Appendix A: Rational Method for Pre-development Flow

Appendix A: Rational Method Calculation for Pre-development Flow

Using Rational Method

C=0.0028CiA

C, Runoff Coefficient= 0.35 For Cultivated land, Silt Loam soil and slope of 0% to 5%

Source: Ministry of Transportation Ontario, MTO Drainage Management Manual, (1997)

For i, calculate Time of Concentration, use Airport method since no drainage course, i.e sheet flow only, and C is less than 0.4

t_c=(3.26x(1.1-C)xL^0.5)/S^0.33= 55 min.

i, intensity, is derived from IDF curves with formula, i=a/(t_c+c)^n

Folllowing chart calculates i (mm/hr) for differing return periods

Return Period	a	c	n	I, mm/hr
2	648	4	0.784	26.5
5	930	4	0.798	36.0
10	1021	3	0.787	41.9
25	1100	2	0.776	47.8
50	1488	3	0.803	57.2
100	1770	4	0.82	62.6

Source: Town of Newmarket, Engineering Design Standards and Criteria

For A, area, use the total area of all the subwatersheds in the post -development scenarios, A=7.7 ha

The peak pre-development flows for differing return periods based on the Rational Method are as follows:

Return Period	Q (cms)
2	0.20
5	0.27
10	0.32
25	0.36
50	0.43
100	0.48

Appendix B: PCSWMM Model Output

Appendix B1: Continuous Modelling

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

Modelling of Vales of Glenway without SWM for Water Balance Calcs, convert Model 5B back to a model without SWM
- Subcatchment 3 split back into 3E and3S
- Added in new Subcatchment 3BRC back to 3S

WARNING 01: wet weather time step reduced to recording interval for Rain Gage 2018precHFR

*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 4
Number of nodes ........... 6
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
2018precHFR          2018precHFR                  VOLUME       5 min.
Chicago_100_yr       Chicago_100_yr               INTENSITY    5 min.
Chicago_2_yr         Chicago_4h_2yr               INTENSITY    5 min.
Chicago_4h           Chicago_4h                   INTENSITY    5 min.
LSRCA_or_STEP        LSRCA_or_STEP                VOLUME       5 min.
Raingage1            2018precHFR                  VOLUME       5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
2E                          1.37    105.00      0.00    2.1000 2018precHFR          J5
2W                          1.13     81.00      0.00    2.1000 2018precHFR          J4
3E                          3.32     95.00      0.00    1.2000 2018precHFR          J1
3S                          1.87     60.00      0.00    0.3700 2018precHFR          J1
```

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	277.50	2.50	0.0	
OF1	OUTFALL	277.40	1.00	0.0	
OF2	OUTFALL	277.40	1.00	0.0	
OF3	OUTFALL	277.40	1.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	20.0	0.5000	0.0130
C2	J4	OF2	CONDUIT	19.5	0.5118	0.0100
C3	J5	OF3	CONDUIT	25.6	0.3900	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	1.70
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	2.23
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS

```
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2018 00:00:00
Ending Date .............. 11/30/2018 04:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 12:00:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

********** Runoff Quantity Continuity **********	Volume hectare-m	Depth mm
Total Precipitation	5.039	655.300
Evaporation Loss	0.782	101.747
Infiltration Loss	2.877	374.069
Surface Runoff	1.398	181.749
Final Storage	0.000	0.000
Continuity Error (%)	-0.346	

********** Flow Routing Continuity **********	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.398	13.977
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.398	13.976
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

```
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.000          0.000
Continuity Error (%) .....          0.002
```

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	3.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2E	655.30	0.00	93.32	362.27	0.00	202.22	202.22	2.77	0.07	0.309
2W	655.30	0.00	97.65	356.63	0.00	203.45	203.45	2.30	0.05	0.310
3E	655.30	0.00	101.79	378.34	0.00	177.36	177.36	5.89	0.06	0.271
3S	655.30	0.00	110.33	385.67	0.00	161.43	161.43	3.02	0.03	0.246

****
Node Depth Summary

****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.16	277.66	95 21:10	0.16
J4	JUNCTION	0.00	0.11	277.61	95 19:25	0.11
J5	JUNCTION	0.00	0.13	277.63	95 19:25	0.13
OF1	OUTFALL	0.00	0.16	277.56	95 21:10	0.16
OF2	OUTFALL	0.00	0.11	277.51	95 19:25	0.11
OF3	OUTFALL	0.00	0.13	277.53	95 19:25	0.13

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.090	0.090	95 21:10	8.91	8.91	0.000
J4	JUNCTION	0.053	0.053	95 19:25	2.3	2.3	0.004
J5	JUNCTION	0.068	0.068	95 19:25	2.77	2.77	0.004
OF1	OUTFALL	0.000	0.090	95 21:10	0	8.91	0.000
OF2	OUTFALL	0.000	0.053	95 19:25	0	2.3	0.000
OF3	OUTFALL	0.000	0.068	95 19:25	0	2.77	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	5.46	0.008	0.090	8.907
OF2	3.90	0.003	0.053	2.299
OF3	3.77	0.003	0.068	2.770
System	4.38	0.014	0.068	13.976

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.090	95 21:10	1.14	0.05	0.16
C2	CONDUIT	0.053	95 19:25	1.19	0.02	0.11
C3	CONDUIT	0.068	95 19:25	1.16	0.03	0.13

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.94	0.05	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.95	0.04	0.00	0.00	0.00	0.00
C3	1.00	0.01	0.00	0.00	0.95	0.04	0.00	0.00	0.01	0.00

****

```
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Tue Jan 19 23:17:33 2021
Analysis ended on:  Tue Jan 19 23:17:53 2021
Total elapsed time: 00:00:20
```

Continuous Model, Post-development, No Bioretention Cells

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

Modelling of Vales of Glenway without SWM for Water Balance Calcs, adjustedModel 5C  model without SWM
- Adjusting E to pan evap
- Adjusted Green-Ampt parameters

WARNING 01: wet weather time step reduced to recording interval for Rain Gage 2018precHFR

*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 8
Number of nodes ........... 6
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
2018precHFR          2018precHFR                  VOLUME       5 min.
Chicago_100_yr       Chicago_100_yr               INTENSITY    5 min.
Chicago_2_yr         Chicago_4h_2yr               INTENSITY    5 min.
Chicago_4h           Chicago_4h                   INTENSITY    5 min.
LSRCA_or_STEP        LSRCA_or_STEP                VOLUME       5 min.
Raingage1            2018precHFR                  VOLUME       5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
------------------------------------------------------------------------------------------------
2EDCI                       0.30     23.00    100.00    2.1000 2018precHFR          J5
2EIC                        1.07     82.00     53.00    2.1000 2018precHFR          J5
2WDCI                       0.25     18.00    100.00    2.1000 2018precHFR          J4
2WIC                        0.88     63.00     47.00    2.1000 2018precHFR          J4
3EDCI                       0.73     21.00    100.00    1.2000 2018precHFR          J1
3EIC                        2.59     74.00     51.00    1.2000 2018precHFR          J1
```

3SDCI	0.41	14.00	100.00	0.3700	2018precHFR	J1
3SIC	1.46	49.00	58.00	0.3700	2018precHFR	J1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	277.50	2.50	0.0	
OF1	OUTFALL	277.40	1.00	0.0	
OF2	OUTFALL	277.40	1.00	0.0	
OF3	OUTFALL	277.40	1.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	20.0	0.5000	0.0130
C2	J4	OF2	CONDUIT	19.5	0.5118	0.0100
C3	J5	OF3	CONDUIT	25.6	0.3900	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	1.70
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	2.23
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

```
****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2018 00:00:00
Ending Date .............. 11/30/2018 04:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 12:00:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         5.039       655.300
Evaporation Loss .........         1.131       147.103
Infiltration Loss ........         1.023       133.009
Surface Runoff ...........         2.910       378.417
Final Storage ............         0.005         0.586
Continuity Error (%) .....        -0.582

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         2.910        29.100
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
```

External Inflow	0.000	0.000
External Outflow	2.910	29.096
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.014	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	2.70 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EDCI	655.30	0.00	172.42	0.00	488.19	0.00	488.19	1.46	0.06	0.74
2EIC	655.30	0.00	133.19	162.37	261.87	103.72	365.58	3.91	0.16	0.55
2WDCI	655.30	0.00	172.74	0.00	487.59	0.00	487.59	1.22	0.05	0.74
2WIC	655.30	0.00	129.21	184.19	232.45	115.06	347.51	3.06	0.12	0.53

3EDCI	655.30	0.00	181.35	0.00	475.28	0.00	475.28	3.47	0.08	0.725
3EIC	655.30	0.00	138.33	177.59	246.04	95.99	342.03	8.86	0.23	0.522
3SDCI	655.30	0.00	185.85	0.00	470.05	0.00	470.05	1.93	0.04	0.717
3SIC	655.30	0.00	146.05	155.51	276.40	79.19	355.58	5.19	0.11	0.543

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.36	277.86	95 19:15	0.36
J4	JUNCTION	0.00	0.19	277.69	95 19:15	0.19
J5	JUNCTION	0.00	0.23	277.73	95 19:15	0.23
OF1	OUTFALL	0.00	0.36	277.76	95 19:15	0.35
OF2	OUTFALL	0.00	0.18	277.58	95 19:15	0.18
OF3	OUTFALL	0.00	0.23	277.63	95 19:15	0.22

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.457	0.457	95 19:15	19.4	19.4	0.011
J4	JUNCTION	0.165	0.165	95 19:15	4.28	4.28	0.021
J5	JUNCTION	0.215	0.215	95 19:15	5.38	5.38	0.023
OF1	OUTFALL	0.000	0.462	95 19:15	0	19.4	0.000
OF2	OUTFALL	0.000	0.166	95 19:15	0	4.28	0.000
OF3	OUTFALL	0.000	0.217	95 19:15	0	5.38	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	9.48	0.010	0.462	19.445
OF2	6.68	0.003	0.166	4.276
OF3	6.66	0.004	0.217	5.375
System	7.61	0.017	0.217	29.096

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.462	95 19:15	1.84	0.27	0.36
C2	CONDUIT	0.166	95 19:15	1.66	0.07	0.19
C3	CONDUIT	0.217	95 19:15	1.64	0.11	0.23

****
Flow Classification Summary
****

	Adjusted /Actual	Fraction of Time in Flow Class							
		Up	Down	Sub	Sup	Up	Down	Norm	Inlet

Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C1	1.00	0.01	0.00	0.00	0.91	0.08	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.92	0.06	0.00	0.00	0.01	0.00
C3	1.00	0.01	0.00	0.00	0.93	0.06	0.00	0.00	0.01	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Wed Jan 20 10:56:39 2021
Analysis ended on: Wed Jan 20 10:57:01 2021
Total elapsed time: 00:00:22

Continuous Model, Post-development, with Bioretention Cells

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

Modelling of Vales of Glenway continuous precip., adjust model 5B by
- Adjusted infiltration parameters of Geen-Ampt
- Adjusting E to pan evaporation

WARNING 01: wet weather time step reduced to recording interval for Rain Gage 2018precHFR

*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 11
Number of nodes ........... 6
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
2018precHFR          2018precHFR                  VOLUME       5 min.
Chicago_100_yr       Chicago_100_yr               INTENSITY    5 min.
Chicago_2_yr         Chicago_4h_2yr               INTENSITY    5 min.
Chicago_4h           Chicago_4h                   INTENSITY    5 min.
LSRCA_or_STEP        LSRCA_or_STEP                VOLUME       5 min.
Raingage1            2018precHFR                  VOLUME       5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
2EBRC                      0.03      3.45      0.00    0.0500 2018precHFR          J5
2EDCI                      0.30     23.00    100.00    2.1000 2018precHFR          2EBRC
2EIC                       1.04     82.00     53.00    2.1000 2018precHFR          2EBRC
2WBRC                      0.03      3.45      0.00    0.0500 2018precHFR          J4
2WDCI                      0.25     18.00    100.00    2.1000 2018precHFR          2WBRC
2WIC                       0.85     63.00     47.00    2.1000 2018precHFR          2WBRC
```

3BRC	0.08	7.50	0.00	0.0500	2018precHFR	J1
3EDCI	0.73	21.00	100.00	1.2000	2018precHFR	3BRC
3EIC	2.59	74.00	51.00	1.2000	2018precHFR	3BRC
3SDCI	0.41	14.00	100.00	0.3700	2018precHFR	3BRC
3SIC	1.39	49.00	58.00	0.3700	2018precHFR	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	Davis_East	1	270.00	0.00	100.00	0.00	0.00
2WBRC	Davis_West	1	270.00	0.00	100.00	0.00	0.00
3BRC	Bathurst	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	277.50	2.50	0.0	
OF1	OUTFALL	277.40	1.00	0.0	
OF2	OUTFALL	277.40	1.00	0.0	
OF3	OUTFALL	277.40	1.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	20.0	0.5000	0.0130
C2	J4	OF2	CONDUIT	19.5	0.5118	0.0100
C3	J5	OF3	CONDUIT	25.6	0.3900	0.0100

****
Cross Section Summary
****

	Full	Full	Hyd.	Max.	No. of	Full

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	1.70
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	2.23
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95

```
*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2018 00:00:00
Ending Date .............. 11/30/2018 04:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 12:00:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.240
```

```
Total Precipitation ......         5.041       655.300
Evaporation Loss .........         1.192       154.974
Infiltration Loss ........         1.391       180.831
Surface Runoff ...........         0.789       102.504
LID Drainage .............         1.691       219.772
Final Storage ............         0.010         1.340
Continuity Error (%) .....        -0.592

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         2.479        24.793
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         2.479        24.791
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.007

***************************
Time-Step Critical Elements
***************************
None

********************************
Highest Flow Instability Indexes
********************************
All links are stable.

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.19 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
```

Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	655.30	19547.74	727.80	4194.81	0.00	0.00	15205.06	4.11	0.14	0.753
2EDCI	655.30	0.00	172.42	0.00	488.19	0.00	488.19	1.46	0.06	0.745
2EIC	655.30	0.00	134.96	159.57	262.01	104.66	366.67	3.81	0.15	0.560
2WBRC	655.30	15486.49	542.28	4755.85	0.00	0.00	10838.22	2.93	0.10	0.671
2WDCI	655.30	0.00	172.74	0.00	487.59	0.00	487.59	1.22	0.05	0.744
2WIC	655.30	0.00	129.60	182.81	232.60	115.92	348.51	2.96	0.11	0.532
3BRC	655.30	24315.11	549.57	1927.38	0.00	0.00	22482.33	17.76	0.45	0.900
3EDCI	655.30	0.00	181.35	0.00	475.28	0.00	475.28	3.47	0.08	0.725
3EIC	655.30	0.00	138.33	177.59	246.04	95.99	342.03	8.86	0.23	0.522
3SDCI	655.30	0.00	185.85	0.00	470.05	0.00	470.05	1.93	0.04	0.717
3SIC	655.30	0.00	145.49	155.32	276.72	79.65	356.37	4.95	0.11	0.544

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	Davis_East	20203.04	727.80	4194.82	1606.34	13598.73	30.14	120.96	-0.08
2WBRC	Davis_West	16141.79	542.28	4755.86	1738.62	9099.60	10.01	25.27	-0.06
3BRC	Bathurst	24970.41	549.57	1927.38	8838.64	13643.71	9.60	24.27	-0.01

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters

J1	JUNCTION	0.01	0.36	277.86	95	19:25	0.35
J4	JUNCTION	0.00	0.14	277.64	95	19:30	0.14
J5	JUNCTION	0.00	0.18	277.68	95	19:25	0.18
OF1	OUTFALL	0.00	0.35	277.75	95	19:25	0.35
OF2	OUTFALL	0.00	0.14	277.54	95	19:30	0.14
OF3	OUTFALL	0.00	0.18	277.58	95	19:25	0.18

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.452	0.452	95	19:25	17.8	17.8	0.006
J4	JUNCTION	0.096	0.096	95	19:30	2.93	2.93	0.007
J5	JUNCTION	0.139	0.139	95	19:25	4.11	4.11	0.014
OF1	OUTFALL	0.000	0.456	95	19:25	0	17.8	0.000
OF2	OUTFALL	0.000	0.096	95	19:30	0	2.93	0.000
OF3	OUTFALL	0.000	0.140	95	19:25	0	4.1	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	16.37	0.005	0.456	17.760
OF2	6.00	0.002	0.096	2.926
OF3	6.53	0.003	0.140	4.105
System	9.64	0.010	0.140	24.791

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.456	95 19:25	1.83	0.27	0.36
C2	CONDUIT	0.096	95 19:30	1.42	0.04	0.14
C3	CONDUIT	0.140	95 19:25	1.44	0.07	0.18

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.84	0.15	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.93	0.06	0.00	0.00	0.00	0.00
C3	1.00	0.01	0.00	0.00	0.92	0.06	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

```
Analysis begun on:  Wed Jan 20 11:45:32 2021
Analysis ended on:  Wed Jan 20 11:45:56 2021
Total elapsed time: 00:00:24
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

Modelling of Vales of Glenway continuous precip., adjust model 5F by
- Adjusted infiltration at bottom of BRCs to 15 mm/hr

WARNING 01: wet weather time step reduced to recording interval for Rain Gage 2018precHFR

```
*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 11
Number of nodes ........... 6
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0
```

```
****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
2018precHFR	2018precHFR	VOLUME	5 min.
Chicago_100_yr	Chicago_100_yr	INTENSITY	5 min.
Chicago_2_yr	Chicago_4h_2yr	INTENSITY	5 min.
Chicago_4h	Chicago_4h	INTENSITY	5 min.
LSRCA_or_STEP	LSRCA_or_STEP	VOLUME	5 min.
Raingage1	2018precHFR	VOLUME	5 min.

```
********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
2EBRC	0.03	3.45	0.00	0.0500	2018precHFR	J5
2EDCI	0.30	23.00	100.00	2.1000	2018precHFR	2EBRC
2EIC	1.04	82.00	53.00	2.1000	2018precHFR	2EBRC
2WBRC	0.03	3.45	0.00	0.0500	2018precHFR	J4
2WDCI	0.25	18.00	100.00	2.1000	2018precHFR	2WBRC
2WIC	0.85	63.00	47.00	2.1000	2018precHFR	2WBRC
3BRC	0.08	7.50	0.00	0.0500	2018precHFR	J1

3EDCI	0.73	21.00	100.00	1.2000	2018precHFR	3BRC
3EIC	2.59	74.00	51.00	1.2000	2018precHFR	3BRC
3SDCI	0.41	14.00	100.00	0.3700	2018precHFR	3BRC
3SIC	1.39	49.00	58.00	0.3700	2018precHFR	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	Davis_East	1	270.00	0.00	100.00	0.00	0.00
2WBRC	Davis_West	1	270.00	0.00	100.00	0.00	0.00
3BRC	Bathurst	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	277.50	2.50	0.0	
OF1	OUTFALL	277.40	1.00	0.0	
OF2	OUTFALL	277.40	1.00	0.0	
OF3	OUTFALL	277.40	1.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	20.0	0.5000	0.0130
C2	J4	OF2	CONDUIT	19.5	0.5118	0.0100
C3	J5	OF3	CONDUIT	25.6	0.3900	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

```
-----------------------------------------------------------------------------------------
C1                CIRCULAR            1.00     0.79     0.25     1.00        1     1.70
C2                CIRCULAR            1.00     0.79     0.25     1.00        1     2.23
C3                CIRCULAR            1.00     0.79     0.25     1.00        1     1.95


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2018 00:00:00
Ending Date .............. 11/30/2018 04:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 12:00:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.240
Total Precipitation ......         5.041       655.300
```

```
Evaporation Loss .........          1.191       154.802
Infiltration Loss ........          2.289       297.549
Surface Runoff ...........          0.621        80.747
LID Drainage .............          0.963       125.154
Final Storage ............          0.009         1.186
Continuity Error (%) .....         -0.595

**************************         Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......          0.000         0.000
Wet Weather Inflow .......          1.584        15.840
Groundwater Inflow .......          0.000         0.000
RDII Inflow ..............          0.000         0.000
External Inflow ..........          0.000         0.000
External Outflow .........          1.584        15.839
Flooding Loss ............          0.000         0.000
Evaporation Loss .........          0.000         0.000
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.000
Continuity Error (%) .....          0.010

***************************
Time-Step Critical Elements
***************************
None

********************************
Highest Flow Instability Indexes
********************************
All links are stable.

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.32 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	655.30	19547.74	727.74	10592.98	0.00	0.00	8851.32	2.39	0.14	0.438
2EDCI	655.30	0.00	172.42	0.00	488.19	0.00	488.19	1.46	0.06	0.745
2EIC	655.30	0.00	134.96	159.57	262.01	104.66	366.67	3.81	0.15	0.560
2WBRC	655.30	15486.49	539.45	8448.86	0.00	0.00	7148.54	1.93	0.10	0.443
2WDCI	655.30	0.00	172.74	0.00	487.59	0.00	487.59	1.22	0.05	0.744
2WIC	655.30	0.00	129.60	182.81	232.60	115.92	348.51	2.96	0.11	0.532
3BRC	655.30	24315.11	533.82	9844.45	0.00	0.00	14582.30	11.52	0.45	0.584
3EDCI	655.30	0.00	181.35	0.00	475.28	0.00	475.28	3.47	0.08	0.725
3EIC	655.30	0.00	138.33	177.59	246.04	95.99	342.03	8.86	0.23	0.522
3SDCI	655.30	0.00	185.85	0.00	470.05	0.00	470.05	1.93	0.04	0.717
3SIC	655.30	0.00	145.49	155.32	276.72	79.65	356.37	4.95	0.11	0.544

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	Davis_East	20203.04	727.74	10592.98	1606.29	7245.03	30.14	77.29	-0.08
2WBRC	Davis_West	16141.79	539.45	8448.87	1409.96	5738.58	10.01	25.27	-0.06
3BRC	Bathurst	24970.41	533.82	9844.45	6832.30	7750.01	9.60	24.27	-0.02

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters

J1	JUNCTION	0.00	0.36	277.86	95	19:25	0.35
J4	JUNCTION	0.00	0.14	277.64	95	19:30	0.14
J5	JUNCTION	0.00	0.18	277.68	95	19:25	0.18
OF1	OUTFALL	0.00	0.35	277.75	95	19:25	0.35
OF2	OUTFALL	0.00	0.14	277.54	95	19:30	0.14
OF3	OUTFALL	0.00	0.18	277.58	95	19:25	0.18

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.449	0.449	95	19:25	11.5	11.5	0.008
J4	JUNCTION	0.096	0.096	95	19:30	1.93	1.93	0.008
J5	JUNCTION	0.139	0.139	95	19:25	2.39	2.39	0.018
OF1	OUTFALL	0.000	0.454	95	19:25	0	11.5	0.000
OF2	OUTFALL	0.000	0.096	95	19:30	0	1.93	0.000
OF3	OUTFALL	0.000	0.140	95	19:25	0	2.39	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

	Flow	Avg	Max	Total

Outfall Node	Freq Pcnt	Flow CMS	Flow CMS	Volume 10^6 ltr
OF1	8.25	0.007	0.454	11.519
OF2	3.58	0.003	0.096	1.930
OF3	4.10	0.003	0.140	2.389
System	5.31	0.012	0.140	15.838

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.454	95 19:25	1.83	0.27	0.35
C2	CONDUIT	0.096	95 19:30	1.42	0.04	0.14
C3	CONDUIT	0.140	95 19:25	1.44	0.07	0.18

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.92	0.07	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.95	0.04	0.00	0.00	0.00	0.00
C3	1.00	0.01	0.00	0.00	0.95	0.04	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jan 21 12:08:46 2021

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

Modelling of Vales of Glenway continuous precip., adjust model 5F with LID by
- Adjusted infiltration offset heights to underdrains to double IWS

WARNING 01: wet weather time step reduced to recording interval for Rain Gage 2018precHFR

*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 11
Number of nodes ........... 6
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
-----------------------------------------------------------------------
2018precHFR          2018precHFR                    VOLUME       5 min.
Chicago_100_yr       Chicago_100_yr                 INTENSITY    5 min.
Chicago_2_yr         Chicago_4h_2yr                 INTENSITY    5 min.
Chicago_4h           Chicago_4h                     INTENSITY    5 min.
LSRCA_or_STEP        LSRCA_or_STEP                  VOLUME       5 min.
Raingage1            2018precHFR                    VOLUME       5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
2EBRC                      0.03      3.45      0.00    0.0500 2018precHFR          J5
2EDCI                      0.30     23.00    100.00    2.1000 2018precHFR          2EBRC
2EIC                       1.04     82.00     53.00    2.1000 2018precHFR          2EBRC
2WBRC                      0.03      3.45      0.00    0.0500 2018precHFR          J4
2WDCI                      0.25     18.00    100.00    2.1000 2018precHFR          2WBRC
2WIC                       0.85     63.00     47.00    2.1000 2018precHFR          2WBRC
3BRC                       0.08      7.50      0.00    0.0500 2018precHFR          J1
```

3EDCI	0.73	21.00	100.00	1.2000	2018precHFR	3BRC
3EIC	2.59	74.00	51.00	1.2000	2018precHFR	3BRC
3SDCI	0.41	14.00	100.00	0.3700	2018precHFR	3BRC
3SIC	1.39	49.00	58.00	0.3700	2018precHFR	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	Davis_East	1	270.00	0.00	100.00	0.00	0.00
2WBRC	Davis_West	1	270.00	0.00	100.00	0.00	0.00
3BRC	Bathurst	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	277.50	2.50	0.0	
OF1	OUTFALL	277.40	1.00	0.0	
OF2	OUTFALL	277.40	1.00	0.0	
OF3	OUTFALL	277.40	1.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OF1	CONDUIT	20.0	0.5000	0.0130
C2	J4	OF2	CONDUIT	19.5	0.5118	0.0100
C3	J5	OF3	CONDUIT	25.6	0.3900	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

```
-----------------------------------------------------------------------------------------
C1                CIRCULAR            1.00     0.79     0.25     1.00        1     1.70
C2                CIRCULAR            1.00     0.79     0.25     1.00        1     2.23
C3                CIRCULAR            1.00     0.79     0.25     1.00        1     1.95


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2018 00:00:00
Ending Date .............. 11/30/2018 04:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 12:00:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       --------
Initial LID Storage ......         0.002         0.240
Total Precipitation ......         5.041       655.300
```

```
Evaporation Loss .........          1.194       155.219
Infiltration Loss ........          1.543       200.563
Surface Runoff ...........          0.825       107.224
LID Drainage .............          1.495       194.347
Final Storage ............          0.016         2.059
Continuity Error (%) .....         -0.591

**************************         Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......          0.000         0.000
Wet Weather Inflow .......          2.320        23.200
Groundwater Inflow .......          0.000         0.000
RDII Inflow ..............          0.000         0.000
External Inflow ..........          0.000         0.000
External Outflow .........          2.320        23.199
Flooding Loss ............          0.000         0.000
Evaporation Loss .........          0.000         0.000
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.000
Continuity Error (%) .....          0.006

***************************
Time-Step Critical Elements
***************************
None

********************************
Highest Flow Instability Indexes
********************************
All links are stable.

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.11 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	655.30	19547.74	740.05	5936.46	0.00	0.00	13305.04	3.59	0.14	0.659
2EDCI	655.30	0.00	172.42	0.00	488.19	0.00	488.19	1.46	0.06	0.745
2EIC	655.30	0.00	134.96	159.57	262.01	104.66	366.67	3.81	0.15	0.560
2WBRC	655.30	15486.49	561.14	6669.45	0.00	0.00	8903.91	2.40	0.10	0.552
2WDCI	655.30	0.00	172.74	0.00	487.59	0.00	487.59	1.22	0.05	0.744
2WIC	655.30	0.00	129.60	182.81	232.60	115.92	348.51	2.96	0.11	0.532
3BRC	655.30	24315.11	562.82	2599.61	0.00	0.00	21776.50	17.20	0.45	0.872
3EDCI	655.30	0.00	181.35	0.00	475.28	0.00	475.28	3.47	0.08	0.725
3EIC	655.30	0.00	138.33	177.59	246.04	95.99	342.03	8.86	0.23	0.522
3SDCI	655.30	0.00	185.85	0.00	470.05	0.00	470.05	1.93	0.04	0.717
3SIC	655.30	0.00	145.49	155.32	276.72	79.65	356.37	4.95	0.11	0.544

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	Davis_East	20203.04	740.05	5936.46	1606.29	11698.76	30.14	267.67	-0.08
2WBRC	Davis_West	16141.79	561.14	6669.46	2100.33	6803.59	10.01	25.27	-0.05
3BRC	Bathurst	24970.41	562.82	2599.61	9174.59	12601.91	9.60	44.17	-0.01

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters

J1	JUNCTION	0.01	0.36	277.86	95	19:25	0.35
J4	JUNCTION	0.00	0.14	277.64	95	19:30	0.14
J5	JUNCTION	0.00	0.18	277.68	95	19:25	0.18
OF1	OUTFALL	0.00	0.35	277.75	95	19:25	0.35
OF2	OUTFALL	0.00	0.14	277.54	95	19:30	0.14
OF3	OUTFALL	0.00	0.18	277.58	95	19:25	0.18

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.452	0.452	95	19:25	17.2	17.2	0.006
J4	JUNCTION	0.096	0.096	95	19:30	2.4	2.4	0.009
J5	JUNCTION	0.139	0.139	95	19:25	3.59	3.59	0.007
OF1	OUTFALL	0.000	0.456	95	19:25	0	17.2	0.000
OF2	OUTFALL	0.000	0.096	95	19:30	0	2.4	0.000
OF3	OUTFALL	0.000	0.140	95	19:25	0	3.59	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

	Flow	Avg	Max	Total

Outfall Node	Freq Pcnt	Flow CMS	Flow CMS	Volume 10^6 ltr
OF1	15.86	0.005	0.456	17.203
OF2	4.90	0.002	0.096	2.404
OF3	4.72	0.004	0.140	3.592
System	8.49	0.011	0.140	23.199

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.456	95 19:25	1.83	0.27	0.36
C2	CONDUIT	0.096	95 19:30	1.42	0.04	0.14
C3	CONDUIT	0.140	95 19:25	1.44	0.07	0.18

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.83	0.15	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.94	0.05	0.00	0.00	0.00	0.00
C3	1.00	0.01	0.00	0.00	0.94	0.05	0.00	0.00	0.01	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jan 21 13:05:31 2021

Appendix B2: SCS Type II 100-year Design Storm

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Made copy of Post Development Modelling without SWM revised Jan. 25,'21 and added storage tank

WARNING 01: wet weather time step reduced to recording interval for Rain Gage SCS_12h_100yr

```
*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 8
Number of nodes ........... 7
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0
```

```
****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
25mm_Chicago	25mm_Chicago	INTENSITY	10 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	10 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	10 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	10 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	10 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	10 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	10 min.
SCS_12h_100yr	SCS_12h_100yr	INTENSITY	6 min.
SCS_12h_10yr	SCS_12h_10yr	INTENSITY	6 min.
SCS_12h_25yr	SCS_12h_25yr	INTENSITY	6 min.
SCS_12h_2yr	SCS_12h_2yr	INTENSITY	6 min.
SCS_12h_50yr	SCS_12h_50yr	INTENSITY	6 min.
SCS_12h_5yr	SCS_12h_5yr	INTENSITY	6 min.
SCS_Type_II_25mm	SCS_Type_II_25mm	INTENSITY	6 min.

```
********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet

2EDCI	0.30	23.00	100.00	2.1000	SCS_12h_100yr	J4
2EIC	1.07	82.00	53.00	2.1000	SCS_12h_100yr	J4
2WDCI	0.25	18.00	100.00	2.1000	SCS_12h_100yr	J3
2WIC	0.88	63.00	47.00	2.1400	SCS_12h_100yr	J3
3EDCI	0.73	21.00	100.00	1.2000	SCS_12h_100yr	J2
3EIC	2.59	74.00	51.00	1.2000	SCS_12h_100yr	J2
3SDCI	0.41	14.00	100.00	0.3700	SCS_12h_100yr	J1
3SIC	1.46	49.00	58.00	0.3700	SCS_12h_100yr	J1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J2	JUNCTION	277.50	2.50	0.0	
J3	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	275.90	2.50	0.0	
OF1	OUTFALL	275.80	2.40	0.0	
SU1	STORAGE	275.90	2.30	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	SU1	CONDUIT	9.7	16.7916	0.0130
C2	J2	SU1	CONDUIT	10.4	15.5195	0.0130
C3	J3	SU1	CONDUIT	9.0	18.1572	0.0130
C4	J4	SU1	CONDUIT	10.0	16.2371	0.0130
C5	J5	OF1	CONDUIT	20.1	0.4969	0.0100
OR1	SU1	J5	ORIFICE			
OR2	SU1	J5	ORIFICE			
W1	SU1	J5	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

C1	CIRCULAR	1.00	0.79	0.25	1.00	1	9.83
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	9.45
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	10.22
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	9.66
C5	CIRCULAR	2.40	4.52	0.60	2.40	1	22.69

```
*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/15/2020 00:00:00
Ending Date .............. 11/16/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:10:00
Wet Time Step ............ 00:06:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.738        95.990
```

```
Evaporation Loss .........          0.008          1.075
Infiltration Loss ........          0.066          8.571
Surface Runoff ...........          0.661         85.903
Final Storage ............          0.006          0.749
Continuity Error (%) .....         -0.320

**************************         Volume         Volume
Flow Routing Continuity        hectare-m       10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......          0.000          0.000
Wet Weather Inflow .......          0.660          6.605
Groundwater Inflow .......          0.000          0.000
RDII Inflow ..............          0.000          0.000
External Inflow ..........          0.000          0.000
External Outflow .........          0.598          5.979
Flooding Loss ............          0.000          0.000
Evaporation Loss .........          0.000          0.000
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.063          0.627
Continuity Error (%) .....         -0.010


***************************
Time-Step Critical Elements
***************************
Link C3 (26.48%)
Link C1 (10.80%)
Link C2 (10.70%)


********************************
Highest Flow Instability Indexes
********************************
Link C2 (4)
Link C4 (3)
Link C1 (3)
Link C3 (2)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.45 sec
Average Time Step           :     4.03 sec
```

```
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :    76.10 %
    3.155 -  1.991 sec      :    22.24 %
    1.991 -  1.256 sec      :     1.66 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EDCI	95.99	0.00	1.13	0.00	94.24	0.00	94.24	0.28	0.12	0.982
2EIC	95.99	0.00	1.01	10.11	49.93	34.72	84.65	0.91	0.36	0.882
2WDCI	95.99	0.00	1.13	0.00	94.24	0.00	94.24	0.24	0.10	0.982
2WIC	95.99	0.00	1.00	11.51	44.27	39.03	83.30	0.73	0.27	0.868
3EDCI	95.99	0.00	1.13	0.00	94.02	0.00	94.02	0.69	0.24	0.979
3EIC	95.99	0.00	1.08	11.64	48.03	34.95	82.98	2.15	0.63	0.865
3SDCI	95.99	0.00	1.13	0.00	93.87	0.00	93.87	0.38	0.12	0.978
3SIC	95.99	0.00	1.10	10.16	54.55	29.59	84.14	1.23	0.34	0.877

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.10	0.68	278.18	0 06:25	0.67
J2	JUNCTION	0.10	0.68	278.18	0 06:25	0.67
J3	JUNCTION	0.09	0.68	278.18	0 06:25	0.67
J4	JUNCTION	0.09	0.68	278.18	0 06:25	0.67
J5	JUNCTION	0.09	0.24	276.14	0 06:25	0.24
OF1	OUTFALL	0.08	0.24	276.04	0 06:25	0.24

SU1	STORAGE	0.96	2.28	278.18	0	06:25	2.27

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.455	0.455	0	05:54	1.61	1.61	-0.019
J2	JUNCTION	0.870	0.870	0	05:54	2.84	2.84	-0.013
J3	JUNCTION	0.375	0.375	0	05:54	0.968	0.968	-0.024
J4	JUNCTION	0.479	0.479	0	05:54	1.19	1.19	-0.021
J5	JUNCTION	0.000	0.478	0	06:25	0	5.98	0.003
OF1	OUTFALL	0.000	0.478	0	06:25	0	5.98	0.000
SU1	STORAGE	0.000	2.179	0	05:54	0	6.61	0.104

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min		Maximum Outflow CMS
SU1	1.380	42	0	0	3.279	99	0	06:25	0.478

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	96.55	0.103	0.478	5.979
System	96.55	0.103	0.478	5.979

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.464	0 06:01	1.54	0.05	0.84
C2	CONDUIT	0.870	0 05:54	2.28	0.09	0.84
C3	CONDUIT	0.375	0 05:54	2.03	0.04	0.84
C4	CONDUIT	0.479	0 05:54	2.19	0.05	0.84
C5	CONDUIT	0.478	0 06:25	2.03	0.02	0.10
OR1	ORIFICE	0.031	0 06:25			
OR2	ORIFICE	0.184	0 06:25			
W1	WEIR	0.263	0 06:25			0.96

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.02	0.15	0.00	0.76	0.07	0.00	0.00	0.82	0.00
C2	1.00	0.02	0.20	0.00	0.69	0.08	0.00	0.00	0.81	0.00

C3	1.00	0.02	0.31	0.00	0.61	0.06	0.00	0.00	0.81	0.00
C4	1.00	0.02	0.31	0.00	0.60	0.06	0.00	0.00	0.81	0.00
C5	1.00	0.03	0.00	0.00	0.02	0.95	0.00	0.00	0.15	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.01	0.01	6.71	0.01	0.01
C2	0.01	0.01	6.71	0.01	0.01
C3	0.01	0.01	6.71	0.01	0.01
C4	0.01	0.01	6.71	0.01	0.01

Analysis begun on: Tue Jan 26 22:38:49 2021
Analysis ended on: Tue Jan 26 22:38:50 2021
Total elapsed time: 00:00:01

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Made copy of Post Development Modelling with SWM ans LID-3 revised Jan. 25,'21 and make storage tank smaller due to BRCs

WARNING 01: wet weather time step reduced to recording interval for Rain Gage SCS_12h_100yr

```
*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 11
Number of nodes ........... 7
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0
```

```
****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
25mm_Chicago	25mm_Chicago	INTENSITY	10 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	10 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	10 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	10 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	10 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	10 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	10 min.
SCS_12h_100yr	SCS_12h_100yr	INTENSITY	6 min.
SCS_12h_10yr	SCS_12h_10yr	INTENSITY	6 min.
SCS_12h_25yr	SCS_12h_25yr	INTENSITY	6 min.
SCS_12h_2yr	SCS_12h_2yr	INTENSITY	6 min.
SCS_12h_50yr	SCS_12h_50yr	INTENSITY	6 min.
SCS_12h_5yr	SCS_12h_5yr	INTENSITY	6 min.
SCS_Type_II_25mm	SCS_Type_II_25mm	INTENSITY	6 min.

```
********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet

2EBRC	0.03	3.45	0.00	0.0500	SCS_12h_100yr	J4
2EDCI	0.30	23.00	100.00	2.1000	SCS_12h_100yr	2EBRC
2EIC	1.07	82.00	53.00	2.1000	SCS_12h_100yr	2EBRC
2WBRC	0.03	3.45	0.00	0.0500	SCS_12h_100yr	J3
2WDCI	0.58	18.00	100.00	2.1000	SCS_12h_100yr	2WBRC
2WIC	0.88	63.00	47.00	2.1400	SCS_12h_100yr	2WBRC
3BRC	0.08	7.50	0.00	0.0500	SCS_12h_100yr	J1
3EDCI	0.73	21.00	100.00	1.2000	SCS_12h_100yr	3BRC
3EIC	2.59	74.00	51.00	1.2000	SCS_12h_100yr	3BRC
3SDCI	0.41	14.00	100.00	0.3700	SCS_12h_100yr	3BRC
3SIC	1.46	49.00	58.00	0.3700	SCS_12h_100yr	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	2EBRC	1	270.00	0.00	100.00	0.00	0.00
2WBRC	2WBRC	1	270.00	0.00	100.00	0.00	0.00
3BRC	3BRC	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J2	JUNCTION	277.50	2.50	0.0	
J3	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	275.90	2.50	0.0	
OF1	OUTFALL	275.80	2.40	0.0	
SU1	STORAGE	275.90	2.30	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	SU1	CONDUIT	9.7	16.7916	0.0130
C2	J2	SU1	CONDUIT	10.4	15.5195	0.0130

C3	J3	SU1	CONDUIT	9.0	18.1572	0.0130
C4	J4	SU1	CONDUIT	10.0	16.2371	0.0130
C5	J5	OF1	CONDUIT	20.1	0.4969	0.0100
OR1	SU1	J5	ORIFICE			
OR2	SU1	J5	ORIFICE			
W1	SU1	J5	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	9.83
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	9.45
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	10.22
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	9.66
C5	CIRCULAR	2.40	4.52	0.60	2.40	1	22.69

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/15/2020 00:00:00
Ending Date .............. 11/16/2020 00:00:00
Antecedent Dry Days ...... 0.0
```

```
Report Time Step ......... 00:10:00
Wet Time Step ............ 00:06:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.226
Total Precipitation ......         0.783        95.990
Evaporation Loss .........         0.009         1.076
Infiltration Loss ........         0.070         8.585
Surface Runoff ...........         0.569        69.759
LID Drainage .............         0.096        11.829
Final Storage ............         0.043         5.311
Continuity Error (%) .....        -0.357

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.665         6.651
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.598         5.976
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.068         0.675
Continuity Error (%) .....        -0.013

***************************
Time-Step Critical Elements
***************************
Link C1 (48.36%)
Link C3 (18.16%)
Link C4 (4.08%)
```

```
********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.34 sec
Average Time Step           :     3.72 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :    69.35 %
    3.155 -  1.991 sec      :    20.42 %
    1.991 -  1.256 sec      :    10.24 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	95.99	4401.68	0.93	28.32	0.00	0.00	4237.31	1.14	0.48	0.942
2EDCI	95.99	0.00	1.13	0.00	94.24	0.00	94.24	0.28	0.12	0.982
2EIC	95.99	0.00	1.01	10.11	49.93	34.72	84.65	0.91	0.36	0.882
2WBRC	95.99	4736.72	0.98	71.28	0.00	0.00	4599.24	1.24	0.49	0.952
2WDCI	95.99	0.00	1.13	0.00	94.12	0.00	94.12	0.55	0.21	0.980
2WIC	95.99	0.00	1.00	11.51	44.27	39.03	83.30	0.73	0.27	0.868
3BRC	95.99	5631.47	0.99	17.63	0.00	0.00	5400.04	4.27	1.35	0.943
3EDCI	95.99	0.00	1.13	0.00	94.02	0.00	94.02	0.69	0.24	0.979
3EIC	95.99	0.00	1.08	11.64	48.03	34.95	82.98	2.15	0.63	0.865
3SDCI	95.99	0.00	1.13	0.00	93.87	0.00	93.87	0.38	0.12	0.978
3SIC	95.99	0.00	1.10	10.16	54.55	29.59	84.14	1.23	0.34	0.877

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	2EBRC	4497.67	0.93	28.32	2874.73	1362.58	30.14	263.86	-0.06
2WBRC	2WBRC	4832.71	0.98	71.28	3789.31	809.93	10.01	173.64	-0.05
3BRC	3BRC	5727.46	0.99	17.63	4921.76	478.27	9.60	320.51	-0.04

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.10	0.68	278.18	0 06:32	0.68
J2	JUNCTION	0.08	0.69	278.19	0 06:32	0.69
J3	JUNCTION	0.09	0.69	278.19	0 06:32	0.69
J4	JUNCTION	0.09	0.69	278.19	0 06:32	0.69
J5	JUNCTION	0.09	0.24	276.14	0 06:32	0.24
OF1	OUTFALL	0.08	0.24	276.04	0 06:32	0.24
SU1	STORAGE	0.89	2.29	278.19	0 06:32	2.29

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	1.348	1.348	0 06:00	4.27	4.27	-0.009
J2	JUNCTION	0.000	0.010	0 06:12	0	0.00351	0.038
J3	JUNCTION	0.490	0.490	0 06:00	1.24	1.24	-0.011
J4	JUNCTION	0.478	0.478	0 06:00	1.14	1.14	-0.008

J5	JUNCTION	0.000	0.481	0	06:32	0	5.98	0.004
OF1	OUTFALL	0.000	0.481	0	06:32	0	5.98	0.000
SU1	STORAGE	0.000	2.317	0	06:00	0	6.65	0.121

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	1.142	39	0	0	2.930	100	0 06:32	0.481

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	89.73	0.105	0.481	5.976
System	89.73	0.105	0.481	5.976

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.348	0	06:00	4.22	0.14	0.84
C2	CONDUIT	0.010	0	06:12	0.02	0.00	0.84
C3	CONDUIT	0.490	0	06:00	1.16	0.05	0.84
C4	CONDUIT	0.478	0	06:00	1.09	0.05	0.84
C5	CONDUIT	0.481	0	06:32	2.04	0.02	0.10
OR1	ORIFICE	0.040	0	06:32			
OR2	ORIFICE	0.185	0	06:32			
W1	WEIR	0.256	0	06:32			0.98

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.08	0.00	0.00	0.73	0.19	0.00	0.00	0.69	0.00
C2	1.00	0.08	0.72	0.00	0.20	0.00	0.00	0.00	0.62	0.00
C3	1.00	0.08	0.05	0.00	0.78	0.09	0.00	0.00	0.72	0.00
C4	1.00	0.08	0.15	0.00	0.77	0.00	0.00	0.00	0.65	0.00
C5	1.00	0.08	0.00	0.00	0.05	0.87	0.00	0.00	0.17	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.01	0.01	6.25	0.01	0.01
C2	0.01	0.01	17.91	0.01	0.01
C3	0.01	0.01	6.25	0.01	0.01

C4	0.01	0.01	6.25	0.01	0.01

```
Analysis begun on:  Wed Jan 27 22:36:58 2021
Analysis ended on:  Wed Jan 27 22:36:58 2021
Total elapsed time: < 1 sec
```

Sensitivity Analysis with i=15 mm/hr.

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Made copy of Post Development Modelling with SWM and LID-2 revised Jan. 25,'21 but change bottom infiltration rate of BRCs

WARNING 01: wet weather time step reduced to recording interval for Rain Gage SCS_12h_100yr

*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 11
Number of nodes ........... 7
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
-----------------------------------------------------------------------
25mm_Chicago         25mm_Chicago                   INTENSITY   10 min.
Chicago_4h_100yr     Chicago_4h_100yr               INTENSITY   10 min.
Chicago_4h_10yr      Chicago_4h_10yr                INTENSITY   10 min.
Chicago_4h_25yr      Chicago_4h_25yr                INTENSITY   10 min.
Chicago_4h_2yr       Chicago_4h_2yr                 INTENSITY   10 min.
Chicago_4h_50yr      Chicago_4h_50yr                INTENSITY   10 min.
Chicago_4h_5yr       Chicago_4h_5yr                 INTENSITY   10 min.
SCS_12h_100yr        SCS_12h_100yr                  INTENSITY    6 min.
SCS_12h_10yr         SCS_12h_10yr                   INTENSITY    6 min.
SCS_12h_25yr         SCS_12h_25yr                   INTENSITY    6 min.
SCS_12h_2yr          SCS_12h_2yr                    INTENSITY    6 min.
SCS_12h_50yr         SCS_12h_50yr                   INTENSITY    6 min.
SCS_12h_5yr          SCS_12h_5yr                    INTENSITY    6 min.
SCS_Type_II_25mm     SCS_Type_II_25mm               INTENSITY    6 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------------------
```

2EBRC	0.03	3.45	0.00	0.0500	SCS_12h_100yr	J4
2EDCI	0.30	23.00	100.00	2.1000	SCS_12h_100yr	2EBRC
2EIC	1.07	82.00	53.00	2.1000	SCS_12h_100yr	2EBRC
2WBRC	0.03	3.45	0.00	0.0500	SCS_12h_100yr	J3
2WDCI	0.58	18.00	100.00	2.1000	SCS_12h_100yr	2WBRC
2WIC	0.88	63.00	47.00	2.1400	SCS_12h_100yr	2WBRC
3BRC	0.08	7.50	0.00	0.0500	SCS_12h_100yr	J1
3EDCI	0.73	21.00	100.00	1.2000	SCS_12h_100yr	3BRC
3EIC	2.59	74.00	51.00	1.2000	SCS_12h_100yr	3BRC
3SDCI	0.41	14.00	100.00	0.3700	SCS_12h_100yr	3BRC
3SIC	1.46	49.00	58.00	0.3700	SCS_12h_100yr	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	2EBRC	1	270.00	0.00	100.00	0.00	0.00
2WBRC	2WBRC	1	270.00	0.00	100.00	0.00	0.00
3BRC	3BRC	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J2	JUNCTION	277.50	2.50	0.0	
J3	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	275.90	2.50	0.0	
OF1	OUTFALL	275.80	2.40	0.0	
SU1	STORAGE	275.90	2.30	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	SU1	CONDUIT	9.7	16.7916	0.0130
C2	J2	SU1	CONDUIT	10.4	15.5195	0.0130

C3	J3	SU1	CONDUIT	9.0	18.1572	0.0130
C4	J4	SU1	CONDUIT	10.0	16.2371	0.0130
C5	J5	OF1	CONDUIT	20.1	0.4969	0.0100
OR1	SU1	J5	ORIFICE			
OR2	SU1	J5	ORIFICE			
W1	SU1	J5	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	9.83
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	9.45
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	10.22
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	9.66
C5	CIRCULAR	2.40	4.52	0.60	2.40	1	22.69

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/15/2020 00:00:00
Ending Date .............. 11/16/2020 00:00:00
Antecedent Dry Days ...... 0.0
```

```
Report Time Step ......... 00:10:00
Wet Time Step ............ 00:06:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.226
Total Precipitation ......         0.783        95.990
Evaporation Loss .........         0.009         1.076
Infiltration Loss ........         0.111        13.604
Surface Runoff ...........         0.553        67.775
LID Drainage .............         0.084        10.347
Final Storage ............         0.031         3.764
Continuity Error (%) .....        -0.364

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.637         6.369
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.630         6.302
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.007         0.067
Continuity Error (%) .....         0.000

***************************
Time-Step Critical Elements
***************************
Link C1 (45.36%)
Link C3 (2.06%)
```

```
********************************
Highest Flow Instability Indexes
********************************
Link C4 (4)
Link C1 (4)
Link C2 (4)
Link C3 (4)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.34 sec
Average Time Step           :     4.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.02
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :    69.91 %
    3.155 -  1.991 sec      :    18.79 %
    1.991 -  1.256 sec      :    11.30 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %


****************************
Subcatchment Runoff Summary
****************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	95.99	4401.68	0.93	334.50	0.00	0.00	3942.18	1.06	0.48	0.876
2EDCI	95.99	0.00	1.13	0.00	94.24	0.00	94.24	0.28	0.12	0.982
2EIC	95.99	0.00	1.01	10.11	49.93	34.72	84.65	0.91	0.36	0.882
2WBRC	95.99	4736.72	0.98	340.50	0.00	0.00	4389.42	1.19	0.49	0.908
2WDCI	95.99	0.00	1.13	0.00	94.12	0.00	94.12	0.55	0.21	0.980
2WIC	95.99	0.00	1.00	11.51	44.27	39.03	83.30	0.73	0.27	0.868
3BRC	95.99	5631.47	0.99	339.00	0.00	0.00	5214.93	4.12	1.34	0.911
3EDCI	95.99	0.00	1.13	0.00	94.02	0.00	94.02	0.69	0.24	0.979
3EIC	95.99	0.00	1.08	11.64	48.03	34.95	82.98	2.15	0.63	0.865
3SDCI	95.99	0.00	1.13	0.00	93.87	0.00	93.87	0.38	0.12	0.978

3SIC	95.99	0.00	1.10	10.16	54.55	29.59	84.14	1.23	0.34	0.877

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	2EBRC	4497.67	0.93	334.50	2865.49	1076.69	30.14	252.50	-0.05
2WBRC	2WBRC	4832.71	0.98	340.50	3673.10	716.32	10.01	113.37	-0.03
3BRC	3BRC	5727.46	0.99	339.00	4759.90	455.03	9.60	185.35	-0.06

