
MEMORANDUM

DATE: 2018-02-28 EMAIL

TO: **City of Ottawa IAD Review Officer**

SUBJECT: **Proposed Stormwater Analysis, 21 Withrow Avenue
City File Number: D07-16-17-0027 and D02-02-17-0104**

OUR FILE: DSEL Project No.17-931

ATTACHMENTS:

- Existing Stormwater Management Plan, SWM-1, by DSEL, Dated February 2018
- Proposed Stormwater Management Plan, SWM-2, by DSEL, Dated February 2018
- Time of Concentration Calculation, Allowable release rate calculation, Dated February 2018
- Existing Conditions EPASWMM Model schematic
- Existing Conditions, 2, 5 & 100-year EPASWMM Output Summary, Dated February 2018
- Proposed Condition EPASWMM Model schematic
- Proposed Conditions, 2, 5 & 100-year EPASWMM Output Summary

The following memo was prepared to support the application for the draft plan of subdivision at 21 Withrow Avenue.

Model Summary

The hydrology and hydraulics of the proposed stormwater management system were analyzed in EPASWMM using the Dynamic Wave Routing Model.

The following assumptions were made in the preparation for the EPASWMM model:

- Hydrology
 - Initial abstraction parameters per City of Ottawa standards.
 - Horton's infiltration for soil loss, per City guidelines.
 - Calculated % impervious area

- Sub-catchment width measured as perpendicular area to catch basins for longest distance of travel.
- Hydraulics
 - Storage Nodes represent both surface and subsurface components. Each node is assigned an invert elevation that corresponds with the tributary catch basin.
 - “Regular” Node represent either connections to the sewer main or strategic maintenance hole locations. Not all structures have been included in model.
 - All conduits have been assigned a Mannings $n = 0.013$.
 - Orifices are all side mounted circular and have a 0.61 discharge coefficient.

An analysis of various storm distributions was completed to determine the critical storm event based on the proposed conditions. It was determined that during the 100-year storm event, the Chicago 6 Hour storm distribution resulted in the highest flow and storage requirements. This distribution is used in all future analysis of the system.

Existing Stormwater Services

The existing runoff from the subject site is directed to 2 separate outlets, Tower Road & St. Helen’s Place. The majority of flow is directed to St. Helen’s Place where flow continues north to Tower Road. Both outlets are conveyed through a series of undefined ditch systems general draining north through the existing residential neighborhood.

In the existing condition flow from the property is conveyed to Tower Road where surface ponding would result. The existing overland flow is north through the 23 Tower Road property, refer to drawing **SWM-1** for existing overland flow route. **Table 1** below summarizes the flow from the subject property and adjacent external areas directed to Tower Road that currently would spill through residential property to the north, refer to **Attachments** for EPASWMM output summary.

Table 1: Existing Flow from Subject Site, 6-Hr Chicago Distribution

Storm Event	Flow to St. Helen’s Place from Area EX1, EX2, A1 (0.804 Ha)		Flow to Tower Road Flow from Area A2 (0.194 Ha)	
	Flow (L/s)	Runoff Volume (cu.m)	Flow (L/s)	Runoff Volume (cu.m)
2-Year	34.9	50	6.3	10
5-Year	53.9	90	13.0	20
100-Year	128.1	270	41.7	70

An existing 300mm storm sewer exits within Cleto Ave which drains eastwards towards Merivale Road, refer to **SWM-1** in the **Attachments** for existing drainage patterns from the subject site and the adjacent storm sewer.

The existing storm sewers were analyzed during the 2, 5 and 100-year events using a 6-hour Chicago distribution. **Table 2** summarizes the flow and surcharge at each node analyzed up to Merivale Road.

Table 2: Existing Flow in Cleto Ave Sewer, 6-Hr Chicago Distribution

Storm Event	2-Year Storm		5-Year Storm		100-Year Storm	
	Flow (L/s)	Surcharge (L/s)	Flow (L/s)	Surcharge (L/s)	Flow (L/s)	Surcharge (L/s)
AD	31.8	0	49.9	0	93.2	7.8
STM12	31.0	0	49.3	0	87.7	51.1
STM13	111.2	0	183.8	0	296.3	0
STM15	120.3	0	199.1	0	324.1	0

As illustrated above, surcharge occurs at node AD and STM12. Please refer to drawing **SWM-1** or EPASWMM model schematic in **Attachments** for node locations.

Stormwater Criteria

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa, summarized below:

- Attenuate to an allowable release rate based on a calculated Rational Method Coefficient no more than 0.5, employing the City of Ottawa IDF parameters for a 2-year storm with a calculated time of concentration equal to or greater than 10 minutes;
- Flow attenuation is required up to and including the 100-year storm event;
- Ensure no negative impacts to downstream stormwater network from the proposed development
- Areas to be retained as existing to ensure the edge condition and adjacent landscaping is maintained, will continue to drain as existing and not contemplated as part of the stormwater management system

Based on the drainage area in the proposed condition of **0.736 ha, 0.29 RC** and a calculated time of concentration of **17 minutes**, a maximum flow of **34 L/s** is allowable up to and including the 100-year storm event. The maximum allowable may have to be reduced further to ensure no negative impacts to the downstream network.

Proposed Stormwater Management System

The stormwater management system is proposed to collect runoff through a series of internal swales, eventually discharging to a sewer connected to the existing 300mm diameter storm sewer within Cleto Ave. A **137mm** circular inlet control device (ICD) is proposed to control flow from the subject site to the allowable release rate at a high water level of **97.32m** or equal to **0.78m** of head above the ICD.

External drainage directed to the subject site will be conveyed through internal swales. During storm events up to the 100-year event the external drainage will be captured and controlled by the ICD. In the 100-year storm event and greater spill will occur to St. Helen's Place. The spill during the 100-year event is less than the runoff from area EX1 and EX2, as currently doing so.

Underground storage is required to control flow to the allowable release rate. The storage requirements and flow are summarized in **Table 3** below, refer to **Attachments** for EPASWMM output summary.

Table 3: Proposed Storage and Flow from Subject Site, 6-Hr Chicago Distribution

Storm Event	Flow from External Area (EX1, EX2, 0.18 Ha) (L/s)	Flow from ICD (EX1, EX2, A1, 0.916 Ha) (L/s)	Required Storage (cu.m)	Flow to Tower Road (Area U2, 0.075 Ha)	Flow to St. Helen's (L/s)
2-Year	4.6	12.9	49	3.4	0
5-Year	17.8	20.4	100	11.3	0
100-Year	61.3	33.6	243	32.5	59.9

During the 100-year storm event a storage of **243m³** is required to control the total release rate to less than the allowable of **34.0 L/s**.

Peak flow to Tower Road and to St. Helen's Place is less than in the existing condition.

