J.F. Sabourin and Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS

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May 22, 2018

David Schaeffer Engineering Limited
120 Iber Road, Unit 103
Ottawa, Ontario K2S 1E9

Attention: Laura Maxwell

Subject: Preliminary Kanata West Pond 7 Sizing *our file: 1476-16*

As requested by your office, we have evaluated, based on the information described below, the minimum volumes required to meet quality, erosion and quantity control requirements for proposed Kanata West Pond 7 in the City of Ottawa. Also as requested, we have summarized the work completed for this project to date.

BACKGROUND INFORMATION - FLOOD LEVEL ANALYSIS

Interim and ultimate conditions PCSWMM models of the Carp River were prepared by the City of Ottawa as per the February 24, 2017 *Carp River PCSWMM Model Documentation*. The 12-hour SCS Type II MTO design storm distribution, as provided with the model, was used to generate 2- to 100-year peak flows and water levels along the Carp River and its tributaries. The ultimate conditions model was modified for the June 13, 2017 *Kanata West Pond 4 and 7 / Impact of Proposed Changes on Carp River Model* memo by JFSA as described below:

- In the City of Ottawa ultimate conditions Carp River PCSWMM model, Pond 4 has a drainage area of 279.234 ha at 62% imperviousness and discharges to the Carp River, and Pond 7 has a drainage area of 34.54 ha at 85% imperviousness, and discharges to Feedmill Creek. Note that the Pond 4 drainage area is slightly off from the 278.288 ha ultimate drainage area at 62% imperviousness documented in the December 2014 *Design Brief for Pond 4, Kanata West, Mattamy Homes*.

- Per information provided by DSEL, approximately 35.640 ha of drainage area in the northwest corner of the Pond 4 catchment area was modelled as redirected to the Kanata West Pond 7, for revised ultimate conditions drainage areas of 243.594 ha at 64% imperviousness to Pond 4 and 57.30 ha at 70% imperviousness to Pond 7 (including 16.5 ha of MTO lands).

- The model was also modified to reflect a 10.50 ha development area at 70% imperviousness discharging uncontrolled to Feedmill Creek. Note that the ultimate conditions PCSWMM model provided by the City has a 4.9 mm initial abstraction value for impervious areas in the 34.54 ha drainage area to Pond 7. This was assumed to be representative of required LID measures on-site, and was carried forward for the revised drainage area to Pond 7, but not the 10.50 ha uncontrolled area.

- A second scenario was also considered, wherein 16.50 ha of the ultimate drainage area to Pond 7 (MTO lands) was treated as currently developed at 30% imperviousness and discharging uncontrolled to Feedmill Creek. The two scenarios were referred to as Ultimate Scenario A (40.80 ha to Pond 7, 16.50 ha to Feedmill Creek) and Ultimate Scenario B (57.30 ha to Pond 7).

- In the City of Ottawa ultimate conditions Carp River PCSWMM model, the Pond 4 stage-storage-area-discharge relationship was modelled as per the ultimate conditions design presented in the December 2014

Design Brief for Pond 4. For the June 2017 analysis, the interim pond stage-storage-area relationship presented in the December 2014 *Design Brief for Pond 4* was inserted into the ultimate conditions PCSWMM model, with changes to the outlet control structure to accommodate ultimate conditions runoff. Note that the revised ultimate Pond 4 design does not meet the 100-year quantity control target specified in the December 2014 *Design Brief for Pond 4*, but instead relies upon the earlier June 2006 *Kanata West Master Servicing Study*, where quantity control is required only up to the 10-year level. In order to respect hydraulic gradeline analyses completed for existing and future upstream developments, the 100-year ultimate pond level was maintained below the 94.74 m elevation simulated in the June 2006 *Kanata West Master Servicing Study* and the December 2014 *Design Brief for Pond 4*.

- In the City of Ottawa ultimate conditions Carp River PCSWMM model, the Pond 7 preliminary stage-storage-area-discharge relationship was modelled to meet unit release rates of 0.51 L/s/ha for the 15 mm 3-hour Chicago design storm and 8 L/s/ha for the 100-year 12-hour SCS Type II design storm, based on the 34.54 ha drainage area and the April 2017 *Feedmill Creek Stormwater Management Criteria Study*. These target release rates of 17.7 L/s and 276.3 L/s were not revised based on the proposed drainage area revisions; instead the volume available in Pond 7 was adjusted in the PCSWMM model for each scenario to meet the established target release rates.

These scenarios were prepared for the purpose of testing their impact on ultimate conditions 2- to 100-year water levels and flows in the Carp River PCSWMM model. Refer to the June 13, 2017 memo for further details.

BACKGROUND INFORMATION - EROSION ANALYSIS

Subsequent to the June 2017 analysis, an erosion analysis by Coldwater Consulting Limited was undertaken to understand the impact of proposed Pond 7 Scenario B on interim and ultimate conditions erosion in Feedmill Creek. Based on information provided by the City of Ottawa and DSEL, the ultimate conditions Scenario B model was revised to Scenario “B2" for the erosion analysis, as follows:

- The 10.50 ha development area at 70% imperviousness discharging uncontrolled to Feedmill Creek was revised to 8.95 ha at 35% imperviousness.

- The Pond 4 stage-storage curve was revised to approximately 1.6 times the interim Pond 4 stage-storage curve and the outlet controls revised to achieve 0 cm of increase in the 2- to 100-year flood levels on the Carp River.

The interim conditions Carp River PCSWMM model, per the City of Ottawa’s February 24, 2017 *Carp River PCSWMM Model Documentation* was also revised to create a new “base” scenario for comparison, wherein the 8.95 ha uncontrolled area at 35% imperviousness, and the undeveloped 16.5 ha MTO lands at 0% imperviousness, are separated out from the larger lumped drainage area and discharge uncontrolled to Feedmill Creek. The model was also modified to replace the Interim Pond 4 outflow hydrograph with Ultimate Pond 4 drainage area and pond modelling from the February 24, 2017 ultimate conditions Carp River PCSWMM model. Surrounding drainage boundaries were revised to match the developed boundaries for Pond 4 where necessary to avoid double-counting or excluding drainage area. Changes made to the PCSWMM model for the revised interim base model are summarized in Table A-1 of Attachment A.

This base interim conditions scenario was then modified to incorporate the Scenario B2 ultimate development scenario for Kanata West Ponds 4 and 7, as described above. Surrounding drainage boundaries were revised to match the developed boundaries for Pond 7 where necessary to avoid double-counting or excluding drainage area.

Details and conclusions of the erosion analysis are presented in the March 13, 2018 *Feedmill Creek SWM Criteria Study - Pond 7 Increased Drainage Area - Erosion and In-Stream Works Analysis* report by Coldwater Consulting

Ltd. The Scenario B2 PCSWMM modelling files prepared for continuous simulation of 1967-2007 Ottawa Airport hourly rainfall data in support of the erosion analysis are attached for interim and ultimate conditions.

CURRENT ANALYSIS - PRELIMINARY SIZING OF POND 7

DSEL has provided an updated drainage area of 40.8 ha to Pond 7 at 71% imperviousness, per the drainage plan provided in Attachment A. Note that this drainage plan excludes the 16.5 ha MTO lands, similar to Scenario A. However, unlike Scenario A, the target release rates from Pond 7 have been pro-rated to allow for potential development of the MTO lands with separate SWM servicing. The target release rates were calculated based on the original Pond 7 drainage area of 34.54 ha from the February 24, 2017 *Carp River Ultimate Conditions PCSWMM model* by the City of Ottawa, less the 16.5 ha occupied by the MTO lands (undeveloped or separately serviced), leaving 18.04 ha. Henceforth, this scenario may be referred to as Scenario C2. Changes made to the PCSWMM model to reflect the proposed drainage area revisions for Scenario C2 are summarized in Table A-1 of Attachment A.

Minimum volume requirements for Pond 7 were estimated in PCSWMM and in a simple SWMHYMO model for the purpose of this analysis; note that additional volume may be required to respect the limitations of real world outlet controls, to provide some degree of construction tolerance, and to allow for a reasonable range of design variation as the development proceeds through later design stages.

