



**SERVICING DESIGN BRIEF
AND
STORMWATER MANAGEMENT
REPORT**

1420 EARL ARMSTRONG ROAD

RIVERSIDE SOUTH RETAIL CENTRE

**SITE PLAN APPLICATION
FILE No. DO7-12-14-0067**

MORGUARD INVESTMENTS LIMITED

**CITY OF OTTAWA
ONTARIO**

12007.330
APRIL 9, 2014
REVISED JUNE 20, 2014
REVISED AUGUST 13, 2014

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CITY OF OTTAWA COMMENTS

In April of 2014, a Site Plan Control Approval Application was submitted to the City of Ottawa with respect to 1420 Earl Armstrong Road. The Application was reviewed by City of Ottawa, Planning and Infrastructure, and comments dated April 28, 2014 were provided on the Application, including the Servicing Design Brief and Stormwater Management Report.

In response to the comments by the City of Ottawa, the Servicing Design Brief and Stormwater Management Report has been revised. Specifically, the City of Ottawa comments have been addressed as follows:

General. For all Engineering Drawings: remove City of Ottawa in title block & indicate who the Client/Owner is on the drawings. This will be required on any future drawing submissions and/or revisions.

Response: *The title block has been revised as noted on all engineering drawings*

1. Composite Utility Plan (10 copies)

Response: *A preliminary Composite Utility Plan, Drawing No. 7 of 8, has been prepared and included in the rear pocket of this report*

2. Stormwater Management Report – Tributary #14 Drainage Area & Supporting calculations are missing from the Report – need to updated Report (6 Copies)

Response: *Paragraph 3.4 Tributary No. 14 and the Hydraulic Evaluation Report have been revised and Appendix 'C', Tributary No. 14 Calculations have been added*

3. Hydraulic Water main Analysis – for both on site and off site missing (6 copies)

Response: *Paragraph 5.2, Proposed Water Distribution System, has been revised and Appendix 'D', Hydraulic Watermain Analysis has been added*

4. Site Servicing Brief – Storm & Sanitary Calculation Sheets are missing from Report – need to update submitted Report (6 copies)

Response: *Sanitary sewer servicing demand and capacity calculations are included in Paragraph 2.2, Proposed Sanitary Servicing*

Paragraph 3.2 Proposed Stormwater Servicing has been revised and storm sewer design sheets have been added

5. Erosion and Sediment Control Plan – missing Off Site Works and no off site protection shown (6 copies)

Response: *The Erosion & Sediment Control Plan, Drawing No. 4 of 8, has been updated to also include off-site work areas*

6. Site Servicing Plan – Servicing & Grading Information for Collector 'D' is missing (55 copies)

Response: *The current design information for Collector Road 'D' has been up-dated on the site grading and servicing plans*

7. Engineering Drawings – Drainage Area Plan indicates Ponding Stages (i.e. 1:2, 1:5 & 1:100 ??). Show on plan what storm event(s) & what maximum ponding level is for each ponding area.

Response: *The SWM Drainage Plan, Drawing No. 3 of 8, has been re-named and revised*

In addition to the above noted revisions, the current Servicing Design Brief and Stormwater Management Report includes changes to the Site Plan, revised driveway access off Limebank Road, as well as modifications to proposed Collector Road D.

1.0 INTRODUCTION

1.1 Background

The Property, being the subject of this Design Brief, is a vacant parcel of land having a municipal address of 1420 Earl Armstrong Road, Ottawa, Ontario (the Subject Property). The site location is shown on **Figure No. 1**. The legal description of the Property is described as Parts 4, 5 and 6, Plan 4R-25540, depicted on **Figure No. 2**.

At this time, Morguard Investments Limited wishes to file a Site Plan Control Approval Application with the City of Ottawa for development of the Subject Property as a multiple building commercial retail centre. For illustration purposes, a Site Plan is included on **Figure No. 3**. A copy of the full scale Site Plan is also included in the rear pocket of this Report. A detailed description of the proposed development is included in the following sections of this Design Brief.

1.2 Site Description

The Subject Property is bounded by Limebank Road to the west, Earl Armstrong Road to the north, proposed Collector Road 'D' to the east and the future Transit Road to the south. The land is roughly square in shape and is encompassing approximately 6.536 ha. The Property is relatively flat however, an intermittent watercourse, generally known as Tributary No. 14, is draining north across the Property.

The site is currently vacant and relatively clear of significant vegetation except for a limited number of trees, generally located along Tributary No. 14. A Geotechnical Investigation Report by the Paterson Group, dated January 28, 2013, indicates that the sub-surface conditions consist of approximately 0.3 m of top soil overlying silty clay. A copy of the topographic survey, also showing site features, is illustrated on **Figure No. 4**.

1.0 INTRODUCTION

1.3 Purpose of Design Brief

Urban Ecosystems Limited has been retained by Morguard Investments Limited to analyze the feasibility of providing municipal services to support the proposed development and to prepare detailed engineering design of site grading, servicing, stormwater management and related works.

It is the intent that the Servicing Design Brief and Stormwater Management Report (SDB), together with other reports and documents will assist the City of Ottawa and other Agencies to evaluate the current Site Plan Control Approval Application.

The following significant drawings and documents have been considered in preparation of this Design Brief and the engineering design of site grading, servicing, stormwater management and related works in connection with the proposed development.

- Site Plan prepared by Petroff Partnership Architects
- Preliminary Landscape Plan by FOTENN
- Topographic Survey by Annis, O'Sullivan, Vollebekk Ltd., O.L.S.
- Geotechnical Investigation by The Paterson Group
- Technical Memorandum by Stantec regarding existing storm flow rates at the Earl Armstrong culvert
- Design Report by J.L. Richards & Associates Ltd. regarding Riverside South Community, Phase 6
- Limebank Road and Earl Armstrong Road Engineering Drawings
- City of Ottawa Guidelines for Design of Sewers and Watermains

1.0 INTRODUCTION

1.4 Proposed Development

As shown on the Site Plan, the proposed development, which is the subject of the current Site Plan Control Approval Application, will be developed in two phases. Phase 1 will include a proposed supermarket having a floor area of approximately 5,388 m², together with a total of Seven free standing buildings with floor areas ranging from approximately 529 m² to approximately 1,394 m². The total building floor area within Phase 1 is approximately 10,961 m².

Phase 2 of the development will include a total of three free standing 2-storey buildings and one single-storey building. The ground floor areas will range from approximately 650 m² to approximately 2,087 m². The total building floor area, including the second stories, is approximately 7,564 m². A copy of Site Plan, SP-100, by Petroff Partnership Architects, issued August 11, 2014 is included in the rear pocket of this report. The Site Plan provides a detailed summary of all relevant development statistics.

The table below is a summary of the proposed building

Table 1 Building Statistics

Building	No. of Stories	Ground Floor (m ²)	G.F.A. (m ²)
A	1	5,388	5,853
B	1	529	529
C	1	1,394	1,394
D	1	562	562
E	2	2,087	4,174
F	2	1,045	2,090
G	1	584	584
H	1	1,057	1,057
I	1	885	885
J	2	650	1,300
K	1	650	650
L	1	562	562
Total		15,393	19,640



Morguard
Investments Limited
AGENT FOR
PENSION FUND REALTY LIMITED
55 City Centre Drive, Suite 800 Mississauga ON L5B 1M3
Telephone: (905) 281-3800 Fax: (905) 281-1800

KEY PLAN

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



DATE APRIL 2014	PROJECT No. 12007.330	FIGURE No. 1
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2.0 SANITARY SEWERAGE

2.1 Existing Sanitary Sewerage

There is an existing 600 mm diameter sanitary sewer in front of the Subject Property on Limebank Road, flowing north, and a 375 mm diameter sanitary sewer flowing west along Earl Armstrong Road. A 375 mm diameter sanitary sewer stub has been installed on Earl Armstrong Road at Collector Road 'D' to service the Riverside South Community, Phase 6.

Preliminary engineering drawings by J.L. Richards & Associates Ltd. for the proposed Collector Road 'D', indicate that the 375 mm diameter sanitary sewer stub connection will be extended south at a grade of 0.16% to the future Transit Road.

At time of preparing this report, the detailed engineering design by J.L. Richards & Associates Ltd. was not finalized for Collector Road D. The pavement configuration has been substantially confirmed and is reflected on the current Site Plan and site engineering drawings. As the Collector Road D design information becomes available, the servicing and grading design drawings for the proposed commercial retail center will be revised and up-dated as required.

2.2 Proposed Sanitary Servicing

The sanitary flows from the Subject Property have been accounted for in the design of the proposed 375 mm diameter sanitary sewers on Collector Road 'D'. Based on a contributing drainage area of 6.536 ha, generating wastewater flows at a rate of 50,000 l/ha/d, and using a peaking factor of 1.5, the wastewater flow from the subject Property is estimated at 5.67 l/s. Adding extraneous flows of 0.28 l/s/ha or 1.83 l/s, the total peak wastewater flow from the Subject Property is estimated at 7.50 l/s.

2.0 SANITARY SEWERAGE

2.2 Proposed Sanitary Servicing (cont'd)

Due to depth constraints, it is proposed that the Subject Property will be serviced with two, 200 mm diameter sanitary sewers, connected to the proposed 375 mm diameter sanitary sewer on Collector Road 'D'.

Based on the Site Plan configuration, and the proposed servicing layout, it is reasonable to assume that the total peak sanitary design flow of 7.50 l/s will be approximately divided equally, or 3.75 l/s, between the two proposed sanitary sewer connections. A copy of the Servicing Plan has been included in the rear pocket of this Report.

As specified by the project mechanical engineers, each of the twelve proposed commercial buildings will be serviced with 150 mm diameter connections at a grade of no less than 1.0%, except the service connection to the proposed supermarket, Building A, will be 200 mm diameter.

The two collector sewer systems will be 200 mm diameter at a minimum grade of 0.50%, having a full flow capacity of 23.2 l/s. The sanitary sewers will therefore have sufficient capacity to adequately service the proposed Retail Centre.

3.0 STORM DRAINAGE

3.1 Existing Stormwater Sewerage

There is an existing 2,700 mm diameter storm sewer in front of the Subject Property on Limebank Road draining to the north. This storm sewer discharges to Riverside South Stormwater Management Pond No. 2, located north of Earl Armstrong Road on the west side of Limebank Road. There is also a 2,250 mm diameter storm sewer on Earl Armstrong Road in front of the property draining west. This storm sewer connects to the Limebank Road 2,700 mm diameter storm sewer which discharges to Riverside South Stormwater Management Pond No. 2.

Preliminary engineering drawings by J.L. Richards & Associates Ltd. show that an 1,800 mm diameter storm sewer stub has been installed on Earl Armstrong Road at Collector Road 'D' to service the Riverside South Community, Phase 6. It is the intention that the 1,800 mm diameter storm sewer stub connection will be extended south along Collector Road 'D', at a grade of 0.12% to the future Transit Road.

3.2 Proposed Stormwater Servicing

Controlled storm runoff from the Subject Property has been accounted for in the design of the proposed 1,800 mm diameter storm sewers on Collector Road 'D'. The maximum discharge rate was established through the Riverside South Community Master Drainage Plan Update, Final Report by Stantec, Dated September 30, 2008. The Master Drainage Plan specify that the storm discharge rate from the Subject Property shall not exceed 203 l/s/ha for all storms, up to and including the 1 in 100 year event. Based on a total site area of 6.536 ha, the total storm discharge from the Subject Property shall not exceed 1,326 l/s.

3.0 STORM DRAINAGE

3.2 Proposed Stormwater Servicing (cont'd)

It is proposed that the Subject Property will be serviced with a 750 mm diameter connection to the proposed 1,800 mm diameter storm sewer on Collector Road 'D'. As illustrated in the Hydrologic Evaluation Calculations, attached in Appendix 'A', the site discharge will be controlled through a 450 mm diameter orifice installed in a manhole to be constructed on the property line. A copy of the Servicing Plan has been included in the rear pocket of this report.

To control storm run-off from the roofs, the Buildings will be equipped with zurn control flow drains, Model Z-105-5 or approved equal, except Building A that will be uncontrolled. The total number of control flow drains will be 32 with one weir per drain.

Each Building will be serviced with a 200 mm diameter storm connection at a grade of no less than 1.0% except Building A will have a 300 mm diameter service. It is acknowledged that the capacity of the storm service connections are significantly greater than the expected roof drains.

The main storm sewers on site are generally designed to convey the 1 in 5 year storm using an entry time of 10 mins. The majority of the storm sewers however are oversized, particularly the larger, downstream pipe segments. This is to provide sufficient underground storage to eliminate any surface ponding during more frequent storms, less than the 1 in 5 year event.

