



**IBI GROUP**  
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**PRELIMINARY STORMWATER MANAGEMENT DESIGN BRIEF**  
**653 Erb Street West, 12 Westhill Drive, City of Waterloo**  
**October 23, 2017**  
**Revised: October 17, 2018**  
**Prepared For: Bel Communities Partnership Limited**  
**IBI Group Project 102225**

## **1. INTRODUCTION**

IBI Group was retained to prepare a Preliminary Stormwater Management Design Brief in support of a Planning Application for residential development located at 653 Erb Street West and 12 Westhill Drive in the City of Waterloo. The current application includes an Official Plan Amendment and a Zoning By-Law Amendment to support the construction two apartment buildings and six stacked townhouse blocks on the site.

This Preliminary Design Brief outlines the stormwater management requirements to accommodate the construction of a residential development. The 1.80 ha site will include on-site controls for stormwater quantity control as per City of Waterloo and Region of Waterloo requirements.

## **2. EXISTING CONDITIONS**

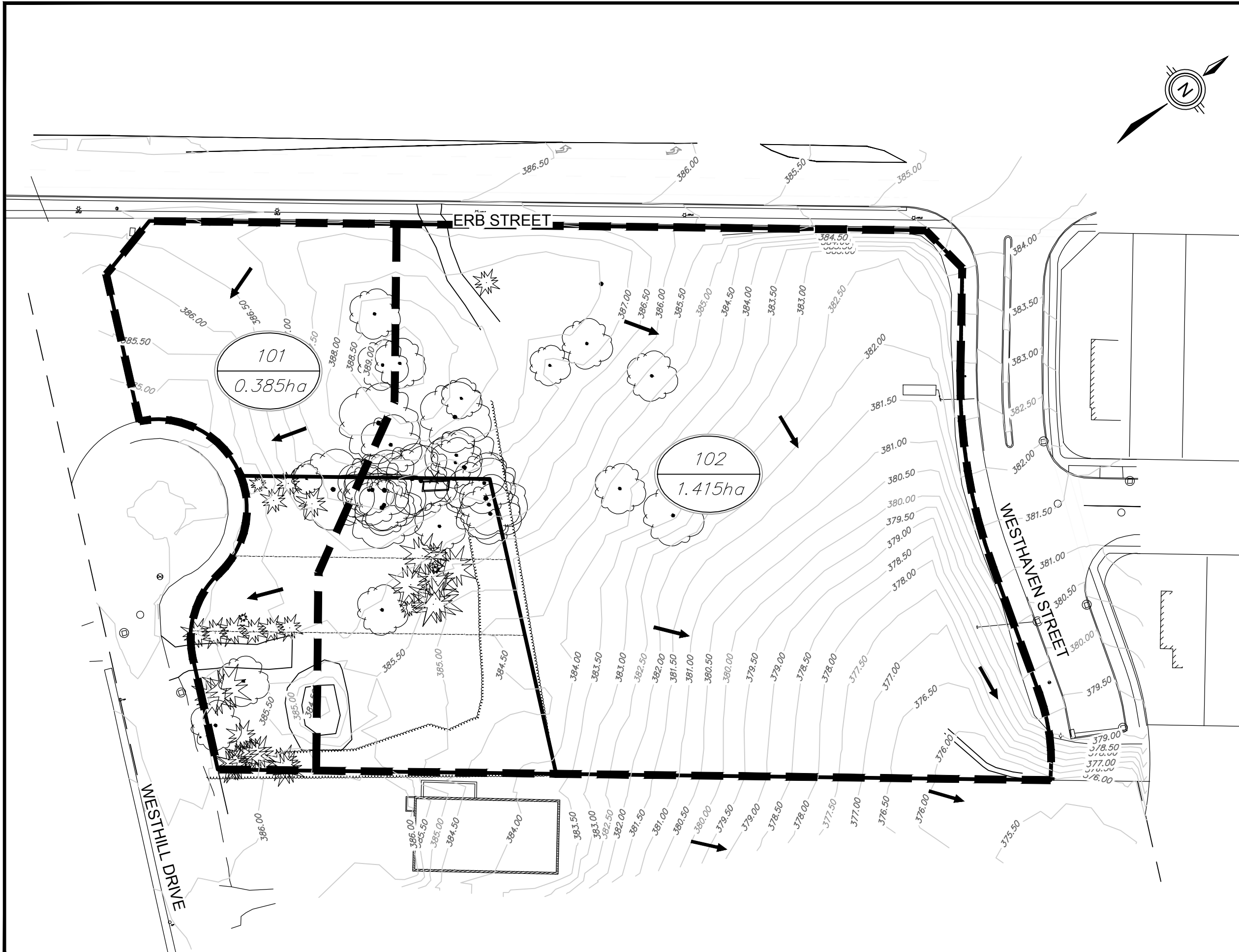
Drainage areas under existing conditions are shown on Figure 1. Runoff from Area 101 sheet drains overland toward Erbsville Street West and Westhill Drive to the north and west. Runoff from Area 102 sheet drains overland toward Westhaven Street to the east. The site is currently vacant, and contains vegetated areas and impervious concrete areas.

Based on the Revised Geotechnical Investigation Report (Proposed Residential Development, 635 Erb Street West and 12 Westhill Drive, Waterloo, Ontario, EnGlobe, June 15, 2017), site soils consist of fill overlying native deposits of sandy, silt till, and glacial till. Groundwater elevations range from 2.0m to 4.9m below existing grade. Based on these soil types, a CN value of 66 was used for the stormwater modelling of pervious areas.

## **3. PROPOSED CONDITIONS**

Under proposed conditions, one 12-storey apartment building, one 13-storey apartment building, and six stacked townhouse blocks will be constructed on the site. The site will also include parking areas and landscaped areas. A proposed on-site storm sewer will convey flows to the existing storm sewer on Westhaven Street, which will then route runoff to an the existing Gies-Westvale Subdivision stormwater management pond to the southeast of the property.

The proposed conditions drainage areas are shown on Figure 2. Stormwater attenuation will be provided on-site to control proposed conditions peak flows to the required levels. On-site infiltration of rooftop runoff will be explored at the detailed design stage.



**LEGEND**

- EXISTING CATCHMENT BOUNDARIES
- DRAINAGE ARROWS
- EX. CATCHMENT SYMBOL  
← CATCHMENT AREA NUMBER  
← AREA (ha)