Table 1: Simulated Release Rates and Volumes for Kanata West Pond 7 (40.8 ha, 71% imperviousness)

Component	Unit Release Rate [1] (L/s/ha)	Target Release Rate [1] (L/s)	Required Storage (m^3)	
			SWMHYMO	PCSWMM
Permanent Pool [3]	N/A	N/A	7616	
Quality Control [3]	N/A	N/A	1632	
15 mm 3-hour Chicago	0.51	9	2650	2417
100-Year 12-Hour SCS	8	144	26880	20244

[1] Unit release rates as per the April 2017 *Feedmill Creek Stormwater Management Criteria Study Final Report* by JFSA Inc. and Coldwater Consulting Ltd.
[2] Target release rates calculated based on the original Pond 7 drainage area of 34.54 ha from the February 24, 2017 Carp River Ultimate Conditions PCSWMM model by the City of Ottawa, less the 16.5 ha occupied by the MTO lands (undeveloped or separately serviced), leaving 18.04 ha.
[3] Quality control and permanent pool requirements based on MOE guidelines for enhanced quality control for wet ponds.

Note that the volume requirements estimated by SWMHYMO are higher than those estimated in PCSWMM due to differences in the modelling programs.

The interim conditions 2- to 100-year 12-hour SCS Type II design storm flows and water levels at key points on Carp River and Feedmill Creek are summarized in Table B-1 of Attachment B for the update interim base scenario and interim Scenario C2. As may be seen from the attached, water levels increase between the two scenarios by up to 5 cm on Feedmill Creek and 3 cm on the Carp River. The interim base and Scenario C2 PCSWMM modelling files for the 2- to 100-year 12-hour SCS design storms are attached, as well as the Scenario C2 15 mm 3-hour Chicago storm PCSWMM modelling files for the preliminary pond sizing exercise. The SWMHYMO modelling files prepared for the preliminary pond sizing exercise are also attached.

Yours truly,
J.F. Sabourin and Associates Inc.

Laura Pipkins, P.Eng.

cc: J.F. Sabourin, M.Eng, P.Eng.
Director of Water Resources Projects

Attachment A: Conceptual Storm Servicing (DSEL, May 2018)
Revised Catchment Boundaries in the Carp River Model
Attachment B: Comparison of 2- to 100-Year Water Levels and Flows at Key Points on Carp River and Feedmill Creek

ATTACHMENT

A

Conceptual Storm Servicing Plan
(DSEL, May 2018)

Revised Catchment Boundaries in the Carp River Model

JFSA Water Resources and Environmental Consultants

FEEDMILL CREEK

HIGHWAY 417

Eastbound Off Ramp

Eastbound On Ramp

MATCH EXISTING CULVERT INV ±102.44

Eastbound On Ramp

FUTURE DEVELOPMENT

MVCA SPILL LINE

900Ø CULVERT
IN INV. 102.668
OUT INV. 102.590

SWM POND 7 OUTFALL

Autopark

CANADIAN TIRE CENTRE

Stormwater management pond (2.5 ha)
POND 7
Sediment Management Area

BUFFER FROM QUARRY

Employment

Commercial

18.3Ha
0.70

PALLADIUM DRIVE

PALLADIUM CORP.

C. & D. BENNETT

PALLADIUM CORP.

18.0Ha
0.70

TRUNK 1

TRUNK 2

Commercial

TRUNK 4

TRUNK 4

HUNTMAR DRIVE

Commercial

Park

High School

TRUNK 1

PARK

TRUNK 2

Commercial

G. & H. WALT

74.2Ha
0.70

R.M.O.C.

TRUNK 4

Park

Future Mixed Use Development

TRUNK 3

HUNTMAR DEVELOPMENT CORP.

POND 4

HUNTMAR DEVELOPMENT CORP.

MAPLE GROVE ROAD

DSEL
david schaeffer engineering ltd

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Stittsville, ON K2S 1E9
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Fax. (613) 836-7183
www.DSEL.ca

LEGEND:
- STUDY LIMIT
- EXISTING DITCH
- MAJOR OVERLAND FLOW

KANATA WEST - 195 HUNTMAR DRIVE
CONCEPTUAL STORM SERVICING PLAN
CITY OF OTTAWA

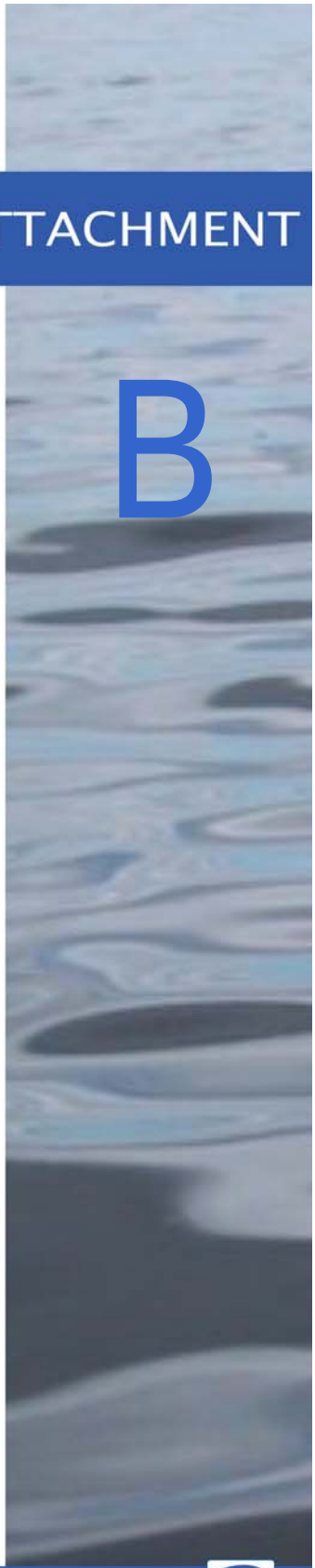
PROJECT No. :	14-624
SCALE	1:2000
DATE:	MAY 2018
DRAWING No.	2

Table A-1: Revised Catchment Boundaries in the Carp River Interim Conditions Model

PCSWMM Catchment ID	Original March 2016 [1]			KWMSS Pond 4/7 Update [2]			Difference			Notes
	Area (ha)	Imperviousness (%)	Width (m)	Area (ha)	Imperviousness (%)	Width (m)	Area (ha)	Imperviousness (%)	Width (m)	
Base										
FS020	11.40	27.000	87.00	6.84	27.000	52.00	-4.56	0.000	-35.00	
FS041	56.31	3.400	425.00							Overlaps with ult. conditions subcatchment
FS041_1[3]				33.89	3.400	253.00				
FS041_2[3]				4.55	3.400	34.33				
FS070	8.71	2.600	241.00	7.47	2.600	207.00	-1.24	0.000	-34.00	MTO Lands Undeveloped to Feedmill Creek
FS107_2[3]				8.95	35.350	366.00				
FS107_3[3]				16.50	0.000	498.00				
PS202[4]	106.24	71.045	708.27	112.90	71.045	753.00	6.66	0.000	44.73	
PS241_1[4]	18.55	57.689	480.00	13.52	57.689	350.00	-5.03	0.000	-130.00	
Scenario C2										
FS020	11.40	27.000	87.00	6.84	27.000	52.00	-4.56	0.000	-35.00	
FS041	56.31	3.400	425.00				-0.35	-48.677	-202.66	Overlaps with ult. conditions subcatchment
FS041_1[3]				11.31	3.400	85.39				
FS041_2[3]				4.55	3.400	34.33				
FS070	8.71	2.600	241.00	7.61	2.600	211.00	-1.10	0.000	-30.00	
FS107[3]				40.80	71.000	507.95				Development to Pond 7
FS107_2[3]				8.95	35.350	366.00				Development to Feedmill Creek
FS107_3[3]				16.50	0.000	498.00				MTO Lands Undeveloped to Feedmill Creek
PS037	11.72	5.000	400.00							
PS030[4]	12.62	11.000	230.00	13.75	11.000	251.00	1.13	0.000	21.00	
PS202[4]	106.24	71.045	708.27	73.89	81.207	493.00	-32.35	10.162	-215.27	
PS212[4]	25.20	58.217	384.73	24.29	58.217	371.00	-0.91	0.000	-13.73	
PS230[4]	26.10	69.428	325.00	26.13	69.428	325.00	0.03	0.000	0.00	
PS241_1[4]	18.55	57.689	480.00	13.52	57.689	350.00	-5.03	0.000	-130.00	
CS216	19.65	95.000	210.00	13.80	95.000	147.00	-5.85	0.000	-63.00	

[1] As per interim/ultimate conditions Carp River PCSWMM model provided by the City of Ottawa dated February 2017.

[2] Modified to accommodate imported Kanata West Pond 4 and 7 drainage areas.