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.07	0.56	278.06	0 06:30	0.54
J2	JUNCTION	0.05	0.56	278.06	0 06:30	0.56
J3	JUNCTION	0.06	0.56	278.06	0 06:31	0.56
J4	JUNCTION	0.06	0.56	278.06	0 06:31	0.56
J5	JUNCTION	0.09	0.24	276.14	0 06:31	0.24
OF1	OUTFALL	0.08	0.24	276.04	0 06:32	0.24
SU1	STORAGE	0.51	2.16	278.06	0 06:31	2.16

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	1.345	1.345	0 06:00	4.12	4.12	-0.004
J2	JUNCTION	0.000	0.008	0 06:12	0	0.00329	0.117

J3	JUNCTION	0.489	0.489	0	06:00	1.19	1.19	-0.009
J4	JUNCTION	0.476	0.476	0	06:00	1.06	1.06	-0.004
J5	JUNCTION	0.000	0.479	0	06:31	0	6.3	0.001
OF1	OUTFALL	0.000	0.479	0	06:32	0	6.3	0.000
SU1	STORAGE	0.000	2.311	0	06:00	0	6.37	0.012

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.638	22	0	0	2.677	94	0 06:31	0.481

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	88.05	0.114	0.479	6.302
System	88.05	0.114	0.479	6.302

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.345	0	06:00	4.75	0.14	0.78
C2	CONDUIT	0.008	0	06:12	0.02	0.00	0.78
C3	CONDUIT	0.489	0	06:00	1.47	0.05	0.78
C4	CONDUIT	0.476	0	06:00	1.33	0.05	0.78
C5	CONDUIT	0.479	0	06:32	2.03	0.02	0.10
OR1	ORIFICE	0.199	0	06:31			
OR2	ORIFICE	0.176	0	06:31			
W1	WEIR	0.104	0	06:31			0.76

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.10	0.00	0.00	0.71	0.19	0.00	0.00	0.73	0.00
C2	1.00	0.10	0.77	0.00	0.13	0.00	0.00	0.00	0.67	0.00
C3	1.00	0.10	0.08	0.00	0.72	0.10	0.00	0.00	0.76	0.00
C4	1.00	0.10	0.14	0.00	0.75	0.01	0.00	0.00	0.70	0.00
C5	1.00	0.10	0.00	0.00	0.04	0.86	0.00	0.00	0.20	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.01	0.01	3.29	0.01	0.01

C2	0.01	0.01	17.89	0.01	0.01
C3	0.01	0.01	3.29	0.01	0.01
C4	0.01	0.01	3.29	0.01	0.01

```
Analysis begun on:  Fri Feb  5 19:30:01 2021
Analysis ended on:  Fri Feb  5 19:30:01 2021
Total elapsed time: < 1 sec
```

Appendix B3: Volume Control (5 mm, 12.5 mm, and 25 mm events)

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Made copy of Post Development Modelling with SWM-2 revised Jan. 25,'21 and added storage BRCs

WARNING 01: wet weather time step reduced to recording interval for Rain Gage SCS_Type_II_5mm

*************
Element Count
*************
Number of rain gages ...... 16
Number of subcatchments ... 11
Number of nodes ........... 7
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                      Data       Recording
Name                  Data Source                     Type       Interval
-----------------------------------------------------------------------------
25mm_Chicago          25mm_Chicago                    INTENSITY   10 min.
Chicago_4h_100yr      Chicago_4h_100yr                INTENSITY   10 min.
Chicago_4h_10yr       Chicago_4h_10yr                 INTENSITY   10 min.
Chicago_4h_25yr       Chicago_4h_25yr                 INTENSITY   10 min.
Chicago_4h_2yr        Chicago_4h_2yr                  INTENSITY   10 min.
Chicago_4h_50yr       Chicago_4h_50yr                 INTENSITY   10 min.
Chicago_4h_5yr        Chicago_4h_5yr                  INTENSITY   10 min.
SCS_12h_100yr         SCS_12h_100yr                   INTENSITY    6 min.
SCS_12h_10yr          SCS_12h_10yr                    INTENSITY    6 min.
SCS_12h_25yr          SCS_12h_25yr                    INTENSITY    6 min.
SCS_12h_2yr           SCS_12h_2yr                     INTENSITY    6 min.
SCS_12h_50yr          SCS_12h_50yr                    INTENSITY    6 min.
SCS_12h_5yr           SCS_12h_5yr                     INTENSITY    6 min.
SCS_Type_II_12.5mm    SCS_Type_II_12.5mm              INTENSITY    6 min.
SCS_Type_II_25mm      SCS_Type_II_25mm                INTENSITY    6 min.
SCS_Type_II_5mm       SCS_Type_II_5mm                 INTENSITY    6 min.


********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
2EBRC	0.03	3.45	0.00	0.0500	SCS_Type_II_5mm	J4
2EDCI	0.30	23.00	100.00	2.1000	SCS_Type_II_5mm	2EBRC
2EIC	1.07	82.00	53.00	2.1000	SCS_Type_II_5mm	2EBRC
2WBRC	0.03	3.45	0.00	0.0500	SCS_Type_II_5mm	J3
2WDCI	0.58	18.00	100.00	2.1000	SCS_Type_II_5mm	2WBRC
2WIC	0.88	63.00	47.00	2.1400	SCS_Type_II_5mm	2WBRC
3BRC	0.08	7.50	0.00	0.0500	SCS_Type_II_5mm	J1
3EDCI	0.73	21.00	100.00	1.2000	SCS_Type_II_5mm	3BRC
3EIC	2.59	74.00	51.00	1.2000	SCS_Type_II_5mm	3BRC
3SDCI	0.41	14.00	100.00	0.3700	SCS_Type_II_5mm	3BRC
3SIC	1.46	49.00	58.00	0.3700	SCS_Type_II_5mm	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	2EBRC	1	270.00	0.00	100.00	0.00	0.00
2WBRC	2WBRC	1	270.00	0.00	100.00	0.00	0.00
3BRC	3BRC	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J2	JUNCTION	277.50	2.50	0.0	
J3	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	275.90	2.50	0.0	
OF1	OUTFALL	275.80	2.40	0.0	
SU1	STORAGE	275.90	2.30	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	J1	SU1	CONDUIT	9.7	16.7916	0.0130
C2	J2	SU1	CONDUIT	10.4	15.5195	0.0130
C3	J3	SU1	CONDUIT	9.0	18.1572	0.0130
C4	J4	SU1	CONDUIT	10.0	16.2371	0.0130
C5	J5	OF1	CONDUIT	20.1	0.4969	0.0100
OR1	SU1	J5	ORIFICE			
OR2	SU1	J5	ORIFICE			
W1	SU1	J5	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	9.83
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	9.45
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	10.22
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	9.66
C5	CIRCULAR	2.40	4.52	0.60	2.40	1	22.69

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 11/15/2020 00:00:00

```
Ending Date ............... 11/16/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:10:00
Wet Time Step ............ 00:06:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.226
Total Precipitation ......         0.041         5.000
Evaporation Loss .........         0.006         0.742
Infiltration Loss ........         0.017         2.128
Surface Runoff ...........         0.000         0.000
LID Drainage .............         0.005         0.670
Final Storage ............         0.014         1.702
Continuity Error (%) .....        -0.313

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.005         0.055
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.003         0.034
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.002         0.021
Continuity Error (%) .....         0.000

***************************
Time-Step Critical Elements
***************************
Link C1 (15.34%)
```

```
********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.67 sec
Average Time Step           :     4.87 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :    99.99 %
    3.155 -  1.991 sec      :     0.01 %
    1.991 -  1.256 sec      :     0.01 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	5.00	93.73	0.49	22.48	0.00	0.00	0.00	0.00	0.00	0.000
2EDCI	5.00	0.00	1.13	0.00	2.89	0.00	2.89	0.01	0.00	0.578
2EIC	5.00	0.00	0.62	2.33	1.55	0.00	1.55	0.02	0.01	0.311
2WBRC	5.00	105.50	0.44	56.21	0.00	0.00	0.00	0.00	0.00	0.000
2WDCI	5.00	0.00	1.13	0.00	2.82	0.00	2.82	0.02	0.00	0.563
2WIC	5.00	0.00	0.56	2.62	1.38	0.00	1.38	0.01	0.01	0.276
3BRC	5.00	117.25	0.34	13.96	0.00	0.00	69.19	0.05	0.00	0.566
3EDCI	5.00	0.00	1.13	0.00	2.78	0.00	2.78	0.02	0.00	0.555
3EIC	5.00	0.00	0.60	2.43	1.45	0.00	1.45	0.04	0.01	0.290
3SDCI	5.00	0.00	1.13	0.00	2.71	0.00	2.71	0.01	0.00	0.543
3SIC	5.00	0.00	0.68	2.08	1.62	0.00	1.62	0.02	0.00	0.324

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	2EBRC	98.73	0.49	22.48	0.00	0.00	30.14	106.04	-0.10
2WBRC	2WBRC	110.50	0.44	56.21	0.00	0.00	10.01	64.18	-0.26
3BRC	3BRC	122.25	0.34	13.96	0.00	69.19	9.60	48.43	-0.06

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.01	277.51	0 09:00	0.01
J2	JUNCTION	0.00	0.00	277.50	0 00:00	0.00
J3	JUNCTION	0.00	0.00	277.50	0 00:00	0.00
J4	JUNCTION	0.00	0.00	277.50	0 00:00	0.00
J5	JUNCTION	0.01	0.01	275.91	0 15:56	0.01
OF1	OUTFALL	0.00	0.00	275.80	0 15:56	0.00
SU1	STORAGE	0.01	0.02	275.92	0 15:56	0.02

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.002	0.002	0 09:00	0.0547	0.0547	-0.002
J2	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J3	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J4	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr

J5	JUNCTION	0.000	0.001	0	15:56	0	0.0339	0.022
OF1	OUTFALL	0.000	0.001	0	15:56	0	0.0339	0.000
SU1	STORAGE	0.000	0.002	0	09:00	0	0.0547	0.060

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.017	1	0	0	0.036	1	0 15:56	0.001

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	65.76	0.001	0.001	0.034
System	65.76	0.001	0.001	0.034

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.002	0	09:00	1.72	0.00	0.02
C2	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C3	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C4	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C5	CONDUIT	0.001	0	15:56	0.50	0.00	0.00
OR1	ORIFICE	0.001	0	15:56			
OR2	ORIFICE	0.000	0	00:00			
W1	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.30	0.24	0.00	0.08	0.38	0.00	0.00	0.57	0.00
C2	1.00	0.30	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.30	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.30	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.31	0.00	0.00	0.11	0.58	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Feb 5 21:11:03 2021
Analysis ended on: Fri Feb 5 21:11:03 2021
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Made copy of Post Development Modelling with SWM-2 revised Jan. 25,'21 and added storage BRCs

WARNING 01: wet weather time step reduced to recording interval for Rain Gage SCS_Type_II_12.5mm