The following figures, 5a through 5e, Storm Sewer Design Sheets, are based on the 1 in 5 year storm event and shows that all sewer segments have sufficient capacity.

CITY OF OTTAWA
STORM SEWER DESIGN SHEET

URBAN ECOSYSTEMS
L I M I T E D
769 HERTON ROAD, SUITE 705
WOODBINE, ONTARIO L4L 8G7
TELEPHONE: (416) 467-6029
FAX: (416) 467-6098

Project / Subdivision: RIVERSIDE - WORGUARD
Consulting Engineer: Urban Ecosystems Limited
Project No.: 12007

Design Parameters (5 Year Storm)

$T_w = 10$ min
A = drainage area (ha)
C = runoff coefficient
 T_c = time of concentration

Design Equations
 $I = \frac{A}{(t + B)^C}$
 $Q = 2.78 \times A \times C \times I$

Prepared by: _____

Checked by: _____

Last Revised: _____

STREET NAME	From MH	Invert (m)	To MH	Invert (m)	Area increment		Sewer AC	Sewer Leg	Cumul. Leg	1-5yr Intensity (mm/hr)	1-25yr Intensity (mm/hr)	1-100yr Intensity (mm/hr)	Flow - Q			Time (minutes)							
					Road/Other ha.	Coef.							BLDG No of Drains	Road (l/s)	BLDG (l/s)		Total (l/s)	Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Log elapsed
STORM SEWER LEG BUILDINGS I & E	13		12		0.19	0.95	9	0.181	0.181	104.9			52.6	13.5	52.6	31.5	0.40	450	188.1	1.15	0.46	10.46	
STORM SEWER LEG	12		11		0.19	0.95		0.181	0.361	102.5			102.8	0.0	102.8								10.46
STORM SEWER LEG BUILDING D	11		10		0.18	0.95	2	0.171	0.532	100.1			147.8	3.0	3.0	35.0	0.40	450	188.1	1.15	0.51	10.97	
STORM SEWER LEG BUILDING L	10		9		0.30	0.95	2	0.285	0.817	98.0			147.8	3.0	3.0	40.0	0.40	675	554.6	1.50	0.44	11.41	
STORM SEWER LEG BUILDING H	9		8		0.07	0.95	4	0.067	0.884	95.9			235.2	6.0	6.0	43.8	0.40	675	554.6	1.50	0.49	11.90	
STORM SEWER LEG BUILDING C	29		8		0.24	0.95	4	0.228	0.228	104.9			66.4	6.0	6.0	43.8	0.40	675	554.6	1.50	0.49	12.38	
STORM SEWER LEG	8		7		0.04	0.95		0.038	1.150	93.8			299.4	0.0	0.0								12.38
STORM SEWER LEG	7		6		0.05	0.95		0.048	1.197	92.5			299.4	31.5	330.9	32.0	0.40	750	734.5	1.61	0.33	12.71	
STORM SEWER LEG	28		6		0.15	0.95		0.143	0.143	104.9			307.4	0.0	0.0	6.5	0.40	750	734.5	1.61	0.07	12.78	
STORM SEWER LEG	6		5		0.00	0.95		0.000	1.340	92.2			41.5	0.0	0.0	22.0	1.00	300	100.9	1.38	0.27	10.27	
STORM SEWER LEG													343.0	0.0	0.0	25.7	0.40	750	734.5	1.61	0.27	13.05	

CITY OF OTTAWA
STORM SEWER DESIGN SHEET

URBAN ECOSYSTEMS
L I M I T E D
7661 WESTON ROAD, SUITE 703
WOODBINE, ONTARIO L4L 8Z7
TELEPHONE: (905) 546-4639
FAX: (905) 546-4694

Project / Subdivision: RIVERSIDE - MORGUARD
Consulting Engineer: Urban Ecosystems Limited
Project No.: 12007

Design Parameters (5 Year Storm)
A = drainage area (ha) T_{wp} = 10 min
C = runoff coefficient A = 860,848
T_c = time of concentration B = 6,013
C = 0.806

Design Equations
$$i = \frac{A}{(t + B)^C}$$

$$Q = 2.78 \times A \times C \times I$$

Prepared by: _____
Checked by: _____
Last Revised: _____

STREET NAME	From MH	Invert (m)	To MH	Invert (m)	Area Increment		Sewer AC	Intensity			Flow - Q		PROPOSED SEWER								
					Road/Other ha.	Coef.		1-5yr (mm/hr)	1-25yr (mm/hr)	1-100yr (mm/hr)	Road (l/s)	BLDG (l/s)	Total (l/s)	Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes)		
STORM SEWER LEG	39		5		0.83	0.95	0.789	0.789	104.9		229.7	0.0	229.7	25.7	0.40	750	734.5	1.81	0.27	10.27	
STORM SEWER LEG	5		4		0.09	0.95	0.086	2.214	91.2		560.4	0.0	560.4								13.05
STORM SEWER LEG BUILDING B	27		4		0.32	0.95	0.304	0.304	104.9		88.6	3.0	88.6								10.00
STORM SEWER LEG	4		3		0.03	0.95	0.029	2.546	89.8		634.7	0.0	634.7								13.41
STORM SEWER LEG	24		3		0.17	0.95	0.162	0.162	104.9		634.7	34.5	669.2	24.0	0.40	900	1194.4	1.82	0.22	13.63	10.00
STORM SEWER LEG BUILDING A Uncontrolled	plug		3		0.55	0.95	0.523	0.523	104.9		47.0	0.0	47.0								10.00
STORM SEWER LEG	3		2		0.03	0.95	0.029	3.259	89.8		47.0	0.0	47.0	7.7	5.00	300	225.6	3.09	0.04	10.04	13.41
STORM SEWER LEG	36		35		0.13	0.95	0.124	0.124	104.9		812.3	0.0	812.3	24.4	0.40	900	1194.4	1.82	0.22	13.64	10.00
STORM SEWER LEG	35		21		0.08	0.95	0.076	0.200	103.3		812.3	34.5	846.8								10.31
											36.0	0.0	36.0								10.31
											57.2	0.0	57.2								10.31
											57.2	0.0	57.2	24.9	0.50	300	71.3	0.98	0.42	10.74	10.74

CITY OF OTTAWA
STORM SEWER DESIGN SHEET

URBAN ECOSYSTEMS
L I M I T E D
7091 WESTON ROAD, SUITE 705
WILLOWDALE, ONTARIO M2H 1A7
TELEPHONE: (416) 491-8679
FAX: (416) 491-8698

Project / Subdivision RIVERSIDE - MORGUARD
Consulting Engineer Urban Ecosystems Limited
Project No.: 12007

Design Parameters (5 Year Storm)

A = drainage area (ha) $T_w = 10$ min
C = runoff coefficient A = 980 848
 $T_c =$ time of concentration B = 6.013
C = 0.806

Design Equations
 $Q = \frac{A}{(1 + S)^2}$
 $Q = 2.78 \times A \times C \times I$

Prepared by: _____

Checked by: _____

Last Revised: _____

STREET NAME	From		To	Invert (m)	Area Increment		Sewer		Intensity 1 - 25yr (mm/hr)	1 - 5yr (mm/hr)	1 - 100yr (mm/hr)	Road (l/s)	BLDG (l/s)	Flow - Q Total (l/s)	Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg elapsed	
	MH	Invert (m)			Road/Other ha.	Coef.	No of Drains	Leg													Cumul.
STORM SEWER LEG	22		21		0.07	0.95	0.067	0.067		104.9		19.4	0.0	19.4	18.3	0.50	300	71.3	0.98	0.31	10.31
STORM SEWER LEG	21		20		0.03	0.95	0.029	0.295		101.2		82.7	0.0	82.7	18.3	0.50	300	71.3	0.98	0.31	10.74
STORM SEWER LEG	20		19		0.03	0.95	0.029	0.323		99.9		89.6	0.0	89.6	18.3	0.40	450	188.1	1.15	0.27	11.00
STORM SEWER LEG	19		18		0.06	0.95	0.057	0.380		98.7		104.1	0.0	104.1	18.3	0.40	450	188.1	1.15	0.27	11.27
STORM SEWER LEG	34		33		0.13	0.95	0.124	0.124		104.9		36.0	0.0	36.0	9.2	0.50	450	210.3	1.28	0.12	11.39
STORM SEWER LEG BUILDING J	33		18		0.08	0.95	0.076	0.200		103.3		57.2	3.0	60.2	18.3	0.50	300	71.3	0.96	0.31	10.31
STORM SEWER LEG	18		17		0.06	0.95	0.057	0.637		98.1		173.4	0.0	173.4	22.1	0.50	375	129.3	1.13	0.32	10.64
STORM SEWER LEG												173.4	3.0	176.4	43.4	0.40	525	283.8	1.27	0.57	11.96

CITY OF OTTAWA
STORM SEWER DESIGN SHEET

URBAN ECOSYSTEMS
L I M I T E D
749 WESTON ROAD, SUITE 705
WOODBRIDGE, ONTARIO L4L 8C7
TELEPHONE: (905) 554-0629
FAX: (905) 554-0688

Project / Subdivision: RIVERSIDE - MORGUARD
Consulting Engineer: Urban Ecosystems Limited
Project No.: 12007

Design Parameters (5 Year Storm)

A = drainage area (ha) $T_{wd} = 10$ min
C = runoff coefficient A = 980.848
 $T_c =$ time of concentration B = 6.013
C = 0.806

Design Equations

$$I = \frac{A}{(t + B)^C}$$

$$Q = 2.78 \times A \times C \times I$$

Prepared by: _____

Checked by: _____

Last Revised: _____

STREET NAME	From MH	Invert (m)	To MH	Invert (m)	Area Increment		Sewer AC	Intensity			Flow - Q		PROPOSED SEWER			Time (minutes) elapsed						
					Road/Other ha	Coef.		1 - 5yr (mm/hr)	1 - 25yr (mm/hr)	1 - 100yr (mm/hr)	Road (l/s)	BLDG (l/s)	Total (l/s)	Length (m)	Grade (%)		Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Leg		
STORM SEWER LEG	32		31		0.10	0.95	0.095	0.095	104.9			27.7	0.0	27.7	37.8	1.00	300	100.9	1.38	0.46	10.46	
STORM SEWER LEG	31		17		0.10	0.95	0.095	0.190	102.6			54.1	0.0	54.1	24.0	1.00	300	100.9	1.38	0.46	10.46	
STORM SEWER LEG	17		16		0.05	0.95	0.048	0.874	95.6			232.0	0.0	232.0	24.0	0.40	525	283.8	1.27	0.32	12.27	
STORM SEWER LEG BUILDINGS F & K	30		16	5	0.18	0.95	0.171	0.171	104.9			49.8	7.5	7.5								10.00
STORM SEWER LEG	16		15		0.05	0.95	0.048	1.093	94.3			286.0	0.0	286.0	24.0	0.40	600	405.1	1.39	0.29	12.56	
STORM SEWER LEG	15		14		0.07	0.95	0.067	1.159	93.1			299.6	0.0	299.6	24.0	0.40	600	405.1	1.39	0.29	12.56	
STORM SEWER LEG	14		2		0.22	0.95	0.209	1.368	90.4			299.6	10.5	310.1	57.2	0.40	600	405.1	1.39	0.69	13.25	
STORM SEWER LEG BUILDING G	23		2	2	0.17	0.95	0.162	0.162	104.9			47.0	3.0	3.0	34.4	2.00	300	142.7	1.96	0.29	10.29	
STORM SEWER LEG	2		1		0.03	0.95	0.029	4.817	88.0			1177.5	0.0	0.0	1177.5	0.40	1050	1801.7	2.02	0.10	13.99	

3.0 STORM DRAINAGE

3.3 Major Stormwater Conveyance From The Site

All storms, up to and including the 1 in 100 year event, will be controlled on site, to limit the storm discharge to a rate, not to exceed 203 l/s/ha or a total maximum of 1,326 l/s.

During severe storms, exceeding the 1 in 100 year event, or in the occurrence of a catastrophic storm sewer system failure, overland flow routes will be provided from the Subject Property following the drive aisles. The overland flow will be routed to Earl Armstrong Road and Collector Road 'D', ultimately discharging to Mosquito Creek.

As discussed in the Design Report for Riverside South Community, Phase 6, by J.L. Richards & Associates Ltd., Limebank Road and Earl Armstrong Road have been designed with roadside ditches to convey overland flow. It is the intention that, with modifications, this system will be maintained.

The Limebank Road ditch will be re-graded to reflect the proposed site access driveway and associated left turn lane. The arrangement is reflected on the Grading Plan attached to this report.

