SUNVALE HOMES

STORMWATER MANAGEMENT REPORT

MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

REVISED DECEMBER 2021

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COBIDE
ENGINEERING INC

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1. INTRODUCTION

Cobide Engineering Inc. was retained by Sunvale Homes to complete a preliminary stormwater management report in support of a Draft Plan Approval Application. The application will be to subdivide the property into a 141 unit subdivision.

A copy of the proposed Draft Plan has been included in Appendix A as Drawing DP1.

1.1 LOCATION

The proposed subdivision development is located Part of Park Lots 10,11 &12 south of Princess Street, Plan Town of Mount Forest & Part of Park Lots I, J, K & L MacDonald's Survey & Part 2 of Division 1 of Lot 2 Concession WSOR (Arthur), Town of Mount Forest, Township of Wellington North, County of Wellington (described herein as the "site"). A Site Location Map is included as Figure 1. The subject property is approximately 9.793 hectares in area.

1.2 DEVELOPMENT PROPOSAL

The proposed development consists of 9.793 hectares of land within the Mount Forest settlement area.

The proposed plan is to develop the site into a residential subdivision. The subdivision will involve the creation of a number of new streets. The development will consist of the following:

- 63 Single Family Lots (Lots 1-45 & 112-129)
- 30 Semi-Detached Lots (Lots 46-61 & 98-111)
- 36 Street Townhouse Lots (Lots 62-97)
- One (1) Cluster Townhouse Block (Block 130)
- One (1) Open Space Blocks for stormwater conveyance
- One (1) Walkway Block

The road network within the subdivision will include the construction of Streets A-E. Streets C & E will connect to Cork Street.

1.3 SCOPE OF WORK

The stormwater management report addresses the design and implementation of drainage and stormwater management facilities for the development.

The report includes:

- Details for erosion protection and sedimentation control for short term, construction phase and the long term.
- Quantity Control
- Quality Control
- Establish lot grading requirements for the proposed subdivision
- Provisions for major flows through the development

1.4 BACKGROUND INFORMATION

In support of this application, the following information was prepared:

- Pre-consultation with the County of Wellington, Township of Wellington North and Saugeen Valley Conservation Authority (SVCA) which will be discussed later in the report. A copy of the correspondence from the pre consultation meeting has been included in Appendix B.

MAP SOURCE - MTO ROAD MAP

COBIDE ENGINEERING INC
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Client/Project

SUNVALE HOMES - MOUNT FOREST SUBDIVISION
FORMER TOWN OF MOUNT FOREST
Township of Wellington North, Ontario
STORMWATER MANAGEMENT REPORT

Figure No.

1

Title

REGIONAL LOCATION MAP

ORIGINAL SHEET – 8 x 11

H:\Sunvale Homes\00702 Sunvale Homes Mount Forest Subdivision\Drawings\Submissions\2019-08-30 First Submission\00702 Regional Location – SWM.dwg Sep 17, 2020 – 3:37pm

2. DRAINAGE CHARACTERISTICS

2.1 REGIONAL

The site is located north of the South Saugeen River; however no part of the subdivision abuts the river.

2.2 LOCAL

On the east side of the property, there is a drainage corridor that conveys runoff from the site and Cork Street and the surrounding streets to the South Saugeen River.

There is also an unnamed watercourse to the west of the site that a portion of the runoff from this site would reach to be conveyed to the South Saugeen River. This unnamed watercourse conveys runoff from a significant area upstream of the development site. Based on aerial photos and site inspections, this watercourse is enclosed for a significant distance downstream of the proposed development before it opens back into an open channel before reaching the South Saugeen River.

2.3 SOILS

According to the Wellington County Soils Survey (1963), the soils on the site are classified as Listowel Silt Loam (LiS). Listowel Silt Loams are a glacial till derived from soft yellowish brown limestones with imperfect drainage. These soils are typically associated with the Hydrologic Soils Group (HSG) BC.

2.4 DISCHARGE POINTS

For the purposes of the report, Discharge Point #1 is any runoff that discharges the South Saugeen River to the south.

Discharge Point #2 is any runoff the discharges to the neighbouring property to the west on the south portion of the property to the unnamed watercourse.

Discharge Point #3 is any runoff the discharges to the neighbouring property to the west on the north portion of the property to the unnamed watercourse.

3. STORMWATER CONTROL

The design guidelines and constraints utilized in the stormwater management review for the development are as follows:

3.1 DESIGN GUIDELINES

The main design guideline utilized in the review is the Ministry of the Environment's "Stormwater Management Planning and Design (SWMP&D) Manual," dated March 2003.

The SWMP&D Manual details the methodologies for the preparation and evaluation of urban/suburban stormwater management measures. The document provides direction on the design of drainage/ stormwater management facilities required to meet the goals and objectives of the various Municipal/ Provincial Review Agencies.

The SWMP&D Manual also provides information on the long-term operation and maintenance techniques for stormwater management facilities that may be implemented in the development of the subdivision.

The storm sewer design criteria to be used are as follows:

- Runoff from the 5 year storm is to be conveyed to a sufficient outlet via a combination of storm sewers and grass swales/ditches;
- Major storm runoff (i.e. >5 years) is to be contained within specified drainage corridors and not adversely impact any of the proposed units within the development or off-site properties;

3.2 METHODOLOGY FOR COMPUTING STORMWATER RUNOFF

As noted previously, the objectives of the Stormwater Management (SWM) Plan for development is to ensure that there is an adequate outlet to convey the runoff from the minor and major storm systems.

The objectives are to be achieved by completing the following tasks:

i. Determining the existing drainage conditions.

ii. Determining the post-development drainage conditions.

iii. Design stormwater management measures that meet the criteria of the Township of Wellington North, MECP and Saugeen Valley Conservation Authority (SVCA).

iv. Summarize the analysis by identifying conclusions and recommendations.

4. EXISTING CONDITIONS

The site was previously used for agricultural purposes.

The existing catchments areas are delineated in Drawing SWM1 in Appendix A.

Summarized below is a description of each of the drainage catchment areas.

4.1 CATCHMENT AREA 101

- This catchment area encompasses the southeast corner of the development.
- Surface water flows by sheet flow to the drainage course on the development site and to the South Saugeen River.
- Catchment Area 101 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 2.85 ha.

4.2 CATCHMENT AREA 102

- This catchment area encompasses the central portion of the development site.
- Surface water flows by sheet flow to the unnamed watercourse to the west side of the site discharging from the site along the southern portion of the west side.
- Catchment Area 102 is considered to discharge at Discharge Point #2 for the purposes of this report.
- Drainage Area = 5.52 ha.

4.3 CATCHMENT AREA 103

- This catchment area encompasses the northwest corner of the development site.
- Surface water flows by sheet flow to the unnamed watercourse to the west side of the site discharging from the site along the northern portion of the west side.
- Catchment Area 103 is considered to discharge at Discharge Point #3 for the purposes of this report.
- Drainage Area = 1.56 ha.

4.4 CATCHMENT AREA EXT1

- This catchment area encompasses the Van Den Broek Subdivision and semi detached units along Cork Street to the northeast of the development site.
- Minor flows within the existing subdivision are captured by the storm sewers and major flows from the entire subdivision will flow overland both discharging to the South Saugeen River via the existing storm sewers and the existing drainage course.
- Catchment Area EXT1 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 11.98 ha.

4.5 CATCHMENT AREA EXT2

- This catchment area encompasses the Betty Dee Property to the east of the development site.
- Minor flows within the existing subdivision are captured by the storm sewers and major flows from the site will flow overland both discharging to the South Saugeen River via the existing storm sewers and the existing drainage course.
- Catchment Area EXT1 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 1.52 ha.

5. PROPOSED CONDITIONS

The proposed catchment area boundaries are delineated on Drawing SWM2 in Appendix A.

Summarized below is a description of each of the drainage catchment areas.

5.1 CATCHMENT 201

- This catchment area encompasses the majority of the property.
- Minor flows will be captured by the storm sewers and major flows will flow overland both discharging to the South Saugeen River. Major flows will be collected downstream of the proposed roads and conveyed via a storm sewer sized for the 100 year storm event.
- Catchment Area 201 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 7.84 ha.

