Appendix A : WATER SUPPLY SERVICING

A.1 DOMESTIC WATER DEMAND ESTIMATE

Estimated Water Demand per City of Ottawa Design Guidelines (July 2010)

WATER DEMAND

Estimated Area:
Commercial and Retail – 250m^2 /1000m^2 = 0.250

Average Daily Demand:

$$Q_{avg} = 0.250 \times \frac{5000L}{d} = 1250\frac{L}{d} \times \frac{1d}{86{,}400s} = 0.014\frac{L}{s}$$

Maximum Daily Demand:

$$Q_{\max\_daily} = 1250\frac{L}{d} \times 1.5 = 1875\frac{L}{d} \times \frac{1d}{86{,}400s} = 0.022\frac{L}{s}$$

Peak Hourly:

$$Q_{peak\_hourly} = 1875\frac{L}{d} \times 1.8 = 3375\frac{L}{d} \times \frac{1d}{86{,}400s} = 0.039\frac{L}{s}$$

A.2 FIRE FLOW REQUIREMENTS PER FUS

Stantec

FUS Fire Flow Calculation

Calculations based on: "*Water Supply for Public Fire Protection*" by Fire Underwriters' Survey, 1999

Stantec Project #: 1604-01302
Project Name: 3500 Hawthorne Road
Date: March 24, 2017
Data input by: Warren Johnson

Fire Flow Calculation #: 1
Building Type/Description/Name: Commercial Building
Gas Station / Convienence Store

Notes:

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

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	**Framing Material**						
		Coefficient related to type of construction (C)	Wood Frame	1.5	Ordinary construction	1	-	
			Ordinary construction	1				
			Non-combustible construction	0.8				
			Fire resistive construction (> 3 hrs)	0.6				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	**Floor Space Area**						
		Type of Housing	Single Family	1	Other (Comm, Ind, Apt etc.)	1	Units	
			Townhouse - indicate # of units	8				
			Other (Comm, Ind, Apt 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	Average Floor Area (A) based on fire resistive building design when vertical openings are inadequately protected:			250	250	Area in Square Meters (m^2)	
					Square Metres (m2)			
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						3,000
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	N/A	3,000
			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	Adequate Sprinkler conforms to NFPA13	-0.3	None	0	N/A	0
			None	0				
		Water Supply Credit	Water supply is standard for sprinkler and fire dept. hose line	-0.1	Water supply is not standard or N/A	0	N/A	0
			Water supply is not standard or N/A	0				
		Sprinkler Supervision Credit	Sprinkler system is fully supervised	-0.1	Sprinkler not fully supervised or N/A	0	N/A	0
			Sprinkler not fully supervised or N/A	0				
5.3	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	30.1 to 45.0m	0.05	0.2	m	600
			East Side	45.1m or greater	0			
			South Side	45.1m or greater	0			
			West Side	10.1 to 20.0m	0.15			
6	Obtain Required Fire Flow, Duration & Volume	***Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:***						**4,000**
		Total Required Fire Flow (above) in L/s:						**67**
		Required Duration of Fire Flow (hrs)						**1.50**
		Required Volume of Fire Flow (m^3)						**360**

A.3 BOUNDARY CONDITIONS

From: Oram, Cody
To: Johnson, Warren
Cc: Kilborn, Kris
Subject: RE: Hydraulic Boundary Conditions - 3500 Hawthorne Road
Date: Tuesday, March 14, 2017 11:27:14 AM
Attachments: image001.png
3500 Hawthorne March 2017.pdf

Hi Warren,

The following are boundary conditions, HGL, for hydraulic analysis at 3500 Hawthorne (zone 2C) assumed to be connected to the 406 mm on Hawthorne (see attached PDF for location).

Minimum HGL = 122.1 m

Maximum HGL = 133.5 m

Max day (0.022 L/s) + FireFlow (67 L/s) = 125.8 m

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.

Regards,

Cody Oram, P.Eng. Senior Engineer
Development Review, South Services
Planning, Infrastructure and Economic Development Department | Services de planification, d'infrastructure et de développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste **13422**, fax/téléc:613-580-2576, cody.oram@ottawa.ca

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From: Johnson, Warren [mailto:Warren.Johnson@stantec.com]
Sent: Wednesday, March 08, 2017 11:19 AM
To: Oram, Cody
Cc: Kilborn, Kris
Subject: Hydraulic Boundary Conditions - 3500 Hawthorne Road

Hi Cody,

I'm looking for watermain hydraulic boundary conditions for the proposed site at 3500 Hawthorne Road. We anticipate connecting to the existing 400mm watermain on Hawthorne Road.