To accommodate a site entrance off Earl Armstrong Road and a proposed bus stop platform on the south side of the road, immediately east of Limebank Road, and also to provide for a driveway on the north side of Building B, it is proposed that the existing ditch will be enclosed. A 900 mm diameter storm sewer at a grade of 0.19% will be installed from Limebank Road and connect to the existing 1,200 mm diameter culvert crossing Earl Armstrong Road. Shallow roadside overland flow ditches will be maintained above the 900 mm diameter storm sewer.

If the proposed road modifications, including changes to the roadside ditches and encroachment into the existing easement are acceptable to the City, detailed engineering drawings will be provided, supported by future study.

3.0 STORM DRAINAGE

3.4 Tributary No. 14

Approximately 68.14 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 68.14 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 of this Report. The outputs of the time to peak and peak flow calculations are attached in Appendix 'C'.

In the interim, it is proposed that a temporary interceptor swale will be constructed, south of the Subject Property, conveying all storm flows from the undeveloped upstream lands, discharging to the road side ditch along Limebank Road. Two existing ditch inlet catchbasins on the east side of Limebank Road, connected to the 2,700 mm diameter storm sewer, will capture approximately 1,000 l/s of the storm flows from the area south of the Subject Property.

3.0 STORM DRAINAGE

3.4 Tributary No. 14 (cont'd)

Excess flows, being approximately 719 l/s, will be conveyed through a temporary overflow swale flowing east along the south boundary of the Subject Property, to a proposed temporary ditch inlet catchbasin connected to the proposed 1800 mm diameter storm sewer on Collector Road D. Copies of the Site Grading Plan and External Storm Drainage Area Plan are included in the rear pockets of this report.

Rideau Valley Conservation Authority has confirmed that Tributary no. 14 is approved in principle to be enclosed. Prior to commencing any construction on the 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.

4.0 STORMWATER MANAGEMENT

4.1 Water Quantity

Development of the Subject Property will require onsite stormwater runoff control for all storms up to and including the 1 in 100 year event. Target discharge rates for lands contributing to Riverside South Stormwater Management Pond No. 2 were identified in the Riverside South Community Master Drainage Plan Update, by Stantec, dated September 2008. The Design Report for Riverside South Community, Phase 6 by J.L. Richards & Associates Limited, dated January 2012, specified that the discharge rate from the Subject Property shall not exceed 203 l/s/ha during all storms up to and including the 1 in 100 year event. All excess runoff shall be detained on site utilizing roofs, parking lots and underground storage.

As illustrated in the Hydrologic Evaluation Calculations for the proposed development of the Subject Property, attached in Appendix A, the water quantity targets will be achieved. The storm discharge from the site will be controlled using a 450 mm diameter orifice in Control Manhole No. 01. During a 1 in 100 year storm event, onsite detention will be achieved through roof top storage of 678 m³, parking lot storage of 2,490 m³ and underground storage of 396 m³.

The Hydrologic Evaluation also show that during more frequent storms, up to and including the 1 in 5 year event, no surface storage will be required, save and accept local ponding in the loading dock area of Building A.

4.2 Water Quality

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 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.

5.0 WATER SUPPLY

5.1 Existing Water Distribution System

There are existing 600 mm.dia. watermains on Limebank Road and Earl Armstrong Road in front of the Subject Property. Preliminary engineering drawings by J.L. Richards & Associates Ltd. show that a 200 mm.dia. watermain stub has been installed on Earl Armstrong Road at Collector Road 'D'. It is the intention that the 200 mm.dia. watermain stub connection will be extended south along Collector Road 'D' to the future Transit Road and beyond, to service the Riverside South Community, Phase 6.

The Design Report for the Riverside South Community, Phase 6 by J.L. Richards & Associates Ltd., dated January 2012 includes a Hydrological Analysis based on preliminary hydrologic boundary conditions provided by the City of Ottawa. The analysis demonstrate that during all water demand conditions, i.e. peak hourly demand, fire flow during maximum day demand and maximum pressure under zero demand, the water distribution system will meet the City of Ottawa and the Ministry of Environment Design Guidelines for a water distribution system.

5.2 Proposed Water Distribution System

The water demand for the Subject Property was considered in the analysis for Riverside South Community Phase 6. All commercial buildings within the Riverside South Retail Centre will be sprinkled. **Table 2**, Water Demand is a preliminary summary of the domestic and sprinkler water demand.

It is proposed that the Subject Property will be serviced with two 200 mm.dia connections to the proposed 200 mm dia. watermain on Collector Road 'D'. The watermain will be looped through the site and individual connections will be provided to each of the proposed buildings. A copy of the Servicing Plan has been included in rear pocket of this report.

5.0 WATER SUPPLY

5.2 Proposed Water Distribution System (cont'd)

Table 2 Water Demand

Building	Gross Floor Area (m²)	Sprinkler Water Demand (l/s)	Domestic Water Demand (l/s)
A	5,388	65	10
B	529	36	4
C	1394	47	6
D	562	36	4
E	4,174	36	9
F	2,090	36	6
G	584	36	4
H	1,057	36	4
I	885	47	5
J	1,302	36	6
K	650	36	4
L	562	36	4

Using current boundary conditions provided by the City of Ottawa, a Hydrologic Analysis was performed on the watermain within the Riverside South Retail Centre site. The analysis show that during all water demand conditions, the water distribution system will meet the City of Ottawa design guidelines, The Hydrologic Analysis Model outputs are included in Appendix 'D'.

6.0 GRADING AND EROSION AND SEDIMENT CONTROL

6.1 Grading

The Subject Property is relatively flat, bisected by an intermittent water course, generally known by Tributary No. 14, draining to the north to a 1200 mm.dia culvert crossing Earl Armstrong Road. The Geotechnical Investigation Report did not identify an unusual or extraordinary soil or ground water conditions.

It is anticipated that the site will be rough graded and that underground services and utilities will be installed using conventional construction methods. **Table 3, Pavement Structure** is a summary of the recommendations provided in the Geotechnical Investigation Report.

Table 3 Pavement Structure

Material	Heavy Duty Pavement (mm)	Light Duty Pavement (mm)
HL-3 Asphalt	40	50
HL-8 Asphalt	50	---
Granular A	150	150
Granular B	450	400

A copy of the Grading Plan has been included in the rear pocket of this report.

6.2 Erosion and Sediment Control

Appropriate erosion and sediment control measures will be installed prior to commencing any construction on site. The erosion and sediment control features will include silt control fencing, site access mud mat, check dams and other erosion and sediment features as required. During construction the silt and erosion control features will be inspected frequently and additional measure will be implemented as appropriate. A copy of the Erosion and Sediment Control Plan is included the rear pocket of this report.

7.0 SUMMARY AND CONCLUSIONS

The servicing Design Brief and Stormwater Management Report, including the accompanying engineering drawings, have been prepared to illustrate how Riverside South Retail Centre, having a municipal address of 1420 Earl Armstrong Road, will be provided with municipal services. The report and engineering drawings conform to higher level studies and reports, including the Riverside South Community Master Drainage Plan Update, Final Report, by Stantec dated September 30, 2008 and a Design Report for Riverside South Community, Phase 6 by J.L. Richards & Associates Ltd, dated January 2012.

The Servicing Design Brief confirms that the existing municipal infrastructural surrounding the Subject Property can adequately support the proposed development with sanitary sewerage, storm drainage and water supply. The Servicing Design Brief also confirm how the post development storm runoff from the Subject Property will be controlled to the maximum allowable release rate as established through the Riverside South Community Master Drainage Plan by Stantec and the Design Report for Riverside South Community, Phase 6 by J.L. Richards & Associates Ltd.

A copy of the City of Ottawa Development Servicing Study Checklist is included in Appendix B.

Respectfully Submitted,


Orjan B. Carlson


Rosario Sacco, P. Eng.



Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698



APPENDIX A

11/11/11

URBAN ECOSYSTEMS LIMITED

7050 WESTON ROAD, SUITE 705

WOODBIDGE, ONTARIO L4L 8G7

uel@urbanecosystems.com

t. (905)856-0629

f. (905)856-0698



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

revised AUGUST 13, 2014

DATE: APRIL 9,2014
 revised July 20,2014
 revised AUGUST 13, 2014

URBAN ECOSYSTEMS LIMITED
 7050 WESTON ROAD, SUITE 705
 WOODBRIDGE, ONTARIO L4L 8G7
 uel@urbanecosystems.com
 t. (905)856-0629
 f. (905)856-0688



STORMWATER MANAGEMENT REPORT

RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A TO K)
1420 EARL ARMSTRONG ROAD
CITY OF OTTAWA
FILE No: 12007.100

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)	49801	49801
Landscaped Area	(m ²)	496	496
Building Area	(m ²)	10005	10005
Uncontrolled Pavement Area	(m ²)	226	226
Uncontrolled Landscape Area	(m ²)	4839	4839



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 32 weirs

Total roof outflow is calculated as:

$$Q_{\text{roof}} = 32 \times 0.15 \text{ L/s/cm hd.} \times 10 \text{ cm head} = 48 \text{ L/s}$$

From Appendix - Table 1 maximum storage volumes: required = 401.7 m³
 available = 677.7 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: $Q = \text{Rain (L/s)}$
 $= 0.95 \times 1.0005 \times \text{mm/hr} \times 2.778$

4.2 Parking Lot Storage and Release Rate

Note: 100 year runoff coefficients:

pavements - C₁₀₀ = C_s 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:

$$C_c = \frac{49801 \times 0.95}{49801} + \frac{496 \times 0.625}{496}$$

$$C_c = 0.95$$



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 Table 2 and dwg SP-1, Urban Ecosystems Project No.: 12007.100 the required pond volume was calculated to be 947 m³

Available site storage:

		Surface Pavement Storage=	2490.0 m³
12.3	m - 1050	dia. stm =	10.7 m ³
88.4	m - 900	dia. stm =	56.2 m ³
84.6	m - 750	dia. stm =	37.4 m ³
83.8	m - 675	dia. stm =	30.0 m ³
135	m - 600	dia. stm =	38.2 m ³
162.8	m - 525	dia. stm =	35.2 m ³
112.3	m - 450	dia. stm =	17.9 m ³
22.1	m - 375	dia. stm =	2.4 m ³
275.2	m - 300	dia. stm =	19.5 m ³
552.6	m - 250	dia. stm =	27.1 m ³
189.6	m - 200	dia. stm =	6.0 m ³
1	2400 mm dia mh(@	2 m avg depth) =	9.0 m ³
5	1800 mm dia mh(@	2 m avg depth) =	25.4 m ³
7	1500 mm dia mh(@	2 m avg depth) =	24.7 m ³
25	1200 mm dia mh(@	2 m avg depth) =	56.5 m ³
		Manhole / Pipe Storage=	396.3 m³
Total site storage =		2886.3	m ³

Required Storage	m ³	947
Available Storage	m ³	2886

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}

$$0.95 \quad \times \quad 5.0297 \quad \times \quad 1 \quad \times \quad 2.778 \quad + \quad 49$$

Note:

Table 3 indicates that the uncontrolled runoff will total 160.7 l/s
 (Landscape = 4839 m² and pavement = 226 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	1047.8	895.1
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	947	297
available storage	m ³	2886	396

