Stormwater Management Report

333 Albert Street

333 Albert Street, City of Waterloo

November 25, 2022

Revised March 9, 2023

Project Reference Number 20-235

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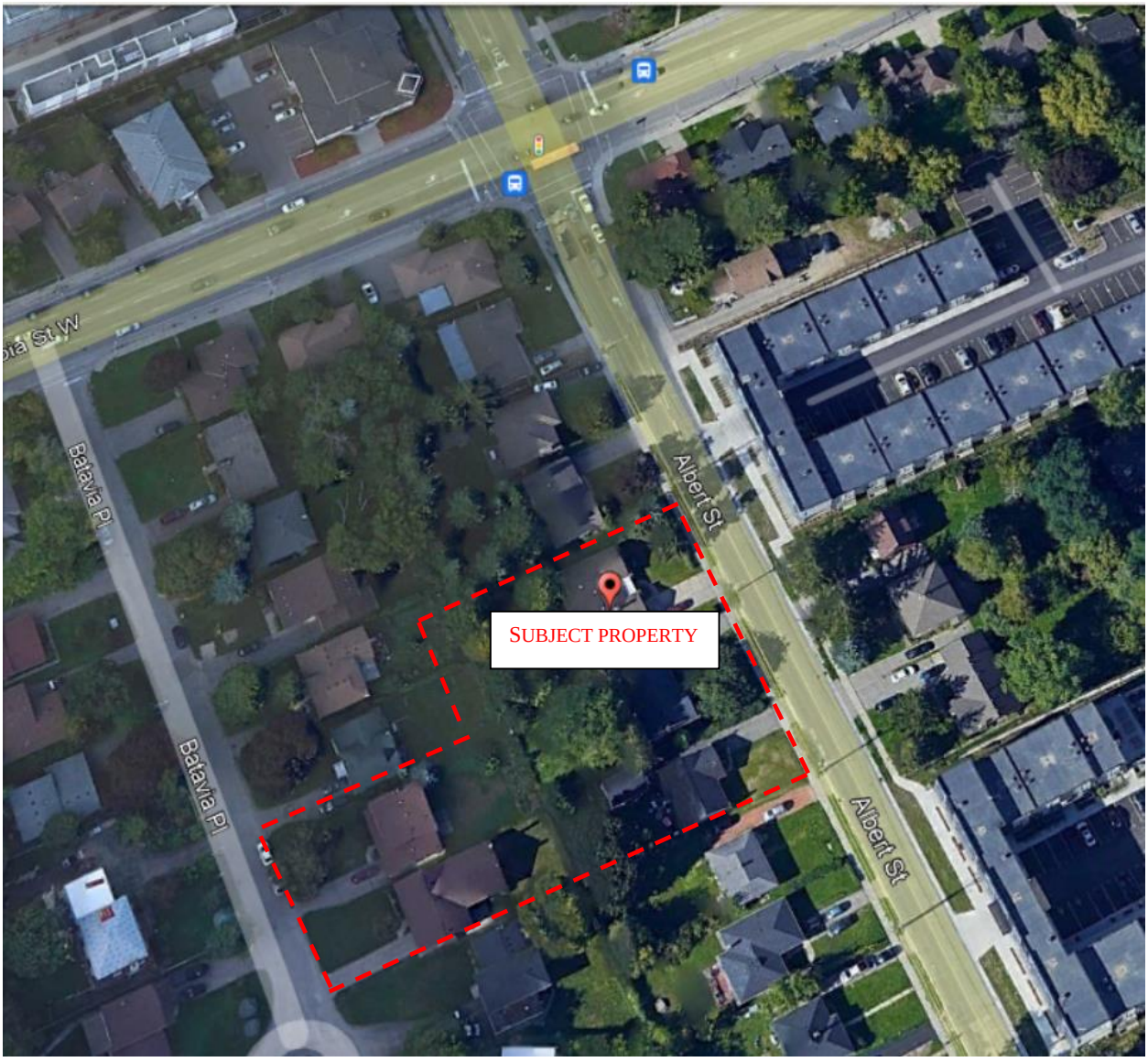
Introduction

This report provides details on the stormwater management design for the proposed building development at Albert Street in City of Waterloo, Ontario.

Background Information

The subject property includes blocks 309-333 Albert Street, and 318-320 Batavia Place in City of Waterloo. The 0.357 ha property is located on the west side of Albert Street and east side of Batavia Place. The site is currently occupied by five (5) one to two story residential dwellings. Landscaping fills the property land except the access driveways. The proposed 6 story, 85 units building will replace the existing buildings. The subject property is bounded by Albert Street to the east, Batavia Place to the west, and existing residential buildings to the north and south. The site location is shown below.

Figure 1- Site Location



Geotechnical Information

Chung & Vander Doelen Engineering LTD. (CVD) conducted a geotechnical investigation in June of 2021. To investigate the subsurface conditions at the site, six (6) boreholes were drilled and sampled to depths between 9.60 and 11.15 m below existing grades.

According to the geotechnical report ground surface elevations at the borehole locations ranged between 341.97 and 344.37 m. Topsoil was encountered at ground surface at Boreholes 1 and 3 to 6 with measured thicknesses ranging between 100 and 225 mm. Pavement structure was contacted at ground surface of Borehole 2 with measured asphalt thickness of 100 mm and granular base thickness of 300 mm. Fill materials varying in composition from clayey silt to silt with varying percentage of sand, to topsoil fill were encountered underlying the surficial topsoil or pavement structure at all six (6) borehole locations and extended to depths between 0.7 and 2.9 m below ground surface. Traces of organics were observed within the fill throughout the site. Trace gravel was encountered within the fill at Boreholes 2, 5 and 6. Asphalt fragments were observed within the fill at Borehole 5. The standard penetration test values indicate a very loose to compact compactness condition. Natural moisture contents were measured between 5 and 22%, indicating a moist moisture condition. The higher moisture contents reflect the presence of organic matters. Based on field observations during drilling operations and measured moisture contents, the groundwater table is inferred at depths between 4.5± to 6.0± m below existing grades, corresponding to elevations between 337.0± and 338.4± m.

Existing Site Drainage Conditions

The site generally directs the runoff overland toward Albert Street and Batavia Place. There are existing catchbasins and catchbasin manholes in Albert Street and Batavia Place at the eastern and western limits of the subject property which inlets runoff into the municipal storm sewer system.

Proposed Site Drainage Conditions

The proposed development consists of a 6-storey building. The parking area will drain to the proposed catchbasin CB1 and the roof runoff drains to the underground chambers. The outflow of the catchbasin CB1 will be controlled by a 75 mm orifice before discharging to the proposed OGS unit. The underground chamber is equipped with a 110 mm orifice for quantity control. The OGS unit and underground chambers discharge to manhole MH2 and finally drain to manhole MH1 on Batavia Place. The manhole MH1 will finally drain to the existing catchbasin manhole CBMH on Batavia Place. The grading of the west and south landscapes will direct the runoff to catchbasin manhole CBMH. The front area of the building on the east side will drain directly to the existing catchbasins on Albert Street.

The OGS structure will provide quality control prior to discharge to the proposed manhole MH2.

The proposed stormwater management will result in a reduction in flows to municipal storm sewer system compared to the existing conditions.

Stormwater Management Design Criteria

The design criteria for the stormwater plan area as stipulated by the City of Waterloo:

1. Provide Quantity control of runoff resulting from the 2-year, 5-year, and 100-year storm events to existing discharge rates
2. Provide quality control of runoff from parking area

The storm sewers have been sized to convey the 5-year storm event. The storm design sheet is included in Appendix B.

Stormwater Management Plan

A stormwater management plan has been prepared for the proposed development. This plan considers quality and quantity control of stormwater runoff from the entire site.

Quality control of runoff will be provided using a strormceptor. Due to the size of the site and the resulting proposed storm sewer network, one OGS unit is proposed.

Stormwater quantity control will be achieved using parking lot pond and underground chambers.

The stormwater management plan for the proposed development is presented here.

Quality control

The stormceptor EF4 unit has been sized to provide TSS removal based on a fine particle size distribution. The OGS sizing information for the quality control structure is included in Appendix D. The drainage area serviced by the OGS unit is summarized in the table below.

Table 1: Oil Grit Separator Summary

OGS ID	Drainage Area	Drainage Area ID	OGS Model
EF4	0.085 ha	202	EF4

Quantity Control

The 2-year, 5-year, and 100-year storm events will be attenuated to less than existing discharge rates. The parking pond and underground chambers are designed to keep the existing outflow to the municipal storm sewer system during 2, 5, and 100-year storms. The proposed parking pond provide storage of runoff from the parking lot. Installed orifices on the OGS unit and underground chambers restricts outflows of the parking pond and rooftop.

Stormwater Modeling

The MIDUSS Model was used to model the 25 mm rainfall, 2-year, 5-year, and 100-year storm events to demonstrate the level of quantity control provided by the proposed stormwater management design. Huff rainfall distribution is used to model the 25 mm rainfall.

The design storm hyetographs are derived using the IDF parameters for the City of Waterloo fitted to the 3 hour Chicago Storm distribution.

$$i_{2yr} = \frac{1109}{(t_d+9.258)^{0.882}} \qquad i_{5yr} = \frac{1755}{(t_d+12.347)^{0.895}} \qquad i_{100yr} = \frac{4692}{(t_d+17.437)^{0.956}}$$

Stormwater Model Input Parameters

Table 2 shows the catchment area input parameters into the model under existing and proposed conditions. Drainage catchment areas for the existing and proposed conditions are shown in Appendix A.

Table 2: Model Input Parameters

Catchment	Description	Area (ha)	Percent Impervious (%)	Overland Slope (%)	Flow Length (m)
Existing Conditions					
101	Albert Street	0.057	35	1.0	10
102	Batavia Place	0.239	15	2.7	50
103	Roofs	0.073	100	40.0	4
Proposed Conditions					
201	Albert Street	0.016	70	4.0	4
202	Parking area	0.085	100	3.0	23
203	South landscape and amenity space	0.079	40	3.5	26
204	Roofs	0.148	100	0.5	9
205	North grass strip	0.015	3	10.0	2

Stormwater Model Results

Table 3 shows the peak flows under the existing and proposed conditions. The overall site peak flow from pre-development conditions to post development has been reduced. The MIDUSS output files are included in Appendix C. Table 4 shows water level and storage of the parking lot pond and underground chambers.

Table 3: MIDUSS Model Results Summary

Design Storm	Existing Condition			Proposed Condition		
	Total to Albert Street (m^3/sec)	***Total to Batavia Place*** (m^3/sec)	***Total to Municipal Sewer System*** (m^3/sec)	***Total to Albert Street*** (m^3/sec)	***Total to Batavia Place*** (m^3/sec)	***Total to Municipal Sewer System*** (m^3/sec)
25 mm	0.001	0.007	**0.008**	0.001	0.007	**0.008**
2 year	0.005	0.024	**0.029**	0.003	0.013	**0.016**
5 year	0.007	0.033	**0.040**	0.004	0.021	**0.025**
100 year	0.016	0.067	**0.083**	0.007	0.066	**0.073**

Table 4: Parking Lot Pond and Underground Chambers Water Level and Storage

Design Storm	Max. Water Level (m)		Storage (m^3)	
	Parking Pond	Underground Chambers	Parking Pond	Underground Chambers
25 mm	341.91	339.50	0.39	26.92
2 year	342.01	339.57	7.19	30.13
5 year	342.04	339.74	13.34	38.03
100 year	342.09	340.55	24.99	66.72

During the 25 mm rainfall event, the total peak flow to the municipal storm sewer is 0.008 m^3/sec, which is equal to the peak flow of 0.008 m^3/sec under existing conditions. During the 2-year storm event, the total peak flow to the municipal storm sewer is 0.016 m^3/sec, which is less than the peak flow of 0.029 m^3/sec under existing conditions. During the 5-year storm, the peak flow to the municipal storm sewer is 0.025 m^3/sec, which is less than the peak flow of 0.040 m^3/sec under existing conditions. During the 100-year storm, the peak flow to the municipal storm sewer is 0.073 m^3/sec, which is less than the peak flow of 0.083 m^3/sec under the existing condition.

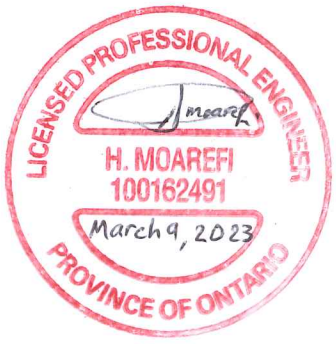
The proposed storm sewer system demonstrates sufficient capacity to service the proposed development and convey the 2-year, 5-year, and 100-year storm event without surcharging.

Conclusions

In summary, the overall site peak flow from pre-development conditions to post development has been reduced and proposed development will not result in an increase in peak discharge rates to the existing storm sewer.

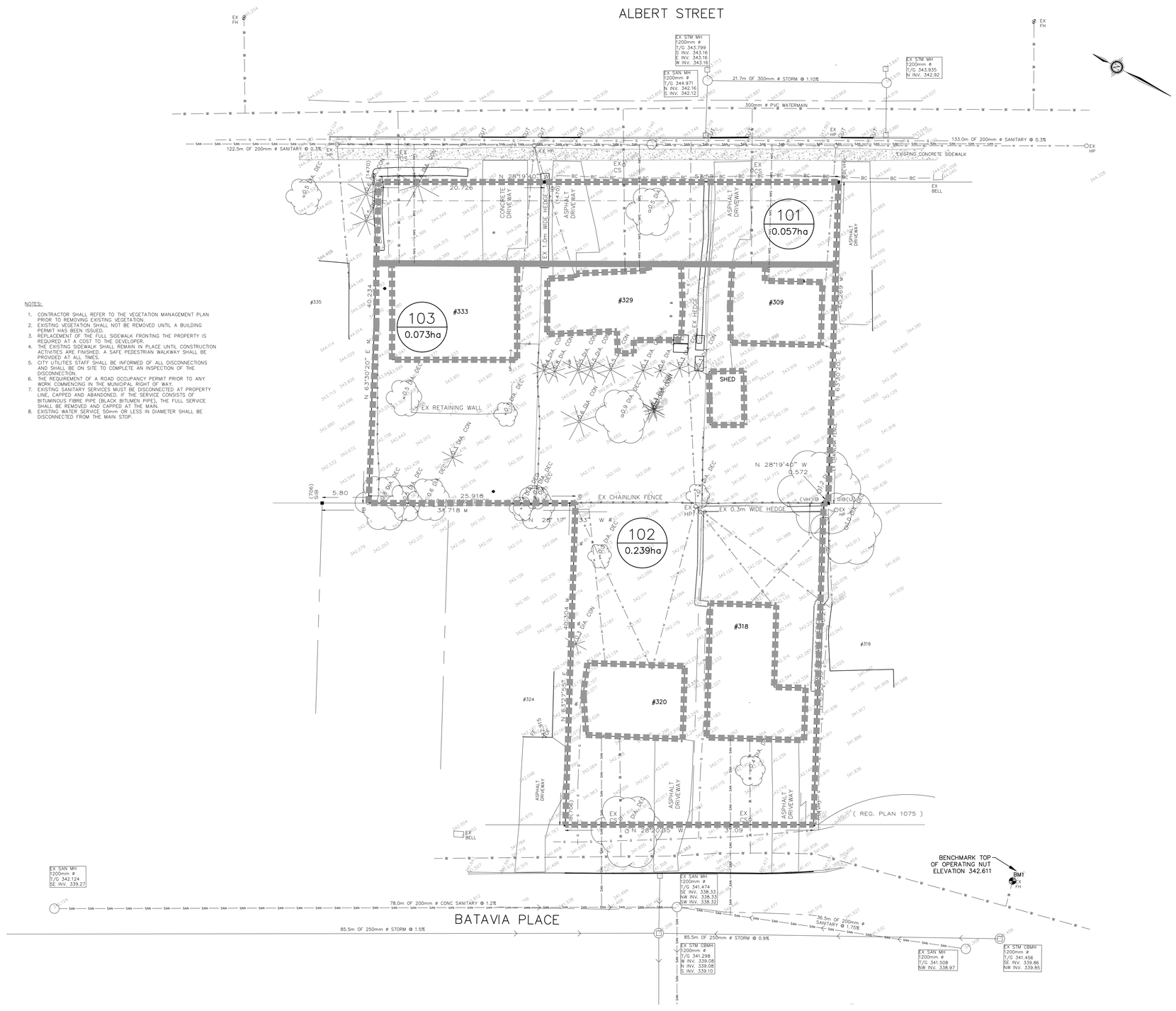
Hossein Moarefi, P.Eng.

K. Smart Associates Limited



Appendix A

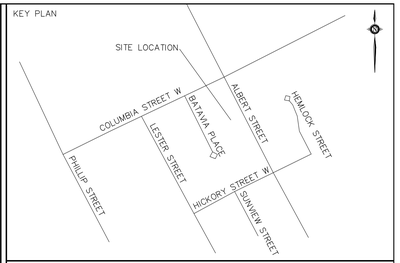
Drainage Catchment Areas for Existing and Proposed Conditions



NOTES:

1. CONTRACTOR SHALL REFER TO THE VEGETATION MANAGEMENT PLAN PRIOR TO REMOVING EXISTING VEGETATION.
2. EXISTING VEGETATION SHALL NOT BE REMOVED UNTIL A BUILDING PERMIT HAS BEEN ISSUED.
3. REPLACEMENT OF THE FULL SIDEWALK FRONTING THE PROPERTY IS REQUIRED AT A COST TO THE DEVELOPER.
4. THE EXISTING SIDEWALK SHALL REMAIN IN PLACE UNTIL CONSTRUCTION ACTIVITIES ARE FINISHED. A SAFE PEDESTRIAN WALKWAY SHALL BE PROVIDED AT ALL TIMES.
5. CITY UTILITIES STAFF SHALL BE INFORMED OF ALL DISCONNECTIONS AND SHALL BE ON SITE TO COMPLETE AN INSPECTION OF THE DISCONNECTION.
6. THE REQUIREMENT OF A ROAD OCCUPANCY PERMIT PRIOR TO ANY WORK COMMENCING IN THE MUNICIPAL RIGHT OF WAY.
7. EXISTING SANITARY SERVICES MUST BE DISCONNECTED AT PROPERTY LINE, CAPPED AND ABANDONED. IF THE SERVICE CONSISTS OF BITUMINOUS FIBRE PIPE (BLACK BITUMEN PIPE), THE FULL SERVICE SHALL BE REMOVED AND CAPPED AT THE MAIN.
8. EXISTING WATER SERVICE 50mm OR LESS IN DIAMETER SHALL BE DISCONNECTED FROM THE MAIN STOP.

KEY PLAN



NOTES:

101
0.000ha
EXISTING CATCHMENT AREA I.D.

CATCHMENT AREA

CATCHMENT AREA BOUNDARY

No.	REVISIONS	BY	DATE
2	REVISED AS PER 1st SUBMISSION COMMENTS	SL	MAR 10, 2023
1	ISSUED FOR SPA 1st SUBMISSION	SL	NOV 30, 2022
	CONSTRUCTION		
	TENDER		
	ISSUE FOR APPROVALS		
	ISSUE BLOCK		

333 ALBERT STREET

CITY OF WATERLOO REGION OF WATERLOO

EXISTING CATCHMENT AREAS

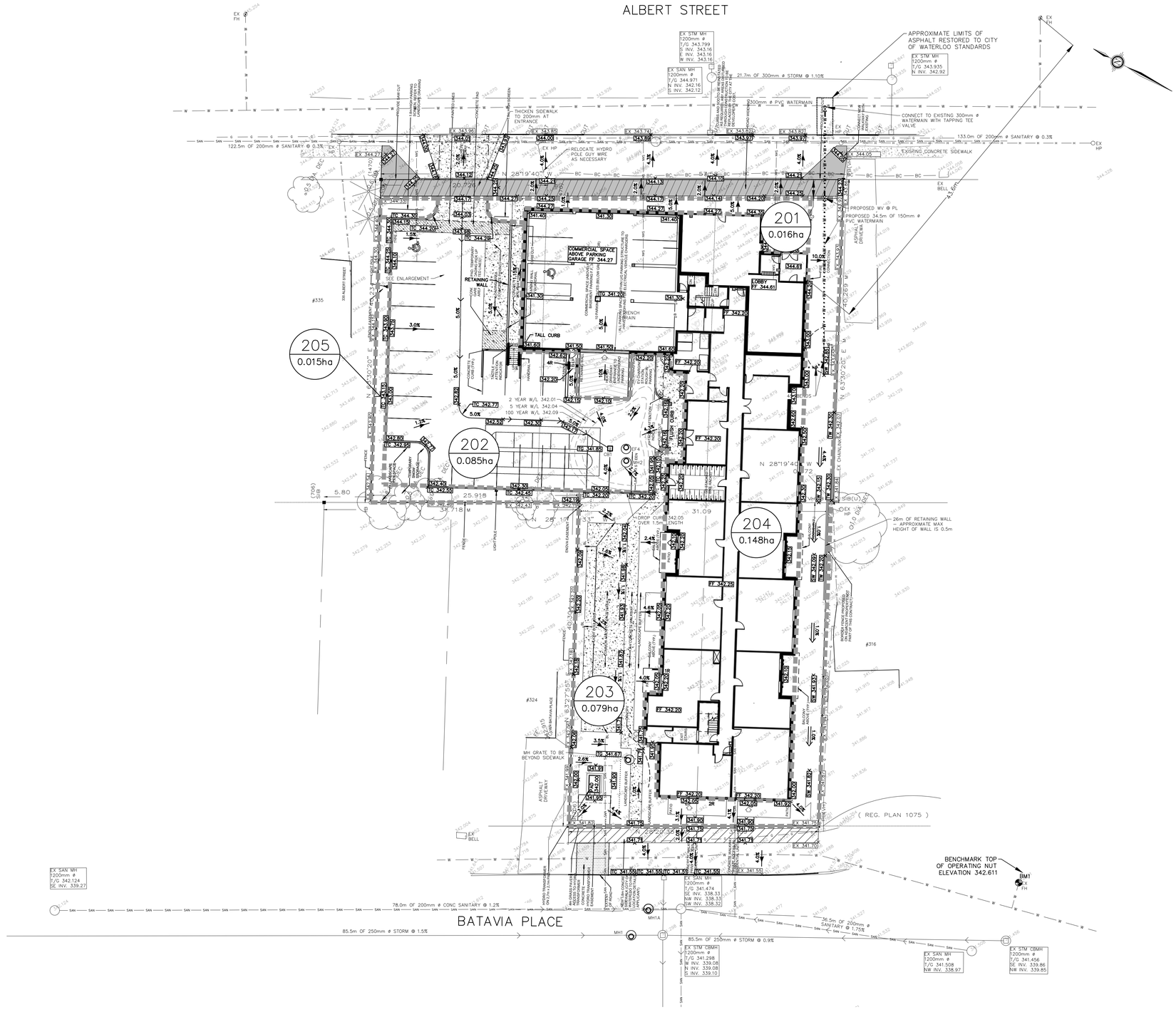
K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER SUDBURY

LICENCED PROFESSIONAL ENGINEER
DAVID A. HARSCH
MAR 16, 2023
PROVINCE OF ONTARIO

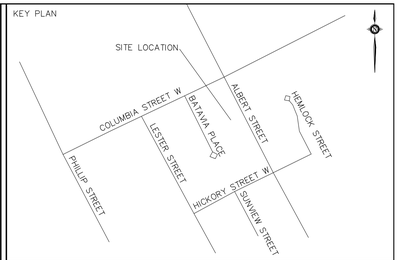
CERTIFIED ENGINEERING TECHNOLOGIST
DACETT ONTARIO
SEAN LICHTI
№ 913130

DESIGNED BY: SL	0 2.5 5	DATE: NOV 30, 2022
CHECKED BY: D.A.H.	SCALE 1:250	SHEET
DRAWN BY: S.L.		1 OF 2
CHECKED BY: D.A.H.	REVISION No. 2	
FILE No. 20-235		

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KEY PLAN



NOTES:

201 / 0.000ha — PROPOSED CATCHMENT AREA I.D.

CATCHMENT AREA

CATCHMENT AREA BOUNDARY

BM1 – TOP OF OPERATING NUT ON FIRE HYDRANT SOUTH OF SITE ON EAST SIDE OF BATAVIA PLACE
ELEV 342.611

No.	REVISIONS	BY	DATE
2	REVISED AS PER 1st SUBMISSION COMMENTS	SL	MAR 10, 2023
1	ISSUED FOR SPA 1st SUBMISSION	SL	NOV 30, 2022
	CONSTRUCTION		
	TENDER		
	ISSUE FOR APPROVALS		
	ISSUE BLOCK		

333 ALBERT STREET

CITY OF WATERLOO — REGION OF WATERLOO

PROPOSED CATCHMENT AREAS

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER — SUDBURY

LICENSED PROFESSIONAL ENGINEER — DAVID A. HARSCH — MAR 16, 2023 — PROVINCE OF ONTARIO

CERTIFIED ENGINEERING TECHNOLOGIST — ONCET — ONTARIO — SEAN LICHTI — Nº. 913130

DESIGNED BY: S.L.	0 2.5 5	DATE: NOV 30, 2022
CHECKED BY: D.A.H.	SCALE 1:250	
DRAWN BY: S.L.		SHEET
CHECKED BY: D.A.H.	REVISION No. 2	2 OF 2
FILE No. 20-235		

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Appendix B

Storm Design Sheet

333 Albert Street., City of Waterloo
STORM SEWER DESIGN SHEETS

K. Smart Associates Limited
Project Numb 20-235
Designed By Hosein Moarefi, P. Eng.
Checked By David Harsch, P. Eng.
Date Mar-23

IDF Parameters - City of Waterloo
5 Year Storm Event

A	*1755*
B	*12.347*
C	*0.895*

Rational Formula: Q=CIA/360
Q: peak flow (m^3/sec)
C: runoff coeficient
I: rainfall intensity (mm/hr)
A: area(ha)

Total time= Tc+pipe travel time (minute)
Tc: inlet time before pipe (minute)
pipe travel time= pipe length/60V (minute)
V: pipe velocity (m/sec)

Manning Equation:Qcap= (D/1000)^2.667*(S/100)^0.5/(3.211*n) (m^3/sec)
D: pipe size (mm)
S: slope of pipe (%)
n: roughness coeficient

1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Catchment	**From**	**To**	**Area (ha)**	**C**	**AC**	**Total AC**	**Tc (minutes)**	**Rain (mm/hr)**	**Q design (cms)**	**Design Pipe Size**	**Qcap (cms)**	**Velocity (m/sec)**	**Mannings 'n'**	**Pipe Slope (%)**	**Pipe Length (meters)**	**PipeTravel Time (minutes)**	**Total Time (minutes)**	**Q/Qcap (%)**
202	CB1[1]	EF4	0.085				10.00		**0.007**	250	**0.084**	1.712	0.013	2.00	1.3	0.013	10.01	8.3%
	EF4	MH2	0.085				10.01		**0.007**	250	**0.084**	1.712	0.013	2.00	0.5	0.005	10.02	8.3%
204	Roof	Underground chambers	0.148	0.90	0.133	0.133	10.00	109.644	**0.041**	200	**0.057**	1.807	0.013	3.00	11.4	0.105	10.11	71.6%
204	Underground chambers[2]	MH2					10.00		**0.011**	200	**0.033**	1.043	0.013	1.00	2.8	0.045	10.04	33.6%
202, 204	MH2	MH1	0.233				10.08	109.278	**0.018**	250	**0.042**	0.856	0.013	0.50	52.6	1.024	11.10	42.9%

NOTES:
1 Outflow restricted by orifice during 5 year event taken from Miduss model
2 Outflow restricted by flow control at underground chambers - 5 year event taken from Miduss model

Appendix C

MIDUSS Output Files

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                                February 7, 2010"
"          10   Units used:                                          ie METRIC"
"               Job folder:                    C:\Users\Administrator\Desktop"
" 81          ADD COMMENT==================================================="
"           1  Lines of comment"
"              333 Albert Street - predevelopment - 25 mm rainfall - Run 3"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Huff distribution"
"            2   Huff distribution"
"       25.000   Rainfall depth"
"      180.000   Duration"
"        1.000   Huff quartile"
"              Maximum intensity            27.833    mm/hr"
"              Total depth                  25.000    mm"
"            6   1.0hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Albert Street catchment"
"       35.000   % Impervious"
"        0.057   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.037   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.020   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.793   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.001     0.000     0.000     0.000 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           0.037      0.020      0.057      hectare"
"              Time of concentration  32.726     2.471      8.578      minutes"
"              Time to Centroid       118.920    60.601     72.373     minutes"
```

```
"              Rainfall depth         25.000     25.000     25.000     mm"
"              Rainfall volume        9.26       4.99       14.25      c.m"
"              Rainfall losses        22.301     5.182      16.310     mm"
"              Runoff depth           2.699      19.818     8.690      mm"
"              Runoff volume          1.00       3.95       4.95       c.m"
"              Runoff coefficient     0.108      0.793      0.348      "
"              Maximum flow           0.000      0.001      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.001     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.001     0.001     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"              Maximum flow                  0.001    c.m/sec"
"              Hydrograph volume             4.954    c.m"
"                     0.001     0.001     0.001     0.001"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.001     0.000     0.001     0.001"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Batavia Place"
"       15.000   % Impervious"
"        0.239   Total Area"
"       50.000   Flow length"
"        2.700   Overland Slope"
"        0.203   Pervious Area"
"       50.000   Pervious length"
"        2.700   Pervious slope"
"        0.036   Impervious Area"
"       50.000   Impervious length"
"        2.700   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.803   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.002     0.000     0.001     0.001 c.m/sec"
"              Catchment 102          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.203      0.036      0.239      hectare"
"             Time of concentration  63.806     4.818      30.329     minutes"
"             Time to Centroid       150.618    63.297     101.063    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        50.79      8.96       59.75      c.m"
"             Rainfall losses        22.299     4.918      19.692     mm"
"             Runoff depth           2.701      20.082     5.308      mm"
"             Runoff volume          5.49       7.20       12.69      c.m"
"             Runoff coefficient     0.108      0.803      0.212      "
"             Maximum flow           0.001      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.002     0.002     0.001     0.001"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   roofs"
"      100.000   % Impervious"
"        0.073   Total Area"
"        4.000   Flow length"
"       40.000   Overland Slope"
"        0.000   Pervious Area"
"        4.000   Pervious length"
"       40.000   Pervious slope"
"        0.073   Impervious Area"
"        4.000   Impervious length"
"       40.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.701   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.004     0.002     0.001     0.001 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.073      0.073      hectare"
"             Time of concentration  6.245      0.471      0.471      minutes"
"             Time to Centroid       92.208     59.800     59.800     minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        0.00       18.25      18.25      c.m"
"             Rainfall losses        22.327     7.484      7.484      mm"
"             Runoff depth           2.673      17.516     17.516     mm"
"             Runoff volume          0.00       12.79      12.79      c.m"
"             Runoff coefficient     0.000      0.701      0.701      "
"             Maximum flow           0.000      0.004      0.004      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.004     0.007     0.001     0.001"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.004     0.007     0.007     0.001"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                  0.007    c.m/sec"
"             Hydrograph volume            25.473    c.m"
"                    0.004     0.007     0.007     0.007"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                  0.007    c.m/sec"
"             Hydrograph volume            25.473    c.m"
"                    0.004     0.007     0.007     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.004     0.007     0.007     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"             Maximum flow                  0.008    c.m/sec"
"             Hydrograph volume            30.426    c.m"
"                    0.004     0.007     0.007     0.008"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.369    hectare"
"             Total Impervious area                     0.129    hectare"
"             Total % impervious                       34.905"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                               February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                          C:\Users\hmoarefi\Desktop"
" 81           ADD COMMENT================================================="
"           1  Lines of comment"
"              333 Albert Street - predevelopment - 2 year - Run 3"
" 31           TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32           STORM Chicago storm"
"            1   Chicago storm"
"     1109.000   Coefficient A"
"        9.258   Constant B"
"        0.882   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           106.427    mm/hr"
"             Total depth                  32.636    mm"
"            4   2hyd   Hydrograph extension used in this file"
" 33           CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Albert Street catchment"
"       35.000   % Impervious"
"        0.057   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.037   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.020   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.164   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.037     0.020     0.057     hectare"
"             Time of concentration  17.665    1.426     5.778     minutes"
"             Time to Centroid       120.764   88.371    97.052    minutes"
"             Rainfall depth         32.636    32.636    32.636    mm"
"             Rainfall volume        12.09     6.51      18.60     c.m"
"             Rainfall losses        27.272    5.429     19.627    mm"
"             Runoff depth           5.363     27.207    13.008    mm"
"             Runoff volume          1.99      5.43      7.41      c.m"
"             Runoff coefficient     0.164     0.834     0.399     "
"             Maximum flow           0.001     0.005     0.005     c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.005     0.005     0.000     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.005     0.005     0.005     0.000"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Albert Street"
"             Maximum flow                 0.005    c.m/sec"
"             Hydrograph volume            7.415    c.m"
"                     0.005     0.005     0.005     0.005"
" 40           HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.005     0.000     0.005     0.005"
" 33           CATCHMENT 102"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           102   Batavia Place"
"        15.000   % Impervious"
"         0.239   Total Area"
"        50.000   Flow length"
"         2.700   Overland Slope"
"         0.203   Pervious Area"
"        50.000   Pervious length"
"         2.700   Pervious slope"
"         0.036   Impervious Area"
"        50.000   Impervious length"
"         2.700   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.164   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.831   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.007     0.000     0.005     0.005 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.203      0.036      0.239      hectare"
"             Time of concentration  34.443     2.781      19.511     minutes"
"             Time to Centroid       140.465    90.473     116.889    minutes"
"             Rainfall depth         32.636     32.636     32.636     mm"
"             Rainfall volume        66.30      11.70      78.00      c.m"
"             Rainfall losses        27.272     5.509      24.007     mm"
"             Runoff depth           5.364      27.126     8.628      mm"
"             Runoff volume          10.90      9.72       20.62      c.m"
"             Runoff coefficient     0.164      0.831      0.264      "
"             Maximum flow           0.003      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.005     0.005"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   roofs"
"      100.000   % Impervious"
"        0.073   Total Area"
"        4.000   Flow length"
"       40.000   Overland Slope"
"        0.000   Pervious Area"
"        4.000   Pervious length"
"       40.000   Pervious slope"
"        0.073   Impervious Area"
"        4.000   Impervious length"
"       40.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.734   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.017     0.007     0.005     0.005 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.073      0.073      hectare"
"             Time of concentration  3.371      0.272      0.272      minutes"
"             Time to Centroid       104.213    86.784     86.784     minutes"
"             Rainfall depth         32.636     32.636     32.636     mm"
"             Rainfall volume        0.00       23.82      23.82      c.m"
"             Rainfall losses        27.407     8.668      8.668      mm"
"             Runoff depth           5.229      23.968     23.968     mm"
```

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"             Runoff volume          0.00       17.50      17.50      c.m"
"             Runoff coefficient     0.000      0.734      0.734      "
"             Maximum flow           0.000      0.017      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.017     0.024     0.005     0.005"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.024     0.024     0.005"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                 0.024    c.m/sec"
"             Hydrograph volume            38.118    c.m"
"                    0.017     0.024     0.024     0.024"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                 0.024    c.m/sec"
"             Hydrograph volume            38.118    c.m"
"                    0.017     0.024     0.024     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.024     0.024     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"             Maximum flow                 0.029    c.m/sec"
"             Hydrograph volume            45.533    c.m"
"                    0.017     0.024     0.024     0.029"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.369    hectare"
"             Total Impervious area                     0.129    hectare"
"             Total % impervious                       34.905"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                               February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                          C:\Users\hmoarefi\Desktop"
" 81           ADD COMMENT================================================="
"           1  Lines of comment"
"              333 Albert Street - predevelopment - 5 year - Run 3"
" 31           TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32           STORM Chicago storm"
"            1   Chicago storm"
"     1755.000   Coefficient A"
"       12.347   Constant B"
"        0.895   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           136.512    mm/hr"
"             Total depth                  47.549    mm"
"            4   5hyd   Hydrograph extension used in this file"
" 33           CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Albert Street catchment"
"       35.000   % Impervious"
"        0.057   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.037   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.020   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.259   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.874   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.007     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.037     0.020     0.057     hectare"
"             Time of concentration  12.248    1.271     5.165     minutes"
"             Time to Centroid       112.836   87.615    96.561    minutes"
"             Rainfall depth         47.549    47.549    47.549    mm"
"             Rainfall volume        17.62     9.49      27.10     c.m"
"             Rainfall losses        35.250    5.997     25.012    mm"
"             Runoff depth           12.299    41.552    22.537    mm"
"             Runoff volume          4.56      8.29      12.85     c.m"
"             Runoff coefficient     0.259     0.874     0.474     "
"             Maximum flow           0.002     0.006     0.007     c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.000     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.007     0.007     0.007     0.000"
" 40           HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"             Maximum flow                 0.007    c.m/sec"
"             Hydrograph volume           12.846    c.m"
"                    0.007     0.007     0.007     0.007"
" 40           HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.007     0.000     0.007     0.007"
" 33           CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Batavia Place"
"       15.000   % Impervious"
"        0.239   Total Area"
"       50.000   Flow length"
"        2.700   Overland Slope"
"        0.203   Pervious Area"
"       50.000   Pervious length"
"        2.700   Pervious slope"
"        0.036   Impervious Area"
"       50.000   Impervious length"
"        2.700   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.259   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.875   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

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"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.007     0.007 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.203      0.036      0.239      hectare"
"             Time of concentration  23.880     2.478      15.895     minutes"
"             Time to Centroid       127.031    89.385     112.986    minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        96.60      17.05      113.64     c.m"
"             Rainfall losses        35.215     5.953      30.826     mm"
"             Runoff depth           12.334     41.596     16.723     mm"
"             Runoff volume          25.06      14.91      39.97      c.m"
"             Runoff coefficient     0.259      0.875      0.352      "
"             Maximum flow           0.007      0.010      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.007     0.007"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   roofs"
"      100.000   % Impervious"
"        0.073   Total Area"
"        4.000   Flow length"
"       40.000   Overland Slope"
"        0.000   Pervious Area"
"        4.000   Pervious length"
"       40.000   Pervious slope"
"        0.073   Impervious Area"
"        4.000   Impervious length"
"       40.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.768   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.023     0.011     0.007     0.007 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.073      0.073      hectare"
"             Time of concentration  2.337      0.243      0.243      minutes"
"             Time to Centroid       100.596    85.906     85.906     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        0.00       34.71      34.71      c.m"
"             Rainfall losses        35.394     11.044     11.044     mm"
"             Runoff depth           12.155     36.505     36.505     mm"
"             Runoff volume          0.00       26.65      26.65      c.m"
"             Runoff coefficient     0.000      0.768      0.768      "
"             Maximum flow           0.000      0.023      0.023      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.023     0.034     0.007     0.007"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.023     0.034     0.034     0.007"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                0.034    c.m/sec"
"             Hydrograph volume           66.617    c.m"
"                    0.023     0.034     0.034     0.034"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                0.034    c.m/sec"
"             Hydrograph volume           66.617    c.m"
"                    0.023     0.034     0.034     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.023     0.034     0.034     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"             Maximum flow                0.040    c.m/sec"
"             Hydrograph volume           79.464    c.m"
"                    0.023     0.034     0.034     0.040"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    0.369    hectare"
"             Total Impervious area                   0.129    hectare"
"             Total % impervious                     34.905"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                               February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                          C:\Users\hmoarefi\Desktop"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             333 Albert Street - predevelopment - 100 year - Run 3"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     4692.000   Coefficient A"
"       17.437   Constant B"
"        0.956   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           239.793    mm/hr"
"             Total depth                  89.960    mm"
"           6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Albert Street catchment"
"       35.000   % Impervious"
"        0.057   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.037   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.020   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.442   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.909   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.016     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.037      0.020      0.057      hectare"
"             Time of concentration  7.439      1.002      4.055      minutes"
"             Time to Centroid       102.514    85.479     93.559     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        33.33      17.95      51.28      c.m"
"             Rainfall losses        50.212     8.153      35.491     mm"
"             Runoff depth           39.748     81.808     54.469     mm"
"             Runoff volume          14.73      16.32      31.05      c.m"
"             Runoff coefficient     0.442      0.909      0.605      "
"             Maximum flow           0.008      0.012      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.016     0.016     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.016     0.016     0.016     0.000"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Albert Street"
"            Maximum flow                 0.016    c.m/sec"
"            Hydrograph volume           31.047    c.m"
"                    0.016     0.016     0.016     0.016"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.016     0.000     0.016     0.016"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Batavia Place"
"       15.000   % Impervious"
"        0.239   Total Area"
"       50.000   Flow length"
"        2.700   Overland Slope"
"        0.203   Pervious Area"
"       50.000   Pervious length"
"        2.700   Pervious slope"
"        0.036   Impervious Area"
"       50.000   Impervious length"
"        2.700   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.443   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.927   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.043     0.000     0.016     0.016 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.203      0.036      0.239      hectare"
"             Time of concentration  14.505     1.954      11.121     minutes"
"             Time to Centroid       111.330    86.723     104.695    minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        182.75     32.25      215.00     c.m"
"             Rainfall losses        50.106     6.583      43.577     mm"
"             Runoff depth           39.855     83.377     46.383     mm"
"             Runoff volume          80.96      29.89      110.86     c.m"
"             Runoff coefficient     0.443      0.927      0.516      "
"             Maximum flow           0.036      0.020      0.043      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.043     0.043     0.016     0.016"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   roofs"
"      100.000   % Impervious"
"        0.073   Total Area"
"        4.000   Flow length"
"       40.000   Overland Slope"
"        0.000   Pervious Area"
"        4.000   Pervious length"
"       40.000   Pervious slope"
"        0.073   Impervious Area"
"        4.000   Impervious length"
"       40.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.809   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.042     0.043     0.016     0.016 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.073      0.073      hectare"
"             Time of concentration  1.420      0.191      0.191      minutes"
"             Time to Centroid       94.773     83.761     83.761     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        0.00       65.67      65.67      c.m"
"             Rainfall losses        50.600     17.204     17.204     mm"
"             Runoff depth           39.360     72.756     72.756     mm"
```

```
"             Runoff volume          0.00       53.11      53.11      c.m"
"             Runoff coefficient     0.000      0.809      0.809      "
"             Maximum flow           0.000      0.042      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.042     0.068     0.016     0.016"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.042     0.068     0.068     0.016"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                 0.068    c.m/sec"
"             Hydrograph volume            163.967    c.m"
"                    0.042     0.068     0.068     0.068"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Batavia Place"
"             Maximum flow                 0.068    c.m/sec"
"             Hydrograph volume            163.967    c.m"
"                    0.042     0.068     0.068     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.042     0.068     0.068     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"             Maximum flow                 0.083    c.m/sec"
"             Hydrograph volume            195.014    c.m"
"                    0.042     0.068     0.068     0.083"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.369    hectare"
"             Total Impervious area                     0.129    hectare"
"             Total % impervious                       34.905"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                                February 7, 2010"
"          10   Units used:                                          ie METRIC"
"               Job folder:                    C:\Users\Administrator\Desktop"
" 81          ADD COMMENT==================================================="
"           2  Lines of comment"
"              333 Albert Street-Post development-25 mm rainfallr- Run 16"
"                  "
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Huff distribution"
"             2   Huff distribution"
"      25.000   Rainfall depth"
"     180.000   Duration"
"       1.000   Huff quartile"
"             Maximum intensity            27.833    mm/hr"
"             Total depth                  25.000    mm"
"            6   1.0hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   To Albert Street"
"      70.000   % Impervious"
"       0.016   Total Area"
"       4.000   Flow length"
"       4.000   Overland Slope"
"       0.005   Pervious Area"
"       4.000   Pervious length"
"       4.000   Pervious slope"
"       0.011   Impervious Area"
"       4.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.108   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.774   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.001     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.005      0.011      0.016      hectare"
"             Time of concentration  12.460     0.941      1.588      minutes"
```

```
"             Time to Centroid       98.305     59.610     61.786     minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        1.20       2.80       4.00       c.m"
"             Rainfall losses        22.309     5.645      10.644     mm"
"             Runoff depth           2.691      19.355     14.356     mm"
"             Runoff volume          0.13       2.17       2.30       c.m"
"             Runoff coefficient     0.108      0.774      0.574      "
"             Maximum flow           0.000      0.001      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.001     0.001     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.001     0.001     0.001     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"             Maximum flow                  0.001    c.m/sec"
"             Hydrograph volume             2.297    c.m"
"                    0.001     0.001     0.001     0.001"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.001     0.000     0.001     0.001"
" 33          CATCHMENT 202"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           202   Parking area"
"       100.000   % Impervious"
"         0.085   Total Area"
"        23.000   Flow length"
"         3.000   Overland Slope"
"         0.000   Pervious Area"
"        23.000   Pervious length"
"         3.000   Pervious slope"
"         0.085   Impervious Area"
"        23.000   Impervious length"
"         3.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.786   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.006     0.000     0.001     0.001 c.m/sec"
```

```
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.085      0.085      hectare"
"            Time of concentration  38.796     2.929      2.929      minutes"
"            Time to Centroid       125.115    61.475     61.475     minutes"
"            Rainfall depth         25.000     25.000     25.000     mm"
"            Rainfall volume        0.00       21.25      21.25      c.m"
"            Rainfall losses        22.300     5.342      5.342      mm"
"            Runoff depth           2.700      19.658     19.658     mm"
"            Runoff volume          0.00       16.71      16.71      c.m"
"            Runoff coefficient     0.000      0.786      0.786      "
"            Maximum flow           0.000      0.006      0.006      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.006     0.006     0.001     0.001"
" 54         POND DESIGN"
"       0.006   Current peak flow    c.m/sec"
"       0.025   Target outflow    c.m/sec"
"        16.7   Hydrograph volume    c.m"
"         21.   Number of stages"
"     341.700   Minimum water level    metre"
"     342.100   Maximum water level    metre"
"     341.700   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               341.700     0.000     0.000"
"               341.720   0.00013  1.00E-07"
"               341.740   0.00047  1.00E-07"
"               341.760   0.00095  1.00E-07"
"               341.780   0.00213  1.00E-07"
"               341.800   0.00276  1.00E-07"
"               341.820   0.00326  1.00E-07"
"               341.840   0.00370  1.00E-07"
"               341.860   0.00409   0.00187"
"               341.880   0.00444   0.05085"
"               341.900   0.00477    0.2353"
"               341.920   0.00508    0.6463"
"               341.940   0.00537     1.373"
"               341.960   0.00565     2.506"
"               341.980   0.00591     4.139"
"               342.000   0.00616     6.357"
"               342.020   0.00641     9.252"
"               342.040   0.00664    12.921"
"               342.060   0.00917    17.443"
"               342.080   0.01904    22.913"
"               342.100   0.03304    29.432"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"               342.050     0.900     1.500     0.000     0.000"
"          1.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"               341.700     0.630    0.0750     1.000"
"          6.   WEDGES"
"                 Wedge   Grade 1   Grade 2     Angle    Number"
"                 invert    g1H:1V    g2H:1V subtended of wedges"
"               341.850   100.000    20.000   120.000     1.000"
"               341.850    20.000    25.000    30.000     1.000"
"               341.850    25.000    45.000    60.000     1.000"
"               341.850    45.000    22.000    34.000     1.000"
"               341.850    22.000    50.000    74.000     1.000"
"               341.850    50.000   100.000    42.000     1.000"
"            Peak outflow                  0.005    c.m/sec"
"            Maximum level               341.908    metre"
"            Maximum storage               0.390    c.m"
"            Centroidal lag                1.030   hours"
"                 0.006     0.006     0.005     0.001 c.m/sec"
" 40         HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Parking"
"            Maximum flow                  0.005    c.m/sec"
"            Hydrograph volume            16.757    c.m"
"                   0.006     0.006     0.005     0.005"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.006     0.000     0.005     0.005"
" 33         CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   South landscape and amenity space"
"      40.000   % Impervious"
"       0.079   Total Area"
"      26.000   Flow length"
"       3.500   Overland Slope"
"       0.047   Pervious Area"
"      26.000   Pervious length"
"       3.500   Pervious slope"
"       0.032   Impervious Area"
"      26.000   Impervious length"
"       3.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.108   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.786   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.002     0.000     0.005     0.005 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.047      0.032      0.079      hectare"
"             Time of concentration  39.870     3.010      9.310      minutes"
"             Time to Centroid       126.212    61.619     72.658     minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        11.85      7.90       19.75      c.m"
"             Rainfall losses        22.300     5.349      15.520     mm"
"             Runoff depth           2.700      19.651     9.480      mm"
"             Runoff volume          1.28       6.21       7.49       c.m"
"             Runoff coefficient     0.108      0.786      0.379      "
"             Maximum flow           0.000      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.002     0.002     0.005     0.005"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.002     0.002     0.002     0.005"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Batavia Place "
"             Maximum flow                 0.002    c.m/sec"
"             Hydrograph volume            7.490    c.m"
"                    0.002     0.002     0.002     0.002"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.002     0.000     0.002     0.002"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Roof"
"      100.000   % Impervious"
"        0.148   Total Area"
"        9.000   Flow length"
"        0.500   Overland Slope"
"        0.000   Pervious Area"
"        9.000   Pervious length"
"        0.500   Pervious slope"
"        0.148   Impervious Area"
"        9.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.787   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.010     0.000     0.002     0.002 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.148      0.148      hectare"
"             Time of concentration  37.822     2.856      2.856      minutes"
"             Time to Centroid       124.125    61.311     61.311     minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        0.00       37.00      37.00      c.m"
"             Rainfall losses        22.300     5.331      5.331      mm"
"             Runoff depth           2.700      19.669     19.669     mm"
"             Runoff volume          0.00       29.11      29.11      c.m"
"             Runoff coefficient     0.000      0.787      0.787      "
"             Maximum flow           0.000      0.010      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.010     0.010     0.002     0.002"
" 54          POND DESIGN"
"        0.010   Current peak flow    c.m/sec"
"        0.043   Target outflow    c.m/sec"
"         29.1   Hydrograph volume    c.m"
"          19.   Number of stages"
"      338.800   Minimum water level    metre"
"      340.650   Maximum water level    metre"
"      338.800   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                338.800     0.000     0.000"
"                338.903  1.00E-07     3.410"
"                339.006  1.00E-07     6.140"
"                339.108  1.00E-07     8.860"
"                339.211  1.00E-07    12.220"
"                339.314  1.00E-07    17.440"
"                339.417  1.00E-07    22.590"
"                339.519   0.00058    27.660"
"                339.622   0.00695    32.620"
"                339.725   0.01099    37.460"
"                339.828   0.01390    42.140"
"                339.931   0.01630    46.640"
"                340.033   0.01837    50.910"
"                340.136   0.02024    54.890"
"                340.239   0.02196    58.380"
"                340.342   0.02355    61.280"
"                340.444   0.02503    64.010"
"                340.547   0.02644    66.730"
"                340.650   0.02777    69.460"
"           1.   ORIFICES"
```

```
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               339.480     0.630    0.1100     1.000"
"            Peak outflow                  0.000    c.m/sec"
"            Maximum level              339.504    metre"
"            Maximum storage             26.917    c.m"
"            Centroidal lag               4.532   hours"
"                 0.010     0.010     0.000     0.002 c.m/sec"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                 0.002    c.m/sec"
"            Hydrograph volume           14.010    c.m"
"                   0.010     0.010     0.000     0.002"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.010     0.000     0.000     0.002"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   North grass strip"
"       3.000   % Impervious"
"       0.015   Total Area"
"       2.000   Flow length"
"      10.000   Overland Slope"
"       0.015   Pervious Area"
"       2.000   Pervious length"
"      10.000   Pervious slope"
"       0.000   Impervious Area"
"       2.000   Impervious length"
"      10.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.107   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.701   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.000     0.000     0.000     0.002 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.015      0.000      0.015      hectare"
"            Time of concentration  6.245      0.471      5.272      minutes"
"            Time to Centroid       92.208     59.800     86.747     minutes"
"            Rainfall depth         25.000     25.000     25.000     mm"
"            Rainfall volume        3.64       0.11       3.75       c.m"
```

```
"            Rainfall losses        22.327     7.484      21.881     mm"
"            Runoff depth           2.673      17.516     3.119      mm"
"            Runoff volume          0.39       0.08       0.47       c.m"
"            Runoff coefficient     0.107      0.701      0.125      "
"            Maximum flow           0.000      0.000      0.000      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.000     0.000     0.000     0.002"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.000     0.000     0.000     0.002"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Uncontrolled"
"            Maximum flow                 0.000    c.m/sec"
"            Hydrograph volume            0.468    c.m"
"                   0.000     0.000     0.000     0.000"
" 40         HYDROGRAPH   Confluence    1"
"           7   Confluence "
"           1   Node #"
"               Albert Street"
"            Maximum flow                 0.001    c.m/sec"
"            Hydrograph volume            2.297    c.m"
"                   0.000     0.001     0.000     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.000     0.001     0.001     0.000"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                 0.003    c.m/sec"
"            Hydrograph volume           16.306    c.m"
"                   0.000     0.001     0.001     0.003"
" 40         HYDROGRAPH   Confluence    3"
"           7   Confluence "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                 0.003    c.m/sec"
"            Hydrograph volume           16.306    c.m"
"                   0.000     0.003     0.001     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.000     0.003     0.003     0.000"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Uncontrolled"
"            Maximum flow                 0.003    c.m/sec"
```

```
"             Hydrograph volume            16.774    c.m"
"                     0.000     0.003     0.003     0.003"
" 40          HYDROGRAPH   Confluence    4"
"            7   Confluence "
"            4   Node #"
"                Uncontrolled"
"             Maximum flow                  0.003    c.m/sec"
"             Hydrograph volume            16.774    c.m"
"                     0.000     0.003     0.003     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.003     0.003     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Parking"
"             Maximum flow                  0.008    c.m/sec"
"             Hydrograph volume            33.531    c.m"
"                     0.000     0.003     0.003     0.008"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Parking"
"             Maximum flow                  0.008    c.m/sec"
"             Hydrograph volume            33.531    c.m"
"                     0.000     0.008     0.003     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.008     0.008     0.000"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.343    hectare"
"             Total Impervious area                     0.276    hectare"
"             Total % impervious                       80.539"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                                February 7, 2010"
"          10   Units used:                                          ie METRIC"
"               Job folder:                    C:\Users\Administrator\Desktop"
" 81          ADD COMMENT==================================================="
"           2  Lines of comment"
"              333 Albert Street- Post development -2 year - Run 16"
" 31          TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"             1   Chicago storm"
"      1109.000   Coefficient A"
"         9.258   Constant B"
"         0.882   Exponent C"
"         0.400   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"              Maximum intensity           106.427    mm/hr"
"              Total depth                  32.636    mm"
"             4   2hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   To Albert Street"
"        70.000   % Impervious"
"         0.016   Total Area"
"         4.000   Flow length"
"         4.000   Overland Slope"
"         0.005   Pervious Area"
"         4.000   Pervious length"
"         4.000   Pervious slope"
"         0.011   Impervious Area"
"         4.000   Impervious length"
"         4.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.162   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.768   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.003     0.000     0.000     0.000 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
```

```
"              Surface Area           0.005      0.011      0.016      hectare"
"              Time of concentration  6.726      0.543      1.056      minutes"
"              Time to Centroid       108.162    87.716     89.414     minutes"
"              Rainfall depth         32.636     32.636     32.636     mm"
"              Rainfall volume        1.57       3.66       5.22       c.m"
"              Rainfall losses        27.339     7.569      13.500     mm"
"              Runoff depth           5.297      25.066     19.135     mm"
"              Runoff volume          0.25       2.81       3.06       c.m"
"              Runoff coefficient     0.162      0.768      0.586      "
"              Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.003     0.003     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.003     0.003     0.003     0.000"
" 40          HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Albert Street"
"              Maximum flow                  0.003    c.m/sec"
"              Hydrograph volume             3.062    c.m"
"                     0.003     0.003     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.003     0.000     0.003     0.003"
" 33          CATCHMENT 202"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           202   Parking area"
"       100.000   % Impervious"
"         0.085   Total Area"
"        23.000   Flow length"
"         3.000   Overland Slope"
"         0.000   Pervious Area"
"        23.000   Pervious length"
"         3.000   Pervious slope"
"         0.085   Impervious Area"
"        23.000   Impervious length"
"         3.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.836   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.019     0.000     0.003     0.003 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.085      0.085      hectare"
"             Time of concentration  20.942     1.691      1.691      minutes"
"             Time to Centroid       124.612    88.796     88.796     minutes"
"             Rainfall depth         32.636     32.636     32.636     mm"
"             Rainfall volume        0.00       27.74      27.74      c.m"
"             Rainfall losses        27.273     5.352      5.352      mm"
"             Runoff depth           5.363      27.283     27.283     mm"
"             Runoff volume          0.00       23.19      23.19      c.m"
"             Runoff coefficient     0.000      0.836      0.836      "
"             Maximum flow           0.000      0.019      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.019     0.019     0.003     0.003"
" 54          POND DESIGN"
"        0.019   Current peak flow    c.m/sec"
"        0.025   Target outflow    c.m/sec"
"         23.2   Hydrograph volume    c.m"
"          21.   Number of stages"
"      341.700   Minimum water level    metre"
"      342.100   Maximum water level    metre"
"      341.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                341.700     0.000     0.000"
"                341.720   0.00013  1.00E-07"
"                341.740   0.00047  1.00E-07"
"                341.760   0.00095  1.00E-07"
"                341.780   0.00213  1.00E-07"
"                341.800   0.00276  1.00E-07"
"                341.820   0.00326  1.00E-07"
"                341.840   0.00370  1.00E-07"
"                341.860   0.00409   0.00187"
"                341.880   0.00444   0.05085"
"                341.900   0.00477    0.2353"
"                341.920   0.00508    0.6463"
"                341.940   0.00537     1.373"
"                341.960   0.00565     2.506"
"                341.980   0.00591     4.139"
"                342.000   0.00616     6.357"
"                342.020   0.00641     9.252"
"                342.040   0.00664    12.921"
"                342.060   0.00917    17.443"
"                342.080   0.01904    22.913"
"                342.100   0.03304    29.432"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                342.050     0.900     1.500     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                341.700     0.630    0.0750     1.000"
"           6.   WEDGES"
"                  Wedge   Grade 1   Grade 2     Angle    Number"
"                 invert    g1H:1V    g2H:1V subtended of wedges"
"                341.850   100.000    20.000   120.000     1.000"
"                341.850    20.000    25.000    30.000     1.000"
"                341.850    25.000    45.000    60.000     1.000"
"                341.850    45.000    22.000    34.000     1.000"
"                341.850    22.000    50.000    74.000     1.000"
"                341.850    50.000   100.000    42.000     1.000"
"              Peak outflow                  0.006    c.m/sec"
"              Maximum level               342.006    metre"
"              Maximum storage               7.187    c.m"
"              Centroidal lag                1.639   hours"
"                   0.019     0.019     0.006     0.003 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Parking"
"              Maximum flow                  0.006    c.m/sec"
"              Hydrograph volume            23.140    c.m"
"                    0.019     0.019     0.006     0.006"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.019     0.000     0.006     0.006"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   South landscape and amenity space"
"       40.000   % Impervious"
"        0.079   Total Area"
"       26.000   Flow length"
"        3.500   Overland Slope"
"        0.047   Pervious Area"
"       26.000   Pervious length"
"        3.500   Pervious slope"
"        0.032   Impervious Area"
"       26.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.164   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.836   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.007     0.000     0.006     0.006 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.047      0.032      0.079      hectare"
"             Time of concentration  21.522     1.738      6.240      minutes"
"             Time to Centroid       125.301    88.863     97.155     minutes"
"             Rainfall depth         32.636     32.636     32.636     mm"
"             Rainfall volume        15.47      10.31      25.78      c.m"
"             Rainfall losses        27.275     5.342      18.501     mm"
"             Runoff depth           5.361      27.294     14.134     mm"
"             Runoff volume          2.54       8.62       11.17      c.m"
"             Runoff coefficient     0.164      0.836      0.433      "
"             Maximum flow           0.001      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.006     0.006"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.007     0.007     0.007     0.006"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Batavia Place "
"             Maximum flow                  0.007    c.m/sec"
"             Hydrograph volume            11.166    c.m"
"                    0.007     0.007     0.007     0.007"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.007     0.000     0.007     0.007"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Roof"
"       100.000   % Impervious"
"         0.148   Total Area"
"         9.000   Flow length"
"         0.500   Overland Slope"
"         0.000   Pervious Area"
"         9.000   Pervious length"
"         0.500   Pervious slope"
"         0.148   Impervious Area"
"         9.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
```

```
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.836   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.033     0.000     0.007     0.007 c.m/sec"
"              Catchment 204          Pervious   Impervious Total Area "
"              Surface Area           0.000      0.148      0.148      hectare"
"              Time of concentration  20.416     1.648      1.648      minutes"
"              Time to Centroid       123.985    88.731     88.731     minutes"
"              Rainfall depth         32.636     32.636     32.636     mm"
"              Rainfall volume        0.00       48.30      48.30      c.m"
"              Rainfall losses        27.274     5.365      5.365      mm"
"              Runoff depth           5.362      27.270     27.270     mm"
"              Runoff volume          0.00       40.36      40.36      c.m"
"              Runoff coefficient     0.000      0.836      0.836      "
"              Maximum flow           0.000      0.033      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.033     0.033     0.007     0.007"
" 54          POND DESIGN"
"         0.033   Current peak flow    c.m/sec"
"         0.043   Target outflow    c.m/sec"
"          40.4   Hydrograph volume    c.m"
"           19.   Number of stages"
"       338.800   Minimum water level    metre"
"       340.650   Maximum water level    metre"
"       338.800   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 338.800     0.000     0.000"
"                 338.903  1.00E-07     3.410"
"                 339.006  1.00E-07     6.140"
"                 339.108  1.00E-07     8.860"
"                 339.211  1.00E-07    12.220"
"                 339.314  1.00E-07    17.440"
"                 339.417  1.00E-07    22.590"
"                 339.519   0.00058    27.660"
"                 339.622   0.00695    32.620"
"                 339.725   0.01099    37.460"
"                 339.828   0.01390    42.140"
"                 339.931   0.01630    46.640"
"                 340.033   0.01837    50.910"
"                 340.136   0.02024    54.890"
"                 340.239   0.02196    58.380"
"                 340.342   0.02355    61.280"
"                 340.444   0.02503    64.010"
"                 340.547   0.02644    66.730"
```

```
"               340.650   0.02777    69.460"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               339.480     0.630    0.1100     1.000"
"            Peak outflow                 0.004    c.m/sec"
"            Maximum level              339.570    metre"
"            Maximum storage             30.134    c.m"
"            Centroidal lag               3.123   hours"
"                 0.033     0.033     0.004     0.007 c.m/sec"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                 0.007    c.m/sec"
"            Hydrograph volume           28.984    c.m"
"                 0.033     0.033     0.004     0.007"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.033     0.000     0.004     0.007"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   North grass strip"
"       3.000   % Impervious"
"       0.015   Total Area"
"       2.000   Flow length"
"      10.000   Overland Slope"
"       0.015   Pervious Area"
"       2.000   Pervious length"
"      10.000   Pervious slope"
"       0.000   Impervious Area"
"       2.000   Impervious length"
"      10.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.160   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.734   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.001     0.000     0.004     0.007 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.015      0.000      0.015      hectare"
"            Time of concentration  3.371      0.272      2.986      minutes"
"            Time to Centroid       104.213    86.784     102.049    minutes"
```

```
"            Rainfall depth         32.636     32.636     32.636     mm"
"            Rainfall volume        4.75       0.15       4.90       c.m"
"            Rainfall losses        27.407     8.668      26.844     mm"
"            Runoff depth           5.229      23.968     5.791      mm"
"            Runoff volume          0.76       0.11       0.87       c.m"
"            Runoff coefficient     0.160      0.734      0.177      "
"            Maximum flow           0.000      0.000      0.001      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.001     0.001     0.004     0.007"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.001     0.001     0.001     0.007"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Uncontrolled"
"            Maximum flow                 0.001    c.m/sec"
"            Hydrograph volume            0.869    c.m"
"                 0.001     0.001     0.001     0.001"
" 40         HYDROGRAPH   Confluence    1"
"           7   Confluence "
"           1   Node #"
"               Albert Street"
"            Maximum flow                 0.003    c.m/sec"
"            Hydrograph volume            3.062    c.m"
"                 0.001     0.003     0.001     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.001     0.003     0.003     0.000"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                 0.010    c.m/sec"
"            Hydrograph volume           32.046    c.m"
"                 0.001     0.003     0.003     0.010"
" 40         HYDROGRAPH   Confluence    3"
"           7   Confluence "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                 0.010    c.m/sec"
"            Hydrograph volume           32.046    c.m"
"                 0.001     0.010     0.003     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.001     0.010     0.010     0.000"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
```

```
"               Uncontrolled"
"              Maximum flow                  0.010    c.m/sec"
"              Hydrograph volume            32.914    c.m"
"                      0.001     0.010     0.010     0.010"
" 40           HYDROGRAPH   Confluence    4"
"             7   Confluence "
"             4   Node #"
"                 Uncontrolled"
"              Maximum flow                  0.010    c.m/sec"
"              Hydrograph volume            32.914    c.m"
"                      0.001     0.010     0.010     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      0.001     0.010     0.010     0.000"
" 40           HYDROGRAPH   Combine    2"
"             6   Combine "
"             2   Node #"
"                 Parking"
"              Maximum flow                  0.016    c.m/sec"
"              Hydrograph volume            56.055    c.m"
"                      0.001     0.010     0.010     0.016"
" 40           HYDROGRAPH   Confluence    2"
"             7   Confluence "
"             2   Node #"
"                 Parking"
"              Maximum flow                  0.016    c.m/sec"
"              Hydrograph volume            56.055    c.m"
"                      0.001     0.016     0.010     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      0.001     0.016     0.016     0.000"
" 38           START/RE-START TOTALS 2"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                     0.343    hectare"
"              Total Impervious area                    0.276    hectare"
"              Total % impervious                      80.539"
" 19           EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                    C:\Users\Administrator\Desktop"
" 81          ADD COMMENT==================================================="
"            5  Lines of comment"
"               333 Albert Street- Post development -5 year - Run 16"
" 31          TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"             1   Chicago storm"
"      1755.000   Coefficient A"
"        12.347   Constant B"
"         0.895   Exponent C"
"         0.400   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"              Maximum intensity           136.512    mm/hr"
"              Total depth                  47.549    mm"
"             4   5hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   To Albert Street"
"        70.000   % Impervious"
"         0.016   Total Area"
"         4.000   Flow length"
"         4.000   Overland Slope"
"         0.005   Pervious Area"
"         4.000   Pervious length"
"         4.000   Pervious slope"
"         0.011   Impervious Area"
"         4.000   Impervious length"
"         4.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.258   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.797   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.004     0.000     0.000     0.000 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
```

```
"              Surface Area           0.005      0.011      0.016      hectare"
"              Time of concentration  4.663      0.484      0.992      minutes"
"              Time to Centroid       103.596    87.014     89.031     minutes"
"              Rainfall depth         47.549     47.549     47.549     mm"
"              Rainfall volume        2.28       5.33       7.61       c.m"
"              Rainfall losses        35.295     9.629      17.329     mm"
"              Runoff depth           12.254     37.920     30.220     mm"
"              Runoff volume          0.59       4.25       4.84       c.m"
"              Runoff coefficient     0.258      0.797      0.636      "
"              Maximum flow           0.000      0.003      0.004      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.004     0.004     0.000     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.004     0.004     0.004     0.000"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Albert Street"
"              Maximum flow                  0.004    c.m/sec"
"              Hydrograph volume             4.835    c.m"
"                     0.004     0.004     0.004     0.004"
" 40           HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.004     0.000     0.004     0.004"
" 33           CATCHMENT 202"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           202   Parking area"
"       100.000   % Impervious"
"         0.085   Total Area"
"        23.000   Flow length"
"         3.000   Overland Slope"
"         0.000   Pervious Area"
"        23.000   Pervious length"
"         3.000   Pervious slope"
"         0.085   Impervious Area"
"        23.000   Impervious length"
"         3.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.878   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.026     0.000     0.004     0.004 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.085      0.085      hectare"
"             Time of concentration  14.520     1.507      1.507      minutes"
"             Time to Centroid       115.618    87.882     87.882     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        0.00       40.42      40.42      c.m"
"             Rainfall losses        35.226     5.816      5.816      mm"
"             Runoff depth           12.323     41.733     41.733     mm"
"             Runoff volume          0.00       35.47      35.47      c.m"
"             Runoff coefficient     0.000      0.878      0.878      "
"             Maximum flow           0.000      0.026      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.026     0.026     0.004     0.004"
" 54          POND DESIGN"
"        0.026   Current peak flow    c.m/sec"
"        0.025   Target outflow    c.m/sec"
"         35.5   Hydrograph volume    c.m"
"          21.   Number of stages"
"      341.700   Minimum water level    metre"
"      342.100   Maximum water level    metre"
"      341.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                341.700     0.000     0.000"
"                341.720   0.00013  1.00E-07"
"                341.740   0.00047  1.00E-07"
"                341.760   0.00095  1.00E-07"
"                341.780   0.00213  1.00E-07"
"                341.800   0.00276  1.00E-07"
"                341.820   0.00326  1.00E-07"
"                341.840   0.00370  1.00E-07"
"                341.860   0.00409   0.00187"
"                341.880   0.00444   0.05085"
"                341.900   0.00477    0.2353"
"                341.920   0.00508    0.6463"
"                341.940   0.00537     1.373"
"                341.960   0.00565     2.506"
"                341.980   0.00591     4.139"
"                342.000   0.00616     6.357"
"                342.020   0.00641     9.252"
"                342.040   0.00664    12.921"
"                342.060   0.00917    17.443"
"                342.080   0.01904    22.913"
"                342.100   0.03304    29.432"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                342.050     0.900     1.500     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                341.700     0.630    0.0750     1.000"
"           6.   WEDGES"
"                  Wedge   Grade 1   Grade 2     Angle    Number"
"                 invert    g1H:1V    g2H:1V subtended of wedges"
"                341.850   100.000    20.000   120.000     1.000"
"                341.850    20.000    25.000    30.000     1.000"
"                341.850    25.000    45.000    60.000     1.000"
"                341.850    45.000    22.000    34.000     1.000"
"                341.850    22.000    50.000    74.000     1.000"
"                341.850    50.000   100.000    42.000     1.000"
"             Peak outflow                  0.007    c.m/sec"
"             Maximum level               342.042    metre"
"             Maximum storage              13.336    c.m"
"             Centroidal lag                1.749   hours"
"                  0.026     0.026     0.007     0.004 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Parking"
"             Maximum flow                  0.007    c.m/sec"
"             Hydrograph volume            35.065    c.m"
"                    0.026     0.026     0.007     0.007"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.026     0.000     0.007     0.007"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   South landscape and amenity space"
"       40.000   % Impervious"
"        0.079   Total Area"
"       26.000   Flow length"
"        3.500   Overland Slope"
"        0.047   Pervious Area"
"       26.000   Pervious length"
"        3.500   Pervious slope"
"        0.032   Impervious Area"
"       26.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.259   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.010     0.000     0.007     0.007 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.047      0.032      0.079      hectare"
"             Time of concentration  14.922     1.549      5.648      minutes"
"             Time to Centroid       116.115    87.938     96.575     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        22.54      15.03      37.56      c.m"
"             Rainfall losses        35.243     5.789      23.461     mm"
"             Runoff depth           12.306     41.761     24.088     mm"
"             Runoff volume          5.83       13.20      19.03      c.m"
"             Runoff coefficient     0.259      0.878      0.507      "
"             Maximum flow           0.002      0.010      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.010     0.010     0.007     0.007"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.010     0.010     0.010     0.007"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Batavia Place "
"             Maximum flow                 0.010    c.m/sec"
"             Hydrograph volume           19.029    c.m"
"                    0.010     0.010     0.010     0.010"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.010     0.000     0.010     0.010"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Roof"
"       100.000   % Impervious"
"         0.148   Total Area"
"         9.000   Flow length"
"         0.500   Overland Slope"
"         0.000   Pervious Area"
"         9.000   Pervious length"
"         0.500   Pervious slope"
"         0.148   Impervious Area"
"         9.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.877   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.046     0.000     0.010     0.010 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.148      0.148      hectare"
"             Time of concentration  14.155     1.469      1.469      minutes"
"             Time to Centroid       115.163    87.834     87.834     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        0.00       70.37      70.37      c.m"
"             Rainfall losses        35.220     5.832      5.832      mm"
"             Runoff depth           12.329     41.717     41.717     mm"
"             Runoff volume          0.00       61.74      61.74      c.m"
"             Runoff coefficient     0.000      0.877      0.877      "
"             Maximum flow           0.000      0.046      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.046     0.046     0.010     0.010"
" 54          POND DESIGN"
"         0.046   Current peak flow    c.m/sec"
"         0.043   Target outflow    c.m/sec"
"          61.7   Hydrograph volume    c.m"
"           19.   Number of stages"
"       338.800   Minimum water level    metre"
"       340.650   Maximum water level    metre"
"       338.800   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 338.800     0.000     0.000"
"                 338.903  1.00E-07     3.410"
"                 339.006  1.00E-07     6.140"
"                 339.108  1.00E-07     8.860"
"                 339.211  1.00E-07    12.220"
"                 339.314  1.00E-07    17.440"
"                 339.417  1.00E-07    22.590"
"                 339.519   0.00058    27.660"
"                 339.622   0.00695    32.620"
"                 339.725   0.01099    37.460"
"                 339.828   0.01390    42.140"
"                 339.931   0.01630    46.640"
"                 340.033   0.01837    50.910"
"                 340.136   0.02024    54.890"
"                 340.239   0.02196    58.380"
"                 340.342   0.02355    61.280"
"                 340.444   0.02503    64.010"
"                 340.547   0.02644    66.730"
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"               340.650   0.02777    69.460"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               339.480     0.630    0.1100     1.000"
"            Peak outflow                  0.011    c.m/sec"
"            Maximum level              339.738    metre"
"            Maximum storage             38.033    c.m"
"            Centroidal lag               2.408   hours"
"                 0.046     0.046     0.011     0.010 c.m/sec"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                  0.016    c.m/sec"
"            Hydrograph volume            58.233    c.m"
"                 0.046     0.046     0.011     0.016"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.046     0.000     0.011     0.016"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   North grass strip"
"       3.000   % Impervious"
"       0.015   Total Area"
"       2.000   Flow length"
"      10.000   Overland Slope"
"       0.015   Pervious Area"
"       2.000   Pervious length"
"      10.000   Pervious slope"
"       0.000   Impervious Area"
"       2.000   Impervious length"
"      10.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.256   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.768   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.001     0.000     0.011     0.016 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.015      0.000      0.015      hectare"
"            Time of concentration  2.337      0.243      2.159      minutes"
"            Time to Centroid       100.596    85.906     99.348     minutes"
```

```
"            Rainfall depth         47.549     47.549     47.549     mm"
"            Rainfall volume        6.92       0.21       7.13       c.m"
"            Rainfall losses        35.394     11.044     34.664     mm"
"            Runoff depth           12.155     36.505     12.885     mm"
"            Runoff volume          1.77       0.16       1.93       c.m"
"            Runoff coefficient     0.256      0.768      0.271      "
"            Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.001     0.001     0.011     0.016"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.001     0.001     0.001     0.016"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Uncontrolled"
"            Maximum flow                  0.001    c.m/sec"
"            Hydrograph volume             1.933    c.m"
"                 0.001     0.001     0.001     0.001"
" 40         HYDROGRAPH   Confluence    1"
"           7   Confluence "
"           1   Node #"
"               Albert Street"
"            Maximum flow                  0.004    c.m/sec"
"            Hydrograph volume             4.835    c.m"
"                 0.001     0.004     0.001     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.001     0.004     0.004     0.000"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                  0.018    c.m/sec"
"            Hydrograph volume            63.068    c.m"
"                 0.001     0.004     0.004     0.018"
" 40         HYDROGRAPH   Confluence    3"
"           7   Confluence "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                  0.018    c.m/sec"
"            Hydrograph volume            63.068    c.m"
"                 0.001     0.018     0.004     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.001     0.018     0.018     0.000"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
```

```
"               Uncontrolled"
"              Maximum flow                  0.019    c.m/sec"
"              Hydrograph volume            65.001    c.m"
"                      0.001     0.018     0.018     0.019"
" 40           HYDROGRAPH   Confluence    4"
"             7   Confluence "
"             4   Node #"
"                 Uncontrolled"
"              Maximum flow                  0.019    c.m/sec"
"              Hydrograph volume            65.001    c.m"
"                      0.001     0.019     0.018     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      0.001     0.019     0.019     0.000"
" 40           HYDROGRAPH   Combine    2"
"             6   Combine "
"             2   Node #"
"                 Parking"
"              Maximum flow                  0.025    c.m/sec"
"              Hydrograph volume           100.066    c.m"
"                      0.001     0.019     0.019     0.025"
" 40           HYDROGRAPH   Confluence    2"
"             7   Confluence "
"             2   Node #"
"                 Parking"
"              Maximum flow                  0.025    c.m/sec"
"              Hydrograph volume           100.066    c.m"
"                      0.001     0.025     0.019     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      0.001     0.025     0.025     0.000"
" 38           START/RE-START TOTALS 2"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    0.343    hectare"
"              Total Impervious area                   0.276    hectare"
"              Total % impervious                     80.539"
" 19           EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                    C:\Users\Administrator\Desktop"
" 81          ADD COMMENT==================================================="
"           2  Lines of comment"
"              333 Albert Street- Post development -100 year - Run 16"
"                  "
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"             1   Chicago storm"
"     4692.000   Coefficient A"
"       17.437   Constant B"
"        0.956   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"              Maximum intensity           239.793    mm/hr"
"              Total depth                  89.960    mm"
"             6   100hyd   Hydrograph extension used in this file"
" 33           CATCHMENT 201"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           201   To Albert Street"
"        70.000   % Impervious"
"         0.016   Total Area"
"         4.000   Flow length"
"         4.000   Overland Slope"
"         0.005   Pervious Area"
"         4.000   Pervious length"
"         4.000   Pervious slope"
"         0.011   Impervious Area"
"         4.000   Impervious length"
"         4.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.435   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.820   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                      0.007     0.000     0.000     0.000 c.m/sec"
```

```
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.005      0.011      0.016      hectare"
"             Time of concentration  2.832      0.381      0.836      minutes"
"             Time to Centroid       96.717     84.809     87.016     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        4.32       10.08      14.39      c.m"
"             Rainfall losses        50.801     16.171     26.560     mm"
"             Runoff depth           39.160     73.789     63.400     mm"
"             Runoff volume          1.88       8.26       10.14      c.m"
"             Runoff coefficient     0.435      0.820      0.705      "
"             Maximum flow           0.001      0.006      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.007     0.007     0.007     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Albert Street"
"              Maximum flow                  0.007    c.m/sec"
"              Hydrograph volume            10.144    c.m"
"                    0.007     0.007     0.007     0.007"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.007     0.000     0.007     0.007"
" 33           CATCHMENT 202"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           202   Parking area"
"       100.000   % Impervious"
"         0.085   Total Area"
"        23.000   Flow length"
"         3.000   Overland Slope"
"         0.000   Pervious Area"
"        23.000   Pervious length"
"         3.000   Pervious slope"
"         0.085   Impervious Area"
"        23.000   Impervious length"
"         3.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.000   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.919   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.049     0.000     0.007     0.007 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.085      0.085      hectare"
"             Time of concentration  8.819      1.188      1.188      minutes"
"             Time to Centroid       104.193    85.712     85.712     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        0.00       76.47      76.47      c.m"
"             Rainfall losses        50.186     7.248      7.248      mm"
"             Runoff depth           39.774     82.712     82.712     mm"
"             Runoff volume          0.00       70.31      70.31      c.m"
"             Runoff coefficient     0.000      0.919      0.919      "
"             Maximum flow           0.000      0.049      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.049     0.049     0.007     0.007"
" 54          POND DESIGN"
"        0.049   Current peak flow    c.m/sec"
"        0.025   Target outflow    c.m/sec"
"         70.3   Hydrograph volume    c.m"
"          21.   Number of stages"
"      341.700   Minimum water level    metre"
"      342.100   Maximum water level    metre"
"      341.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                341.700     0.000     0.000"
"                341.720   0.00013  1.00E-07"
"                341.740   0.00047  1.00E-07"
"                341.760   0.00095  1.00E-07"
"                341.780   0.00213  1.00E-07"
"                341.800   0.00276  1.00E-07"
"                341.820   0.00326  1.00E-07"
"                341.840   0.00370  1.00E-07"
"                341.860   0.00409   0.00187"
"                341.880   0.00444   0.05085"
"                341.900   0.00477    0.2353"
"                341.920   0.00508    0.6463"
"                341.940   0.00537     1.373"
"                341.960   0.00565     2.506"
"                341.980   0.00591     4.139"
"                342.000   0.00616     6.357"
"                342.020   0.00641     9.252"
"                342.040   0.00664    12.921"
"                342.060   0.00917    17.443"
"                342.080   0.01904    22.913"
"                342.100   0.03304    29.432"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
```

```
"              elevation coefficie   breadth sideslope sideslope"
"                342.050     0.900     1.500     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                341.700     0.630    0.0750     1.000"
"           6.   WEDGES"
"                  Wedge   Grade 1   Grade 2     Angle    Number"
"                 invert    g1H:1V    g2H:1V subtended of wedges"
"                341.850   100.000    20.000   120.000     1.000"
"                341.850    20.000    25.000    30.000     1.000"
"                341.850    25.000    45.000    60.000     1.000"
"                341.850    45.000    22.000    34.000     1.000"
"                341.850    22.000    50.000    74.000     1.000"
"                341.850    50.000   100.000    42.000     1.000"
"              Peak outflow                  0.024    c.m/sec"
"              Maximum level               342.086    metre"
"              Maximum storage              24.991    c.m"
"              Centroidal lag                1.761   hours"
"                   0.049     0.049     0.024     0.007 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"             6   Combine "
"             2   Node #"
"                 Parking"
"              Maximum flow                  0.024    c.m/sec"
"              Hydrograph volume            70.558    c.m"
"                     0.049     0.049     0.024     0.024"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.049     0.000     0.024     0.024"
" 33          CATCHMENT 203"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           203   South landscape and amenity space"
"        40.000   % Impervious"
"         0.079   Total Area"
"        26.000   Flow length"
"         3.500   Overland Slope"
"         0.047   Pervious Area"
"        26.000   Pervious length"
"         3.500   Pervious slope"
"         0.032   Impervious Area"
"        26.000   Impervious length"
"         3.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.442   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.921   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.022     0.000     0.024     0.024 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.047      0.032      0.079      hectare"
"             Time of concentration  9.064      1.221      4.505      minutes"
"             Time to Centroid       104.500    85.748     93.602     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        42.64      28.43      71.07      c.m"
"             Rainfall losses        50.170     7.134      32.956     mm"
"             Runoff depth           39.790     82.826     57.004     mm"
"             Runoff volume          18.86      26.17      45.03      c.m"
"             Runoff coefficient     0.442      0.921      0.634      "
"             Maximum flow           0.010      0.018      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.022     0.022     0.024     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.022     0.022     0.022     0.024"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Batavia Place "
"             Maximum flow                  0.022    c.m/sec"
"             Hydrograph volume            45.034    c.m"
"                    0.022     0.022     0.022     0.022"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.022     0.000     0.022     0.022"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Roof"
"      100.000   % Impervious"
"        0.148   Total Area"
"        9.000   Flow length"
"        0.500   Overland Slope"
"        0.000   Pervious Area"
"        9.000   Pervious length"
"        0.500   Pervious slope"
"        0.148   Impervious Area"
"        9.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
```

```
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.918   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.086     0.000     0.022     0.022 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.148      0.148      hectare"
"             Time of concentration  8.598      1.158      1.158      minutes"
"             Time to Centroid       103.906    85.674     85.674     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        0.00       133.14     133.14     c.m"
"             Rainfall losses        50.160     7.356      7.356      mm"
"             Runoff depth           39.800     82.604     82.604     mm"
"             Runoff volume          0.00       122.25     122.25     c.m"
"             Runoff coefficient     0.000      0.918      0.918      "
"             Maximum flow           0.000      0.086      0.086      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.086     0.086     0.022     0.022"
" 54          POND DESIGN"
"        0.086   Current peak flow    c.m/sec"
"        0.043   Target outflow    c.m/sec"
"        122.3   Hydrograph volume    c.m"
"          19.   Number of stages"
"      338.800   Minimum water level    metre"
"      340.650   Maximum water level    metre"
"      338.800   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                338.800     0.000     0.000"
"                338.903  1.00E-07     3.410"
"                339.006  1.00E-07     6.140"
"                339.108  1.00E-07     8.860"
"                339.211  1.00E-07    12.220"
"                339.314  1.00E-07    17.440"
"                339.417  1.00E-07    22.590"
"                339.519   0.00058    27.660"
"                339.622   0.00695    32.620"
"                339.725   0.01099    37.460"
"                339.828   0.01390    42.140"
"                339.931   0.01630    46.640"
"                340.033   0.01837    50.910"
"                340.136   0.02024    54.890"
"                340.239   0.02196    58.380"
"                340.342   0.02355    61.280"
"                340.444   0.02503    64.010"
```

```
"               340.547   0.02644    66.730"
"               340.650   0.02777    69.460"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               339.480     0.630    0.1100     1.000"
"            Peak outflow                  0.026    c.m/sec"
"            Maximum level               340.547    metre"
"            Maximum storage              66.722    c.m"
"            Centroidal lag                2.082   hours"
"                  0.086     0.086     0.026     0.022 c.m/sec"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                  0.044    c.m/sec"
"            Hydrograph volume           144.783    c.m"
"                    0.086     0.086     0.026     0.044"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.086     0.000     0.026     0.044"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   North grass strip"
"       3.000   % Impervious"
"       0.015   Total Area"
"       2.000   Flow length"
"      10.000   Overland Slope"
"       0.015   Pervious Area"
"       2.000   Pervious length"
"      10.000   Pervious slope"
"       0.000   Impervious Area"
"       2.000   Impervious length"
"      10.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.438   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.809   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.004     0.000     0.026     0.044 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.015      0.000      0.015      hectare"
"            Time of concentration  1.420      0.191      1.353      minutes"
```

```
"            Time to Centroid       94.773     83.761     94.177     minutes"
"            Rainfall depth         89.960     89.960     89.960     mm"
"            Rainfall volume        13.09      0.40       13.49      c.m"
"            Rainfall losses        50.600     17.204     49.598     mm"
"            Runoff depth           39.360     72.756     40.362     mm"
"            Runoff volume          5.73       0.33       6.05       c.m"
"            Runoff coefficient     0.438      0.809      0.449      "
"            Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.004     0.004     0.026     0.044"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.004     0.004     0.004     0.044"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Uncontrolled"
"            Maximum flow                  0.004    c.m/sec"
"            Hydrograph volume             6.054    c.m"
"                    0.004     0.004     0.004     0.004"
" 40         HYDROGRAPH   Confluence    1"
"           7   Confluence "
"           1   Node #"
"               Albert Street"
"            Maximum flow                  0.007    c.m/sec"
"            Hydrograph volume            10.144    c.m"
"                    0.004     0.007     0.004     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.004     0.007     0.007     0.000"
" 40         HYDROGRAPH   Combine    3"
"           6   Combine "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                  0.048    c.m/sec"
"            Hydrograph volume           154.927    c.m"
"                    0.004     0.007     0.007     0.048"
" 40         HYDROGRAPH   Confluence    3"
"           7   Confluence "
"           3   Node #"
"               Batavia Place "
"            Maximum flow                  0.048    c.m/sec"
"            Hydrograph volume           154.927    c.m"
"                    0.004     0.048     0.007     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.004     0.048     0.048     0.000"
" 40         HYDROGRAPH   Combine    4"
"           6   Combine "
```

```
"            4   Node #"
"                Uncontrolled"
"             Maximum flow                  0.052    c.m/sec"
"             Hydrograph volume           160.982    c.m"
"                    0.004     0.048     0.048     0.052"
" 40          HYDROGRAPH   Confluence    4"
"            7   Confluence "
"            4   Node #"
"                Uncontrolled"
"             Maximum flow                  0.052    c.m/sec"
"             Hydrograph volume           160.982    c.m"
"                    0.004     0.052     0.048     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.004     0.052     0.052     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Parking"
"             Maximum flow                  0.073    c.m/sec"
"             Hydrograph volume           231.539    c.m"
"                    0.004     0.052     0.052     0.073"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                Parking"
"             Maximum flow                  0.073    c.m/sec"
"             Hydrograph volume           231.539    c.m"
"                    0.004     0.073     0.052     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.004     0.073     0.073     0.000"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    0.343    hectare"
"             Total Impervious area                   0.276    hectare"
"             Total % impervious                     80.539"
" 19          EXIT"
```