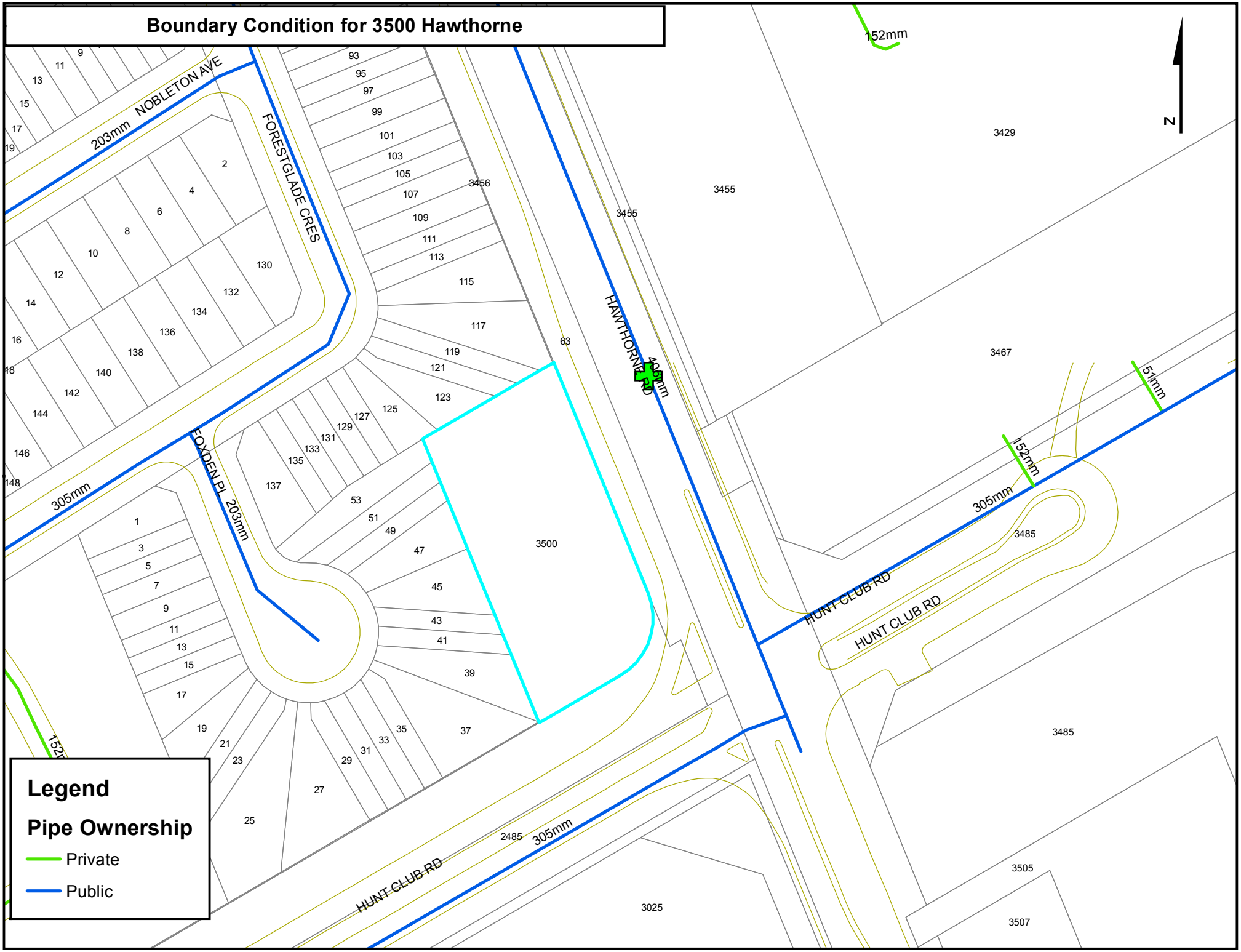
Attached are the FUS calculations for the proposed building and location plan. The intended land use is Commercial, for a 1 story gas station and convenience store with an area of 250m2.

Estimated domestic demands and fire flow requirements for the site are as follows:
Average Day Demand – 0.014L/s
Max Day Demand - 0.022L/s
Peak Hour Demand - 0.039L/s
Fire Flow Requirement per FUS - 67L/s

Thanks,

Warren Johnson, C.E.T.
Civil Engineering Technologist
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Phone: 613-784-2272
warren.johnson@stantec.com

Boundary Condition for 3500 Hawthorne



Appendix B : WASTEWATER SERVICING

B.1 SANITARY SEWER DESIGN SHEET

Stantec

SUBDIVISION:
3500 HAWTHORNE ROAD

DATE: 2017/03/24
REVISION: 1
DESIGNED BY: WAJ
CHECKED BY:

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401302

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	350 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	50,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (COMM., INST.):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	50,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.28 l/s/Ha		
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
C1A	BLDG	1	0.00	0	0	0	0	0.00	0	4.00	0.0	0.37	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.3	0.37	0.37	0.1	0.4	2.0	150	PVC	DR 28	1.00	15.3	**2.77%**	0.86	0.31
	1	EX STUB	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.3	0.00	0.37	0.1	0.4	1.8	200	PVC	SDR 35	1.00	33.4	**1.27%**	1.05	0.30
																												200							

