed phasing of the development, if applicable.

☐ Reference to geotechnical studies and recommendations concerning servicing.

☒ All preliminary and formal site plan submissions should have the following information:
- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available
☒ Availability of public infrastructure to service proposed development
☐ Identification of system constraints
☒ Identify boundary conditions
☒ Confirmation of adequate domestic supply and pressure
☒ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
☐ Address reliability requirements such as appropriate location of shut-off valves
☐ Check on the necessity of a pressure zone boundary modification.
☒ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

- ☒ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

- ☒ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☒ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- ☒ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix ‘C’) format.
- ☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

- ☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☒ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- ☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.
- ☐ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

- ☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☒ Clearly stated conclusions and recommendations
- ☒ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- ☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario