SERVICING DESIGN BRIEF
AND
STORMWATER MANAGEMENT REPORT

1420 EARL ARMSTRONG ROAD

TOWN SQUARE CENTRE

RIVERSIDE SOUTH

MORGUARD INVESTMENTS LIMITED

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

CITY OF OTTAWA
ONTARIO

FILE NO. 12007.330
APRIL 9, 2014
NOV 6, 2017
REVISED AUG 20, 2020
REVISED MARCH 8, 2021

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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 was revised and dated August 13, 2014.

In August of 2014, the Site Plan Control Approval Application was resubmitted to the City of Ottawa. Additional detailed comments on the Application was provided by the City in November and December 2014.

The City of Ottawa provided additional comments dated June 24, 2016, that were addressed in the Servicing and Design Brief & Stormwater Management Report, revised November 30, 2016.

Subsequently, the City of Ottawa provided further technical comments dated February 24, 2017. The following summarizes those comments and how they have been addressed in the current revision of the Servicing Design Brief and Stormwater Management Report.

Technical Comments – Feb 24, 2017

General Comments

1. The proposed piping system will require municipal consent and an ECA from the Ministry of Environment and Climate Change.

Response: ***MOE Application included for review.***

2. MOECC ECA required for this temporary ditch. Please provide correspondence from the MOECC.

Response: ***MOE Application included for review.***

3. New comment: Due to the grade raise restrictions for this area, please provide a geotechnical memorandum for this site concurring with the final grades shown on the grading plan.

Response: ***Paragraph 6.1 Grading, has been revised and memorandum is attached in Appendix E.***

- Ensure to complete all the title blocks. Some drawings do not mention who designed and who draw the plan.

Response: ***Revised.***

- Provide a draft of the ECA application at the next review.

Response: ***MOE Application included for review.***

4. Prior to issuing commence work notification, the in-service memo for this road will have to be issued. We will put a condition in the agreement.

Response: ***Acknowledged.***

6. The proposed piping system will require municipal consent and an ECA from the Ministry of Environment and Climate Change.

Storm Sewer Design Sheet:

- Some of the pipe sections are not consistently shown in the design sheet (i.e. pipe sections from CBs to CBMH 32).

Response: ***Revised.***

- Pipe section from CBMH 30 to CBMH 29 is not shown.

Response: ***Revised.***

- None of the storm pipes from the buildings are shown on the sheet.

Response: ***Revised.***

- Some of the information is cut-off

Response: ***Revised.***

- Please rectify CBMH 15 to CBMH 14 to CBMH2.

Response: ***Revised.***

- For the existing area, provide capacity based on trapezoidal channel and not pipe sizes.

Response: ***The following response addresses this comment and parts of comments #6 and #10. Analyzing based on the Airport formula would result in flows that are far less than the actual ultimate flows in this area. We have used a 10 minute inlet time and created a design sheet using pipes at a realistic slope that would much more accurately reflect the ultimate flows and times of concentration for this area.***

The attached design sheet and servicing/drainage area drawings show that the proposed 900mm diameter pipe along Earl Armstrong is designed to pick up the flow from the existing 600mm diameter culvert crossing Limebank (200 l/s) as well as the difference between the 10 year and 100 year flows (521 l/s) that will be picked up by the proposed DICB in the vicinity of the existing 600mm culvert.

We have also identified the 0.03Ha of uncontrolled drainage at the Earl Armstrong entrance to our site as 100 year flow entering our 900mm pipe

through the double catchbasins shown.

- The time of flow can be calculated based on the Airport Formula.

Response: ***See above.***

- Separate the flows going into the existing CB inlet south of the future Town Square Boulevard and the flows north of Town Square Boulevard. The flows should be based on the Sewer Design Guidelines – minor system for 10 year return period. The table needs to be rectified for the external flows on the second page. May you should use a different table for clarity purposes. If you need the plans to show the drainage from Limebank, please let me know.

Response: ***External plan revised to reflect design sheet.***

- Should MH 38 be MH 33?

Response: ***Revised.***

10. You are only required to show one example of detailed calculations, but you must provide the storage tables for each catchment area including the roof tops and surface storage. This is required to determine the storm seer design sheet. – The rooftop storage tables should be done for each roof, not all roofs combined. You can use the same table for roofs with the same shape and area. (i.e. roofs buildings D and L).

Response: ***On drawing 3 of 8, SWM Drainage Plan, we have summarized the surface ponding volume for each catchment area, during the 1:100 year storm event. We have also summarized the roof ponding volumes for each of the controlled buildings, during the 1:100 year storm event.***

The ponding on the building roofs and the surface ponding are independent of each other. It will therefore not be correct to combine the two types of ponding in one calculation. Furthermore, the ponding has no direct impact on the design of the minor system. The storm sewers are designed to be free flowing during the 1:5 year storm event. Roof runoff is an input on the storm sewer design sheet, using the maximum runoff based on the number of roof drains and 10 cm of head. That is a conservative method, as the maximum head during a 100 year storm event is only 7.5 cm and during a 5 year storm event is 5.7 cm, as shown in the SWM Report.

The table summarizing the roof storage volumes is based on the number of drains on each of the controlled roofs. This is very similar to the results if each roof will be modelled separately. The differences would be immaterial as the model assume 10 cm of ponding during a 1:100 year storm event, whereas the maximum ponding is only approximately 7.5 cm.

We trust the above clarifications address your comments.

- The proposed works for the storm pipe to connect to the culvert under Earl Armstrong and discharging into Mosquito Creek will require an MOECC ECA. River Valley Conservation Authority (RVCA) will have to be consulted for the new pipe system. Provide correspondence and comments from RVCA and the MOECC Ottawa District Office. Municipal Approval is required for this pipe. Provide design to Marina Down at marina.down@ottawa.ca. Any pipe section on private land will require an easement for the City if it hasn't been conveyed already.

Response: ***Paragraph 3.3 Major Stormwater Conveyance from the site has been revised and correspondence is included in Appendix F. Also see above response to comment #6.***

- At the end of the report, you are mentioning Morguard will be enclosing tributary 14, should this be done by Urbandale for the subdivision works? Please confirm. Provide correspondence for the conservation authority to determine what is required for this site.

Response: ***We are making an MOECC application for this enclosure and provided it with this submission.***

14. Asad Yousfani & OC Transpo staff to review and confirm temporary ditch & finished grades at south property line /BRT corridor are acceptable – pending.

Response: ***Acknowledged.***

19. Further review for the grading plans will be done, once the stormwater management is addressed:

- Pending the approval of the RMA for Earl Armstrong. We are waiting from the transportation team to determine to the property design. Provide grades along the new right turn lane, entrance on the north side of the site. Is it possible to provide grades to remove the proposed catchbasins on the north entrance?

Response: ***Acknowledged. We have added detailed grading information at the entrance and have shown the relocated DCBs.***

- Pending the approval of the RMA for Earl Armstrong. We are waiting from the transportation team to determine to the proper design. Provide grades along the entrance on Limebank Road.

Response: ***Acknowledged. We have added detailed grading information at the entrance.***

26. Capacity of 900 diam. storm sewer in Earl Armstrong Road to be reviewed and possibly a hybrid sewer/ditch combination could be considered. Provide flow from the proposed catchbasins located on the north side of the site at the new entrance (for 100 year if uncontrolled flow). MOE ECA application will likely be required. Please correspond with Ottawa MOECC office and provide comments to the City: Emily Diamond at 613-521-3450 ext. 238 or Emily.diamond@ontario.ca – I couldn't find the 100 year flow.

Response: ***The revised design sheet confirms that the 900 diam. storm sewer will convey the flows. We have also shown the 100 year flow into the DCBs on the design sheet and storm drainage area plan.***

33. New comments: Provide a detail for the storm connection to the existing ditch inlet to be removed and connection with the new ditch inlet for the temporary storm ditch.

Response: ***We have relocated the manhole outside of the future sidewalk and adjusted the location of the DICB.***

37. Condition – circulate to Urbandale (change of file lead)

Response: ***Acknowledged.***

45. Show high voltage hydro pole line fronting the site on Limebank & Earl Armstrong Road. Some of the poles are close to the proposed 900 mm diameter concrete storm sewer. Please discuss with Hydro for relocation of the hydro lines and provide correspondence to the City including Marina Down (Municipal Approval). – pending municipal consent.

Response: ***The hydro lines are shown and there seems to be no conflict with the existing poles.***

46. Additional details of existing off-site utilities will be required and municipal consent circulation required if there is extensive off-site works. Provide response when available. Please note it could hold up approval and commence work notification. –pending municipal consent.

Response: ***Acknowledged.***

50. Please rectify to say proposed instead of propose.

Response: ***Revised.***

51. Please clarify the 600 mm and 1200 mm culverts connections to the manhole.

Response: ***We have shown a "doghouse" requirement for the manhole connections to the existing culverts.***

52. Shown the easement limits on the plan.

Response: ***Revised.***

1.0 INTRODUCTION

1.1 Background

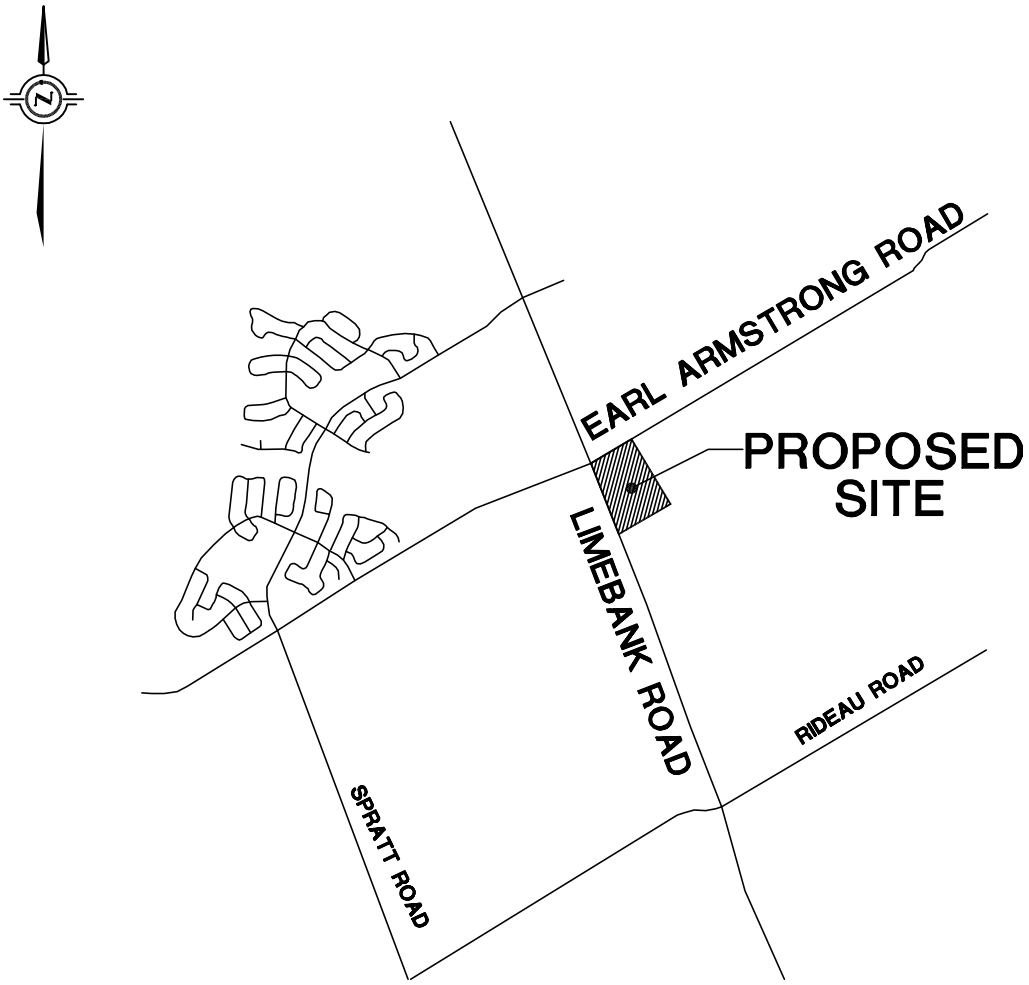
The Property, being the subject of this Design Brief, is a vacant parcel of land having a municipal address of 1420 Earl Armstrong Road, Ottawa, Ontario (the Subject Property). The site location is shown on **Figure No. 1**. The legal description of the Property is described as Parts 4, 5 and 6, Plan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

Morguard Investments Limited has filed 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 current 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, Ceremonial Road (under construction) to the east and future Town Square Boulevard 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 a topographic survey, also showing site features, is illustrated on **Figure No. 4**.