Appendix C : STORMWATER MANAGEMENT

C.1 STORM SEWER DESIGN SHEET

Stantec

3500 HAWTHORNE ROAD

DATE: 2017/11/03
REVISION: 2
DESIGNED BY: MJS
CHECKED BY:

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401284

DESIGN PARAMETERS
$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min
BEDDING CLASS = B

LOCATION			DRAINAGE AREA																						PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
R101A	STUB	STC300	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	1.6	1.6	1.6	3.8	200	200	CIRCULAR	PVC	-	1.00	33.3	**4.80%**	1.05	0.45	0.14
																				10.14																			
L202A	CB 202	STC 300	0.00	0.09	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.000	0.000	0.072	0.072	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	20.9	38.7	200	200	CIRCULAR	PVC	-	1.00	33.3	**62.89%**	1.05	0.96	0.67
																				10.67																			
L200A	CB 200	CBMH103	0.00	0.17	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.000	0.000	0.128	0.128	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	37.0	17.0	200	200	CIRCULAR	PVC	-	1.00	33.3	**111.07%**	1.05	1.05	0.27
																				10.27																			
L201A	CB 201	CBMH103	0.00	0.03	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.000	0.000	0.013	0.013	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	3.8	25.5	200	200	CIRCULAR	PVC	-	1.00	33.3	**11.34%**	1.05	0.57	0.74
																				10.74																			
L103A	103	102	0.00	0.04	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.000	0.000	0.022	0.163	0.000	0.000	0.000	0.000	10.74	74.07	100.43	117.71	172.04	0.0	0.0	45.4	4.5	300	300	CIRCULAR	PVC	-	0.60	74.5	**60.99%**	1.06	0.96	0.08
	102	STC300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.163	0.000	0.000	0.000	0.000	10.82	73.79	100.05	117.26	171.39	0.0	0.0	45.3	6.4	300	300	CIRCULAR	PVC	-	0.60	74.5	**60.76%**	1.06	0.96	0.11
	STC300	EX MH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.235	0.000	0.000	0.000	0.000	10.93	73.40	99.52	116.63	170.47	1.6	1.6	66.6	65.0	300	300	CIRCULAR	PVC	-	1.03	97.6	**68.27%**	1.39	1.31	0.83
																				11.76																			
																													300	300									

C.2 RATIONAL METHOD CALCULATIONS

Stormwater Management Calculations

File No: **160401284**
Project: **PROPOSED COMMERCIAL DEVELOPMENT**
Date: **03-Nov-17**

SWM Approach:
Post-development to Pre-development flows

Post-Development Site Conditions:

Overall Runoff Coefficient for Site and Sub-Catchment Areas

Runoff Coefficient Table

Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"		Runoff Coefficient "C"	"A x C"		Overall Runoff Coefficient
Roof	R101A	Hard	0.025		0.9	0.023		
		Soft	0.000		0.2	0.000		
		Subtotal		0.025			0.0225	0.900
Controlled - Tributary	(L103A+L201A+L200A)	Hard	0.165		0.9	0.149		
		Soft	0.066		0.2	0.013		
		Subtotal		0.231			0.1619667	0.700
Controlled - Tributary	L202A	Hard	0.077		0.9	0.069		
		Soft	0.018		0.2	0.004		
		Subtotal		0.094			0.0726426	0.770
Uncontrolled - Non-Tributary	U1A	Hard	0.006		0.9	0.006		
		Soft	0.005		0.2	0.001		
		Subtotal		0.011			0.0067567	0.590
Uncontrolled - Non-Tributary	U2A	Hard	0.000		0.9	0.000		
		Soft	0.010		0.2	0.002		
		Subtotal		0.010			0.0019784	0.200
Total				**0.372**			**0.266**	
Overall Runoff Coefficient= C:								**0.71**

Total Roof Areas	**0.025 ha**
Total Tributary Surface Areas (Controlled and Uncontrolled)	**0.326 ha**
Total Tributary Area to Outlet	**0.351 ha**
Total Uncontrolled Areas (Non-Tributary)	**0.021 ha**
Total Site	**0.372 ha**

Stormwater Management Calculations

Project #160401284, PROPOSED COMMERCIAL DEVELOPMENT
Modified Rational Method Calculatons for Storage

5 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	998.071
b =	6.053
c =	0.814

t (min)	I (mm/hr)
5	141.18
10	104.19
15	83.56
20	70.25
25	60.90
30	53.93
35	48.52
40	44.18
45	40.63
50	37.65
55	35.12
60	32.94