The existing stormwater system was analyzed including the contribution from the subject property, summarized in **Table 4** below.

Table 4: Proposed Flow in Existing Cleto Ave Sewer, 6-Hr Chicago Distribution

Storm Event	2-Year Storm		5-Year Storm		100-Year Storm	
	Flow (L/s)	Surcharge (L/s)	Flow (L/s)	Surcharge (L/s)	Flow (L/s)	Surcharge (L/s)
AD	33.1	0	53.5	0	93.6	1.7
STM12	32.4	0	52.4	0	90.0	50.6
STM13	112.5	0	186.7	0	296.3	0
STM15	121.5	0	202.0	0	324.1	0

Comparing **Table 4** to **Table 2** shows that there is approximately a **1.5%** increase in flow in the 2-year and 5-year event and still contained within the sewer, and no change in flow at STM15 in the 100-year event. There is no increase in surcharge in the proposed condition at either node AD or STM12.

The stormwater management plan is proposed to re-direct flow away from Tower Road and to Cleto Avenue. This results in a reduced peak flow and runoff volume to Tower Road providing a benefit to residents on Tower Road that currently would have issues with surface ponding and overland flow through their private property.

The flow to the existing Cleto Ave storm sewer from the proposed development and runoff from EX12 is summarized graphically below for the 100-year storm event.

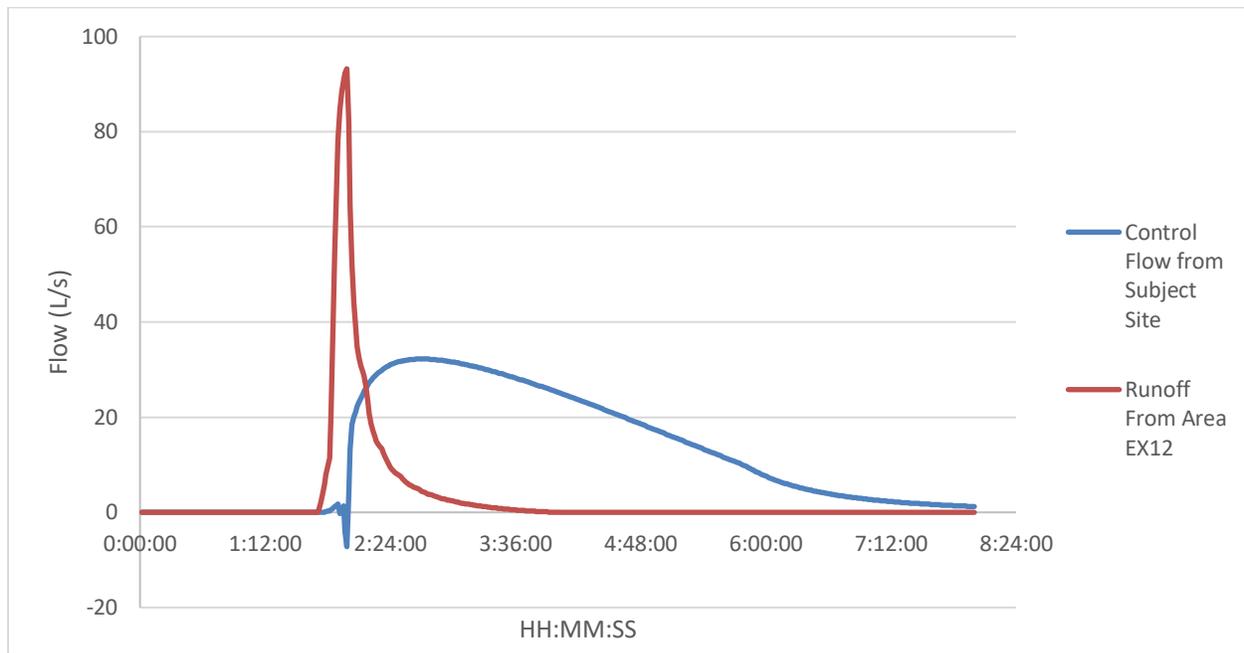


Figure 1: Flow from Subject Site, Runoff from Area EX12, 100-year Storm event 6 Hr Chicago distribution

We trust the preceding memo is sufficient to support the draft plan of subdivision application. Please contact the undersigned if you have any questions or concerns.

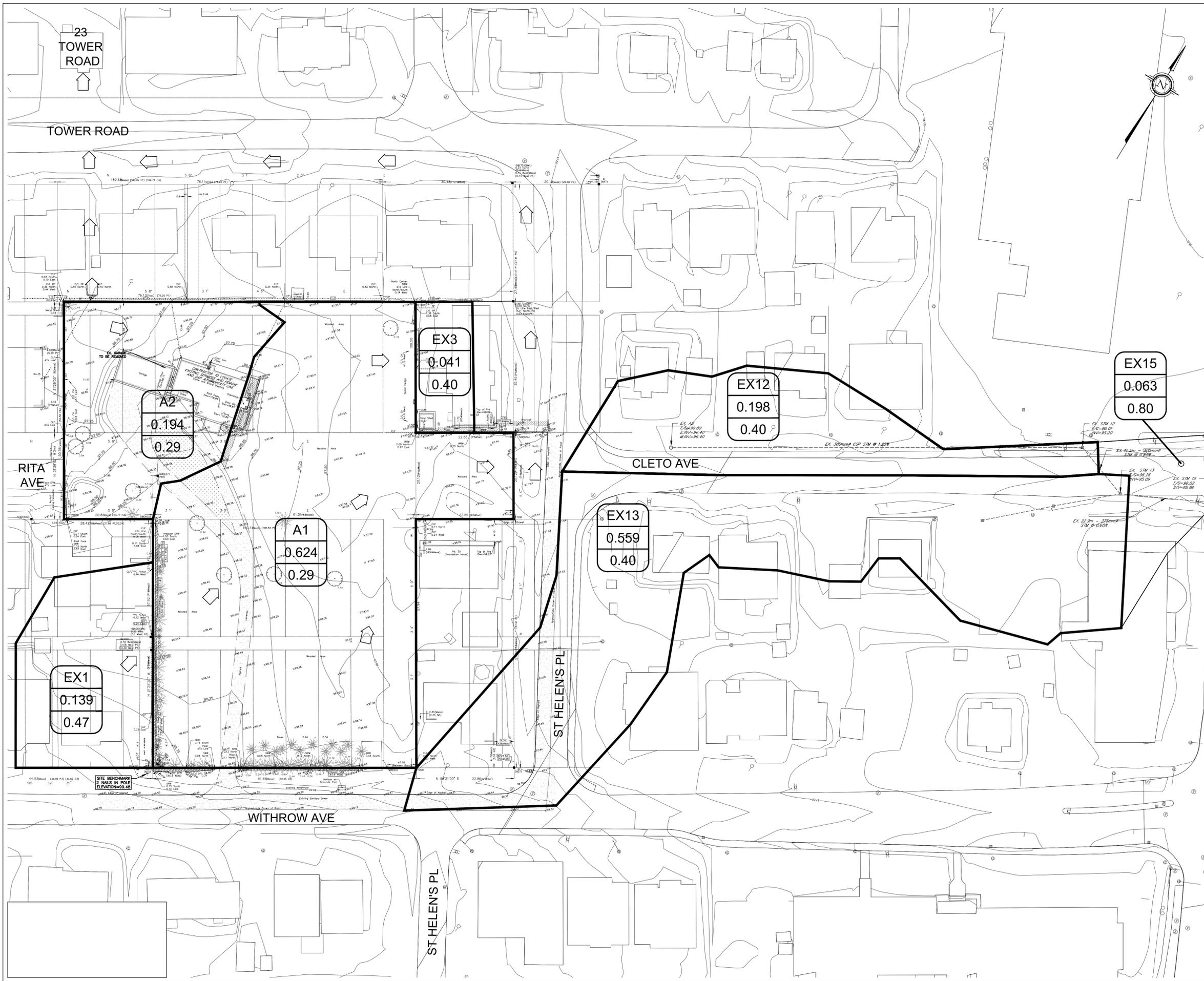
Yours truly,
David Schaeffer Engineering Ltd.

Yours truly,
David Schaeffer Engineering Ltd.

Per: Steven L. Merrick P.Eng.

Per: Adam D. Fobert, P.Eng

Z:\Projects\17-931_Theberge_21-Withrow\B_Design\B3_Reports\B3-2_Servicing (DSEL)\memo\2018-02-26_swm-memo\2018-02-27_931_swm-memo.docx



LEGEND

- PROPERTY LINE
- DRAINAGE DIVIDE
- MAJOR SYSTEM FLOW ROUTE

EX6	DRAINAGE AREA ID
4.010	AREA IN Ha
0.19	RATIONAL METHOD RUNOFF COEFFICIENT

NOT FOR CONSTRUCTION

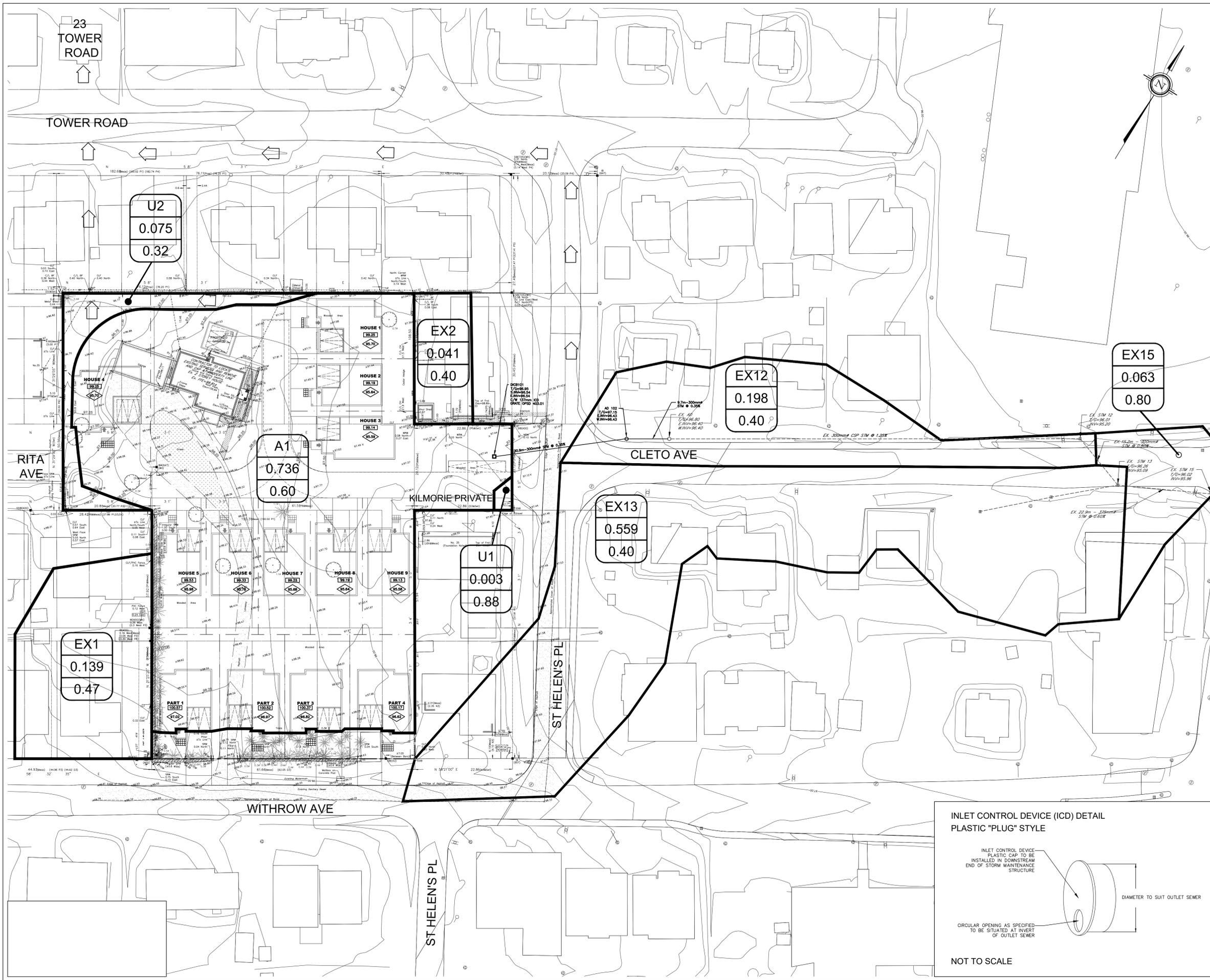
TOPOGRAPHIC INFORMATION
 TOPOGRAPHIC INFORMATION PROVIDED BY FARLEY, SMITH & DENIS SURVEYING LTD. 2015
 PROJ. NO. 432-15
 DATED NOVEMBER 11, 2015
BENCH MARK
 2 NAILS IN POLE LOCATED AT SOUTH-WEST CORNER OF SUBJECT PROPERTY
 ELEV=99.48

No.	S.L.M.	BY	DATE	DESCRIPTION
1	S.L.M.		18.02.28	ISSUED FOR MUNICIPAL REVIEW

PROJECT No. 17-931	REVIEWED BY
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**EXISTING STORM DRAINAGE PLAN
 21 WITHROW AVENUE** © DSEL

<p>THEBERGE HOMES</p> <p>DSEL <small>david schaeffer engineering ltd</small> <small>SENIOR SUBCONTRACTORS</small></p> <p>DESIGNED BY: B.N.C. CHECKED BY: A.D.F. SCALE: 1:400 DATE: FEBRUARY 2018</p>	<p>904 Lady Ellen Place Ottawa, Ontario, K1Z 5L5 Tel. (613) 421-1515</p> <p>120 Iber Road Unit 103 Stittsville, Ontario, K2S 1E9 Tel. (613) 836-0856 Fax. (613) 836-7183 www.DSEL.ca</p> <p>DRAWN BY: A.W.T. CHECKED BY: S.L.M. DRAWING NO. SWM-1 SHEET NO. 1 of 2</p>
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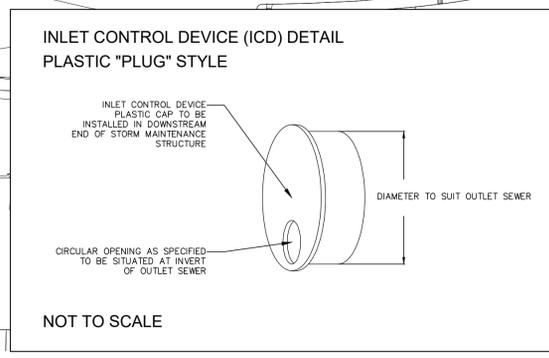
LEGEND

	PROPERTY LINE		PROPOSED STORM MANHOLE
	PROPOSED STORM SEWER		PROPOSED CATCH BASIN
	DRAINAGE DIVIDE		PROPOSED CB 'T'
	PROPOSED SWALE		
	PROPOSED PERFORATED SUBDRAIN		
	MAJOR SYSTEM FLOW ROUTE		
	DRAINAGE AREA ID		EXISTING DRAINAGE AREA ID
	AREA IN Ha RATIONAL METHOD RUNOFF COEFFICIENT		AREA IN Ha RATIONAL METHOD RUNOFF COEFFICIENT
	SURFACE PONDING AREA		
	MAX PONDING		
	INTERMEDIATE PONDING		

NOT FOR CONSTRUCTION

TOPOGRAPHIC INFORMATION
 TOPOGRAPHIC INFORMATION PROVIDED BY FARLEY, SMITH & DENIS SURVEYING LTD. 2015
 PROJ. NO. 432-15
 DATED NOVEMBER 11, 2015
BENCH MARK
 2 NAILS IN POLE LOCATED AT SOUTH-WEST CORNER OF SUBJECT PROPERTY
 ELEV=99.48

No.	S.L.M.	BY	DATE	DESCRIPTION
1	S.L.M.	YY.MM.DD	18.02.28	ISSUED FOR MUNICIPAL REVIEW



PROJECT No. 17-931

REVIEWED BY _____

STORMWATER MANAGEMENT PLAN
21 WITHROW AVENUE

THEBERGE HOMES

904 Lady Ellen Place
 Ottawa, Ontario, K1Z 5L5
 Tel. (613) 421-1515

DSEL
 david schaeffer engineering ltd
 STORM SUBDIVISIONS™

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 www.DSEL.ca

DRAWN BY: A.W.T.	CHECKED BY: S.L.M.	DRAWING NO. SWM-2	SHEET NO. 2 of 2
DESIGNED BY: B.N.C.	CHECKED BY: A.D.F.		
SCALE: 1:400	DATE: FEBRUARY 2018		

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area A1 to St Helen's Place
Existing Drainage Characteristics From Internal Site - East

Area	0.62 ha
C	0.29 Rational Method runoff coefficient
L	60 m
Up Elev	98.42 m
Dn Elev	97.38 m
Slope	1.7 %
Tc	17.03 min

1) Time of Concentration per Federal Aviation Administration

t_c , in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

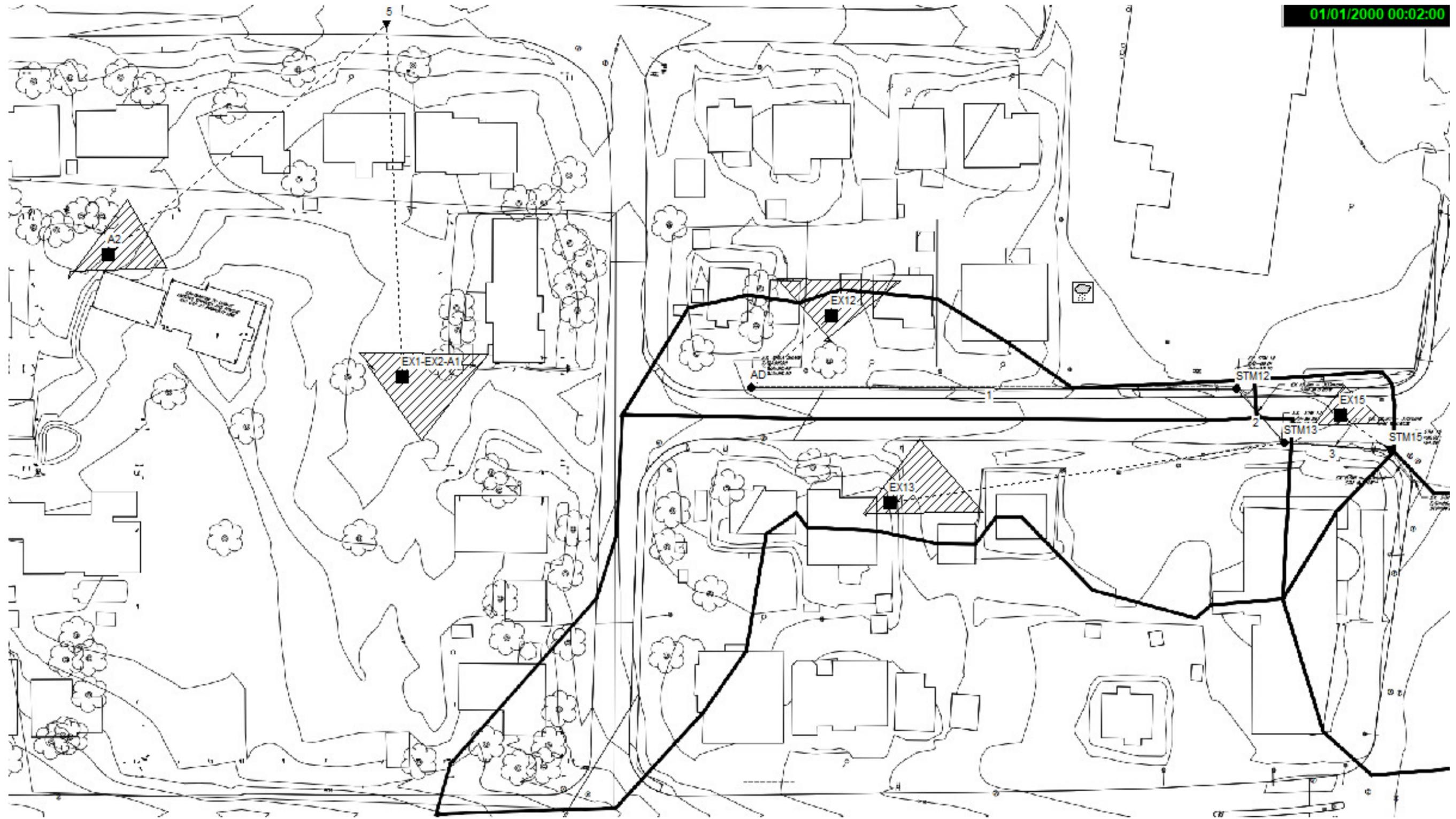
$$t_c = \frac{1.8(1.1 - C)L^{0.5}}{S^{0.333}}$$

Target Flow Rate

Area	0.74 ha
C	0.29 Rational Method runoff coefficient
t_c	17.0 min

2-year	
i	57.4 mm/hr
Q	34.0 L/s

EXISTING CONDITION – EPASWMM MODEL SCHEMATIC



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

 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 LPS
 Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date JAN-01-2000 00:01:00
 Ending Date JAN-02-2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:01:00
 Dry Time Step 00:01:00
 Routing Time Step 2.00 sec

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.067	36.852
Evaporation Loss	0.000	0.000
Infiltration Loss	0.048	26.273
Surface Runoff	0.018	10.029
Final Surface Storage	0.001	0.573
Continuity Error (%)	-0.065	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.018	0.182
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.018	0.182
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

EXISTING-2-YEAR.txt

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 2.00 sec
 Average Time Step : 2.00 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.00

Subcatchment Runoff Summary

Runoff Coeff	Total Precip	Total Runon	Total Evap	Total Infil	Total Runoff	Total Runoff	Peak Runoff
Subcatchment	mm	mm	mm	mm	mm	10 ⁶ ltr	LPS
EX12	36.85	0.00	0.00	22.80	13.21	0.03	31.79
0.358							
EX13	36.85	0.00	0.00	22.90	13.10	0.07	82.54
0.356							
EX15	36.85	0.00	0.00	5.12	30.39	0.02	10.83
0.825							
EX1-EX2-A1	36.85	0.00	0.00	29.78	6.78	0.05	34.92
0.184							
A2	36.85	0.00	0.00	31.88	4.78	0.01	6.26
0.130							

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
AD	JUNCTION	0.00	0.11	96.51	0 01:59
STM12	JUNCTION	0.00	0.15	95.35	0 01:59
STM13	JUNCTION	0.01	0.27	95.35	0 02:00
STM15	OUTFALL	0.00	0.25	95.21	0 02:00

Existing 2-Year

5 OUTFALL 0.00 0.00 0.00 0 00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
AD	JUNCTION	31.77	31.77	0 01:59	0.026	0.026
STM12	JUNCTION	0.00	31.03	0 01:59	0.000	0.026
STM13	JUNCTION	82.52	111.24	0 01:59	0.073	0.099
STM15	OUTFALL	10.83	120.33	0 02:00	0.019	0.119
5	OUTFALL	41.15	41.15	0 01:58	0.064	0.064

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
STM15	24.75	5.54	120.33	0.119
5	23.52	3.14	41.15	0.064
System	24.13	8.68	156.98	0.182

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	31.03	0 01:59	1.19	0.29	0.44
2	CONDUIT	33.44	0 02:00	0.68	0.41	0.69

3 CONDUIT 111.17 0 02:00 1.41 0.84 0.67

 Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit		
1	1.00	0.08	0.00	0.00	0.89	0.04	0.00	0.00	0.06	0.0000
2	1.00	0.08	0.00	0.00	0.92	0.00	0.00	0.00	0.04	0.0000
3	1.00	0.08	0.00	0.00	0.88	0.04	0.00	0.00	0.08	0.0000

 Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Feb 28 13:07:12 2018
 Analysis ended on: Wed Feb 28 13:07:12 2018
 Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

 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 LPS
 Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date JAN-01-2000 00:01:00
 Ending Date JAN-02-2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:01:00
 Dry Time Step 00:01:00
 Routing Time Step 2.00 sec

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.067	36.852
Evaporation Loss	0.000	0.000
Infiltration Loss	0.048	26.273
Surface Runoff	0.018	10.029
Final Surface Storage	0.001	0.573
Continuity Error (%)	-0.065	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.018	0.182
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.018	0.182
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

EXISTING-5-YEAR.txt

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 2.00 sec
 Average Time Step : 2.00 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.00

Subcatchment Runoff Summary

Runoff Coeff	Total Precip	Total Runon	Total Evap	Total Infil	Total Runoff	Total Runoff	Peak Runoff
Subcatchment	mm	mm	mm	mm	mm	10 ⁶ ltr	LPS
EX12 0.358	36.85	0.00	0.00	22.80	13.21	0.03	31.79
EX13 0.356	36.85	0.00	0.00	22.90	13.10	0.07	82.54
EX15 0.825	36.85	0.00	0.00	5.12	30.39	0.02	10.83
EX1-EX2-A1 0.184	36.85	0.00	0.00	29.78	6.78	0.05	34.92
A2 0.130	36.85	0.00	0.00	31.88	4.78	0.01	6.26

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
AD	JUNCTION	0.00	0.11	96.51	0 01:59
STM12	JUNCTION	0.00	0.15	95.35	0 01:59
STM13	JUNCTION	0.01	0.27	95.35	0 02:00
STM15	OUTFALL	0.00	0.25	95.21	0 02:00

Existing 5-Year

5 OUTFALL 0.00 0.00 0.00 0 00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
AD	JUNCTION	31.77	31.77	0 01:59	0.026	0.026
STM12	JUNCTION	0.00	31.03	0 01:59	0.000	0.026
STM13	JUNCTION	82.52	111.24	0 01:59	0.073	0.099
STM15	OUTFALL	10.83	120.33	0 02:00	0.019	0.119
5	OUTFALL	41.15	41.15	0 01:58	0.064	0.064

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
STM15	24.75	5.54	120.33	0.119
5	23.52	3.14	41.15	0.064
System	24.13	8.68	156.98	0.182

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
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2	CONDUIT	33.44	0 02:00	0.68	0.41	0.69

3 CONDUIT 111.17 0 02:00 1.41 0.84 0.67

 Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---								Avg. Froude Number	Avg. Flow Change
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit			
1	1.00	0.08	0.00	0.00	0.89	0.04	0.00	0.00	0.06	0.0000	
2	1.00	0.08	0.00	0.00	0.92	0.00	0.00	0.00	0.04	0.0000	
3	1.00	0.08	0.00	0.00	0.88	0.04	0.00	0.00	0.08	0.0000	

 Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Feb 28 13:07:12 2018
 Analysis ended on: Wed Feb 28 13:07:12 2018
 Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

 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.