Appendix D

OGS Sizing Information

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

03/06/2023

Province:	Ontario
City:	Waterloo
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	333 Albert St.
Drainage Area (ha):	0.09
% Imperviousness:	100.00

Runoff Coefficient 'c': 0.90

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	3.07
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	333 Albert St.
Project Number:	20-235
Designer Name:	Hossein Moarefi
Designer Company:	K.Smart Associates Limited
Designer Email:	hmoarefi@ksmart.ca
Designer Phone:	705-222-6175
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	97
EF6	99
EF8	100
EF10	100
EF12	100

Recommended Stormceptor EF Model: EF4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 97

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

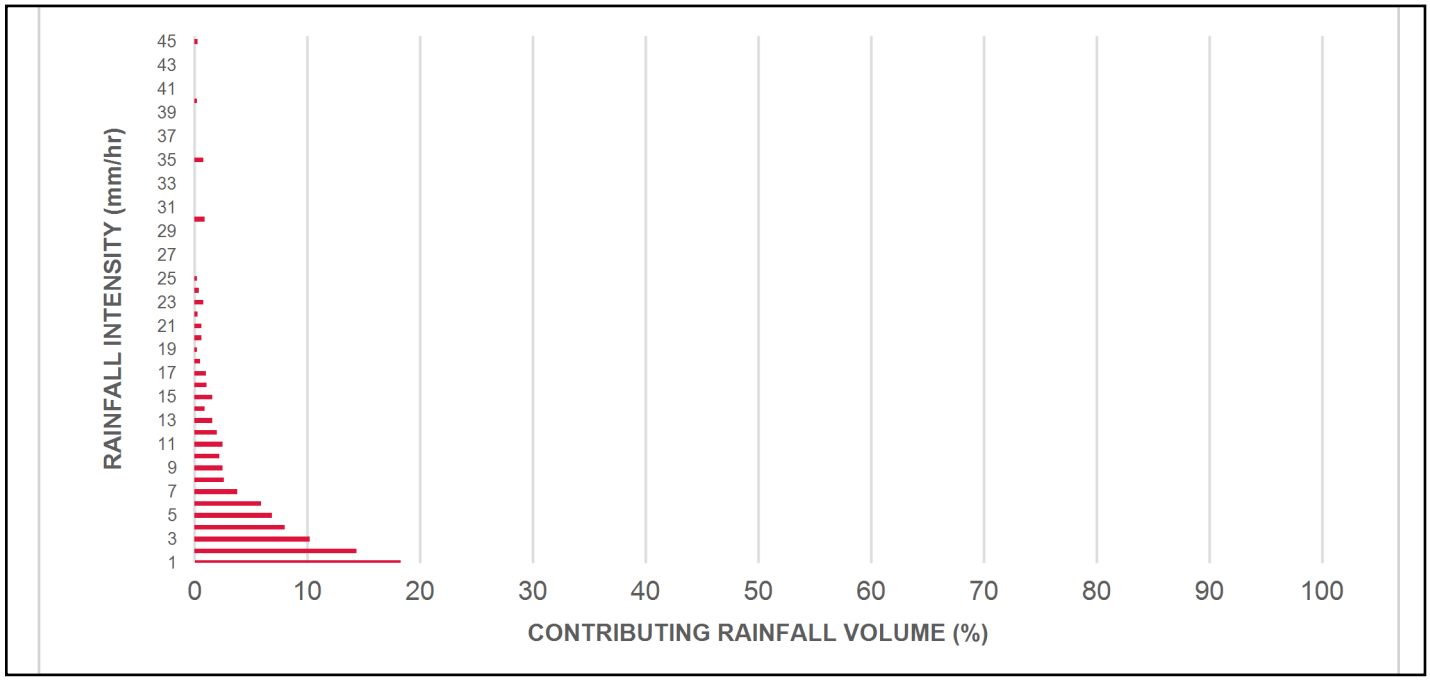
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Stormceptor® EF Sizing Report