5 YEAR Predevelopment Target Release from Portion of Site

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 0.372
C: 0.50

Typical Time of Concentration

tc (min)	I (5 yr) (mm/hr)	Qtarget (L/s)
10	104.19	**53.9**

5 YEAR Modified Rational Method for Entire Site

Subdrainage Area: R101A — Roof
Area (ha): 0.03 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)
10	104.19	6.52	1.6	4.9	3.0	
20	70.25	4.39	1.6	2.8	3.4	
30	53.93	3.37	1.6	1.8	3.2	
40	44.18	2.76	1.6	1.2	2.8	
50	37.65	2.36	1.6	0.8	2.3	
60	32.94	2.06	1.6	0.5	1.7	
70	29.37	1.84	1.6	0.2	1.0	
80	26.56	1.66	1.6	0.1	0.3	
90	24.29	1.52	1.6	0.0	0.0	
100	22.41	1.40	1.6	0.0	0.0	
110	20.82	1.30	1.6	0.0	0.0	
120	19.47	1.22	1.6	0.0	0.0	

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	103.55	0.10	1.6	3.4	10.0	0.0

Subdrainage Area: A+L201A+L200A) — Controlled - Tributary
Area (ha): 0.23
C: 0.70

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	46.91	19.9	27.0	**16.2**
20	70.25	31.63	19.9	11.7	14.1
30	53.93	24.28	19.9	4.4	7.9
40	44.18	19.89	19.9	0.0	0.0
50	37.65	16.95	19.9	0.0	0.0
60	32.94	14.83	19.9	0.0	0.0
70	29.37	13.23	19.9	0.0	0.0
80	26.56	11.96	19.9	0.0	0.0
90	24.29	10.94	19.9	0.0	0.0
100	22.41	10.09	19.9	0.0	0.0
110	20.82	9.38	19.9	0.0	0.0
120	19.47	8.77	19.9	0.0	0.0

Storage: ɜ Above CB

Orifice Equation: ɜ CdA(2gh)^0.5 — Where Cd = 0.572
Orifice Diameter: 83.00 mm
Invert Elevation 82.26 m
T/G Elevation 84.22 m
Max Ponding Depth 0.15 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
5-year Water Level	84.37	2.11	19.9	16.2	74.4	OK

Project #160401284, PROPOSED COMMERCIAL DEVELOPMENT
Modified Rational Method Calculatons for Storage

100 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	1735.688
b =	6.014
c =	0.820

t (min)	I (mm/hr)
5	242.70
10	178.56
15	142.89
20	119.95
25	103.85
30	91.87
35	82.58
40	75.15
45	69.05
50	63.95
55	59.62
60	55.89

100 YEAR Modified Rational Method for Entire Site

Subdrainage Area: R101A — Roof
Area (ha): 0.03 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)
10	178.56	12.41	3.8	8.6	5.2	
20	119.95	8.34	3.8	4.6	5.5	
30	91.87	6.38	3.8	2.6	4.7	
40	75.15	5.22	3.8	1.5	3.5	
50	63.95	4.44	3.8	0.7	2.1	
60	55.89	3.88	3.8	0.1	0.4	
70	49.79	3.46	3.8	0.0	0.0	
80	44.99	3.13	3.8	0.0	0.0	
90	41.11	2.86	3.8	0.0	0.0	
100	37.90	2.63	3.8	0.0	0.0	
110	35.20	2.45	3.8	0.0	0.0	
120	32.89	2.29	3.8	0.0	0.0	

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	122.39	0.12	3.8	5.5	10.0	0.0

Subdrainage Area: A+L201A+L200A) — Controlled - Tributary
Area (ha): 0.23
C: 0.88

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	100.50	20.8	79.7	47.8
20	119.95	67.51	20.8	46.7	**56.0**
30	91.87	51.71	20.8	30.9	55.6
40	75.15	42.29	20.8	21.5	51.5
50	63.95	36.00	20.8	15.2	45.5
60	55.89	31.46	20.8	10.6	38.2
70	49.79	28.02	20.8	7.2	30.2
80	44.99	25.32	20.8	4.5	21.5
90	41.11	23.14	20.8	2.3	12.4
100	37.90	21.33	20.8	0.5	3.0
110	35.20	19.81	20.8	0.0	0.0
120	32.89	18.51	20.8	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: Q = CdA(2gh)^0.5 — Where Cd = 0.572
Orifice Diameter: 83.00 mm
Invert Elevation 82.26 m
T/G Elevation 84.22 m
Max Ponding Depth 0.35 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	84.57	2.31	20.8	56.0	74.4	OK
					18.39	

Stormwater Management Calculations

Project #160401284, PROPOSED COMMERCIAL DEVELOPMENT
Modified Rational Method Calculatons for Storage

