STORMWATER MANAGEMENT REPORT

1234 Prestone Drive
Ottawa, Ontario

Report No. 13036-SWM

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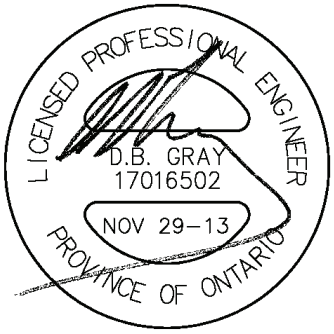

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D. B. G R A Y E N G I N E E R I N G I N C.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
dbgray@rogers.com

STORMWATER MANAGEMENT REPORT

1234 Prestone Drive
Ottawa, Ontario

This report addresses the stormwater management requirements of a church property located on 9,114 sq.m. of land at 1234 Prestone Drive. Three additions totaling 351 sq.m. are proposed for the existing 584 sq.m. church.

This report forms part of the stormwater management design for the proposed development. Also refer to drawing SG-1 & SG-2 prepared by D. B. Gray Engineering Inc.

WATER QUALITY:

During construction, an erosion and sediment control plan has been developed (see notes 2.1 to 2.5on drawing SG-1). In summary: to filter out construction sediment a silt fence barrier will be installed at the perimeter of construction; and geotextile fabric will be placed between the grate and frame of all existing catch basins adjacent to the site and all new catch basins as they are installed.

WATER QUANTITY:

The stormwater management criteria for quantity control are to control the post development peak flows to pre-development (existing) peak flows for the 5-year and 100-year storm events. It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.48.

As recommended in City of Ottawa Technical Bulletin ISDTB-2012-1, the drainage system has been “stress tested” using design storms calculated on the basis of a 20% increase of the City’s 1:100 year IDF curve rainfall values. The purpose of the stress test is to identify potential flooding of properties and, if necessary, to modify the proposed drainage system to prevent the flooding.

Calculations are based on the Rational Method. The runoff coefficients for the 100 year event were increased by 25% to maximum 1.00.

Stormwater will be stored within the development on the surface above catch basins in a car park and grassed landscaped and underground in catch basins, manholes and sewer pipes.

The entire site currently drains uncontrolled off the site. It is proposed that the perimeter and front entrance (Drainage Area I – 3660 sq.m.) will be allowed to flow uncontrolled off the site. The flow from these areas is calculated at 20 minutes concentration.

An inlet control device (ICD) located at the outlet pipe of catch basin CB-1 will control the release of stormwater from Drainage Area II (2649 sq.m.). The ICD will restrict the flow and force the stormwater to back up onto the parking area above the catch basin. The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal manufactured by IPEX) and shall be sized by the manufacturer for a discharge rate of 35.75 l/s at 1.87 m head. It is calculated that an orifice area of 9674 sq.mm. ($\pm$111 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 35.75 l/s at 1.87 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 35.12 l/s at 1.81 m.

An inlet control device (ICD) located at the outlet pipe of catch basin CB-2 will control the release of stormwater from Drainage Area III (1180 sq.m.). The ICD will restrict the flow and force the stormwater to back up onto the parking area above the catch basin. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" and shall be sized by the manufacturer for a discharge rate of 10.99 l/s at 2.22 m head. It is calculated that an orifice area of 7854 sq.mm. (100 mm diameter) and a discharge coefficient of 0.212 will restrict the outflow rate to 10.99 l/s at 2.22 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 10.84 l/s at 2.16 m.

An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-6 will control the release of stormwater from Drainage Area IV (1625 sq.m.). The ICD will restrict the flow and force the stormwater to back up into a sewer and onto the grassed landscaped above the catch basin CB-5. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" and shall be sized by the manufacturer for a discharge rate of 7.01 l/s at 2.77 m head. It is calculated that an orifice area 4418 sq.mm. (75 mm diameter) and a discharge coefficient of 0.216 will restrict the outflow rate to 7.01 l/s at 2.77 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 6.89 l/s at 2.67

Stormwater released through the ICDs in CB-1 and CB-2 will be conveyed off the site via an existing 200mm storm sewer connection. Stormwater released through the ICD in CB/MH-6 will be conveyed off the site via a proposed 250mm storm sewer connection. Each sewer connects to an existing 750mm municipal storm in Prestone Drive.

Stress Test:
In the event that the 1:100 year IDF rainfall values are increased by 20%:

The depth of the water stored above CB-1 in the Drainage Area II parking area increases from 0.20 m depth at the catch basin to about 0.22 m depth.

The depth of the water stored above CB-2 in the Drainage Area III parking area increases from 0.15 m depth at the catch basin to about 0.17 m depth.
The depth of the water stored above CB-5 in the Drainage Area IV landscaped area increases from 0.24 m depth at the catch basin to about 0.26 m depth.
The maximum flowrate off the site will increase by about 9% from 96.99 to 105.91 l/s.
The maximum volume of on-site storage will increase by about 33% from 106.51 to 141.72 cu.m.
There are no potential flooding issues and therefore the proposed drainage system does not need to be modified.

ONE HUNDRED YEAR EVENT:

MAXIMUM ALLOWABLE RELEASE RATE (Pre-development (Existing) Conditions):

The maximum permitted flow for the subject site is calculated as follows:

Area (A):	9114 sq.m.
Time of Concentration (T):	20 minutes
Rainfall Intensity (Five Year Event) (i):	120 mm/hr
Runoff Coefficient (C):	0.48
Maximum Allowable Release Rate:	146.46 l/s

FIVE YEAR EVENT:

MAXIMUM ALLOWABLE RELEASE RATE (Pre-development (Existing) Conditions):

The maximum permitted flow for the subject site is calculated as follows:

Area (A):	9114 sq.m.
Time of Concentration (T):	20 minutes
Rainfall Intensity (Five Year Event) (i):	70 mm/hr
Runoff Coefficient (C):	0.42
Maximum Allowable Release Rate:	74.12 l/s

CONCLUSIONS:

WATER QUALITY:

An erosion and sediment control plan as been developed to be implemented during construction

WATER QUANTITY:

One Hundred Year Storm Event:
The maximum allowable release rate for the one hundred year storm event for the site is 146.46 l/s. The post-development release rate for the 100-year storm event is calculated to be 96.99 l/s. Therefore the maximum post development release rate for the 100-year storm event is less than the maximum allowable release rate. A maximum stored volume of 106.51 cu.m. is required to achieve the post development release rate.

