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STORMWATER MANAGEMENT REPORT

RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A TO K)

1420 EARL ARMSTRONG ROAD

CITY OF OTTAWA

FILE No: 12007.100

DATE: APRIL 9, 2014

revised JULY 20, 2014

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1420 EARL ARMSTRONG ROAD
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1.0 INTRODUCTION

The purpose of this report is to provide recommended grading and drainage proposals with the objective to control storm runoff from the above proposed commercial development. The report provides an analysis of the overall site bounded by Earl Armstrong Road to the north, Limebank Road to the west, proposed Collector Road 'D' to the east and future Transit Road to the south. The property is located within in the Riverside South Community Phase 6, City of Ottawa. The Report also addresses Tributary No. 14, an external drainage area south of the subject property. Details are included in Appendix B to this Report.

In September 2008, Stantec prepared a report entitled, Riverside South Community Master Drainage Plan Update, Final Report. That study established the overall storm drainage strategy for the Riverside South Community and determined parameters for future developments within the community plan.

In January 2012, J.L. Richards & Associates Limited prepared a Design Report for Riverside South Community Phase 6. That study provided further details and design parameters with respect storm drainage of future developments within the study area.

The Stantec and the J.L. Richards studies established maximum allowable runoff from development blocks within the Riverside South Community area, including for the Subject Property. On site detention of excess runoff from the Subject Property will be required in order not to exceed the allowable site release rate.

The intent of this hydrologic evaluation is to outline the proposed stormwater management necessary to satisfy the site storage requirements produced by the occurrence of the 100 year return frequency design storm.

The maximum volume of storm runoff for the site was determined using the modified rational method MRM, as outlined in the American Public Works Association Publication title Practice in Detention of Urban Stormwater Runoff.

Copies of the Proposed Site Plan, Site Grading Plan, Servicing Plan and the SWM Drainage Plan are included in the rear pockets of this Report. The rainfall intensities are derived from the City of Ottawa IDF curves.

2.0 ALLOWABLE SITE RUNOFF

The Master Drainage Study by Stantec and the Design Report by J.L. Richards established that the maximum allowable post development storm runoff from the subject property shall not exceed 203 L/s/ha for all storms up to and including the 1:100 year event.

All excess runoff shall be detained on site through surface, roof and underground storage.

ALLOWABLE RELEASE RATE

$$\text{Site Area} = 6.54 \text{ ha.} \times 203 \text{ L/s/ha} = 1327 \text{ L/s}$$

3.0 POST-DEVELOPMENT SITE CONDITION

	unit	Total	System A
Total Site Area	(m ²)	65367	65367
Pavement Area	(m ²)	48578	48578
Landscaped Area	(m ²)	484	484
Building Area	(m ²)	10367	10367
Uncontrolled Pavement Area	(m ²)	413	413
Uncontrolled Landscape Area	(m ²)	5525	5525



4.0 EVALUATION OF SITE RUNOFF - SYSTEM A

4.1 Roof Top Storage

Proposed roofs to be equipped with control flow drains.

Model ID: Zurn Control Flo Z-105-5
 Weir Rating 6 USGPM per inch head (0.15 L/s/cm head)
 Quantity: One weir per hopper. Based on manufacturers table, one hopper drains a maximum roof area of 465m² with a maximum head of 10.16 cm

For this building 33 weirs

Total roof outflow is calculated as:

$$Q_{\text{roof}} = 33 \times 0.15 \text{ L/s/cm hd.} \times 10 \text{ cm head} = 49.5 \text{ L/s}$$

From Appendix - Table 1 maximum storage volumes: required = 416.8 m³
 available = 702.2 m³

As shown, the available storage volume for the roof can easily contain the respective required maximum roof storage volumes.

Note: Peak rate of runoff, eg: $Q = \text{Rain (L/s)}$
 $= 0.95 \times 1.0367 \times \text{mm/hr} \times 2.778$

4.2 Parking Lot Storage and Release Rate

Note: 100 year runoff coefficients:

pavements - C₁₀₀ = C₅ x 0.5 + 0.5 = 0.9 x 0.5 + 0.5 = 0.95
 landscaped - C₁₀₀ = 0.25 x 0.5 + 0.5 = 0.625

4.2.1 The composite runoff coefficients for the site, excluding building, are calculated as follows:

$$C_c = \frac{48578 \times 0.95}{48578} + \frac{484 \times 0.625}{484}$$

$$C_c = 0.95$$



4.2.2 Release rate calculations are based on orifice flow formula:

$$Q = C \times A \times (2gH)^{1/2}$$

where,

Q = discharge in m³/s

C = shape coefficient, 0.62 for orifice plate, dimensionless

A = area of orifice in m²

g = acceleration due to gravity in m/s²

H = head from centre of orifice to ponding level in m

Orifice Plate at Existing Storm Manhole

max. ponding level	(m)	92.5
invert of orifice	(m)	88.15
head	(m)	4.125
diameter of orifice	(mm)	450
Q, orifice discharge	(l/s)	887.1

4.2.3 Using the Modified Rational Method, the maximum storage volume required on the parking lot was calculated. As shown in Appendix A, Table 2 and dwg 3 of 8, SWM drainage Plan, Urban Ecosystems Limited Project No. 12007.100 The required pond volume was calculated to be 906 m³

Available site storage:

12.5	m -	1050	Surface Pavement Storage=	1278.0	m ³
81	m -	900	dia. stm =	10.8	m ³
87.5	m -	750	dia. stm =	51.5	m ³
91	m -	675	dia. stm =	38.7	m ³
135	m -	600	dia. stm =	32.6	m ³
174	m -	525	dia. stm =	38.2	m ³
137	m -	450	dia. stm =	37.7	m ³
37.5	m -	375	dia. stm =	21.8	m ³
299.5	m -	300	dia. stm =	4.1	m ³
113.5	m -	250	dia. stm =	21.2	m ³
0	m -	200	dia. stm =	5.6	m ³
2		2400 mm dia mh(@	2 m avg depth) =	0.0	m ³
2		1800 mm dia mh(@	2 m avg depth) =	18.1	m ³
8		1500 mm dia mh(@	2 m avg depth) =	10.2	m ³
19		1200 mm dia mh(@	2 m avg depth) =	28.3	m ³
				43.0	m ³
Total site storage =			Manhole / Pipe Storage=	361.6	m ³
				1639.6	m ³

Required Storage	m ³	906
Available Storage	m ³	1640

Therefore, there is sufficient storage in the parking lot to self contain the drainage and control the 100 year runoff to the allowable rate within the site.

Note: Peak runoff rate, $Q = R A I N + Q_{roof}$
 $0.95 \times 4.9062 \times 1 \times 2.778 + 50$

Note:

Table 3 indicates that the uncontrolled runoff will total 190.7 l/s
 (Landscape = 5525 m² and pavement = 413 m²)



3.0 WATER QUALITY CONTROL

Storm runoff from the subject property will be directed to a proposed 1800 mm dia storm sewer to be constructed on Collector Road 'D'. This storm sewer connects to the existing storm sewers on Earl Armstrong Road and Limebank Road discharging to Riverside South Stormwater Management Pond No. 2, which provides for water quality controls. The Riverside South retail centre development is therefore not required to include onsite stormwater quality features.

7.0 SUMMARY



The following table summarizes the results presented in this report.

SYSTEM		100 YR STM	5 YR STM
orifice size	mm	450	450
total site release rate	L/s	1077.8	905.0
allowable site release rate	L/s	1327.0	1327.0
maximum ponding elevation	m	92.5	92.2
catchbasin elevation	m	92.2	92.2
ponding depth	m	0.3	0
required storage	m ³	906	279
available storage	m ³	1640	362

Respectfully submitted,

Urban Ecosystems Limited

Rosario Sacco, P. Eng.


 DATED revised January 20, 2016


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APPENDIX A

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
 MUNICIPALITY: CITY OF OTTAWA
 FILE NO.: 12007.100
 Date: revised January 20, 2016
 LOCATION: 1420 EARL ARMSTRONG ROAD

SITE STORM WATER MANAGEMENT

SUMMARY

	Total
Site area (sq.m) :	65367
Controlled Pavement area (sq.m) :	48578
Controlled Landscaped area (sq.m) :	484
BLDGs B,C,D,E,F,G,H,I,J,K Roof area (sq.m) :	10367
Uncontrolled Pavement area (sq.m.) :	413
Uncontrolled Landscape area (sq.m.) :	5525

Includes Building A

SYSTEM A

CONTROLLED	Orifice release rate (l/sec) :	887.1
UNCONTROLLED	Site release rate (l/sec) :	190.7
TOTAL	Site release rate (l/sec) :	1077.8
ALLOWABLE	Site release rate (l/sec) :	1327.0



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ROOF DRAINAGE CHARACTERISTICS

SITE PLAN CHARACTERISTICS - SYSTEMS A
 Site area (sq.m): 65367
 Controlled Pavement area (sq.m): 48578
 Controlled Landscaped area (sq.m): 484
 Proposed Roof area (sq.m): 10367
 Rainfall intensity (mm/hr): 10367
 Pavement coefficient: 0.95
 Landscape coefficient: 0.625
 Roof area coefficient: 0.95
 1 2yr = $732.951/(6.199+t)^{0.810}$
 1 5yr = $998.071/(6.053+t)^{0.814}$
 1 100yr = $1735.688/(6.014+t)^{0.820}$
 Total roof area (sq. m): 10367
 Total number of roof hoppers: 33
 Total number of weirs: 33
 Max. sloped roof depth (mm): 50.8
 Max. sloped roof storage (cu.m): 175.55
 Max. parapit roof storage (cu.m): 526.64
 Weir rating (l/sec): 0.15
 Weir area rating (sq. m.): 465
 Maximum head (cm): 10.16
 Peak roof outflow rate (l/sec): 50.3
 33 hoppers @ 1 weir = 33
 hoppers @ 2 weir = 0

TABLE 1 - ROOF DRAINAGE SYSTEM

Time (min.)	1st ITERATION				2nd ITERATION				3rd ITERATION					
	Rainfall Intensity (mm/hr)	Peak rate of runoff Q (l/sec)	Peak Runoff volume (cu.m.)	Peak roof outflow volume (cu.m)	Required storage volume (cu.m)	Volume in sloped roof areas (cu.m)	Volume contained by roof parapit (cu.m)	Total head on roof hoppers (cm)	Roof outflow rate (l/sec)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	Total head on roof hoppers (cm)	Roof outflow volume (cu.m)	Required storage volume (cu.m)
5	242.70	664.03	199.21	15.09	184.12	175.55	8.57	5.16	25.56	7.67	191.54	5.23	7.77	191.44
10	178.56	488.53	293.12	30.18	262.94	175.55	87.39	5.92	29.32	17.59	275.53	6.04	17.95	275.17
15	142.89	390.95	351.86	45.26	306.59	175.55	131.05	6.30	31.40	28.26	323.59	6.51	28.99	322.86
20	119.95	328.18	393.81	60.35	333.46	175.55	157.92	6.60	32.69	39.22	354.59	6.81	40.43	353.38
25	103.85	284.12	426.18	75.44	350.74	175.55	175.20	6.77	33.51	50.27	375.91	7.01	52.07	374.11
30	91.87	251.35	452.43	90.53	361.90	175.55	186.35	6.88	34.04	61.28	391.15	7.16	63.79	388.63
35	82.58	225.93	474.46	105.61	368.84	175.55	193.29	6.94	34.38	72.19	402.27	7.27	75.54	398.92
40	75.15	205.99	493.43	120.70	372.73	175.55	197.18	6.98	34.56	82.95	410.48	7.35	87.27	406.15
45	69.05	188.92	510.08	135.79	374.29	175.55	198.74	7.00	34.64	93.52	416.56	7.40	98.97	411.12
50	63.95	174.98	524.93	150.88	374.05	175.55	198.50	6.99	34.62	103.87	421.05	7.45	110.61	414.32
55	59.62	163.13	538.32	165.96	372.36	175.55	196.81	6.98	34.54	113.99	424.33	7.48	122.18	416.14
60	55.89	152.93	550.53	181.05	369.48	175.55	193.93	6.95	34.41	123.86	426.67	7.50	133.69	416.84
65	52.65	144.04	561.75	196.14	365.61	175.55	190.06	6.91	34.22	133.46	428.29	7.52	145.13	416.62
70	49.79	136.22	572.13	211.23	360.91	175.55	185.36	6.87	34.00	142.79	429.35	7.53	156.51	415.62
75	47.26	129.29	581.80	226.31	355.49	175.55	179.94	6.82	33.74	151.82	429.98	7.53	167.83	413.97
80	44.99	123.09	590.85	241.40	349.45	175.55	173.90	6.76	33.45	160.56	430.29	7.54	179.09	411.76
85	42.95	117.52	599.35	256.49	342.86	175.55	167.32	6.69	33.13	168.99	430.36	7.54	190.30	409.06
90	41.11	112.48	607.38	271.58	335.80	175.55	160.25	6.63	32.80	177.11	430.27	7.54	201.47	405.91
95	39.43	107.89	614.98	286.66	328.32	175.55	152.77	6.55	32.44	184.91	430.07	7.54	212.60	402.38
100	37.90	103.70	622.21	301.75	320.45	175.55	144.91	6.48	32.06	192.39	429.82	7.53	223.72	398.49
105	36.50	99.86	629.09	316.84	312.25	175.55	136.70	6.40	31.67	199.54	429.55	7.53	234.83	394.26
110	35.20	96.31	635.66	331.93	303.73	175.55	128.19	6.32	31.27	206.36	429.30	7.53	245.93	389.73
115	34.01	93.04	641.95	347.01	294.94	175.55	119.39	6.23	30.85	212.84	429.11	7.53	257.05	384.91
120	32.89	90.00	647.99	362.10	285.89	175.55	110.34	6.14	30.41	218.98	429.01	7.52	268.19	379.81
125	31.86	87.17	653.79	377.19	276.60	175.55	101.06	6.05	29.97	224.78	429.01	7.52	279.36	374.43
130	30.90	84.54	659.38	392.28	267.10	175.55	91.56	5.96	29.52	230.24	429.14	7.53	290.59	368.80

Roof = RAIN = 2.736 x l (l/sec)

Peak roof outflow rate =
 no. of hoppers x weir rating x max. head
 = 50.3 l/sec
 Peak roof outflow volume =
 = 50.3 x time x 60/1000 cu. m.

Roof outflow rate =
 head x weir rating x no. of hoppers
 = head x 4.95 l/sec

Required max. roof storage (cu. m.): 416.8
 Available roof storage (cu. m.): 702.2

SYSTEM A 100 YR STORM
SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) : 48578
 Controlled Landscaped area (sq.m) : 484
 Total area - excl. Bldg (sq.m) : 49062
 Composite runoff coefficient : 0.95

OUTLET CHARACTERISTICS

Orifice diameter (mm) : 450
 Area of orifice (sq.m) : 0.15904
 Orifice coefficient : 0.62
 Max. ponding elev. : 92.50
 Catchbasin elev. : 92.20
 Ponding depth. : 0.30
 Orifice invert : 88.15
 Orifice center line elev. : 88.375
 Head (m) : 4.125
 Orifice release rate (l/sec) : 887.1

TABLE 2 - System Storage

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Runoff volume (cu.m)	Orifice Outflow volume (cu.m)	Required storage volume (cu.m)
10	178.56	2354.46	1412.68	532.25	880.42
15	142.89	1894.23	1704.81	798.38	906.43
20	119.95	1598.16	1917.80	1064.51	853.29
25	103.85	1390.36	2085.54	1330.64	754.91

Required site storage (cu. m) : 906
 Available site storage (cu. m) : 1640
 SEE DRAWING SP-1

$$Q_{site} = RAIN + Q_{roof} = 12.904 \times I + 50.3 \text{ l/sec}$$

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)
10	178.56	190.75
15	142.89	152.65
20	119.95	128.14

Peak runoff (L/sec) : 190.7

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) : 413
 Controlled Landscaped area (sq.m.) : 5525
 Total area (sq.m) : 5938
 Composite runoff coefficient : 0.648

SYSTEM A 100 YR STORM
SITE SUMMARY

Orifice release rate (l/sec) : 887.1
 Uncontrolled release rate (l/sec) : 190.7
 Total site release rate (l/sec) : **1077.8**
 Allowable site release rate (l/sec) : 1327.0

ROOF DRAINAGE CHARACTERISTICS

SITE PLAN CHARACTERISTICS - SYSTEMS A

Site area (sq.m) : 65367
 Controlled Pavement area (sq.m) : 48578
 Controlled Landscaped area (sq.m) : 484
 Proposed Roof area (sq.m) : 10367

Pavement coefficient : 0.9
 Landscape coefficient : 0.25
 Roof area coefficient : 0.95

Rainfall intensity (mm/hr) :
 12yr = 732.95/(6.199+t)^{0.810}
 15yr = 998.07/(6.053+t)^{0.814}
 100yr = 1735.688/(6.014+t)^{0.820}

Total roof area (sq. m) : 10367
 Total number of roof hoppers : 33
 Total number of weirs : 33
 Max. sloped roof depth (mm) : 50.8
 Max. sloped roof storage (cu.m) : 175.55
 Max. parapit roof storage (cu.m) : 526.64

Weir rating (l/sec) : 0.15
 Weir area rating (sq. m.) : 465
 Maximum head (cm) : 10.16
 Peak roof outflow rate (l/sec) : 50.3

33 hoppers @ 1 weir = 33
 0 hoppers @ 2 weir = 0
 Total 33 hoppers

TABLE 1 - ROOF DRAINAGE SYSTEM

Time (min.)	1st ITERATION					2nd ITERATION					3rd ITERATION				
	Rainfall Intensity (mm/hr)	Peak rate of runoff Q (l/sec)	Peak Runoff volume (cu.m.)	Peak roof outflow volume (cu.m)	Required storage volume (cu.m)	Volume in sloped roof areas (cu.m)	Volume contained by roof parapit (cu.m)	Total head on roof hoppers (cm)	Roof outflow rate (l/sec)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	Total head on roof hoppers (cm)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	
5	141.18	386.26	115.88	15.09	100.79	100.79	-74.76	2.20	10.87	3.26	112.62	2.65	3.94	111.94	
10	104.19	285.07	171.04	30.18	140.87	140.87	-34.68	3.74	18.52	11.11	159.93	4.48	13.30	157.74	
15	83.56	228.61	205.75	45.26	160.48	160.48	-15.06	4.50	22.27	20.04	185.71	5.18	23.07	182.68	
20	70.25	192.20	230.64	60.35	170.29	170.29	-5.25	4.88	24.14	28.97	201.67	5.33	31.67	198.97	
25	60.90	166.61	249.91	75.44	174.48	174.48	-1.07	5.04	24.94	37.41	212.50	5.44	40.37	209.55	
30	53.93	147.54	265.58	90.53	175.05	175.05	-0.50	5.06	25.05	45.09	220.49	5.51	49.13	216.45	
35	48.52	132.74	278.76	105.61	173.14	173.14	-2.40	4.99	24.69	51.84	226.91	5.58	57.96	220.80	
40	44.18	120.89	290.13	120.70	169.43	169.43	-6.12	4.84	23.98	57.54	232.58	5.63	66.89	223.24	
45	40.63	111.16	300.13	135.79	164.34	164.34	-11.21	4.65	23.01	62.11	238.01	5.68	75.95	224.18	
50	37.65	103.02	309.05	150.88	158.18	158.18	-17.37	4.41	21.83	65.48	243.57	5.74	85.18	223.87	
55	35.12	96.10	317.12	165.96	151.15	151.15	-24.40	4.14	20.49	67.61	249.51	5.79	94.64	222.48	
60	32.94	90.13	324.47	181.05	143.42	143.42	-32.13	3.84	19.01	68.44	256.04	5.86	104.36	220.11	
65	31.04	84.93	331.24	196.14	135.10	135.10	-40.44	3.52	17.42	67.94	263.30	5.93	114.41	216.83	
70	29.37	80.36	337.51	211.23	126.29	126.29	-49.26	3.18	15.74	66.10	271.42	6.00	124.84	212.67	
75	27.89	76.30	343.36	226.31	117.04	117.04	-58.51	2.82	13.97	62.87	280.48	6.09	135.70	207.65	
80	26.56	72.67	348.83	241.40	107.43	107.43	-68.12	2.45	12.14	58.25	290.58	6.19	147.06	201.76	
85	25.37	69.41	353.98	256.49	97.49	97.49	-78.06	2.07	10.24	52.21	301.77	6.30	158.98	195.00	
90	24.29	66.45	358.84	271.58	87.26	87.26	-88.29	1.67	8.28	44.74	314.10	6.42	171.51	187.33	
95	23.31	63.76	363.45	286.66	76.78	76.78	-98.76	1.27	6.28	35.81	327.64	6.55	184.72	178.72	
100	22.41	61.30	367.83	301.75	66.08	66.08	-109.47	0.86	4.24	25.43	342.40	6.69	198.68	169.15	
105	21.58	59.05	372.01	316.84	55.17	55.17	-120.38	0.44	2.15	13.57	358.43	6.84	213.43	158.57	
110	20.82	56.97	376.00	331.93	44.07	44.07	-131.48	0.01	0.03	0.23	375.77	7.01	229.06	146.94	
115	20.12	55.05	379.82	347.01	32.80	32.80	-142.74	-0.43	-2.12	-14.60	394.42	7.19	245.62	134.20	
120	19.47	53.26	383.49	362.10	21.39	21.39	-154.16	-0.87	-4.30	-30.94	414.43	7.38	263.17	120.31	
125	18.86	51.60	387.02	377.19	9.83	9.83	-165.72	-1.31	-6.51	-48.79	435.81	7.59	281.80	105.22	
130	18.29	50.05	390.41	392.28	-1.86	-1.86	-177.41	-1.77	-8.74	-68.15	458.57	7.81	301.55	88.87	

Qroof = RAIN = 2.736 x I (l/sec)

Peak roof outflow rate =
 no. of hoppers x weir rating x max. head
 = 50.3 l/sec

Peak roof outflow volume =
 = 50.3 x time x 60/1000 cu. m.

Roof outflow rate =
 head x weir rating x no. of hoppers
 = head x 4.95 l/sec

Required max. roof storage (cu. m.) : 224.2
 Available roof storage (cu. m.) : 702.2

SYSTEM A 5 YR STORM
SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) : 48578
 Controlled Landscaped area (sq.m) : 484
 Total area - excl. Bldg (sq.m) : 49062
 Composite runoff coefficient : 0.89

OUTLET CHARACTERISTICS

Orifice diameter (mm) : 450
 Area of orifice (sq.m) : 0.15904
 Orifice coefficient : 0.62
 Max. ponding elev. : 92.20
 Catchbasin elev. : 92.20
 Ponding depth. : 0.00
 Orifice invert : 88.15
 Orifice center line elev. : 88.375
 Head (m) : 3.825
 Orifice release rate (l/sec) : 854.2

NO SURFACE PONDING

TABLE 2 - System Storage

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Runoff volume (cu.m)	Orifice Outflow volume (cu.m)	Required storage volume (cu.m.)
10	104.19	1319.27	791.56	512.53	279.03
15	83.56	1067.94	961.15	768.80	192.35
20	70.25	905.89	1087.06	1025.07	61.99
25	60.90	791.95	1187.92	1281.34	-93.41

Required site storage (cu. m) : 279
 Available site storage (cu. m) : 362
 SEE DRAWING SP-1

$$Q_{site} = RAIN + \text{Croof} = 12.179 \times I + 50.3 \text{ l/sec}$$

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)
10	104.19	50.74
15	83.56	40.69
20	70.25	34.21

Peak runoff (L/sec) : 50.7

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) : 413
 Uncontrolled Landscaped area (sq.m.) : 5525
 Total area (sq.m) : 5938
 Composite runoff coefficient : 0.295

SYSTEM A 5 YR STORM
SITE SUMMARY

Orifice release rate (l/sec) : 854.2
 Uncontrolled release rate (l/sec) : 50.7
 Total site release rate (l/sec) : **905.0**
 Allowable site release rate (l/sec) : **1327.0**

URBAN ECOSYSTEMS LIMITED
7050 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698



APPENDIX B

Tributary No. 14

Approximately 68.38 ha of upstream lands to the south, are currently draining through the Subject Property via Tributary No. 14. Ultimately, the storm runoff from this area will be controlled as established through the Riverside South Community Master Drainage Area Plan. The storm drainage will be collected in local storm sewers and conveyed to the sewers on Limebank Road, ultimately discharging to Riverside South Stormwater Management Pond No. 2.

The peak flows from the upstream 68.38 ha of undeveloped lands, based on pasture lands and an estimated time to peak of 1.73 hours, were calculated to be 1.719 m³/s. It is noted that this flow is significantly higher than what was reported in the Riverside South Community Master Drainage Plan, primarily due to a shorter time to peak. An External Storm Drainage Area Plan, Drawing 8 of 8, is included in the rear pocket.

In the interim, it is proposed that a temporary interceptor swale will be constructed (by others), immediately south of future Town Square Boulevard. The swale will convey all storm flows from the undeveloped upstream lands, discharging to the proposed storm sewers on Ceremonial Road.

The drainage from the Town Square Boulevard right of way, will be intercepted by a temporary swale located immediately south of the Subject Property. The swale will flow westerly, discharging to a temporary inlet catchbaisn to be located on the east side of Limebank Road and connected to the Limebank Road storm sewer systems.

Rideau Valley Conservation Authority has confirmed that Tributary no. 14 is approved in principle to be enclosed. Prior to commencing any construction on this Subject Property, including grading or any site alteration works, Morguard Investments Limited will file an application under Ontario Regulation 174/06 Section 28 with Rideau Valley Conservation Authority, for a Permit to enclose/alter Tributary No. 14.

PreOtt

```

SSSSS W W M M H H Y Y M M O O O 999 999
S W W W MM MM H H Y Y MM MM O O 9 9 9 9
SSSSS W W W M M M H H H H Y M M M O O ## 9 9 9 9 Ver 4.05
S W W M M H H Y M M O O 9999 9999 Sept 2011
SSSSS W W M M H H Y M M O O 9 9 9 9 # 2637819
Stormwater Management Hydrologic Model 999 999

```

```

*****
***** SWMHYMO Ver/4.05 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 836-3884 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

```

```

+++++ Licensed user: The Sernas Group +++++
+++++ whitby SERIAL#:2637819 +++++
+++++

```

```

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 105408 *****
***** Max. number of flow points : 105408 *****
*****

```

```

***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
***** ----- *****
***** ID: Hydrograph Identification numbers, (1-10). *****
***** NYHD: Hydrograph reference numbers, (6 digits or characters). *****
***** AREA: Drainage area associated with hydrograph, (ac.) or (ha.). *****
***** QPEAK: Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s). *****
***** TpeakDate_hh:mm is the date and time of the peak flow. *****
***** R.V.: Runoff Volume of simulated hydrograph, (in) or (mm). *****
***** R.C.: Runoff Coefficient of simulated hydrograph, (ratio). *****
***** *: see WARNING or NOTE message printed at end of run. *****
***** **: see ERROR message printed at end of run. *****
*****

```

.....

```

***** SUMMARY OUTPUT *****
*****
* DATE: 2014-06-10 TIME: 15:29:25 RUN COUNTER: 000270 *
*****
* Input filename: C:\DDRIVE~1\PreOtt.dat *
* Output filename: C:\DDRIVE~1\PreOtt.out *
* Summary filename: C:\DDRIVE~1\PreOtt.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *

```

PreOtt

```

#*****
# Project Name: [Riverside Ottawa]   Project Number: [8811895.400]
# Date       : 07-22-2004
# Modeller   : [Ken Chow]
# Company    : GHD
# License #  : 2640114
#*****
** END OF RUN : 1

```

RUN:COMMAND#

002:0001-----

```

START
[TZERO = .00 hrs on 0]
[METOUT= 2 (1=imperial, 2=metric output)]
[NSTORM= 2 ]
[NRUN = 2 ]

```

```

#*****
# Project Name: [Riverside Ottawa]   Project Number: [8811895.400]
# Date       : 07-22-2004
# Modeller   : [Ken Chow]
# Company    : GHD
# License #  : 2640114
#*****

```

002:0002-----

```

MASS STORM
Filename = C:\D DRIVE\24SCSII.mst
Comment = 24 hour SCS II storm mass curve
[SDT= 2.00:SDUR= 24.00:PTOT= 103.20]

```

002:0003-----ID:NHYD-----AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

```

-
DESIGN NASHYD      01:200      63.30    2.056 No_date   13:22   51.59
.500
[CN= 72.0: N= 3.00]
[Tp= 1.37:DT= 2.00]

```

002:0004-----ID:NHYD-----AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

```

-
PRINT HYD         01:200      63.30    2.056 No_date   13:22   51.59
n/a

```

002:0005-----ID:NHYD-----AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

```

-
DESIGN NASHYD      01:200      63.30    1.719 No_date   13:48   51.59
.500
[CN= 72.0: N= 3.00]
[Tp= 1.73:DT= 2.00]

```

002:0006-----ID:NHYD-----AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.

n/a PRINT HYD 01:200 PreOtt 63.30 1.719 No_date 13:48 51.59

002:0007-----

- FINISH-----

--

WARNINGS / ERRORS / NOTES

Simulation ended on 2014-06-10 at 15:29:25

=====
==

PreOtt

2 Metric units

```
*****  
*# Project Name: [Riverside Ottawa] Project Number: [8811895.400]  
*# Date : 07-22-2004  
*# Modeller : [Ken Chow]  
*# Company : GHD  
*# License # : 2640114  
*****
```

```
START TZERO=[0.0], METOUT=[2], NSTORM=[2], NRUN=[2]  
*%-----|-----
```

```
* SCS 24 hours distribution  
* Parameters taken from IDF curve parameters provided by City of Ottawa  
* Sewer Guidelines October 2012  
*%-----|-----
```

```
*100 year event  
*%-----|-----
```

```
*-----|-----
```

```
MASS STORM PTOTAL=[103.2] (mm), CSDT=[2] (min),  
CURVE_FILENAME=["C:\D DRIVE\24SCSII.mst"]
```

```
*****  
* EXTERNAL AREAS based on Row Crops and a Tp of 1.37  
*
```

```
DESIGN NASHYD ID=[1], NHYD=["200"], DT=[2]min, AREA=[63.3] (ha),  
DWF=[0] (cms), CN/C=[72], TP=[1.37]hrs,  
RAINFALL=[ , , , ](mm/hr), END=-1
```

```
*  
PRINT HYD ID=[1], # OF PCYCLES=[-1]  
*
```

```
*****  
* EXTERNAL AREAS based on Pasture and a Tp of 1.73  
*
```

```
DESIGN NASHYD ID=[1], NHYD=["200"], DT=[2]min, AREA=[63.3] (ha),  
DWF=[0] (cms), CN/C=[72], TP=[1.73]hrs,  
RAINFALL=[ , , , ](mm/hr), END=-1
```

```
*  
PRINT HYD ID=[1], # OF PCYCLES=[-1]  
*
```

```
FINISH
```

PreOtt

```

SSSSS W W M M H H Y Y M M 000 999 999 =====
S W W W MM MM H H Y Y MM MM O O 9 9 9 9
SSSSS W W W M M M H H H H Y M M M O O ## 9 9 9 9 Ver 4.05
S W W M M H H Y M M O O 9999 9999 Sept 2011
SSSSS W W M M H H Y M M 000 9 9
9 9 9 9 # 2637819
Stormwater Management Hydrologic Model 999 999 =====

```

```

*****
***** SWMHYMO Ver/4.05 *****
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***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 836-3884 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

```

```

+++++ Licensed user: The Sernas Group +++++
+++++ whitby SERIAL#:2637819 +++++
+++++

```

```

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 105408 *****
***** Max. number of flow points : 105408 *****
*****

```

```

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2014-06-10 TIME: 15:29:25 RUN COUNTER: 000270 *
*****
* Input filename: C:\DDRIVE~1\PreOtt.dat *
* Output filename: C:\DDRIVE~1\PreOtt.out *
* Summary filename: C:\DDRIVE~1\PreOtt.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

```

001:0001

```

*****
*# Project Name: [Riverside Ottawa] Project Number: [8811895.400]
*# Date : 07-22-2004
*# Modeller : [Ken Chow]
*# Company : GHD
*# License # : 2640114
*****
** END OF RUN : 1

```

PreOtt

| START | Project dir.: C:\DDRIVE~1\

Rainfall dir.: C:\DDRIVE~1\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 002
NSTORM= 2
1=-----
2=ibution

002:0002-----

*# Project Name: [Riverside Ottawa] Project Number: [8811895.400]
*# Date : 07-22-2004
*# Modeller : [Ken Chow]
*# Company : GHD
*# License # : 2640114

002:0002-----

* Parameters taken from IDF curve parameters provided by City of Ottawa
* Sewer Guidelines October 2012
* 100 year event
*

| MASS STORM | Filename: C:\D DRIVE\24SCSII.mst
| Ptotal=103.20 mm | Comments: 24 hour SCS II storm mass curve

Duration of storm = 24.00 hrs
Mass curve time step = 12.00 min
Selected storm time step = 2.00 min
Volume of derived storm = 103.20 mm

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.03	1.032	6.03	2.064	12.03	20.640	18.03	1.548
.07	1.032	6.07	2.064	12.07	20.640	18.07	1.548
.10	1.032	6.10	2.064	12.10	20.640	18.10	1.548
.13	1.032	6.13	2.064	12.13	20.640	18.13	1.548
.17	1.032	6.17	2.064	12.17	20.640	18.17	1.548
.20	1.032	6.20	2.064	12.20	20.640	18.20	1.548
.23	1.032	6.23	2.064	12.23	12.900	18.23	1.548
.27	1.032	6.27	2.064	12.27	12.900	18.27	1.548
.30	1.032	6.30	2.064	12.30	12.900	18.30	1.548
.33	1.032	6.33	2.064	12.33	12.900	18.33	1.548
.37	1.032	6.37	2.064	12.37	12.900	18.37	1.548
.40	1.032	6.40	2.064	12.40	12.900	18.40	1.548
.43	1.032	6.43	2.064	12.43	9.288	18.43	2.064
.47	1.032	6.47	2.064	12.47	9.288	18.47	2.064
.50	1.032	6.50	2.064	12.50	9.288	18.50	2.064
.53	1.032	6.53	2.064	12.53	9.288	18.53	2.064
.57	1.032	6.57	2.064	12.57	9.288	18.57	2.064
.60	1.032	6.60	2.064	12.60	9.288	18.60	2.064

		PreOtt					
.63	1.032	6.63	2.064	12.63	8.772	18.63	1.548
.67	1.032	6.67	2.064	12.67	8.772	18.67	1.548
.70	1.032	6.70	2.064	12.70	8.772	18.70	1.548
.73	1.032	6.73	2.064	12.73	8.772	18.73	1.548
.77	1.032	6.77	2.064	12.77	8.772	18.77	1.548
.80	1.032	6.80	2.064	12.80	8.772	18.80	1.548
.83	1.032	6.83	2.064	12.83	6.192	18.83	1.548
.87	1.032	6.87	2.064	12.87	6.192	18.87	1.548
.90	1.032	6.90	2.064	12.90	6.192	18.90	1.548
.93	1.032	6.93	2.064	12.93	6.192	18.93	1.548
.97	1.032	6.97	2.064	12.97	6.192	18.97	1.548
1.00	1.032	7.00	2.064	13.00	6.192	19.00	1.548
1.03	1.032	7.03	2.064	13.03	5.160	19.03	2.064
1.07	1.032	7.07	2.064	13.07	5.160	19.07	2.064
1.10	1.032	7.10	2.064	13.10	5.160	19.10	2.064
1.13	1.032	7.13	2.064	13.13	5.160	19.13	2.064
1.17	1.032	7.17	2.064	13.17	5.160	19.17	2.064
1.20	1.032	7.20	2.064	13.20	5.160	19.20	2.064
1.23	1.032	7.23	2.064	13.23	5.160	19.23	1.548
1.27	1.032	7.27	2.064	13.27	5.160	19.27	1.548
1.30	1.032	7.30	2.064	13.30	5.160	19.30	1.548
1.33	1.032	7.33	2.064	13.33	5.160	19.33	1.548
1.37	1.032	7.37	2.064	13.37	5.160	19.37	1.548
1.40	1.032	7.40	2.064	13.40	5.160	19.40	1.548
1.43	1.032	7.43	2.064	13.43	5.160	19.43	2.064
1.47	1.032	7.47	2.064	13.47	5.160	19.47	2.064
1.50	1.032	7.50	2.064	13.50	5.160	19.50	2.064
1.53	1.032	7.53	2.064	13.53	5.160	19.53	2.064
1.57	1.032	7.57	2.064	13.57	5.160	19.57	2.064
1.60	1.032	7.60	2.064	13.60	5.160	19.60	2.064
1.63	1.032	7.63	2.064	13.63	5.160	19.63	1.548
1.67	1.032	7.67	2.064	13.67	5.160	19.67	1.548
1.70	1.032	7.70	2.064	13.70	5.160	19.70	1.548
1.73	1.032	7.73	2.064	13.73	5.160	19.73	1.548
1.77	1.032	7.77	2.064	13.77	5.160	19.77	1.548
1.80	1.032	7.80	2.064	13.80	5.160	19.80	1.548
1.83	1.032	7.83	2.064	13.83	5.160	19.83	2.064
1.87	1.032	7.87	2.064	13.87	5.160	19.87	2.064
1.90	1.032	7.90	2.064	13.90	5.160	19.90	2.064
1.93	1.032	7.93	2.064	13.93	5.160	19.93	2.064
1.97	1.032	7.97	2.064	13.97	5.160	19.97	2.064
2.00	1.032	8.00	2.064	14.00	5.160	20.00	2.064
2.03	1.032	8.03	3.096	14.03	3.096	20.03	1.548
2.07	1.032	8.07	3.096	14.07	3.096	20.07	1.548
2.10	1.032	8.10	3.096	14.10	3.096	20.10	1.548
2.13	1.032	8.13	3.096	14.13	3.096	20.13	1.548
2.17	1.032	8.17	3.096	14.17	3.096	20.17	1.548
2.20	1.032	8.20	3.096	14.20	3.096	20.20	1.548
2.23	1.032	8.23	3.096	14.23	3.096	20.23	1.548
2.27	1.032	8.27	3.096	14.27	3.096	20.27	1.548
2.30	1.032	8.30	3.096	14.30	3.096	20.30	1.548
2.33	1.032	8.33	3.096	14.33	3.096	20.33	1.548
2.37	1.032	8.37	3.096	14.37	3.096	20.37	1.548
2.40	1.032	8.40	3.096	14.40	3.096	20.40	1.548
2.43	1.032	8.43	3.096	14.43	3.096	20.43	1.032
2.47	1.032	8.47	3.096	14.47	3.096	20.47	1.032
2.50	1.032	8.50	3.096	14.50	3.096	20.50	1.032
2.53	1.032	8.53	3.096	14.53	3.096	20.53	1.032
2.57	1.032	8.57	3.096	14.57	3.096	20.57	1.032
2.60	1.032	8.60	3.096	14.60	3.096	20.60	1.032
2.63	1.032	8.63	3.096	14.63	3.096	20.63	1.548
2.67	1.032	8.67	3.096	14.67	3.096	20.67	1.548
2.70	1.032	8.70	3.096	14.70	3.096	20.70	1.548

PreOtt							
2.73	1.032	8.73	3.096	14.73	3.096	20.73	1.548
2.77	1.032	8.77	3.096	14.77	3.096	20.77	1.548
2.80	1.032	8.80	3.096	14.80	3.096	20.80	1.548
2.83	1.032	8.83	3.096	14.83	3.096	20.83	1.548
2.87	1.032	8.87	3.096	14.87	3.096	20.87	1.548
2.90	1.032	8.90	3.096	14.90	3.096	20.90	1.548
2.93	1.032	8.93	3.096	14.93	3.096	20.93	1.548
2.97	1.032	8.97	3.096	14.97	3.096	20.97	1.548
3.00	1.032	9.00	3.096	15.00	3.096	21.00	1.548
3.03	1.032	9.03	3.096	15.03	2.580	21.03	1.032
3.07	1.032	9.07	3.096	15.07	2.580	21.07	1.032
3.10	1.032	9.10	3.096	15.10	2.580	21.10	1.032
3.13	1.032	9.13	3.096	15.13	2.580	21.13	1.032
3.17	1.032	9.17	3.096	15.17	2.580	21.17	1.032
3.20	1.032	9.20	3.096	15.20	2.580	21.20	1.032
3.23	1.032	9.23	3.096	15.23	2.580	21.23	1.548
3.27	1.032	9.27	3.096	15.27	2.580	21.27	1.548
3.30	1.032	9.30	3.096	15.30	2.580	21.30	1.548
3.33	1.032	9.33	3.096	15.33	2.580	21.33	1.548
3.37	1.032	9.37	3.096	15.37	2.580	21.37	1.548
3.40	1.032	9.40	3.096	15.40	2.580	21.40	1.548
3.43	1.032	9.43	3.096	15.43	2.580	21.43	1.032
3.47	1.032	9.47	3.096	15.47	2.580	21.47	1.032
3.50	1.032	9.50	3.096	15.50	2.580	21.50	1.032
3.53	1.032	9.53	3.096	15.53	2.580	21.53	1.032
3.57	1.032	9.57	3.096	15.57	2.580	21.57	1.032
3.60	1.032	9.60	3.096	15.60	2.580	21.60	1.032
3.63	1.032	9.63	3.096	15.63	2.580	21.63	1.548
3.67	1.032	9.67	3.096	15.67	2.580	21.67	1.548
3.70	1.032	9.70	3.096	15.70	2.580	21.70	1.548
3.73	1.032	9.73	3.096	15.73	2.580	21.73	1.548
3.77	1.032	9.77	3.096	15.77	2.580	21.77	1.548
3.80	1.032	9.80	3.096	15.80	2.580	21.80	1.548
3.83	1.032	9.83	3.096	15.83	2.580	21.83	1.032
3.87	1.032	9.87	3.096	15.87	2.580	21.87	1.032
3.90	1.032	9.90	3.096	15.90	2.580	21.90	1.032
3.93	1.032	9.93	3.096	15.93	2.580	21.93	1.032
3.97	1.032	9.97	3.096	15.97	2.580	21.97	1.032
4.00	1.032	10.00	3.096	16.00	2.580	22.00	1.032
4.03	2.064	10.03	5.676	16.03	2.580	22.03	1.032
4.07	2.064	10.07	5.676	16.07	2.580	22.07	1.032
4.10	2.064	10.10	5.676	16.10	2.580	22.10	1.032
4.13	2.064	10.13	5.676	16.13	2.580	22.13	1.032
4.17	2.064	10.17	5.676	16.17	2.580	22.17	1.032
4.20	2.064	10.20	5.676	16.20	2.580	22.20	1.032
4.23	2.064	10.23	5.676	16.23	2.580	22.23	1.548
4.27	2.064	10.27	5.676	16.27	2.580	22.27	1.548
4.30	2.064	10.30	5.676	16.30	2.580	22.30	1.548
4.33	2.064	10.33	5.676	16.33	2.580	22.33	1.548
4.37	2.064	10.37	5.676	16.37	2.580	22.37	1.548
4.40	2.064	10.40	5.676	16.40	2.580	22.40	1.548
4.43	2.064	10.43	5.676	16.43	2.580	22.43	1.032
4.47	2.064	10.47	5.676	16.47	2.580	22.47	1.032
4.50	2.064	10.50	5.676	16.50	2.580	22.50	1.032
4.53	2.064	10.53	5.676	16.53	2.580	22.53	1.032
4.57	2.064	10.57	5.676	16.57	2.580	22.57	1.032
4.60	2.064	10.60	5.676	16.60	2.580	22.60	1.032
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4.73	2.064	10.73	5.676	16.73	2.580	22.73	1.548
4.77	2.064	10.77	5.676	16.77	2.580	22.77	1.548
4.80	2.064	10.80	5.676	16.80	2.580	22.80	1.548

				PreOtt				
4.83	2.064	10.83	5.676	16.83	1.548	22.83	1.032	
4.87	2.064	10.87	5.676	16.87	1.548	22.87	1.032	
4.90	2.064	10.90	5.676	16.90	1.548	22.90	1.032	
4.93	2.064	10.93	5.676	16.93	1.548	22.93	1.032	
4.97	2.064	10.97	5.676	16.97	1.548	22.97	1.032	
5.00	2.064	11.00	5.676	17.00	1.548	23.00	1.032	
5.03	2.064	11.03	7.740	17.03	1.548	23.03	1.032	
5.07	2.064	11.07	7.740	17.07	1.548	23.07	1.032	
5.10	2.064	11.10	7.740	17.10	1.548	23.10	1.032	
5.13	2.064	11.13	7.740	17.13	1.548	23.13	1.032	
5.17	2.064	11.17	7.740	17.17	1.548	23.17	1.032	
5.20	2.064	11.20	7.740	17.20	1.548	23.20	1.032	
5.23	2.064	11.23	11.352	17.23	2.064	23.23	1.032	
5.27	2.064	11.27	11.352	17.27	2.064	23.27	1.032	
5.30	2.064	11.30	11.352	17.30	2.064	23.30	1.032	
5.33	2.064	11.33	11.352	17.33	2.064	23.33	1.032	
5.37	2.064	11.37	11.352	17.37	2.064	23.37	1.032	
5.40	2.064	11.40	11.352	17.40	2.064	23.40	1.032	
5.43	2.064	11.43	27.348	17.43	1.548	23.43	1.548	
5.47	2.064	11.47	27.348	17.47	1.548	23.47	1.548	
5.50	2.064	11.50	27.348	17.50	1.548	23.50	1.548	
5.53	2.064	11.53	27.348	17.53	1.548	23.53	1.548	
5.57	2.064	11.57	27.348	17.57	1.548	23.57	1.548	
5.60	2.064	11.60	27.348	17.60	1.548	23.60	1.548	
5.63	2.064	11.63	56.760	17.63	2.064	23.63	1.032	
5.67	2.064	11.67	56.760	17.67	2.064	23.67	1.032	
5.70	2.064	11.70	56.760	17.70	2.064	23.70	1.032	
5.73	2.064	11.73	56.760	17.73	2.064	23.73	1.032	
5.77	2.064	11.77	56.760	17.77	2.064	23.77	1.032	
5.80	2.064	11.80	56.760	17.80	2.064	23.80	1.032	
5.83	2.064	11.83	116.100	17.83	1.548	23.83	1.032	
5.87	2.064	11.87	116.100	17.87	1.548	23.87	1.032	
5.90	2.064	11.90	116.100	17.90	1.548	23.90	1.032	
5.93	2.064	11.93	116.100	17.93	1.548	23.93	1.032	
5.97	2.064	11.97	116.100	17.97	1.548	23.97	1.032	
6.00	2.064	12.00	116.100	18.00	1.548	24.00	1.032	

002:0003

* EXTERNAL AREAS based on Row Crops and a Tp of 1.37

*

DESIGN NASHYD	Area (ha)=	63.30	Curve Number (CN)=	72.00
01:200 DT= 2.00	Ia (mm)=	1.500	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.370		

Unit Hyd Qpeak (cms)= 1.765

PEAK FLOW (cms)= 2.056 (i)

TIME TO PEAK (hrs)= 13.367

RUNOFF VOLUME (mm)= 51.591

TOTAL RAINFALL (mm)= 103.200

RUNOFF COEFFICIENT = .500

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

002:0004

*

```

-----
| PRINT HYD          |
| ID=01 (200 )      |
| DT= 2.00 PCYC=-1 |
|-----|

```

```

AREA      (ha)= 63.300
QPEAK     (cms)= 2.056 (i)
TPEAK     (hrs)= 13.367
VOLUME    (mm)= 51.591

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

002:0005

*

* EXTERNAL AREAS based on Pasture and a Tp of 1.73

*

```

-----
| DESIGN NASHYD      |
| 01:200 DT= 2.00  |
|-----|

```

```

Area      (ha)= 63.30 Curve Number (CN)=72.00
Ia        (mm)= 1.500 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 1.730

```

Unit Hyd Qpeak (cms)= 1.398

```

PEAK FLOW      (cms)= 1.719 (i)
TIME TO PEAK   (hrs)= 13.800
RUNOFF VOLUME  (mm)= 51.591
TOTAL RAINFALL (mm)= 103.200
RUNOFF COEFFICIENT = .500

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

002:0006

*

```

-----
| PRINT HYD          |
| ID=01 (200 )      |
| DT= 2.00 PCYC=-1 |
|-----|

```

```

AREA      (ha)= 63.300
QPEAK     (cms)= 1.719 (i)
TPEAK     (hrs)= 13.800
VOLUME    (mm)= 51.591

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

002:0007

*

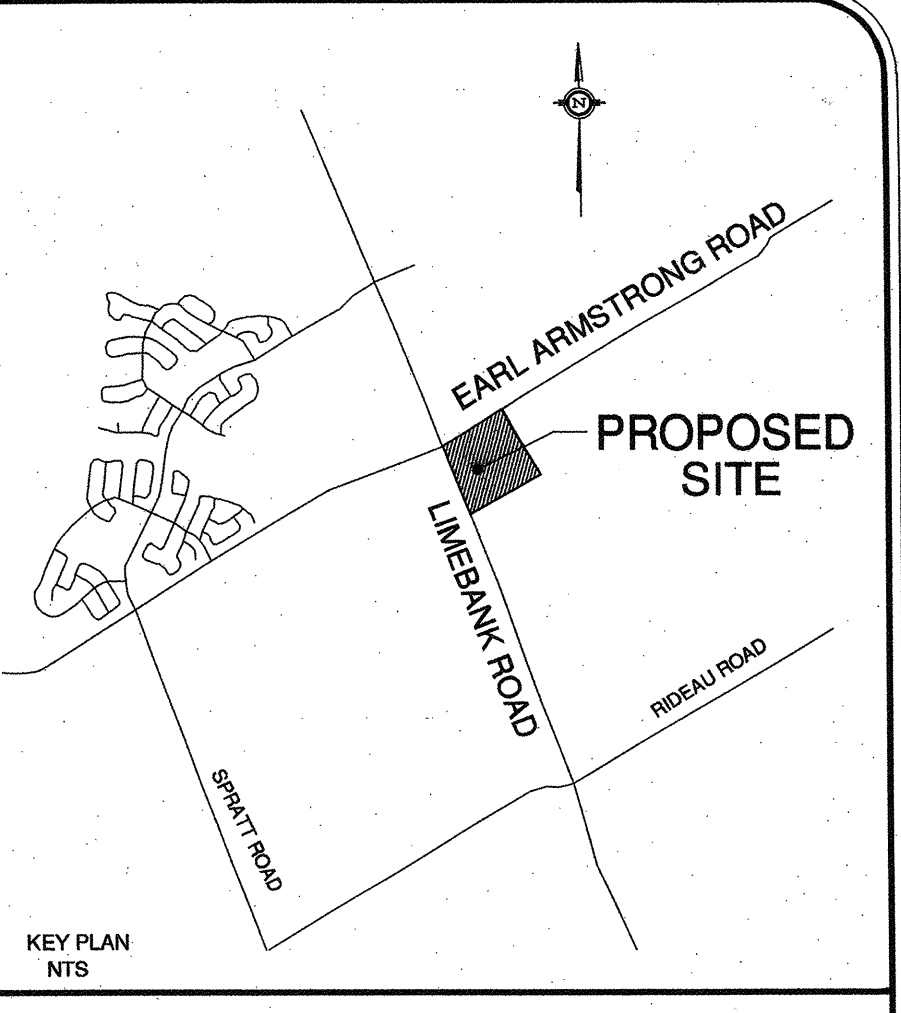
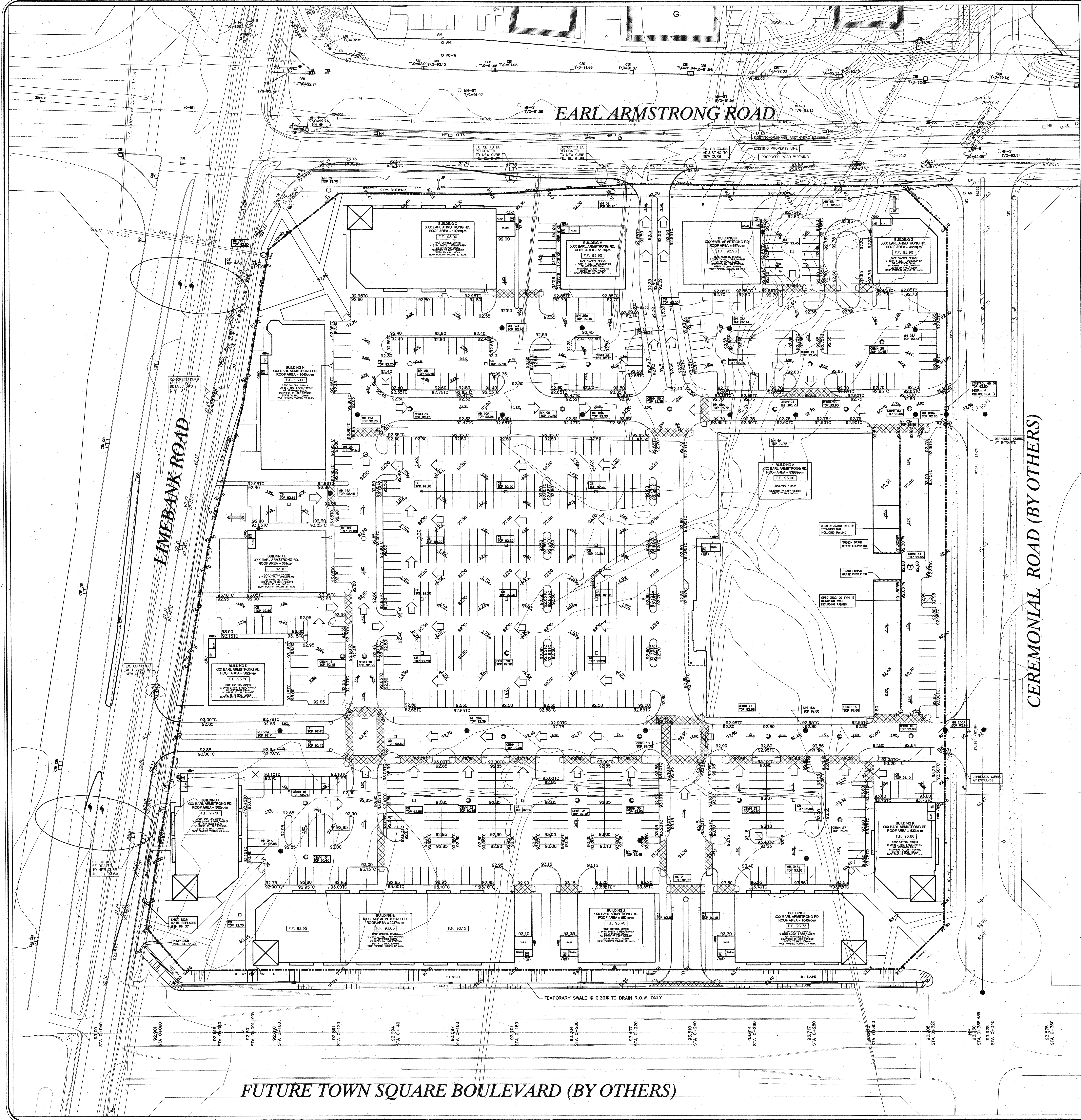
FINISH

**

WARNINGS / ERRORS / NOTES

Simulation ended on 2014-06-10 at 15:29:25

==



- LEGEND**
- EXISTING CURB
 - - - EXISTING CURB TO BE REMOVED
 - PROPOSED CURB
 - PROPOSED SIDEWALK
 - OVERLAND FLOW ROUTE
 - 1.5% DIRECTION AND SLOPE OF XXXXX DRAINAGE
 - PROPOSED PAVEMENT
 - 95.45 EXISTING ELEVATION

NOTE:
THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING 5 OF 8, NOTES & DETAILS PROJECT 12007

LOCAL BENCHMARK:
CUT CROSS IN CONCRETE TRAFFIC ISLAND AT THE NORTH-EAST CORNER OF EARL ARMSTRONG ROAD AND LIMEBANK ROAD AS ESTABLISHED BY ANNS COLLIVAN, VOLLEBERG LTD. O.L.S.

ELEVATION 92.87

No.	By	Date	Revision	Checked
1.	D.S.	Mar 17/14	REV. PROFILE OF TOWN SQUARE BLVD. AND BLD'S E, F, J & K	O.B.C.
2.	D.S.	Apr 28/14	REVISED AS PER CITY COMMENTS	O.B.C.
3.	D.S.	Aug 14/14	SITE PLAN REVISIONS	O.B.C.
4.	S.J.H.	Mar 20/14	REVISED AS PER CITY COMMENTS	
5.	S.J.H.	Apr 12/14	SITE PLAN REVISION	
6.	J.H.	July 18/14	ISSUED FOR SECOND SUBMISSION	
7.	J.H.	July 18/14	SITE PLAN REVISION	
8.	J.H.	May 20/14	REVISED AS PER CITY COMMENTS	
9.	C.R.M.	Apr 9/14	ISSUED FOR SITE PLAN APPROVAL	

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.

Director of Engineering _____ Date _____

URBAN ECOSYSTEMS LIMITED
7050 WESTON ROAD, SUITE 705
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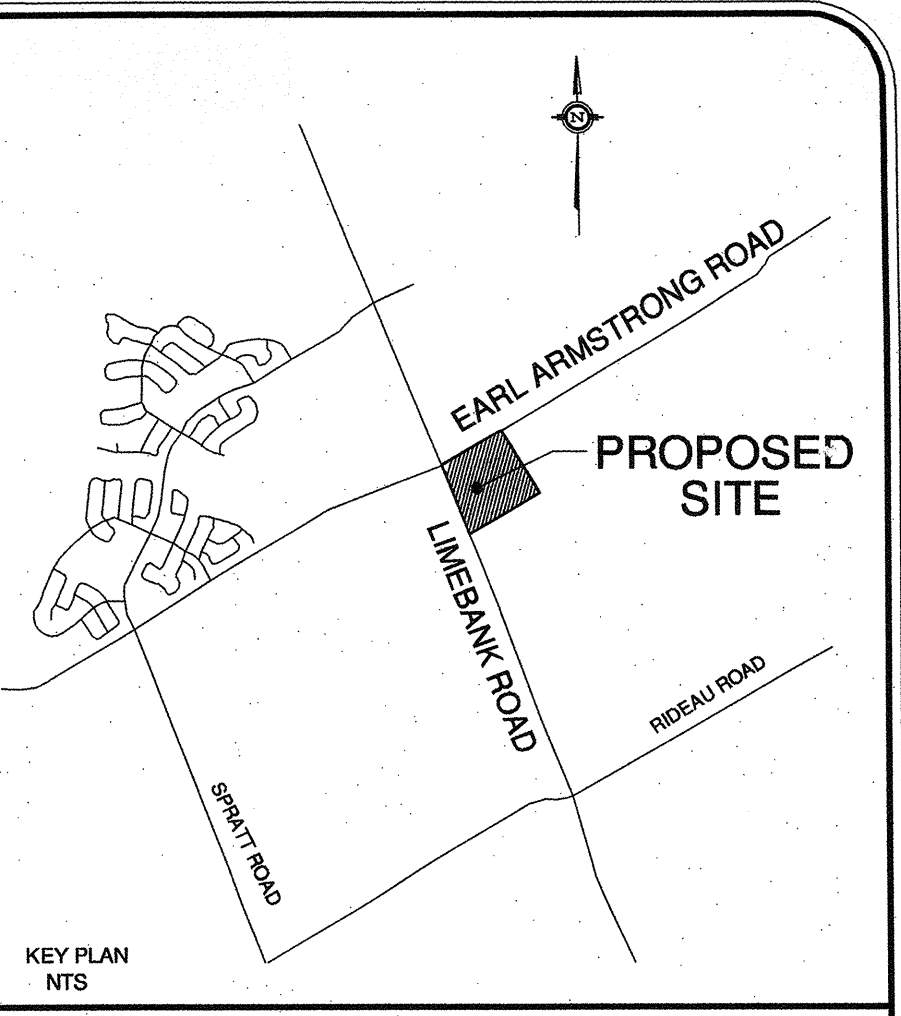
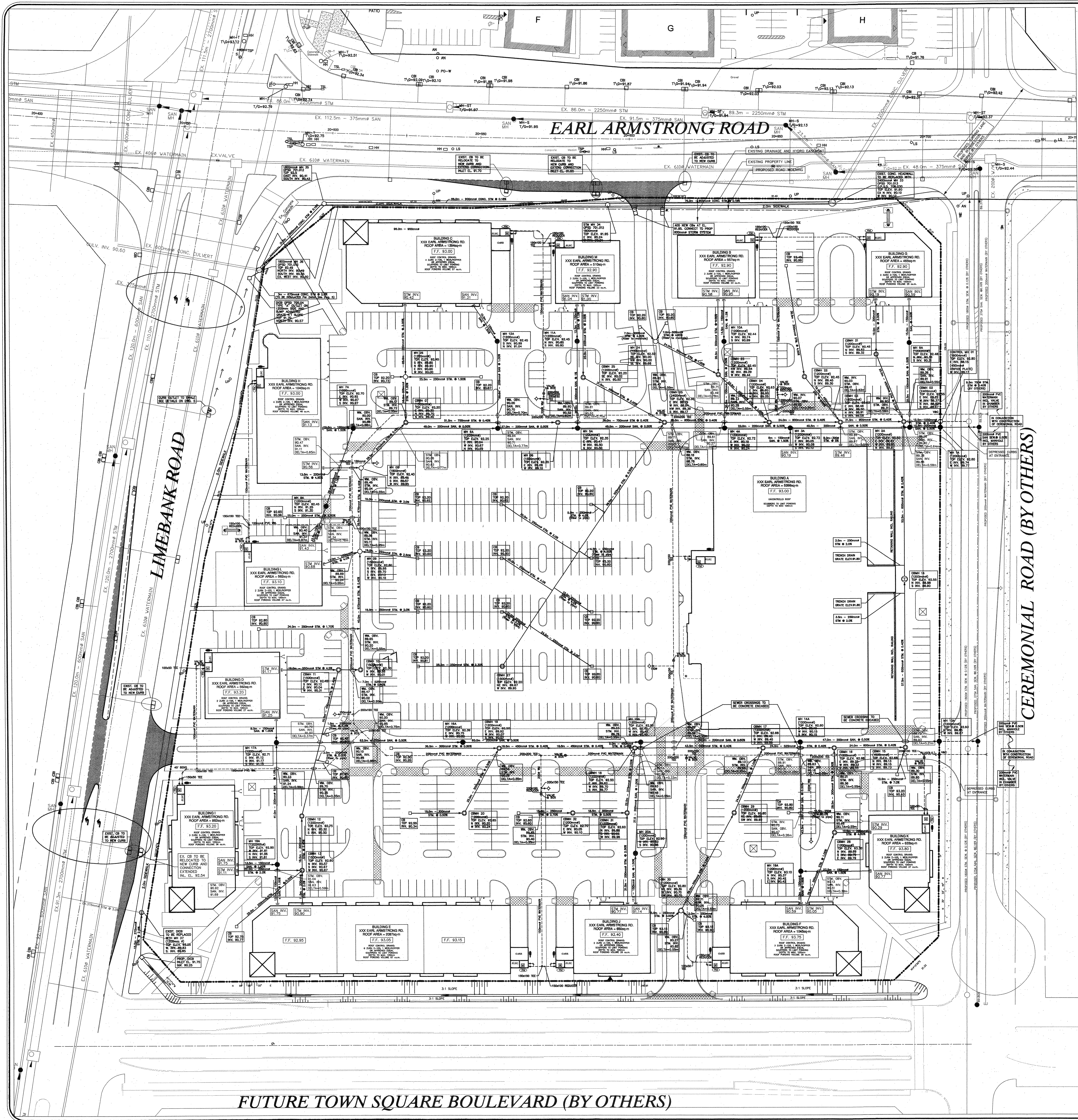
TOWN SQUARE CENTRE
RIVERSIDE SOUTH
CITY OF OTTAWA

MORGUARD INVESTMENTS LTD.
55 CITY CENTER DRIVE
MISSISSAUGA, ONTARIO

FILE NO D07-12-14-0067
GRADING PLAN

Designed By	XXX	Date	APR 2014	Checked By	R.S.
Drawn By	XXX	Project No.	12007	Approved By	
Scale:	1:500	Drawing No.	1018		

ID - P:\2012\12007\12007-Site Plan.dwg - Tue, 26 Jan 2015 - 16:30



WATER CONNECTIONS

BUILDING	FIRE (mm Ø)	DOMESTIC (mm Ø)
A	150	100
B	100	50
C	150	50
D	100	50
E	150	100
F	100	50
G	150	50
H	150	50
I	150	50
J	100	50
K	100	50
L	100	50
M	100	50

THERMAL PIPE INSULATION
SEE DETAIL ON DWG 5 OF 8

FROM M.H.	TO M.H.	THICKNESS
5A	6A	50 mm
6A	7A	50 mm
7A	8A	100 mm
8A	BLDG. L	100 mm
7A	BLDG. H	50 mm
5A	11A	50 mm
11A	BLDG. M	50 mm
6A	12A	100 mm
12A	BLDG. C	100 mm
15A	16A	50 mm
16A	17A	50 mm
17A	18A	100 mm
18A	BLDG. E	100 mm
18A	BLDG. I	100 mm
15A	20A	50 mm
20A	BLDG. J	50 mm
33	34	100 mm
34	35	100 mm
35	36	100 mm

- LEGEND**
- EXISTING CURB
 - - - EXISTING CURB TO BE REMOVED
 - PROPOSED CURB
 - PROPOSED SIDEWALK
 - OVERLAND FLOW ROUTE
 - DIRECTION AND SLOPE OF SURFACE DRAINAGE
 - PROPOSED PAVEMENT
 - EXISTING ELEVATION
 - WATER METER
 - REMOTE READ-OUT
 - SIAMSE CONNECTION
 - GAS METER

CLAY SEALS SHALL BE INSTALLED IN THE SERVICE TRENCHES. THE SEALS SHALL BE 1.5M LONG (IN THE TRENCH DIRECTION) AND SHALL EXTEND FROM TRENCH WALL TO TRENCH WALL. THE SEALS SHALL EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUBBEDDING AND COVER MATERIAL. SEALS SHALL CONSIST OF RELATIVELY DRY AND COMPACTABLE BROWN SILTY CLAY, COMPACTED TO A MINIMUM OF 95% OF THE SPREAD. THE CLAY SEALS SHALL BE PLACED AT THE SITE BOUNDARIES AND AT STRATEGIC LOCATIONS AT NO MORE THAN 80M INTERVALS ALONG THE SERVICE TRENCHES, AS DIRECTED BY THE GEOTECHNICAL ENGINEER.

NOTE:
THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING 5 OF 8, NOTES & DETAILS PROJECT 12007

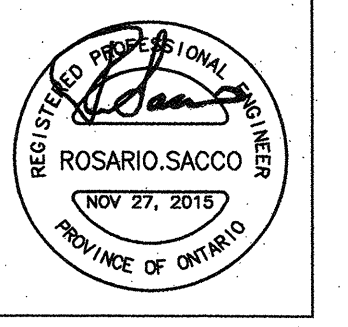
LOCAL BENCHMARK:
CUT CROSS IN CONCRETE TRAFFIC ISLAND AT THE NORTH-EAST CORNER OF EARL ARMSTRONG ROAD AND LIMEBANK ROAD AS ESTABLISHED BY ANNS, CRULLIVAN, VOLLEBEKE LTD. O.L.S.

ELEVATION 92.87

No.	By	Date	Revision	Checked
10.	D.S.	Nov 27/13	REV. GRADES OF TOWN SQUARE BLVD. AND BLD'S E, F, J & K	O.B.C.
9.	O.B.C.	Oct 15/13	HYDRANT LOCATIONS	O.B.C.
8.	D.S.	Aug 26/13	REVISED AS PER CITY COMMENTS	O.B.C.
7.	D.S.	Aug 14/13	SITE PLAN REVISIONS	O.B.C.
6.	C.R.M.	Jan 28/13	REVISED AS PER CITY COMMENTS	
5.	J.H.	Aug 12/12	SITE PLAN REVISION	
4.	J.H.	July 18/12	ISSUED FOR SECOND SUBMISSION	
3.	J.H.	July 14/12	SITE PLAN REVISION	
2.	J.H.	May 20/12	REVISED AS PER CITY COMMENTS	
1.	C.R.M.	Apr 9/12	ISSUED FOR SITE PLAN APPROVAL	

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.

Director of Engineering _____ Date _____



URBAN ECOSYSTEMS LIMITED
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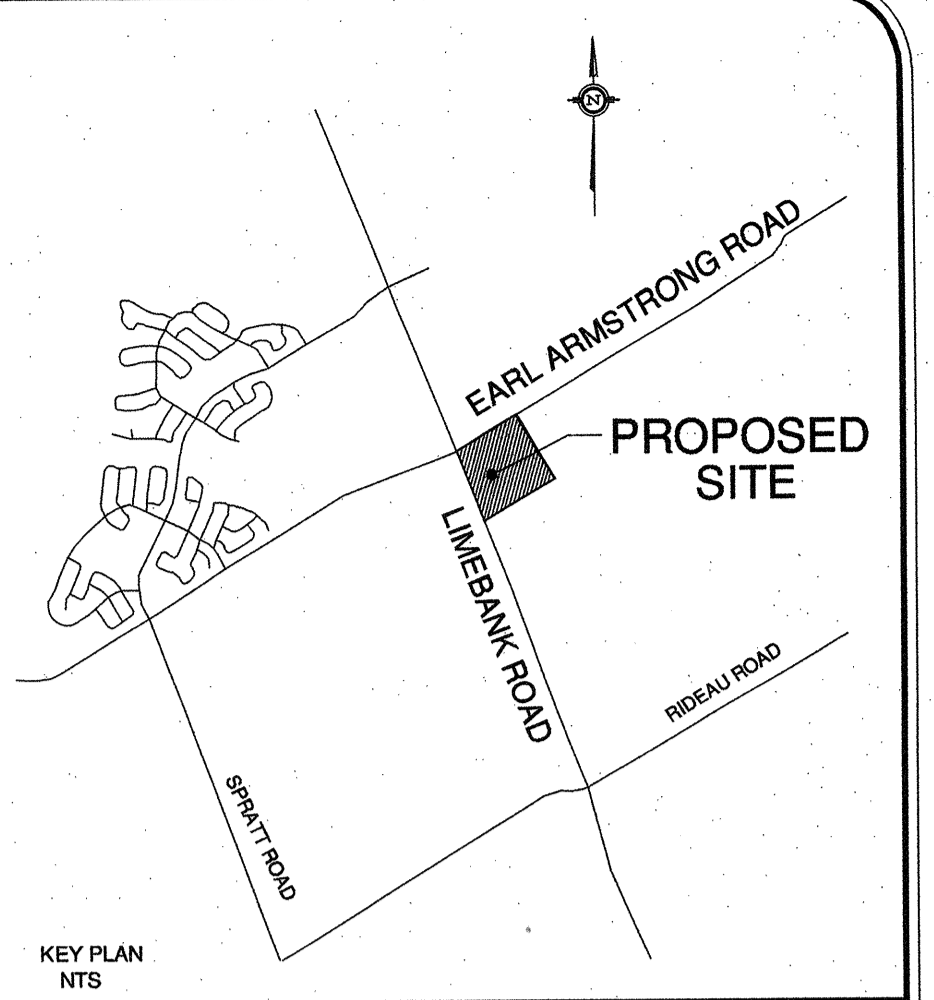
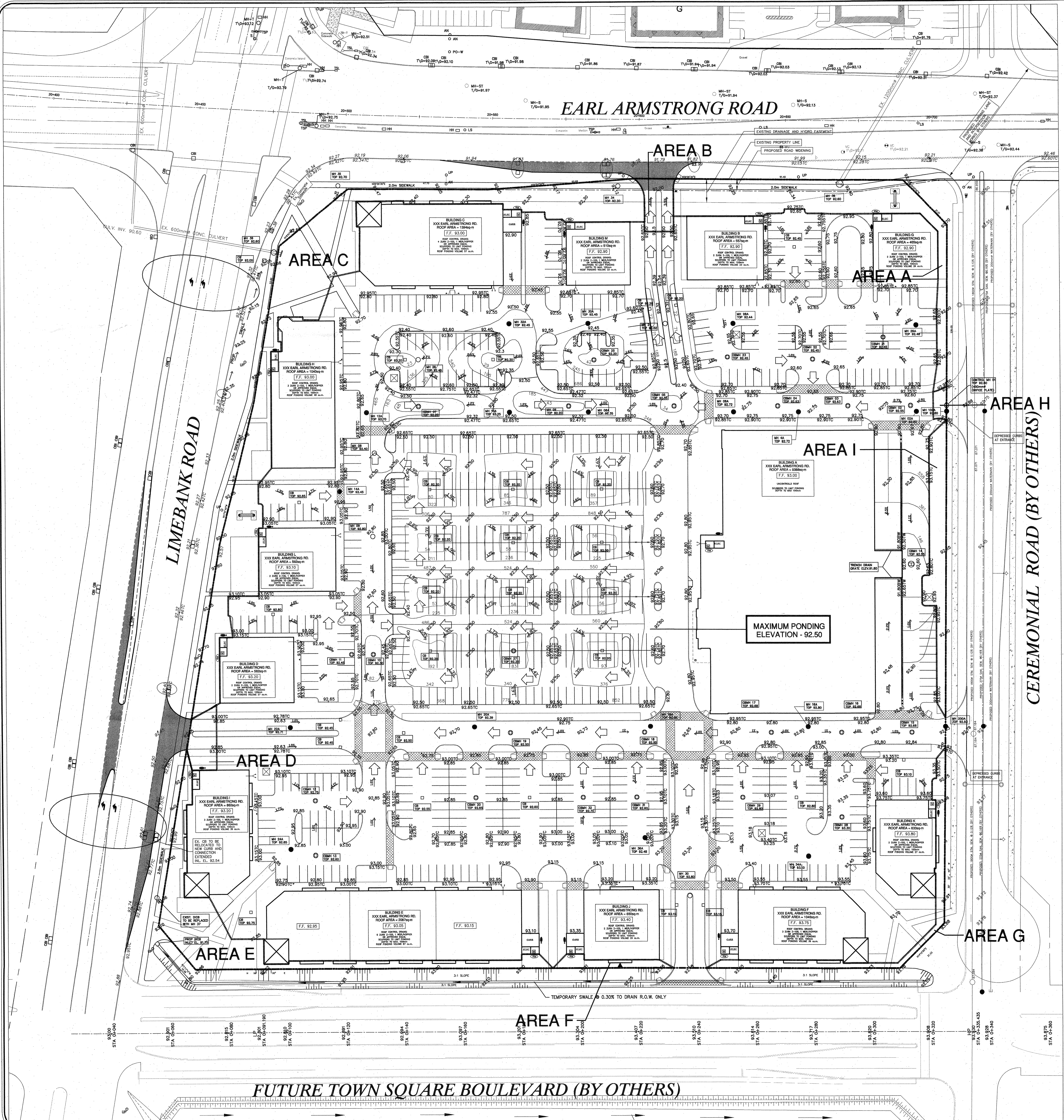
TOWN SQUARE CENTRE
RIVERSIDE SOUTH
CITY OF OTTAWA

MORGUARD INVESTMENTS LTD.
55 CITY CENTER DRIVE
MISSISSAUGA, ONTARIO

FILE NO D07-12-14-0067
SERVICING PLAN

Designed By	XXX	Date	APR 2014	Checked By	R.S.
Drawn By	XXX	Approved By			
Scale:	1:500	Project No.	12007	Drawing No.	20f8

FUTURE TOWN SQUARE BOULEVARD (BY OTHERS)



AREA	sq.m.	SURFACE TYPE
A	1,196	UNCONTROLLED LANDSCAPE
B	186	UNCONTROLLED PAVEMENT
C	2,785	UNCONTROLLED LANDSCAPE
D	182	UNCONTROLLED PAVEMENT
E	1,054	UNCONTROLLED LANDSCAPE
F	116	UNCONTROLLED PAVEMENT
G	374	UNCONTROLLED LANDSCAPE
H	45	UNCONTROLLED PAVEMENT
I	48	CONTROLLED LANDSCAPE
	48,578	CONTROLLED PAVEMENT
	10,367	CONTROLLED BUILDINGS
	65,367	TOTAL SITE AREA

ELEVATION	VOLUME (m³)	ACCUM. VOLUME (m³)
91.80 - 91.90	3	3
91.90 - 92.00	11	14
92.00 - 92.10	19	33
92.10 - 92.20	26	59
92.20 - 92.30	86	146
92.30 - 92.40	317	463
92.40 - 92.50	815	1,278

STORM WATER MANAGEMENT SUMMARY TABLE

SITE AREA SUMMARY	sq.m.
CONTROLLED PAVED	48,578
CONTROLLED LANDSCAPED	454
CONTROLLED ROOF	10,367
UNCONTROLLED PAVED	413
UNCONTROLLED LANDSCAPED	5,525
TOTAL SITE AREA	65,367

ROOF DRAINAGE SYSTEM	
TOTAL CONTROLLED ROOF AREA	10,367 sq.m.
PEAK OUTFLOW RATE	50.3 l/s
TOTAL NO. OF WEIRS	33
REQUIRED ROOF STORAGE	416.8 cu.m.
AVAILABLE ROOF STORAGE	702.2 cu.m.

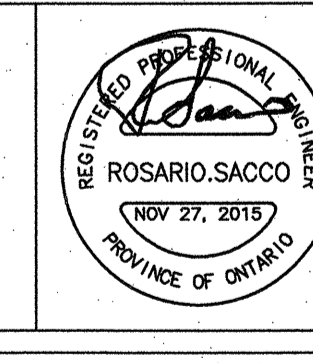
SITE DRAINAGE SYSTEM - 100 YEAR	
ORIFICE DIAMETER	450 mm
MAXIMUM PONDING ELEV.	98.50 m
MAXIMUM PONDING DEPTH	0.30 m
ORIFICE INVERT	88.15
ORIFICE RELEASE RATE	887.1 l/sec.
UNCONTROLLED RELEASE RATE	190.7 l/sec.
TOTAL RELEASE RATE	1077.8 l/sec.
ALLOWABLE RELEASE RATE	1327.0 l/sec.
REQUIRED SITE STORAGE	906 cu.m.
AVAILABLE SITE STORAGE	1640 cu.m.

LOCAL BENCHMARK:
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ELEVATION 92.87		
6. D.S. Aug 28/15	REVISED AS PER CITY COMMENTS	D.R.C.
7. D.S. Aug 14/15	SITE PLAN REVISIONS	D.R.C.
8. C.A.M. Jan 29/15	REVISED AS PER CITY COMMENTS	
9. L.S. Jan 27/14	SITE PLAN REVISIONS	
4. J.R. Jan 15/14	ISSUED FOR SECOND SUBMISSION	
3. J.R. Jan 14/14	SITE PLAN REVISIONS	
2. J.R. May 20/14	REVISED AS PER CITY COMMENTS	
1. C.A.M. Apr 27/14	ISSUED FOR SITE PLAN APPROVAL	
No. By Date	Revision	Checked

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.

Director of Engineering: _____ Date: _____



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UJEL

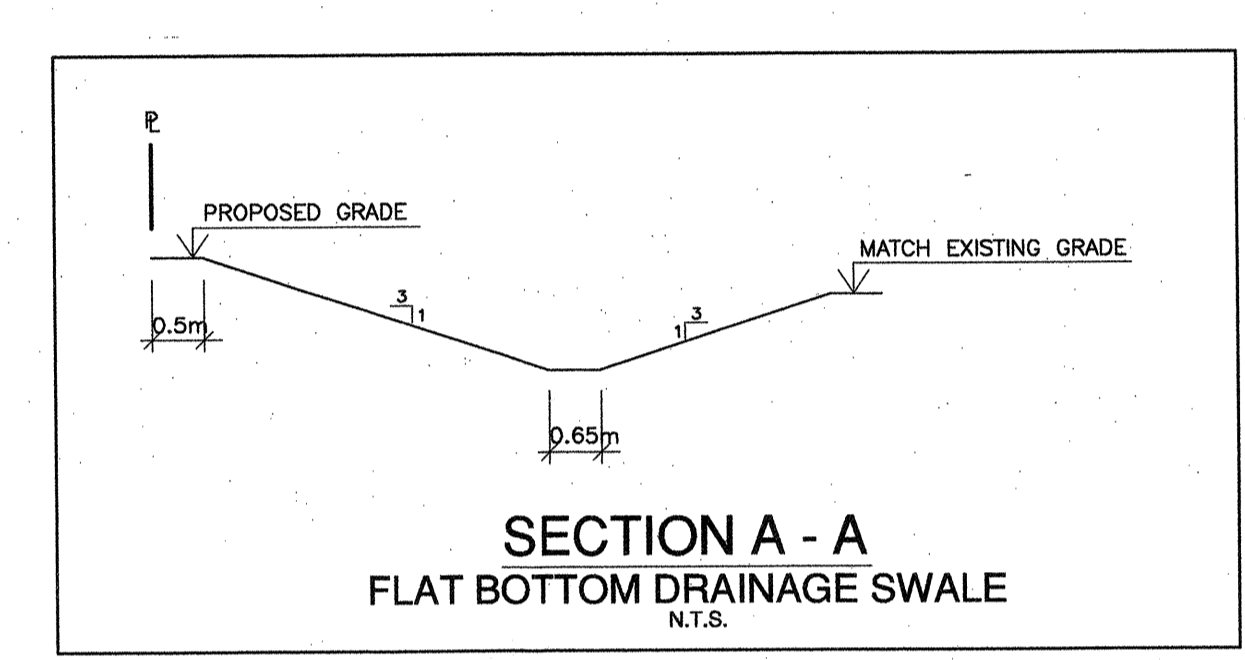
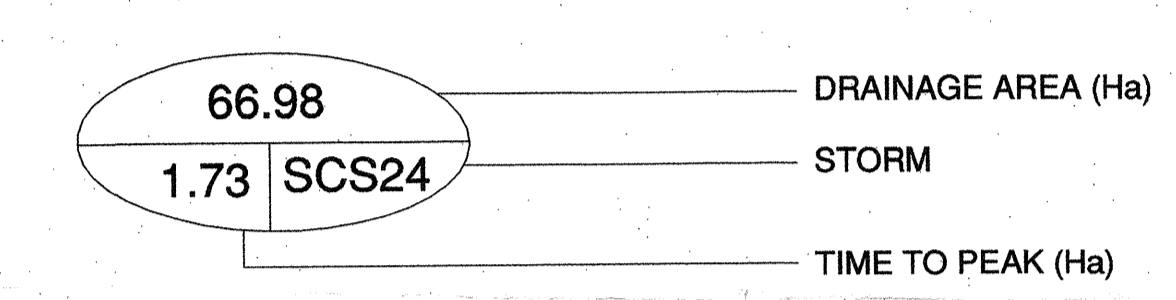
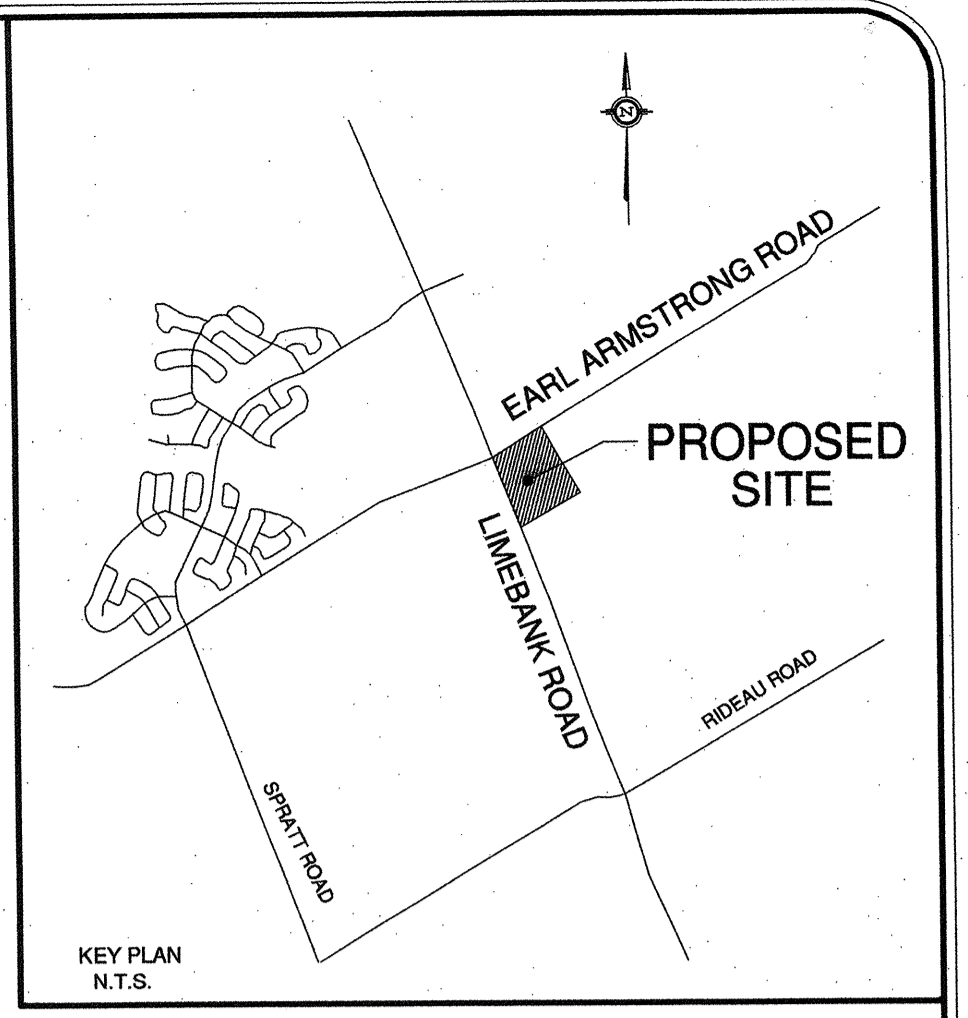
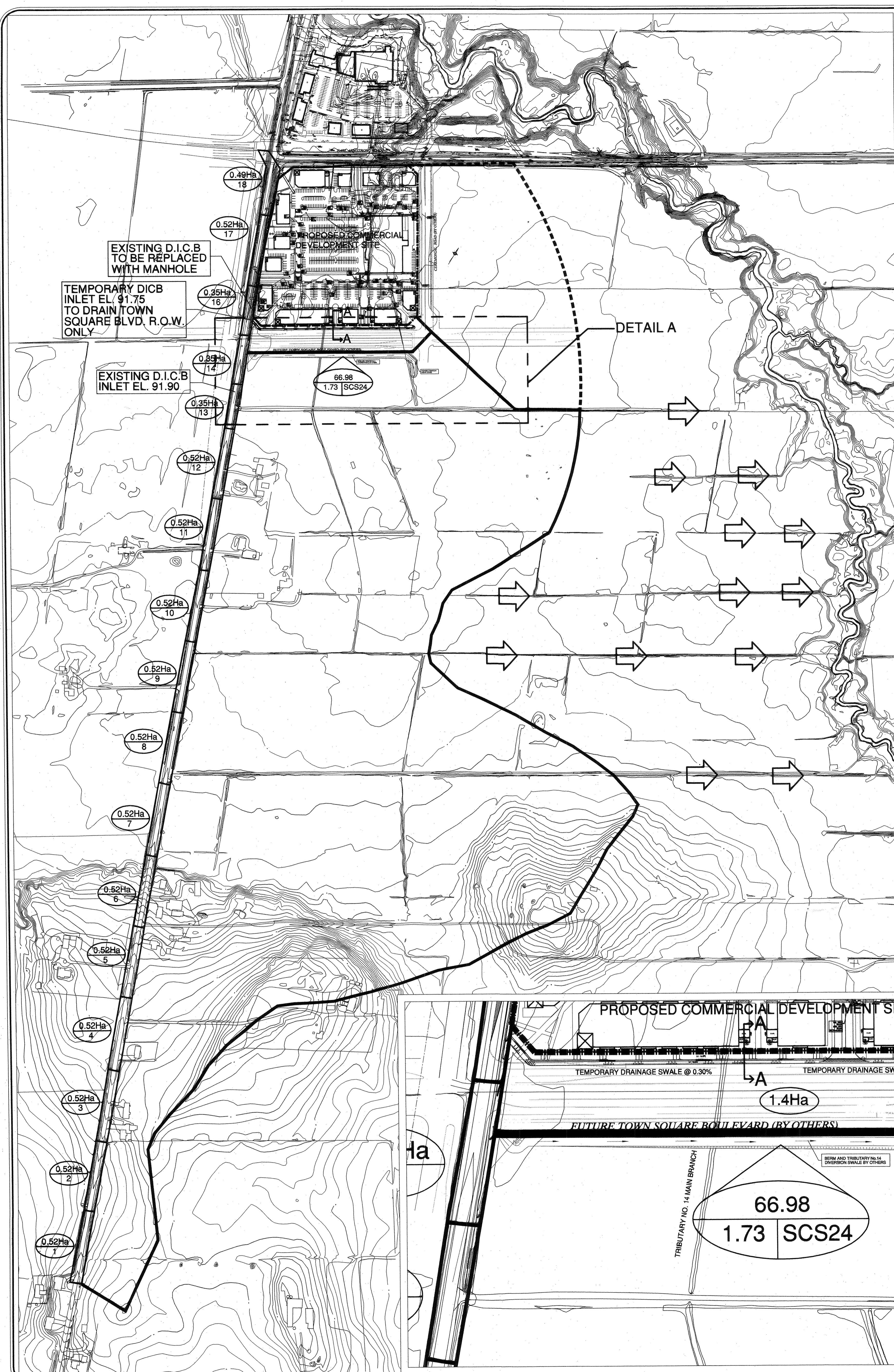
TOWN SQUARE CENTRE
RIVERSIDE SOUTH
CITY OF OTTAWA

MORGUARD INVESTMENTS LTD.
55 CITY CENTER DRIVE
MISSISSAUGA, ONTARIO

FILE NO D07-12-14-0067

SWM DRAINAGE PLAN

Designed By	XXX	Date	APR 2014	Checked By	R.S.
Drawn By	XXX	Project No.	12007	Approved By	
Scale:	1:500	Drawing No.			3 of 8



NOTE:
 THIS DRAWING SHALL BE READ
 IN CONJUNCTION WITH DRAWING
 4 OF 8, EROSION & SEDIMENT
 CONTROL PLAN, AND DRAWING
 5 OF 8, NOTES & DETAILS
 PROJECT 12007

LOCAL BENCHMARK:
 CUT CROSS IN CONCRETE TRAFFIC ISLAND AT THE NORTH-EAST
 CORNER OF EARL ARMSTRONG ROAD AND LIMEBANK ROAD
 AS ESTABLISHED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD, O.L.S.

ELEVATION 92.87

No.	Date	Revision	Checked
1.	CR.M	Apr 8/14	ISSUED FOR SITE PLAN APPROVAL
2.	J.H.	May 20/14	REVISED AS PER CITY COMMENTS
3.	J.H.	July 16/14	ISSUED FOR SECOND SUBMISSION
4.	CR.M	Jan 29/15	REVISED AS PER CITY COMMENTS
5.	D.S.	Aug 14/15	SITE PLAN REVISIONS
6.	D.S.	Aug 19/15	REVISED AS PER CITY COMMENTS

APPROVED AS TO FORM IN RELIANCE UPON
 THE PROFESSIONAL SKILL AND ABILITY OF
 URBAN ECOSYSTEMS LIMITED AS TO DESIGN
 AND SPECIFICATION.

Director of Engineering _____ Date _____

REGISTERED PROFESSIONAL ENGINEER
 ROSARIO SACCO
 NOV 27, 2015
 PROVINCE OF ONTARIO

URBAN ECOSYSTEMS LIMITED
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 WOODBRIDGE, ONTARIO L4L 8G7
 uel@urbanecosystems.com
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 f. (905)856-0698

U.E.L.

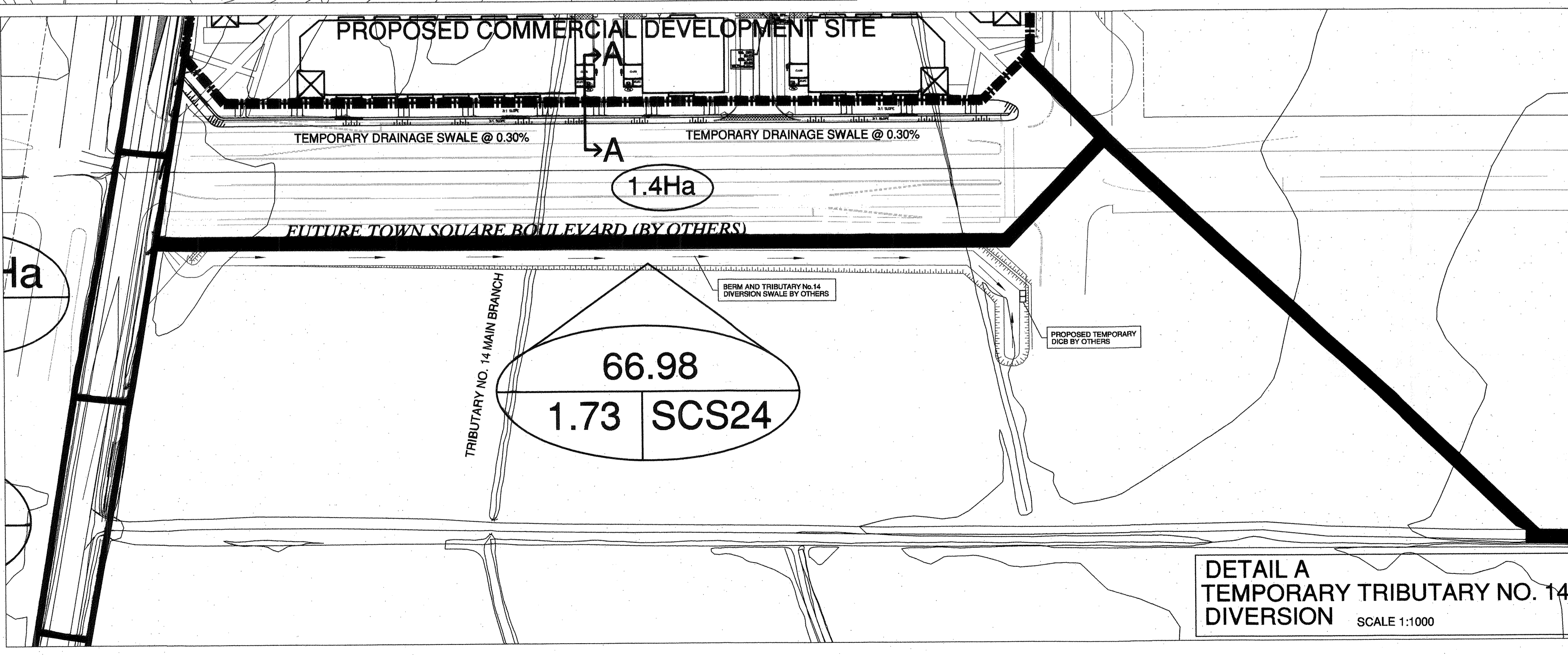
TOWN SQUARE CENTRE
 RIVERSIDE SOUTH
 CITY OF OTTAWA

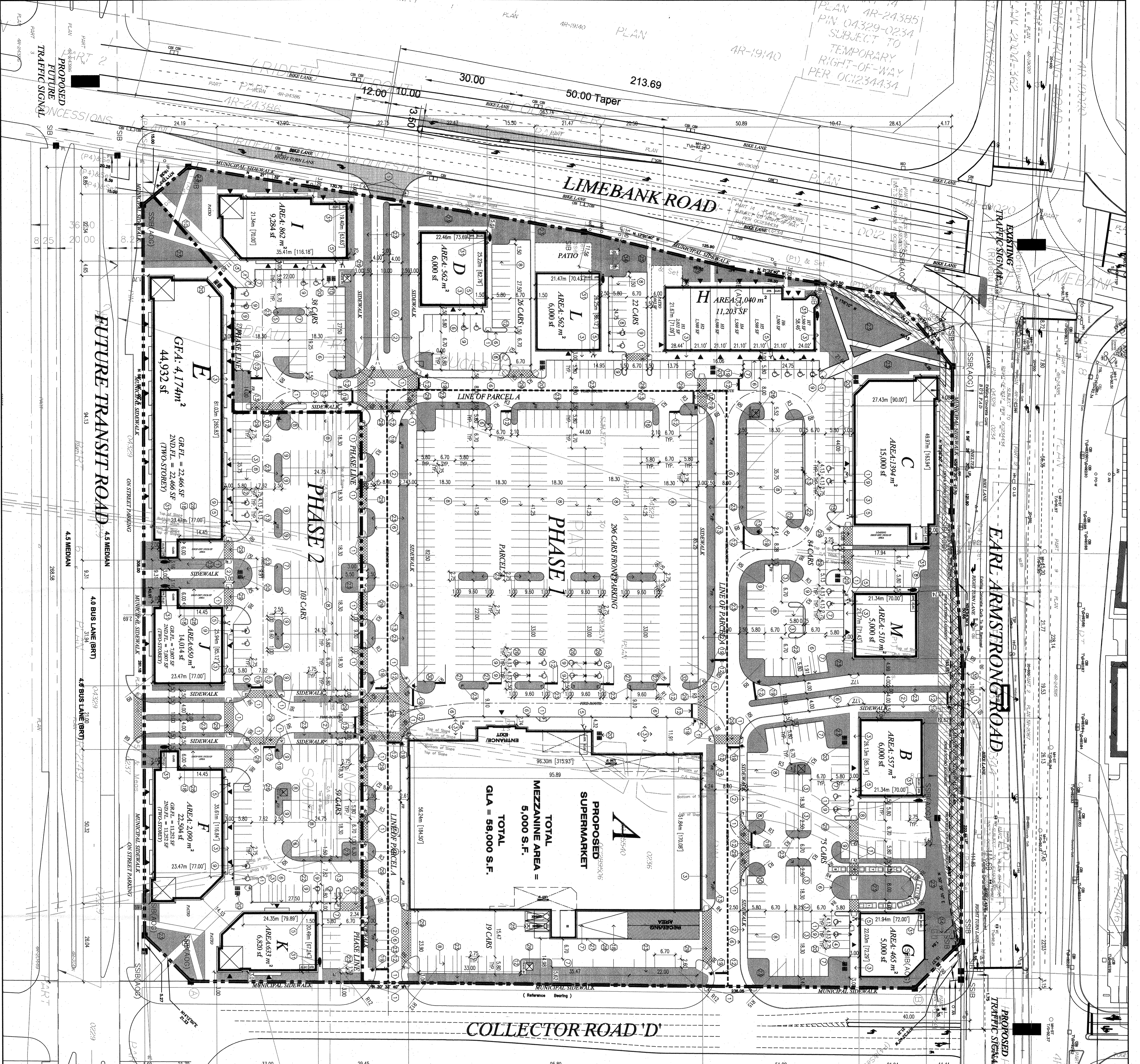
MORGUARD INVESTMENTS LTD.
 55 CITY CENTER DRIVE
 MISSISSAUGA, ONTARIO

FILE No D07-12-14-0067

**EXTERNAL STORM DRAINAGE AREA
 AND OFF SITE DITCHING PLAN**

Designed By	XXX	Date	APR 2014	Checked By	R.S.
Drawn By	XXX	Approved By			
Scale:	1:3000	Project No.	12007	Drawing No.	8 of 8

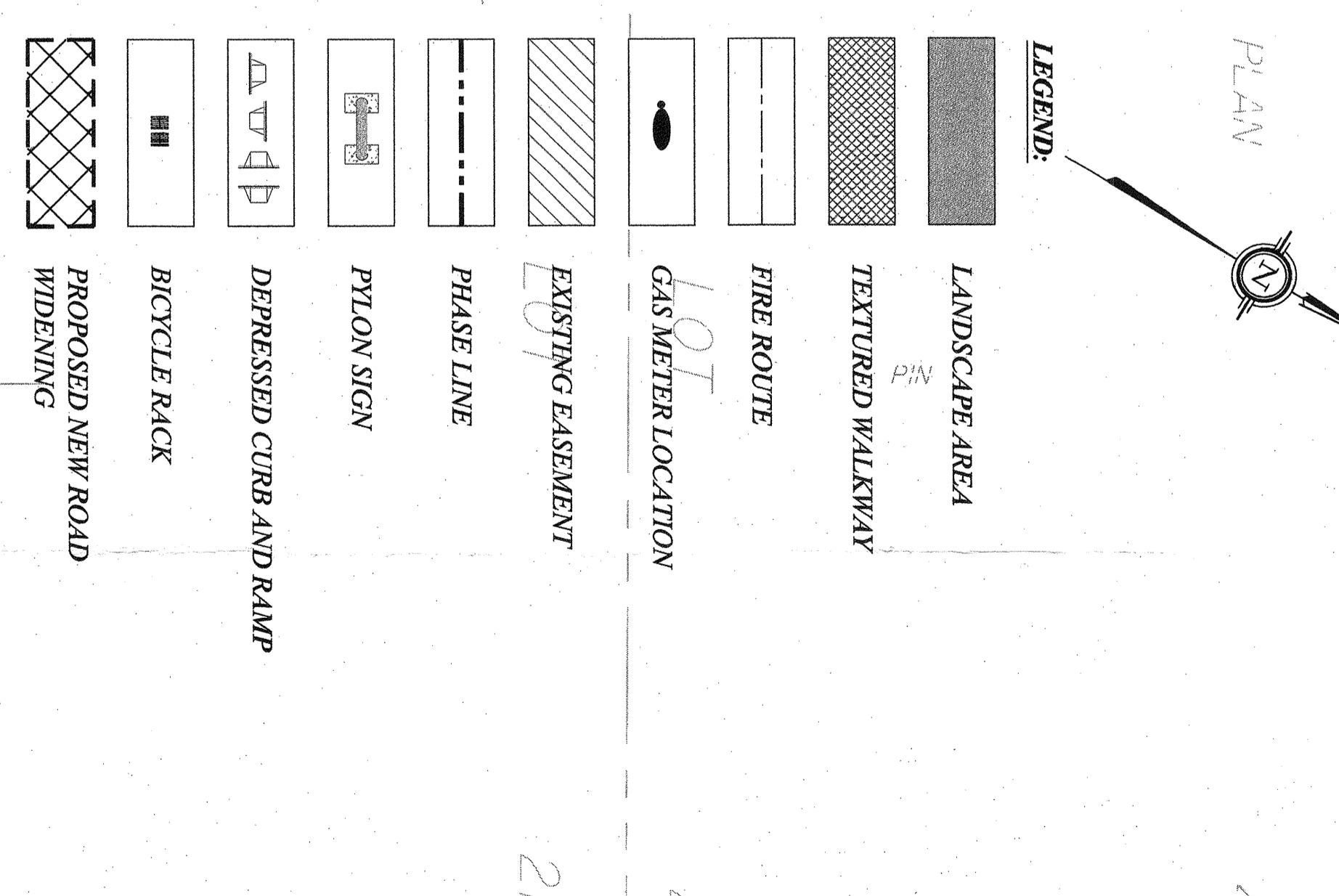




PLAN OF SURVEY OF CONGRESSION 2 (RIDEAU FRONT) CITY OF OTTAWA
 Surveyed by Arnis, O'Sullivan, Vollebæk Ltd.

GENERAL NOTES:

- 1 CONCRETE CURB AND RAMP
- 2 CONCRETE SIDEWALK 3.0 M WIDE (UNLESS NOTED OTHERWISE)
- 3 CONCRETE SIDEWALK AT BUILDING SHALL BE CONSTRUCTED BY BUILDING CONTRACTOR REFER TO ARCH. DWGS. FOR EXTENT
- 4 GUARDRAIL AS REQUIRED BY ORC
- 5 SHIMASE CONNECTION
- 6 CONCRETE CURB
- 7 HEAVY DUTY CONCRETE PAVING
- 8 90° PARKING STRIP (TPP)
- 9 HANDICAP PAVEMENT MARKING AND SIGN (RC-6 TPP)