```
*************
Element Count
*************
Number of rain gages ...... 16
Number of subcatchments ... 11
Number of nodes ........... 7
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0
```

```
****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
25mm_Chicago	25mm_Chicago	INTENSITY	10 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	10 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	10 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	10 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	10 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	10 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	10 min.
SCS_12h_100yr	SCS_12h_100yr	INTENSITY	6 min.
SCS_12h_10yr	SCS_12h_10yr	INTENSITY	6 min.
SCS_12h_25yr	SCS_12h_25yr	INTENSITY	6 min.
SCS_12h_2yr	SCS_12h_2yr	INTENSITY	6 min.
SCS_12h_50yr	SCS_12h_50yr	INTENSITY	6 min.
SCS_12h_5yr	SCS_12h_5yr	INTENSITY	6 min.
SCS_Type_II_12.5mm	SCS_Type_II_12.5mm	INTENSITY	6 min.
SCS_Type_II_25mm	SCS_Type_II_25mm	INTENSITY	6 min.
SCS_Type_II_5mm	SCS_Type_II_5mm	INTENSITY	6 min.

```
********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
2EBRC	0.03	3.45	0.00	0.0500	SCS_Type_II_12.5mm	J4
2EDCI	0.30	23.00	100.00	2.1000	SCS_Type_II_12.5mm	2EBRC
2EIC	1.07	82.00	53.00	2.1000	SCS_Type_II_12.5mm	2EBRC
2WBRC	0.03	3.45	0.00	0.0500	SCS_Type_II_12.5mm	J3
2WDCI	0.58	18.00	100.00	2.1000	SCS_Type_II_12.5mm	2WBRC
2WIC	0.88	63.00	47.00	2.1400	SCS_Type_II_12.5mm	2WBRC
3BRC	0.08	7.50	0.00	0.0500	SCS_Type_II_12.5mm	J1
3EDCI	0.73	21.00	100.00	1.2000	SCS_Type_II_12.5mm	3BRC
3EIC	2.59	74.00	51.00	1.2000	SCS_Type_II_12.5mm	3BRC
3SDCI	0.41	14.00	100.00	0.3700	SCS_Type_II_12.5mm	3BRC
3SIC	1.46	49.00	58.00	0.3700	SCS_Type_II_12.5mm	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	2EBRC	1	270.00	0.00	100.00	0.00	0.00
2WBRC	2WBRC	1	270.00	0.00	100.00	0.00	0.00
3BRC	3BRC	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J2	JUNCTION	277.50	2.50	0.0	
J3	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	275.90	2.50	0.0	
OF1	OUTFALL	275.80	2.40	0.0	
SU1	STORAGE	275.90	2.30	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	J1	SU1	CONDUIT	9.7	16.7916	0.0130
C2	J2	SU1	CONDUIT	10.4	15.5195	0.0130
C3	J3	SU1	CONDUIT	9.0	18.1572	0.0130
C4	J4	SU1	CONDUIT	10.0	16.2371	0.0130
C5	J5	OF1	CONDUIT	20.1	0.4969	0.0100
OR1	SU1	J5	ORIFICE			
OR2	SU1	J5	ORIFICE			
W1	SU1	J5	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	9.83
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	9.45
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	10.22
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	9.66
C5	CIRCULAR	2.40	4.52	0.60	2.40	1	22.69

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/15/2020 00:00:00
```

```
Ending Date ............... 11/16/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:10:00
Wet Time Step ............ 00:06:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.226
Total Precipitation ......         0.102        12.500
Evaporation Loss .........         0.007         0.837
Infiltration Loss ........         0.038         4.676
Surface Runoff ...........         0.000         0.000
LID Drainage .............         0.035         4.347
Final Storage ............         0.024         2.907
Continuity Error (%) .....        -0.319

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.035         0.354
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.025         0.254
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.010         0.100
Continuity Error (%) .....        -0.035

***************************
Time-Step Critical Elements
***************************
Link C1 (12.06%)
```

```
********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.90 sec
Average Time Step           :     4.83 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :    95.93 %
    3.155 -  1.991 sec      :     4.06 %
    1.991 -  1.256 sec      :     0.01 %
    1.256 -  0.792 sec      :     0.01 %
    0.792 -  0.500 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	12.50	334.37	0.53	23.11	0.00	0.00	156.22	0.04	0.00	0.45(
2EDCI	12.50	0.00	1.13	0.00	10.38	0.00	10.38	0.03	0.01	0.831
2EIC	12.50	0.00	0.74	5.73	5.53	0.00	5.53	0.06	0.03	0.442
2WBRC	12.50	380.84	0.47	58.40	0.00	0.00	239.10	0.06	0.00	0.608
2WDCI	12.50	0.00	1.13	0.00	10.29	0.00	10.29	0.06	0.02	0.823
2WIC	12.50	0.00	0.70	6.46	4.90	0.00	4.90	0.04	0.02	0.392
3BRC	12.50	430.05	0.82	14.43	0.00	0.00	313.55	0.25	0.00	0.708
3EDCI	12.50	0.00	1.13	0.00	10.24	0.00	10.24	0.07	0.02	0.819
3EIC	12.50	0.00	0.73	5.98	5.27	0.00	5.27	0.14	0.05	0.421
3SDCI	12.50	0.00	1.13	0.00	10.17	0.00	10.17	0.04	0.01	0.813
3SIC	12.50	0.00	0.79	5.12	5.95	0.00	5.95	0.09	0.03	0.476

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	2EBRC	346.87	0.53	23.11	0.00	156.22	30.14	197.59	-0.12
2WBRC	2WBRC	393.34	0.47	58.40	0.00	239.10	10.01	105.78	-0.10
3BRC	3BRC	442.55	0.82	14.43	0.00	313.55	9.60	124.68	-0.29

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.01	0.02	277.52	0 07:06	0.02
J2	JUNCTION	0.00	0.00	277.50	0 00:00	0.00
J3	JUNCTION	0.00	0.01	277.51	0 08:00	0.01
J4	JUNCTION	0.00	0.01	277.51	0 12:06	0.01
J5	JUNCTION	0.02	0.03	275.93	0 16:59	0.03
OF1	OUTFALL	0.01	0.01	275.81	0 16:59	0.01
SU1	STORAGE	0.05	0.10	276.00	0 16:59	0.10

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.005	0.005	0 09:18	0.247	0.247	0.004
J2	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J3	JUNCTION	0.003	0.003	0 08:00	0.0646	0.0646	0.000
J4	JUNCTION	0.002	0.002	0 12:12	0.0422	0.0422	-0.003

J5	JUNCTION	0.000	0.006	0	16:59	0	0.254	0.023
OF1	OUTFALL	0.000	0.006	0	16:59	0	0.254	0.000
SU1	STORAGE	0.000	0.009	0	11:18	0	0.354	0.117

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.070	2	0	0	0.139	4	0 16:59	0.006

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	71.06	0.004	0.006	0.254
System	71.06	0.004	0.006	0.254

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.005	0	09:18	2.58	0.00	0.06
C2	CONDUIT	0.000	0	00:00	0.00	0.00	0.05
C3	CONDUIT	0.003	0	08:00	1.27	0.00	0.05
C4	CONDUIT	0.002	0	12:12	0.22	0.00	0.05
C5	CONDUIT	0.006	0	16:59	0.78	0.00	0.01
OR1	ORIFICE	0.006	0	16:59			
OR2	ORIFICE	0.000	0	00:00			
W1	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.26	0.00	0.00	0.53	0.21	0.00	0.00	0.66	0.00
C2	1.00	0.26	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.26	0.30	0.00	0.32	0.12	0.00	0.00	0.70	0.00
C4	1.00	0.26	0.44	0.00	0.30	0.00	0.00	0.00	0.59	0.00
C5	1.00	0.27	0.00	0.00	0.06	0.67	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Feb 5 21:08:01 2021
Analysis ended on: Fri Feb 5 21:08:01 2021
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Made copy of Post Development Modelling with SWM-2 revised Jan. 25,'21 and added storage BRCs

WARNING 01: wet weather time step reduced to recording interval for Rain Gage SCS_Type_II_25mm

```
*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 11
Number of nodes ........... 7
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0
```