Subdrainage Area: L202A — Controlled - Tributary
Area (ha): 0.09
C: 0.77

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	21.0	19.1	1.9	**1.1**
20	70.25	14.2	19.1	0.0	0.0
30	53.93	10.9	19.1	0.0	0.0
40	44.18	8.9	19.1	0.0	0.0
50	37.65	7.6	19.1	0.0	0.0
60	32.94	6.7	19.1	0.0	0.0
70	29.37	5.9	19.1	0.0	0.0
80	26.56	5.4	19.1	0.0	0.0
90	24.29	4.9	19.1	0.0	0.0
100	22.41	4.5	19.1	0.0	0.0
110	20.82	4.2	19.1	0.0	0.0
120	19.47	3.9	19.1	0.0	0.0

Storage: ᵴ Above CB

Orifice Equation: ᵴ CdA(2gh)^0.5 Where Cd = 0.572
Orifice Diameter: 83.00 mm
Invert Elevation 82.64 m
T/G Elevation 84.44 m
Max Ponding Depth 0.15 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
5-year Water Level	84.59	1.95	19.1	1.1	27.8	OK

Subdrainage Area: U1A — Uncontrolled - Non-Tributary
Area (ha): 0.01
C: 0.59

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	2.0	2.0		
20	70.25	1.3	1.3		
30	53.93	1.0	1.0		
40	44.18	0.8	0.8		
50	37.65	0.7	0.7		
60	32.94	0.6	0.6		
70	29.37	0.6	0.6		
80	26.56	0.5	0.5		
90	24.29	0.5	0.5		
100	22.41	0.4	0.4		
110	20.82	0.4	0.4		
120	19.47	0.4	0.4		

Subdrainage Area: U2A — Uncontrolled - Non-Tributary
Area (ha): 0.01
C: 0.20

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	0.6	0.6		
20	70.25	0.4	0.4		
30	53.93	0.3	0.3		
40	44.18	0.2	0.2		
50	37.65	0.2	0.2		
60	32.94	0.2	0.2		
70	29.37	0.2	0.2		
80	26.56	0.1	0.1		
90	24.29	0.1	0.1		
100	22.41	0.1	0.1		
110	20.82	0.1	0.1		
120	19.47	0.1	0.1		

SUMMARY TO OUTLET

		Vrequired	Vavailable*	
Tributary Area	0.326 ha			
Total 5yr Flow to Sewer	40.7 L/s	0	0 m^3	Ok
Non-Tributary Area	0.021 ha			
Total 5yr Flow Uncontrolled	2.5 L/s			
Total Area	0.347 ha			
Total 5yr Flow	43.2 L/s			
Target	53.9 L/s			

Project #160401284, PROPOSED COMMERCIAL DEVELOPMENT
Modified Rational Method Calculatons for Storage

Subdrainage Area: L202A — Controlled - Tributary
Area (ha): 0.09
C: 0.96

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	45.1	19.5	25.6	**15.4**
20	119.95	30.3	19.5	10.8	13.0
30	91.87	23.2	19.5	3.7	6.7
40	75.15	19.0	19.5	0.0	0.0
50	63.95	16.1	19.5	0.0	0.0
60	55.89	14.1	19.5	0.0	0.0
70	49.79	12.6	19.5	0.0	0.0
80	44.99	11.4	19.5	0.0	0.0
90	41.11	10.4	19.5	0.0	0.0
100	37.90	9.6	19.5	0.0	0.0
110	35.20	8.9	19.5	0.0	0.0
120	32.89	8.3	19.5	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: Q = CdA(2gh)^0.5 Where Cd = 0.572
Orifice Diameter: 83.00 mm
Invert Elevation 82.64 m
T/G Elevation 84.44 m
Max Ponding Depth 0.22 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	84.66	2.02	19.5	15.4	27.8	OK
					12.45	

Subdrainage Area: U1A — Uncontrolled - Non-Tributary
Area (ha): 0.01
C: 0.74

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	4.2	4.2		
20	119.95	2.8	2.8		
30	91.87	2.2	2.2		
40	75.15	1.8	1.8		
50	63.95	1.5	1.5		
60	55.89	1.3	1.3		
70	49.79	1.2	1.2		
80	44.99	1.1	1.1		
90	41.11	1.0	1.0		
100	37.90	0.9	0.9		
110	35.20	0.8	0.8		
120	32.89	0.8	0.8		

Subdrainage Area: U2A — Uncontrolled - Non-Tributary
Area (ha): 0.01
C: 0.25

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	1.2	1.2		
20	119.95	0.8	0.8		
30	91.87	0.6	0.6		
40	75.15	0.5	0.5		
50	63.95	0.4	0.4		
60	55.89	0.4	0.4		
70	49.79	0.3	0.3		
80	44.99	0.3	0.3		
90	41.11	0.3	0.3		
100	37.90	0.3	0.3		
110	35.20	0.2	0.2		
120	32.89	0.2	0.2		