5.2 CATCHMENT 202

- This catchment area encompasses the southeast corner of the development.
- Minor flows within the proposed townhouses will be captured by the storm sewers and major flows from the entire catchment will flow overland both discharging to the South Saugeen River via the existing drainage course.
- Catchment Area 202 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 1.37 ha.

5.3 CATCHMENT 203

- This catchment area encompasses the rear yards along the northern portion of the west side of the site.
- Minor flows and major flows will flow overland both discharging towards the unnamed water course to the west of the site.
- Catchment Area 203 is considered to discharge at Discharge Point #3 for the purposes of this report.
- Drainage Area = 0.37 ha.

5.4 CATCHMENT 204

- This catchment area encompasses the rear yards along the southern portion of the west side of the site.
- Minor flows and major flows will flow overland both discharging towards the unnamed water course to the west of the site.
- Catchment Area 204 is considered to discharge at Discharge Point #2 for the purposes of this report.
- Drainage Area = 0.25 ha.

5.5 CATCHMENT AREA EXT1

- This catchment area encompasses the Van Den Broek Subdivision and semi detached units along Cork Street to the northeast of the development site. A portion of Lot 120 is also included in this drainage area.
- Minor flows within the existing subdivision are captured by the storm sewers and major flows from the entire subdivision will flow overland both discharging to the South Saugeen River via the existing storm sewers and the existing drainage course.
- Catchment Area EXT1 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 12.02 ha.

5.6 CATCHMENT AREA EXT2

- This Catchment has remained unchanged from the Pre-Development Conditions.

6. QUANTITY CONTROL MODELLING

The hydrologic modelling software PCSWMM Version 5.6.1803 Professional 2D was used to determine the pre and post-development peak flows of the 2 yr., 5 yr., 25 yr., 50 yr., and 100 yr. storm events (6 hour duration, SCS Type II, AMC II storm, Mount Forest IDF Parameters). Based on the pre-consultation meeting minutes, previously discussed, it was indicated that all post development flows must match pre-development levels to the neighbouring property to the west. Based on a proposed direct outlet to the South Saugeen River, post development flows do not have to meet predevelopment levels for this outlet. A copy of this correspondence has been included in Appendix B. The IDF Parameters used have been included as Appendix C.

The pre-development and post development parameters and model outputs are contained in Appendix D and E respectively.

6.1 DESIGN REQUIREMENTS

The intent of stormwater quantity control is to limit the flows under proposed conditions to existing levels or less to protect the downstream watercourses, infrastructure and properties.

Minor flows from the majority of the development will be conveyed via a new storm sewer collection system that will be constructed throughout the development. This storm sewer collection system will be designed to accommodate all flows up to and including the 5 year storm event.

Major flows (>5 year), will be conveyed overland within the road allowance of each street.

As noted previously, a direct outlet to the South Saugeen River will be provided for this development. To ensure the direct outlet does not cause erosion concerns along the outlet route, the storm sewer from the development to the outlet will be sized to convey the 100 year design storm event.

An inlet pond is proposed to collect the major flow and provide an inlet into the oversized storm sewer. Preliminary grading of this pond is shown on the proposed grading plan included in Appendix A.

6.2 PEAK FLOW MODELLING RESULTS

The following summarizes the pre-development and post development peak flows to the two (2) discharge points.

Table 6.1 - Peak Flow Summary

RETURN PERIOD	DISCHARGE POINT #1 (l/s)		DISCHARGE POINT #2 (l/s)		DISCHARGE POINT #3 (l/s)	
	PRE	POST	PRE	POST	PRE	POST
2 Year	585	1065	47	10	14	12
5 Year	809	1443	83	14	24	17
25 Year	1184	2052	156	21	47	26
50 Year	1343	2305	195	24	59	31
100 Year	1497	2553	237	27	71	35

MTO 100 Year	1692	2879	305	32	91	42

The following summarizes the pre-development and post development results at each discharge point:

6.2.1 DISCHARGE POINT #1

All storm events in the post development scenario are above pre-development levels however since a direct outlet is being provided to the South Saugeen River that is fully contained within the storm sewer there is no erosion or flooding risk between the development and the South Saugeen River. Erosion protection will be provided at the outlet to the South Saugeen River.

6.2.2 DISCHARGE POINT #2

All storm events in the post development scenario are less than or equal to pre-development levels.

6.2.3 DISCHARGE POINT #3

All storm events in the post development scenario are less than or equal to pre-development levels.

6.3 TOTAL VOLUME MODELLING RESULTS

The following summarizes the pre-development and post development total volume discharged for Discharge Points #2 and #3 where it is not a direct outlet to a watercourse.

Table 6.2 – Total Volume Summary

RETURN PERIOD	DISCHARGE POINT #2 (m^3)		DISCHARGE POINT #3 (m^3)	
	PRE	POST	PRE	POST
2 Year	636	53	175	66
5 Year	968	72	265	92
25 Year	1540	102	420	134
50 Year	1790	116	490	153
100 Year	2050	129	562	172
MTO 100 Year	2460	149	673	200

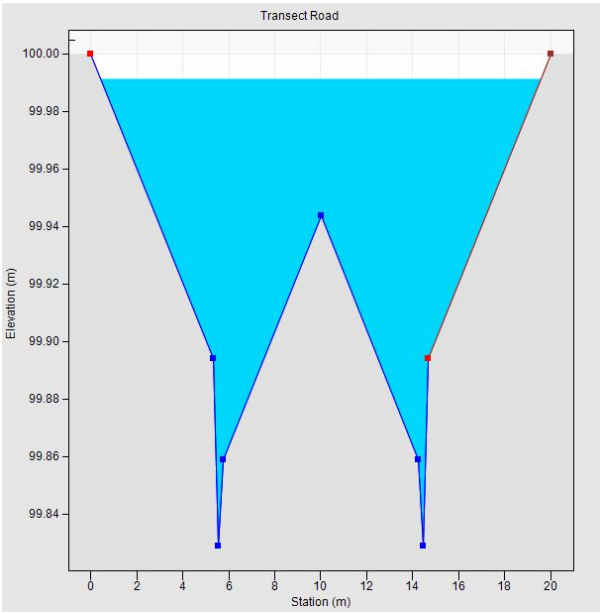
As seen in the Table above, the total volume of runoff on the west side is less than pre-development levels for all storm events at both discharge locations. Based on the above modelling results and the reduction in both peak flow and volume to the western property boundary, we do not foresee any issues at Discharge Points #2 and #3.

7. MAJOR STORM EVENTS

7.1 MTO 100 YEAR STORM EVENT OVERLAND FLOW

The capacity of the road as a channel was modelled to determine the maximum depth of flow on the road. Utilizing the proposed cross section and the minimum road slope of 0.5%, the total flow from Catchment 201 can be conveyed while still being contained within the road allowance with a depth of flow above the centerline of the road of 5cm. Based on the proposed grading and road alignments, there is no section that will be required to convey the full amount of the 100 year design storm. The storm sewers will also convey approximately half of the total flow based on being designed for the 5 year storm event. Therefore in reality the depth of flow during a design major storm event is expected to be less than 5cm.

A section showing the depth of flow with the full peak flow from the MTO 100 year design storm event with a channel slope of 0.5%.



7.2 HURRICANE HAZEL FLOOD EVENT

The proposed design has been modelled to determine the Hurricane Hazel Flood Event (HHFE) Floodplain Elevations.

The existing storm sewer outlet from Cork Street is proposed to be extended to the south side of the proposed street. The existing channel will be maintained from the proposed storm sewer outlet to the WWTP access road.

At the proposed outlet during the Hurricane Hazel event the water level will be 0.35 m in depth therefore the HHFE floodplain elevation at this location is 409.05 m. As seen on the proposed grading plan, this depth will not impact any of the proposed lots. At the existing culvert under the WWTP access road, the water level will be 1.63 m in depth therefore the HHFE Floodplain elevation will be 408.28 m. The lowest point in the access road is 409.37 m therefore the HHFE does not overtop the access road.

The modelling also indicates that the proposed pond for collection of overland flow from the development can also contain the HHFE without overtopping.