Morguard
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PENSION FUND REALTY LIMITED

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KEY PLAN

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uel@urbanecosystems.com
t. (905)856-0629
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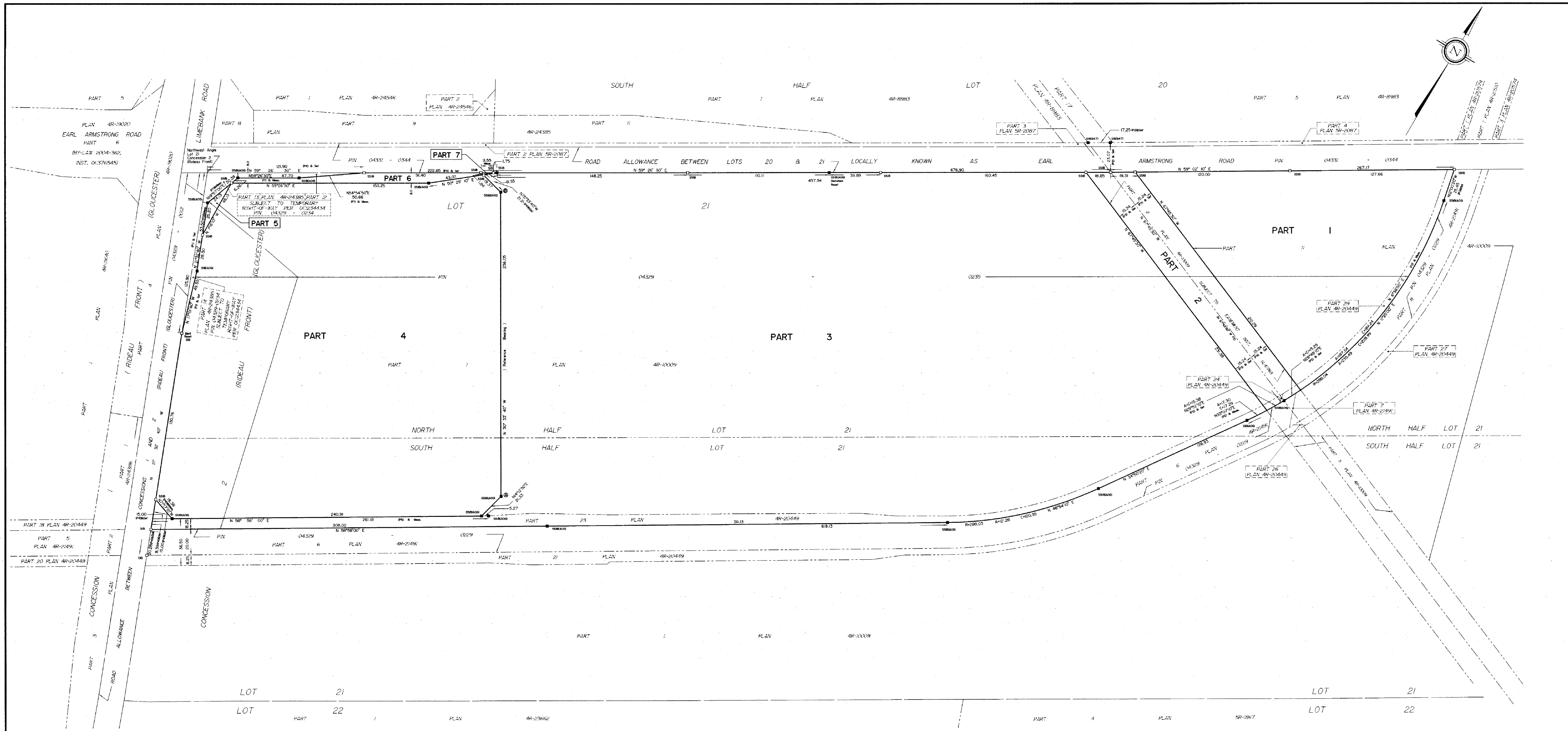
DATE	PROJECT No.	FIGURE No.
APRIL 2014	12007.330	1



I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT. DATE August 29/2011 EDWARD M. LANCASTER ONTARIO LAND SURVEYOR	PLAN 4R-25540 RECEIVED AND DEPOSITED DATE: Aug 24-11 LAND REGISTRAR FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON NO. 4.

SCHEDULE

PART	PART OF LOT	CONCESSION	ALL OF PIN
1			
2		2	
3			
4	21	(RIDEAU FRONT)	04329-0235
5		(GLOUCESTER)	
6			
7			

Part 2: Subject to easement Inst. GL41763.

PLAN OF SURVEY OF

PART OF LOT 21

CONCESSION 2 (RIDEAU FRONT)

Geographic Township of Gloucester

CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 1000

40 30 20 10 0 20 40 Metres

Metric

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

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act, the Land Titles Act and the regulations made under them.
2. The survey was completed on the 3rd day of August, 2011.

August 29/2011 — Date

Edward M. Lancaster
Ontario Land Surveyor

Notes & Legend

—□—	Denotes	Survey Monument Planted
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
(WIT)	"	Witness
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
Meas.	"	Measured
(P1)	"	Plan 4R-24385
(P2)	"	Plan 4R-21491
(P3)	"	Plan 4R-1009
(P4)	"	(AOG) Plan, October 14, 2010
(P5)	"	Plan 4R-20449

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.99994.

Bearings are derived from simultaneous GPS observations on survey monuments A to B, shown hereon, having a grid bearing of N 30°33'40" W and are referred to the Ontario Coordinate System, MTM NAD-83 (original) Zone 9.

Coordinate values are to urban accuracy in accordance with O. Reg. 216/10.

. Point A Northing 5015853.64 Easting 370494.15
. Point B Northing 5016056.89 Easting 370374.14

Caution: Coordinates cannot, in themselves, be used to re-establish corners or boundaries shown on this plan.

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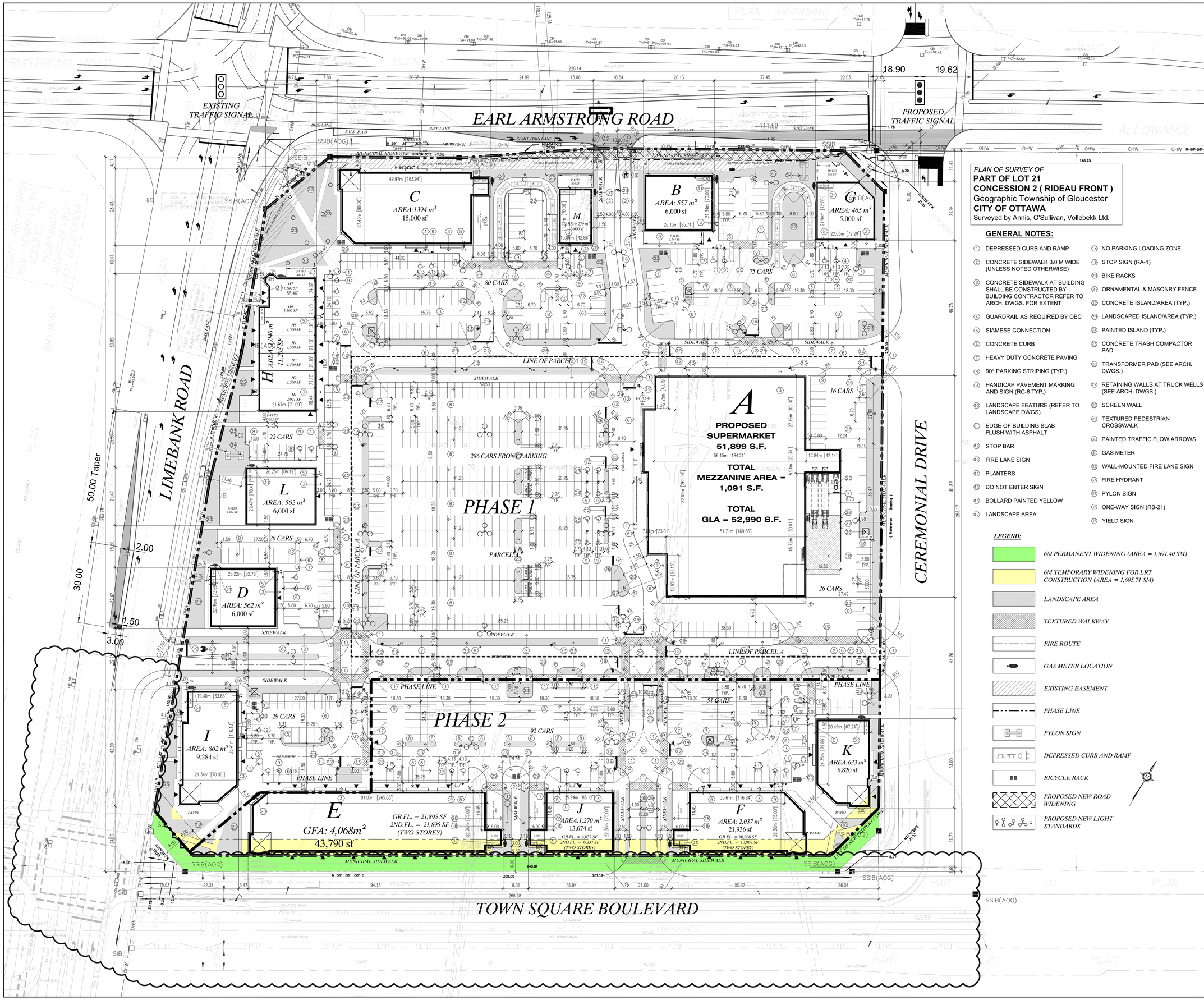
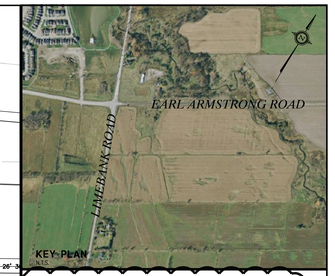
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors
Job No. 11891-11 Urbandale Pt Lt 21 C2 RF GL R F | CRO

DATE	PROJECT No.	FIGURE No.
APRIL 2014	12007.330	2





PLAN OF SURVEY OF
PART OF LOT 21
CONCESSION 2 (RIDEAU FRONT)
Geographic Township of Gloucester
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

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. SIAMESE CONNECTION
6. CONCRETE CURB
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

LEGEND:

- *6M PERMANENT WIDENING (AREA = 1,691.40 SM)*
- *6M TEMPORARY WIDENING FOR LRT CONSTRUCTION (AREA = 1,695.71 SM)*
- *LANDSCAPE AREA*
- *TEXTURED WALKWAY*
- *FIRE ROUTE*
- *GAS METER LOCATION*
- *EXISTING EASEMENT*
- *PHASE LINE*
- *PYLON SIGN*
- *DEPRESSED CURB AND RAMP*
- *BICYCLE RACK*
- *PROPOSED NEW ROAD WIDENING*
- *PROPOSED NEW LIGHT STANDARDS*

SITE STATISTICS

OVERALL SITE:
TOTAL SITE AREA = 685,437.67 SF (15.74 ACRES) (6.37 HA.)
TOTAL GR. FL. RETAIL AREA = 159,906 SF (14,855.75 SM)
TOTAL 2ND FL. OFFICE AREA = 40,791SF (3,789.60 SM)
TOTAL GLA = 200,697 SF (18,645.36 SM)

TOTAL PARKING REQ. @ 3.6/100 SM = 671 CARS
TOTAL PARKING PROVIDED = 3.77/100 SM = 703 CARS

PHASE 1 STATS:
PHASE 1 AREA = 542,369.05 SF (12.45 ACRES) (5.04 HA.)
TOTAL GLA = 114,477 SF (10,635.26 SM)

TOTAL RETAIL PARKING REQUIRED @ 3.6/100 SM = 382 CARS
TOTAL PARKING PROVIDED = 5.27/100 SM = 560 CARS

PHASE 1 BUILDING AREAS:

	GROUND FL. RETAIL	2ND FL. OFFICE
BIG BOX RETAIL STORE A	51,899 SF	1,091 SF
BUILDING B	6,000 SF	-
BUILDING C	15,000 SF	-
BUILDING D	6,000 SF	-
BUILDING G	5,000 SF	-
BUILDING H	11,203 SF	-
BUILDING I	9,284 SF	-
BUILDING L	6,000 SF	-
BUILDING M	3,000 SF	-
TOTAL	***113,386 SF***	***1,091 SF***

PHASE 2 STATS:
PHASE 2 AREA = 143,068.17 SF (3.28 ACRES) (1.32 HA.)
TOTAL GLA = 86,220 SF (8,010.10 SM)

TOTAL PARKING REQ. @ 3.6/100 SM = 288 CARS
TOTAL PARKING PROVIDED = 1.79/100 SM = 143 CARS

PHASE 2 BUILDING AREAS:

	GROUND FL. RETAIL	2ND FL. OFFICE
BUILDING E	21,895 SF	21,895 SF
BUILDING F	10,968 SF	10,968 SF
BUILDING J	6,837 SF	6,837 SF
BUILDING K	6,820 SF	-
TOTAL	***46,520 SF***	***39,700 SF***

SP-100

DATE ISSUED: 21-02-28

CITY FILE NO.:

No.	REVISIONS MARK VOID ALL COPIES PREVIOUS FINAL DATE	YY/MM/DD	BY
25.	NEW TOWNSQUARE BOULEVARD, REVISED STATISTICS	21-02-28	AU
24.	BUILDING A + PROPERTY LINES + TOWN SQUARE BLVD. REVISED	21-02-21	AU
23.	PATIOS ADDED, SITE ENTRANCES REVISED	17/09/18	AU
22.	LIGHT STANDARDS ADDED	16/11/30	AU
21.	BUILDING 'H' DRIVE-THRU AND SITE	16/11/09	AU
20.	TRANSIT ROAD DETAILS REMOVED	16/09/09	AU
19.	GAS ADDED, MOVED, SIDEWALK TO M. CART CORRALS FOR 'A'	16/09/01	AU
18.	NORTH-WEST CORNER SIDE WALK REVISED	16/09/02	AU
17.	PROPERTY BEARINGS ADDED	15/08/26	AU
16.	L.S. AREA + SIDEWALKS ADDED TO BLDG. H,I,J,K	15/08/11	AU
15.	REVISED LANDSCAPING AREAS	15/07/28	AU
14.	PROPOSED NEW ROAD WIDENING	15/07/21	AU
13.	MUNICIPAL SIDEWALK AND LANDSCAPE REVISED	15/07/21	AU
12.	TRANSFORMER 'S' ADDED	15/05/20	AU
11.	REVISED AS PER LANDSCAPE COMMENTS	15/04/27	AU
10.	REVISED AS PER CITY COMMENTS	14/12/15	AU
9.	LIMEBANK ENTRANCE	14/08/11	AU
8.	RIGHT TURN LANES REVISED	14/07/10	AU
7.	BLDG. A SHELL PLAN REVISED	14/07/07	AU
6.	RIGHT TURN LANES ADDED	14/07/03	AU
5.	COLLECTOR ROAD 'D' REVISED	14/07/02	AU
4.	SUN + HYDRO EASEMENT NOTES	14/06/09	AU
3.	REVISED MEDIANS AND PROPOSED ROAD	14/06/02	AU
2.	ADDITIONAL EASEMENT INFORMATION	14/05/05	AU
1.	ISSUED FOR SITE PLAN APPROVAL	14/04/09	AU

MASTER SITE PLAN

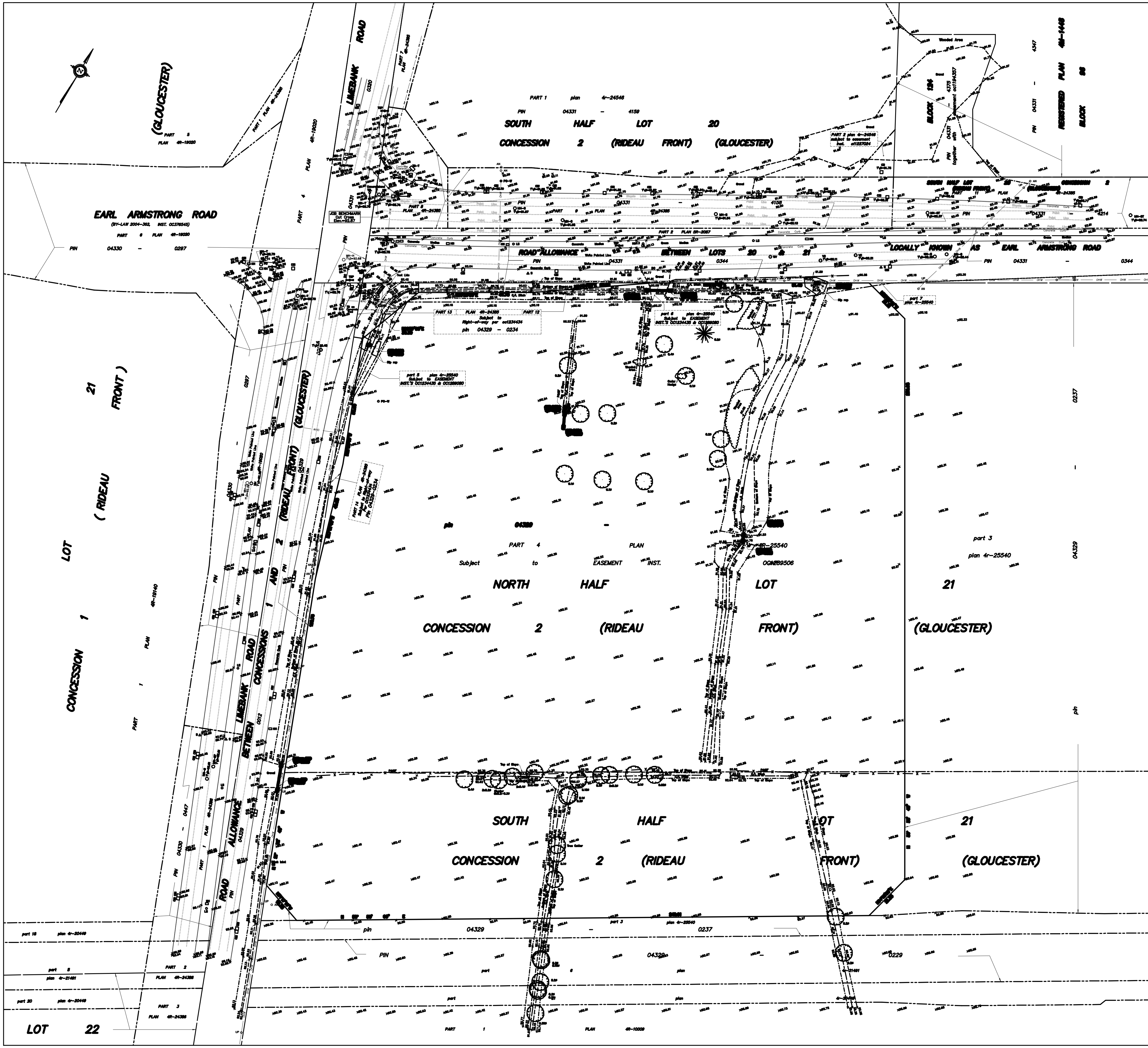
SCALE: 1:500

TOWN SQUARE COMMERCIAL CENTRE
LIMEBANK ROAD & EARL ARMSTRONG ROAD
OTTAWA, ONTARIO
FOR: OWNER

PETROFF PARTNERSHIP ARCHITECTS
PETROFF
260 TOWN CENTRE BLVD. SUITE 300
MARKHAM ONTARIO CANADA L3R 8H8
TEL. 905. 470. 7000 FAX. 905. 470. 2500

DRAWN BY	RY
CHECKED BY	A.U.
DATE	SEPT. 16, 2011
ISSUED	

PROJECT No. 11159.00
DWG. No. SP-100



TOPOGRAPHICAL PLAN OF

PART OF LOT 21
CONCESSION 2 (RIDEAU FRONT)
Geographic Township of Gloucester
CITY OF OTTAWA

Prepared by Annis, O'Sullivan, Vollebekk Ltd.

Plan amended March 14, 2014 to add Ditch Inlet CB at south end of site on the east side of Limebank Road.

Scale 1 : 500

20 15 10 5 0 10 20 Metres

Metric

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

Date V. Andrew Shelp, O.L.S.

Notes & Legend

Symbol	Denotes	
OHW	"	Overhead Wires
CB	"	Catch Basin
CBI	"	Catch Basin Inlet
MH-ST	"	Maintenance Hole (Storm Sewer)
MH-S	"	Maintenance Hole (Sanitary)
MH-H	"	Maintenance Hole (Hydro)
MH-T	"	Maintenance Hole (Traffic)
MH	"	Maintenance Hole (Unidentified)
VC	"	Valve Chamber (Watermain)
CSP	"	Corrugated Steel Pipe
CCP	"	Concrete Pipe
TSL	"	Traffic Light
UP	"	Utility Pole
AN	"	Anchor
LS	"	Light Standard
TB	"	Unidentified Terminal Box
TSP	"	Traffic Signal Post
S	"	Sign
	"	Deciduous Tree
	"	Coniferous Tree
FH	"	Fire Hydrant
WV	"	Water Valve
Ø	"	Diameter
+85.00	"	Location of Elevations
+85.00	"	Top of Concrete Curb Elevation
C/L	"	Centreline
	"	Property Line
HH	"	Handhole
GR	"	Guard Rail
P&W	"	Post and Wire
DC	"	Depressed Curb

Bearings are grid.

SITE AREA = 6.536 Hectares

BOUNDARY INFORMATION COMPILED FROM OFFICE RECORDS & PLANS.

ELEVATION NOTES

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

UTILITY NOTES

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

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Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No.13831-13 Marguard Pt.Lt 21 C 2 RF GL T D3 | 1g

DATE	PROJECT No.	FIGURE No.
APRIL 2014	12007.330	4

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, Stormwater Management Report and accompanying engineering drawings, 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, February 28, 2021
- Landscape Plans by FOTENN, revision 7, dated November 18, 2016
- 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

1.4 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 ground floor area of approximately 4,821.6 m^2, together with a total of eight free standing buildings with floor areas ranging from approximately 278.7 m^2 to approximately 1,393.5 m^2. The total building ground floor Area within Phase 1 is approximately 10,535.1 m^2.

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 633.6 m^2 to approximately 2,034.1 m^2. The total building floor area, including the second stories, is approximately 8,010.2 m^2. A copy of Site Plan, SP-100, by Petroff Partnership Architects, revised on Feb. 28, 2021 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	4,821.6	4,923
B	1	557.4	557.4
C	1	1393.5	1,393.5
D	1	557.4	557.4
E	2	2,034.1	4,068.2
F	2	1,019	2,038
G	1	464.5	464.5
H	1	1,040.8	1,040.8
I	1	862.5	862.5
J	2	635.2	1,270.4
K	1	633.6	633.6
L	1	557.4	557.4
M	1	278.7	278.7
Total		14,857	18,646.7

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 has been installed on Ceremonial Road from Earl Armstrong Road to Town Square Blvd., to service the Riverside South Community, Phase 6. Two 200mm diam. sanitary sewer connections have been installed on Ceremonial Road to service the Subject Property

At the time of up-dating this report, the detailed engineering design by J.L. Richards & Associates Ltd. for Ceremonial Road has been approved by the City of Ottawa. The road has been constructed up to and including base asphalt, and installation of utilities is pending. The approved engineering design of Ceremonial Road has been reflected on the current Site Plan and site engineering drawings.

2.2 Proposed Sanitary Servicing

The sanitary flows from the Subject Property have been accounted for in the design of the 375 mm diameter sanitary sewers on Ceremonial Road. 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. Taking into account that the shopping centre is typically operating for 12 hours per day, the peak flow will be 15.0 l/s.

The project mechanical engineers have estimated the fixture units and sanitary sewer discharge loads from the shopping centre. Conservatively, they have estimated a total of 1740 fixture units that will result in a peak flow of approximately 18.5 l/s or 20.3 l/s, including extraneous flow.

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 sewer systems, connected to the 375 mm diameter sanitary sewer on Ceremonial Road.

The two collector sewer systems will be 200 mm diameter at a minimum grade of 0.5%, having a full flow capacity of 24.2 l/s. Table 2, Sanitary Sewer Flow Calculations, is based on a total estimated peak flow, including extraneous flow, of 20.3 l/s. The flow distribution is based on the finished floor area of the contributing buildings as a percentage of the total gross floor area on the site. The calculations demonstrate that the sanitary sewers will have sufficient capacity to adequately service the proposed retail centre.

Table 2 Sanitary Sewer Flow Calculations

Contrib. Building	Contrib. Area (%)	From M.M	To M.M	Peak Flow (l/s)	Pipe Length (m)	Pipe Diam. mm	Pipe Slope	Pipe CAP. l/s
North System								
L	2.99	7A	8A	0.61	28.0	200	0.50	24.2
L&M	4.48	6A	7A	0.91	49.0	200	0.50	24.2
C	7.48	6A	12A	1.52	30.0	200	1.00	34.2
L, H & C	16.10	5A	6A	3.27	27.0	200	0.50	24.2
M	1.50	5A	11A	0.30	30.0	200	1.00	34.2
L, H, C & M	17.54	4A	5A	3.56	49.5	200	0.50	24.2
B	2.99	4A	10A	0.61	30.0	200	1.50	42.0
L, H, C, M & B	20.53	3A	4A	4.17	22.0	200	0.50	24.2
L,H,C, M, B & A	46.93	2A	3A	9.53	40.5	200	0.50	24.2
G	2.49	2A	9A	0.51	29.5	200	1.50	42.0
L, H, C, M, B, A & G	49.43	1A	2A	10.03	10.5	200	0.50	24.2
South System								
E & I	26.45	17A	18A	5.37	41.0	200	0.50	24.2
E, I & D	29.43	16A	17A	5.97	63.0	200	0.50	24.2
E, I & D	36.24	15A	16A	7.36	60.0	200	0.50	24.2
J	6.81	15A	20A	1.38	37.5	200	1.00	34.2
E, I, D & J	36.24	14A	15A	7.36	54.0	200	0.50	24.2
F & K	14.33	14A	19A	2.91	43.5	200	0.50	24.2
E, I, D J, F & K	50.57	13A	14A	10.27	47.0	200	0.50	24.2

2.2 Proposed Sanitary Servicing (cont'd)

As specified by the project mechanical engineers, each of the thirteen 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.

Due to the relatively shallow sanitary sewer on Ceremonial Road and the elevations of the existing and proposed roads surrounding the Property, several sections of the proposed sanitary system will have to be insulated as shown in Thermal Pipe Insulation Table on drawing 2 of 8 Servicing Plan.

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.

A 1,800 mm diameter storm sewer has been installed on Ceremonial Road from Earl Armstrong Road to Town Square Blvd., to service the Riverside South Community, Phase 6. A 750mm diam. storm sewer connection has been installed on Ceremonial Road to service the Subject Property

3.2 Proposed Stormwater Servicing

At the time of up-dating this report, the detailed engineering design by J.L. Richards & Associates Ltd. for Ceremonial Road has been approved by the City of Ottawa. The road has been constructed up to and including base asphalt, and installation of utilities is pending. The approved engineering design of Ceremonial Road has been reflected on the current Site Plan and site engineering drawings.

Controlled storm runoff from the Subject Property has been accounted for in the design of the 1,800 mm diameter storm sewers on Ceremonial Road. 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.

3.2 Proposed Stormwater Servicing (cont'd)

The Subject Property will be serviced with a 750 mm diameter connection to the proposed 1,800 mm diameter storm sewer on Ceremonial Road. 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 30 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 discharge flows.

The main storm sewers on site are generally designed to covey 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. A Stormwater Management Report revised March 8, 2021, is included in Appendix 'A' and is also submitted under separate cover.

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

Figure No. 6 is a reduced scale drainage area plan. For more drainage area details refer to full size drawing number 6 of 8 in the rear pocket.

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Project / Subdivision RIVERSIDE - MORGUARD

Consulting Engineer Urban Ecosystems Limited

Project No.: 12007

Design Parameters (5 Year Storm)

A = drainage area (ha)	T_{init}= 10 min
C = runoff coefficient	A= 998.071
T_c = time of concentration	B= 6.053
	C= 0.814

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 Road/Other ha.	Road/Other Coef.	BLDG No of Drains	Sewer AC Leg	AC Cumul.	Intensity I - 5yr (mm/hr)	I - 25yr (mm/hr)	I -100yr (mm/hr)	Flow - Q Road (l/s)	BLDG (l/s)	Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	elapsed
STORM SEWER LEG	**38**		**13**		0.03	0.90		0.027	0.027	104.2			7.8		**7.8**	**29.5**	**0.50**	**250**	**43.9**	0.87	0.57	10.00
STORM SEWER LEG	**13**		**12**		0.07	0.90		0.063	0.090	101.3												10.57
BUILDING I	Conn.		13				3							4.5	**4.5**	**22.0**	**2.00**	**200**	**48.4**	1.49	0.25	10.00
BUILDING E	Conn.		13				6							9.0	**9.0**	**11.5**	**2.00**	**200**	**48.4**	1.49	0.13	10.00
													25.3	13.5	**38.8**	**14.0**	**0.40**	**300**	**63.8**	0.87	0.27	10.83
STORM SEWER LEG	**12**		**11**		0.07	0.90		0.063														
CB	36		Pipe		0.08	0.90		0.072		104.2			20.8		**20.8**	**3.5**	**3.00**	**250**	**107.5**	2.12	0.03	10.00
CB	37		Pipe		0.06	0.90		0.054		104.2			15.6		**15.6**	**1.5**	**3.00**	**250**	**107.5**	2.12	0.01	10.00
									0.279	100.0			77.5	13.5	**91.0**	**50.5**	**0.40**	**450**	**188.1**	1.15	0.73	11.10
STORM SEWER LEG	**11**		**10**		0.06	0.90		0.054		98.7												
BUILDING D	Conn.		11				2							3.0	**3.0**	**19.0**	**4.50**	**250**	**131.6**	2.60	0.12	10.00
									0.333	98.7			91.3	16.5	**107.8**	**7.0**	**0.40**	**525**	**283.8**	1.27	0.09	11.84
STORM SEWER LEG	**10**		**9**		0.09	0.90		0.081														
CB	17		Pipe		0.06	0.90		0.054		104.2			15.6		**15.6**	**19.5**	**2.00**	**250**	**87.7**	1.73	0.19	10.00
CB	45		Pipe		0.05	0.90		0.045		104.2			13.0		**13.0**	**34.0**	**1.70**	**250**	**80.9**	1.60	0.35	10.00
									0.513	95.4			135.9	16.5	**152.4**	**40.0**	**0.40**	**675**	**554.6**	1.50	0.44	11.93
STORM SEWER LEG	**9**		**8**		0.08	0.90		0.072														
CB	44		Pipe		0.05	0.90		0.045		104.2			13.0		**13.0**	**25.0**	**2.00**	**250**	**87.7**	1.73	0.24	10.00
CB	14		Pipe		0.05	0.90		0.045		104.2			13.0		**13.0**	**19.0**	**2.50**	**250**	**98.1**	1.94	0.16	10.00
CB	11		Pipe		0.08	0.90		0.072		104.2			20.8		**20.8**	**19.0**	**3.00**	**250**	**107.5**	2.12	0.15	10.00
BUILDING L	Conn.		9				2							3.0	**3.0**	**13.0**	**4.00**	**200**	**68.4**	2.11	0.10	10.00
									0.747	95.0			197.1	19.5	**216.6**	**28.5**	**0.40**	**675**	**554.6**	1.50	0.32	12.24
STORM SEWER LEG	**8**		**7**		0.08	0.90		0.072														
BUILDING H	Conn.		8				3							4.5	**4.5**	**13.5**	**4.50**	**200**	**72.6**	2.24	0.10	10.00
									0.819	93.7			213.0	24.0	**237.0**	**28.5**	**0.40**	**675**	**554.6**	1.50	0.32	12.56
STORM SEWER LEG	**26**		**7**		0.00	0.90		0.000														
CB	4		26		0.15	0.90		0.135		104.2			39.1		**39.1**	**4.0**	**18.00**	**250**	**263.2**	5.19	0.01	10.00
CB	3		26		0.14	0.90		0.126		104.2			36.5		**36.5**	**25.5**	**1.50**	**250**	**76.0**	1.50	0.28	10.00
BUILDING C	Conn.		26				4							6.0	**6.0**	**25.0**	**2.00**	**200**	**48.4**	1.49	0.28	10.00
									0.261	104.2			75.5	6.0	**81.5**	**15.5**	**1.00**	**375**	**182.9**	1.60	0.16	10.28
STORM SEWER LEG	**7**		**6**		0.15	0.90		0.135														
									1.215	92.4			311.7	30.0	**341.7**	**51.5**	**0.40**	**750**	**734.5**	1.61	0.53	12.88