Five Year Storm Event:
The maximum allowable release rate for the five year storm event for the site is 74.12 l/s. The post-development release rate for the 5-year storm event is calculated to be 74.12 l/s. Therefore the maximum post development release rate for the 5-year storm event is equal to the maximum allowable release rate. A maximum stored volume of 34.64 cu.m. is required to achieve the post development release rate.

Stress Test:
Increasing the 1:100 year IDF rainfall values by 20% does not identify any potential flooding issues and therefore the proposed drainage system does not need to be modified.

Summary Tables

ONE HUNDRED YEAR EVENT

Drainage Area	Maximum Allowable Release Rate	Maximum Release Rate	Maximum Volume Required	Maximum Volume Stored
	l/s	l/s	cu.m.	cu.m.
AREA I (Uncontrolled flow off site)	-	43.24	-	-
AREA II (CB-1)	-	35.75	59.87	59.87
AREA III (CB-2)	-	10.99	15.25	15.25
AREA III (CB-5 & CB/MH-6)	-	7.01	31.40	31.40
TOTAL	146.46	96.99	106.51	106.51

FIVE YEAR EVENT

Drainage Area	Maximum Allowable Release Rate	Maximum Release Rate	Maximum Volume Required	Maximum Volume Stored
	l/s	l/s	cu.m.	cu.m.
AREA I (Uncontrolled flow off site)	-	21.25	-	-
AREA II (CB-1)	-	35.12	19.05	19.05
AREA III (CB-2)	-	10.84	4.21	4.21
AREA III (CB-5 & CB/MH-6)	-	6.89	11.38	11.38
TOTAL	74.12	74.12	34.64	34.64

STRESS TEST - 20% INCREASE TO ONE HUNDRED YEAR EVENT RAINFALL

Drainage Area	Maximum Allowable Release Rate	Maximum Release Rate	Maximum Volume Required	Maximum Volume Stored
	l/s	l/s	cu.m.	cu.m.
AREA I (Uncontrolled flow off site)	-	51.89	-	-
AREA II (CB-1)	-	35.94	80.42	80.42
AREA III (CB-2)	-	11.03	20.57	20.57
AREA III (CB-5 & CB/MH-6)		7.05	40.73	40.73
TOTAL	-	105.91	141.72	141.72

STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

- Q = flowrate in litres per second
- C_d = coefficient of discharge
- A_o = orifice area in sq.m.
- g = 9.81 m/s2
- h = head above orifice in meters

Storage calculations above the catch basins are based on the following formula for volume of a cone:

$$V = (A \times d)/3$$

where:

- V = volume in cu.m.
- A = ponding area in sq.m.
- d = ponding depth in meters

Calculations for sub-surface storage (manholes and sewer pipes) are based on the following formula for volume of a cylinder:

$$V = L \times Pi \times (d/2)^2$$

where:

- V = volume in cu.m.
- L = depth of water in manhole or length of pipe in meters
- d = diameter of manhole (1.22 m) or pipe in meters

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STORM WATER MANAGEMENT CALCULATIONS
Rational Method

ONE HUNDRED YEAR EVENT

Maximum Allowable Flow Rate

Pre-development (Existing) Conditions

			C
Roof Area:	584	sq.m.	1.00
Asphalt/Concrete Area:	2234	sq.m.	1.00
Landscaped:	6296	sq.m.	0.25
Total Catchment Area	9114	sq.m.	0.48

Area (A):	9114	sq.m.
Time of Concentration:	20	min.
Rainfall Intensity (i):	120	mm/hr (100 year event)
Runoff Coeficient (C):	0.48	
Flow Rate (2.78AiC):	146.46	l/s
(Maximum Allowable Flow Rate)		

DRAINAGE AREA I (Uncontrolled Flow Off Site):

			C
Roof Area:	44	sq.m.	1.00
Asphalt/Concrete Area:	465	sq.m.	1.00
Landscaped:	3151	sq.m.	0.25
Total Catchment Area	3660	sq.m.	0.35

Area (A):	3660	sq.m.
Time of Concentration:	20	min.
Rainfall Intensity (i):	120	mm/hr (100 year event)
Runoff Coeficient (C):	0.35	
Flow Rate (2.78AiC):	43.24	l/s

DRAINAGE AREA II (CB-1)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	242	sq.m.	1.00
Asphalt/Concrete Area:	2299	sq.m.	1.00
Landscaped:	108	sq.m.	0.25
Total Catchment Area	2649	sq.m.	0.97

Water Elevation:	87.50	m
ICD Invert:	85.63	m
(Outlet Pipe OF CB-1):		
Head:	1.87	m
Orifice Diameter	111	mm
Orifice Area:	9674	sq.mm.
Coefficient of Discharge:	0.610	
Max. Release Rate:	35.75	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB-1	85.63	1.67	0.60	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB-1	889	0.20	59.26	cu.m.
		Achieved Vol:	59.87	cu.m.
		Max. Vol. Required:	59.87	cu.m.

Time	i	2.78AiC	ICD Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	243	173.27	35.75	137.52	41.26
10	179	127.47	35.75	91.73	55.04
15	143	102.01	35.75	66.27	59.64
20	120	85.63	35.75	49.89	59.87
25	104	74.14	35.75	38.39	57.59
30	92	65.59	35.75	29.84	53.71
35	83	58.95	35.75	23.21	48.74
40	75	53.65	35.75	17.90	42.96
45	69	49.30	35.75	13.55	36.58
50	64	45.66	35.75	9.91	29.74
55	60	42.57	35.75	6.82	22.51
60	56	39.90	35.75	4.16	14.97
65	53	37.58	35.75	1.84	7.17
70	50	35.55	35.55	0.00	0.00
75	47	33.74	33.74	0.00	0.00
80	45	32.12	32.12	0.00	0.00
85	43	30.66	30.66	0.00	0.00
90	41	29.35	29.35	0.00	0.00
95	39	28.15	28.15	0.00	0.00
100	38	27.06	27.06	0.00	0.00
105	36	26.06	26.06	0.00	0.00
110	35	25.13	25.13	0.00	0.00
115	34	24.28	24.28	0.00	0.00
120	33	23.48	23.48	0.00	0.00
125	32	22.75	22.75	0.00	0.00
130	31	22.06	22.06	0.00	0.00
135	30	21.41	21.41	0.00	0.00
140	29	20.81	20.81	0.00	0.00
145	28	20.24	20.24	0.00	0.00
150	28	19.71	19.71	0.00	0.00
180	24	17.06	17.06	0.00	0.00
210	21	15.10	15.10	0.00	0.00
240	19	13.57	13.57	0.00	0.00
270	17	12.35	12.35	0.00	0.00
300	16	11.34	11.34	0.00	0.00

DRAINAGE AREA III (CB-2)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	0	sq.m.	1.00
Asphalt/Concrete Area:	544	sq.m.	1.00
Landscaped:	636	sq.m.	0.25
Total Catchment Area	1180	sq.m.	0.60

Water Elevation:	87.68	m
ICD Invert:	85.46	m
(Outlet Pipe OF CB-1):		
Head:	2.22	m
Orifice Diameter	100	mm
Orifice Area:	7854	sq.mm.
Coefficient of Discharge:	0.212	
Max. Release Rate:	10.99	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB-2	85.46	2.07	0.75	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB-2	290	0.15	14.50	cu.m.
		Achieved Vol:	15.25	cu.m.
		Max. Vol. Required:	15.25	cu.m.

Time	i	2.78AiC	ICD Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	243	47.43	10.99	36.45	10.93
10	179	34.90	10.99	23.91	14.35
15	143	27.93	10.99	16.94	15.25
20	120	23.44	10.99	12.46	14.95
25	104	20.30	10.99	9.31	13.96
30	92	17.95	10.99	6.97	12.54
35	83	16.14	10.99	5.15	10.82
40	75	14.69	10.99	3.70	8.88
45	69	13.49	10.99	2.51	6.77
50	64	12.50	10.99	1.51	4.54
55	60	11.65	10.99	0.67	2.20
60	56	10.92	10.92	0.00	0.00
65	53	10.29	10.29	0.00	0.00
70	50	9.73	9.73	0.00	0.00
75	47	9.24	9.24	0.00	0.00
80	45	8.79	8.79	0.00	0.00
85	43	8.39	8.39	0.00	0.00
90	41	8.03	8.03	0.00	0.00
95	39	7.71	7.71	0.00	0.00
100	38	7.41	7.41	0.00	0.00
105	36	7.13	7.13	0.00	0.00
110	35	6.88	6.88	0.00	0.00
115	34	6.65	6.65	0.00	0.00
120	33	6.43	6.43	0.00	0.00
125	32	6.23	6.23	0.00	0.00
130	31	6.04	6.04	0.00	0.00
135	30	5.86	5.86	0.00	0.00
140	29	5.70	5.70	0.00	0.00
145	28	5.54	5.54	0.00	0.00
150	28	5.40	5.40	0.00	0.00
180	24	4.67	4.67	0.00	0.00
210	21	4.13	4.13	0.00	0.00
240	19	3.71	3.71	0.00	0.00
270	17	3.38	3.38	0.00	0.00
300	16	3.11	3.11	0.00	0.00

DRAINAGE AREA IV (CB-5 & CB/MH-6)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	649	sq.m.	1.00
Asphalt/Concrete Area:	85	sq.m.	1.00
Landscaped:	891	sq.m.	0.25
Total Catchment Area	1625	sq.m.	0.59

Water Elevation:	87.69	m
ICD Invert: (Outlet Pipe OF CB/MH-6):	84.92	m
Head:	2.77	m
Orifice Diameter	75	mm
Orifice Area:	4418	sq.mm.
Coefficient of Discharge:	0.216	
Max. Release Rate:	7.01	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB/MH-6	84.92	2.77	3.13	cu.m.
CB-5	85.00	2.45	0.88	cu.m.

Storage in Sewer Pipes

Diameter	Length		
250	36.2	1.78	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB/MH-6	326	0.24	25.61	cu.m.
		Achieved Vol:	31.40	cu.m.
		Max. Vol. Required:	31.40	cu.m.

Time	i	2.78AiC	Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	243	64.55	7.01	57.54	17.26
10	179	47.49	7.01	40.48	24.29
15	143	38.01	7.01	30.99	27.89
20	120	31.90	7.01	24.89	29.87
25	104	27.62	7.01	20.61	30.91
30	92	24.43	7.01	17.42	31.36
35	83	21.96	7.01	14.95	31.40
40	75	19.99	7.01	12.97	31.14
45	69	18.37	7.01	11.35	30.65
50	64	17.01	7.01	10.00	29.99
55	60	15.86	7.01	8.85	29.19
60	56	14.87	7.01	7.85	28.27
65	53	14.00	7.01	6.99	27.26
70	50	13.24	7.01	6.23	26.16
75	47	12.57	7.01	5.56	25.00
80	45	11.97	7.01	4.95	23.78
85	43	11.42	7.01	4.41	22.50
90	41	10.93	7.01	3.92	21.18
95	39	10.49	7.01	3.48	19.81
100	38	10.08	7.01	3.07	18.41
105	36	9.71	7.01	2.69	16.97
110	35	9.36	7.01	2.35	15.51
115	34	9.04	7.01	2.03	14.02
120	33	8.75	7.01	1.74	12.50
125	32	8.47	7.01	1.46	10.96
130	31	8.22	7.01	1.21	9.40
135	30	7.98	7.01	0.97	7.82
140	29	7.75	7.01	0.74	6.22
145	28	7.54	7.01	0.53	4.61
150	28	7.34	7.01	0.33	2.98
180	24	6.36	6.36	0.00	0.00
210	21	5.62	5.62	0.00	0.00
240	19	5.06	5.06	0.00	0.00
270	17	4.60	4.60	0.00	0.00
300	16	4.23	4.23	0.00	0.00

FIVE YEAR EVENT

Maximum Allowable Flow Rate

Pre-development (Existing) Conditions

			C
Roof Area:	584	sq.m.	0.90
Asphalt/Concrete Area:	2234	sq.m.	0.90
Landscaped:	6296	sq.m.	0.20
Total Catchment Area	9114	sq.m.	0.42
Area (A):	9114	sq.m.	
Time of Concentration:	20	min.	
Rainfall Intensity (i):	70	mm/hr (5 year event)	
Runoff Coeficient (C):	0.42		
Flow Rate (2.78AiC):	74.12	l/s	
(Maximum Allowable Flow Rate)			

DRAINAGE AREA I (Uncontrolled Flow Off Site):

			C
Roof Area:	44	sq.m.	0.90
Asphalt/Concrete Area:	465	sq.m.	0.90
Landscaped:	3151	sq.m.	0.20
Total Catchment Area	3660	sq.m.	0.30
Area (A):	3660	sq.m.	
Time of Concentration:	20	min.	
Rainfall Intensity (i):	70	mm/hr (5 year event)	
Runoff Coeficient (C):	0.30		
Flow Rate (2.78AiC):	21.25	l/s	

DRAINAGE AREA II (CB-1)

(FIVE YEAR EVENT)

			C
Roof Area:	242	sq.m.	0.90
Asphalt/Concrete Area:	2299	sq.m.	0.90
Landscaped:	108	sq.m.	0.20
Total Catchment Area	2649	sq.m.	0.87

Water Elevation:	87.44	m
ICD Invert:	85.63	m
(Outlet Pipe OF CB-1):		
Head:	1.81	m
Orifice Diameter	111	mm
Orifice Area:	9674	sq.mm.
Coefficient of Discharge:	0.610	
Max. Release Rate:	35.12	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB-1	85.63	1.67	0.60	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB-1	408	0.14	18.44	cu.m.

Achieved Vol: 19.05 cu.m.

Max. Vol. Required: 19.05 cu.m.

Time	i	2.78AiC	ICD Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	141	90.60	35.12	55.48	16.64
10	104	66.87	35.12	31.74	19.05
15	84	53.62	35.12	18.50	16.65
20	70	45.08	35.12	9.96	11.95
25	61	39.08	35.12	3.96	5.94
30	54	34.61	34.61	0.00	0.00
35	49	31.14	31.14	0.00	0.00
40	44	28.36	28.36	0.00	0.00
45	41	26.07	26.07	0.00	0.00
50	38	24.16	24.16	0.00	0.00
55	35	22.54	22.54	0.00	0.00
60	33	21.14	21.14	0.00	0.00
65	31	19.92	19.92	0.00	0.00
70	29	18.85	18.85	0.00	0.00
75	28	17.90	17.90	0.00	0.00
80	27	17.05	17.05	0.00	0.00
85	25	16.28	16.28	0.00	0.00
90	24	15.59	15.59	0.00	0.00
95	23	14.96	14.96	0.00	0.00
100	22	14.38	14.38	0.00	0.00
105	22	13.85	13.85	0.00	0.00
110	21	13.36	13.36	0.00	0.00
115	20	12.91	12.91	0.00	0.00
120	19	12.49	12.49	0.00	0.00
125	19	12.10	12.10	0.00	0.00
130	18	11.74	11.74	0.00	0.00
135	18	11.40	11.40	0.00	0.00
140	17	11.08	11.08	0.00	0.00
145	17	10.78	10.78	0.00	0.00
150	16	10.50	10.50	0.00	0.00
180	14	9.10	9.10	0.00	0.00
210	13	8.06	8.06	0.00	0.00
240	11	7.25	7.25	0.00	0.00
270	10	6.60	6.60	0.00	0.00
300	9	6.07	6.07	0.00	0.00

DRAINAGE AREA III (CB-2)

(FIVE YEAR EVENT)

			C
Roof Area:	0	sq.m.	0.90
Asphalt/Concrete Area:	544	sq.m.	0.90
Landscaped:	636	sq.m.	0.20
Total Catchment Area	1180	sq.m.	0.52

Water Elevation:	87.62	m
ICD Invert:	85.46	m
(Outlet Pipe OF CB-1):		
Head:	2.16	m
Orifice Diameter	100	mm
Orifice Area:	7854	sq.mm.
Coefficient of Discharge:	0.212	
Max. Release Rate:	10.84	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB-2	85.46	2.07	0.75	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB-2	112	0.09	3.47	cu.m.
		Achieved Vol:	4.21	cu.m.
		Max. Vol. Required:	4.21	cu.m.

Time	i	2.78AiC	ICD Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	141	24.21	10.84	13.36	4.01
10	104	17.87	10.84	7.02	4.21
15	84	14.33	10.84	3.48	3.13
20	70	12.05	10.84	1.20	1.44
25	61	10.44	10.44	0.00	0.00
30	54	9.25	9.25	0.00	0.00
35	49	8.32	8.32	0.00	0.00
40	44	7.58	7.58	0.00	0.00
45	41	6.97	6.97	0.00	0.00
50	38	6.46	6.46	0.00	0.00
55	35	6.02	6.02	0.00	0.00
60	33	5.65	5.65	0.00	0.00
65	31	5.32	5.32	0.00	0.00
70	29	5.04	5.04	0.00	0.00
75	28	4.78	4.78	0.00	0.00
80	27	4.55	4.55	0.00	0.00
85	25	4.35	4.35	0.00	0.00
90	24	4.16	4.16	0.00	0.00
95	23	4.00	4.00	0.00	0.00
100	22	3.84	3.84	0.00	0.00
105	22	3.70	3.70	0.00	0.00
110	21	3.57	3.57	0.00	0.00
115	20	3.45	3.45	0.00	0.00
120	19	3.34	3.34	0.00	0.00
125	19	3.23	3.23	0.00	0.00
130	18	3.14	3.14	0.00	0.00
135	18	3.05	3.05	0.00	0.00
140	17	2.96	2.96	0.00	0.00
145	17	2.88	2.88	0.00	0.00
150	16	2.81	2.81	0.00	0.00
180	14	2.43	2.43	0.00	0.00
210	13	2.15	2.15	0.00	0.00
240	11	1.94	1.94	0.00	0.00
270	10	1.76	1.76	0.00	0.00
300	9	1.62	1.62	0.00	0.00

DRAINAGE AREA IV (CB-5 & CB/MH-6)

(FIVE YEAR EVENT)

			C
Roof Area:	649	sq.m.	0.90
Asphalt/Concrete Area:	85	sq.m.	0.90
Landscaped:	891	sq.m.	0.20
Total Catchment Area	1625	sq.m.	0.52

Water Elevation:	87.59	m
ICD Invert: (Outlet Pipe OF CB/MH-6):	84.92	m
Head:	2.67	m
Orifice Diameter	75	mm
Orifice Area:	4418	sq.mm.
Coefficient of Discharge:	0.216	
Max. Release Rate:	6.89	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB/MH-6	84.92	2.67	3.02	cu.m.
CB-5	85.00	2.45	0.88	cu.m.

Storage in Sewer Pipes

Diameter	Length		
250	36.2	1.78	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB/MH-6	120	0.14	5.70	cu.m.
		Achieved Vol:	11.385	cu.m.
		Max. Vol. Required:	11.385	cu.m.

Time	i	2.78AiC	Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	141	32.92	6.89	26.03	7.81
10	104	24.30	6.89	17.40	10.44
15	84	19.48	6.89	12.59	11.33
20	70	16.38	6.89	9.49	11.38
25	61	14.20	6.89	7.31	10.96
30	54	12.58	6.89	5.68	10.23
35	49	11.31	6.89	4.42	9.28
40	44	10.30	6.89	3.41	8.18
45	41	9.47	6.89	2.58	6.96
50	38	8.78	6.89	1.89	5.66
55	35	8.19	6.89	1.30	4.28
60	33	7.68	6.89	0.79	2.84
65	31	7.24	6.89	0.34	1.34
70	29	6.85	6.85	0.00	0.00
75	28	6.50	6.50	0.00	0.00
80	27	6.19	6.19	0.00	0.00
85	25	5.92	5.92	0.00	0.00
90	24	5.66	5.66	0.00	0.00
95	23	5.43	5.43	0.00	0.00
100	22	5.23	5.23	0.00	0.00
105	22	5.03	5.03	0.00	0.00
110	21	4.86	4.86	0.00	0.00
115	20	4.69	4.69	0.00	0.00
120	19	4.54	4.54	0.00	0.00
125	19	4.40	4.40	0.00	0.00
130	18	4.27	4.27	0.00	0.00
135	18	4.14	4.14	0.00	0.00
140	17	4.03	4.03	0.00	0.00
145	17	3.92	3.92	0.00	0.00
150	16	3.82	3.82	0.00	0.00
180	14	3.31	3.31	0.00	0.00
210	13	2.93	2.93	0.00	0.00
240	11	2.63	2.63	0.00	0.00
270	10	2.40	2.40	0.00	0.00
300	9	2.21	2.21	0.00	0.00

STRESS TEST - 20% INCREASE TO ONE HUNDRED YEAR EVENT RAINFALL

DRAINAGE AREA I (Uncontrolled Flow Off Site):

			C
Roof Area:	44	sq.m.	1.00
Asphalt/Concrete Area:	465	sq.m.	1.00
Landscaped:	3151	sq.m.	0.25
Total Catchment Area	3660	sq.m.	0.35
Area (A):	3660	sq.m.	
Time of Concentration:	20	min.	
Rainfall Intensity (i):	144	mm/hr (100 year event)	
Runoff Coeficient (C):	0.35		
Flow Rate (2.78AiC):	51.89	l/s	

DRAINAGE AREA II (CB-1)

(STRESS TEST)

			C
Roof Area:	242	sq.m.	1.00
Asphalt/Concrete Area:	2299	sq.m.	1.00
Landscaped:	108	sq.m.	0.25
Total Catchment Area	2649	sq.m.	0.97

Water Elevation:	87.52	m
ICD Invert:	85.63	m
(Outlet Pipe OF CB-1):		
Head:	1.89	m
Orifice Diameter	111	mm
Orifice Area:	9674	sq.mm.
Coefficient of Discharge:	0.610	
Max. Release Rate:	35.94	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB-1	85.63	1.67	0.60	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB-1	1084	0.22	79.82	cu.m.
		Achieved Vol:	80.42	cu.m.
		Max. Vol. Required:	80.42	cu.m.