SUMMARY TO OUTLET

		Vrequired	Vavailable*	
Tributary Area	0.326 ha			
Total 100yr Flow to Sewer	44.1 L/s	0	0 m^3	Ok
Non-Tributary Area	0.021 ha			
Total 100yr Flow Uncontrolled	5.4 L/s			
Total Area	0.347 ha			
Total 100yr Flow	49.5 L/s			
Target	53.9 L/s			

Project #160401284, PROPOSED COMMERCIAL DEVELOPMENT
Roof Drain Design Sheet, Area R101A
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0004	0.0008	0	0.025	6	0	0	0.025
0.050	0.0008	0.0015	0	0.050	22	0	0	0.050
0.075	0.0012	0.0023	1	0.075	50	1	1	0.075
0.100	0.0015	0.0031	3	0.100	89	2	3	0.100
0.125	0.0019	0.0038	6	0.125	139	3	6	0.125
0.150	0.0023	0.0046	10	0.150	200	4	10	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.3	211.0	0.3	0.05861
1.2	381.8	0.9	0.16466
2.9	557.6	1.7	0.31955
5.7	735.4	2.8	0.52384
10.0	914.3	4.2	0.7778

Rooftop Storage Summary

Total Building Area (sq.m)		250
Assume Available Roof Area (sq.	80%	200
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		2
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		10
Estimated 100 Year Drawdown Time (h)		0.5

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min	L/s	Notch Rating
0.051	45.5	0.00076	232

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.003	0.004	-
Depth (m)	0.104	0.122	0.150
Volume (cu.m)	3.4	5.5	10.0
Draintime (hrs)	0.4	0.5	

C.3 OIL/GRIT SEPARATOR SIZING

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	10/4/2017
Project Name	3500 Hawthorne Road
Project Number	160401302
Location	Ottawa, ON

Designer Information

Company	Stantec Consulting Ltd.
Contact	Dustin Thiffault, P.Eng.

Notes

N/A

Drainage Area

Total Area (ha)	0.372
Imperviousness (%)	100

The Stormceptor System model STC 300 achieves the water quality objective removing 87% TSS for a CLOCA (clay, silt and sand) particle size distribution.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0.000	00.000
0.008	49.500

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 300	**87**
STC 750	90
STC 1000	91
STC 1500	91
STC 2000	93
STC 3000	93
STC 4000	95
STC 5000	95
STC 6000	96
STC 9000	97
STC 10000	97
STC 14000	98

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

CLOCA (clay, silt and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
850	3.3	2.65	0.1465		50	3.9	2.65	0.0022
425	23.4	2.65	0.0698		36	2.6	2.65	0.0012
300	17.5	2.65	0.0439		22	1.3	2.65	0.0004
250	6.5	2.65	0.0335		12	1.9	2.65	0.0004
212	6.5	2.65	0.0259		9	0	2.65	0.0004
150	11.7	2.65	0.0145		6.5	1.3	2.65	0.0004
125	5.2	2.65	0.0105		3	1.3	2.65	0.0004
100	3.9	2.65	0.0070		1.5	1.3	2.65	0.0004
75	3.9	2.65	0.0040		1	4.5	2.65	0.0004

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

Appendix D : CORRESPONDENCE

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue, Ottawa ON K2C 3G4

November 7, 2017
File: 160401247

Attention: John Bernier, Planner
City of Ottawa

Dear John,

Reference: Technical Circulation Comments, 3500 Hawthorne Road, Site Plan Control Application dated June 16, 2017

General

3. Please include the file number D07-12-17-0043 on the bottom right, outside of the frame on all plans.
R/ File number has been included.

4. Include the attached signature block on all drawings.
R/ Signature block has been included.

6. Include name and address of developer/owner, applicant, architects, designers, engineers, and surveyors on all plans.
R/ Name and addresses added.

Conservation Authority Comments

44. See attached letter for additional RVCA responses and questions.
R/ RVCA noted no objections to the proposed site.

Engineering Comments

SITE SERVICING PLAN, SSP-1, prepared by Stantec, Project# 160401284, revision 1, dated 17.04.06.

1. CCTV inspection required to confirm location, invert and condition of existing 200mm sanitary and 300mm storm pipes located west of the subject site.
R/ Invert and condition of existing pipe to be confirmed by contractor prior to construction as per note on SSP-1.

2. Specify ICD type and flow rate on the drawing as well as schedule.
R/ ICD note has been included in structure label.

3. Extend road cut limits to include CB 203 lead.
R/ Road cut has been extended to include CB 203 lead.

Reference: Technical Circulation Comments, 3500 Hawthorne Road, Site Plan Control Application dated June 16, 2017

4. Specify size and type of fire hydrant lead.
R/ Size and type of hydrant lead to be outlined in specs.

5. Confirm if relocation of CB 203 is not effecting the designed CB spacing along Hawthorne Road, include rationale in site servicing report.
R/ The relocation of CB 203 is not to result in any change to drainage characteristics of the CB itself. Catchbasins further west of the subject site along Hawthorne are spaced between 30-35m apart, similar to the proposed spacing of 33m from relocated CB to the CB west of the proposed site. As such, we anticipate no concerns with the relocated CB position.