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Project / Subdivision RIVERSIDE - MORGUARD

Consulting Engineer Urban Ecosystems Limited

Project No.: 12007

Design Parameters (5 Year Storm)

A = drainage area (ha)	T_{init}= 10 min
C = runoff coefficient	A= 998.071
T_c = time of concentration	B= 6.053
	C= 0.814

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 Road/Other ha.	Coef.	BLDG No of Drains	Sewer AC Leg	Cumul.	Intensity I - 5yr (mm/hr)	I - 25yr (mm/hr)	I -100yr (mm/hr)	Flow - Q Road (l/s)	BLDG (l/s)	Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	elapsed
STORM SEWER LEG	**6**		**5**		0.05	0.90		0.045														
									1.260	91.1			318.8	30.0	**348.8**	**36.0**	**0.40**	**750**	**734.5**	1.61	0.37	13.41
STORM SEWER LEG	**25**		**5**		0.19	0.90		0.171														
BUILDING M	Conn.		25				2							3.0	**3.0**	**27.0**	**2.00**	**200**	**48.4**	1.49	0.30	10.00
									0.171	104.2			49.5	3.0	**52.5**	**28.5**	**1.00**	**300**	**100.9**	1.38	0.34	10.30
STORM SEWER LEG	**20**		**27**		0.09	0.90		0.081														10.00
									0.081	104.2			23.4	0.0	**23.4**	**28.5**	**2.30**	**250**	**94.1**	1.86	0.26	0.26
STORM SEWER LEG	**27**		**5**		0.10	0.90		0.090														10.00
CB	18		Pipe		0.05	0.90		0.045		104.2			13.0		**13.0**	**10.0**	**4.00**	**250**	**124.1**	2.45	0.07	10.00
CB	21		Pipe		0.16	0.90		0.144		104.2			41.7		**41.7**	**24.5**	**3.00**	**250**	**107.5**	2.12	0.19	10.00
CB	15		Pipe		0.06	0.90		0.052		104.2			15.1		**15.1**	**20.0**	**4.00**	**250**	**124.1**	2.45	0.14	10.00
CB	19		Pipe		0.09	0.90		0.081		104.2			23.4		**23.4**	**15.0**	**4.00**	**250**	**124.1**	2.45	0.10	10.00
CB	12		Pipe		0.09	0.90		0.081		104.2			23.4		**23.4**	**30.0**	**3.00**	**250**	**107.5**	2.12	0.24	10.00
CB	16		Pipe		0.10	0.90		0.090		104.2			26.0		**26.0**	**4.5**	**4.50**	**250**	**131.6**	2.60	0.03	10.00
CB	13		Pipe		0.16	0.90		0.144		104.2			41.7		**41.7**	**5.0**	**4.00**	**250**	**124.1**	2.45	0.03	10.00
									0.727	104.2			210.4	0.0	**210.4**	**99.5**	**0.50**	**525**	**317.2**	1.42	1.17	11.17
STORM SEWER LEG	**5**		**4**		0.07	0.90		0.063														
									2.221	89.1			549.4	33.0	**582.4**	**35.5**	**0.40**	**900**	**1194.4**	1.82	0.33	13.78
STORM SEWER LEG	**24**		**23**		0.05	0.90		0.045														10.00
									0.045	104.2			13.0		**13.0**	**24.0**	**1.00**	**300**	**100.9**	1.38	0.29	10.65
STORM SEWER LEG	**23**		**4**		0.13	0.90		0.117														

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	C= 0.814

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 Road/Other ha.	Coef.	BLDG No of Drains	Sewer AC Leg	Cumul.	Intensity I - 5yr (mm/hr)	I - 25yr (mm/hr)	I -100yr (mm/hr)	Flow - Q Road (l/s)	BLDG (l/s)	Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	elapsed
BUILDING B	Conn.		23				2							3.0	**3.0**	**26.0**	**4.00**	**200**	**68.4**	2.11	0.21	10.00
									0.162	100.9			45.4	3.0	**48.4**	**23.5**	**1.00**	**450**	**297.4**	1.81	0.22	10.21
STORM SEWER LEG	**4**		**3**		0.03	0.90		0.027														
									2.410	87.7			587.0	36.0	**623.0**	**24.0**	**0.40**	**900**	**1194.4**	1.82	0.22	14.11
STORM SEWER LEG	**43**		**22**		0.05	0.90		0.045														10.00
									0.045	104.2			13.0	0.0	**13.0**	**38.5**	**4.00**	**300**	**201.8**	2.77	0.23	10.23
STORM SEWER LEG	**22**		**3**		0.11	0.90		0.099														
									0.144	103.0			41.2	0.0	**41.2**	**19.5**	**2.00**	**450**	**420.6**	2.56	0.13	10.36
STORM SEWER LEG	**3**		**2**		0.03	0.90		0.027														
BUILDING A UNCONTROLLED	Conn.		3		0.49	0.90		0.441						0.0								
									3.022	86.6			726.4	36.0	**762.4**	**21.5**	**0.40**	**900**	**1194.4**	1.82	0.20	14.33
STORM SEWER LEG	**21**		**2**		0.16	0.90		0.144														
BUILDING G	Conn.		21				2							3.0	**3.0**	**19.0**	**3.00**	**300**	**174.7**	2.39	0.13	10.00
									0.144	104.2			41.7	3.0	**44.7**	**25.0**	**2.00**	**450**	**420.6**	2.56	0.16	10.13
STORM SEWER LEG	**35**		**19**		0.07	0.90		0.063														10.00
									0.063	104.2			18.2		**18.2**	**36.5**	**0.50**	**300**	**71.3**	0.98	0.62	10.62
STORM SEWER LEG	**34**		**20**		0.09	0.90		0.081														10.00
									0.081	104.2			23.4		**23.4**	**18.5**	**0.50**	**300**	**71.3**	0.98	0.32	10.32
STORM SEWER LEG	**20**		**19**		0.08	0.90		0.072														
									0.153	102.6			43.6		**43.6**	**22.5**	**0.50**	**300**	**71.3**	0.98	0.38	0.38
STORM SEWER LEG	**19**		**18**		0.05	0.90		0.045														10.00
									0.261	101.0			73.2		**73.2**	**46.0**	**0.40**	**450**	**188.1**	1.15	0.67	11.24

CITY OF OTTAWA

STORM SEWER DESIGN SHEET

URBAN ECOSYSTEMS
L I M I T E D
7050 WESTON ROAD, SUITE 705
WOODBRIDGE , ONTARIO L4L 8G7
TELEPHONE: (905)856-0629
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Project / Subdivision RIVERSIDE - MORGUARD

Consulting Engineer Urban Ecosystems Limited

Project No.: 12007

Design Parameters (5 Year Storm)

A = drainage area (ha)	T_{init}= 10 min
C = runoff coefficient	A= 998.071
T_c = time of concentration	B= 6.053
	C= 0.814

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 Road/Other ha.	Coef.	BLDG No of Drains	Sewer AC Leg	Cumul.	Intensity I - 5yr (mm/hr)	I - 25yr (mm/hr)	I -100yr (mm/hr)	Flow - Q Road (l/s)	BLDG (l/s)	Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	elapsed
STORM SEWER LEG	33		32		0.10	0.90		0.090														10.00
									0.090	104.2			26.0		**26.0**	**18.5**	**2.70**	**250**	**101.9**	2.01	0.15	10.15
STORM SEWER LEG	32		31		0.10	0.90		0.090														
									0.180	103.4			51.7		**51.7**	**18.5**	**0.50**	**300**	**71.3**	0.98	0.32	10.31
STORM SEWER LEG	31		18		0.08	0.90		0.072														
BUILDING J	Conn.		31				2							3.0	**3.0**	**27.0**	**2.30**	**200**	**51.9**	1.60	0.28	
									0.252	102.6			71.8	3.0	**74.8**	**22.0**	**0.50**	**375**	**129.3**	1.13	0.32	10.62
STORM SEWER LEG	50		Pipe		0.04	0.90		0.036														10.00
									0.036	104.2			10.4		**10.4**	**15.5**	**0.40**	**250**	**39.2**	0.77	0.33	10.33
STORM SEWER LEG	18		17		0.12	0.90		0.108														
									0.657	98.0			178.9	3.0	**181.9**	**43.5**	**0.40**	**525**	**283.8**	1.27	0.57	11.91
STORM SEWER LEG	30		29		0.09	0.90		0.081														10.00
									0.081	104.2			23.4		**23.4**	**38.0**	**1.00**	**300**	**100.9**	1.38	0.46	10.46
STORM SEWER LEG	29		17		0.08	0.90		0.072														
									0.153	101.8			43.3		**43.3**	**24.0**	**1.00**	**300**	**100.9**	1.38	0.29	10.92
STORM SEWER LEG	17		16		0.03	0.90		0.027														
									0.837	95.1			221.0	3.0	**224.0**	**24.0**	**0.40**	**525**	**283.8**	1.27	0.32	12.48
STORM SEWER LEG	41		Pipe		0.08	0.90		0.072														10.00
									0.072	104.2			20.8		**20.8**	**15.5**	**2.00**	**250**	**87.7**	1.73	0.15	10.15
STORM SEWER LEG	28		16		0.11	0.90		0.099		230.5												
BUILDING K	Conn.		28				2							2.0	**2.0**	**11.0**	**4.00**	**200**	**68.4**	2.11	0.09	10.00
BUILDING F	Conn.		28				3							4.5	**4.5**	**22.5**	**1.00**	**200**	**34.2**	1.06	0.36	10.00
									0.171	103.4			49.1	6.5	**55.6**	**28.5**	**0.50**	**300**	**71.3**	0.98	0.49	10.30

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A = drainage area (ha)	T_{init}= 10 min
C = runoff coefficient	A= 998.071
T_c = time of concentration	B= 6.053
	C= 0.814

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 Road/Other ha.	Coef.	BLDG No of Drains	Sewer AC Leg	Cumul.	Intensity I - 5yr (mm/hr)	I - 25yr (mm/hr)	I -100yr (mm/hr)	Flow - Q Road (l/s)	BLDG (l/s)	Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	elapsed
STORM SEWER LEG	16		15		0.03	0.90		0.027														
									1.035	92.7			266.4	9.5	**275.9**	**24.0**	**0.40**	**600**	**405.1**	1.39	0.29	12.80
STORM SEWER LEG	42		15		0.03	0.90		0.027														10.00
									0.027	104.2			7.8	0.0	**7.8**	**10.0**	**7.00**	**250**	**164.1**	3.24	0.05	10.05
STORM SEWER LEG	TD22		Pipe		0.04	0.90		0.036														10.00
									0.036	104.2			10.4	0.0	**10.4**	**3.5**	**2.00**	**250**	**87.7**	1.73	0.03	10.03
STORM SEWER LEG	51		Pipe		0.05	0.90		0.045														10.00
									0.045	104.2			13.0		**13.0**	**31.5**	**1.00**	**250**	**62.0**	1.22	0.43	10.43
STORM SEWER LEG	15		14		0.05	0.90		0.045														
									1.188	91.4			301.6	9.5	**311.1**	**57.5**	**0.40**	**600**	**405.1**	1.39	0.69	13.09
STORM SEWER LEG	TD23		Pipe		0.04	0.90		0.036														10.00
									0.036	104.2			10.4	0.0	**10.4**	**3.5**	**2.00**	**250**	**87.7**	1.73	0.03	10.03
STORM SEWER LEG	14		2		0.07	0.90		0.063														10.00
									1.287	90.3			322.7	9.5	**332.2**	**53.5**	**0.40**	**600**	**405.1**	1.39	0.64	10.64
STORM SEWER LEG	2		Control		0.07	0.90		0.063														
									4.516	85.8			1076.0	48.5	**1124.5**	**12.5**	**0.40**	**1050**	**1801.7**	2.02	0.10	14.52
SEE EXTERNAL STORM DRAINAGE AREA AND OFFSITE DITCHING PLAN DWG 8 of 8										10 yr. intens.		100 yr. intens.	10 yr. flow	100 yr. flow	overland NET							10.00
LIMEBANK AREA # 1	FUT.		FUT.		0.52	0.70		0.364	0.364	122.1		174.1	123.5	176.0	**52.5**	**120.0**	**0.30**	**450**	**162.9**	0.99	2.02	10.00
LIMEBANK AREA # 2	FUT.		FUT.		0.52	0.70		0.364	0.728	110.9		158.1	224.2	319.7	**95.6**	**120.0**	**0.30**	**600**	**350.8**	1.20	1.66	12.02
LIMEBANK AREA # 3	FUT.		FUT.		0.52	0.70		0.364	1.092	103.2		147.3	312.9	446.6	**133.7**	**120.0**	**0.30**	**675**	**480.3**	1.30	1.54	13.68
LIMEBANK AREA # 4	FUT.		FUT.		0.52	0.70		0.364	1.456	97.0		138.6	392.3	560.4	**168.1**	**120.0**	**0.30**	**675**	**480.3**	1.30	1.54	15.22
LIMEBANK AREA # 5	FUT.		FUT.		0.52	0.70		0.364	1.820	91.7		131.0	463.2	662.3	**199.1**	**120.0**	**0.30**	**750**	**636.1**	1.39	1.43	16.76