Time	i	2.78AiC	ICD Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	291	207.92	35.75	172.18	51.65
10	214	152.97	35.75	117.22	70.33
15	171	122.42	35.75	86.67	78.00
20	144	102.76	35.75	67.01	80.42
25	125	88.96	35.75	53.22	79.83
30	110	78.70	35.75	42.96	77.32
35	99	70.74	35.75	35.00	73.50
40	90	64.38	35.75	28.63	68.71
45	83	59.15	35.75	23.41	63.20
50	77	54.79	35.75	19.04	57.13
55	72	51.08	35.75	15.33	50.60
60	67	47.88	35.75	12.14	43.70
65	63	45.10	35.75	9.36	36.49
70	60	42.65	35.75	6.91	29.02
75	57	40.48	35.75	4.74	21.32
80	54	38.54	35.75	2.80	13.43
85	52	36.80	35.75	1.05	5.37
90	49	35.22	35.22	0.00	0.00
95	47	33.78	33.78	0.00	0.00
100	45	32.47	32.47	0.00	0.00
105	44	31.27	31.27	0.00	0.00
110	42	30.16	30.16	0.00	0.00
115	41	29.13	29.13	0.00	0.00
120	39	28.18	28.18	0.00	0.00
125	38	27.30	27.30	0.00	0.00
130	37	26.47	26.47	0.00	0.00
135	36	25.70	25.70	0.00	0.00
140	35	24.97	24.97	0.00	0.00
145	34	24.29	24.29	0.00	0.00
150	33	23.65	23.65	0.00	0.00
180	29	20.48	20.48	0.00	0.00
210	25	18.11	18.11	0.00	0.00
240	23	16.28	16.28	0.00	0.00
270	21	14.82	14.82	0.00	0.00
300	19	13.61	13.61	0.00	0.00

DRAINAGE AREA III (CB-2)

(STRESS TEST)

			C
Roof Area:	0	sq.m.	1.00
Asphalt/Concrete Area:	544	sq.m.	1.00
Landscaped:	636	sq.m.	0.25
Total Catchment Area	1180	sq.m.	0.60

Water Elevation:	87.70	m
ICD Invert:	85.46	m
(Outlet Pipe OF CB-1):		
Head:	2.24	m
Orifice Diameter	100	mm
Orifice Area:	7854	sq.mm.
Coefficient of Discharge:	0.212	
Max. Release Rate:	11.03	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB-2	85.46	2.07	0.75	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB-2	357	0.17	19.83	cu.m.

Achieved Vol: 20.57 cu.m.

Max. Vol. Required: 20.57 cu.m.

Time	i	2.78AiC	ICD Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	291	56.92	10.99	45.93	13.78
10	214	41.88	10.99	30.89	18.53
15	171	33.51	10.99	22.53	20.27
20	144	28.13	10.99	17.14	20.57
25	125	24.35	10.99	13.37	20.05
30	110	21.55	10.99	10.56	19.01
35	99	19.37	10.99	8.38	17.60
40	90	17.62	10.99	6.64	15.93
45	83	16.19	10.99	5.21	14.06
50	77	15.00	10.99	4.01	12.04
55	72	13.98	10.99	3.00	9.89
60	67	13.11	10.99	2.12	7.64
65	63	12.35	10.99	1.36	5.30
70	60	11.68	10.99	0.69	2.90
75	57	11.08	10.99	0.10	0.43
80	54	10.55	10.55	0.00	0.00
85	52	10.07	10.07	0.00	0.00
90	49	9.64	9.64	0.00	0.00
95	47	9.25	9.25	0.00	0.00
100	45	8.89	8.89	0.00	0.00
105	44	8.56	8.56	0.00	0.00
110	42	8.26	8.26	0.00	0.00
115	41	7.97	7.97	0.00	0.00
120	39	7.71	7.71	0.00	0.00
125	38	7.47	7.47	0.00	0.00
130	37	7.25	7.25	0.00	0.00
135	36	7.03	7.03	0.00	0.00
140	35	6.84	6.84	0.00	0.00
145	34	6.65	6.65	0.00	0.00
150	33	6.48	6.48	0.00	0.00
180	29	5.61	5.61	0.00	0.00
210	25	4.96	4.96	0.00	0.00
240	23	4.46	4.46	0.00	0.00
270	21	4.06	4.06	0.00	0.00
300	19	3.73	3.73	0.00	0.00

DRAINAGE AREA IV (CB-5 & CB/MH-6)

(STRESS TEST)

			C
Roof Area:	649	sq.m.	1.00
Asphalt/Concrete Area:	85	sq.m.	1.00
Landscaped:	891	sq.m.	0.25
Total Catchment Area	1625	sq.m.	0.59

Water Elevation:	87.71	m
ICD Invert: (Outlet Pipe OF CB/MH-6):	84.92	m
Head:	2.79	m
Orifice Diameter	75	mm
Orifice Area:	4418	sq.mm.
Coefficient of Discharge:	0.216	
Max. Release Rate:	7.05	l/s

Storage in MH's & CB's

	Invert	Depth		
	m	m		
CB/MH-6	84.92	2.79	3.16	cu.m.
CB-5	85.00	2.45	0.88	cu.m.

Storage in Sewer Pipes

Diameter	Length		
250	36.2	1.78	cu.m.

Surface Storage Above Catch Basin

	Area	Depth		
CB/MH-6	401	0.26	34.92	cu.m.
		Achieved Vol:	40.73	cu.m.
		Max. Vol. Required:	40.73	cu.m.