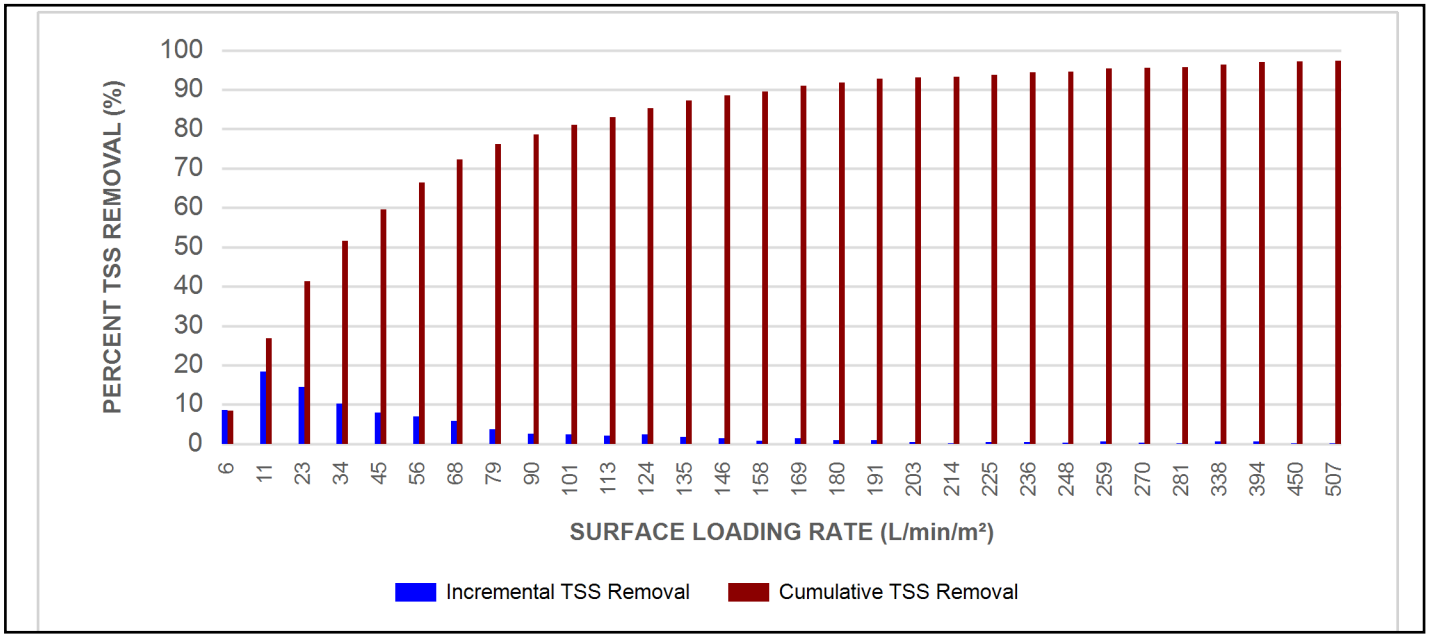
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.11	7.0	6.0	100	8.5	8.5
1	18.3	26.8	0.23	14.0	11.0	100	18.3	26.8
2	14.4	41.3	0.45	27.0	23.0	100	14.4	41.3
3	10.2	51.5	0.68	41.0	34.0	100	10.2	51.5
4	8.0	59.5	0.90	54.0	45.0	100	8.0	59.5
5	6.9	66.4	1.13	68.0	56.0	100	6.9	66.4
6	5.9	72.3	1.35	81.0	68.0	100	5.9	72.3
7	3.8	76.1	1.58	95.0	79.0	100	3.8	76.1
8	2.6	78.7	1.80	108.0	90.0	97	2.5	78.6
9	2.5	81.1	2.03	122.0	101.0	96	2.4	81.0
10	2.2	83.3	2.25	135.0	113.0	95	2.1	83.0
11	2.5	85.8	2.48	149.0	124.0	93	2.3	85.3
12	2.0	87.8	2.70	162.0	135.0	92	1.8	87.2
13	1.6	89.4	2.93	176.0	146.0	91	1.5	88.6
14	0.9	90.4	3.15	189.0	158.0	89	0.8	89.5
15	1.6	91.9	3.38	203.0	169.0	88	1.4	90.9
16	1.1	93.0	3.60	216.0	180.0	86	0.9	91.8
17	1.0	94.0	3.83	230.0	191.0	84	0.9	92.7
18	0.5	94.6	4.05	243.0	203.0	83	0.5	93.1
19	0.2	94.8	4.28	257.0	214.0	83	0.2	93.3
20	0.6	95.4	4.50	270.0	225.0	82	0.5	93.8
21	0.6	96.1	4.73	284.0	236.0	82	0.5	94.4
22	0.3	96.4	4.95	297.0	248.0	81	0.2	94.6
23	0.8	97.2	5.18	311.0	259.0	81	0.7	95.3
24	0.4	97.6	5.40	324.0	270.0	80	0.4	95.6
25	0.2	97.8	5.63	338.0	281.0	79	0.1	95.7
30	0.9	98.7	6.76	405.0	338.0	77	0.7	96.4
35	0.8	99.5	7.88	473.0	394.0	74	0.6	97.0
40	0.2	99.7	9.01	540.0	450.0	73	0.2	97.2
45	0.3	100.0	10.13	608.0	507.0	72	0.2	97.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**97 %**

Climate Station ID: 6149387 *Years of Rainfall Data*: 34

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

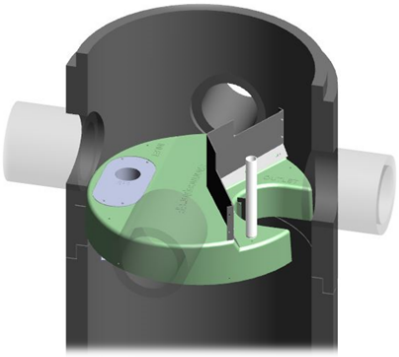
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

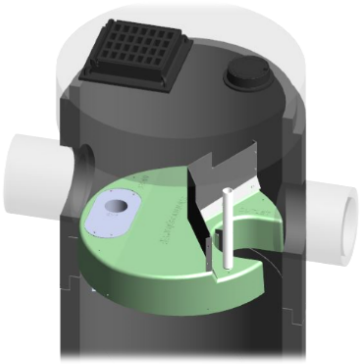
DESIGN FLEXIBILITY

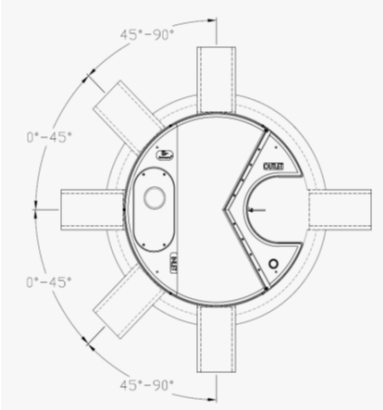
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1

4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

Appendix E

Underground Chambers Storage Table

Project: **Albert St, Waterloo**

Chamber Model -	MC-3500	
Units -	**Metric**	Click Here for Imperial
Number of Chambers -	10	
Number of End Caps -	4	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	338.90	m
Amount of Stone Above Chambers -	305	mm
Amount of Stone Below Chambers -	400	mm
Area of system -	67.13	sq.meters

☑ Include Perimeter Stone in Calculations

Min. Area - 54.756 sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1854	0.00	0.00	0.00	0.00	0.682	0.68	69.46	340.75
1829	0.00	0.00	0.00	0.00	0.682	0.68	68.78	340.73
1803	0.00	0.00	0.00	0.00	0.682	0.68	68.10	340.70
1778	0.00	0.00	0.00	0.00	0.682	0.68	67.42	340.68
1753	0.00	0.00	0.00	0.00	0.682	0.68	66.73	340.65
1727	0.00	0.00	0.00	0.00	0.682	0.68	66.05	340.63
1702	0.00	0.00	0.00	0.00	0.682	0.68	65.37	340.60
1676	0.00	0.00	0.00	0.00	0.682	0.68	64.69	340.58
1651	0.00	0.00	0.00	0.00	0.682	0.68	64.01	340.55
1626	0.00	0.00	0.00	0.00	0.682	0.68	63.33	340.53
1600	0.00	0.00	0.00	0.00	0.682	0.68	62.64	340.50
1575	0.00	0.00	0.00	0.00	0.682	0.68	61.96	340.47
1549	0.00	0.00	0.02	0.00	0.675	0.69	61.28	340.45
1524	0.01	0.00	0.05	0.00	0.659	0.72	60.59	340.42
1499	0.01	0.00	0.08	0.00	0.647	0.73	59.87	340.40
1473	0.01	0.00	0.11	0.01	0.634	0.75	59.14	340.37
1448	0.02	0.00	0.19	0.01	0.601	0.80	58.38	340.35
1422	0.03	0.00	0.29	0.01	0.561	0.86	57.58	340.32
1397	0.04	0.00	0.35	0.01	0.535	0.90	56.72	340.30
1372	0.04	0.00	0.40	0.01	0.515	0.93	55.82	340.27
1346	0.04	0.00	0.45	0.02	0.497	0.96	54.89	340.25
1321	0.05	0.00	0.48	0.02	0.481	0.98	53.93	340.22
1295	0.05	0.01	0.52	0.02	0.466	1.00	52.94	340.20
1270	0.05	0.01	0.55	0.02	0.453	1.02	51.94	340.17
1245	0.06	0.01	0.58	0.02	0.441	1.04	50.91	340.14
1219	0.06	0.01	0.60	0.03	0.429	1.06	49.87	340.12
1194	0.06	0.01	0.63	0.03	0.418	1.08	48.81	340.09
1168	0.07	0.01	0.65	0.03	0.408	1.09	47.73	340.07
1143	0.07	0.01	0.68	0.03	0.399	1.11	46.64	340.04
1118	0.07	0.01	0.70	0.03	0.390	1.12	45.54	340.02
1092	0.07	0.01	0.72	0.03	0.381	1.13	44.42	339.99
1067	0.07	0.01	0.73	0.04	0.373	1.14	43.29	339.97
1041	0.08	0.01	0.75	0.04	0.366	1.16	42.14	339.94
1016	0.08	0.01	0.77	0.04	0.358	1.17	40.99	339.92
991	0.08	0.01	0.78	0.04	0.351	1.18	39.82	339.89
965	0.08	0.01	0.80	0.04	0.345	1.19	38.64	339.87
940	0.08	0.01	0.81	0.04	0.339	1.20	37.46	339.84
914	0.08	0.01	0.83	0.04	0.333	1.21	36.26	339.81
889	0.08	0.01	0.84	0.05	0.327	1.21	35.05	339.79
864	0.09	0.01	0.85	0.05	0.322	1.22	33.84	339.76
838	0.09	0.01	0.86	0.05	0.316	1.23	32.62	339.74
813	0.09	0.01	0.88	0.05	0.311	1.24	31.39	339.71
787	0.09	0.01	0.89	0.05	0.307	1.24	30.15	339.69
762	0.09	0.01	0.90	0.05	0.302	1.25	28.91	339.66
737	0.09	0.01	0.91	0.05	0.298	1.26	27.66	339.64
711	0.09	0.01	0.91	0.05	0.294	1.26	26.40	339.61
686	0.09	0.01	0.92	0.06	0.290	1.27	25.13	339.59
660	0.09	0.01	0.93	0.06	0.286	1.27	23.87	339.56
635	0.09	0.01	0.94	0.06	0.283	1.28	22.59	339.54
610	0.09	0.01	0.95	0.06	0.280	1.28	21.31	339.51
584	0.10	0.01	0.95	0.06	0.276	1.29	20.03	339.48
559	0.10	0.01	0.96	0.06	0.273	1.29	18.74	339.46
533	0.10	0.02	0.97	0.06	0.271	1.30	17.44	339.43
508	0.10	0.02	0.97	0.06	0.268	1.30	16.14	339.41
483	0.10	0.02	0.98	0.06	0.265	1.31	14.84	339.38
457	0.10	0.02	0.99	0.06	0.263	1.31	13.54	339.36
432	0.10	0.02	0.99	0.07	0.258	1.32	12.22	339.33
406	0.00	0.00	0.00	0.00	0.682	0.68	10.91	339.31
381	0.00	0.00	0.00	0.00	0.682	0.68	10.23	339.28
356	0.00	0.00	0.00	0.00	0.682	0.68	9.54	339.26
330	0.00	0.00	0.00	0.00	0.682	0.68	8.86	339.23
305	0.00	0.00	0.00	0.00	0.682	0.68	8.18	339.20
279	0.00	0.00	0.00	0.00	0.682	0.68	7.50	339.18
254	0.00	0.00	0.00	0.00	0.682	0.68	6.82	339.15
229	0.00	0.00	0.00	0.00	0.682	0.68	6.14	339.13
203	0.00	0.00	0.00	0.00	0.682	0.68	5.45	339.10
178	0.00	0.00	0.00	0.00	0.682	0.68	4.77	339.08
152	0.00	0.00	0.00	0.00	0.682	0.68	4.09	339.05
127	0.00	0.00	0.00	0.00	0.682	0.68	3.41	339.03
102	0.00	0.00	0.00	0.00	0.682	0.68	2.73	339.00
76	0.00	0.00	0.00	0.00	0.682	0.68	2.05	338.98
51	0.00	0.00	0.00	0.00	0.682	0.68	1.36	338.95
25	0.00	0.00	0.00	0.00	0.682	0.68	0.68	338.93