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Consulting Engineer Urban Ecosystems Limited

Project No.: 12007

Design Parameters (5 Year Storm)

A = drainage area (ha)	T_{init}= 10 min
C = runoff coefficient	A= 998.071
T_c = time of concentration	B= 6.053
	C= 0.814

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 Road/Other ha.	Area increment Road/Other Coef.	Area increment BLDG No of Drains	Sewer AC Leg	Sewer AC Cumul.	Intensity I - 5yr (mm/hr)	Intensity I - 25yr (mm/hr)	Intensity I -100yr (mm/hr)	Flow - Q Road (l/s)	Flow - Q BLDG (l/s)	Flow - Q Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	Time (minutes) elapsed
LIMEBANK AREA # 6	FUT.		FUT.		0.52	0.70		0.364	2.184	87.2		124.8	528.8	756.8	**227.9**	**120.0**	**0.30**	**750**	**636.1**	1.39	1.43	18.19
LIMEBANK AREA # 7	FUT.		FUT.		0.52	0.70		0.364	2.548	83.2		119.2	588.7	843.2	**254.5**	**120.0**	**0.30**	**825**	**820.2**	1.49	1.35	19.62
LIMEBANK AREA # 8	FUT.		FUT.		0.52	0.70		0.364	2.912	79.8		114.4	645.3	925.1	**279.8**	**120.0**	**0.30**	**825**	**820.2**	1.49	1.35	20.97
LIMEBANK AREA # 9	FUT.		FUT.		0.52	0.70		0.364	3.276	76.7		110.0	697.7	1001.1	**303.4**	**120.0**	**0.30**	**825**	**820.2**	1.49	1.35	22.31
LIMEBANK AREA # 10	FUT.		FUT.		0.52	0.70		0.364	3.640	73.8		106.1	746.4	1072.0	**325.6**	**120.0**	**0.30**	**900**	**1034.4**	1.58	1.27	23.66
LIMEBANK AREA # 11	FUT.		FUT.		0.52	0.70		0.364	4.004	71.4		102.6	793.4	1140.5	**347.1**	**120.0**	**0.30**	**900**	**1034.4**	1.58	1.27	24.93
LIMEBANK AREA # 12	FUT.		FUT.		0.52	0.70		0.364	4.368	69.1		99.3	837.6	1205.1	**367.5**	**120.0**	**0.30**	**900**	**1034.4**	1.58	1.27	26.20
LIMEBANK AREA # 13	FUT.		FUT.		0.35	0.70		0.245	4.613	66.9		96.3	857.1	1234.2	**377.1**	**75.0**	**0.30**	**900**	**1034.4**	1.58	0.79	27.47
LIMEBANK AREA # 14	FUT.		FUT.		0.35	0.70		0.245	4.858	65.6		94.6	885.6	1275.8	**390.3**	**75.0**	**0.30**	**900**	**1034.4**	1.58	0.79	28.26
TOWN SQUARE BLVD. AREA # 15	FUT.		FUT.		1.40	0.75		1.050	1.050	122.1		174.1	356.1	507.7	**151.5**	**287.0**	**0.30**	**675**	**480.3**	1.30	3.68	10.00 10.00
LIMEBANK AREA # 16	FUT.		FUT.		0.35	0.70		0.245	6.153	64.4		92.9	1100.9	1586.9	**486.0**	**75.0**	**0.30**	**975**	**1280.5**	1.66	0.75	29.06
LIMEBANK AREA # 17	FUT.		FUT.		0.52	0.70		0.364	6.517	63.3		91.3	1146.0	1652.7	**506.7**	**120.0**	**0.30**	**1050**	**1560.3**	1.75	1.15	29.81
LIMEBANK AREA # 18	FUT.		FUT.		0.49	0.70		0.343	6.860	61.7		89.1	1175.7	1696.9	**521.2**	**120.0**	**0.30**	**1050**	**1560.3**	1.75	1.15	30.95

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C = runoff coefficient	A= 998.071
T_c = time of concentration	B= 6.053
	C= 0.814

Design Equations

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

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

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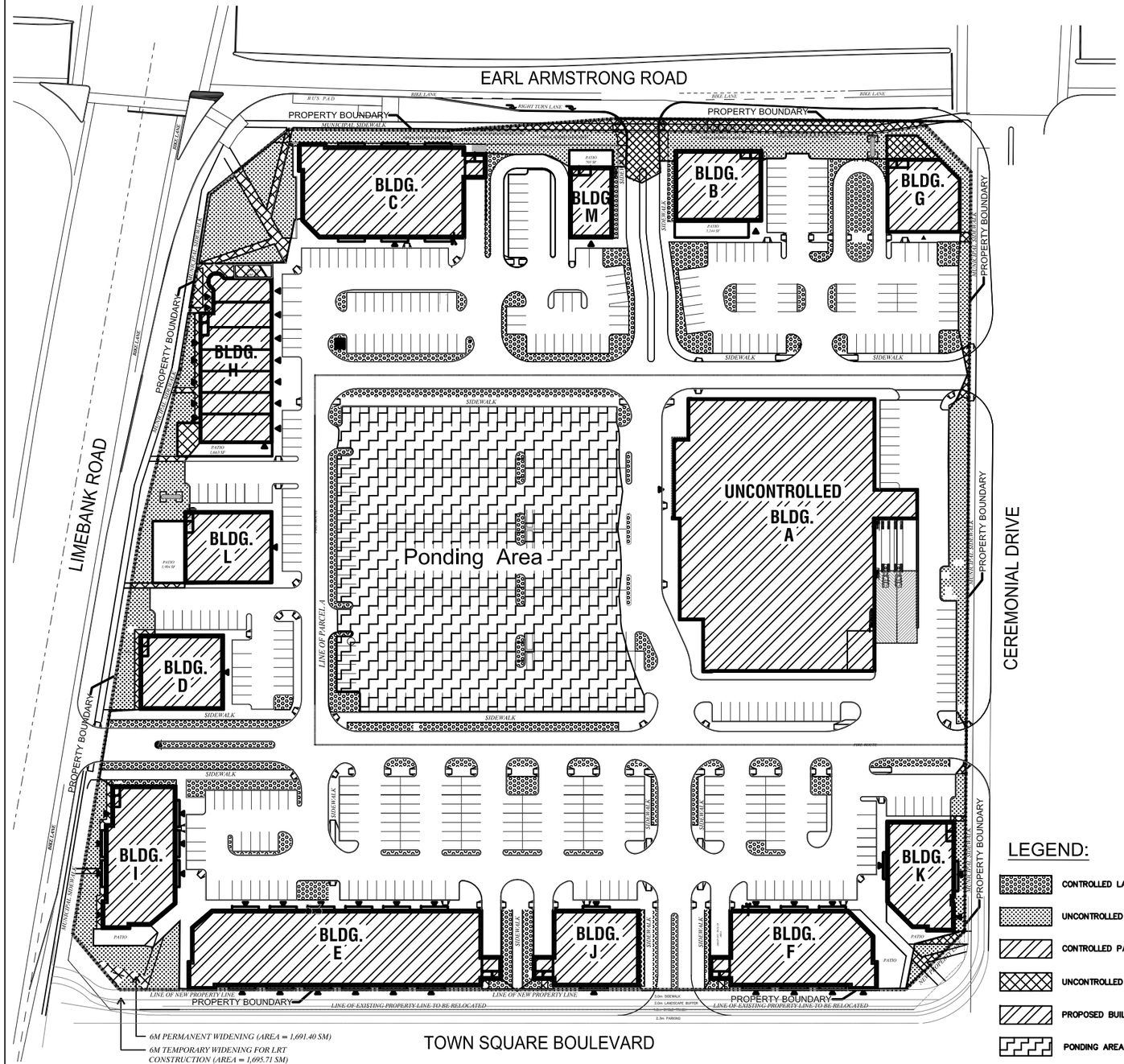
STREET NAME	From MH	Invert (m)	To MH	Invert (m)	Area increment Road/Other ha.	Coef.	BLDG No of Drains	Sewer AC Leg	Cumul.	Intensity I - 5yr (mm/hr)	I - 25yr (mm/hr)	I -100yr (mm/hr)	Flow - Q Road (l/s)	BLDG (l/s)	Total (l/s)	PROPOSED SEWER Length (m)	Grade (%)	Dia (mm)	Capac. (l/s)	Veloc. (m/s)	Time (minutes) Leg	elapsed
										10 yr. intens.		100 yr. intens.										
intersection E.A.-Limebank (add 200 l/s)	**DICB**		**36**		0.03	0.50		0.015	0.015	271.6			11.3		**11.3**							
														721.2	**721.2**							
													11.3	**721.2**	**732.5**	**3.0**	**2.00**	**675**	**1240.2**	3.36	0.01	10.00
intersection E.A.-Limebank at Ex. Culvert	**36**		**35**		0.00	0.75		0.001	0.016	271.6			11.9		**11.9**							
														721.2	**721.2**							
													11.9	**721.2**	**733.0**	**31.0**	**0.18**	**900**	**801.3**	1.22	0.42	10.01
intersection E.A.-Limebank at Ex. Culvert	**35**		**34**		0.00	0.75		0.001	0.017	271.6			12.4		**12.4**							
														721.2	**721.2**							
													12.4	**721.2**	**733.6**	**96.0**	**0.18**	**900**	**801.3**	1.22	1.31	10.44
intersection E.A.-Limebank at Ex. Culvert	**34**		**33**		0.03	0.95		0.029	0.045			160.1	20.0		**20.0**							
														721.2	**721.2**							
													20.0	**721.2**	**741.2**	**76.0**	**0.18**	**900**	**801.3**	1.22	1.04	11.75
Ex. 1200 diameter across E.A.	**MH.**		**MH.**		0.00	0.75		0.001	0.046	271.6			34.5		**34.5**							
														721.2	**721.2**							
													34.5	**721.2**	**755.7**	**55.0**	**0.20**	**1200**	**1819.0**	1.56	0.59	12.79



MAXIMUM PONDING ELEVATION 92.5

MAXIMUM PONDING VOLUME 2,091m^3

DRAINAGE AREAS

BUILDING A = (UNCONTROLLED ROOF)	4821.6 Sq. m.
BUILDING B =	557.4 Sq. m.
BUILDING C =	1393.5 Sq. m.
BUILDING D =	557.4 Sq. m.
BUILDING E =	2034.1 Sq. m.
BUILDING F =	1019 Sq. m.
BUILDING G =	464.5 Sq. m.
BUILDING H =	1040.8 Sq. m.
BUILDING I =	862.5 Sq. m.
BUILDING J =	635.2 Sq. m.
BUILDING K =	633.6 Sq. m.
BUILDING L =	557.4 Sq. m.
BUILDING M =	278.7 Sq. m.
TOTAL =	14,857 Sq. m.

LANDSCAPE

uncontrolled LANDSCAPE = 4,126 Sq. m.

controlled LANDSCAPE = 3,024 Sq. m.

HARD SURFACE

uncontrolled HARD SURFACE = 1186 Sq. m.

controlled HARD SURFACE = 45,306 Sq. m. INCL BLDG A

TOTAL = 53,642 Sq. m.

GRAND TOTAL = 63,677 Sq.m.

LEGEND:

CONTROLLED LANDSCAPE	3,024 sq.m.
UNCONTROLLED LANDSCAPE	4,126 sq.m.
CONTROLLED PAVEMENT	45,306 sq.m (Incl. BLDG "A" OF 4,821.6 sq.m.)
UNCONTROLLED PAVEMENT	1,186 sq.m.
PROPOSED BUILDING	10,035 sq.m. (Exclude BLDG "A" OF 4,821.6 sq.m.)
PONDING AREA	7,772 sq.m.

TOWN SQUARE CENTRE
RIVERSIDE SOUTH, OTTAWA

URBAN ECOSYSTEMS LIMITED
7050 WESTON ROAD, SUITE 705

STORMWATER MANAGEMENT DRAINAGE AREA PLAN

DATE	PROJECT No.	FIGURE
MARCH 2021	12007	FIG. 6

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 Ceremonial Road, 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, this system will be replaced with storm sewers.

It is proposed that the existing road side ditches along Limebank Road and Earl Armstrong Road will be eliminated. Rideau Valley Conservation Authority has confirmed that they have no objection to the elimination of the roadside ditches. Correspondence is included in Appendix F.

All drainage east of Limebank Road, south of Town Square Boulevard, has been diverted to the storm sewers on Ceremonial Road. Drainage from the Town Square Boulevard right of way will be diverted to a temporary ditch inlet catchbasin connected to the Limebank Road storm sewer system.

As the urbanization of Limebank Road will continue, the storm sewer system will be extended to the south. The storm sewers will be designed to carry the 1 in 10 storm. Excess flows, up to and including the 1 in 100 year storm will be conveyed overland along the road.

3.3 Major Stormwater Conveyance from The Site (cont'd)

We have calculated the excess flow from Limebank Road at the intersection with Earl Armstrong Road to be approximately 512/sec. This is a conservative estimate as it does not take into account surface ponding. Furthermore, this flow will be split between the east and west side of Limebank Road.

It is proposed that the excess flow will be diverted off Limebank Road at a low point located approximately 80m south of Earl Armstrong Road and flow overland to a proposed ditch inlet catchbasin approximately 40m south of the intersection.

The excess flow from Limebank Road, together with approximately 200 l/s from the culvert crossing Limebank Road, will be conveyed through a 900 mm diameter storm sewers to the existing 1200 mm diameter culvert crossing Earl Armstrong Road. As shown on the Storm Sewer Design sheets, the total estimated flow is 721.2 l/s and the capacity of the 900 mm diameter storm sewer is 801.3 l/s.

It should also be noted that, due to the relatively shallow storm culvert crossing Earl Armstrong Road, the proposed storm sewers will have to be insulated as shown in Thermal Pipe Insulation Table on drawing 2 of 8, Servicing Plan.

3. 4 Tributary No. 14

Approximately 68.38 ha of upstream lands to the south, were 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.