8. QUALITY CONTROL

To meet the requirements of the SVCA and the MECP, stormwater quality control will be provided for the proposed development. The MOE SWMP&D Manual recommends that the required level of protection be associated with the habitat sensitivity of the receiving watercourse. The ultimate receiving watercourse for this development is the South Saugeen River. For the purposes of this report, an 'Enhanced' water quality protection level will be implemented in accordance to the MOE 2003 Guidelines and SVCA requirements.

In keeping with the approach suggested in the SWMP&D manual however, a 'treatment train' approach to stormwater quality management has been proposed for this development. This approach consists of three (3) levels of treatment which are described as follows:

- Lot level control measures
- Conveyance control measures
- End-of-Pipe control measures

A review of each measure and it's suitability for use in the development is discussed below:

8.1 LOT LEVEL CONTROL MEASURES

The Township's design standards require minimum grades of 2% from the back of curb to the property line. Therefore, reduced lot grading of the front, side and rear yards to less than 2% is not feasible.

The subdivision property contains native soils that exhibit average drainage characteristics. The use of individual drainage pits and infiltration trenches therefore has not been considered as a feasible option. There are also concerns that based on the ongoing maintenance typically is not being completed that the long term viability of this option is not realistic.

It is proposed that all runoff draining from rooftops be directed overland across the grass lawns to encourage infiltration and filtering of pollutants from this runoff.

8.2 CONVEYANCE CONTROL MEASURES

The Township's standard road cross section only allows for the use of curb and gutter in new urban type subdivisions. Therefore, the use of grass swales as a conveyance control measure for runoff from the subdivision streets cannot be implemented.

Grassed drainage swales may be proposed to be constructed in the rear yards of some of the lots. These swales will provide rear yard drainage for the proposed lots. Swales will have slopes of at least 2.0% where possible. This will assist with removing pollutants and sediment from the runoff prior to draining into the municipal storm sewer system.

All catchbasins and manholes within the subdivision will be provided with minimum 600 mm and 300 mm sumps respectively which will assist in removing a portion of the sediment contained in the runoff from the street.

8.3 END-OF-PIPE CONTROL MEASURES

The use of an Oil Grit Separator (OGS) was selected as an 'end of pipe' control measure. The basic function of an OGS is to remove pollutants from runoff. An OGS was selected to maximize the developable area.

The OGS will be designed during the detailed design stages in conformance with the MOE design guidelines to achieve an "Enhanced" Level of protection.

The OGS will be placed upstream of the major storm inlet basin but close to the proposed road for ease of maintenance.

The OGS has been designed in conformance with the MECP design guidelines to achieve an “Enhanced” Level of protection. The OGS will be a FD-8HC from Hydro International as supplied by Armtec or approved equivalent.

The OGS sizing is included in Appendix E. The OGS area is slightly less than Catchment 201 as the OGS is sized based on what is being conveyed via the storm sewers within the roads and Catchment 201 includes Block 126 that will flow overland to the inlet basin.

9. EROSION & SEDIMENTATION CONTROL

9.1 CONSTRUCTION STAGE

The following are details regarding the erosion and sediment control measures to be implemented during construction:

- Placement of siltation fences in all areas where surface drainage flows over disturbed areas. Siltation fence shall remain erect until construction is completed and the upstream area is fully re-vegetated.
- The stormwater management pond should be constructed first to act as a sedimentation pond during construction;
- Placement of temporary straw check dams within swales and any other locations where a concentrated flow of runoff may occur. All proposed drainage swales are to be seeded during construction;
- Installation of filter cloth under all new and existing catchbasin grates until paving of the subdivision streets is completed;
- Mud mats will be placed at construction accesses to keep public roadways free from debris during the construction period.

Once the ground surface of the site has been stabilized, the straw bale check dams and siltation fences can then be removed.

During the construction phase, it is important to ensure that erosion/sediment control is in place to ensure against transport of sediment into the existing downstream drainage ditches.

A detailed Erosion and Sedimentation Control plan including drawings will be completed during detailed design.

9.2 LOT DEVELOPMENT

During individual construction of homes within the subdivision, siltation barriers are to be constructed, as appropriate, to prevent the erosion of materials into the storm sewer system or the existing drainage ditches. The siltation barriers can be in the form of siltation fences or shallow excavated sediment traps in the direction of flow from the construction site to the proposed drainage system.

The responsibility for the individual sediment control is the landowner constructing the dwelling.

10. CONCLUSIONS & RECOMMENDATIONS

The above report presented the Preliminary Stormwater Management Plan in support of the Draft Plan of Subdivision Application. Based on the findings of this report, the following conclusions are made:

1. Stormwater quantity control is not required as the runoff to the South Saugeen River is outletting at the river and therefore poses no risk to lands between the river and the development and post development runoff to the unnamed watercourse to the west is less than or equal to pre development peak flows and total volume.
2. Stormwater quality will be provided by a treatment train approach which will include lot level control, conveyance control and 'end-of-pipe' control measures.

   Lot level control will be provided by directing most impervious areas not directly connected to the municipal storm sewer system, over vegetated areas and directing all rear yard drainage to grass swales prior to discharging into the proposed storm sewer system.

   Conveyance control will be provided by and providing a minimum 600 mm sumps in all catchbasins and a minimum 300 mm sumps in all catchbasin manholes.

   End-of-pipe control will be provided by an OGS. The OGS alone is capable of providing an enhanced level of quality control and therefore the Lot Level and Conveyance controls are over and above treatments.

   All three levels of the treatment train approach will be used for the development to provide an "Enhanced" Level of protection for the development.

Based on the above conclusions of this report, it is recommended that the above Stormwater Management Report for the subdivision be submitted to the County of Wellington, SVCA, and Township of Wellington North as part of the Draft Plan Approval Application.

Sincerely,

Cobide Engineering Inc.

Travis Burnside, P. Eng.

H:\Sunvale Homes\00702 Sunvale Homes Mount Forest Subdivision\Reports\SWM\2020-08-22 Sunvale SWM Report.docx

Appendix A

DRAWINGS

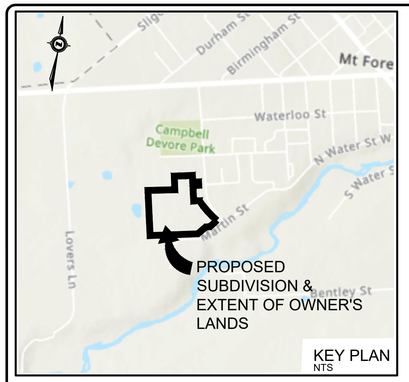
STORMWATER MANAGEMENT REPORT

SUNVALE HOMES MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

DRAFT PLAN OF SUBDIVISION

PART OF PARK LOTS 10, 11 & 12
SOUTH OF PRINCESS STREET
PLAN TOWN OF MOUNT FOREST &
PART OF PARK LOTS 'I', 'K' & 'L'
MACDONALD'S SURVEY &
PART OF DIVISION 1 OF
LOT 2 CON WOSR (ARTHUR)
(TOWN OF MOUNT FOREST)
TOWNSHIP OF WELLINGTON NORTH
COUNTY OF WELLINGTON



RELEVANT SITE INFORMATION

DETACHED RESIDENTIAL LOTS (LOTS 1 TO 45 INCL. AND 112-129 INCL.)	3.893 ha.
SEMI-DETACHED RESIDENTIAL LOTS (LOTS 46 TO 61 INCL. & 98 TO 111 INCL.)	1.028 ha.
MULTI-FAMILY RESIDENTIAL LOTS (LOTS 62 TO 97)	1.116 ha.
MULTI-FAMILY RESIDENTIAL LOTS (BLOCK 130)	0.542 ha.
MUNICIPAL STREET (STREETS A TO E)	2.323 ha.
OPEN SPACE (BLOCK 131)	0.867 ha.
WALKWAY (BLOCK 132)	0.010 ha.
RESERVES/ DAYLIGHTING (BLOCKS 133-137)	0.014 ha.
TOTAL PROPOSED SUBDIVISION	9.793 ha.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 OF THE PLANNING ACT

a. AS SHOWN
b. AS SHOWN
c. AS SHOWN
d. SINGLE FAMILY RESIDENTIAL, SEMI-DETACHED RESIDENTIAL MULTI-FAMILY RESIDENTIAL
e. AS SHOWN
f. AS SHOWN
g. AS SHOWN
h. MUNICIPAL WATER SUPPLY
i. SDAND,SANDY SILT & GRAVEL
j. AS SHOWN
k. WATER, STORM SEWERS, SANITARY SEWERS, HYDRO, TELEPHONE
l. AS SHOWN

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE CORRECTLY SHOWN.

OCTOBER 9, 2020
DATE

LUKE WILCOX
ONTARIO LAND SURVEYOR
VAN HARTEN SURVEYING INC.
660 RIDDELL ROAD, UNIT 1
ORANGEVILLE, ON L9W5G5

OWNER'S CERTIFICATE

I, THE REGISTERED OWNER OF THESE LANDS, HEREBY AUTHORIZE COBIDE ENGINEERING INC. TO SUBMIT THIS DRAFT PLAN FOR APPROVAL.

OCTOBER 9, 2020
DATE

OWNER
JOHN WELTON
I HAVE THE AUTHORIZATION TO BIND THE CORPORATION
JOHN WELTON CUSTOM HOMEBUILDING LTD.
685 RIDDELL ROAD, UNIT 6
ORANGEVILLE, ON
L9W 5J7

Notes

1. TOPOGRAPHICAL INFORMATION DERIVED FROM TOPOGRAPHICAL SURVEY BY TRITON ENGINEERING LTD. AND FIELD SURVEY BY COBIDE ENGINEERING INC. 2016.
2. PROPERTY BOUNDARY DERIVED FROM NOTES AND RECORDS OF VAN HARTEN SURVEYING INC. PROJECT # 28708-20

Benchmark Information

BM1 — TOP OF SIB LOCATED ON THE WEST SIDE OF CORK STREET AT THE SOUTHEAST CORNER OF PART 12 PLAN 61R-21276.
ELEVATION 410.86m

SCALE 1:750 (24 x 36)
10 0 10 20 50 METRES
50 0 25 50 100 FEET

No.	DATE	DESCRIPTION	BY	APPD
1	DEC 17/21	SECOND SUBMISSION	TLB	TLB
0	OCT 9/20	FIRST SUBMISSION	TLB	TLB

REVISION / ISSUE

COBIDE ENGINEERING INC
517 10th STREET, UNIT A, Hanover, Ontario N4N 1R4
Telephone: (519) 506-5959
www.cobideeng.com

Client: JOHN WELTON CUSTOM HOMEBUILDING LTD.

Design:	TLB	Scale:	1:750
Drawn:	JAF	Approved:	
Checked:	SJC		
Date:	AUG 2020		Design Engineer

DRAWING No. 00702-DP1

LEGEND
- EXISTING STREET/PROPERTY LINES
- PROPOSED STREET/PROPERTY LINES
- EDGE OF EXISTING PAVEMENT
- EDGE OF EXISTING GRAVEL
- EXISTING STORM SEWER
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING DITCH
- EXISTING MANHOLE
- EXISTING CATCH BASIN
- EXISTING HYDRO GUY WIRE
- EXISTING HYDRO POLE
- EXISTING TELEPHONE PEDESTAL
- STANDARD IRON BAR
- IRON BAR
- EXISTING DECIDUOUS TREE AND DIAMETER
- EXISTING CONIFEROUS TREE AND DIAMETER
- EXISTING CONTOUR

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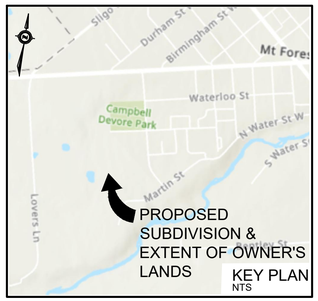

LEGEND

- SUBDIVISION BOUNDARY
- EXISTING STREET/PROPERTY LINES
- PROPOSED EDGE OF PAVEMENT
- EDGE OF EXISTING GRAVEL
- EXISTING DITCH AND DIRECTION OF FLOW
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING HYDRO GUY WIRE
- EXISTING HYDRO POLE
- EXISTING CABLE TV PEDESTAL
- EXISTING TELEPHONE PEDESTAL
- STANDARD IRON BAR
- IRON BAR
- EXISTING DECIDUOUS TREE AND DIAMETER
- EXISTING CONIFEROUS TREE AND DIAMETER
- BENCHMARK
- REMOVAL
- PROPOSED ELEVATION / EXISTING ELEVATION
- EXISTING CONTOUR
- CATCHMENT AREA ID
- CATCHMENT AREA IN HECTARES
- STORM DRAINAGE AREA BOUNDARY

CAUTION:
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Notes

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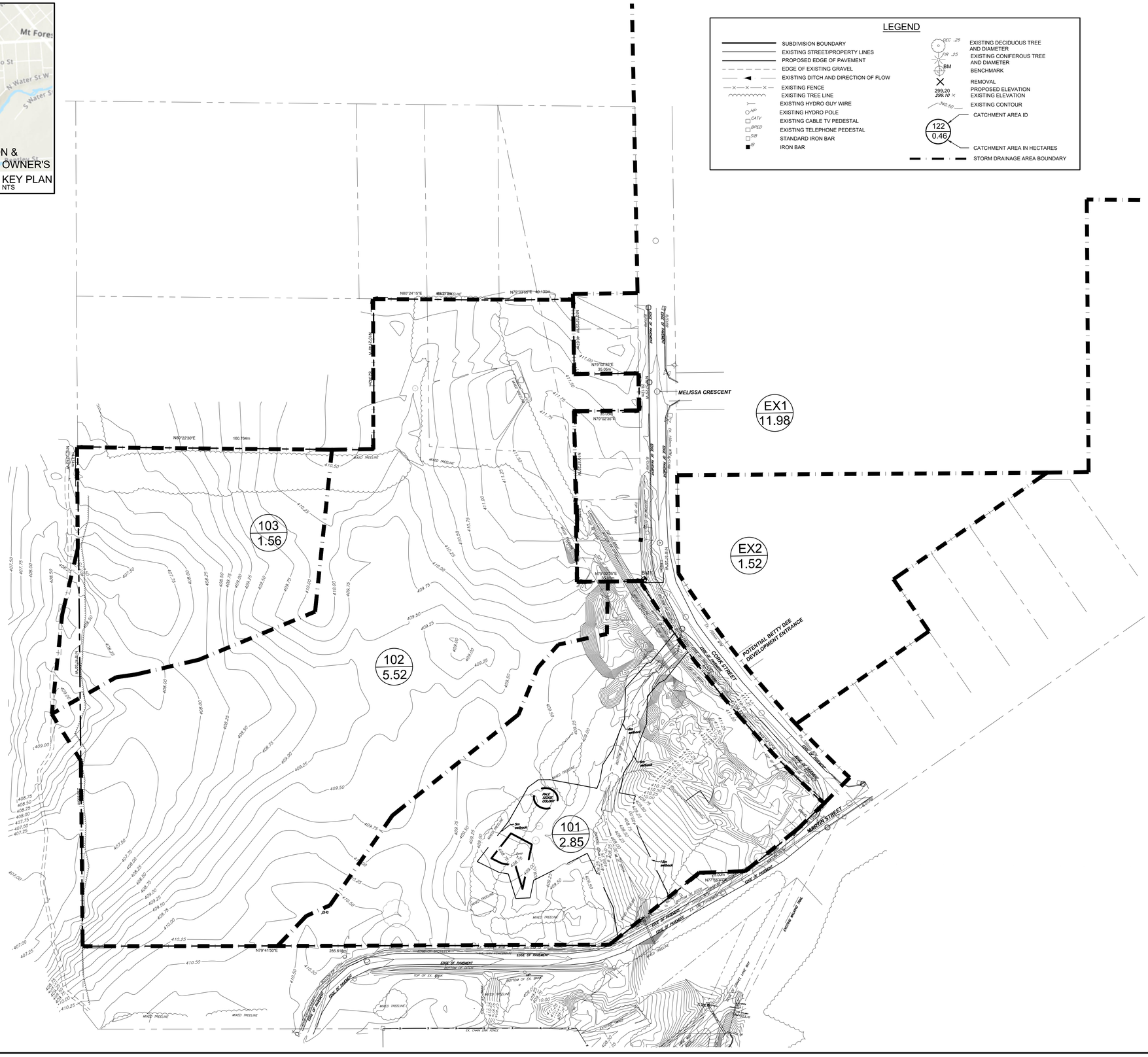
2. LOT FABRIC OF DERIVED FROM PLAN 61R-21276 PREPARED BY WILSON FORD SURVEYING ON FEBRUARY 14, 2018.



SCALE 1:750 (24 x 36)

10 0 10 20 50 METRES

50 0 25 50 100 FEET

Benchmark Information

BM1 TOP OF SIB LOCATED ON THE WEST SIDE OF CORK STREET AT THE SOUTHEAST CORNER OF PART 12 PLAN 61R-21276.
ELEVATION 410.86m

No.	DATE	DESCRIPTION	BY	APPD
1	DEC 17/21	REVISED DRAFT PLAN APPROVAL SUBMISSION	TLB	TLB
0	SEPT 16/20	DRAFT PLAN APPROVAL SUBMISSION	TLB	TLB

REVISION / ISSUE

Seal not valid unless signed and dated

LICENSED PROFESSIONAL ENGINEER
T. L. BURNSIDE
100199868
PROVINCE OF ONTARIO
12/17/21

COBIDE ENGINEERING INC
517 10th STREET Hanover, Ontario N4N 1R4
Telephone: (519) 506-5959
www.cobideeng.com

Title:
SUNVALE HOMES
PROPOSED MOUNT FOREST SUBDIVISION
Township of Wellington North
PRE DEVELOPMENT CATCHMENT AREAS

Client: SUNVALE HOMES

Design:	TLB	Scale:	1:750
Drawn:	TLB	Approved:	
Checked:	TLB		
Date:	JAN 2019		Design Engineer

DRAWING No. 00702-SP1

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CAUTION:
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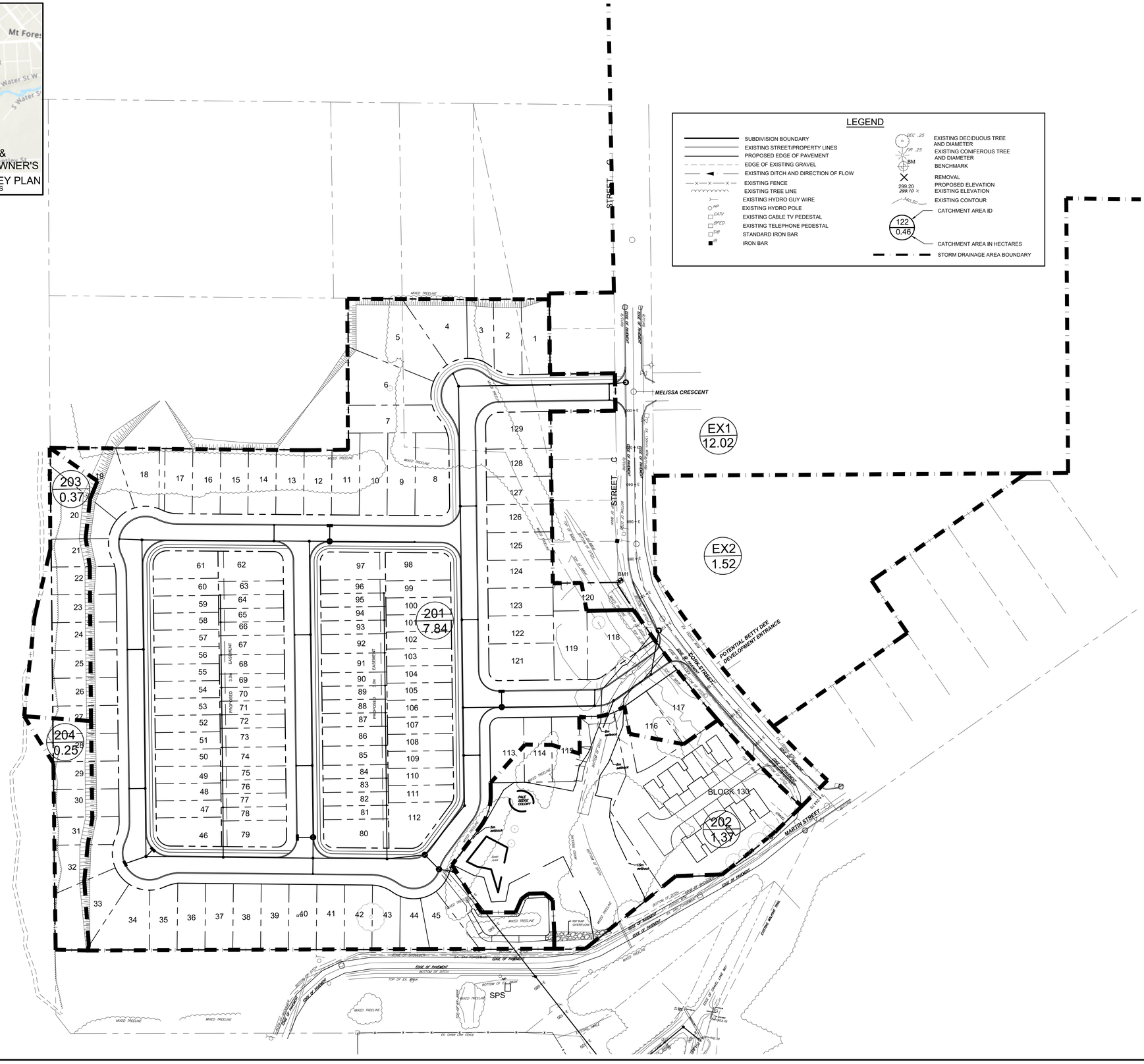
LEGEND

- SUBDIVISION BOUNDARY
- EXISTING STREET/PROPERTY LINES
- PROPOSED EDGE OF PAVEMENT
- EDGE OF EXISTING GRAVEL
- EXISTING DITCH AND DIRECTION OF FLOW
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING HYDRO GUY WIRE
- EXISTING HYDRO POLE
- EXISTING CABLE TV PEDESTAL
- EXISTING TELEPHONE PEDESTAL
- STANDARD IRON BAR
- IRON BAR
- EXISTING DECIDUOUS TREE AND DIAMETER
- EXISTING CONIFEROUS TREE AND DIAMETER
- BENCHMARK
- REMOVAL
- PROPOSED ELEVATION / EXISTING ELEVATION
- EXISTING CONTOUR
- CATCHMENT AREA ID
- CATCHMENT AREA IN HECTARES
- STORM DRAINAGE AREA BOUNDARY



SCALE 1:750 (24 x 36)

10 0 10 20 50 METRES
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1	NOV 18/21	REVISED DRAFT PLAN APPROVAL SUBMISSION	TLB	TLB
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REVISION / ISSUE

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Title:
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Township of Wellington North
POST DEVELOPMENT CATCHMENT AREAS

Client: SUNVALE HOMES

Design:	TLB	Scale:	1:750
Drawn:	TLB	Approved:	
Checked:	TLB		
Date:	JAN 2019		Design Engineer

DRAWING No. 00702-SP1

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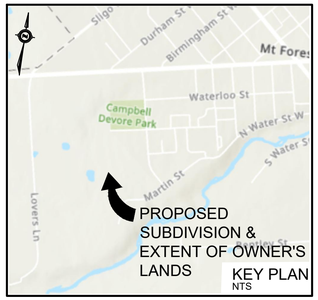