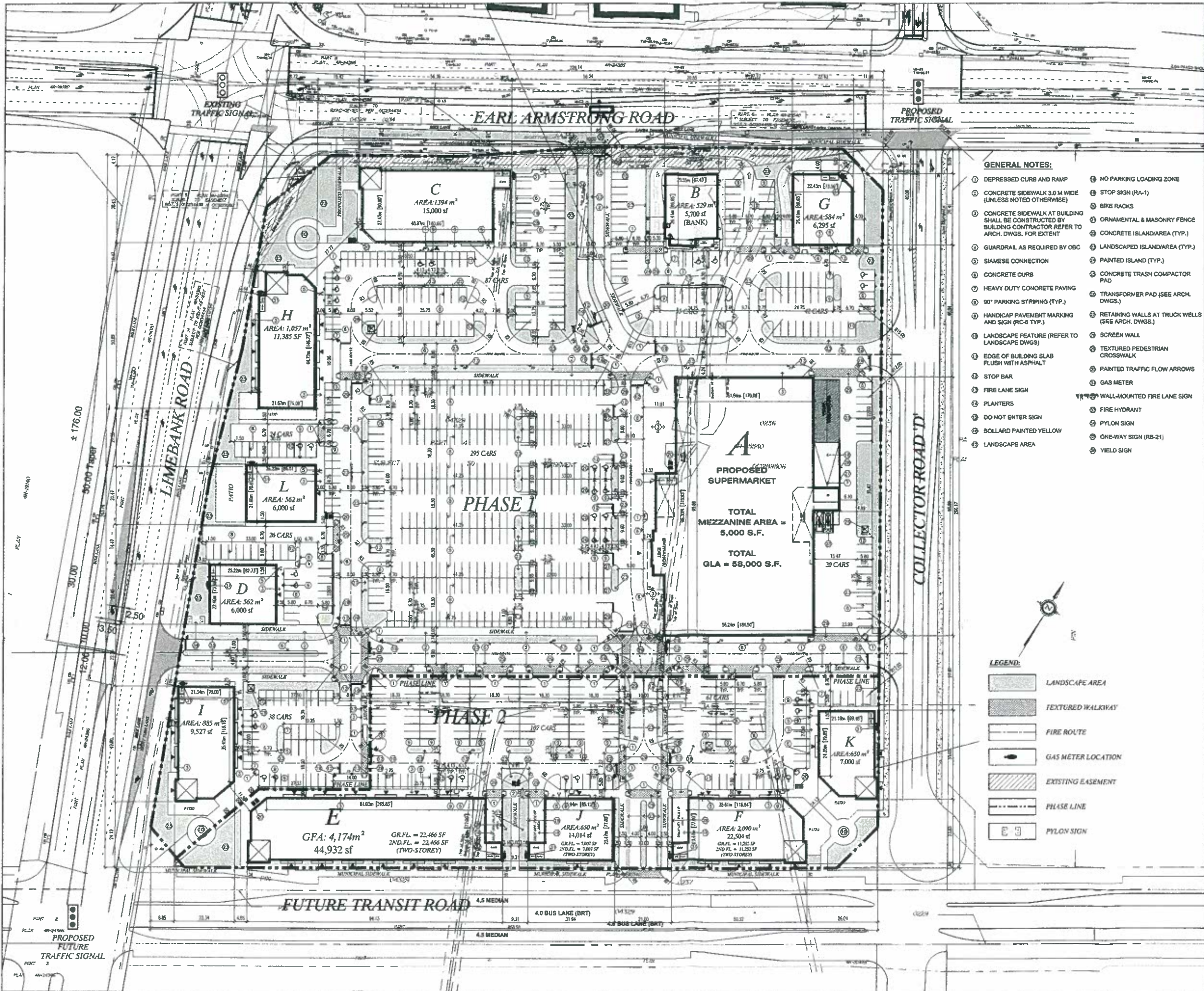
Respectfully submitted,

Urban Ecosystems Limited

Rosario Sacco, P. Eng.



DATE revised AUGUST 13, 2014



- GENERAL NOTES:**
- ① DEPRESSED 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 OBC
 - ⑤ SIAMSE CONNECTION
 - ⑥ CONCRETE CURBS
 - ⑦ HEAVY DUTY CONCRETE PAVING
 - ⑧ 90° PARKING STRIPING (TYP.)
 - ⑨ HANDICAP PAVEMENT MARKING AND SIGN (RC-6 TYP.)
 - ⑩ LANDSCAPE FEATURE (REFER TO LANDSCAPE DWGS)
 - ⑪ EDGE OF BUILDING SLAB FLUSH 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 (TYP.)
 - ㉓ LANDSCAPED ISLAND/AREA (TYP.)
 - ㉔ PAINTED ISLAND (TYP.)
 - 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) (6.53 HA.)
 TOTAL GR. FL. RETAIL AREA = 165,832 SF (15,387.72 SM)
 TOTAL 2ND FL. OFFICE AREA = 45,725 SF (4,247.99 SM)
 TOTAL PARKING PROVIDED = 757 CARS

PARKING RATIO EXCLUDES 2ND FL. OFFICE =
 4.52/100 SM
 (4.57/1000 SF)

PHASE 1 STATS:
 PHASE 1 AREA = 544,733.13 SF (12.51 ACRES) (5.07 HA.)
 GR. FL. RETAIL AREA = 117,907 SF (10,963.92 SM)
 2ND FL. OFFICE AREA = 5,000 SF (464 SM)
 PARKING PROVIDED = 588 CARS

PARKING RATIO EXCLUDES 2ND FL. OFFICE =
 5.39/100 SM
 (5.00/1000 SF)

PHASE 1 BUILDING AREAS:

BUILDING	AREA (SF)	AREA (SM)
BIG BOX RETAIL STORE A	58,000 SF	5,000 SM
BUILDING B	6,700 SF	-
BUILDING C	15,000 SF	-
BUILDING D	6,000 SF	-
BUILDING G	6,295 SF	-
BUILDING H	11,385 SF	-
BUILDING I	9,527 SF	-
BUILDING L	6,000 SF	-
TOTAL	117,907 SF	5,000 SM

PHASE 2 STATS:
 PHASE 2 AREA = 158,909.02 SF (3.64 ACRES) (1.48 HA.)
 GR. FL. RETAIL AREA = 47,725 SF (4,433.79 SM)
 2ND FL. OFFICE AREA = 40,725 SF (3,783.48 SM)
 PARKING PROVIDED = 168 CARS

PARKING RATIO EXCLUDES 2ND FL. OFFICE =
 3.79/100 SM
 (3.52/1000 SF)

PHASE 2 BUILDING AREAS:

BUILDING	AREA (SF)	AREA (SM)
BUILDING E	22,466 SF	2,466 SM
BUILDING F	11,252 SF	1,252 SM
BUILDING J	7,007 SF	7,007 SF
BUILDING K	7,000 SF	-
TOTAL	47,725 SF	4,725 SM

PROPOSED SUPERMARKET

TOTAL MEZZANINE AREA = 5,000 S.F.

TOTAL GLA = 58,000 S.F.

- LEGEND:**
- LANDSCAPE AREA
 - TEXTURED WALKWAY
 - FIRE ROUTE
 - GAS METER LOCATION
 - EXISTING EASEMENT
 - PHASE LINE
 - PYLON SIGN

SP-100

DATE ISSUED: 14-08-11
 CITY FILE NO.:

NO.	REVISIONS	DATE	BY
1	ISSUE FOR PERMIT	14-08-11	AS
2	REVISED PER CITY COMMENTS	14-08-11	AS
3	REVISED PER CITY COMMENTS	14-08-11	AS
4	REVISED PER CITY COMMENTS	14-08-11	AS
5	REVISED PER CITY COMMENTS	14-08-11	AS
6	REVISED PER CITY COMMENTS	14-08-11	AS
7	REVISED PER CITY COMMENTS	14-08-11	AS
8	REVISED PER CITY COMMENTS	14-08-11	AS
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48	REVISED PER CITY COMMENTS	14-08-11	AS
49	REVISED PER CITY COMMENTS	14-08-11	AS
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51	REVISED PER CITY COMMENTS	14-08-11	AS
52	REVISED PER CITY COMMENTS	14-08-11	AS
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94	REVISED PER CITY COMMENTS	14-08-11	AS
95	REVISED PER CITY COMMENTS	14-08-11	AS
96	REVISED PER CITY COMMENTS	14-08-11	AS
97	REVISED PER CITY COMMENTS	14-08-11	AS
98	REVISED PER CITY COMMENTS	14-08-11	AS
99	REVISED PER CITY COMMENTS	14-08-11	AS
100	REVISED PER CITY COMMENTS	14-08-11	AS

MASTER SITE PLAN

SCALE: 1:500

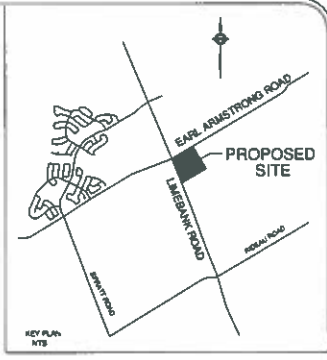
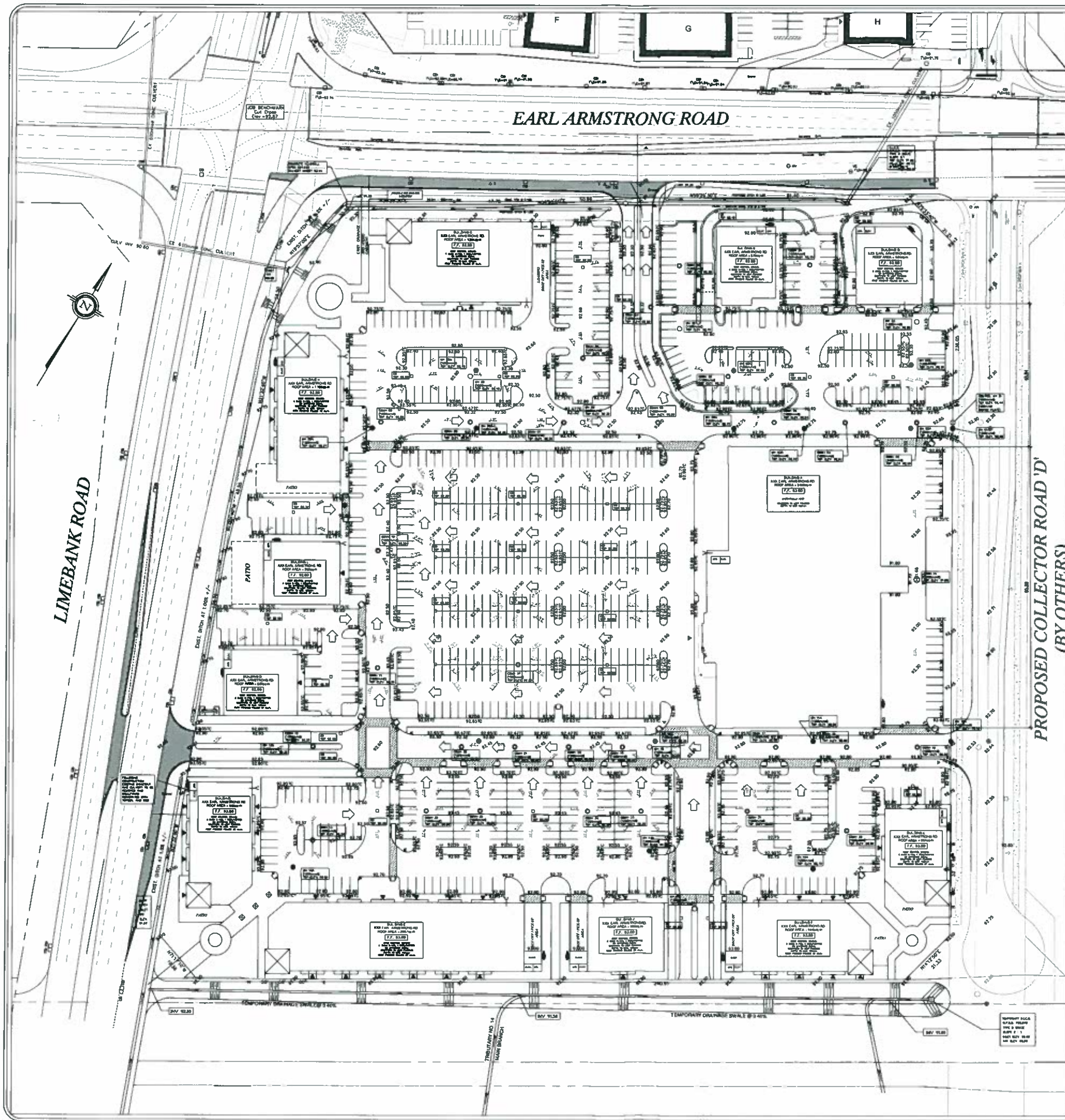
LIMEBANK & EARL ARMSTRONG
 LIMEBANK ROAD & EARL ARMSTRONG ROAD
 OTTAWA, ONTARIO
 FOR: OWNER

PETROFF PARTNERSHIP ARCHITECTS

PETROFF

300 TOWN CENTRE BLVD. SUITE 300
 MARKHAM ONTARIO CANADA L3R 0Y8
 TEL: 905.470.7000 FAX: 905.470.2900

DATE: SEP 16, 2011
 SHEET NO. 11159.00
 PROJECT NO. SP-100



- CURB TO BE REMOVED
- PROPOSED CURB
- PROPOSED ASPHALT PAVEMENT

- LEGEND**
- OVERLAND FLOW ROUTE
 - DIRECTION AND SLOPE OF SURFACE DRAINAGE

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

LOCAL BENCHMARK:
CUT CORNER IN CONCRETE TRAFFIC ISLAND AT THE NORTH-EAST CORNER OF EARL ARMSTRONG ROAD AND LIMEBANK ROAD AS ESTABLISHED BY ANNE O'NEILL/CIVIL ENGINEER U.T. 01-0

ELEVATION LIST

NO.	DESCRIPTION	ELEVATION
1	LOCAL BENCHMARK	100.00
2	EXIST. ASPHALT PAVEMENT	100.00
3	EXIST. CONCRETE PAVEMENT	100.00
4	EXIST. GRAVEL DRIVEWAY	100.00
5	EXIST. GRAVEL DRIVEWAY	100.00
6	EXIST. GRAVEL DRIVEWAY	100.00
7	EXIST. GRAVEL DRIVEWAY	100.00
8	EXIST. GRAVEL DRIVEWAY	100.00
9	EXIST. GRAVEL DRIVEWAY	100.00
10	EXIST. GRAVEL DRIVEWAY	100.00

APPROVED AS TO FORM & SUBSTANCE, WITH THE PROFESSIONAL SEAL & SIGNATURE OF THE ENGINEER CHARGED AS TO ACCURACY & COMPLETION.