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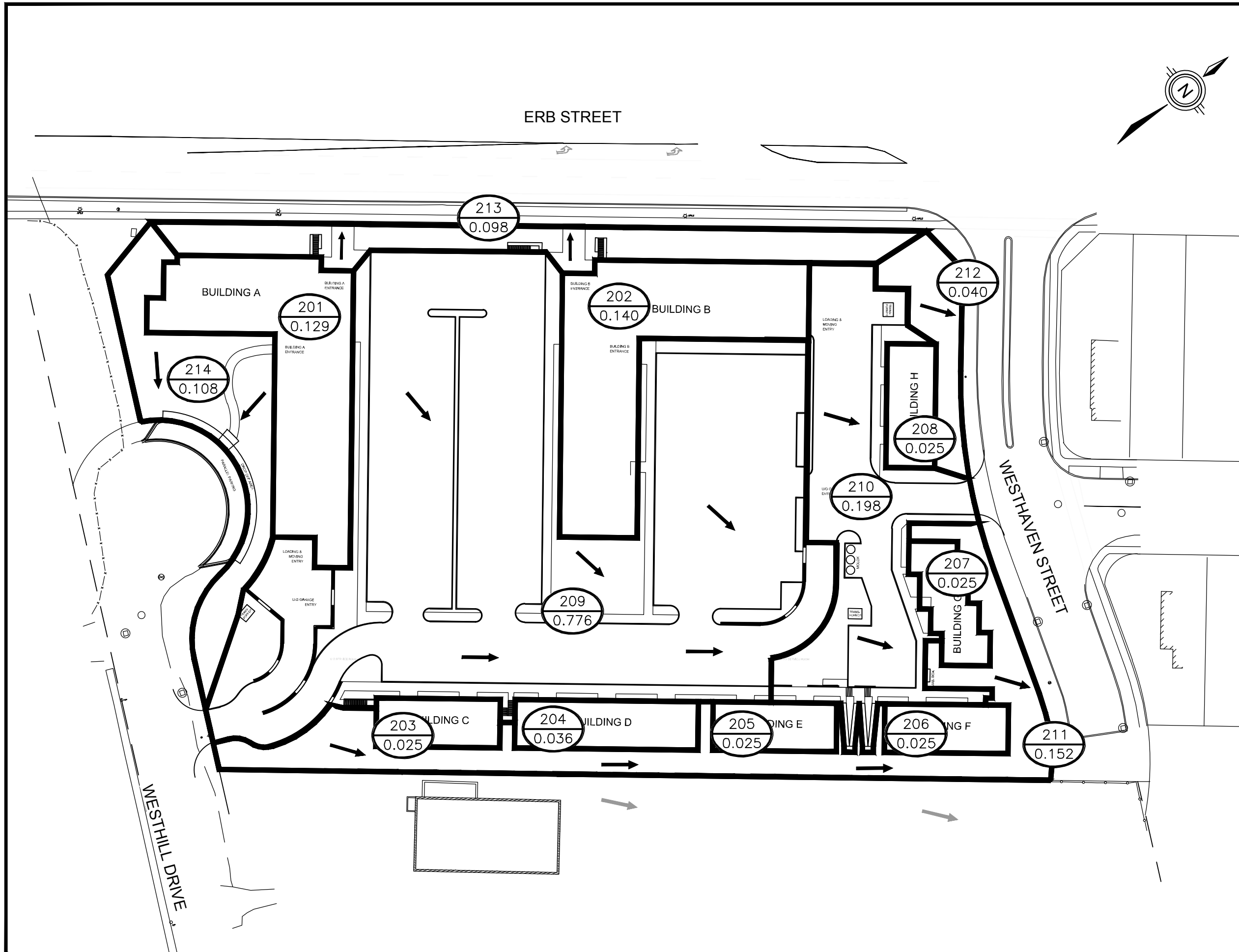
SCALE 1:750  
 DATE OCTOBER 2018  
 PROJECT No. 102225

CITY OF WATERLOO  
 REGIONAL MUNICIPALITY  
 OF WATERLOO

635 ERB STREET  
 WATERLOO, ON

PRE-DEVELOPMENT  
 STORM AREA PLAN

FIGURE 1



**LEGEND**

- PROPOSED CATCHMENT BOUNDARIES
- EX DRAINAGE ARROWS
- PROP. DRAINAGE ARROWS
- PROP. CATCHMENT SYMBOL  
CATCHMENT AREA NUMBER  
AREA (ha)

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CITY OF WATERLOO  
 REGIONAL MUNICIPALITY  
 OF WATERLOO

635 ERB STREET  
 WATERLOO, ON

POST-DEVELOPMENT  
 STORM AREA PLAN

FIGURE 2

Preliminary Stormwater Management Design Brief– October 17, 2018  
 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
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## 4. STORMWATER MANAGEMENT

The stormwater management criteria for this development are based on City of Waterloo and Region of Waterloo requirements as follows:

- Stormwater management for quantity control is provided for the property in the Gies-Westvale Subdivision stormwater management pond located to the southeast of the proposed development. The pond design has accounted for a drainage area of 1.26ha with a runoff coefficient value of 0.70 from the subject lands;
- The remainder of the site draining toward Erb Street West and Westhill Drive will require that proposed conditions peak flows be controlled to existing conditions levels for the 2 year, 5 year, and 100 year storm events;
- Stormwater management for quality control is required for parking lot areas to a Normal Protection Level as per MECP standards, which is provided in the downstream Gies-Westvale Subdivision stormwater management pond;
- The stormwater management design must consider infiltration of rooftop runoff if soil and groundwater conditions permit.

The existing and proposed conditions have been modelled using MIDUSS utilizing City of Waterloo IDF curves, and modelling variables are summarized in Table 1.

**Table 1: MIDUSS Modelling Variables**

CATCHMENT ID	DESCRIPTION	AREA (HA)	LENGTH (M)	GRADIENT (%)	IMPERV. (%)	MANNING 'N'	PERVIOUS CN
<b>EXISTING CONDITIONS</b>							
101	Draining West	0.385	20	8	10	0.250	66
102	Draining East *	1.260	50	10	70	0.250	66
<b>Total</b>		<b>1.645</b>			<b>56</b>		
<b>PROPOSED CONDITIONS</b>							
201	Roof	0.129	15	1	100	0.013	98
202	Roof	0.140	15	1	100	0.013	98
203	Roof	0.025	10	1	100	0.013	98
204	Roof	0.036	10	1	100	0.013	98
205	Roof	0.025	10	1	100	0.013	98
206	Roof	0.025	10	1	100	0.013	98
207	Roof	0.025	10	1	100	0.013	98
208	Roof	0.025	10	1	100	0.013	98
209	Parking/Landscaping	0.776	20	2	97	0.250	66
210	Landscaping	0.198	10	2	80	0.250	66
211	Landscaping	0.152	10	5	0	0.250	66
212	Landscaping	0.040	10	5	0	0.250	66
213	Landscaping	0.098	10	5	15	0.250	66
214	Landscaping	0.108	10	5	11	0.250	66
<b>Total</b>		<b>1.800</b>			<b>69</b>		

\* Area to East = 1.415ha, allowable Area to East = 1.26ha, with C = 0.70 (equivalent to 70% imperviousness)

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As shown in Table 1, the impervious area under proposed conditions will increase from existing (allowable) conditions. Accordingly, on-site stormwater quantity control will be required in addition to that provided in the Gies-Westvale Subdivision stormwater management pond.

On-site attenuation will be provided on rooftop areas, using flow control drains for attenuation. The preliminary rooftop stage-storage-discharge calculations are attached. Approximately 125m<sup>3</sup> of surface and/or underground storage will be required in the parking lot to control proposed conditions peak flows to existing levels for flows discharging toward the Gies-Westvale Subdivision stormwater management pond.

The exact locations and configurations of stormwater storage areas will be provided at the detailed design stage. A single storm sewer connection for the site will be provided to the existing storm sewer on Westhaven Street.

Existing and proposed conditions peak flows are shown in Table 2. Additional peak flow attenuation measures for flows toward the west will be explored at the detailed design stage. The preliminary MIDUSS modelling is attached.

**Table 2: Peak Flows**

RETURN EVENT	EXISTING (ALLOWABLE) CONDITIONS	PROPOSED CONDITIONS
	PEAK FLOW (M <sup>3</sup> /S)	PEAK FLOW (M <sup>3</sup> /S)
<b>Draining East</b>		
2 Year	0.193	0.192
5 Year	0.272	0.265
100 Year	0.520	0.518
<b>Draining West</b>		
2 Year	0.009	0.006
5 Year	0.013	0.009
100 Year	0.065	0.037

The location(s) of infiltration facilities for rooftop runoff will be confirmed at the detailed design stage. Based on the Geotechnical Investigation, native soils include areas of sand which may support active infiltration of roof runoff. Any proposed infiltration facilities will be located a minimum 5.0m away from buildings.

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## **5. CLOSURE**

We trust the foregoing is satisfactory and will allow review and approval the Preliminary Stormwater Management Design Brief and preliminary engineering drawings for this development.

All of which is respectfully submitted.

**IBI GROUP**

A handwritten signature in blue ink, appearing to read 'AKroess', is positioned above the name of the signatory.

Andy Kroess, M.Eng., P.Eng.

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 201 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 1290 (m<sup>2</sup>)  
 Number of Roof Drains = 8  
 Roof Cell Area = 161.3 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 12.70 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	4.48	0.04	0.30	0.00038	0.00304
2	0.051	17.92	0.30	2.43	0.00076	0.00608
3	0.076	40.31	1.02	8.19	0.00114	0.00912
4	0.102	71.67	2.43	19.42	0.00152	0.01216
5	0.127	111.98	4.74	37.92	0.00190	0.01520
6	0.152	161.25	8.19	65.53	0.00228	0.01824

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 202 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 1400 (m<sup>2</sup>)  
 Number of Roof Drains = 8  
 Roof Cell Area = 175.0 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 13.23 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	4.86	0.04	0.33	0.00038	0.00304
2	0.051	19.44	0.33	2.63	0.00076	0.00608
3	0.076	43.75	1.11	8.89	0.00114	0.00912
4	0.102	77.78	2.63	21.07	0.00152	0.01216
5	0.127	121.53	5.14	41.16	0.00190	0.01520
6	0.152	175.00	8.89	71.12	0.00228	0.01824

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)



**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 203 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 250 (m<sup>2</sup>)  
 Number of Roof Drains = 4  
 Roof Cell Area = 62.5 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 7.91 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	1.74	0.01	0.06	0.00038	0.00152
2	0.051	6.94	0.12	0.47	0.00076	0.00304
3	0.076	15.63	0.40	1.59	0.00114	0.00456
4	0.102	27.78	0.94	3.76	0.00152	0.00608
5	0.127	43.40	1.84	7.35	0.00190	0.00760
6	0.152	62.50	3.18	12.70	0.00228	0.00912

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 204 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 360 (m<sup>2</sup>)  
 Number of Roof Drains = 6  
 Roof Cell Area = 60.0 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 7.75 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	1.67	0.01	0.08	0.00038	0.00228
2	0.051	6.67	0.11	0.68	0.00076	0.00456
3	0.076	15.00	0.38	2.29	0.00114	0.00684
4	0.102	26.67	0.90	5.42	0.00152	0.00912
5	0.127	41.67	1.76	10.58	0.00190	0.01140
6	0.152	60.00	3.05	18.29	0.00228	0.01368

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 205 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 250 (m<sup>2</sup>)  
 Number of Roof Drains = 4  
 Roof Cell Area = 62.5 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 7.91 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	1.74	0.01	0.06	0.00038	0.00152
2	0.051	6.94	0.12	0.47	0.00076	0.00304
3	0.076	15.63	0.40	1.59	0.00114	0.00456
4	0.102	27.78	0.94	3.76	0.00152	0.00608
5	0.127	43.40	1.84	7.35	0.00190	0.00760
6	0.152	62.50	3.18	12.70	0.00228	0.00912

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 206 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 250 (m<sup>2</sup>)  
 Number of Roof Drains = 4  
 Roof Cell Area = 62.5 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 7.91 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	1.74	0.01	0.06	0.00038	0.00152
2	0.051	6.94	0.12	0.47	0.00076	0.00304
3	0.076	15.63	0.40	1.59	0.00114	0.00456
4	0.102	27.78	0.94	3.76	0.00152	0.00608
5	0.127	43.40	1.84	7.35	0.00190	0.00760
6	0.152	62.50	3.18	12.70	0.00228	0.00912

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 207 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 250 (m<sup>2</sup>)  
 Number of Roof Drains = 4  
 Roof Cell Area = 62.5 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 7.91 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	1.74	0.01	0.06	0.00038	0.00152
2	0.051	6.94	0.12	0.47	0.00076	0.00304
3	0.076	15.63	0.40	1.59	0.00114	0.00456
4	0.102	27.78	0.94	3.76	0.00152	0.00608
5	0.127	43.40	1.84	7.35	0.00190	0.00760
6	0.152	62.50	3.18	12.70	0.00228	0.00912

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

**102225 - 653 Erb Street West, 12 Westhill Drive, City of Waterloo  
Area 208 Roof Stage-Storage-Discharge Relationship**

Total Rooftop Area = 250 (m<sup>2</sup>)  
 Number of Roof Drains = 4  
 Roof Cell Area = 62.5 (m<sup>2</sup>)  
 The Length of a Cell Side\* = 7.91 (m)  
 Maximum Ponding Depth = 0.152 (m)  
 Total Number of Notches per Drain = 1

Depth	Depth	Base Area	Cell Volume	Total Volume	Notch Discharge**	Total Discharge
(inch)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
0	0.000	0	0.00	0.00	0.00000	0.00000
1	0.025	1.74	0.01	0.06	0.00038	0.00152
2	0.051	6.94	0.12	0.47	0.00076	0.00304
3	0.076	15.63	0.40	1.59	0.00114	0.00456
4	0.102	27.78	0.94	3.76	0.00152	0.00608
5	0.127	43.40	1.84	7.35	0.00190	0.00760
6	0.152	62.50	3.18	12.70	0.00228	0.00912

\* - assumed that the cell is square

\*\* - notch discharge given as 0.38 l/s/notch/inch of head

(from Zurn Control-Flo Roof Drainage System Technical Catalogue)

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35 COMMENT
7 line(s) of comment
*****
* 102225 - RESIDENTIAL DEVELOPMENT *
* 635 ERB ST W & 12 WESTHILL DR, CITY OF WATERLOO *
* IBI GROUP *
* OCTOBER 2017 - PRELIMINARY *
* REVISED OCTOBER 2018 *
*****
35 COMMENT
4 line(s) of comment
*****
* 2 YEAR CHICAGO STORM *
* CITY OF WATERLOO IDF PARAMETERS *
*****
2 STORM
1 1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
1101.000 Coefficient a
9.258 Constant b (min)
.882 Exponent c
.400 Fraction to peak r
180.000 Duration ó 180 min
32.400 mm Total depth
3 IMPERVIOUS
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.100 Ia/S Coefficient
.518 Initial Abstraction
35 COMMENT
3 line(s) of comment
*****
* EXISTING CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 102 - ALLOWABLE AREA *
*****
4 CATCHMENT
102.000 ID No.ó 99999
1.260 Area in hectares
50.000 Length (PERV) metres
10.000 Gradient (%)
70.000 Per cent Impervious
50.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.193 .000 .000 .000 c.m/s
.077 .835 .608 C perv/imperv/total
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
15 ADD RUNOFF .193 .193 .000 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 101 *
*****
4 CATCHMENT

```

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101.000 ID No.ó 99999
      .385 Area in hectares
20.000 Length (PERV) metres
8.000 Gradient (%)
10.000 Per cent Impervious
20.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .250 Manning "n"
66.000 SCS Curve No or C
      .100 Ia/S Coefficient
13.085 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .009 .000 .000 .000 c.m/s
      .077 .822 .151 C perv/imperv/total
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
15 ADD RUNOFF
      .009 .009 .000 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* PROPOSED CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 201 *
*****
4 CATCHMENT
201.000 ID No.ó 99999
      .129 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .028 .000 .000 .000 c.m/s
      .835 .835 .835 C perv/imperv/total
15 ADD RUNOFF
      .028 .028 .000 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
      .000 .000 .0
      .025 .00304 .3
      .051 .00608 2.4
      .076 .00912 8.1
      .102 .0122 19.2
      .127 .0152 37.9
      .152 .0182 65.5
      Peak Outflow = .010 c.m/s
      Maximum Depth = .085 metres
      Maximum Storage = 12. c.m
      .028 .028 .010 .000 c.m/s
17 COMBINE
500 Junction Node No.
      .028 .028 .010 .010 c.m/s
14 START

```



```

1      1=Zero; 2=Define
35     COMMENT
3      1 line(s) of comment
      *****
      * AREA 202 *
      *****
4      CATCHMENT
202.000 ID No.6 99999
      .140 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .031 .000 .010 .010 c.m/s
      .835 .835 .835 C perv/imperv/total
15     ADD RUNOFF
35     COMMENT
3      1 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10     POND
7      Depth - Discharge - Volume sets
      .000 .000 .0
      .025 .00304 .3
      .051 .00608 2.6
      .076 .00912 8.9
      .102 .0122 21.1
      .127 .0152 41.2
      .152 .0182 71.2
      Peak Outflow = .010 c.m/s
      Maximum Depth = .086 metres
      Maximum Storage = 14. c.m
      .031 .031 .010 .010 c.m/s
17     COMBINE
500    Junction Node No.
      .031 .031 .010 .020 c.m/s
14     START
1      1=Zero; 2=Define
35     COMMENT
3      1 line(s) of comment
      *****
      * AREA 203 *
      *****
4      CATCHMENT
203.000 ID No.6 99999
      .025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .006 .000 .010 .020 c.m/s
      .831 .831 .831 C perv/imperv/total
15     ADD RUNOFF
35     COMMENT
3      1 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *

```

```

*****
10  POND
    7 Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .00152    .1
      .051      .00304    .5
      .076      .00456    1.6
      .102      .00608    3.8
      .127      .00760    7.4
      .152      .00912   12.7
    Peak Outflow = .004 c.m/s
    Maximum Depth = .062 metres
    Maximum Storage = 1. c.m
    .006      .006      .004      .020 c.m/s
17  COMBINE
    500 Junction Node No.
      .006      .006      .004      .024 c.m/s
14  START
    1 1=Zero; 2=Define
35  COMMENT
    3 line(s) of comment
      *****
      * AREA 204 *
      *****
4   CATCHMENT
    204.000 ID No.6 99999
      .036 Area in hectares
    10.000 Length (PERV) metres
      1.000 Gradient (%)
    100.000 Per cent Impervious
    10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
    98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .008      .000      .004      .024 c.m/s
      .831      .831      .831      C perv/imperv/total
15  ADD RUNOFF
      .008      .008      .004      .024 c.m/s
35  COMMENT
    3 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10  POND
    7 Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .00228    .1
      .051      .00456    .7
      .076      .00684    2.3
      .102      .00912    5.4
      .127      .0114     10.6
      .152      .0137     18.3
    Peak Outflow = .005 c.m/s
    Maximum Depth = .060 metres
    Maximum Storage = 1. c.m
    .008      .008      .005      .024 c.m/s
17  COMBINE
    500 Junction Node No.
      .008      .008      .005      .029 c.m/s
14  START
    1 1=Zero; 2=Define
35  COMMENT
    3 line(s) of comment
      *****
      * AREA 205 *
      *****
4   CATCHMENT
    205.000 ID No.6 99999
      .025 Area in hectares
    10.000 Length (PERV) metres

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```

1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.006 .000 .005 .029 c.m/s
.831 .831 .831 C perv/imperv/total
15 ADD RUNOFF
.006 .006 .005 .029 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .004 c.m/s
Maximum Depth = .062 metres
Maximum Storage = 1. c.m
.006 .006 .004 .029 c.m/s
17 COMBINE
500 Junction Node No.
.006 .006 .004 .033 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 206 *
*****
4 CATCHMENT
206.000 ID No.6 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.006 .000 .004 .033 c.m/s
.831 .831 .831 C perv/imperv/total
15 ADD RUNOFF
.006 .006 .004 .033 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7

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102225R.OUT
Peak Outflow = .004 c.m/s
Maximum Depth = .062 metres
Maximum Storage = 1. c.m
.006 .006 .004 .033 c.m/s
17 COMBINE
500 Junction Node No.
.006 .006 .004 .037 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 1 line(s) of comment
*****
* AREA 207 *
*****
4 CATCHMENT
207.000 ID No.6 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.006 .000 .004 .037 c.m/s
.831 .831 .831 C perv/imperv/total
15 ADD RUNOFF
.006 .006 .004 .037 c.m/s
35 COMMENT
3 1 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .004 c.m/s
Maximum Depth = .062 metres
Maximum Storage = 1. c.m
.006 .006 .004 .037 c.m/s
17 COMBINE
500 Junction Node No.
.006 .006 .004 .041 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 1 line(s) of comment
*****
* AREA 208 *
*****
4 CATCHMENT
208.000 ID No.6 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv

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102225R.OUT
.006 .000 .004 .041 c.m/s
.831 .831 .831 C perv/imperv/total
15 ADD RUNOFF .006 .006 .004 .041 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .004 c.m/s
Maximum Depth = .062 metres
Maximum Storage = 1. c.m
.006 .006 .004 .041 c.m/s
17 COMBINE
500 Junction Node No.
.006 .006 .004 .045 c.m/s
18 CONFLUENCE
500 Junction Node No.
.006 .045 .004 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* AREA 209 *
*****
4 CATCHMENT
209.000 ID No.ó 99999
.776 Area in hectares
20.000 Length (PERV) metres
2.000 Gradient (%)
97.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.166 .045 .004 .000 c.m/s
.077 .835 .812 C perv/imperv/total
15 ADD RUNOFF .166 .202 .004 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* AREA 210 *
*****
4 CATCHMENT
210.000 ID No.ó 99999
.198 Area in hectares
10.000 Length (PERV) metres
2.000 Gradient (%)
80.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.037 .202 .004 .000 c.m/s
.077 .822 .673 C perv/imperv/total
15 ADD RUNOFF .037 .239 .004 .000 c.m/s

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35  COMMENT
    3  line(s) of comment
      *****
      * SURFACE STORAGE *
      *****
10  POND
    4  Depth - Discharge - Volume sets
        .000      .000      .0
        .100      .160      40.0
        .200      .260      70.0
        .300      .500     125.0
    Peak Outflow = .192 c.m/s
    Maximum Depth = .132 metres
    Maximum Storage = 50. c.m
        .037      .239      .192      .000 c.m/s
17  COMBINE
    600  Junction Node No.
        .037      .239      .192      .192 c.m/s
14  START
    1  1=Zero; 2=Define
35  COMMENT
    3  line(s) of comment
      *****
      * AREA 211 *
      *****
    4  CATCHMENT
    211.000  ID No.ó 99999
        .152  Area in hectares
    10.000  Length (PERV) metres
        5.000  Gradient (%)
        .000  Per cent Impervious
    10.000  Length (IMPERV)
        .000  %Imp. with Zero Dpth
        1  Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .250  Manning "n"
    66.000  SCS Curve No or C
        .100  Ia/s Coefficient
    13.085  Initial Abstraction
        1  Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .001      .000      .192      .192 c.m/s
            .077      .000      .077      C perv/imperv/total
15  ADD RUNOFF
        .001      .001      .192      .192 c.m/s
    9  ROUTE
        .000  Conduit Length
        .000  No Conduit defined
        .000  Zero lag
        .000  Beta weighting factor
        .000  Routing timestep
        0  No. of sub-reaches
            .001      .001      .001      .192 c.m/s
17  COMBINE
    600  Junction Node No.
        .001      .001      .001      .192 c.m/s
14  START
    1  1=Zero; 2=Define
35  COMMENT
    3  line(s) of comment
      *****
      * AREA 212 *
      *****
    4  CATCHMENT
    212.000  ID No.ó 99999
        .040  Area in hectares
    10.000  Length (PERV) metres
        5.000  Gradient (%)
        .000  Per cent Impervious
    10.000  Length (IMPERV)
        .000  %Imp. with Zero Dpth
        1  Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .250  Manning "n"
    66.000  SCS Curve No or C
        .100  Ia/s Coefficient
    13.085  Initial Abstraction

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102225R.OUT
1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .000      .000      .001      .192 c.m/s
      .077      .000      .077      C perv/imperv/total
15    ADD RUNOFF
      .000      .000      .001      .192 c.m/s
9      ROUTE
      .000      Conduit Length
      .000      No Conduit defined
      .000      Zero lag
      .000      Beta weighting factor
      .000      Routing timestep
      0        No. of sub-reaches
      .000      .000      .000      .192 c.m/s
17    COMBINE
600   Junction Node No.
      .000      .000      .000      .192 c.m/s
35    COMMENT
3     line(s) of comment
      *****
      * TOTAL FLOW EAST TO SWM POND *
      *****
18    CONFLUENCE
600   Junction Node No.
      .000      .192      .000      .000 c.m/s
14    START
1     1=Zero; 2=Define
35    COMMENT
3     line(s) of comment
      *****
      * AREA 213 *
      *****
4     CATCHMENT
213.000 ID No.ó 99999
      .098 Area in hectares
      10.000 Length (PERV) metres
      5.000 Gradient (%)
      15.000 Per cent Impervious
      10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .250 Manning "n"
      66.000 SCS Curve No or C
      .100 Ia/s Coefficient
      13.085 Initial Abstraction
      1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .003      .000      .000      .000 c.m/s
      .077      .803      .185      C perv/imperv/total
15    ADD RUNOFF
      .003      .003      .000      .000 c.m/s
9      ROUTE
      .000      Conduit Length
      .000      No Conduit defined
      .000      Zero lag
      .000      Beta weighting factor
      .000      Routing timestep
      0        No. of sub-reaches
      .003      .003      .003      .000 c.m/s
17    COMBINE
700   Junction Node No.
      .003      .003      .003      .003 c.m/s
14    START
1     1=Zero; 2=Define
35    COMMENT
3     line(s) of comment
      *****
      * AREA 214 *
      *****
4     CATCHMENT
214.000 ID No.ó 99999
      .108 Area in hectares
      10.000 Length (PERV) metres
      5.000 Gradient (%)
      11.000 Per cent Impervious
      10.000 Length (IMPERV)

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                                102225R.OUT
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.003 .000 .003 .003 c.m/s
.077 .803 .156 C perv/imperv/total
15 ADD RUNOFF .003 .003 .003 .003 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.003 .003 .003 .003 c.m/s
17 COMBINE
700 Junction Node No.
.003 .003 .003 .006 c.m/s
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
18 CONFLUENCE
700 Junction Node No.
.003 .006 .003 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
4 line(s) of comment
*****
* 5 YEAR CHICAGO STORM *
* CITY OF WATERLOO IDF PARAMETERS *
*****
2 STORM
1 1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
1755.000 Coefficient a
12.347 Constant b (min)
.895 Exponent c
.400 Fraction to peak r
180.000 Duration ó 180 min
47.549 mm Total depth
3 IMPERVIOUS
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.100 Ia/S Coefficient
.518 Initial Abstraction
35 COMMENT
3 line(s) of comment
*****
* EXISTING CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 102 - ALLOWABLE AREA *
*****
4 CATCHMENT
102.000 ID No.ó 99999
1.260 Area in hectares
50.000 Length (PERV) metres
10.000 Gradient (%)
70.000 Per cent Impervious
50.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient

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102225R.OUT
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.272 .000 .003 .000 c.m/s
.151 .878 .660 C perv/imperv/total
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
15 ADD RUNOFF
.272 .272 .003 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 101 *
*****
4 CATCHMENT
101.000 ID No.6 99999
.385 Area in hectares
20.000 Length (PERV) metres
8.000 Gradient (%)
10.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.013 .000 .003 .000 c.m/s
.151 .858 .221 C perv/imperv/total
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
15 ADD RUNOFF
.013 .013 .003 .000 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* PROPOSED CONDITIONS *
*****
35 COMMENT
3 line(s) of comment
*****
* AREA 201 *
*****
4 CATCHMENT
201.000 ID No.6 99999
.129 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.040 .000 .003 .000 c.m/s
.877 .877 .877 C perv/imperv/total
15 ADD RUNOFF
.040 .040 .003 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****

```

\* BUILDING ROOFTOP STORAGE \*  
 \*\*\*\*\*

10

POND  
 7 Depth - Discharge - Volume sets  
 .000 .000 .0  
 .025 .00304 .3  
 .051 .00608 2.4  
 .076 .00912 8.1  
 .102 .0122 19.2  
 .127 .0152 37.9  
 .152 .0182 65.5  
 Peak Outflow = .012 c.m/s  
 Maximum Depth = .104 metres  
 Maximum Storage = 20. c.m  
 .040 .040 .012 .000 c.m/s

17

COMBINE  
 500 Junction Node No.  
 .040 .040 .012 .012 c.m/s

14

START  
 1 1=Zero; 2=Define

35

COMMENT  
 3 line(s) of comment  
 \*\*\*\*\*  
 \* AREA 202 \*  
 \*\*\*\*\*

4

CATCHMENT  
 202.000 ID No.ó 99999  
 .140 Area in hectares  
 15.000 Length (PERV) metres  
 1.000 Gradient (%)  
 100.000 Per cent Impervious  
 15.000 Length (IMPERV)  
 .000 %Imp. with Zero Dpth  
 1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat  
 .013 Manning "n"  
 98.000 SCS Curve No or C  
 .000 Ia/s Coefficient  
 .518 Initial Abstraction  
 1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv  
 .043 .000 .012 .012 c.m/s  
 .877 .877 .877 C perv/imperv/total

15

ADD RUNOFF  
 .043 .043 .012 .012 c.m/s

35

COMMENT  
 3 line(s) of comment  
 \*\*\*\*\*  
 \* BUILDING ROOFTOP STORAGE \*  
 \*\*\*\*\*

10

POND  
 7 Depth - Discharge - Volume sets  
 .000 .000 .0  
 .025 .00304 .3  
 .051 .00608 2.6  
 .076 .00912 8.9  
 .102 .0122 21.1  
 .127 .0152 41.2  
 .152 .0182 71.2  
 Peak Outflow = .013 c.m/s  
 Maximum Depth = .105 metres  
 Maximum Storage = 23. c.m  
 .043 .043 .013 .012 c.m/s

17

COMBINE  
 500 Junction Node No.  
 .043 .043 .013 .025 c.m/s

14

START  
 1 1=Zero; 2=Define

35

COMMENT  
 3 line(s) of comment  
 \*\*\*\*\*  
 \* AREA 203 \*  
 \*\*\*\*\*

4

CATCHMENT  
 203.000 ID No.ó 99999  
 .025 Area in hectares

```

10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.008 .000 .013 .025 c.m/s
.870 .870 .870 C perv/imperv/total
15 ADD RUNOFF
.008 .008 .013 .025 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .005 c.m/s
Maximum Depth = .077 metres
Maximum Storage = 2. c.m
.008 .008 .005 .025 c.m/s
17 COMBINE
500 Junction Node No.
.008 .008 .005 .029 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 204 *
*****
4 CATCHMENT
204.000 ID No.ó 99999
.036 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.011 .000 .005 .029 c.m/s
.870 .870 .870 C perv/imperv/total
15 ADD RUNOFF
.011 .011 .005 .029 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00228 .1
.051 .00456 .7
.076 .00684 2.3
.102 .00912 5.4
.127 .0114 10.6

```

```

102225R.OUT
.152 .0137 18.3
Peak Outflow = .007 c.m/s
Maximum Depth = .076 metres
Maximum Storage = 2. c.m
.011 .011 .007 .029 c.m/s
17 COMBINE
500 Junction Node No.
.011 .011 .007 .036 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 205 *
*****
4 CATCHMENT
205.000 ID No.ó 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.008 .000 .007 .036 c.m/s
.870 .870 .870 C perv/imperv/total
15 ADD RUNOFF
.008 .008 .007 .036 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .005 c.m/s
Maximum Depth = .077 metres
Maximum Storage = 2. c.m
.008 .008 .005 .036 c.m/s
17 COMBINE
500 Junction Node No.
.008 .008 .005 .041 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 206 *
*****
4 CATCHMENT
206.000 ID No.ó 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/s Coefficient
.518 Initial Abstraction

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102225R.OUT
1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .008      .000      .005      .041 c.m/s
      .870      .870      .870      C perv/imperv/total
15  ADD RUNOFF
      .008      .008      .005      .041 c.m/s
35  COMMENT
3      line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10  POND
7  Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .00152      .1
      .051      .00304      .5
      .076      .00456      1.6
      .102      .00608      3.8
      .127      .00760      7.4
      .152      .00912      12.7
      Peak Outflow =      .005 c.m/s
      Maximum Depth =      .077 metres
      Maximum Storage =      2. c.m
      .008      .008      .005      .041 c.m/s
17  COMBINE
500  Junction Node No.
      .008      .008      .005      .046 c.m/s
14  START
1      1=Zero; 2=Define
35  COMMENT
3      line(s) of comment
      *****
      * AREA 207 *
      *****
4  CATCHMENT
207.000  ID No.ó 99999
      .025  Area in hectares
10.000  Length (PERV) metres
1.000  Gradient (%)
100.000  Per cent Impervious
10.000  Length (IMPERV)
      .000  %Imp. with Zero Dpth
      1  Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013  Manning "n"
98.000  SCS Curve No or C
      .000  Ia/s Coefficient
      .518  Initial Abstraction
      1  Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .008      .000      .005      .046 c.m/s
      .870      .870      .870      C perv/imperv/total
15  ADD RUNOFF
      .008      .008      .005      .046 c.m/s
35  COMMENT
3      line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10  POND
7  Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .00152      .1
      .051      .00304      .5
      .076      .00456      1.6
      .102      .00608      3.8
      .127      .00760      7.4
      .152      .00912      12.7
      Peak Outflow =      .005 c.m/s
      Maximum Depth =      .077 metres
      Maximum Storage =      2. c.m
      .008      .008      .005      .046 c.m/s
17  COMBINE
500  Junction Node No.
      .008      .008      .005      .051 c.m/s
14  START
1      1=Zero; 2=Define

```

```

35  COMMENT
    3  line(s) of comment
    *****
    * AREA 208 *
    *****
4  CATCHMENT
208.000  ID No.ó 99999
    .025  Area in hectares
    10.000 Length (PERV) metres
    1.000 Gradient (%)
    100.000 Per cent Impervious
    10.000 Length (IMPERV)
    .000 %Imp. with Zero Dpth
    1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
    .013 Manning "n"
    98.000 SCS Curve No or C
    .000 Ia/S Coefficient
    .518 Initial Abstraction
    1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
    .008 .000 .005 .051 c.m/s
    .870 .870 .870 C perv/imperv/total
15  ADD RUNOFF
    .008 .008 .005 .051 c.m/s
35  COMMENT
    3  line(s) of comment
    *****
    * BUILDING ROOFTOP STORAGE *
    *****
10  POND
    7 Depth - Discharge - Volume sets
    .000 .000 .0
    .025 .00152 .1
    .051 .00304 .5
    .076 .00456 1.6
    .102 .00608 3.8
    .127 .00760 7.4
    .152 .00912 12.7
    Peak Outflow = .005 c.m/s
    Maximum Depth = .077 metres
    Maximum Storage = 2. c.m
    .008 .008 .005 .051 c.m/s
17  COMBINE
500 Junction Node No.
    .008 .008 .005 .056 c.m/s
18  CONFLUENCE
500 Junction Node No.
    .008 .056 .005 .000 c.m/s
35  COMMENT
    3  line(s) of comment
    *****
    * AREA 209 *
    *****
4  CATCHMENT
209.000  ID No.ó 99999
    .776  Area in hectares
    20.000 Length (PERV) metres
    2.000 Gradient (%)
    97.000 Per cent Impervious
    20.000 Length (IMPERV)
    .000 %Imp. with Zero Dpth
    1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
    .250 Manning "n"
    66.000 SCS Curve No or C
    .100 Ia/S Coefficient
    13.085 Initial Abstraction
    1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
    .233 .056 .005 .000 c.m/s
    .151 .877 .855 C perv/imperv/total
15  ADD RUNOFF
    .233 .277 .005 .000 c.m/s
35  COMMENT
    3  line(s) of comment
    *****
    * AREA 210 *

```

```

*****
4  CATCHMENT
210.000 ID No.ó 99999
.198 Area in hectares
10.000 Length (PERV) metres
2.000 Gradient (%)
80.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.050 .277 .005 .000 c.m/s
.151 .858 .716 C perv/imperv/total
15 ADD RUNOFF .050 .327 .005 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* SURFACE STORAGE *
*****
10 POND
4 Depth - Discharge - Volume sets
.000 .000 .0
.100 .160 40.0
.200 .260 70.0
.300 .500 125.0
Peak Outflow = .261 c.m/s
Maximum Depth = .200 metres
Maximum Storage = 70. c.m
.050 .327 .261 .000 c.m/s
17 COMBINE
600 Junction Node No.
.050 .327 .261 .261 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 211 *
*****
4 CATCHMENT
211.000 ID No.ó 99999
.152 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.005 .000 .261 .261 c.m/s
.150 .000 .150 C perv/imperv/total
15 ADD RUNOFF .005 .005 .261 .261 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.005 .005 .005 .261 c.m/s
17 COMBINE
600 Junction Node No.
.005 .005 .005 .264 c.m/s
14 START

```

```

1      1=Zero; 2=Define
35     COMMENT
3      1line(s) of comment
      *****
      * AREA 212 *
      *****
4      CATCHMENT
212.000 ID No.ó 99999
      .040 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
      .000 Per cent Impervious
10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .250 Manning "n"
66.000 SCS Curve No or C
      .100 Ia/S Coefficient
13.085 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .001 .000 .005 .264 c.m/s
      .150 .000 .150 C perv/imperv/total
15     ADD RUNOFF
      .001 .001 .005 .264 c.m/s
9      ROUTE
      .000 Conduit Length
      .000 No Conduit defined
      .000 Zero lag
      .000 Beta weighting factor
      .000 Routing timestep
      0 No. of sub-reaches
      .001 .001 .001 .264 c.m/s
17     COMBINE
600 Junction Node No.
      .001 .001 .001 .265 c.m/s
35     COMMENT
3      1line(s) of comment
      *****
      * TOTAL FLOW EAST TO SWM POND *
      *****
18     CONFLUENCE
600 Junction Node No.
      .001 .265 .001 .000 c.m/s
14     START
1      1=Zero; 2=Define
35     COMMENT
3      1line(s) of comment
      *****
      * AREA 213 *
      *****
4      CATCHMENT
213.000 ID No.ó 99999
      .098 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
15.000 Per cent Impervious
10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .250 Manning "n"
66.000 SCS Curve No or C
      .100 Ia/S Coefficient
13.085 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .005 .000 .001 .000 c.m/s
      .150 .836 .253 C perv/imperv/total
15     ADD RUNOFF
      .005 .005 .001 .000 c.m/s
9      ROUTE
      .000 Conduit Length
      .000 No Conduit defined
      .000 Zero lag
      .000 Beta weighting factor
      .000 Routing timestep

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                                102225R.OUT
      0      No. of sub-reaches
17      .005      .005      .005      .000 c.m/s
      COMBINE
700      Junction Node No.
      .005      .005      .005      .005 c.m/s
14      START
1      1=Zero; 2=Define
35      COMMENT
3      line(s) of comment
      *****
      * AREA 214 *
      *****
4      CATCHMENT
214.000      ID No.ó 99999
      .108      Area in hectares
10.000      Length (PERV) metres
5.000      Gradient (%)
11.000      Per cent Impervious
10.000      Length (IMPERV)
      .000      %Imp. with Zero Dpth
      1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .250      Manning "n"
66.000      SCS Curve No or C
      .100      Ia/S Coefficient
13.085      Initial Abstraction
      1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .004      .000      .005      .005 c.m/s
      .150      .836      .226      C perv/imperv/total
15      ADD RUNOFF
      .004      .004      .005      .005 c.m/s
9      ROUTE
      .000      Conduit Length
      .000      No Conduit defined
      .000      Zero lag
      .000      Beta weighting factor
      .000      Routing timestep
      0      No. of sub-reaches
      .004      .004      .004      .005 c.m/s
17      COMBINE
700      Junction Node No.
      .004      .004      .004      .009 c.m/s
35      COMMENT
3      line(s) of comment
      *****
      * TOTAL FLOW TO WEST *
      *****
18      CONFLUENCE
700      Junction Node No.
      .004      .009      .004      .000 c.m/s
14      START
1      1=Zero; 2=Define
35      COMMENT
4      line(s) of comment
      *****
      * 100 YEAR CHICAGO STORM *
      * CITY OF WATERLOO IDF PARAMETERS *
      *****
2      STORM
1      1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
4692.000      Coefficient a
17.437      Constant b (min)
      .956      Exponent c
      .400      Fraction to peak r
180.000      Duration ó 180 min
      89.960 mm      Total depth
3      IMPERVIOUS
1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013      Manning "n"
98.000      SCS Curve No or C
      .100      Ia/S Coefficient
      .518      Initial Abstraction
35      COMMENT
3      line(s) of comment
      *****

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* EXISTING CONDITIONS *
*****
35 COMMENT
3   line(s) of comment
*****
* AREA 102 - ALLOWABLE AREA *
*****
4   CATCHMENT
102.000 ID No.ó 99999
1.260   Area in hectares
50.000 Length (PERV) metres
10.000 Gradient (%)
70.000 Per cent Impervious
50.000 Length (IMPERV)
.000   %Imp. with Zero Dpth
1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250   Manning "n"
66.000 SCS Curve No or C
.100   Ia/s Coefficient
13.085 Initial Abstraction
1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .520   .000   .004   .000 c.m/s
      .316   .920   .739   C perv/imperv/total
35 COMMENT
3   line(s) of comment
*****
* TOTAL FLOW EAST TO SWM POND *
*****
15 ADD RUNOFF
      .520   .520   .004   .000 c.m/s
14 START
1      1=Zero; 2=Define
35 COMMENT
3   line(s) of comment
*****
* AREA 101 *
*****
4   CATCHMENT
101.000 ID No.ó 99999
.385   Area in hectares
20.000 Length (PERV) metres
8.000  Gradient (%)
10.000 Per cent Impervious
20.000 Length (IMPERV)
.000   %Imp. with Zero Dpth
1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250   Manning "n"
66.000 SCS Curve No or C
.100   Ia/s Coefficient
13.085 Initial Abstraction
1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .065   .000   .004   .000 c.m/s
      .314   .884   .371   C perv/imperv/total
35 COMMENT
3   line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
15 ADD RUNOFF
      .065   .065   .004   .000 c.m/s
14 START
1      1=Zero; 2=Define
35 COMMENT
3   line(s) of comment
*****
* PROPOSED CONDITIONS *
*****
35 COMMENT
3   line(s) of comment
*****
* AREA 201 *
*****
4   CATCHMENT
201.000 ID No.ó 99999

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.129 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.075 .000 .004 .000 c.m/s
.919 .919 .919 C perv/imperv/total
15 ADD RUNOFF .075 .075 .004 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00304 .3
.051 .00608 2.4
.076 .00912 8.1
.102 .0122 19.2
.127 .0152 37.9
.152 .0182 65.5
Peak Outflow = .017 c.m/s
Maximum Depth = .139 metres
Maximum Storage = 51. c.m
.075 .075 .017 .000 c.m/s
17 COMBINE
500 Junction Node No.
.075 .075 .017 .017 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 202 *
*****
4 CATCHMENT
202.000 ID No.6 99999
.140 Area in hectares
15.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
15.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.081 .000 .017 .017 c.m/s
.919 .919 .919 C perv/imperv/total
15 ADD RUNOFF .081 .081 .017 .017 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00304 .3
.051 .00608 2.6
.076 .00912 8.9
.102 .0122 21.1

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102225R.OUT
.127 .0152 41.2
.152 .0182 71.2
Peak Outflow = .017 c.m/s
Maximum Depth = .141 metres
Maximum Storage = 57. c.m
.081 .081 .017 .017 c.m/s
17 COMBINE
500 Junction Node No.
.081 .081 .017 .034 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 203 *
*****
4 CATCHMENT
203.000 ID No.6 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.014 .000 .017 .034 c.m/s
.903 .903 .903 C perv/imperv/total
15 ADD RUNOFF
.014 .014 .017 .034 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .007 c.m/s
Maximum Depth = .111 metres
Maximum Storage = 5. c.m
.014 .014 .007 .034 c.m/s
17 COMBINE
500 Junction Node No.
.014 .014 .007 .040 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 204 *
*****
4 CATCHMENT
204.000 ID No.6 99999
.036 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient

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.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.021 .000 .007 .040 c.m/s
.903 .903 .903 C perv/imperv/total
15 ADD RUNOFF
.021 .021 .007 .040 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00228 .1
.051 .00456 .7
.076 .00684 2.3
.102 .00912 5.4
.127 .0114 10.6
.152 .0137 18.3
Peak Outflow = .010 c.m/s
Maximum Depth = .109 metres
Maximum Storage = 7. c.m
.021 .021 .010 .040 c.m/s
17 COMBINE
500 Junction Node No.
.021 .021 .010 .049 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 205 *
*****
4 CATCHMENT
205.000 ID No.6 99999
.025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.013 Manning "n"
98.000 SCS Curve No or C
.000 Ia/S Coefficient
.518 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.014 .000 .010 .049 c.m/s
.903 .903 .903 C perv/imperv/total
15 ADD RUNOFF
.014 .014 .010 .049 c.m/s
35 COMMENT
3 line(s) of comment
*****
* BUILDING ROOFTOP STORAGE *
*****
10 POND
7 Depth - Discharge - Volume sets
.000 .000 .0
.025 .00152 .1
.051 .00304 .5
.076 .00456 1.6
.102 .00608 3.8
.127 .00760 7.4
.152 .00912 12.7
Peak Outflow = .007 c.m/s
Maximum Depth = .111 metres
Maximum Storage = 5. c.m
.014 .014 .007 .049 c.m/s
17 COMBINE
500 Junction Node No.
.014 .014 .007 .056 c.m/s
14 START