```
****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
25mm_Chicago	25mm_Chicago	INTENSITY	10 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	10 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	10 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	10 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	10 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	10 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	10 min.
SCS_12h_100yr	SCS_12h_100yr	INTENSITY	6 min.
SCS_12h_10yr	SCS_12h_10yr	INTENSITY	6 min.
SCS_12h_25yr	SCS_12h_25yr	INTENSITY	6 min.
SCS_12h_2yr	SCS_12h_2yr	INTENSITY	6 min.
SCS_12h_50yr	SCS_12h_50yr	INTENSITY	6 min.
SCS_12h_5yr	SCS_12h_5yr	INTENSITY	6 min.
SCS_Type_II_25mm	SCS_Type_II_25mm	INTENSITY	6 min.

```
********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet

2EBRC	0.03	3.45	0.00	0.0500	SCS_Type_II_25mm	J4
2EDCI	0.30	23.00	100.00	2.1000	SCS_Type_II_25mm	2EBRC
2EIC	1.07	82.00	53.00	2.1000	SCS_Type_II_25mm	2EBRC
2WBRC	0.03	3.45	0.00	0.0500	SCS_Type_II_25mm	J3
2WDCI	0.58	18.00	100.00	2.1000	SCS_Type_II_25mm	2WBRC
2WIC	0.88	63.00	47.00	2.1400	SCS_Type_II_25mm	2WBRC
3BRC	0.08	7.50	0.00	0.0500	SCS_Type_II_25mm	J1
3EDCI	0.73	21.00	100.00	1.2000	SCS_Type_II_25mm	3BRC
3EIC	2.59	74.00	51.00	1.2000	SCS_Type_II_25mm	3BRC
3SDCI	0.41	14.00	100.00	0.3700	SCS_Type_II_25mm	3BRC
3SIC	1.46	49.00	58.00	0.3700	SCS_Type_II_25mm	3BRC

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
2EBRC	2EBRC	1	270.00	0.00	100.00	0.00	0.00
2WBRC	2WBRC	1	270.00	0.00	100.00	0.00	0.00
3BRC	3BRC	1	790.00	0.00	100.00	0.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	277.50	2.50	0.0	
J2	JUNCTION	277.50	2.50	0.0	
J3	JUNCTION	277.50	2.50	0.0	
J4	JUNCTION	277.50	2.50	0.0	
J5	JUNCTION	275.90	2.50	0.0	
OF1	OUTFALL	275.80	2.40	0.0	
SU1	STORAGE	275.90	2.30	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	SU1	CONDUIT	9.7	16.7916	0.0130
C2	J2	SU1	CONDUIT	10.4	15.5195	0.0130

C3	J3	SU1	CONDUIT	9.0	18.1572	0.0130
C4	J4	SU1	CONDUIT	10.0	16.2371	0.0130
C5	J5	OF1	CONDUIT	20.1	0.4969	0.0100
OR1	SU1	J5	ORIFICE			
OR2	SU1	J5	ORIFICE			
W1	SU1	J5	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	9.83
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	9.45
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	10.22
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	9.66
C5	CIRCULAR	2.40	4.52	0.60	2.40	1	22.69

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/15/2020 00:00:00
Ending Date .............. 11/16/2020 00:00:00
Antecedent Dry Days ...... 0.0
```

```
Report Time Step ......... 00:10:00
Wet Time Step ............ 00:06:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......         0.002         0.226
Total Precipitation ......         0.204        25.000
Evaporation Loss .........         0.008         0.950
Infiltration Loss ........         0.056         6.830
Surface Runoff ...........         0.040         4.869
LID Drainage .............         0.066         8.100
Final Storage ............         0.037         4.570
Continuity Error (%) .....        -0.370

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.106         1.057
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.067         0.672
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.038         0.385
Continuity Error (%) .....        -0.044

***************************
Time-Step Critical Elements
***************************
Link C1 (11.00%)
Link C3 (1.37%)
```

```
********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.60 sec
Average Time Step           :     4.74 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :    93.55 %
    3.155 -  1.991 sec      :     1.96 %
    1.991 -  1.256 sec      :     4.49 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.01 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
2EBRC	25.00	873.65	0.65	24.76	0.00	0.00	699.56	0.19	0.02	0.778
2EDCI	25.00	0.00	1.13	0.00	22.93	0.00	22.93	0.07	0.03	0.917
2EIC	25.00	0.00	0.86	8.08	12.18	3.44	15.62	0.17	0.06	0.625
2WBRC	25.00	965.74	0.87	63.89	0.00	0.00	800.29	0.22	0.03	0.808
2WDCI	25.00	0.00	1.13	0.00	22.81	0.00	22.81	0.13	0.04	0.913
2WIC	25.00	0.00	0.83	9.18	10.80	3.79	14.59	0.13	0.05	0.584
3BRC	25.00	1087.41	0.87	15.76	0.00	0.00	825.79	0.65	0.10	0.742
3EDCI	25.00	0.00	1.13	0.00	22.75	0.00	22.75	0.17	0.05	0.910
3EIC	25.00	0.00	0.90	9.13	11.66	2.81	14.47	0.37	0.11	0.579
3SDCI	25.00	0.00	1.13	0.00	22.66	0.00	22.66	0.09	0.02	0.907
3SIC	25.00	0.00	0.94	8.01	13.21	2.22	15.42	0.23	0.06	0.617

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
2EBRC	2EBRC	898.65	0.65	24.76	66.94	632.61	30.14	204.83	-0.11
2WBRC	2WBRC	990.74	0.87	63.89	180.11	620.18	10.01	137.34	-0.16
3BRC	3BRC	1112.41	0.87	15.76	418.03	407.76	9.60	281.64	-0.18

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.02	0.07	277.57	0 06:18	0.07
J2	JUNCTION	0.00	0.00	277.50	0 00:00	0.00
J3	JUNCTION	0.01	0.05	277.55	0 06:12	0.04
J4	JUNCTION	0.01	0.04	277.54	0 06:12	0.04
J5	JUNCTION	0.03	0.04	275.94	0 15:35	0.04
OF1	OUTFALL	0.01	0.02	275.82	0 15:35	0.02
SU1	STORAGE	0.20	0.32	276.22	0 15:35	0.32

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.095	0.095	0 06:24	0.652	0.652	0.003
J2	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J3	JUNCTION	0.032	0.032	0 06:12	0.216	0.216	-0.007
J4	JUNCTION	0.022	0.022	0 06:12	0.189	0.189	-0.011
J5	JUNCTION	0.000	0.011	0 15:35	0	0.672	0.018

OF1	OUTFALL	0.000	0.011	0	15:35	0	0.672	0.000
SU1	STORAGE	0.000	0.117	0	06:18	0	1.06	0.278

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.290	9	0	0	0.457	14	0 15:35	0.011

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	75.57	0.010	0.011	0.672
System	75.57	0.010	0.011	0.672

****
Link Flow Summary

****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.095	0	06:24	5.06	0.01	0.17
C2	CONDUIT	0.000	0	00:00	0.00	0.00	0.16
C3	CONDUIT	0.032	0	06:12	4.49	0.00	0.17
C4	CONDUIT	0.022	0	06:12	3.75	0.00	0.17
C5	CONDUIT	0.011	0	15:35	0.89	0.00	0.01
OR1	ORIFICE	0.011	0	15:35			
OR2	ORIFICE	0.000	0	00:00			
W1	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.21	0.00	0.00	0.67	0.13	0.00	0.00	0.73	0.00
C2	1.00	0.21	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.21	0.03	0.00	0.71	0.05	0.00	0.00	0.74	0.00
C4	1.00	0.21	0.14	0.00	0.61	0.04	0.00	0.00	0.74	0.00
C5	1.00	0.21	0.00	0.00	0.04	0.74	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Wed Jan 27 22:02:17 2021
Analysis ended on: Wed Jan 27 22:02:17 2021
Total elapsed time: < 1 sec

Appendix C: Cost Estimates Detailed Calculation

Appendix C (page 1 of 2) : Cost Estimate of Traditional SWM System

Capital Cost

Water Quality Component

Item	Description	Quantity	Unit	Unit Price ($)	Source (see notes)	Total ($)	
1	Imbrium Jellyfish Unit - JF1	1	each	$ 105,639	1	$ 105,639	
2	Extra MH's for offline configuration	2	each	$ 7,168	2	$ 14,336	
3	Imbrium Jellyfish Unit - JF2	1	each	$ 161,332	1	$ 161,332	
4	Extra MH's for offline configuration	2	each	$ 9,068	2	$ 18,136	
5	Imbrium Jellyfish Unit - JF1	1	each	$ 68,370	1	$ 68,370	
6	Extra MH's for offline configuration	2	each	$ 5,267	2	$ 10,534	
7	Imbrium Jellyfish Unit - JF1	1	each	$ 73,041	1	$ 73,041	
8	Extra MH's for offline configuration	2	each	$ 5,267	2	$ 10,534	
				Sub-Total		$ 461,922	
				+ 25% Engineering and Contingencies	Typical	$ 115,481	
				Total		**$ 577,403**	**"A"**

Water Quantity Component

9	Pro-rate Mosaik Glenway storage tank according to volume			
	$3312m^3/2495m^3$ x $1,016,440, in 2014 $	$ 1,349,278	2	
	Use price indexing to bring to 2020 $ (multiply by 1.199)		$ 1,617,785	
	+ 25% Engineering and Contingencies		$ 404,446	
		Total	**$ 2,022,231**	**"B"**

Maintenance Cost over 50 years

Water Quality Component

Item	Description	Occurrences	Unit Price ($)	Source (see notes)	Total ($)	
10	System inspections, quarterly per year	200	$ 250	1	$ 50,000	
11	Replace cartridges in JF1, every 4 years	12	$ 6,800	1	$ 81,600	
12	Replace cartridges in JF2, every 4 years	12	$ 11,900	1	$ 142,800	
13	Replace cartridges in JF3, every 4 years	12	$ 4,250	1	$ 51,000	
14	Replace cartridges in JF4, every 4 years	12	$ 5,100	1	$ 61,200	
			Total		**$ 386,600**	**"C"**

Water Quantity Component

15	System inspections, yearly	50	$ 150	N.A.	$ 7,500	
16	Flushing	12	$ 1,000	N.A.	$ 12,000	
			Total		**$ 19,500**	**"D"**

Overall Construction and Lifetime Cost ("A"+"B"+"C"+"D") $ 3,005,733

Notes:

1 Unit costs from email correspondence with manufacturer

2 Unit costs from tender between Mosaic Glenway and the contractor, 2014

Appendix C (page 2 of 2) : Cost Estimate of SWM System with Bioretention Cells

Capital Cost

Water Quality Component

Item	Description	Quantity	Unit	Unit Price ($)	Source (see notes)	Total ($)	
1	Ditch Inlet Catch Basins	2	each	$ 1,446	2	$ 2,892	
2	Bioretention Cell Davis East	1	each	$ 73,600	2	$ 73,600	
3	Bioretention Cell Davis West	1	each	$ 87,200	2	$ 87,200	
4	Bioretention Cell Bathurst	1	each	$ 41,394	2	$ 41,394	
						$ 205,086	(2014 $)
	Use price indexing to bring to 2020 $ (multiply by 1.199)			Sub-Total		$ 245,898	(2020 $)
	+ 25% Engineering and Contingencies					$ 61,475	
				Total		**$ 307,373**	**"A"**

Water Quantity Component

5	Pro-rate Mosaik Glenway storage tank according to volume	$ 1,124,399	2		
	$2944m^3/2495m^3$ x $1,016,440, in 2014 $	$ 1,199,358			
	Use price indexing to bring to 2020 $ (multiply by 1.199)			$ 1,438,031	
	+ 25% Engineering and Contingencies			$ 359,508	
		Total		**$ 1,797,538**	**"B"**

Maintenance Cost over 50 years

Water Quality Component (Bioretention Cells)

Item	Description	Occurrences	Unit Price ($)	Source (see notes)	Total ($)	
6	Davis East inspections, litter cleaning etc. per year	50	$ 1,400	3	$ 70,000	
7	Davis East Media & Drain Replacement, per 10 years	5	$ 2,100	3	$ 10,500	
8	Davis West inspections, litter cleaning etc. per year	50	$ 1,400	3	$ 70,000	
9	Davis West Media & Drain Replacement, per 10 years	5	$ 2,100	3	$ 10,500	
10	Bathurst inspections, litter cleaning etc. per year	50	$ 4,096	3	$ 204,815	
11	Bathurst Media & Drain Replacement, per 10 years	5	$ 6,144	3	$ 30,722	
			Total		**$ 396,537**	**"C"**

Water Quantity Component

12	System inspections, yearly	50	$ 150	N.A.	$ 7,500	
13	Flushing, every 4 years	12	$ 1,000	N.A.	$ 12,000	
			Total		**$ 19,500**	**"D"**

Overall Construction and Lifetime Cost ("A"+"B"+"C"+"D") $ 2,520,948

Notes:

1 Unit costs from email correspondence with manufacturer
2 Unit costs from tender between Mosaic Glenway and the contractor, 2014
3 STEP report on LID costs