6. Please note STM 102 and STC 750 are located in soft areas and could potentially be inaccessible during winter due to snow accumulation, move MHs to hard surface if possible.
R/ It is not possible to locate both storm and sanitary manholes within hard surface area without causing conflicts. It is recommended to install a sign to indicate that the area is to be kept clear of snow.

7. STM 102 is located within 2.0m to the proposed tree, north-west of STM 102, relocate tree/manhole to achieve horizontal separation.
R/ Proposed tree has been relocated to achieve minimum separation.

8. Please note there is only 0.16m of clearance at crossing #1, raise storm pipe if possible.
R/ It is not possible to raise the storm pipe due to constraints with cover upstream of the crossing.

9. Manufacturer's Confirmation of STC 750 is required to confirm if connection arrangement is acceptable.
R/ Manufacturer will be engaged to review STC 300 arrangement.

10. TWSI design/detail to conform to transportation comments.
R/ TWSI's now demonstrated on site servicing & grading plan.

11. Add note for pylon sign located at north-east corner of the site.
R/ Note has been added.

12. Specify survey drawing, date and company used for the design.
R/ Note has been added.

13. Specify location of proposed roof drains, 100-yr ponding limit, as well as roof drain schedule.
R/ Roof drain schedule and 100 year ponding limit have been included on the drawing.

Reference: Technical Circulation Comments, 3500 Hawthorne Road, Site Plan Control Application dated June 16, 2017

14. Provide adequate horizontal separation between proposed 150mm watermain and proposed STM 104.
R/ Proposed watermain has been relocated to provide 3.0m horizontal separation from the storm sewer.

GRADING PLAN, GP-1, prepared by Stantec, Project# 160401284, revision 1, dated 17.04.06.

15. Private access from Hawthorne road to be raised to 2.0% to conform to private approach by-law no. 2003-447.
R/ Private approach by-law 2003-447 section 25 (r) states that "No person shall construct a private approach serving any parking area with a grade exceeding 2% and the grade on the private approach shall descend in the direction of the roadway." The current slopes range from 0.60% to 1.5% and conforms to this by-law.

16. Include geotechnical report project no., date, consultant.
R/ Note has been added.

17. Specify heavy duty asphalt limits.
R/ All asphalt areas are to meet the geotechnical recommendations as outlined in the report.

18. Provide a detail for each type of paving structure.
R/ Detail has been provided on drawing GP-1.

19. Raise grades to a minimum of 1.0% where possible.
R/ Grades have been revised to 1.0% where possible.

20. Parking area south of the building appears to be flat, raise slopes to avoid potential ponding areas.
R/ Slopes have been increased to ensure there will be no ponding in this area.

21. Identify snow storage location.
R/ Snow storage location has been identified.

22. Freeze line work near connection to existing 400mm watermain.
R/ Revised as noted.

EROSION CONTROL PLAN AND DETAIL SHEET, EC-1, prepared by Stantec, Project# 160401284, revision 1, dated 17.04.06.

Reference: Technical Circulation Comments, 3500 Hawthorne Road, Site Plan Control Application dated June 16, 2017

23. Confirm mud mat excavation will not impact existing underground utilities in the area of the proposed mud mat.
R/ Proposed mud mat has been relocated to within the site boundary.

STORM DRAINAGE PLAN, SD-1, prepared by Stantec, Project# 160401284, revision 1, dated 17.04.06.

24. Copy roof drain & ICD schedules to site servicing plan.
R/ Roof drain and ICD schedules have been included on SSP-1.

25. Show roof drain locations.
R/ Proposed rood drain locations shown on plan with note to refer to building architectural plans for additional detail.

SANITARY DRAINAGE PLAN, SA-1, prepared by Stantec, Project# 160401284, revision 1, dated 17.04.06.

26. No comments.

B. List of Report(s):
Servicing Report – 3500 Hawthorne Road, prepared by Stantec, Project# 160401284, dated April 7, 2017.

B1. Section 3.2 – Proposed water demands have been estimated at 50,000 L/ha/day, please provide site specific water demands for the proposed development.
R/ The estimated demand presented in the report is a conservative value, and lies at the upper end of common sewage flow rates for shopping centres per MOECC sewage design guidelines. Given the limited requirements for domestic water on-site (no car-wash, drive-thru paper service only, employee limited washroom), as well as proximity to a large diameter watermain, no domestic water supply volume issues are anticipated.