Time	i	2.78AiC	Release Rate	Stored Rate	Stored Volume
min.	mm/hr	l/s	l/s	l/s	cu.m.
5	291	77.46	7.01	70.45	21.14
10	214	56.99	7.01	49.98	29.99
15	171	45.61	7.01	38.59	34.74
20	144	38.28	7.01	31.27	37.53
25	125	33.15	7.01	26.13	39.20
30	110	29.32	7.01	22.31	40.16
35	99	26.36	7.01	19.34	40.62
40	90	23.98	7.01	16.97	40.73
45	83	22.04	7.01	15.03	40.57
50	77	20.41	7.01	13.40	40.20
55	72	19.03	7.01	12.02	39.66
60	67	17.84	7.01	10.83	38.98
65	63	16.80	7.01	9.79	38.18
70	60	15.89	7.01	8.88	37.29
75	57	15.08	7.01	8.07	36.31
80	54	14.36	7.01	7.35	35.26
85	52	13.71	7.01	6.70	34.15
90	49	13.12	7.01	6.11	32.98
95	47	12.59	7.01	5.57	31.77
100	45	12.10	7.01	5.08	30.51
105	44	11.65	7.01	4.64	29.21
110	42	11.24	7.01	4.22	27.87
115	41	10.85	7.01	3.84	26.50
120	39	10.50	7.01	3.49	25.10
125	38	10.17	7.01	3.16	23.67
130	37	9.86	7.01	2.85	22.22
135	36	9.57	7.01	2.56	20.74
140	35	9.30	7.01	2.29	19.25
145	34	9.05	7.01	2.04	17.73
150	33	8.81	7.01	1.80	16.19
180	29	7.63	7.01	0.62	6.65
210	25	6.75	6.75	0.00	0.00
240	23	6.07	6.07	0.00	0.00
270	21	5.52	5.52	0.00	0.00
300	19	5.07	5.07	0.00	0.00

Summary of Pre-consultation with City of Ottawa

From: Lebrun, Julie (Planning) [mailto:Julie.Lebrun@ottawa.ca]
Sent: June-18-13 2:11 PM
To: Ralph Vandenberg
Cc: Terrence Leversedge (kestrelaerospaceresearch@gmail.com); Kathy Pearce (pgts@rogers.com)
Subject: RE: 1234 Prestone Drive - Church expansion

Hi Ralph,

Please see my responses in red below.

Thanks,

Julie

From: Ralph Vandenberg [mailto:ralph@vwarchitects.ca]
Sent: June 12, 2013 4:32 PM
To: Lebrun, Julie (Planning)
Cc: Terrence Leversedge (kestrelaerospaceresearch@gmail.com); Kathy Pearce (pgts@rogers.com)
Subject: RE: 1234 Prestone Drive - Church expansion

Hi Julie: I'm trying to assist the church in developing their budget and properly determining figures related to the Site Plan Control process. Attached is a more updated plan that what we discussed in the Pre-Application meeting.

Could you verify:

1. Is there is an existing Site Plan Agreement on the property? Yes
2. If there is, is this application a " Revision - Manager Approval, Public Consultation" or is the addition (+/-5,000ft2) to the existing (6,287ft2) building, or can this be a simple Manager or Staff approval with no Public Consultation?
3. Is the additional Engineering Design Review and Inspection Fee applicable for this project? Yes they are applicable

Thanks,
Ralph

Vandenberg & Wildeboer Architects Inc.
Ralph Vandenberg – B. Arch, OAA, MRAIC, LEED AP
160 Flamborough Way, Kanata, Ontario, K2K 3H9
Ph 613 287-0144 x200 Fx 613 271-8609
www.vwarchitects.ca | Download Vcard

From: Lebrun, Julie (Planning) [mailto:Julie.Lebrun@ottawa.ca]
Sent: May-30-13 11:11 AM
To: Ralph Vandenberg; 'kestrelaerospaceresearch@gmail.com'
Cc: Sevigny, John; Yousfani, Asad
Subject: 1234 Prestone Drive - Church expansion

Good morning,

As discussed in our pre-consultation meeting on May 28th, the applicant will be submitting a site plan application with the City to add a new Hall, nursery, classrooms and administration offices to the existing church as well as additional parking. As a follow-up I have provided links to the by-law regarding aisle provisions, landscaping provisions for parking areas and the provisions for the I1B zone.

Links to the Consolidated Zoning By-law:

1) Aisle provisions
http://ottawa.ca/en/residents/laws-licenses-and-permits/laws/city-ottawa-zoning-law/zoning-law-2008-250-consolidation-43

2) Landscaping provisions for parking areas
http://ottawa.ca/en/residents/laws-licenses-and-permits/laws/city-ottawa-zoning-law/zoning-law-2008-250-consolidation-45

3) I1B zone provisions
http://ottawa.ca/en/residents/laws-licenses-and-permits/laws/city-ottawa-zoning-law/zoning-law-2008-250-consolidation-65

You will be required to submit the following with your site plan application:

Site Plan
Landscape Plan
Color Architectural Elevation drawings
Tree Conservation Report (a tree cutting permit will be required for any on site tree removal – contact Mark Richardson (x 23839)
Phase 1 ESA

As part of their engineering submission we will require the following report/studies as part of their application:

Site Servicing Brief:

- The report is to follow the City's Servicing Study guidelines which can be found at the following link: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications
- Prior to submitting the servicing report the consultant should contact me and request boundary conditions for the water service design. The consultant will need to provide the type of development, fire flow required, average day demand, maximum day demand and maximum hour demand.
- We have confirmed with infrastructure management that there are no concerns with existing sanitary capacity within the right-of-way therefore the consultant will only need to confirm that the existing service size is adequate for their expansion.
- The storm water management design is to be calculated using a post-development release rate equivalent to the pre-development release rate for the 1:5 year storm. All flows volumes up to and including the 1:100 year storm, above the 1:5 year pre-development flow rate, are to be controlled/stored on site.

Geotechnical Brief:

- Containing detailed information on geotechnical matters and recommendations (i.e. pavement, foundation, bedding construction etc.). The report is to follow the City's Geotechnical Reporting Guidelines which can be found at http://www.ottawa.ca/cs/groups/content/@webottawa/documents/pdf/mdaw/mtm4/~edisp/cap137602.pdf

Exterior Site Lighting Letter

- This requirement was not mentioned in the pre-consult however it would be appreciated if we could have it at the time of submission. That being said, we would not deem the application incomplete if it was the only thing missing from the submission.

- The letter is to be certified by a qualified engineer confirming the site lighting design a) meets the criteria for Full Cut-off (Sharp cut-off) Classification, as recognized by the Illuminating Engineering Society of North America (IESNA or IES) AND b) the site lighting spillage will be minimal (i.e. 0.5 foot-candle is normally the maximum allowable spillage).