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 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
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 Starting Date JAN-01-2000 00:01:00
 Ending Date JAN-02-2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:01:00
 Dry Time Step 00:01:00
 Routing Time Step 2.00 sec

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.150	82.291
Evaporation Loss	0.000	0.000
Infiltration Loss	0.072	39.867
Surface Runoff	0.076	41.910
Final Surface Storage	0.001	0.573
Continuity Error (%)	-0.072	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.076	0.762
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.075	0.750
Internal Outflow	0.001	0.013
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.027	

EXISTING-100-YEAR.txt

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.91 sec
 Average Time Step : 2.00 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.01

Subcatchment Runoff Summary

Runoff	Total	Total	Total	Total	Total	Total	Peak
Coeff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff
Subcatchment	mm	mm	mm	mm	mm	10 ⁶ ltr	LPS
EX12	82.29	0.00	0.00	31.62	49.89	0.10	93.22
0.606							
EX13	82.29	0.00	0.00	31.69	49.82	0.28	259.72
0.605							
EX15	82.29	0.00	0.00	7.63	73.33	0.05	27.80
0.891							
EX1-EX2-A1	82.29	0.00	0.00	48.08	33.93	0.27	128.06
0.412							
A2	82.29	0.00	0.00	48.28	33.84	0.07	41.65
0.411							

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
AD	JUNCTION	0.01	0.40	96.80	0 01:57
STM12	JUNCTION	0.01	0.81	96.01	0 01:52
STM13	JUNCTION	0.02	0.91	95.99	0 01:58
STM15	OUTFALL	0.01	0.38	95.34	0 01:55

Existing 100-Year

5 OUTFALL 0.00 0.00 0.00 0 00:00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
AD	JUNCTION	93.21	93.21	0 01:59	0.099	0.099
STM12	JUNCTION	0.00	87.73	0 01:59	0.000	0.098
STM13	JUNCTION	259.71	296.33	0 01:59	0.278	0.365
STM15	OUTFALL	27.80	324.13	0 01:59	0.046	0.411
5	OUTFALL	169.68	169.68	0 01:59	0.338	0.338

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
AD	JUNCTION	0.04	0.100	0.000
STM12	JUNCTION	0.19	0.510	0.000
STM13	JUNCTION	0.19	0.524	0.261

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
AD	0.03	7.77	0 01:57	0.000	0.40
STM12	0.11	51.05	0 01:59	0.012	0.81

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
STM15	27.70	17.22	324.13	0.411

EXISTING-100-YEAR.txt

5	25.69	15.28	169.68	0.338

System	26.69	32.49	493.81	0.750

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	87.73	0 01:59	1.28	0.81	1.00
2	CONDUIT	84.89	0 02:00	1.20	1.03	1.00
3	CONDUIT	296.33	0 01:59	2.68	2.24	1.00

 Flow Classification Summary

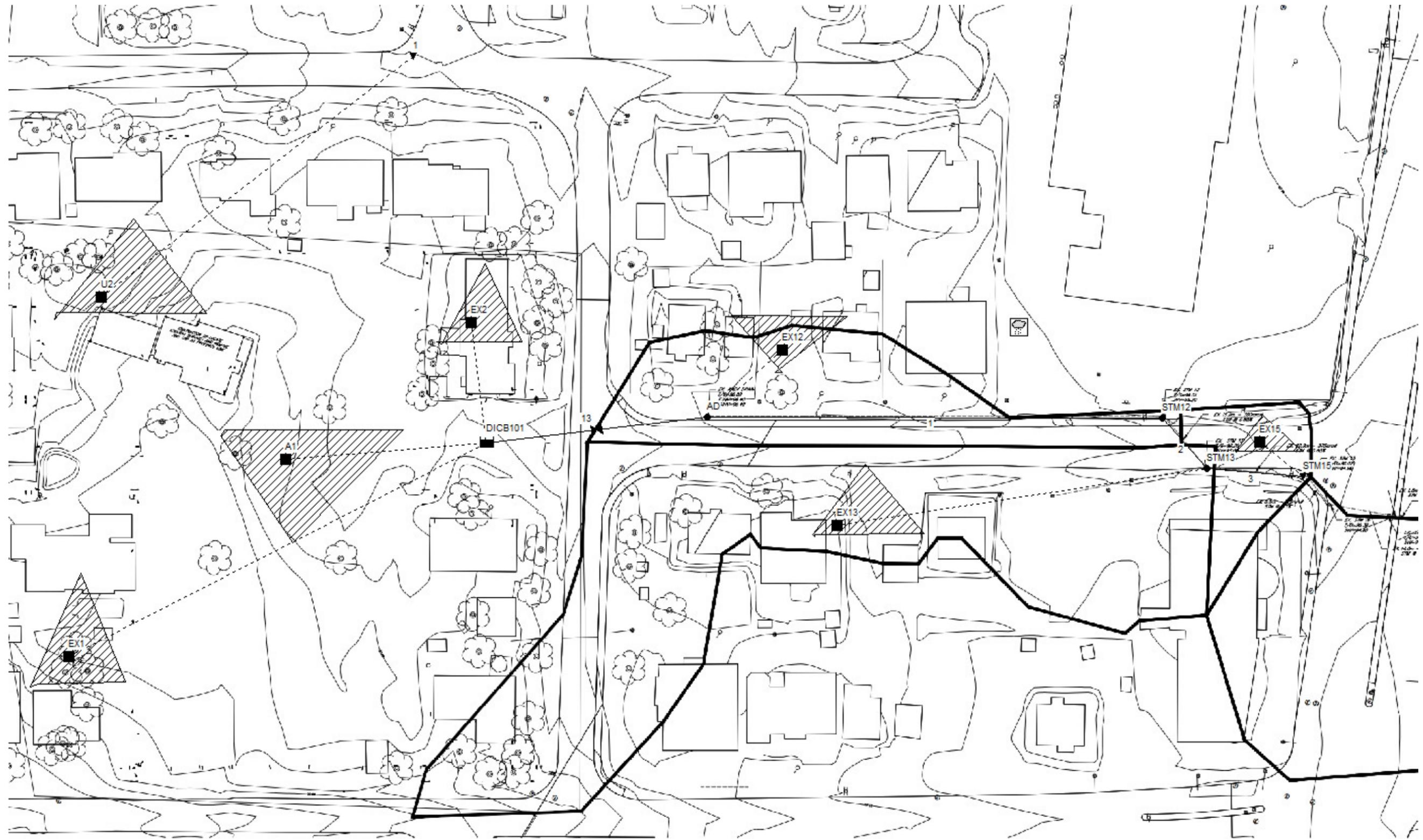
Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---						Avg. Froude Number	Avg. Flow Change	
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit		
1	1.00	0.07	0.00	0.00	0.86	0.07	0.00	0.00	0.11	0.0000
2	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.06	0.0001
3	1.00	0.07	0.00	0.00	0.87	0.06	0.00	0.00	0.13	0.0001