URSIAN ECOSYSTEMS LIMITED
7000 HURON ROAD, SUITE 100
MISSISSAUGA, ONTARIO L4X 1L7
TEL: 905-874-1111
FAX: 905-874-1112



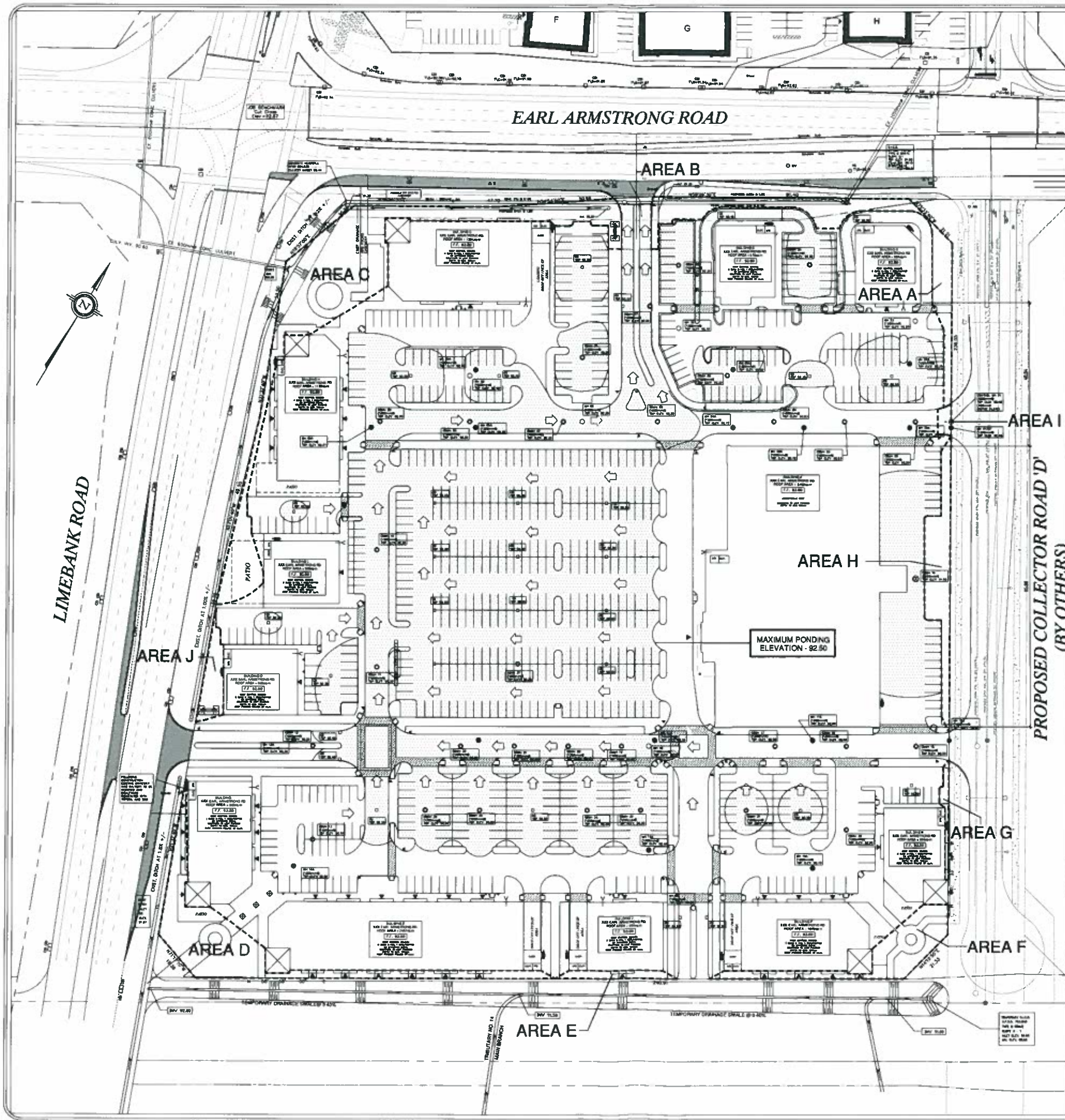
RIVERSIDE SOUTH RETAIL CENTER
CITY OF OTTAWA

MORGUARD INVESTMENTS LTD.
55 CITY CENTER DRIVE
MISSISSAUGA, ONTARIO

FILE No D07-12-14-0067
GRADING PLAN

Designed By: ESK Date: APR 2014 Drawn By: R.S.
Drawn By: XXX Approved By:
Scale: 1:500 Project No: 12007 Drawing No: 10/8

10 - P:\RIVERSIDE SOUTH RETAIL CENTER - SITE PLAN - Working - P.L. 03 Nov 2014 - 1055



AREA	SURFACE TYPE
A - 796 sq.m.	UNCONTROLLED LANDSCAPE
B - 163 sq.m.	UNCONTROLLED ASPHALT
C - 2,084 sq.m.	UNCONTROLLED LANDSCAPE
D - 1,983 sq.m.	UNCONTROLLED LANDSCAPE
E - 99 sq.m.	UNCONTROLLED LANDSCAPE
F - 539 sq.m.	UNCONTROLLED LANDSCAPE
G - 66 sq.m.	UNCONTROLLED LANDSCAPE
H - 496 sq.m.	CONTROLLED LANDSCAPE
I - 43 sq.m.	UNCONTROLLED ASPHALT
J - 192 sq.m.	UNCONTROLLED LANDSCAPE
48,854 sq.m.	CONTROLLED ASPHALT
10,005 sq.m.	CONTROLLED BUILDINGS
63,357 sq.m.	TOTAL SITE AREA

SURFACE PONDING VOLUME	
ELEV. 91.70 = 1 cu.m.	
ELEV. 91.80 = 6 cu.m.	
ELEV. 91.90 = 17 cu.m.	
ELEV. 92.00 = 32 cu.m.	
ELEV. 92.10 = 48 cu.m.	
ELEV. 92.20 = 66 cu.m.	
ELEV. 92.30 = 87 cu.m.	
ELEV. 92.40 = 108 cu.m.	
ELEV. 92.50 = 1,486 cu.m.	
TOTAL STORAGE = 2,490 cu.m.	

STORM WATER MANAGEMENT SUMMARY TABLE	
SITE AREA SUMMARY (sq.m.)	
PAVED	48,801
LANDSCAPED	496
ROOF	10,005
UNCONTROLLED PAVED	225
UNCONTROLLED LANDSCAPED	4,838
TOTAL SITE AREA	65,357

ROOF DRAINAGE SYSTEM	
TOTAL ROOF AREA	10,005 sq.m.
PEAK OUTFLOW RATE	48 l/s
TOTAL NO. OF ROOFS	32
REQUIRED ROOF STORAGE	402 cu.m.
AVAILABLE ROOF STORAGE	678 cu.m.

SITE DRAINAGE SYSTEM - 100 YEAR	
ORIFICE DIAMETER	450 mm
MAXIMUM PONDING DEPTH	98.50 m
ORIFICE HEIGHT	0.30 m
ORIFICE RELEASE RATE	88.15 l/s/m
UNCONTROLLED RELEASE RATE	150.7 l/s/m
TOTAL RELEASE RATE	1047.8 l/s/m
ALLOWABLE RELEASE RATE	1327.0 l/s/m
REQUIRED SITE STORAGE	947 cu.m.
AVAILABLE SITE STORAGE	2,686 cu.m.

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

ELEVATION KEY	
1. 1.0m	UNCONTROLLED SITE PLAN
2. 1.0m	UNCONTROLLED SITE PLAN
3. 1.0m	UNCONTROLLED SITE PLAN
4. 1.0m	UNCONTROLLED SITE PLAN
5. 1.0m	UNCONTROLLED SITE PLAN
6. 1.0m	UNCONTROLLED SITE PLAN

APPROVED BY: [Signature]
 Director of Engineering

URSIAN ECOSYSTEMS LIMITED
 1000 BAYVIEW AVE. SUITE 100
 SCARBOROUGH, ONTARIO M1S 5B7
 TEL: (416) 291-1111
 WWW.URSIAN.COM

RIVERSIDE SOUTH RETAIL CENTER
 CITY OF OTTAWA
 MORGUARD INVESTMENTS LTD.
 55 CITY CENTER DRIVE
 MARKHAM, ON L3R 9V9

FILE No D07-12-14-0067
SWM DRAINAGE PLAN

Designed By: [Signature]	Date: APR 2011	Checked By: [Signature]
Drawn By: [Signature]	Project No: 12007	Approved By: [Signature]
Scale: 1:500		Sheet No: 3 of 8

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



APPENDIX A

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
 MUNICIPALITY: CITY OF OTTAWA
 FILE NO.: 12007.100
 Date: revised AUGUST 13, 2014
 LOCATION: 1420 EARL ARMSTRONG ROAD

URBAN ECOSYSTEMS LIMITED
 7650 WESTON ROAD, SUITE 705
 WOODBRIDGE, ONTARIO L4L 8G7
 uel@urbanecosystems.com
 (905)856-0629
 (905)856-0688



SITE STORM WATER MANAGEMENT

SUMMARY

	Total	
Site area (sq.m) :	65367	65367
Controlled Pavement area (sq.m) :	49801	49801
Controlled Landscaped area (sq.m) :	496	496
BLDGs B,C,D,E,F,G,H,I,J,K Roof area (sq.m) :	10005	10005
Uncontrolled Pavement area (sq.m.) :	226	226
Uncontrolled Landscape area (sq.m.) :	4839	4839

Includes Building A

SYSTEM A

CONTROLLED	Orifice release rate (l/sec) :	887.1
UNCONTROLLED	Site release rate (l/sec) :	160.7
TOTAL	Site release rate (l/sec) :	1047.8
ALLOWABLE	Site release rate (l/sec) :	1327.0

ROOF DRAINAGE CHARACTERISTICS

Total roof area (sq. m) : 10005
 Total number of roof hoppers : 32
 Total number of weirs : 32
 Max. sloped roof depth (mm) : 50.8
 Max. sloped roof storage (cu.m) : 169.42
 Max. parapit roof storage (cu.m) : 508.25
 Weir rating (l/sec) : 0.15
 Weir area rating (sq. m.) : 465
 Maximum head (cm) : 10.16
 Peak roof outflow rate (l/sec) : 48.8

SITE PLAN CHARACTERISTICS - SYSTEMS A

Pavement coefficient : 0.95
 Landscape coefficient : 0.625
 Roof area coefficient : 0.95
 Rainfall intensity (mm/hr) :
 1 2yr = $732.951 / (6.199 + t)^{0.810}$
 1 5yr = $998.071 / (6.053 + t)^{0.814}$
 1 100yr = $1735.688 / (6.014 + t)^{0.820}$
 Controlled Pavement area (sq.m) : 65367
 Controlled Landscaped area (sq.m) : 49801
 Controlled Landscaped area (sq.m) : 496
 Proposed Roof area (sq.m) : 10005
 Uncontrolled Pavement area (sq.m) : 226
 Uncontrolled Landscaped area (sq.m) : 4839