ATTACHMENT

B

Comparison of 2- to 100-Year Water Levels and Flows at Key Points on Carp River and Feedmill Creek

JFSA Water Resources and Environmental Consultants

Table B-1A: 2-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario C2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Interim Base [1]		KWMSS Pond 7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	4.77	93.79	4.76	93.79	-0.01	0.00
Near Fernbank Pond 2 Outfall	CJ200	4.85	93.76	4.84	93.76	-0.01	0.00
Hazeldean Road	CJ199	4.55	93.76	4.55	93.76	0.00	0.00
Maple Grove Road	CJ172	3.32	93.74	3.35	93.73	0.03	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	9.66	93.67	9.56	93.67	-0.10	0.00
Highway 417	CJ120	9.88	93.62	9.79	93.62	-0.09	0.00
Feedmill Creek	CJ106	10.03	93.51	9.95	93.50	-0.08	-0.01
Richardson Side Road	CJ050	12.66	92.67	12.64	92.67	-0.02	0.00
Huntmar Drive	CJ032	14.07	91.69	14.07	91.69	0.00	0.00
Downstream of Eco Woods Pond	FJ105	0.50	117.52	0.50	117.52	0.00	0.00
Upstream of Overland Drive	FJ094	1.11	113.38	1.11	113.37	0.00	-0.01
Upstream of Maple Grove open road allowance	FJ088	0.62	110.66	0.61	110.66	-0.01	0.00
Downstream of Maple Grove open road allowance	FJ087	0.59	110.20	0.59	110.20	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	0.59	110.17	0.59	110.17	0.00	0.00
Downstream of future Expansion Area 3	FJ074	1.25	106.82	1.27	106.82	0.02	0.00
Existing major system spill point (Interim model)	FJ073	1.14	106.51	1.15	106.52	0.01	0.01
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	0.63	106.44	0.65	106.45	0.02	0.01
Upstream of Highway 417*	FJ063	3.07	105.20	2.26	105.20	-0.81	0.00
Downstream of Highway 417	FJ062	1.51	105.18	1.53	105.18	0.02	0.00
Upstream of Palladium Dr.	FJ038	3.09	99.57	3.09	99.56	0.00	-0.01
Upstream of 417 on-ramp	FJ034	3.02	98.70	3.00	98.69	-0.02	-0.01
Upstream of 417 off-ramp	FJ032	3.02	98.63	2.99	98.62	-0.03	-0.01
Upstream of Tanger access road	FJ027	3.03	97.41	3.03	97.41	0.00	0.00
Upstream of Huntmar Drive	FJ019	3.90	96.80	3.90	96.80	0.00	0.00
Between Huntmar Drive and the Carp River	FJ007	3.90	94.36	3.90	94.36	0.00	0.00

[1] As per interim conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to include ultimate Kanata West Pond 4 and uncontrolled drainage to Feedmill Creek.

[2] Modified to reflect revised Kanata West Pond 7 drainage area and design, and surrounding areas draining uncontrolled to Feedmill Creek.

Pond 4 stage-storage-outflow design also modified.

Table B-1B: 5-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario C2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Interim Base [1]		KWMSS Pond 7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	7.08	94.05	7.07	94.05	-0.01	0.00
Near Fernbank Pond 2 Outfall	CJ200	7.17	94.03	7.17	94.03	0.00	0.00
Hazeldean Road	CJ199	6.72	94.03	6.75	94.02	0.03	-0.01
Maple Grove Road	CJ172	5.05	94.00	5.06	94.00	0.01	0.00
Palladium Drive (Near Pond 4 Outfall)	CJ150	14.43	93.89	14.18	93.88	-0.25	-0.01
Highway 417	CJ120	14.84	93.83	14.54	93.82	-0.30	-0.01
Feedmill Creek	CJ106	15.37	93.67	15.27	93.66	-0.10	-0.01
Richardson Side Road	CJ050	19.45	92.88	19.29	92.88	-0.16	0.00
Huntmar Drive	CJ032	23.72	92.02	23.60	92.02	-0.12	0.00
Downstream of Eco Woods Pond	FJ105	0.64	117.59	0.64	117.59	0.00	0.00
Upstream of Overland Drive	FJ094	1.30	113.42	1.29	113.41	-0.01	-0.01
Upstream of Maple Grove open road allowance	FJ088	0.77	110.79	0.77	110.79	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	0.84	110.32	0.84	110.32	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	0.84	110.29	0.84	110.29	0.00	0.00
Downstream of future Expansion Area 3	FJ074	1.76	106.87	1.80	106.87	0.04	0.00
Existing major system spill point (Interim model)	FJ073	1.63	106.63	1.65	106.64	0.02	0.01
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	1.02	106.53	1.05	106.54	0.03	0.01
Upstream of Highway 417*	FJ063	3.97	105.36	3.98	105.36	0.01	0.00
Downstream of Highway 417	FJ062	2.09	105.32	2.11	105.32	0.02	0.00
Upstream of Palladium Dr.	FJ038	5.08	99.94	5.07	99.94	-0.01	0.00
Upstream of 417 on-ramp	FJ034	5.05	99.19	5.02	99.19	-0.03	0.00
Upstream of 417 off-ramp	FJ032	5.04	99.10	5.01	99.10	-0.03	0.00
Upstream of Tanger access road	FJ027	5.10	97.68	5.09	97.68	-0.01	0.00
Upstream of Huntmar Drive	FJ019	6.46	97.09	6.45	97.09	-0.01	0.00
Between Huntmar Drive and the Carp River	FJ007	6.44	94.67	6.43	94.67	-0.01	0.00