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LEGEND

- SUBDIVISION BOUNDARY
- PROPOSED RIGHT OF WAY
- PROPOSED PROPERTY LINES
- EDGE OF EXISTING PAVEMENT
- EDGE OF EXISTING GRAVEL
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- PROPOSED SUBDRAIN
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- PROPOSED SANITARY SERVICE
- EXISTING SANITARY SERVICE
- PROPOSED WATER SERVICE
- PROPOSED STORM SERVICE
- SANMH — PROPOSED SANITARY MANHOLE
- SANMH — EXISTING SANITARY MANHOLE
- STMMH — PROPOSED STORM MANHOLE
- STMMH — EXISTING STORM MANHOLE
- CBMH — PROPOSED CATCHBASIN MANHOLE
- TICBMH — PROPOSED TWIN INLET CATCHBASIN MANHOLE
- TICB — PROPOSED TWIN INLET CATCHBASIN
- CB — PROPOSED CATCH BASIN
- CB — EXISTING CATCH BASIN
- DICB — PROPOSED DITCH INLET CATCHBASIN
- CO — PROPOSED SANITARY SERVICE CLEANOUT
- CO — EXISTING SANITARY SERVICE CLEANOUT
- CSV — PROPOSED CURB STOP VALVE
- CSV — EXISTING CURB STOP VALVE
- PROPOSED HYDRANT SET
- HYD — EXISTING FIRE HYDRANT
- PROPOSED GATE VALVE
- BV — EXISTING GATE VALVE
- PROPOSED CAP C/W THRUST BLOCK
- PROPOSED BLOWOFF
- T T — EXISTING UNDERGROUND TELEPHONE CABLE
- CATV — EXISTING UNDERGROUND TV CABLE
- GAS — EXISTING UNDERGROUND GAS LINE
- H H — EXISTING UNDERGROUND HYDRO CABLE
- EXISTING HYDRO GUY WIRE
- HP — EXISTING HYDRO POLE
- CATV — EXISTING CABLE TV PEDESTAL
- BRTD — EXISTING TELEPHONE PEDESTAL
- SIB — STANDARD IRON BAR
- IB — IRON BAR
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EXISTING GAS MARKER
- EXISTING WELL
- BM — BENCHMARK
- BH — BOREHOLE
- 486.21 — PROPOSED ELEVATION / EXISTING ELEVATION
- DROP CURB

SCALE 1:750 (24 x 36)
10 0 10 20 50 METRES
50 0 25 50 100 FEET

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REVISION / ISSUE

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Title:
SUNVALE HOMES
PROPOSED MOUNT FOREST SUBDIVISION
Township of Wellington North
CONCEPTUAL GRADING PLAN

Client: SUNVALE HOMES

Design:	TLB	Scale:	1:750
Drawn:	TLB	Approved:	
Checked:	TLB		
Date:	JAN 2019		Design Engineer

DRAWING No. 00702-GR1

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Appendix B

PRE-CONSULTATION

STORMWATER MANAGEMENT REPORT

SUNVALE HOMES MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

COBIDE ENGINEERING INC

MEETING SUMMARY

Sunvale Homes – Mount Forest Subdivision

00702

Date:	June 14, 2019	**Project:**	00702
Time:	1:00 pm	**Location:**	Township of Wellington North Office

Attendees: Mr. Mike Givens, Township of Wellington North
Mr. Darren Jones, Township of Wellington North
Mr. Matt Aston, Township of Wellington North
Mr. Frank Vanderloo, BM Ross
Ms. Linda Redmond, Wellington County
Mr. John Welton, Sunvale Homes
Mr. Ron Davidson, Ron Davidson Land Use Planning
Mr. Travis Burnside, Cobide Engineering Inc.

Purpose: Pre- Consultation Meeting

Distribution: All Present, Ms. Brandi Walter

Prepared By: Travis Burnside

On June 14, 2019, a pre-consultation meeting was held to review the submission requirements related to the Sunvale Homes – Mount Forest Development project. The following is a review of items discussed.

1.0 OVERVIEW OF PROPERTY

The proposed subdivision is located at the intersection of Cork Street and Martin Street. The development will consist of a mix of residential unit types. The current proposal includes 58 single family lots, 30 semi-detached units, 36 street townhouse units and 15 cluster townhouse units.

Two road connections are currently proposed to Cork Street.

It was requested that a walkway block be provided for somewhere between Lots 11 and 19. ***Action: Cobide***

BM Ross also noted the location of the proposed Betty Dee property on the east side of Cork Street and requested that the proposed entrance be shown on future submissions of the plans. ***Action: Cobide***

2.0 OFFICIAL PLAN

The property's current land use designations are residential therefore an Official Plan Amendment (OPA) will not be required as the proposed development is within the residential land use designation.

3.0 ZONING BY-LAW

The property is currently zoned 'Future Development' therefore, a Zoning By-Law Amendment will be required to allow for residential development of the property. It was discussed that the Zoning By-Law amendment and Draft Plan be submitted at the same time and therefore only one public meeting will be required. ***Action: Davidson***

A Planning Justification report will be required as part of the Zoning By-Law Amendment.

The development is 9.79 ha in total area however 0.55 ha has been outlined in the EIS as undevelopable lands. This leaves 9.24 ha available for development.

The plan currently shows 15 units/ha. The County will be looking for a density of 16 units/ha in the final plan however a lower density may be accepted if it can be demonstrated why achieving the requested density is not feasible. ***Action: Davidson***

Subsequent to the meeting, the Townships current setbacks were discussed. The Zoning By-Law Amendment Application will likely include a request for site specific zoning to allow for reduced setbacks.

4.0 ENVIRONMENTAL IMPACT STUDY (EIS)

An EIS for the property was completed by the previous owner. An amendment to the EIS will be required to review the storm outlet which is discussed in further detail in later sections. ***Action: Cobide***

The SVCA would welcome the opportunity to review the EIS and provide initial comments ahead of the Draft Plan Application being submitted.

5.0 FUNCTIONAL SERVICING REPORT

A FSR will be required to address the sanitary sewer, storm sewer, watermain capacity and pressure, as well as servicing from various utilities (Wellington North Power, Wightman, Eastlink, Union Gas). ***Action: Cobide***

The FSR will need to review the viability of using the Cork Street Sanitary Pumping Station including the lowering of sanitary sewers along Cork Street. If this is not feasible, the option of a new sanitary pumping station can be addressed.

6.0 STORMWATER MANAGEMENT

A stormwater management report will be required to address the impacts of the development. Runoff will be required to be treated to an enhanced level of treatment. ***Action: Cobide***

It is currently proposed to provide a direct outlet from the development to South Saugeen River. The storm sewer would outlet close the existing Martin Street storm sewer outlet. This storm sewer may need to be sized to accommodate the 100 year storm event to reduce erosion concerns on Martin Street and the proposed walking trail.

As per previous correspondence with the SVCA, the proposed outlet must be located above the Hurricane Hazel Flood Elevation.

Any runoff that is directed to the westerly property line must meet pre development peak flow rates as well as pre development peak volumes as this area is not owned by the Township.

7.0 ARCHAEOLOGICAL ASSESSMENT

An archaeological assessment is required to be completed. ***Action: Cobide***

8.0 TRAFFIC IMPACT STUDY

A traffic impact study is required for this development ***Action: Cobide***

9.0 GEOTECHNICAL INVESTIGATION

A geotechnical investigation will be required as part of the development. The geotechnical report shall include review of the storm sewer outlet. ***Action: Cobide***

The geotechnical report is not required as part of the Draft Plan Application.

It will be completed after the proposed sanitary servicing and preliminary grading has been worked out.

10.0 SITE SERVICING

The site will be serviced with a storm sewer system that will outlet directly to the South Saugeen River.

The catchment area may be too large for an OGS to service. A settling basin may be proposed to provide quality control to an enhanced level.

The existing sanitary sewer on Cork Street is not deep enough to service the proposed development. Therefore, the sewer either has to be lowered and a sanitary pumping station installed. The Township preference is for all lots to have a gravity connection that outlet to either a new pumping station or the existing Cork Street station.

If a new Sanitary Pumping Station is proposed, further discussions will need to be had regarding the forcemain connection to the existing system. The new forcemain could either connect to existing sanitary sewer on Cork Street or directly to the WWTP.

The watermain will connect to the existing system at both connections to Cork Street. BM Ross confirmed there are no capacity issues in this part of Mount Forest.

The Town will require the internal road to be built to an urban cross section with 8.5m of asphalt, curb and gutter and 1.5m sidewalk on one side of the road.

The plan will need to be revised to have 13.25m edge of pavement radii on bends not at intersections.

A sidewalk may be required to be installed on Cork Street as part of this project. The Township has already collected money from other developments to pay for this work.

As part of the development, Cork Street may need to be reconstructed to an urban standard. This includes a 900mm diameter storm sewer from the current crossing to Martin Street. If required, the development would be able to use this storm sewer for a portion of its runoff such as from the cluster Townhouse development.