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)	Total head on roof hoppers (cm)	Roof outflow volume (cu.m)	Required storage volume (cu.m)
5	242.70	640.84	192.25	14.63	177.62	169.42	8.20	5.16	24.78	7.43	5.23	7.54	184.82
10	178.56	471.47	282.88	29.26	253.62	169.42	84.20	5.92	28.42	17.05	5.92	17.41	265.83
15	142.89	377.30	339.57	43.89	295.68	169.42	126.26	6.34	30.44	27.40	6.51	28.11	311.46
20	119.95	316.72	380.06	58.52	321.54	169.42	152.12	6.60	31.68	38.02	6.81	39.20	340.86
25	103.85	274.20	411.30	73.15	338.15	169.42	168.73	6.77	32.48	48.72	7.01	50.48	360.82
30	91.87	242.57	436.63	87.78	348.84	169.42	179.43	6.87	32.99	59.39	7.16	61.84	374.79
35	82.58	218.04	457.89	102.41	355.48	169.42	186.06	6.94	33.31	69.95	7.26	73.22	384.67
40	75.15	198.42	476.20	117.04	359.15	169.42	189.74	6.98	33.49	80.37	7.34	84.59	391.61
45	69.05	182.32	492.27	131.67	360.60	169.42	191.18	6.99	33.56	90.60	7.40	95.92	396.35
50	63.95	168.87	506.60	146.30	360.29	169.42	190.88	6.99	33.54	100.62	7.44	107.20	399.40
55	59.62	157.43	519.52	160.93	358.59	169.42	189.17	6.97	33.46	110.42	7.48	118.42	401.11
60	55.89	147.59	531.31	175.56	355.74	169.42	186.32	6.94	33.32	119.96	7.50	129.57	401.74
65	52.65	139.01	542.13	190.20	351.94	169.42	182.52	6.90	33.14	129.25	7.51	140.65	401.48
70	49.79	131.47	552.16	204.83	347.33	169.42	177.91	6.86	32.92	138.26	7.52	151.67	400.48
75	47.26	124.77	561.48	219.46	342.03	169.42	172.61	6.81	32.67	146.99	7.53	162.64	398.85
80	44.99	118.79	570.22	234.09	336.13	169.42	166.71	6.75	32.38	155.43	7.53	173.55	396.67
85	42.95	113.42	578.42	248.72	329.71	169.42	160.29	6.68	32.07	163.58	7.53	184.41	394.01
90	41.11	108.55	586.17	263.35	322.82	169.42	153.41	6.61	31.74	171.42	7.53	195.23	390.94
95	39.43	104.12	593.51	277.98	315.53	169.42	146.11	6.54	31.39	178.95	7.53	206.03	387.48
100	37.90	100.08	600.48	292.61	307.87	169.42	138.45	6.46	31.03	186.16	7.53	216.80	383.68
105	36.50	96.37	607.12	307.24	299.88	169.42	130.46	6.38	30.64	193.05	7.53	227.56	379.56
110	35.20	92.95	613.47	321.87	291.60	169.42	122.18	6.30	30.25	199.62	7.52	238.33	375.14
115	34.01	89.79	619.54	336.50	283.04	169.42	113.62	6.22	29.84	205.86	7.52	249.11	370.43
120	32.89	86.86	625.37	351.13	274.24	169.42	104.82	6.13	29.41	211.77	7.52	259.91	365.46
125	31.86	84.13	630.97	365.76	265.21	169.42	95.79	6.04	28.98	217.35	7.52	270.75	360.22
130	30.90	81.58	636.36	380.39	255.97	169.42	86.55	5.95	28.54	222.58	7.52	281.64	354.72

Roof = RAIN = 2.640 x I (l/sec)

Peak roof outflow rate =
 no. of hoppers x weir rating x max. head
 = 48.8 l/sec
 Peak roof outflow volume =
 = 48.8 x time x 60/1000 cu. m.

Roof outflow rate =
 head x weir rating x no. of hoppers
 = head x 4.80 l/sec

Required max. roof storage (cu. m.) : 401.7
 Available roof storage (cu. m.) : 677.7

Total 32 hoppers
 Total 32 hoppers



SYSTEM A 100 YR STORM
SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) : 49801
 Controlled Landscaped area (sq.m) : 496
 Total area - excl. Bldg (sq.m) : 50297
 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	2410.94	1446.57	532.25	914.31
15	142.89	1939.13	1745.22	798.38	946.83
20	119.95	1635.60	1962.73	1064.51	898.22
25	103.85	1422.57	2133.86	1330.64	803.22

Required site storage (cu. m) : 947
 Available site storage (cu. m) : 2886
 SEE DRAWING SP-1

$$Q_{\text{site}} = \text{RAIN} + Q_{\text{roof}} = 13.229 \times I + 48.8 \text{ l/sec}$$

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)
10	178.56	160.67
15	142.89	128.58
20	119.95	107.93

Peak runoff (L/sec) : 160.7

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) : 226
 Uncontrolled Landscaped area (sq.m.) : 4839
 Total area (sq.m) : 5065
 Composite runoff coefficient : 0.640

SYSTEM A 100 YR STORM
SITE SUMMARY

Orifice release rate (l/sec) : 887.1
 Uncontrolled release rate (l/sec) : 160.7
 Total site release rate (l/sec) : 1047.8
 Allowable site release rate (l/sec) : 1327.0

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A TO K)
MUNICIPALITY: CITY OF OTTAWA
JOB NO.: 12007.100
DATE: revised AUGUST 13, 2014
LOCATION: 1420 EARL ARMSTRONG ROAD

ROOF DRAINAGE CHARACTERISTICS

SITE PLAN CHARACTERISTICS - S Y S T E M S A

Pavement coefficient: 0.9
Landscape coefficient: 0.25
Roof area coefficient: 0.95
rainfall intensity (mm/hr):
12yr = 732.951/(6.199+t)^0.810
15yr = 998.071/(6.053+t)^0.814
100yr = 1735.688/(6.014+t)^0.820
Site area (sq.m): 65367
Controlled Pavement area (sq.m): 49801
Controlled Landscaped area (sq.m): 496
Proposed Roof area (sq.m): 10005
Uncontrolled Pavement area (sq.m.): 226
Uncontrolled Landscaped area (sq.m.): 4839

Total roof area (sq. m): 10005
Total number of roof hoppers: 32
Total number of weirs: 32
Max. sloped roof depth (mm): 50.8
Max. sloped roof storage (cu.m): 169.42
Max. parapit roof storage (cu.m): 508.25
Weir rating (l/sec): 0.15
Weir area rating (sq. m.): 465
Maximum head (cm): 10.16
Peak roof outflow rate (l/sec): 48.8

32 hoppers @ 1 weir = 32
0 hoppers @ 2 weir = 0
Total 32 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	372.77	111.83	14.63	97.20	97.20	-72.22	2.19	10.53	3.16	108.67	2.65	3.82	108.01	
10	104.19	275.11	165.07	29.26	135.81	135.81	-33.61	3.74	17.93	10.76	154.31	4.48	12.89	152.18	
15	83.56	220.63	198.56	43.89	154.67	154.67	-14.75	4.49	21.55	19.40	179.16	5.18	22.37	176.20	
20	70.25	185.49	222.59	58.52	164.07	164.07	-5.35	4.87	23.36	28.03	194.56	5.33	30.71	191.88	
25	60.90	160.79	241.19	73.15	168.03	168.03	-1.38	5.02	24.12	36.18	205.01	5.44	39.14	202.05	
30	53.93	142.39	256.30	87.78	168.52	168.52	-0.90	5.04	24.21	43.58	212.72	5.51	47.63	208.67	
35	48.52	128.11	269.02	102.41	166.61	166.61	-2.81	4.97	23.85	50.08	218.95	5.58	56.20	212.83	
40	44.18	116.67	280.00	117.04	162.95	162.95	-6.46	4.82	23.14	55.54	224.45	5.63	64.86	215.14	
45	40.63	107.28	289.65	131.67	157.97	157.97	-11.45	4.62	22.19	59.91	229.74	5.68	73.65	216.00	
50	37.65	99.42	298.26	146.30	151.96	151.96	-17.46	4.38	21.03	63.10	235.16	5.74	82.61	215.65	
55	35.12	92.74	306.04	160.93	145.11	145.11	-24.31	4.11	19.72	65.07	240.97	5.80	91.80	214.25	
60	32.94	86.98	313.14	175.56	137.58	137.58	-31.84	3.81	18.27	65.79	247.36	5.86	101.24	211.90	
65	31.04	81.97	319.68	190.20	129.48	129.48	-39.94	3.48	16.72	65.21	254.47	5.93	111.01	208.67	
70	29.37	77.55	325.73	204.83	120.90	120.90	-48.52	3.14	15.07	63.31	262.42	6.01	121.15	204.58	
75	27.89	73.64	331.37	219.46	111.91	111.91	-57.51	2.78	13.35	60.07	271.30	6.10	131.72	199.64	
80	26.56	70.13	336.65	234.09	102.56	102.56	-66.86	2.41	11.55	55.46	281.19	6.20	142.78	193.87	
85	25.37	66.98	341.62	248.72	92.90	92.90	-76.52	2.02	9.70	49.47	292.15	6.31	154.39	187.23	
90	24.29	64.13	346.31	263.35	82.96	82.96	-86.46	1.62	7.79	42.08	304.23	6.43	166.60	179.71	
95	23.31	61.54	350.76	277.98	72.78	72.78	-96.64	1.22	5.84	33.28	317.48	6.56	179.48	171.28	
100	22.41	59.16	354.98	292.61	62.38	62.38	-107.04	0.80	3.84	23.05	331.93	6.70	193.08	161.90	
105	21.58	56.99	359.02	307.24	51.78	51.78	-117.64	0.38	1.81	11.39	347.62	6.86	207.48	151.53	
110	20.82	54.98	362.87	321.87	41.00	41.00	-128.42	-0.05	-0.26	-1.72	364.58	7.03	222.73	140.13	
115	20.12	53.12	366.56	336.50	30.06	30.06	-139.36	-0.49	-2.36	-16.28	382.84	7.21	238.90	127.66	
120	19.47	51.40	370.10	351.13	18.97	18.97	-150.45	-0.93	-4.49	-32.31	402.41	7.41	256.05	114.05	
125	18.86	49.80	373.50	365.76	7.74	7.74	-161.68	-1.38	-6.64	-49.82	423.32	7.62	274.24	99.26	
130	18.29	48.31	376.78	380.39	-3.61	-3.61	-173.03	-1.84	-8.82	-68.80	445.58	7.84	293.54	83.24	

Roof= RAIN = 2.640 x I (l/sec)
Peak roof outflow rate = no. of hoppers x weir rating x max. head = 48.8 l/sec
Peak roof outflow volume = 48.8 x time x 60/1000 cu. m.
Required max. roof storage (cu. m.): 216.0
Available roof storage (cu. m.): 677.7

Roof outflow rate = head x no. of hoppers = head x 4.80 l/sec

**SYSTEM A 5 YR STORM
 SITE STORM WATER MANAGEMENT**

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) : 49801
 Controlled Landscaped area (sq.m) : 496
 Total area - excl. Bldg (sq.m) : 50297
 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	1349.69	809.81	512.53	297.28
15	83.56	1092.04	962.83	768.80	214.03
20	70.25	925.90	1111.08	1025.07	86.01
25	60.90	809.10	1213.64	1281.34	-67.69

Required site storage (cu. m) : 297
 Available site storage (cu. m) : 396
 SEE DRAWING SP-1

$$Q_{site} = RAIN + Q_{roof} = 12.486 \times I + 48.8 \text{ l/sec}$$

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)
10	104.19	40.90
15	83.56	32.80
20	70.25	27.58

Peak runoff (L/sec) : 40.9

**UNCONTROLLED
 SITE CHARACTERISTICS**

Incontrolled Pavement area (sq.m.) : 226
 Incontrolled Landscaped area (sq.m.) : 4839
 Total area (sq.m) : 5065
 Composite runoff coefficient : 0.279

**SYSTEM A 5 YR STORM
 SITE SUMMARY**

Orifice release rate (l/sec) : 854.2
 Uncontrolled release rate (l/sec) : 40.9
 Total site release rate (l/sec) : 895.1
 Allowable site release rate (l/sec) : 1327.0

Urban Ecosystems Limited
7050 WESTON ROAD, SUITE 705
WOODBIDGE, ONTARIO L4L 8G7
uel@urbanecosystems.com
t. (905)856-0629
f. (905)856-0698



APPENDIX B

Tributary No. 14

Approximately 68.14 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 68.14 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, south of the Subject Property, conveying all storm flows from the undeveloped upstream lands, discharging to the road side ditch along Limebank Road. Two existing ditch inlet catchbasins on the east side of Limebank Road, connected to the 2,700 mm diameter storm sewer, will capture approximately 1,000 l/s of the storm flows from the area south of the Subject Property.

Excess flows, being approximately 719 l/s, will be conveyed through a temporary overflow swale flowing east along the south boundary of the Subject Property, to a proposed ditch inlet catchbasin connected to the proposed 1800 mm diameter storm sewer on Collector Road D. Copies of the Site Grading Plan and External Storm Drainage Area Plan are included in the rear pockets of this report.