3. 4 Tributary No. 14 (cont'd)

The peak flows from the upstream 68.38 ha of undeveloped lands, based on pasture lands and an estimated time to peak of 1.73 hours, were calculated to be 1.719 m^3/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.

Copies of the Site Grading Plan, Drawing 1 of 8 and the External Storm Drainage Area Plan, Drawing 8 of 8, are 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, a temporary interceptor swale has been constructed immediately south of future Town Square Boulevard. The swale is conveying all storm flows from the undeveloped upstream lands, discharging to the storm sewers on Ceremonial Road.

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

Rideau Valley Conservation Authority has confirmed that Tributary no. 14 is approved 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.

As illustrated in the Hydrologic Evaluation Calculations for the proposed development, 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 679.7 m^3, parking lot storage of 1,671.9 m^3 and underground storage of 419.6 m^3, as summarized on Drawing 3 of 8, SWM Drainage Plan.

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 the 1800 mm dia. storm sewer on Ceremonial Road. This storm sewer connects to the 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. A 200 mm diameter watermain has been installed on Ceremonial Road from Earl Armstrong Road to Town Square Blvd., to service the Riverside South Community, Phase 6. Two 200mm diam. watermain connections have been installed on Ceremonial Road to service the Subject Property

At the time of up-dating this report, the detailed engineering design by J.L. Richards & Associates Ltd. for Ceremonial Road has been approved by the City of Ottawa. The road has been constructed up to and including base asphalt, and installation of utilities is pending. The approved engineering design of Ceremonial Road has been reflected on the current Site Plan and site engineering drawings.

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. peek 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 Hydrological Analysis for Riverside South Community Phase 6. All commercial buildings within the Town Square Retail Centre will be sprinkled. **Table 3**, Water Demand is a preliminary summary of the domestic and sprinkler water demand.

5.2 Proposed Water Distribution System (cont'd)

It is proposed that the Subject Property will be serviced with two 200 mm.dia connections to the proposed 200 mm dia. watermain on Ceremonial Road. 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.

Table 3 Water Demand

Building	Gross Floor Area (m^2)	Sprinkler Water Demand (l/s)	Domestic Water Demand (l/s)
A	4,923	65	10
B	557.4	36	4
C	1,393.5	47	6
D	557.4	36	4
E	4,068.2	36	9
F	2,038	36	6
G	464.5	36	4
H	1,040.8	36	4
I	862.5	47	5
J	1,270.4	36	6
K	633.6	36	4
L	557.4	36	4
M	278.7	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'.

A Hydrological Water Analysis was also performed by J.L. Richards & Associates Ltd., in connection with the design of Ceremonial Road. That analysis confirmed that the water distribution system will meet the City of Ottawa design guidelines.

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. A copy of the Grading Plan has been included in the rear pocket of this report. A Memorandum by the Geotechnical Engineers, confirming that the proposed final grades are acceptable, is included in Appendix E.

It is anticipated that the site will be rough graded and that underground services and utilities will be installed using conventional construction methods. **Table 4**, Pavement Structure is a summary of the recommendations provided in the Geotechnical Investigation Report.

Table 4 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

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 ac companying 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.

Appendix A

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STORMWATER MANAGEMENT REPORT

RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)

1420 EARL ARMSTRONG ROAD

CITY OF OTTAWA

File No: 12007.100

DATE: MARCH 8, 2021

DATE: MARCH 8, 2021

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STORMWATER MANAGEMENT REPORT

RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)

1420 EARL ARMSTRONG ROAD
CITY OF OTTAWA
File No: 12007.100

1.0 INTRODUCTION

The purpose of this report is to provide recommended grading and drainage prooposals 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 Amstrong 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.

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 Riversdie 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, inlcuding 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 occurance 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.

The rainfall intensities retain 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

Site Area = 6.37 ha. x 203 L/s/ha = 1293 L/s

3.0 POST-DEVELOPMENT SITE CONDITION

	unit	Total	System A
Total Site Area	(m^2)	63677	63677
Pavement Area	(m^2)	45306	45306
Landscaped Area	(m^2)	3024	3024
Building Area	(m^2)	10035	10035
Uncontrolled Pavement Area	(m^2)	1186	1186
Uncontrolled Landscape Area	(m^2)	4126	4126

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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 465m^2 with a maximum head of 10.16 cm

For this building 30 weirs

Total roof outflow is calculated as:

Q_{roof} = 30 x 0.15 L/s/cm hd. x 10 cm head
= 45 L/s

From Appendix - Table 1 maximum storage volumes: required = 410.8 m^3
available = 679.7 m^3

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 = Rain (L/s)
= 0.95 x 1.0035 x mm/hr x 2.778

4.2 Parking Lot Storage and Release Rate

Note: 100 year runoff coefficients:

pavements - C_{100} = C_5 x 0.5 + 0.5 = 0.9 x 0.5 + 0.5 = 0.95
landscaped - C_{100} = 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:

$$C_c = \frac{45306 \times 0.95 + 3024 \times 0.625}{45306 + 3024}$$

C_c = 0.93

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4.2.2 Release rate calculations are based on orifice flow formula:

$Q = C \times A \times (2gH)^{1/2}$
where,
Q = discharge in m^3/s
C = shape coefficient, 0.62 for orifice plate, dimensionless
A = area of orifice in m^2
g = acceleration due to gravity in m/s^2
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 848 m^3

Available site storage:

			Surface Pavement Storage=	1671.9	m^3
12.3	m -	1050	dia. stm =	10.7	m^3
88.4	m -	900	dia. stm =	56.2	m^3
94.4	m -	750	dia. stm =	41.7	m^3
83.8	m -	675	dia. stm =	30.0	m^3
205.7	m -	600	dia. stm =	58.2	m^3
91.5	m -	525	dia. stm =	19.8	m^3
69.3	m -	450	dia. stm =	11.0	m^3
464.9	m -	300	dia. stm =	32.9	m^3
631	m -	250	dia. stm =	31.0	m^3
179	m -	200	dia. stm =	5.6	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
28	1200	mm dia mh(@	2 m avg depth) =	63.3	m^3
			Manhole / Pipe Storage=	419.6	m^3

Total site storage = 2091.5 m^3

Required Storage	m^3	848
Available Storage	m^3	2091

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 + Qroof
0.93 x 4.833 x I x 2.778 + 46

Note:
Table 3 indicates that the uncontrolled runoff will total 183.8 l/s
(Landscape = 4126 m^2 and pavement = 1186 m^2)

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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	1070.9	915.0
allowable site release rate	L/s	1292.6	1292.6
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	848	236
available storage	m^3	2091	420

Respectfully submitted,

Urban Ecosystems Limited

Rosario Sacco, P. Eng.

LICENSED PROFESSIONAL ENGINEER
R. SACCO
PROVINCE OF ONTARIO

DATED MARCH 8, 2021

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APPENDIX

PROJECT:	RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
MUNICIPALITY:	CITY OF OTTAWA
FILE NO.:	12007.100
Date:	MARCH 8, 2021
LOCATION:	1420 EARL ARMSTRONG ROAD

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SITE STORM WATER MANAGEMENT

SUMMARY

	Total	
Site area (sq.m) :	63677	63677
Controlled Pavement area (sq.m) :	45306	45306
Controlled Landscaped area (sq.m) :	3024	3024
BLDGs B,C,D,E,F,G,H,I,J,K Roof area (sq.m) :	10035	10035
Uncontrolled Pavement area (sq.m.) :	1186	1186
Uncontrolled Landscape area (sq.m.) :	4126	4126

Includes Building A

SYSTEM A

CONTROLLED	**Orifice release rate (l/sec) :**	**887.1**
UNCONTROLLED	**Site release rate (l/sec) :**	**183.8**
TOTAL	**Site release rate (l/sec) :**	**1070.9**
ALLOWABLE	**Site release rate (l/sec) :**	**1292.6**

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
MUNICIPALITY: CITY OF OTTAWA
JOB NO.: 12007.100
DATE: MARCH 8, 2021
LOCATION: 1420 EARL ARMSTRONG ROAD

URBAN ECOSYSTEMS LIMITED

SYSTEM A 100 YR STORM

SITE STORM WATER MANAGEMENT

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

Site area (sq.m) :	63677	Pavement coefficient :	0.95
Controlled Pavement area (sq.m) :	45306	Landscape coefficient :	0.625
Controlled Landscaped area (sq.m) :	3024	Roof area coefficient :	0.95
Proposed Roof area (sq.m) :	10035	Rainfall intensity (mm/hr) :	
		I 2yr =	732.951/(6.199+t)^.810
Uncontrolled Pavement area (sq.m.) :	1186	I 5yr =	998.071/(6.053+t)^.814
Uncontrolled Landscaped area (sq.m.) :	4126	I 100yr =	1735.688/(6.014+t)^.820

ROOF DRAINAGE CHARACTERISTICS

Total roof area (sq. m) :	10035	Weir rating (l/sec) :	0.15
Total number of roof hoppers :	30	Weir area rating (sq. m.) :	465
Total number of weirs :	30	Maximum head (cm) :	10.16
Max. sloped roof depth (mm) :	50.8	Peak roof outflow rate (l/sec) :	45.7
Max. sloped roof storage (cu.m) :	169.93		
Max. parapit roof storage (cu.m) :	509.78	30 hoppers @ 1 weir =	30
		hoppers @ 2 weir =	0
	Total	30 hoppers	30 weir

TABLE 1 - ROOF DRAINAGE SYSTEM

	1st ITERATION					2nd ITERATION						3rd ITERATION			
Time (min.)	Rainfall Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	Peak Runoff volume (cu.m.)	Peak roof outflow volume (cu.m)	Required storage volume (cu.m)	Volume in sloped roof areas (cu.m)	Volume contained by roof parapit (cu.m)	Total head on roof hoppers (cm)	Roof outflow rate (l/sec)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	Total head on roof hoppers (cm)	Roof outflow volume (cu.m)	Required storage volume (cu.m)	
5	242.70	642.76	192.83	13.72	179.11	169.93	9.19	5.17	23.27	6.98	185.85	5.24	7.07	185.76	
10	178.56	472.88	283.73	27.43	256.30	169.93	86.37	5.94	26.73	16.04	267.69	6.05	16.35	267.38	
15	142.89	378.43	340.59	41.15	299.44	169.93	129.51	6.37	28.67	25.80	314.79	6.52	26.42	314.17	
20	119.95	317.67	381.20	54.86	326.34	169.93	156.41	6.64	29.87	35.85	345.35	6.83	36.87	344.33	
25	103.85	275.02	412.53	68.58	343.95	169.93	174.03	6.81	30.66	46.00	366.54	7.04	47.51	365.02	
30	91.87	243.30	437.94	82.30	355.64	169.93	185.71	6.93	31.19	56.14	381.80	7.19	58.25	379.69	
35	82.58	218.70	459.26	96.01	363.25	169.93	193.32	7.01	31.53	66.21	393.05	7.30	69.02	390.24	
40	75.15	199.01	477.62	109.73	367.90	169.93	197.97	7.05	31.74	76.17	401.45	7.39	79.78	397.84	
45	69.05	182.87	493.75	123.44	370.30	169.93	200.38	7.08	31.85	85.98	407.76	7.45	90.52	403.23	
50	63.95	169.37	508.12	137.16	370.96	169.93	201.03	7.08	31.87	95.62	412.49	7.50	101.21	406.90	
55	59.62	157.90	521.08	150.88	370.21	169.93	200.28	7.08	31.84	105.08	416.01	7.53	111.85	409.23	
60	55.89	148.03	532.90	164.59	368.31	169.93	198.38	7.06	31.76	114.32	418.58	7.56	122.44	410.46	
65	52.65	139.43	543.76	178.31	365.45	169.93	195.53	7.03	31.63	123.35	420.41	7.58	132.96	410.80	<------
70	49.79	131.86	553.81	192.02	361.79	169.93	191.86	6.99	31.46	132.15	421.66	7.59	143.42	410.39	
75	47.26	125.15	563.17	205.74	357.43	169.93	187.50	6.95	31.27	140.71	422.46	7.60	153.83	409.34	
80	44.99	119.15	571.93	219.46	352.47	169.93	182.54	6.90	31.05	149.02	422.91	7.60	164.18	407.74	
85	42.95	113.76	580.16	233.17	346.99	169.93	177.06	6.84	30.80	157.08	423.08	7.60	174.48	405.68	
90	41.11	108.88	587.93	246.89	341.04	169.93	171.11	6.79	30.53	164.88	423.05	7.60	184.74	403.19	
95	39.43	104.44	595.29	260.60	334.68	169.93	164.76	6.72	30.25	172.41	422.87	7.60	194.96	400.33	
100	37.90	100.38	602.28	274.32	327.96	169.93	158.03	6.65	29.95	179.68	422.60	7.60	205.14	397.14	
105	36.50	96.66	608.94	288.04	320.91	169.93	150.98	6.58	29.63	186.67	422.27	7.59	215.31	393.63	
110	35.20	93.23	615.30	301.75	313.55	169.93	143.63	6.51	29.30	193.38	421.92	7.59	225.46	389.85	
115	34.01	90.06	621.40	315.47	305.93	169.93	136.00	6.44	28.96	199.82	421.58	7.59	235.60	385.80	
120	32.89	87.12	627.24	329.18	298.06	169.93	128.13	6.36	28.61	205.96	421.28	7.58	245.75	381.49	
125	31.86	84.38	632.86	342.90	289.96	169.93	120.03	6.28	28.24	211.82	421.04	7.58	255.90	376.95	
130	30.90	81.83	638.26	356.62	281.65	169.93	111.72	6.19	27.87	217.39	420.88	7.58	266.09	372.18	

Qroof= R A I N
= 2.648 x I (l / sec)

Peak roof outflow rate =
no. of hoppers x weir rating x max. head
= 45.7 l/sec

Peak roof outflow volume =
= 45.7 x time x 60/1000 cu. m.