B2. Section 4.3/Appendix B.1 (Sanitary Sewer Design Sheet) – Check downstream capacity of existing sanitary sewer up to existing manhole on Foxden Place.
R/ The downstream sanitary sewer maintains no additional connections between the existing stub and manhole on Fox Den Place. As such, no capacity concerns are anticipated along the 200mm diameter sewer at 1% slope shown.

B3. Section 5.3.3 – Total release rate for the site (54.22 L/s) is greater than the allowable release rate (54.02), reduce release rate where possible by increasing storage volume/decreasing ICD flow rate.

Reference: Technical Circulation Comments, 3500 Hawthorne Road, Site Plan Control Application dated June 16, 2017

R/ Storage volume has been increased to allow for reduced discharge rate. The total release rate for the site is now 51.0L/s

B4. Attach correspondence from MOECC and RVCA to servicing report.
R/ RVCA correspondence attached. As the site land use is industrial in nature, an MOECC direct submission ECA will be required along with sign-off from City of Ottawa staff, to be submitted once approved.

Regards,

STANTEC CONSULTING LTD.

Kris Kilborn
Associate, Community Development
Phone: (613) 724-4337
Fax: (613) 722-2799
kris.kilborn@stantec.com

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Conservation Partners
Partenaires de conservation

Mississippi Valley Conservation
de la vallée Mississippi

OFFICE DE PROTECTION DE LA NATURE DE LA VALLÉE RIDEAU
RIDEAU VALLEY CONSERVATION AUTHORITY

SOUTH NATION CONSERVATION
DE LA NATION SUD

May 24th, 2017
File: 17-OTT-ZBA

City of Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West, 4th floor
Ottawa, Ontario K1P 1J1

Attention: John Bernier

Subject: **City of Ottawa**
Zoning By-law Amendment D02-02-17-0028
3500 Hawthorne Road, City of Ottawa.

Dear Mr. Bernier:

The Conservation Partners have completed a review of the above noted application for a Zoning By-law Amendment to facilitate the development of a gas bar with a fast-food restaurant, drive-through facility, and convenience retail uses within a 250 square metre building.

We have undertaken our review within the context of Sections 2.3 Natural Heritage, 2.4 Water Quality and Quantity and 3.1 Natural Hazards of the Provincial Policy Statement under Section 3 of the Planning Act. The following comments are offered for your consideration.

Natural Hazards/ Natural Heritage

There have been no natural hazards or Natural Heritage Features identified on the site which would preclude this application.

Conclusion

In conclusion, the Conservation Authority has no objection to this Zoning By-law Amendment application. Please contact me at ext. 1191 if you have any questions.

Yours truly,

Jamie Batchelor, RPP
Planner, Planning and Regulations (RVCA)

Cc: Nancy Meloche; Stantec Consulting Ltd.

Conservation Partners
Partenaires de conservation

Mississippi Valley Conservation
de la vallée Mississippi

OFFICE DE PROTECTION DE LA NATURE DE LA VALLÉE RIDEAU
RIDEAU VALLEY CONSERVATION AUTHORITY

SOUTH NATION CONSERVATION
DE LA NATION SUD

May 24th, 2017
File: 17-OTT-SPC

City of Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West, 4th floor
Ottawa, Ontario K1P 1J1

Attention: John Bernier

Subject: **City of Ottawa**
Site Plan Control D07-12-17-0043
3500 Hawthorne Road, City of Ottawa.

Dear Mr. Bernier:

The Conservation Partners have completed a review of the above noted application for the development of a gas bar and a one storey building with a total gross floor area (GFA) of 250 square metres that will contain a fast food restaurant and a convenience/retail use. A surface lot will contain 14 parking spaces.

We have undertaken our review within the context of Sections 2.3 Natural Heritage, 2.4 Water Quality and Quantity and 3.1 Natural Hazards of the Provincial Policy Statement under Section 3 of the Planning Act. The following comments are offered for your consideration.

Natural Heritage/Hazards

We have not identified any natural heritage or natural hazard features that would preclude the approval of the application.

Stormwater Management

Based on the information provided in the report "Servicing Report – 3500 Hawthorne Road" dated April 7th, 2017, prepared by Stantec Consulting Ltd., stormwater from this site is being directed to an existing storm sewer within an easement that leads to the Foxden Place ROW at the western boundary of the subject site. The stormwater management plan proposes a water quality target of 80% TSS removal through the installation of a stormceptor 750. The RVCA is satisfied that the water quality target is appropriate for the receiving watercourse.

Please note, that the RVCA did not conduct a technical review of the report. We will rely on the City to ensure that the stormwater management plan is consistent with the design assumptions for the existing storm sewers.

Conclusion

In conclusion, the Conservation Authority has no objection to this Site Plan Control application. Please contact me at ext. 1191 if you have any questions.

Yours truly,

Jamie Batchelor, RPP
Planner, Planning and Regulations (RVCA)

Cc: Nancy Meloche: Stantec Consulting Ltd.

Appendix E : DRAWINGS