As per The Townships servicing standards, all water services shall be copper.

As per The Townships servicing standards, all storm sewers 450mm diameter and larger shall be concrete.

11.0 PARKLAND

The Parkland requirements were not discussed at the meeting however should be confirmed prior to submission of the application. The current proposal does not include any parkland. If the Township wishes for Parkland to be included we would request that we be notified as soon as possible.

12.0 OTHER BUSINESS

The Draft Plan Approval Application will trigger a review by Wellington County of the previously completed Methane Gas Monitoring Report regarding the decommissioned landfill located between the development and the WWTP.

The meeting adjourned at 3:00 pm.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

COBIDE ENGINEERING INC.

Travis Burnside
Director

H:\Sunvale Homes\00702 Sunvale Homes Mount Forest Subdivision\Correspondence\Meeting_Notes\2019-06-19 Pre-Consultation Meeting Summary 00702.doc

Appendix C

IDF PARAMETERS

STORMWATER MANAGEMENT REPORT

SUNVALE HOMES MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2019/02/27

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MOUNT FOREST (AUT) ON 6145504

Latitude: 43 59'N Longitude: 80 45'W Elevation/Altitude: 414 m

Years/Années : 1962 - 2016 # Years/Années : 38

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Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

****

Year / Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1962	10.4	14.7	18.0	18.0	19.6	23.9	33.0	38.9	45.0
1963	14.0	15.2	21.1	31.7	43.7	49.3	51.3	54.9	61.0
1964	10.4	12.2	14.7	25.7	28.4	29.5	35.3	37.6	61.2
1965	10.2	14.5	17.0	22.6	31.5	32.3	33.0	33.5	33.5
1966	9.9	15.2	19.3	21.1	24.6	27.2	28.2	38.1	56.1
1967	11.2	12.7	13.7	17.3	22.9	24.6	36.3	49.8	50.0
1968	8.4	13.5	17.8	28.7	43.4	52.1	74.4	74.7	83.8
1969	6.1	10.4	12.4	18.0	20.1	20.1	35.1	37.6	39.6
1970	8.6	13.2	13.5	15.7	19.0	20.1	36.8	53.6	56.9
1971	12.7	15.0	15.7	16.0	17.8	20.3	26.2	27.2	34.0
1972	6.9	10.2	13.0	18.0	22.4	33.3	45.2	47.5	50.3
1973	5.6	9.4	11.2	13.2	15.2	18.0	23.1	24.4	32.5
1974	5.3	7.1	9.7	19.0	35.6	40.6	42.7	42.7	42.7
1975	6.3	8.4	9.7	18.0	21.1	28.4	36.1	47.5	51.1
1976	9.1	13.5	16.5	19.0	27.7	33.8	35.8	35.8	43.4
1977	11.7	17.0	18.8	20.1	27.7	41.1	69.1	81.3	81.3
1978	14.8	15.4	18.0	21.2	21.6	25.6	40.3	43.7	52.5
1979	10.5	11.1	11.1	14.4	16.6	32.4	40.5	53.4	64.5
1980	8.9	16.3	19.3	25.4	34.3	43.5	48.3	49.4	49.4
1981	7.7	8.8	10.8	12.7	13.4	17.2	31.0	35.8	41.4
1982	6.9	10.9	13.9	18.6	24.6	29.6	30.4	30.6	32.6

1983	7.9	13.7	15.8	31.4	37.2	38.2	38.2	42.0	43.3
1984	6.8	9.2	11.2	14.6	14.6	20.2	25.2	32.8	33.0
1985	8.8	16.4	22.0	38.6	49.2	53.9	56.2	56.2	64.4
1986	8.2	12.7	15.7	22.7	27.2	39.8	46.8	64.4	93.3
2003	9.2	15.8	18.0	23.6	29.2	34.6	37.0	37.0	40.2
2004	8.4	13.0	16.0	20.0	22.4	25.0	39.0	39.4	39.4
2005	5.6	9.2	12.0	20.0	26.8	32.2	32.2	32.4	40.0
2006	8.6	15.2	20.0	21.0	23.2	34.0	48.8	55.2	55.4
2007	11.4	19.0	22.6	30.0	33.8	35.8	35.8	43.4	55.4
2008	9.8	12.8	14.0	19.0	23.2	33.4	47.0	53.0	78.4
2009	12.4	17.6	18.8	24.6	25.2	28.0	38.6	44.4	56.6
2010	8.0	11.6	12.2	17.6	22.8	31.4	59.2	64.8	65.4
2012	6.8	7.8	8.2	12.4	17.0	20.8	34.8	45.4	53.8
2013	8.2	11.2	15.0	26.0	28.4	42.4	65.2	67.2	67.8
2014	9.8	15.4	18.0	25.4	28.0	29.2	33.2	40.2	40.6
2015	8.2	10.2	10.8	12.6	17.6	20.0	29.0	30.6	31.4
2016	9.0	12.0	15.8	24.4	44.4	51.2	52.2	53.8	54.2
# Yrs. Années	38	38	38	38	38	38	38	38	38
Mean Moyenne	9.0	12.8	15.3	21.0	26.4	31.9	40.8	45.8	52.0
Std. Dev. Écart-type	2.3	2.9	3.7	5.9	8.8	9.9	12.0	12.9	15.3
Skew. Dissymétrie	0.58	-0.05	0.05	0.85	0.91	0.56	1.12	0.81	0.83
Kurtosis	3.38	2.46	2.39	4.02	3.57	2.89	4.15	3.69	3.59

*-99.9 Indicates Missing Data/Données manquantes

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Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	8.6	10.6	12.0	13.6	14.9	16.1	38
10 min	12.3	14.9	16.7	18.8	20.4	22.0	38
15 min	14.7	17.9	20.1	22.8	24.8	26.8	38
30 min	20.0	25.3	28.7	33.1	36.3	39.5	38
1 h	24.9	32.7	37.8	44.3	49.1	53.9	38
2 h	30.3	39.0	44.8	52.1	57.5	62.9	38
6 h	38.8	49.4	56.4	65.3	71.9	78.4	38
12 h	43.7	55.1	62.7	72.3	79.4	86.4	38
24 h	49.5	63.0	71.9	83.2	91.5	99.9	38

****

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	103.8	127.8	143.6	163.7	178.6	193.4	38
	+/- 7.9	+/- 13.3	+/- 18.0	+/- 24.3	+/- 29.1	+/- 33.9	38
10 min	74.1	89.6	99.9	113.0	122.6	132.2	38
	+/- 5.1	+/- 8.7	+/- 11.7	+/- 15.8	+/- 18.9	+/- 22.0	38
15 min	58.8	71.8	80.4	91.3	99.3	107.3	38
	+/- 4.3	+/- 7.2	+/- 9.8	+/- 13.2	+/- 15.8	+/- 18.4	38
30 min	40.1	50.5	57.4	66.1	72.6	79.0	38
	+/- 3.4	+/- 5.8	+/- 7.8	+/- 10.6	+/- 12.6	+/- 14.7	38
1 h	24.9	32.7	37.8	44.3	49.1	53.9	38
	+/- 2.6	+/- 4.3	+/- 5.8	+/- 7.9	+/- 9.4	+/- 10.9	38
2 h	15.1	19.5	22.4	26.0	28.8	31.4	38
	+/- 1.4	+/- 2.4	+/- 3.3	+/- 4.4	+/- 5.3	+/- 6.2	38
6 h	6.5	8.2	9.4	10.9	12.0	13.1	38
	+/- 0.6	+/- 1.0	+/- 1.3	+/- 1.8	+/- 2.1	+/- 2.5	38
12 h	3.6	4.6	5.2	6.0	6.6	7.2	38
	+/- 0.3	+/- 0.5	+/- 0.7	+/- 1.0	+/- 1.2	+/- 1.3	38
24 h	2.1	2.6	3.0	3.5	3.8	4.2	38
	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.6	+/- 0.7	+/- 0.8	38

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

****

Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	36.5	45.3	51.0	58.3	63.7	69.1
Std. Dev. /Écart-type (RR)	35.7	43.5	48.7	55.3	60.2	65.0
Std. Error/Erreur-type	8.4	10.6	12.1	14.1	15.5	17.0
Coefficient (A)	21.9	27.5	31.2	35.9	39.4	42.9
Exponent/Exposant (B)	-0.701	-0.693	-0.689	-0.686	-0.683	-0.682
Mean % Error/% erreur moyenne	9.3	10.4	11.1	11.8	12.2	12.5