Engineering Drawings:

- The following are the engineering plans that are required with the submission. The link below outlines the requirements for the plans http://ottawa.ca/en/city_hall/planningprojectsreports/planning/dev_review_process/guide/servicing_grading/index.html
  - Site Servicing Plan
  - Grading and Drainage Plan
  - Erosion and Sediment Control Plan (can be combined with the grading plan)

A couple items to make note of are:

- A Closed Circuit Television (CCTV) inspection will be required in order to re-use the existing services. This will be required prior to site plan approval.
- All existing and proposed parking areas are to have barrier curbs.

The transportation engineer will require the following:

-A Transportation Brief (TB) is required: More details on the format / analysis methodologies to complete a TB can be found under Appendix C, page # 25 of the October 2006 Transportation Impact Assessment Guidelines.

Following are **some** of the elements the required TB will document in it.

- Identify any turning lanes to serve the access points along public road(s);
- Determine the appropriate curb radii, daylight triangles, and storage length at the entrances;
- Determine the appropriate width of access points and their spacing. The Private Approach BY-LAW needs to be referred to (http://www.ottawa.ca/residents/bylaw/a_z/private_approach/index_en.html);

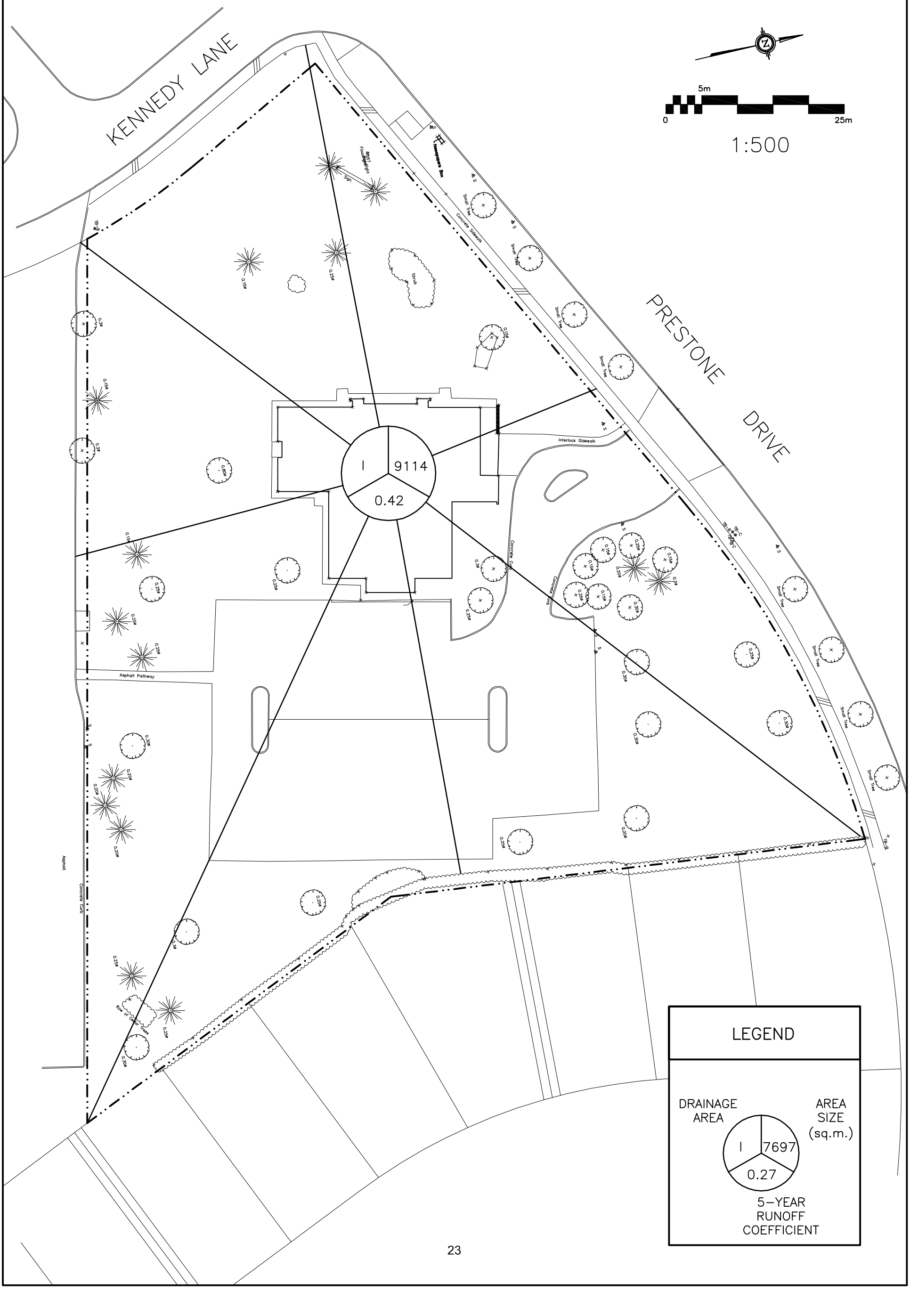
-A Noise Study is required: May 2010 City of Ottawa Environmental Noise Control Guidelines should be referred to complete the required study.

If you have any further questions, please do not hesitate to contact us.

Regards,

Julie Lebrun, MCIP, RPP
Planner / Urbaniste
Planning and Growth Management Department/
Service de l'urbanisme et gestion de la croissance
City of / Ville d'Ottawa
110, avenue Laurier Avenue West / Ouest,
4th Floor / 4ième étage
Ottawa, ON K1P 1J1
' ***580-2424 ext. 27816***
7***580-2576***
8 ***Julie.Lebrun@ottawa.ca***
Mail Code / Courrier interne : 01-14

PRE-DEVELOPMENT DRAINAGE AREAS



POST DEVELOPMENT DRAINAGE AREAS