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

```
*****
# 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.

```
.500 DESIGN NASHYD      01:200      63.30    2.056 No_date  13:22  51.59
      [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.

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

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

```
.500 DESIGN NASHYD      01:200      63.30    1.719 No_date  13:48  51.59
      [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 =====
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 *****
*****
```

```
***** DETAILED 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: _____ *
*****
```

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 |
Ptotal=103.20 mm

Filename: C:\D DRIVE\24SCSII.mst
 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	
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4.47	2.064	10.47	5.676	16.47	2.580	22.47	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	
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5.07	2.064	11.07	7.740	17.07	1.548	23.07	1.032	
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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	
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5.33	2.064	11.33	11.352	17.33	2.064	23.33	1.032	
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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	
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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

PreOtt

*

PRINT HYD	AREA	(ha)=	63.300
ID=01 (200)	QPEAK	(cms)=	2.056 (i)
DT= 2.00 PCYC=-1	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	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)=	1.730	

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	AREA	(ha)=	63.300
ID=01 (200)	QPEAK	(cms)=	1.719 (i)
DT= 2.00 PCYC=-1	TPEAK	(hrs)=	13.800
	VOLUME	(mm)=	51.591

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

002:0007

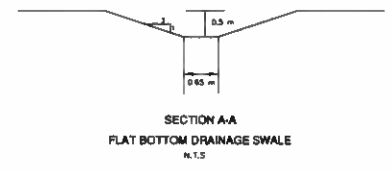
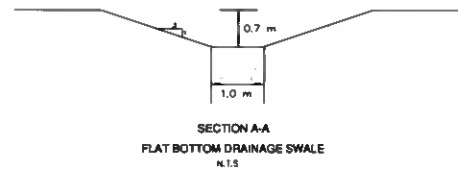
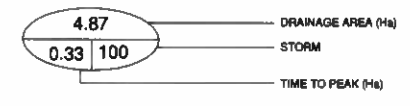
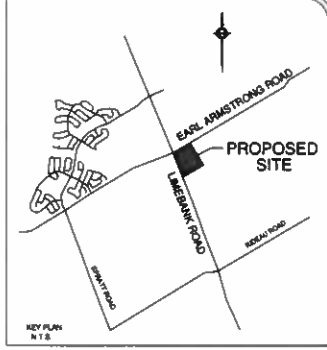
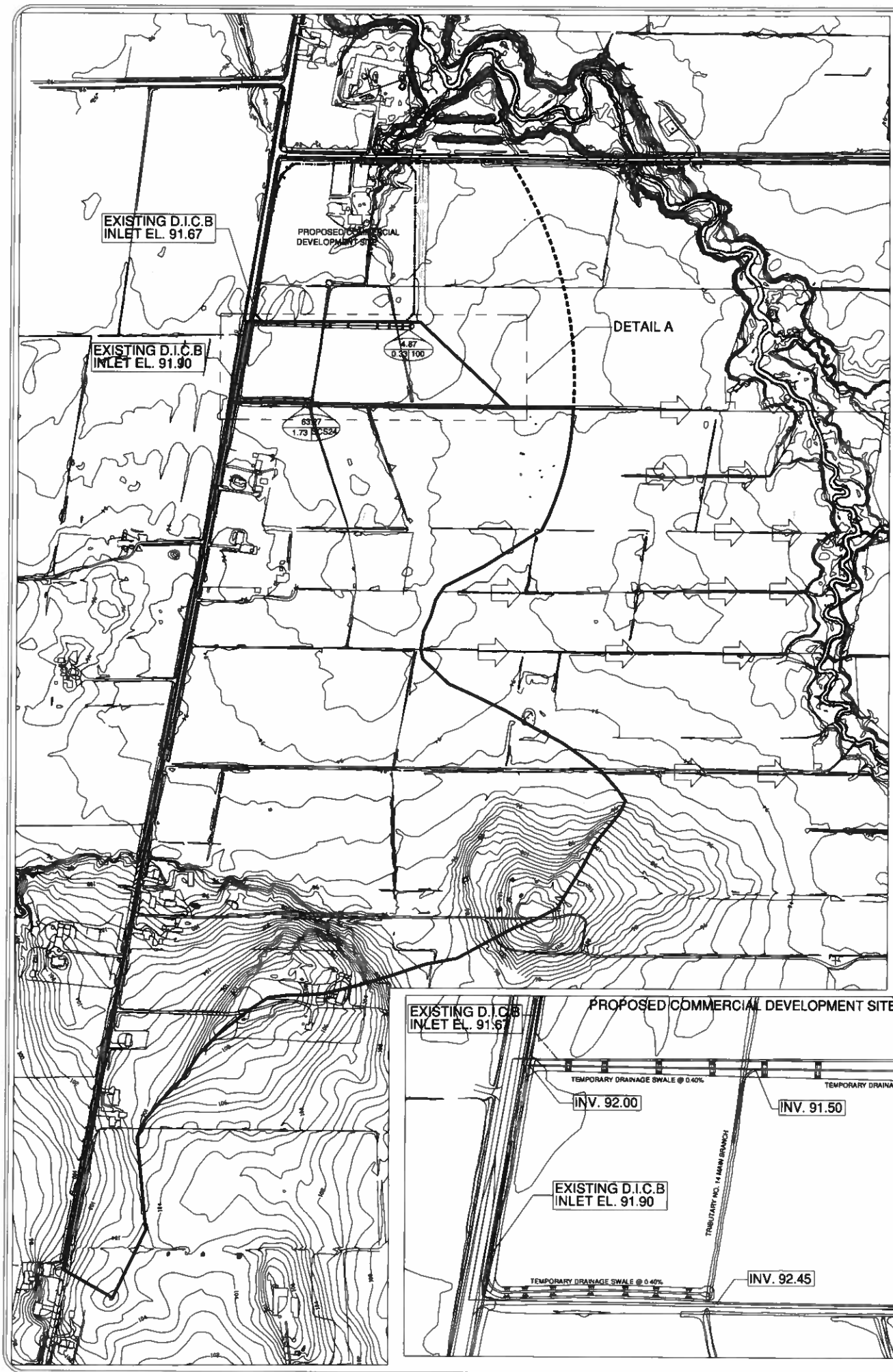
*

FINISH

WARNINGS / ERRORS / NOTES

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

=====
==



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:
ONE CROSS IN CONCRETE FINISH BLIND AT THE NORTH-EAST CORNER OF EARL ARMSTRONG ROAD AND LAMBANK ROAD AS ESTABLISHED BY ARNS, O'SULLIVAN, VOLLENDOEK LTD. O.L.S.

ELEVATION IN METERS

NO.	DESCRIPTION	ELEVATION
1	LOCAL BENCHMARK	91.67
2	EXISTING D.I.C.B INLET	91.67
3	EXISTING D.I.C.B INLET	91.90
4	TEMPORARY D.I.C.B INLET	90.60
5	TEMPORARY D.I.C.B INLET	88.50

APPROVED AS TO FORM AND SUBSTANCE WITH THE EXCEPTIONS, REVISIONS AND DEVIATIONS LISTED AS TO DESIGN AND PERFORMANCE.

RESHARD SACCO
C.E.T. 18, 2002
PROFESSOR OF ENGINEERING

URBAN ECOSYSTEMS LIMITED
1000 WILSON AVENUE SUITE 100
WILLOWDALE, ONTARIO M2H 1A7
416-491-8888
1 PROGRESS RD
1 PROGRESS RD

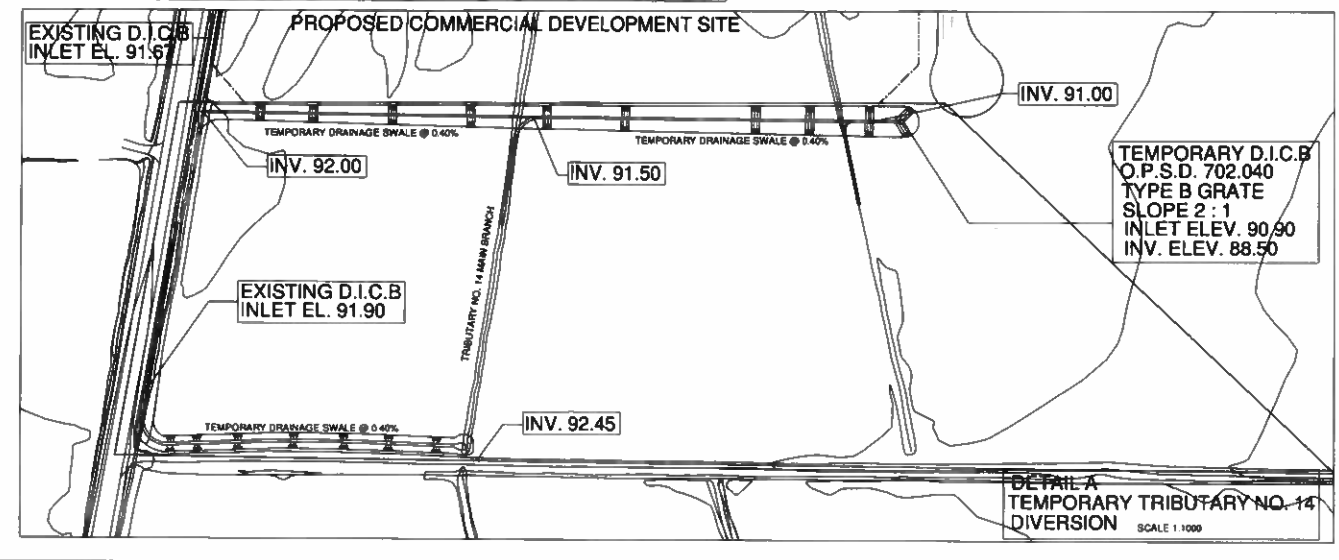
UJEL

RIVERSIDE SOUTH RETAIL CENTER
CITY OF OTTAWA

MORGUARD INVESTMENTS LTD.
55 CITY CENTER DRIVE
MISSISSAUGA, ONTARIO

FILE No D07-12-14-0067
EXTERNAL STORM DRAINAGE AREA PLAN

Designed By: XXX	Date: APR 2014	Checked By: A.S.
Drawn By: XXX	Project No: 12007	Approval: XXX
Scale: 1:2000	Project No: 12007	Drawing No: 8 of 8



10 - PLAN/2014/2007/211C - Planning - City of Ottawa - 2014 - 10/25

APPENDIX B

CITY OF OTTAWA

DEVELOPMENT SERVICING STUDY CHECKLIST

4.1 General Content

Executive Summary (for larger reports only).

- Not Applicable

Date and revision number of the report.

- Addressed in Servicing Design Brief and Stormwater Management Report

Location map and plan showing municipal address, boundary, and layout of proposed development.

- Addressed in Servicing Design Brief and Stormwater Management Report

Plan showing the site and location of all existing services.

- Addressed on drawing 12007, 2 of 5 in the Servicing Design Brief and Stormwater Management Report

Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

- Servicing Design and Stormwater Management Report has been undertaken in support of the Site Plan application
- The Servicing Design and proposed Stormwater Management is consistent with the Riverside South Community Master Drainage Plan and the design report for Riverside South Community Phase 6
- Development statistics are included on the site plan

Summary of Pre-consultation Meetings with City and other approval agencies.

- City comments are addressed in Servicing Design Brief and Stormwater Management Report
- A pre-consultation meeting with the City of Ottawa took place on October 1, 2013

Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.

- Riverside South Community Master Drainage Plan Update, Final Report by Stantec dated September 30, 2008
- Design Report for Riverside South Community Phase 6 by JL Richards & Associates Ltd dated January 2012

Statement of objectives and servicing criteria.

- Addressed in section 1.3 of the Servicing Design Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area.

- Addressed on drawing 12007, 2 of 5 and in Servicing Design Brief and Stormwater Management Report

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

- Tributary No. 14

Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

- Addressed on drawing 12007, 1 of 5 of the Servicing Design Brief and Stormwater Management Report

Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

- Not Applicable

Proposed phasing of the development, if applicable.

- The development will be phased (two phases) as shown on the site plan and engineering drawings

Reference to geotechnical studies and recommendations concerning servicing.

- Separate report submitted to City

All preliminary and formal site plan submissions should have the following information:

- All addressed as required On drawings and in Servicing Design Brief and Stormwater Management Report

4.2 Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available.

- Servicing Design and Proposed Stormwater management is consistent with the Master Servicing Study

Availability of public infrastructure to service proposed development.

- Addressed in section 5.0 of the Servicing Design Brief and Stormwater Management Report

Identification of system constraints.