[1] As per interim conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to include ultimate Kanata West Pond 4 and uncontrolled drainage to Feedmill Creek.

[2] Modified to reflect revised Kanata West Pond 7 drainage area and design, and surrounding areas draining uncontrolled to Feedmill Creek.

Pond 4 stage-storage-outflow design also modified.

Table B-1C: 10-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario C2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Interim Base [1]		KWMSS Pond 7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	8.57	94.20	8.56	94.19	-0.01	-0.01
Near Fernbank Pond 2 Outfall	CJ200	8.62	94.18	8.63	94.17	0.01	-0.01
Hazeldean Road	CJ199	8.03	94.17	8.06	94.17	0.03	0.00
Maple Grove Road	CJ172	6.36	94.15	6.37	94.14	0.01	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	17.91	94.02	17.60	94.01	-0.31	-0.01
Highway 417	CJ120	18.40	93.95	18.03	93.94	-0.37	-0.01
Feedmill Creek	CJ106	20.04	93.77	18.72	93.77	-1.32	0.00
Richardson Side Road	CJ050	24.39	93.00	24.11	93.00	-0.28	0.00
Huntmar Drive	CJ032	30.59	92.22	30.39	92.21	-0.20	-0.01
Downstream of Eco Woods Pond	FJ105	0.78	117.64	0.78	117.64	0.00	0.00
Upstream of Overland Drive	FJ094	1.56	113.47	1.47	113.47	-0.09	0.00
Upstream of Maple Grove open road allowance	FJ088	0.90	110.89	0.90	110.89	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	1.02	110.41	1.02	110.41	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	1.02	110.38	1.02	110.38	0.00	0.00
Downstream of future Expansion Area 3	FJ074	2.14	106.89	2.18	106.89	0.04	0.00
Existing major system spill point (Interim model)	FJ073	1.96	106.69	1.99	106.70	0.03	0.01
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	1.31	106.58	1.37	106.59	0.06	0.01
Upstream of Highway 417*	FJ063	4.07	105.47	4.00	105.47	-0.07	0.00
Downstream of Highway 417	FJ062	2.62	105.41	2.69	105.41	0.07	0.00
Upstream of Palladium Dr.	FJ038	6.78	100.22	6.73	100.21	-0.05	-0.01
Upstream of 417 on-ramp	FJ034	6.80	99.41	6.74	99.41	-0.06	0.00
Upstream of 417 off-ramp	FJ032	6.81	99.24	6.75	99.23	-0.06	-0.01
Upstream of Tanger access road	FJ027	6.94	97.86	6.96	97.85	0.02	-0.01
Upstream of Huntmar Drive	FJ019	8.45	97.29	8.39	97.29	-0.06	0.00
Between Huntmar Drive and the Carp River	FJ007	8.24	94.89	8.18	94.89	-0.06	0.00

[1] As per interim conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to include ultimate Kanata West Pond 4 and uncontrolled drainage to Feedmill Creek.

[2] Modified to reflect revised Kanata West Pond 7 drainage area and design, and surrounding areas draining uncontrolled to Feedmill Creek.

Pond 4 stage-storage-outflow design also modified.

Table B-1D: 25-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario C2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Interim Base [1]		KWMSS Pond 7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	10.23	94.34	10.21	94.34	-0.02	0.00
Near Fernbank Pond 2 Outfall	CJ200	10.27	94.32	10.27	94.32	0.00	0.00
Hazeldean Road	CJ199	9.41	94.32	9.49	94.31	0.08	-0.01
Maple Grove Road	CJ172	8.42	94.28	8.42	94.28	0.00	0.00
Palladium Drive (Near Pond 4 Outfall)	CJ150	22.71	94.17	22.28	94.16	-0.43	-0.01
Highway 417	CJ120	23.19	94.09	22.77	94.08	-0.42	-0.01
Feedmill Creek	CJ106	23.65	93.88	23.20	93.87	-0.45	-0.01
Richardson Side Road	CJ050	31.42	93.15	30.98	93.14	-0.44	-0.01
Huntmar Drive	CJ032	39.75	92.44	39.44	92.44	-0.31	0.00
Downstream of Eco Woods Pond	FJ105	1.01	117.72	0.99	117.72	-0.02	0.00
Upstream of Overland Drive	FJ094	1.82	113.54	1.73	113.54	-0.09	0.00
Upstream of Maple Grove open road allowance	FJ088	1.06	111.01	1.06	111.01	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	1.26	110.51	1.26	110.51	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	1.26	110.47	1.26	110.47	0.00	0.00
Downstream of future Expansion Area 3	FJ074	2.68	106.93	2.73	106.93	0.05	0.00
Existing major system spill point (Interim model)	FJ073	2.43	106.75	2.47	106.76	0.04	0.01
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	1.74	106.63	1.84	106.64	0.10	0.01
Upstream of Highway 417*	FJ063	5.42	105.65	5.42	105.67	0.00	0.02
Downstream of Highway 417	FJ062	3.38	105.52	3.48	105.52	0.10	0.00
Upstream of Palladium Dr.	FJ038	9.09	100.56	8.93	100.54	-0.16	-0.02
Upstream of 417 on-ramp	FJ034	8.96	99.77	8.85	99.75	-0.11	-0.02
Upstream of 417 off-ramp	FJ032	8.96	99.47	8.83	99.46	-0.13	-0.01
Upstream of Tanger access road	FJ027	9.10	98.07	8.98	98.06	-0.12	-0.01
Upstream of Huntmar Drive	FJ019	10.83	97.59	10.68	97.58	-0.15	-0.01
Between Huntmar Drive and the Carp River	FJ007	10.79	95.00	10.71	94.99	-0.08	-0.01

[1] As per interim conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to include ultimate Kanata West Pond 4 and uncontrolled drainage to Feedmill Creek.

[2] Modified to reflect revised Kanata West Pond 7 drainage area and design, and surrounding areas draining uncontrolled to Feedmill Creek.

Pond 4 stage-storage-outflow design also modified.

Table B-1E: 50-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario C2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Interim Base [1]		KWMSS Pond 7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	11.41	94.44	11.36	94.43	-0.05	-0.01
Near Fernbank Pond 2 Outfall	CJ200	11.47	94.42	11.48	94.41	0.01	-0.01
Hazeldean Road	CJ199	10.32	94.41	10.43	94.41	0.11	0.00
Maple Grove Road	CJ172	9.85	94.37	9.84	94.36	-0.01	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	26.14	94.26	25.63	94.25	-0.51	-0.01
Highway 417	CJ120	26.66	94.18	26.19	94.17	-0.47	-0.01
Feedmill Creek	CJ106	27.19	93.94	26.72	93.93	-0.47	-0.01
Richardson Side Road	CJ050	36.29	93.24	35.80	93.23	-0.49	-0.01
Huntmar Drive	CJ032	46.18	92.60	45.83	92.59	-0.35	-0.01
Downstream of Eco Woods Pond	FJ105	1.20	117.78	1.20	117.78	0.00	0.00
Upstream of Overland Drive	FJ094	2.16	113.63	1.82	113.63	-0.34	0.00
Upstream of Maple Grove open road allowance	FJ088	1.23	111.08	1.23	111.08	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	1.44	110.58	1.44	110.58	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	1.44	110.53	1.44	110.53	0.00	0.00
Downstream of future Expansion Area 3	FJ074	3.06	106.95	3.11	106.95	0.05	0.00
Existing major system spill point (Interim model)	FJ073	2.80	106.78	2.85	106.80	0.05	0.02
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	2.00	106.66	2.22	106.69	0.22	0.03
Upstream of Highway 417*	FJ063	5.69	105.79	5.68	105.82	-0.01	0.03
Downstream of Highway 417	FJ062	3.89	105.62	4.06	105.62	0.17	0.00
Upstream of Palladium Dr.	FJ038	10.81	100.80	10.63	100.78	-0.18	-0.02
Upstream of 417 on-ramp	FJ034	10.63	100.09	10.47	100.06	-0.16	-0.03
Upstream of 417 off-ramp	FJ032	10.63	99.68	10.48	99.66	-0.15	-0.02
Upstream of Tanger access road	FJ027	10.78	98.21	10.64	98.19	-0.14	-0.02
Upstream of Huntmar Drive	FJ019	12.56	97.75	12.46	97.74	-0.10	-0.01
Between Huntmar Drive and the Carp River	FJ007	12.82	95.10	12.69	95.10	-0.13	0.00