```

```

1      1=Zero; 2=Define
35     COMMENT
3      1 line(s) of comment
      *****
      * AREA 206 *
      *****
4      CATCHMENT
206.000 ID No.6 99999
      .025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .014 .000 .007 .056 c.m/s
      .903 .903 .903 C perv/imperv/total
15     ADD RUNOFF
      .014 .014 .007 .056 c.m/s
35     COMMENT
3      1 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10     POND
7      Depth - Discharge - Volume sets
      .000 .000 .0
      .025 .00152 .1
      .051 .00304 .5
      .076 .00456 1.6
      .102 .00608 3.8
      .127 .00760 7.4
      .152 .00912 12.7
      Peak Outflow = .007 c.m/s
      Maximum Depth = .111 metres
      Maximum Storage = 5. c.m
      .014 .014 .007 .056 c.m/s
17     COMBINE
500   Junction Node No.
      .014 .014 .007 .063 c.m/s
14     START
1      1=Zero; 2=Define
35     COMMENT
3      1 line(s) of comment
      *****
      * AREA 207 *
      *****
4      CATCHMENT
207.000 ID No.6 99999
      .025 Area in hectares
10.000 Length (PERV) metres
1.000 Gradient (%)
100.000 Per cent Impervious
10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .014 .000 .007 .063 c.m/s
      .903 .903 .903 C perv/imperv/total
15     ADD RUNOFF
      .014 .014 .007 .063 c.m/s
35     COMMENT
3      1 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *

```

```

*****
10  POND
    7 Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .00152    .1
      .051      .00304    .5
      .076      .00456    1.6
      .102      .00608    3.8
      .127      .00760    7.4
      .152      .00912   12.7
    Peak Outflow =      .007 c.m/s
    Maximum Depth =     .111 metres
    Maximum Storage =    5. c.m
      .014      .014      .007      .063 c.m/s
17  COMBINE
    500 Junction Node No.
      .014      .014      .007      .070 c.m/s
14  START
    1 1=Zero; 2=Define
35  COMMENT
    3 line(s) of comment
      *****
      * AREA 208 *
      *****
4   CATCHMENT
    208.000 ID No.6 99999
      .025 Area in hectares
    10.000 Length (PERV) metres
      1.000 Gradient (%)
    100.000 Per cent Impervious
      10.000 Length (IMPERV)
      .000 %Imp. with Zero Dpth
      1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .013 Manning "n"
      98.000 SCS Curve No or C
      .000 Ia/S Coefficient
      .518 Initial Abstraction
      1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
      .014      .000      .007      .070 c.m/s
      .903      .903      .903      C perv/imperv/total
15  ADD RUNOFF
      .014      .014      .007      .070 c.m/s
35  COMMENT
    3 line(s) of comment
      *****
      * BUILDING ROOFTOP STORAGE *
      *****
10  POND
    7 Depth - Discharge - Volume sets
      .000      .000      .0
      .025      .00152    .1
      .051      .00304    .5
      .076      .00456    1.6
      .102      .00608    3.8
      .127      .00760    7.4
      .152      .00912   12.7
    Peak Outflow =      .007 c.m/s
    Maximum Depth =     .111 metres
    Maximum Storage =    5. c.m
      .014      .014      .007      .070 c.m/s
17  COMBINE
    500 Junction Node No.
      .014      .014      .007      .077 c.m/s
18  CONFLUENCE
    500 Junction Node No.
      .014      .077      .007      .000 c.m/s
35  COMMENT
    3 line(s) of comment
      *****
      * AREA 209 *
      *****
4   CATCHMENT
    209.000 ID No.6 99999
      .776 Area in hectares

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20.000 Length (PERV) metres
2.000 Gradient (%)
97.000 Per cent Impervious
20.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.437 .077 .007 .000 c.m/s
.316 .917 .899 C perv/imperv/total
15 ADD RUNOFF .437 .496 .007 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* AREA 210 *
*****
4 CATCHMENT
210.000 ID No.ó 99999
.198 Area in hectares
10.000 Length (PERV) metres
2.000 Gradient (%)
80.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.093 .496 .007 .000 c.m/s
.314 .884 .770 C perv/imperv/total
15 ADD RUNOFF .093 .588 .007 .000 c.m/s
35 COMMENT
3 line(s) of comment
*****
* SURFACE STORAGE *
*****
10 POND
4 Depth - Discharge - Volume sets
.000 .000 .0
.100 .160 40.0
.200 .260 70.0
.300 .500 125.0
Peak Outflow = .488 c.m/s
Maximum Depth = .295 metres
Maximum Storage = 122. c.m
.093 .588 .488 .000 c.m/s
17 COMBINE
600 Junction Node No.
.093 .588 .488 .488 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 211 *
*****
4 CATCHMENT
211.000 ID No.ó 99999
.152 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C

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.100      Ia/S Coefficient
13.085    Initial Abstraction
1         Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
          .024      .000      .488      .488 c.m/s
          .314      .000      .314      C perv/imperv/total
15      ADD RUNOFF
          .024      .024      .488      .488 c.m/s
9       ROUTE
          .000      Conduit Length
          .000      No Conduit defined
          .000      Zero lag
          .000      Beta weighting factor
          .000      Routing timestep
          0         No. of sub-reaches
          .024      .024      .024      .488 c.m/s
17      COMBINE
600     Junction Node No.
          .024      .024      .024      .512 c.m/s
14      START
1       1=Zero; 2=Define
35      COMMENT
3       line(s) of comment
          *****
          * AREA 212 *
          *****
4       CATCHMENT
212.000  ID No.ó 99999
          .040      Area in hectares
10.000   Length (PERV) metres
          5.000   Gradient (%)
          .000   Per cent Impervious
10.000   Length (IMPERV)
          .000   %Imp. with Zero Dpth
          1       Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
          .250   Manning "n"
66.000   SCS Curve No or C
          .100   Ia/S Coefficient
13.085   Initial Abstraction
1       Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
          .006      .000      .024      .512 c.m/s
          .314      .000      .314      C perv/imperv/total
15      ADD RUNOFF
          .006      .006      .024      .512 c.m/s
9       ROUTE
          .000      Conduit Length
          .000      No Conduit defined
          .000      Zero lag
          .000      Beta weighting factor
          .000      Routing timestep
          0         No. of sub-reaches
          .006      .006      .006      .512 c.m/s
17      COMBINE
600     Junction Node No.
          .006      .006      .006      .518 c.m/s
35      COMMENT
3       line(s) of comment
          *****
          * TOTAL FLOW EAST TO SWM POND *
          *****
18      CONFLUENCE
600     Junction Node No.
          .006      .518      .006      .000 c.m/s
14      START
1       1=Zero; 2=Define
35      COMMENT
3       line(s) of comment
          *****
          * AREA 213 *
          *****
4       CATCHMENT
213.000  ID No.ó 99999
          .098      Area in hectares
10.000   Length (PERV) metres
          5.000   Gradient (%)

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15.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.018 .000 .006 .000 c.m/s
.314 .854 .395 C perv/imperv/total
15 ADD RUNOFF
.018 .018 .006 .000 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.018 .018 .018 .000 c.m/s
17 COMBINE
700 Junction Node No.
.018 .018 .018 .018 c.m/s
14 START
1 1=Zero; 2=Define
35 COMMENT
3 line(s) of comment
*****
* AREA 214 *
*****
4 CATCHMENT
214.000 ID No. 99999
.108 Area in hectares
10.000 Length (PERV) metres
5.000 Gradient (%)
11.000 Per cent Impervious
10.000 Length (IMPERV)
.000 %Imp. with Zero Dpth
1 Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
.250 Manning "n"
66.000 SCS Curve No or C
.100 Ia/S Coefficient
13.085 Initial Abstraction
1 Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
.019 .000 .018 .018 c.m/s
.314 .854 .373 C perv/imperv/total
15 ADD RUNOFF
.019 .019 .018 .018 c.m/s
9 ROUTE
.000 Conduit Length
.000 No Conduit defined
.000 Zero lag
.000 Beta weighting factor
.000 Routing timestep
0 No. of sub-reaches
.019 .019 .019 .018 c.m/s
17 COMBINE
700 Junction Node No.
.019 .019 .019 .037 c.m/s
35 COMMENT
3 line(s) of comment
*****
* TOTAL FLOW TO WEST *
*****
18 CONFLUENCE
700 Junction Node No.
.019 .037 .019 .000 c.m/s
20 MANUAL

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