- Not Applicable

Identify boundary conditions.

- Will be addressed in subsequent submission

Confirmation of adequate domestic supply and pressure.

- Addressed in Design Report for Riverside South Community Phase 6

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.

- Addressed in Design Report for Riverside South Community Phase 6

Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

- Addressed in Design Report for Riverside South Community Phase 6

Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.

- The entire Water Distribution System will be installed in Phase 1

Address reliability requirements such as appropriate location of shut-off valves.

- Not Applicable

Check on the necessity of a pressure zone boundary modification.

- Not Applicable

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.

- Addressed in Design Report for Riverside South Community Phase 6

Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

- Addressed on drawing 12007, 2 of 5 of the Servicing Design Brief and Stormwater Management Report

Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

- Not Applicable

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

- Addressed in section 5.0 of the Servicing Design Brief and Stormwater Management Report

Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

- Not Applicable

4.3 Development Servicing Report: Wastewater

Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

- Addressed in section 2.0 of the Servicing Design Brief and Stormwater Management Report

Confirm consistency with Master Servicing Study and/or justifications for deviations.

- Servicing Design and Proposed Stormwater Management is consistent with the Master Servicing Study

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

- Not Applicable

Description of existing sanitary sewer available for discharge of wastewater from proposed development.

- Addressed in section 2.0 and Appendix A of the Servicing Design Brief and Stormwater Management Report

Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable).

- Addressed in Design Report for Riverside South Community Phase 6

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.

- Not Applicable

Description of proposed sewer network including sewers, pumping stations, and forcemains.

- Not Applicable

Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).

- Not Applicable

Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

- Not Applicable

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

- Not Applicable

Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

- Not Applicable

Special considerations such as contamination, corrosive environment etc.

- Not Applicable

4.4 Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property).

- Addressed in Design Report for Riverside South Community Phase 6

Analysis of available capacity in existing public infrastructure.

- Not Applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

- Addressed on drawing 12007, 2 of 5 of the Servicing Design Brief and Stormwater Management Report

Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period; if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

- Addressed in Design Report for Riverside South Community Phase 6

Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

- Addressed in Design Report for Riverside South Community Phase 6

Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

- Addressed in Design Report for Riverside South Community Phase 6

Set-back from private sewage disposal systems.

- Not Applicable

Watercourse and hazard lands setbacks.

- Not Applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

- Not Applicable

Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

- Servicing Design for Proposed Stormwater Management is consistent with Master Servicing Study

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

- Addressed in Hydrologic Evaluation Calculations in Appendix A

Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

- Tributary No. 14 is approved to be enclosed

Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.

- Addressed in Hydrologic Evaluation Calculations in Appendix A

Any proposed diversion of drainage catchment areas from one outlet to another.

- Not Applicable

Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

- Addressed in Servicing Design Brief and Stormwater Management Report

If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.

- Not Applicable

Identification of potential impacts to receiving watercourses.

- Not Applicable

Identification of municipal drains and related approval requirements.

- Not Applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development.

- Addressed in Servicing Design Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- Addressed in Servicing Design Brief and Stormwater Management Report

Inclusion of hydraulic analysis including hydraulic grade line elevations.

- Not Applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

- Addressed in Servicing Design Brief and Stormwater Management Report

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.

- Not Applicable

Identification of fill constraints related to floodplain and geotechnical investigation.

- Not Applicable

4.5 Approval and Permit Requirements: Checklist

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

- Tributary No. 14 has been approved to be enclosed

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

- A Certificate of Approval application will be submitted with respect to the proposed Stormwater Management Works

Changes to Municipal Drains.

- Not Applicable

Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

- Not Applicable

4.6 Conclusion Checklist

Clearly stated conclusions and recommendations.

- Addressed in section 7.0 of the Servicing Design Brief and Stormwater Management Report

Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

- Not Applicable (First Submission)

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.

- Addressed in Servicing Design Brief and Stormwater Management Report

APPENDIX 'C'

TRIBUTARY NO. 14 TIME TO PEAK AND FLOW CALCULATIONS

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 *****
***** 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). *****
***** NHYD: 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]

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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 OOO          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 HHHH 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 OOO              9 9
                                           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 *****
*****

```

```

***** DETAILED 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: _____ *
*****

```

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	
4.63	2.064	10.63	5.676	16.63	2.580	22.63	1.548	
4.67	2.064	10.67	5.676	16.67	2.580	22.67	1.548	
4.70	2.064	10.70	5.676	16.70	2.580	22.70	1.548	
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          | AREA      (ha)= 63.300
| ID=01 (200 )      | QPEAK    (cms)= 2.056 (i)
| DT= 2.00 PCYC=-1 | 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      | 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)= 1.730

```

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          | AREA      (ha)= 63.300
| ID=01 (200 )      | QPEAK    (cms)= 1.719 (i)
| DT= 2.00 PCYC=-1 | 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

==

APPENDIX 'D'

HYDRAULIC WATERMAIN ANALYSIS

Orjan Carlson

From: Rogers, Christopher <Christopher.Rogers@ottawa.ca>
Sent: July 3, 2014 1:55 PM
To: Elliott, Gord
Subject: RE: Riverside South Retail Centre - 12007.330

Gord,

Boundary conditions are as follows, considering both pre and post pressure zone reconfiguration.

PKHR = 123.9m
MXDY + Fire (7,000 Lpm) = 123.5m
MXDY + Fire (3,000 Lpm) = 125.3m
Max HGL = 147.0m

Disclaimer: Unless otherwise stated, 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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

From: Orjan Carlson [mailto:orjan@urbanecosystems.com]
Sent: 2014/07/03 12:08 PM
To: Elliott, Gord
Cc: Rogers, Christopher
Subject: RE: Riverside South Retail Centre - 12007.330

Good afternoon,

Please find attached, fire flow demand calculations as prepared by the project mechanical engineers, Smith + Andersen. I trust this information is sufficient for you to provide me with the hydraulic boundary conditions for 1420 Earl Armstrong Road.

Regards,
Orjan Carlson



Urban Ecosystems Ltd.
7050 Weston Road, Suite 705
Woodbridge, Ontario
t. (905) 856 0629
f. (905) 856 0698

--!NOTICE OF DISCLAIMER!--

```
*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                *
*                               Analysis for Pipe Networks                  *
*                               Version 2.0                                *
*****
```

Input File: maxdaily.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
101	101	102	250	610
102	102	103	85	200
103	103	104	110	200
104	104	105	110	200
105	105	106	100	200
106	106	107	105	200
107	107	108	90	200
108	108	103	110	200
109	1	101	50	610

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
101	0.00	146.99	55.99	0.00
102	0.00	146.94	55.24	0.00
103	0.00	141.87	50.17	0.00
104	0.00	140.41	48.71	0.00
105	40.00	138.94	47.24	0.00
106	17.00	138.93	47.23	0.00
107	15.00	139.10	47.40	0.00
108	25.00	139.67	47.97	0.00
1	-97.00	147.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
101	97.00	0.33	0.19	Open
102	97.00	3.09	59.64	Open
103	43.18	1.37	13.32	Open
104	43.18	1.37	13.32	Open
105	3.18	0.10	0.11	Open
106	-13.82	0.44	1.62	Open
107	-28.82	0.92	6.30	Open

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
108	-53.82	1.71	20.04	Open

109

97.00

maxdaily
0.33 0.19

Open

```

*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                 *
*                               Version 2.0                               *
*****
    
```

Input File: fireandmax.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
101	101	102	250	610
102	102	103	85	200
103	103	104	110	200
104	104	105	110	200
105	105	106	100	200
106	106	107	105	200
107	107	108	90	200
108	108	103	110	200
109	1	101	50	610

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
101	0.00	146.96	55.96	0.00
102	0.00	146.75	55.05	0.00
103	0.00	124.80	33.10	0.00
104	0.00	116.73	25.03	0.00
105	157.00	108.66	16.96	0.00
106	17.00	110.31	18.61	0.00
107	15.00	113.34	21.64	0.00
108	25.00	117.14	25.44	0.00
1	-214.00	147.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
101	214.00	0.73	0.83	Open
102	214.00	6.81	258.21	Open
103	108.50	3.45	73.39	Open
104	108.50	3.45	73.39	Open
105	-48.50	1.54	16.52	Open
106	-65.50	2.09	28.83	Open
107	-80.50	2.56	42.23	Open

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
108	-105.50	3.36	69.69	Open

109

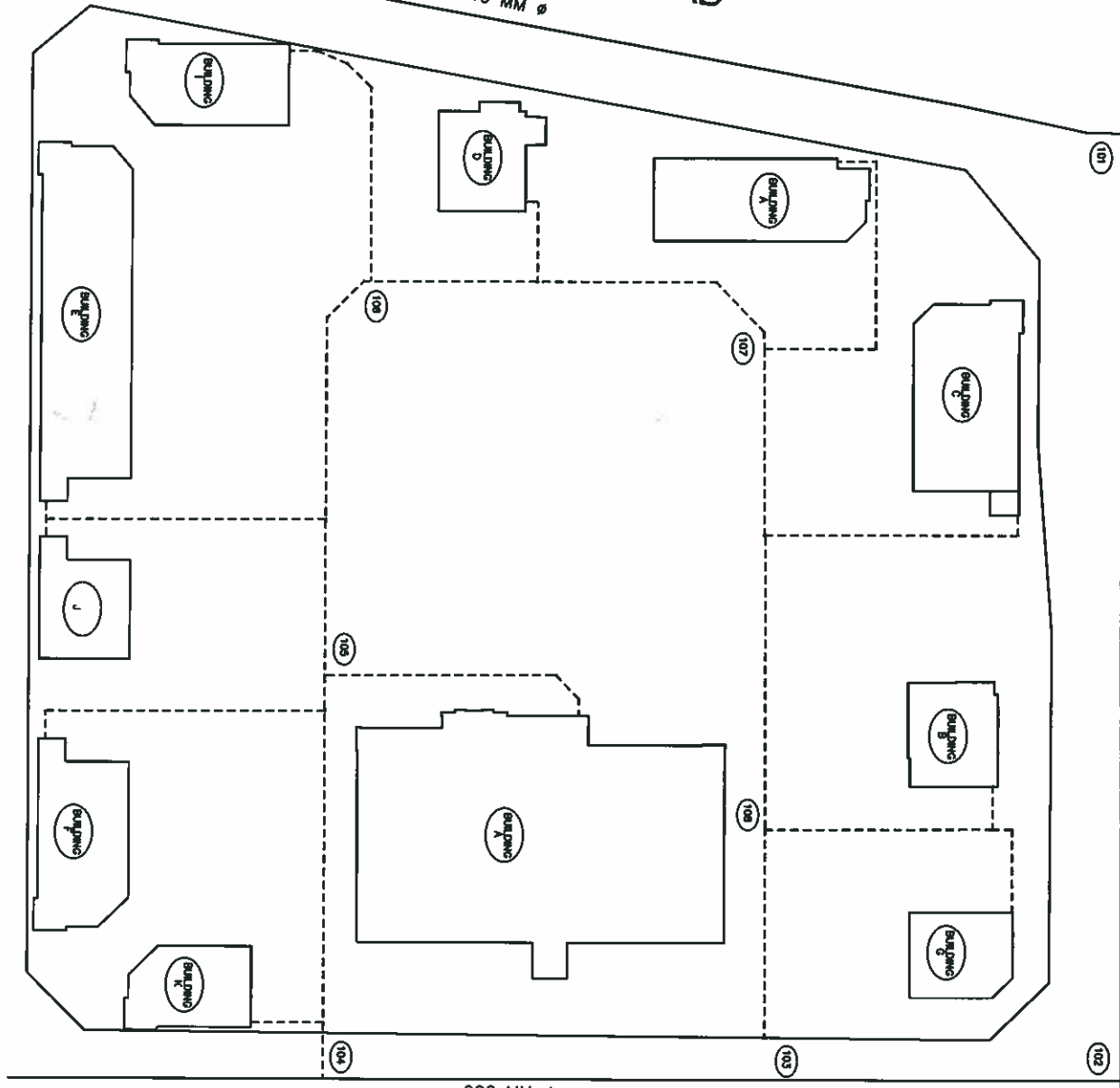
214.00

fireandmax
0.73 0.83

Open

LIMEBANK ROAD
610 MM ϕ

EARL ARMSTRONG ROAD
610 MM ϕ



200 MM ϕ
COLLECTOR ROAD D

LEGEND
— EXTERNAL WATERMAIN
- - - INTERNAL WATERMAIN
⑩ NODE ID

WATERMAIN SCHEMATIC
REVISED SOUTH RETAIL CENTER
12007.330