[1] As per interim conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to include ultimate Kanata West Pond 4 and uncontrolled drainage to Feedmill Creek.

[2] Modified to reflect revised Kanata West Pond 7 drainage area and design, and surrounding areas draining uncontrolled to Feedmill Creek.

Pond 4 stage-storage-outflow design also modified.

Table B-1F: 100-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario C2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Interim Base [1]		KWMSS Pond 7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	12.66	94.50	12.50	94.51	-0.16	0.01
Near Fernbank Pond 2 Outfall	CJ200	12.78	94.48	12.64	94.49	-0.14	0.01
Hazeldean Road	CJ199	11.43	94.48	11.46	94.49	0.03	0.01
Maple Grove Road	CJ172	11.01	94.43	11.13	94.44	0.12	0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	28.37	94.32	28.59	94.33	0.22	0.01
Highway 417	CJ120	28.74	94.24	29.16	94.24	0.42	0.00
Feedmill Creek	CJ106	29.35	94.00	29.75	94.00	0.40	0.00
Richardson Side Road	CJ050	38.78	93.35	39.49	93.38	0.71	0.03
Huntmar Drive	CJ032	52.16	93.02	53.85	93.05	1.69	0.03
Downstream of Eco Woods Pond	FJ105	1.44	117.86	1.43	117.86	-0.01	0.00
Upstream of Overland Drive	FJ094	2.30	113.71	2.30	113.71	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	1.69	111.15	1.69	111.15	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	1.77	110.70	1.78	110.71	0.01	0.01
Adjacent to future Expansion Area 3	FJ085	1.77	110.64	1.78	110.64	0.01	0.00
Downstream of future Expansion Area 3	FJ074	3.44	106.96	3.51	106.97	0.07	0.01
Existing major system spill point (Interim model)	FJ073	3.16	106.80	3.22	106.85	0.06	0.05
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	2.19	106.69	2.62	106.74	0.43	0.05
Upstream of Highway 417*	FJ063	6.46	105.99	5.66	106.03	-0.80	0.04
Downstream of Highway 417	FJ062	4.42	105.77	4.73	105.77	0.31	0.00
Upstream of Palladium Dr.	FJ038	11.87	101.15	11.66	101.08	-0.21	-0.07
Upstream of 417 on-ramp	FJ034	11.78	100.33	11.57	100.28	-0.21	-0.05
Upstream of 417 off-ramp	FJ032	11.78	99.83	11.57	99.80	-0.21	-0.03
Upstream of Tanger access road	FJ027	11.93	98.31	11.73	98.29	-0.20	-0.02
Upstream of Huntmar Drive	FJ019	13.72	97.89	13.61	97.87	-0.11	-0.02
Between Huntmar Drive and the Carp River	FJ007	14.00	95.12	13.89	95.11	-0.11	-0.01

[1] As per interim conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to include ultimate Kanata West Pond 4 and uncontrolled drainage to Feedmill Creek.

[2] Modified to reflect revised Kanata West Pond 7 drainage area and design, and surrounding areas draining uncontrolled to Feedmill Creek.

Pond 4 stage-storage-outflow design also modified.