Roof outflow rate =
head x weir rating x no. of hoppers
= head x 4.50 l/sec

Required max. roof storage (cu. m.) : 410.8
Available roof storage (cu. m.) : 679.7

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
JOB NO.: 12007.100

URBAN ECOSYSTEMS
LIMITED

SYSTEM A 100 YR STORM
SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) :	45306
Controlled Landscaped area (sq.m) :	3024
Total area - excl. Bldg (sq.m) :	48330
Composite runoff coefficent :	0.93

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	2274.45	1364.67	532.25	832.41	
15	142.89	1829.29	1646.36	798.38	847.98	<-------
20	119.95	1542.91	1851.49	1064.51	786.98	
25	103.85	1341.91	2012.87	1330.64	682.23	

Required site storage (cu. m) : 848
Available site storage (cu. m) : 2091
SEE DRAWING SP-1

Qsite= R A I N + Qroof
= 12.482 x I + 45.7 l/sec

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	
10	178.56	183.80	<-------
15	142.89	147.09	
20	119.95	123.47	

Peak runoff (L/sec) : 183.8

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) :	1186
ncontrolled Landscaped area (sq.m.) :	4126
Total area (sq.m) :	5312
Composite runoff coefficent :	0.698

SYSTEM A 100 YR STORM
SITE SUMMARY

Orifice release rate (l/sec) :	887.1
Uncontrolled release rate (l/sec) :	183.8
Total site release rate (l/sec) :	**1070.9**
Allowable site release rate (l/sec) :	**1292.6**

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
MUNICIPALITY: CITY OF OTTAWA
JOB NO.: 12007.100
DATE: MARCH 8, 2021
LOCATION: 1420 EARL ARMSTRONG ROAD

URBAN ECOSYSTEMS LIMITED

SYSTEM A 5 YR STORM

SITE STORM WATER MANAGEMENT

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

Site area (sq.m) :	63677	Pavement coefficient :	0.9
Controlled Pavement area (sq.m) :	45306	Landscape coefficient :	0.25
Controlled Landscaped area (sq.m) :	3024	Roof area coefficient :	0.95
Proposed Roof area (sq.m) :	10035	Rainfall intensity (mm/hr) :	
		I 2yr =	732.951/(6.199+t)^.810
Uncontrolled Pavement area (sq.m.) :	1186	I 5yr =	998.071/(6.053+t)^.814
Uncontrolled Landscaped area (sq.m.) :	4126	I 100yr =	1735.688/(6.014+t)^.820

ROOF DRAINAGE CHARACTERISTICS

Total roof area (sq. m) :	10035	Weir rating (l/sec) :	0.15
Total number of roof hoppers :	30	Weir area rating (sq. m.) :	465
Total number of weirs :	30	Maximum head (cm) :	10.16
Max. sloped roof depth (mm) :	50.8	Peak roof outflow rate (l/sec) :	45.7
Max. sloped roof storage (cu.m) :	169.93		
Max. parapit roof storage (cu.m) :	509.78	30 hoppers @ 1 weir =	30
		0 hoppers @ 2 weir =	0
		Total 30 hoppers	30 weir

TABLE 1 - ROOF DRAINAGE SYSTEM

	1st ITERATION					2nd ITERATION						3rd ITERATION			
Time (min.)	Rainfall Intensity I (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	373.89	112.17	13.72	98.45	98.45	-71.48	2.23	10.04	3.01	109.15	2.66	3.59	108.58	
10	104.19	275.94	165.56	27.43	138.13	138.13	-31.80	3.81	17.16	10.29	155.27	4.50	12.14	153.42	
15	83.56	221.29	199.16	41.15	158.01	158.01	-11.92	4.61	20.72	18.65	180.51	5.19	21.00	178.16	
20	70.25	186.05	223.26	54.86	168.39	168.39	-1.53	5.02	22.59	27.10	196.16	5.34	28.84	194.41	
25	60.90	161.27	241.91	68.58	173.33	169.93	3.40	5.11	23.01	34.52	207.39	5.45	36.81	205.10	
30	53.93	142.82	257.07	82.30	174.78	169.93	4.85	5.13	23.08	41.54	215.53	5.53	44.83	212.24	
35	48.52	128.49	269.83	96.01	173.82	169.93	3.89	5.12	23.03	48.37	221.46	5.59	52.86	216.97	
40	44.18	117.02	280.84	109.73	171.11	169.93	1.18	5.09	22.91	54.99	225.85	5.64	60.88	219.95	
45	40.63	107.60	290.52	123.44	167.07	167.07	-2.85	4.97	22.35	60.34	230.18	5.68	69.02	221.50	
50	37.65	99.72	299.15	137.16	161.99	161.99	-7.93	4.76	21.44	64.31	234.84	5.73	77.31	221.84	<------
55	35.12	93.02	306.96	150.88	156.08	156.08	-13.84	4.53	20.38	67.24	239.72	5.78	85.77	221.19	
60	32.94	87.25	314.08	164.59	149.49	149.49	-20.44	4.27	19.19	69.10	244.98	5.83	94.41	219.67	
65	31.04	82.21	320.63	178.31	142.33	142.33	-27.60	3.98	17.91	69.85	250.79	5.89	103.30	217.34	
70	29.37	77.79	326.70	192.02	134.68	134.68	-35.25	3.68	16.54	69.46	257.25	5.95	112.46	214.25	
75	27.89	73.86	332.36	205.74	126.62	126.62	-43.31	3.35	15.09	67.91	264.45	6.02	121.94	210.42	
80	26.56	70.35	337.66	219.46	118.20	118.20	-51.72	3.02	13.58	65.19	272.46	6.10	131.80	205.86	
85	25.37	67.18	342.64	233.17	109.47	109.47	-60.46	2.67	12.02	61.28	281.36	6.19	142.07	200.57	
90	24.29	64.32	347.35	246.89	100.46	100.46	-69.47	2.31	10.40	56.16	291.19	6.29	152.81	194.54	
95	23.31	61.72	351.81	260.60	91.20	91.20	-78.72	1.94	8.74	49.82	301.99	6.40	164.06	187.75	
100	22.41	59.34	356.05	274.32	81.73	81.73	-88.20	1.56	7.04	42.24	313.81	6.51	175.87	180.18	
105	21.58	57.16	360.09	288.04	72.06	72.06	-97.87	1.18	5.30	33.42	326.67	6.64	188.30	171.79	
110	20.82	55.14	363.96	301.75	62.20	62.20	-107.72	0.79	3.54	23.35	340.61	6.78	201.39	162.56	
115	20.12	53.28	367.66	315.47	52.19	52.19	-117.74	0.39	1.74	12.01	355.64	6.93	215.20	152.46	
120	19.47	51.56	371.21	329.18	42.02	42.02	-127.90	-0.02	-0.08	-0.59	371.80	7.09	229.77	141.44	
125	18.86	49.95	374.62	342.90	31.72	31.72	-138.20	-0.43	-1.93	-14.47	389.10	7.26	245.16	129.46	
130	18.29	48.45	377.91	356.62	21.30	21.30	-148.63	-0.84	-3.80	-29.64	407.55	7.45	261.42	116.49	

Qroof= R A I N
= 2.648 x I (l / sec)

Peak roof outflow rate =
no. of hoppers x weir rating x max. head
= 45.7 l/sec

Peak roof outflow volume =
= 45.7 x time x 60/1000 cu. m.

Roof outflow rate =
head x weir rating x no. of hoppers
= head x 4.50 l/sec

Required max. roof storage (cu. m.) : 221.8
Available roof storage (cu. m.) : 679.7

PROJECT: RIVERSIDE SOUTH RETAIL CENTRE (BLDGS A to K)
JOB NO.: 12007.100

URBAN ECOSYSTEMS LIMITED

SYSTEM A 5 YR STORM
SITE STORM WATER MANAGEMENT

SITE CHARACTERISTICS

Controlled Pavement area (sq.m) :	45306
Controlled Landscaped area (sq.m) :	3024
Total area - excl. Bldg (sq.m) :	48330
Composite runoff coefficent :	0.86

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	1247.84	748.70	512.53	236.17	<-------
15	83.56	1009.75	908.78	768.80	139.98	
20	70.25	856.24	1027.48	1025.07	2.41	
25	60.90	748.30	1122.45	1281.34	-158.88	

Required site storage (cu. m) : 236
Available site storage (cu. m) : 420
SEE DRAWING SP-1

Qsite= R A I N + Qroof
= 11.537 x I + 45.7 l/sec

TABLE 3 - Uncontrolled Runoff

Time (min.)	Intensity I (mm/hr)	Peak rate of runoff Q (l/sec)	
10	104.19	60.75	<-------
15	83.56	48.72	
20	70.25	40.96	

Peak runoff (L/sec) : 60.8

UNCONTROLLED SITE CHARACTERISTICS

Uncontrolled Pavement area (sq.m.) :	1186
ncontrolled Landscaped area (sq.m.) :	4126
Total area (sq.m) :	5312
Composite runoff coefficent :	0.395

SYSTEM A 5 YR STORM
SITE SUMMARY

Orifice release rate (l/sec) :	854.2
Uncontrolled release rate (l/sec) :	60.8
Total site release rate (l/sec) :	**915.0**
Allowable site release rate (l/sec) :	**1292.6**

Tributary No. 14

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

The peak flows from the upstream 68.38 ha of undeveloped lands, based on pasture lands and an estimated time to peak of 1.73 hours, were calculated to be 1.719 m^3/s. It is noted that this flow is significantly higher than what was reported in the Riverside South Community Master Drainage Plan, primarily due to a shorter time to peak. An External Storm Drainage Area Plan, Drawing 8 of 8, is included in the rear pocket.

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

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

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

```
   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  HHHHH    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             *********
 ********************************************************************************

 ***** 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.                *****
 ********************************************************************************
 ********************************************************************************

 ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ********************************************************************************

 ************************   S U M M A R Y   O U T P U T   ***********************
 ********************************************************************************
 *         DATE: 2014-06-10      TIME: 15:29:25      RUN COUNTER: 000270         *
 ********************************************************************************
 * Input   filename: C:\DDRIVE~1\PreOtt.dat                                     *
 * Output  filename: C:\DDRIVE~1\PreOtt.out                                     *
 * Summary filename: C:\DDRIVE~1\PreOtt.sum                                     *
 * User comments:                                                               *
 * 1:_____________________________________________________________________     *
 * 2:_____________________________________________________________________     *
 * 3:_____________________________________________________________________     *
```

```
**********************************************************************************

#**********************************************************************************
#  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#

)02:0001----------------------------------------------------------------------------

      START
       [TZERO =     .00 hrs on        0]
       [METOUT=    2    (1=imperial, 2=metric output)]
       [NSTORM=    2 ]
       [NRUN  =    2 ]
t**********************************************************************************
t  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
t  Date        : 07-22-2004
t  Modeller    : [Ken Chow]
t  Company     : GHD
t  License #   : 2640114
t**********************************************************************************

)02:0002----------------------------------------------------------------------------

      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]

)02:0003---------------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]

)02:0004---------------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
l/a

)02:0005---------------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]

)02:0006---------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
```

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

)02:0007-----------------------------------------------------------------------------
-
      FINISH
-------------------------------------------------------------------------------
--
*******************************************************************************
**
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-06-10     at 15:29:25
===============================================================================
==
```

```
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
```

```
   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  HHHHH    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               *********
 ********************************************************************************


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

--------------------------------------------------------------------------------
--
)01:0001----------------------------------------------------------------------
--
'#*******************************************************************************
'#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
'#  Date        : 07-22-2004
'#  Modeller    : [Ken Chow]
'#  Company     : GHD
'#  License #   : 2640114
'#*******************************************************************************
  ** END OF RUN :   1

'********************************************************************************
```

```
--------------------
| 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
-------------------------------------------------------------------------------
--
)02:0002---------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
*#  Date         : 07-22-2004
*#  Modeller     : [Ken Chow]
*#  Company      : GHD
*#  License #    : 2640114
*#*****************************************************************************
-------------------------------------------------------------------------------
--
)02:0002---------------------------------------------------------------------
--
* 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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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

.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

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

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

02:0003----------

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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.

02:0004----------

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*
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| 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.
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002:0005----------------------------------------------------------------------
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*
******************
* 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.

--------------------------------------------------------------------------------
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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.
--------------------------------------------------------------------------------
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002:0007----------------------------------------------------------------------
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*
      FINISH
--------------------------------------------------------------------------------
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*********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
  Simulation ended on 2014-06-10     at 15:29:25
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Appendix B

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 defendable 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 feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

- 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

```
 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  HHHHH    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             *********
 ********************************************************************************

 ***** 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.                 *****
 ********************************************************************************
 ********************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ********************************************************************************

 ************************  S U M M A R Y   O U T P U T  ************************
 ********************************************************************************
 *         DATE: 2014-06-10      TIME: 15:29:25      RUN COUNTER: 000270        *
 ********************************************************************************
 * Input   filename: C:\DDRIVE~1\PreOtt.dat                                     *
 * Output  filename: C:\DDRIVE~1\PreOtt.out                                     *
 * Summary filename: C:\DDRIVE~1\PreOtt.sum                                     *
 * User comments:                                                               *
 * 1:_____________________________________________________________________      *
 * 2:_____________________________________________________________________      *
 * 3:_____________________________________________________________________      *
```

```
**********************************************************************************

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

**********************************************************************************


 RUN:COMMAND#

002:0001----------------------------------------------------------------------------
-
      START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   2 ]
       [NRUN  =   2 ]
#**********************************************************************************
#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
#  Date        : 07-22-2004
#  Modeller    : [Ken Chow]
#  Company     : GHD
#  License #   : 2640114
#**********************************************************************************

002:0002----------------------------------------------------------------------------
-
      MASS STORM
       Filename = C:\D DRIVE\24SCSII.mst
       Comment  = 24 hour SCS II storm mass curve
       [SDT= 2.00:SDUR=  24.00:PTOT= 103.20]

002:0003---------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
-
      DESIGN NASHYD       01:200           63.30    2.056 No_date   13:22   51.59
.500
       [CN= 72.0: N= 3.00]
       [Tp= 1.37:DT= 2.00]

002:0004---------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
-
      PRINT HYD           01:200           63.30    2.056 No_date   13:22   51.59
n/a

002:0005---------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
-
      DESIGN NASHYD       01:200           63.30    1.719 No_date   13:48   51.59
.500
       [CN= 72.0: N= 3.00]
       [Tp= 1.73:DT= 2.00]

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

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

002:0007-------------------------------------------------------------------------
-
      FINISH
-------------------------------------------------------------------------------
--
*******************************************************************************
**
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-06-10     at 15:29:25
===============================================================================
==
```

```
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
```

```
   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  HHHHH    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             *********
 ********************************************************************************

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

--------------------------------------------------------------------------------
--
001:0001--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [Riverside Ottawa]    Project Number: [8811895.400]
*#  Date        : 07-22-2004
*#  Modeller    : [Ken Chow]
*#  Company     : GHD
*#  License #   : 2640114
*#*****************************************************************************
  ** END OF RUN :   1

********************************************************************************
```

```
--------------------
| 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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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

.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

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

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

FUS Fire Flow
Smith + Andersen Consulting Engineering
S+A 14-0240 - Info - Field Notes
May 30, 2014

Riverside South Retail Centre											
Building ID	A	B	C	D	E	F	G	H	I	J	K
Type of construction	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible	Non-combustible
Construction coefficient	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Ground floor area (square metres) A	5,388.0	576.0	1,394.0	622.0	4,303.0	1,962.0	585.0	1,187.0	885.0	1,302.0	650.0
√A	73.4	24.0	37.3	24.9	65.6	44.3	24.2	34.5	29.7	36.1	25.5
Height in stories	1.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	2.0	1.0
Fire flow F = 220CVA (litres/minute)	12,918.9	4,224.0	6,571.2	4,389.4	11,545.1	7,795.8	4,256.9	6,063.7	5,235.8	6,350.6	4,487.1
Occupancy factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sprinkler factor - to NFPA 13 (-30%)	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No
Sprinkler factor - sprinklers plus fire hoses (-10%)	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No
Sprinkler factor - Fully supervised system (-10%)	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No
Sprinkler factor - total (-50%)	0.5	1.0	0.5	1.0	0.5	0.5	1.0	0.5	1.0	0.5	1.0
Exposures factor	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.1	1.2	1.2	1.2
Calculated total fire flow litres/minute	7,105.4	4,646.4	3,614.2	4,828.4	6,927.1	4,482.6	4,682.6	3,335.0	6,021.2	3,810.4	5,160.2
Round off total fire flow to nearest 1,000 l/min	7,000	5,000	4,000	5,000	7,000	4,000	5,000	3,000	6,000	4,000	5,000
Minimum total fire flow 2,000 l/min	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Total fire flow litres/minute	7,000	5,000	4,000	5,000	7,000	4,000	5,000	3,000	6,000	4,000	5,000

jan Carlson

m: Rogers, Christopher <Christopher.Rogers@ottawa.ca>
t: July 3, 2014 1:55 PM
Elliott, Gord
ject: RE: Riverside South Retail Centre - 12007.330

d,

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

IR = 123.9m
DY + Fire (7,000 Lpm) = 123.5m
DY + Fire (3,000 Lpm) = 125.3m
‹ HGL = 147.0m

laimer: Unless otherwise stated, the boundary condition information is based on current operation of the city water ribution system. The computer model simulation is based on the best information available at the time. The ration of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test a. The variation in physical watermain properties can therefore alter the results of the computer model ulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that ur between the watermain and the hydrant that the model cannot take into account.

m: Orjan Carlson [mailto:orjan@urbanecosystems.com]
t: 2014/07/03 12:08 PM
Elliott, Gord
Rogers, Christopher
ject: RE: Riverside South Retail Centre - 12007.330

d afternoon,
se find attached, fire flow demand calculations as prepared by the project mechanical engineers, Smith + Andersen. st this information is sufficient for you to provide me with the hydraulic boundary conditions for 1420 Earl strong Road.

ards,
n Carlson

an Ecosystems Ltd.
) Weston Road, Suite 705
dbridge, Ontario
05) 856 0629
05) 856 0698