 Conduit Surge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1	0.04	0.04	0.04	0.01	0.01
2	0.19	0.19	0.19	0.01	0.01
3	0.06	0.06	0.07	0.25	0.06

Analysis begun on: Wed Feb 28 13:14:15 2018
 Analysis ended on: Wed Feb 28 13:14:16 2018
 Total elapsed time: 00:00:01

PROPOSED CONDITION – EPASWMM MODEL SCHEMATIC



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

 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 LPS
 Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date JAN-01-2000 00:01:00
 Ending Date JAN-02-2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:01:00
 Dry Time Step 00:01:00
 Routing Time Step 2.00 sec

WARNING 03: negative offset ignored for Link 13

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.067	36.852
Evaporation Loss	0.000	0.000
Infiltration Loss	0.045	24.609
Surface Runoff	0.021	11.464
Final Surface Storage	0.001	0.807
Continuity Error (%)	-0.077	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.021	0.208
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.021	0.208
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.018	

PROPOSED-2-YEAR.txt

 Time-Step Critical Elements

 None

 Highest Flow Instability Indexes

 All links are stable.

 Routing Time Step Summary

 Minimum Time Step : 2.00 sec
 Average Time Step : 2.00 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.00

 Subcatchment Runoff Summary

Runoff Coeff Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 ⁶ ltr	Peak Runoff LPS
EX12 0.358	36.85	0.00	0.00	22.80	13.21	0.03	31.79
EX13 0.356	36.85	0.00	0.00	22.90	13.10	0.07	82.54
EX15 0.825	36.85	0.00	0.00	5.12	30.39	0.02	10.83
A1 0.307	36.85	0.00	0.00	24.66	11.31	0.08	37.99
EX2 0.158	36.85	0.00	0.00	30.62	5.81	0.00	3.13
EX1 0.013	36.85	0.00	0.00	36.36	0.49	0.00	1.50
U2 0.100	36.85	0.00	0.00	32.94	3.67	0.00	5.34

 Node Depth Summary

 Average Maximum Maximum Time of Max
 Depth Depth HGL Occurrence

Proposed-2-Year

PROPOSED-2-YEAR.txt

Node	Type	Meters	Meters	Meters	days	hr:min
AD	JUNCTION	0.01	0.11	96.51	0	01:59
STM12	JUNCTION	0.01	0.16	95.36	0	01:59
STM13	JUNCTION	0.02	0.27	95.35	0	02:00
STM15	OUTFALL	0.01	0.25	95.21	0	02:00
1	OUTFALL	0.00	0.00	0.00	0	00:00
DICB101	STORAGE	0.02	0.17	96.71	0	02:38

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
AD	JUNCTION	31.77	33.09	0 01:59	0.026	0.112
STM12	JUNCTION	0.00	32.36	0 01:59	0.000	0.113
STM13	JUNCTION	82.52	112.45	0 01:59	0.073	0.186
STM15	OUTFALL	10.83	121.54	0 02:00	0.019	0.205
1	OUTFALL	5.34	5.34	0 01:59	0.003	0.003
DICB101	STORAGE	40.34	40.34	0 02:05	0.086	0.086

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
DICB101	STORAGE	0.95	0.036	0.607

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DICB101	0.004	2	0	0.049	20	0 02:38	12.88

 Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
STM15	32.38	7.32	121.54	0.205
1	1.93	1.65	5.34	0.003
System	17.15	8.98	126.11	0.208

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	32.36	0 01:59	1.20	0.30	0.45
2	CONDUIT	34.82	0 02:00	0.84	0.42	0.69
3	CONDUIT	112.38	0 02:00	1.42	0.85	0.68
13	ORIFICE	12.88	0 02:38			1.00

 Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
1	1.00	0.08 0.00 0.00 0.69 0.23 0.00 0.00							0.34	0.0000
2	1.00	0.08 0.00 0.00 0.79 0.07 0.00 0.06							0.28	0.0000
3	1.00	0.08 0.00 0.00 0.77 0.15 0.00 0.00							0.33	0.0000

 Conduit Surchage Summary

No conduits were surcharged.

Analysis begun on: Wed Feb 28 18:13:58 2018
 Analysis ended on: Wed Feb 28 18:13:58 2018
 Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

 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 LPS
 Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date JAN-01-2000 00:01:00
 Ending Date JAN-02-2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:01:00
 Dry Time Step 00:01:00
 Routing Time Step 2.00 sec

WARNING 03: negative offset ignored for Link 13

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.089	49.016
Evaporation Loss	0.000	0.000
Infiltration Loss	0.050	27.668
Surface Runoff	0.037	20.583
Final Surface Storage	0.001	0.807
Continuity Error (%)	-0.086	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.037	0.373
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.037	0.373
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.020	

PROPOSED-5-YEAR.txt

 Time-Step Critical Elements

 None

 Highest Flow Instability Indexes

 All links are stable.

 Routing Time Step Summary

 Minimum Time Step : 0.89 sec
 Average Time Step : 2.00 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.00

 Subcatchment Runoff Summary

Runoff Coeff Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 ⁶ ltr	Peak Runoff LPS
EX12 0.461	49.02	0.00	0.00	25.60	22.59	0.04	49.94
EX13 0.459	49.02	0.00	0.00	25.69	22.50	0.13	134.81
EX15 0.848	49.02	0.00	0.00	6.12	41.56	0.03	15.20
A1 0.424	49.02	0.00	0.00	27.36	20.78	0.15	73.69
EX2 0.283	49.02	0.00	0.00	34.74	13.87	0.01	7.00
EX1 0.132	49.02	0.00	0.00	42.56	6.46	0.01	10.81
U2 0.230	49.02	0.00	0.00	37.53	11.26	0.01	13.55

 Node Depth Summary

 Average Maximum Maximum Time of Max
 Depth Depth HGL Occurrence

Proposed-5-Year

PROPOSED-5-YEAR.txt

Node	Type	Meters	Meters	Meters	days	hr:min
AD	JUNCTION	0.01	0.15	96.55	0	01:59
STM12	JUNCTION	0.02	0.52	95.72	0	01:58
STM13	JUNCTION	0.03	0.56	95.64	0	01:58
STM15	OUTFALL	0.02	0.32	95.28	0	01:59
1	OUTFALL	0.00	0.00	0.00	0	00:00
DICB101	STORAGE	0.03	0.33	96.87	0	02:38