- 10 LANDSCAPE FEATURE (REFER TO LANDSCAPE DWGS)
- 11 EDGE OF BUILDING SLAB FLOSH WITH ASPHALT
- 12 STOP BAR
- 13 FIRE LANE SIGN
- 14 PLANTERS
- 15 DO NOT ENTER SIGN
- 16 BOLLARD PAINTED YELLOW
- 17 LANDSCAPE AREA
- 18 NO PARKING LOADING ZONE
- 19 STOP SIGN (RA-1)
- 20 BIKE RACKS
- 21 ORNAMENTAL & MASONRY FENCE
- 22 CONCRETE ISLAND/AREA (TPP)
- 23 LANDSCAPED ISLAND/AREA (TPP)
- 24 PAINTED ISLAND (TPP)
- 25 CONCRETE TRASH COMPACTOR PAD
- 26 TRANSFORMER PAD (SEE ARCH. DWGS)
- 27 RETAINING WALLS AT TRUCK WELLS (SEE ARCH. DWGS)
- 28 SCREEN WALL
- 29 TEXTURED PEDESTRIAN CROSSWALK
- 30 PAINTED TRAFFIC FLOW ARROWS
- 31 GAS METER
- 32 WALL-MOUNTED FIRE LANE SIGN
- 33 FIRE HYDRANT
- 34 PYLON SIGN
- 35 ONE-WAY SIGN (RB-21)
- 36 YIELD SIGN



SITE STATISTICS

OVERALL SITE:
 TOTAL SITE AREA = 703,582.72 SF (16.15 ACRES) (6,633 HA)
 TOTAL GR. FL. RETAIL AREA = 169,032 SF (15,703.99 SM)
 TOTAL 2ND FL. OFFICE AREA = 40,725 SF (3,763.47 SM)
 TOTAL RETAIL PARKING REQ. @ 3.6/100 SM = 566 CARS
 TOTAL OFFICE PARKING REQ. @ 2.4/100 SM = 91 CARS
 TOTAL PARKING PROVIDED = 722 CARS

PHASE 1 STATS:
 GR. FL. RETAIL AREA = 121,487 SF (11,288.51 SM)
 2ND FL. OFFICE AREA = 6,000 SF (557.07 SM)
 TOTAL PARKING PROVIDED = 590 CARS

PHASE 2 BUILDING AREAS:

BIG BOX RETAIL STORE A	30,000 SF	2,780.07 SM
BUILDING B	15,000 SF	1,390.04 SM
BUILDING C	6,000 SF	556.02 SM
BUILDING D	3,000 SF	278.01 SM
BUILDING E	3,284 SF	303.88 SM
BUILDING F	6,000 SF	556.02 SM
BUILDING G	3,284 SF	303.88 SM
BUILDING H	727,487 SF	67,247.87 SM
TOTAL	47,848 SF	4,437.87 SM

PHASE 2 STATISTICS:
 PHASE 2 AREA = 163,900.02 SF (6.64 ACRES) (1.48 HA)
 GR. FL. RETAIL AREA = 47,265 SF (4,417.07 SM)
 2ND FL. OFFICE AREA = 6,000 SF (557.07 SM)
 TOTAL RETAIL PARKING REQ. @ 3.6/100 SM = 168 CARS
 TOTAL OFFICE PARKING REQ. @ 2.4/100 SM = 91 CARS
 TOTAL PARKING PROVIDED = 182 CARS

EXCLUDED W/ OFFICE PARKING RATIO

BUILDING E	22,468 SF	2,088.88 SM
BUILDING F	17,007 SF	1,577.87 SM
BUILDING K	6,820 SF	632.88 SM
TOTAL	47,848 SF	4,437.87 SM

NOTES:
 1. TOTAL ROOF CONTROL DRAINS: 38 (2/18) 1-105

SP-100

DATE ISSUED: 15-08-26

CITY FILE NO.:

1	PROJECT: LIMEBANK & EARL ARMSTRONG	15-08-26
2	CLIENT: PETROFF PARTNERSHIP ARCHITECTS	15-08-26
3	DESIGNER: PETROFF PARTNERSHIP ARCHITECTS	15-08-26
4	DATE: 15-08-26	15-08-26
5	PROJECT NO.:	1159.00
6	DATE: 15-08-26	15-08-26
7	PROJECT NO.:	1159.00
8	DATE: 15-08-26	15-08-26
9	PROJECT NO.:	1159.00
10	DATE: 15-08-26	15-08-26
11	PROJECT NO.:	1159.00
12	DATE: 15-08-26	15-08-26
13	PROJECT NO.:	1159.00
14	DATE: 15-08-26	15-08-26
15	PROJECT NO.:	1159.00
16	DATE: 15-08-26	15-08-26
17	PROJECT NO.:	1159.00
18	DATE: 15-08-26	15-08-26
19	PROJECT NO.:	1159.00
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28	DATE: 15-08-26	15-08-26
29	PROJECT NO.:	1159.00
30	DATE: 15-08-26	15-08-26
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47	PROJECT NO.:	1159.00
48	DATE: 15-08-26	15-08-26
49	PROJECT NO.:	1159.00
50	DATE: 15-08-26	15-08-26

MASTER SITE PLAN

PETROFF PARTNERSHIP ARCHITECTS
 LIMEBANK & EARL ARMSTRONG
 OTTAWA, ONTARIO
 FOR: OWNER

SCALE: 1:500

**260 TOWN CENTRE BLVD, SUITE 300
 MARKHAM ONTARIO CANADA L3R 9B8
 TEL: 905.470.7000 FAX: 905.470.2500**

1159.00
 SP-100