```
*********************************************************************
*                            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	VelocityUnit m/s	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	VelocityUnit m/s	Headloss m/km	Status
108	-53.82	1.71	20.04	Open

		maxdaily		
109	97.00	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:

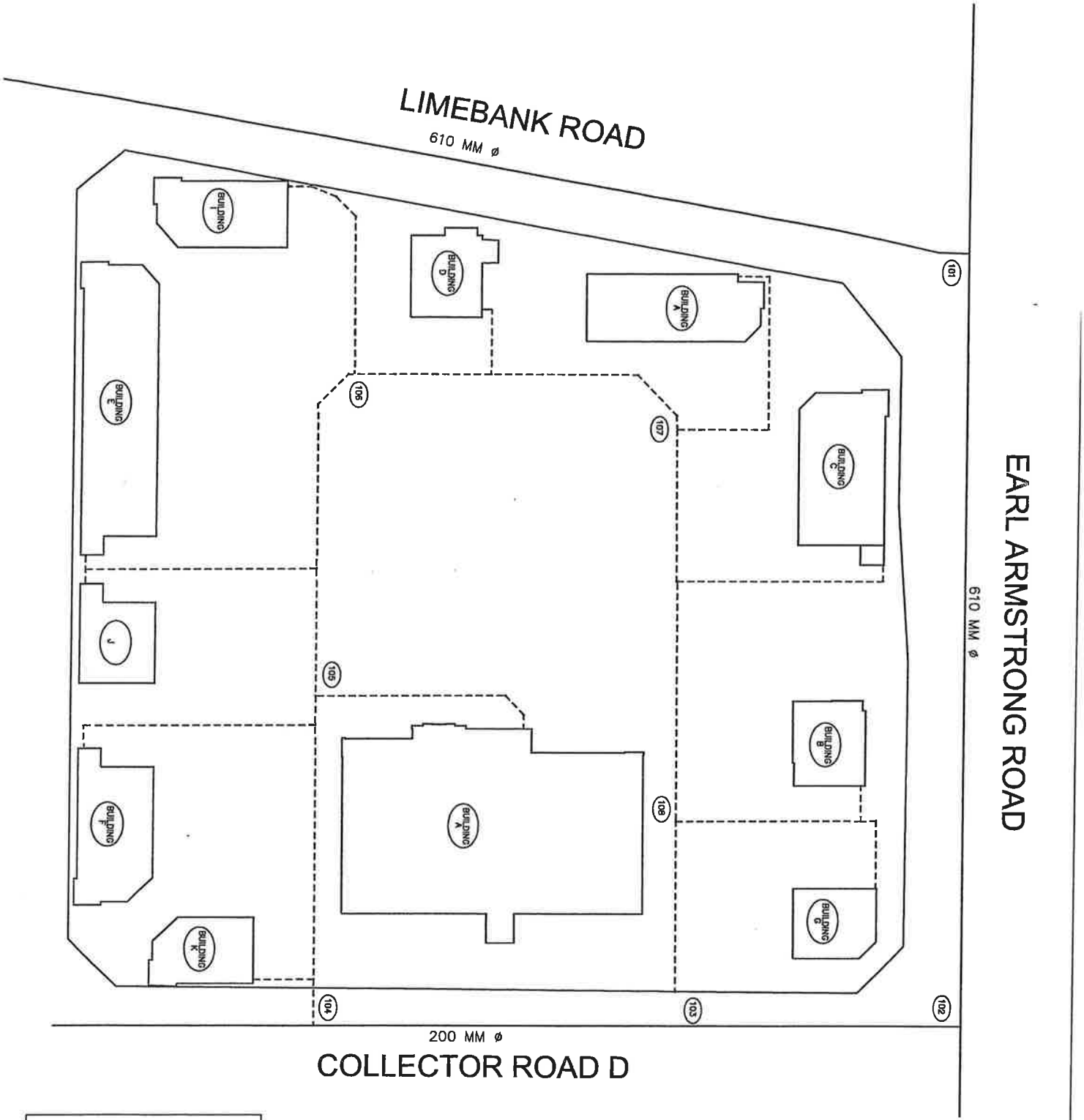
Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
101	214.00	0.73	0.83	Open
102	214.00	6.81	258.21	Open
103	108.50	3.45	73.39	Open
104	108.50	3.45	73.39	Open
105	-48.50	1.54	16.52	Open
106	-65.50	2.09	28.83	Open
107	-80.50	2.56	42.23	Open

♀

Link Results: (continued)

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

		fireandmax		
109	214.00	0.73	0.83	Open



LEGEND

——— EXTERNAL WATERMAIN

- - - - INTERNAL WATERMAIN

(104) NODE ID

WATERMAIN SCHEMATIC
REVISED SOUTH RETAIL CENTER
12007.330

Appendix E

patersongroup

consulting engineers

memorandum

to:	Morguard Investments Ltd. - **Ms. Margaret Knowles** - mknowles@morguard.com
to:	Urban Ecosystems Ltd. - **Mr. Orjan Carlson** - orjan@urbanecosystems.com
re:	Geotechnical Design Summary Details **Proposed Commercial Development** **Earl Armstrong Road at Limebank Road - Ottawa**
date:	March 21, 2017
file:	PG2744-MEMO.01
from:	Nicholas Zulinski

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide a grading plan review for the proposed commercial buildings at the aforementioned development. The following memorandum should be read in conjunction with Paterson Report PG2744-1 dated January 28, 2013.

Grading Plan Review

Paterson reviewed the following grading plan prepared by Urban Ecosystems Ltd. for the aforementioned development:

- ❑ Grading Plan - Project No. 12007 - Drawing No. 1 of 8 - Revision 10 dated November 21, 2016.

Based on our review of the above noted grading plan, there were some minor instances where the permissible grade raise was exceeded. However, upon further review of both the existing soil profiles and the proposed grading requirements, the proposed grades are considered acceptable from a geotechnical perspective. Therefore, no lightweight fill is required at the subject site.

We trust that this information satisfies your immediate requirements.

Paterson Group Inc.

Nicholas Zulinski, P.Geo.

David J. Gilbert, P.Eng.

Paterson Group Inc.

Head Office and Laboratory
154 Colonnade Road South
Ottawa - Ontario - K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

Northern Office and Laboratory
63 Gibson Street
North Bay - Ontario - P1B 8Z4
Tel: (705) 472-5331 Fax: (705) 472-2334

St. Lawrence Office
993 Princess Street - Suite 100
Kingston - Ontario - K7L 1H3
Tel: (613) 542-7381

Appendix F

Mississippi Valley Conservation
de la vallée Mississippi

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

SOUTH NATION CONSERVATION
DE LA NATION SUD

September 25, 2014
File: 14-GLO-SPC

City of Ottawa
Planning and Growth Management Department
110 Laurier Avenue West, 4th floor
Ottawa, Ontario K1P 1J1

Attention: Cathlyn Kaufman

Subject: **Morguard Investment Ltd.**
Site Plan Control D07-12-14-0067
1420 Earl Armstrong Road

Dear Ms. Kaufman:

The Conservation Partners Planning and Development Review Team has completed a review of the above noted application for Site Plan Control to develop a commercial/retail plaza and associated parking area on municipal services on the subject lands. Revised plans included in our review include:

- 'Master Site Plan' Drawing No. SP-100 dated September 16, 2011 revision #, dated August 11, 2014 prepared by Petroff Partnership Architects.
- "Servicing Plan" Dwg. No. 12007, revision #5 dated August 12, 2014 prepared by Urban Ecosystems Ltd.
- '*Stormwater Management Report, Riverside South Retail Centre (Buildings A to K; 1420 Earl Armstrong Rd' (file #12007.100 ~ revision dated, August 13, 2014)* prepared by Urban Ecosystems Ltd.
- '*Servicing Design Brief and Stormwater Management Report: 1420 Earl Armstrong Rd, Riverside South Retail Centre ' (file #12007.330 ~ revision dated, August 13, 2014)* prepared by Urban Ecosystems Ltd.

We have undertaken our review within the context of Sections 2.1 Natural Heritage, 2.2 Water Quality and Quantity and 3.1 Natural Hazards of the Provincial Policy Statement under Section 3 of the Planning Act. The following comments are offered for your consideration.

Water Quality and Quantity: Storm Water Management

The stormwater management design described in the stormwater management report indicates that the design in keeping with the accepted 2012 J.L. Richards report for Phase 6 of the RSS community. Stormwater is collected in the municipal sewers on Limebank Road and Earl Armstrong Road, both of which discharge to the RSS Pond 2 which

provides appropriate quality controls for the receiver, Mosquito Creek. We defer review of the quality controls to the City of Ottawa.

A watercourse, known as Tributary 14 currently bisects the site and is ultimately expected to be closed as part of the RSS development. Compensation for loss of fish habitat was undertaken through the Chapman Mills compensation project. The application proposes to divert the watercourse around the site into a local stormsewer system and ultimately through the municipal sewers on Limebank Road. This interim condition, until adjacent development takes place, is acceptable to the RVCA.

The watercourse, Tributary 14, is subject to the "Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation (Ontario Regulation 174/06 under Section 28 of the Conservation Authorities Act), as administered by the Rideau Valley Conservation Authority. The works to divert (relocate) the watercourse requires a permit under O.Reg 174/06 as administered by the RVCA prior to undertaking any work on the bed or banks. No application has been submitted to the RVCA at this time.

Conclusion

The Conservation Partners have no objection to the proposed site plan proposal. We recommend that the following clause be included in the site plan agreement:

1) A permit shall be received from the Rideau Valley Conservation Authority under O.Reg 174/06 prior to undertaking works to alter the watercourse known as Tributary 14.

Please keep us informed regarding the status of these applications. Please contact me at ext. 1137 if you have any questions.

Yours truly,

Jocelyn Chandler, M.Pl., RPP, MCIP
Planner, Planning and Regulations (RVCA)

Cc: Paul Black, Fotenn
Orjan B. Carlson, Urban Ecosystems

Orjan Carlson

From: Anthony Francis <afrancis@kilgourassociates.com>
Sent: November-02-17 11:17 AM
To: Orjan Carlson
Subject: Fwd: 1420 Earl Armstrong

Anthony Francis, PhD
Senior Ecologist

Kilgour & Associates Ltd.
2285C St. Laurent Blvd., Unit 16
Ottawa, Ontario, K1G 4Z6
613-260-5555 direct
613-277-4027 cell
877-260-4420 fax
afrancis@kilgourassociates.com
http://www.kilgourassociates.com

---------- Forwarded message ----------
From: **Jamie Batchelor** <jamie.batchelor@rvca.ca>
Date: Mon, Apr 10, 2017 at 3:39 PM
Subject: RE: 1420 Earl Armstrong
To: Anthony Francis <afrancis@kilgourassociates.com>

Hi Tony,

Sorry for the late reply. I can confirm, that based on the information in the file, the RVCA will not be requesting an HDFA for the roadside ditch at this location.

From: Anthony Francis [mailto:afrancis@kilgourassociates.com]
Sent: Thursday, March 23, 2017 3:47 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: 1420 Earl Armstrong

Hi Jamie,

We would like to start preparing our application to you to close the final portion of Trib 14 on the Morguard property at 1420 Earl Armstrong. Trib 14 was the only feature on site for which a permit to alter a water way was requested by Jocelyn in her letter of Sept 25, 2014 (File: 14-GLO-SPC... included below). As mentioned though during our last conversation, it is also their intention to enclose the existing roadside ditch at this location, fully in accordance with the original general plans for the development. The current specific plans are included below. The City is on side with this proposal however, they have requested that we obtain confirmation that the RVCA has no issues with this portion of the plan. Are you still okay with the plan for the roadside ditch? If so, we can begin preparing the application to close Trib 14.

Thanks

Tony

Anthony Francis, PhD
Senior Ecologist

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