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
AD	JUNCTION	49.94	53.47	0 01:59	0.045	0.212
STM12	JUNCTION	0.00	52.43	0 01:59	0.000	0.212
STM13	JUNCTION	134.80	186.67	0 01:59	0.126	0.338
STM15	OUTFALL	15.20	201.96	0 01:59	0.026	0.364
1	OUTFALL	13.55	13.55	0 01:59	0.008	0.008
DICB101	STORAGE	87.05	87.05	0 02:01	0.168	0.168

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
STM12	JUNCTION	0.04	0.222	0.288
STM13	JUNCTION	0.04	0.170	0.615
DICB101	STORAGE	2.11	0.195	0.448

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DICB101	0.008	3	0	0.100	41	0 02:38	20.44

PROPOSED-5-YEAR.txt

 Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
STM15	36.79	11.50	201.96	0.364
1	2.92	3.37	13.55	0.008
System	19.85	14.86	215.43	0.373

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	52.43	0 01:59	1.27	0.48	0.75
2	CONDUIT	55.96	0 02:01	0.95	0.68	1.00
3	CONDUIT	186.83	0 01:59	1.76	1.41	0.92
13	ORIFICE	20.44	0 02:38			1.00

 Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---								Avg. Froude Number	Avg. Flow Change
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit			
1	1.00	0.08	0.00	0.00	0.66	0.26	0.00	0.00	0.39	0.0000	
2	1.00	0.08	0.00	0.00	0.76	0.08	0.00	0.09	0.33	0.0000	
3	1.00	0.08	0.00	0.00	0.74	0.19	0.00	0.00	0.37	0.0001	

 Conduit Surcharge Summary

Conduit	Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Normal Flow	Hours Capacity Limited
2	0.04	0.04	0.04	0.01	0.01
3	0.01	0.01	0.01	0.12	0.01

Analysis begun on: Wed Feb 28 18:15:23 2018

PROPOSED-5-YEAR.txt

Analysis ended on: Wed Feb 28 18:15:24 2018

Total elapsed time: 00:00:01

Proposed-5-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

 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 LPS
 Process Models:
 Rainfall/Runoff YES
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date JAN-01-2000 00:01:00
 Ending Date JAN-02-2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:01:00
 Dry Time Step 00:01:00
 Routing Time Step 2.00 sec

WARNING 03: negative offset ignored for Link 13

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	0.149	82.292
Evaporation Loss	0.000	0.000
Infiltration Loss	0.061	33.881
Surface Runoff	0.086	47.677
Final Surface Storage	0.001	0.807
Continuity Error (%)	-0.090	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.086	0.863
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.082	0.819
Internal Outflow	0.004	0.044
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.036	

PROPOSED-100-YEAR.txt

 Time-Step Critical Elements

 None

 Highest Flow Instability Indexes

 All links are stable.

 Routing Time Step Summary

 Minimum Time Step : 0.78 sec
 Average Time Step : 2.00 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.01

 Subcatchment Runoff Summary

Runoff Coeff Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 ⁶ ltr	Peak Runoff LPS
EX12 0.606	82.29	0.00	0.00	31.62	49.89	0.10	93.22
EX13 0.605	82.29	0.00	0.00	31.69	49.82	0.28	259.72
EX15 0.891	82.29	0.00	0.00	7.63	73.33	0.05	27.80
A1 0.589	82.29	0.00	0.00	32.93	48.51	0.36	198.66
EX2 0.474	82.29	0.00	0.00	42.92	39.00	0.02	17.33
EX1 0.354	82.29	0.00	0.00	53.19	29.15	0.04	43.96
U2 0.429	82.29	0.00	0.00	46.83	35.28	0.03	32.51

 Node Depth Summary

 Average Maximum Maximum Time of Max
 Depth Depth HGL Occurrence

Proposed-100-Year

PROPOSED-100-YEAR.txt

Node	Type	Meters	Meters	Meters	days	hr:min
AD	JUNCTION	0.02	0.40	96.80	0	01:59
STM12	JUNCTION	0.03	0.81	96.01	0	01:52
STM13	JUNCTION	0.04	0.91	95.99	0	01:58
STM15	OUTFALL	0.03	0.38	95.34	0	01:55
1	OUTFALL	0.00	0.00	0.00	0	00:00
DICB101	STORAGE	0.09	0.78	97.32	0	02:19

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
AD	JUNCTION	93.19	93.62	0 01:56	0.099	0.481
STM12	JUNCTION	0.00	89.97	0 02:01	0.000	0.480
STM13	JUNCTION	259.62	296.32	0 01:58	0.278	0.746
STM15	OUTFALL	27.78	324.09	0 01:58	0.046	0.792
1	OUTFALL	32.49	32.49	0 01:58	0.026	0.026
DICB101	STORAGE	254.12	259.84	0 01:59	0.414	0.414

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
AD	JUNCTION	0.06	0.100	0.000
STM12	JUNCTION	0.23	0.510	0.000
STM13	JUNCTION	0.22	0.524	0.261
DICB101	STORAGE	3.88	0.643	0.000

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
AD	0.01	1.74	0 01:59	0.000	0.40
STM12	0.11	50.59	0 01:59	0.012	0.81
DICB101	0.38	59.91	0 02:19	0.032	0.78

PROPOSED-100-YEAR.txt

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DICB101	0.026	11	0	0.243	100	0 02:19	33.60

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
STM15	44.79	20.52	324.09	0.792
1	4.94	6.22	32.49	0.026
System	24.87	26.73	356.58	0.819

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	89.97	0 02:01	1.36	0.83	1.00
2	CONDUIT	90.07	0 02:01	1.27	1.09	1.00
3	CONDUIT	296.31	0 01:58	2.68	2.24	1.00
13	ORIFICE	33.60	0 02:19			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	--- Fraction of Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
1	1.00	0.07	0.00	0.00	0.60	0.33	0.00	0.00	0.47	0.0000
2	1.00	0.07	0.00	0.00	0.70	0.09	0.00	0.14	0.40	0.0001
3	1.00	0.07	0.00	0.00	0.68	0.25	0.00	0.00	0.44	0.0001

Conduit Surcharge Summary

PROPOSED-100-YEAR.txt

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1	0.06	0.06	0.06	0.01	0.01
2	0.23	0.23	0.23	0.03	0.03
3	0.06	0.06	0.07	0.32	0.06

Analysis begun on: Wed Feb 28 18:16:45 2018
 Analysis ended on: Wed Feb 28 18:16:45 2018
 Total elapsed time: < 1 sec