Appendix D

PRE DEVELOPMENT MODEL PARAMETERS AND OUTPUT

STORMWATER MANAGEMENT REPORT

SUNVALE HOMES MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

Table A.1 Parameter Summary Table

Existing Conditions										
Outlet Location	**Model Catchment ID**	**Description**	**Area (ha)**	**Drainage Channel (m)**	**Flow Length (m)**	**Gradient (%)**	**Total Imperv. Connected (%)**	**Not Connected Imperv. (%)**	**Manning's 'n' (Perv.)**	**CN (Perv.)**
South Saugeen	101	Southeast Portion of Property	2.85	320	89	3.0	0.0	100%	0.28	72.3
Unnamed Watercourse	102	Middle of the Development	5.52	320	173	3.0	0.0	100%	0.17	76.4
Unnamed Watercourse	103	Northwest corner of development	1.56	132	118	3.0	0.0	100%	0.20	75.0
South Saugeen	Ex 1	Van Den Broek Subdivision	11.95	3060	39	2.0	46.3	50%	0.25	77.0
South Saugeen	Ex 2	Betty Dee Property	1.52	150	101	2.0	0.0	100%	0.30	72.0

Table A.2 Site Soils: (as per Ontario Soil Survey Report No. 35 for Wellington County)

Soil Type
Listowel Silt Loam

Hydologic Soil Group
BC

TABLE OF CURVE NUMBERS (CN's)									
Land Use	Hydrologic Soil Type								
	A	AB	B	BC	C	CD	D	Manning's 'n'	
Meadow	50	54	58	64.5	71	74.5	78	0.4	continuous grass
Woodlot	50	55.3	60.5	67	73.5	76.8	80	0.4	forests
Long Grass	55	60	65	72	79	81.5	84	0.3	natural, not maintained
Lawns	60	65.5	71	77	83	86	89	0.25	maintained
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	farm pasture
Crop	66	70	74	78	82	84	86	0.13	farm land
Fallow (bare)	77	82	86	89	91	93	94	0.05	idle farm land (bare)
Built-up	60	65.5	71	77	83	89	89	0.25	Lawns Existing
Streets, paved	98	98	98	98	98	98	98	0.01	

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
101	0	0	0	100	0	0	0	100
102	0	0	0	100	0	0	0	100
103	0	0	0	100	0	0	0	100
EX1	0	0	0	100	0	0	0	100
EX2	0	0	0	100	0	0	0	100

LAND USE (%) - Existing Conditions										
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Imperv. Not Connected (Rooftops)	Imperv. Connected	Total
101	0	20	59	0	0.0	21.0	0	0.0	0.0	100
102	0	12	5	0	0	83	0	0.0	0.0	100
103	0	27	0	0	0	73	0	0.0	0.0	100
EX1	0	0	0	54	0.0	0	0	23.3	23.1	100
EX2	0	0	100	0	0	0	0	0.0	0.0	100

CURVE NUMBER (CN) - Existing Conditions											
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Built-up	Imperv. Not Connected (Rooftops)	Weighted CN - Pervious	Manning's 'n'
101	65	67	72	77	70.5	78	89	77	90	72.3	0.28
102	65	67.0	72	77	71	78	89	77	90	76.4	0.17
103	65	67	72	77	70.5	78	89	77	90	75.0	0.20
EX1	65	67	72	77	70.5	78	89	77	90	77.0	0.25
EX2	65	67	72	77	70.5	78	89	77	90	72.0	0.30

Table A.3: Impervious Area Determination for Subcatchment 101 - 102

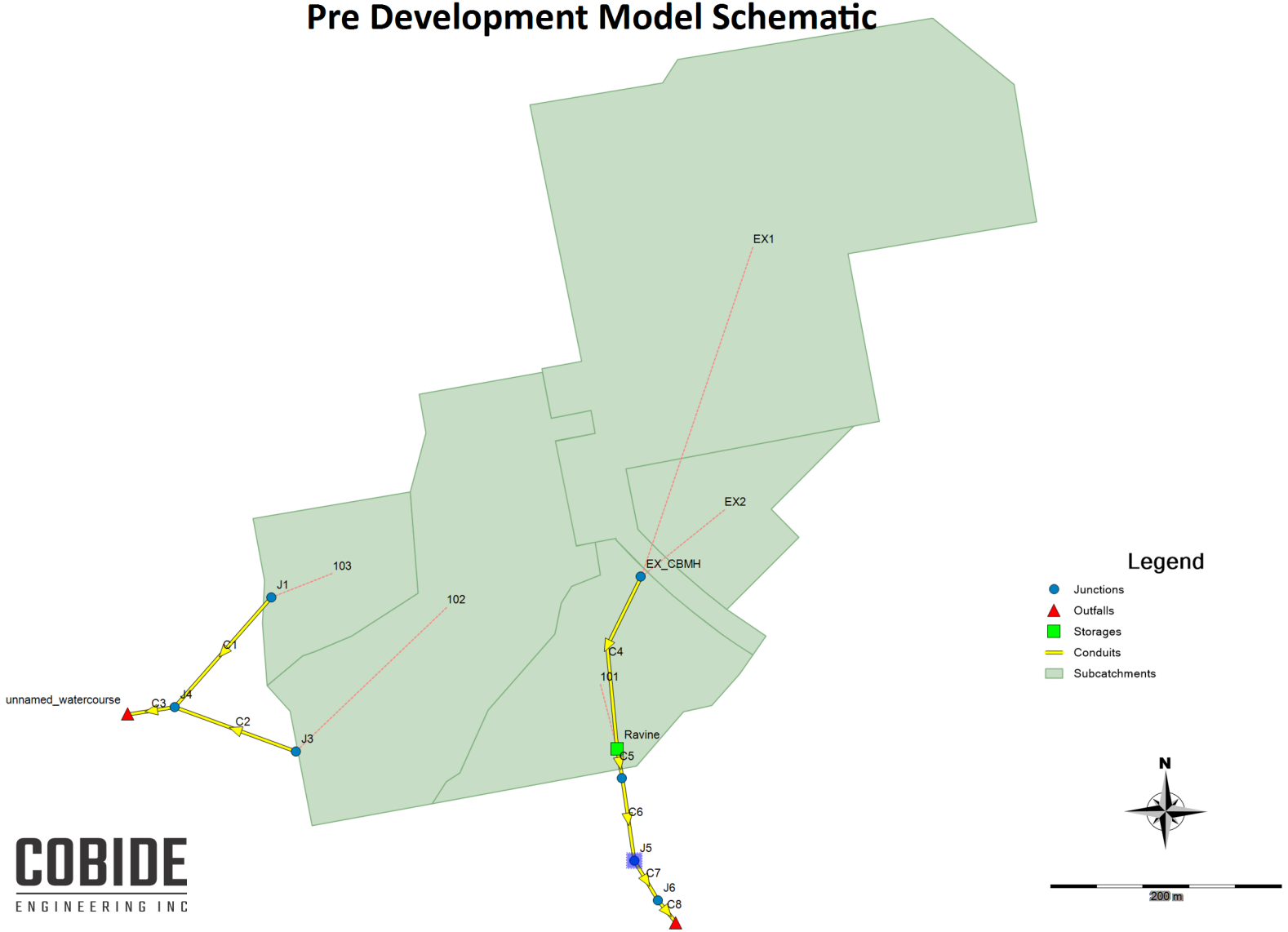
Existing Conditions

Area of Concern	Total Area (ha)	Impervious Area Connected		Impervious Area Not Connected (Rooftops)		Total (%)
		(ha)	(%)	(ha)	(%)	
101	2.85	0.00	0.0	0.00	0.0	0.0
102	5.52	0.00	0.0	0.00	0.0	0.0
103	1.56	0.00	0.0	0.00	0.0	0.0
EX1	11.95	2.76	23.1	2.78	23.3	46.3
EX2	1.52	0.00	0.0	0.00	0.0	0.0

Table A.3 - Impervious Area Determination for Existing Catchments 101-102

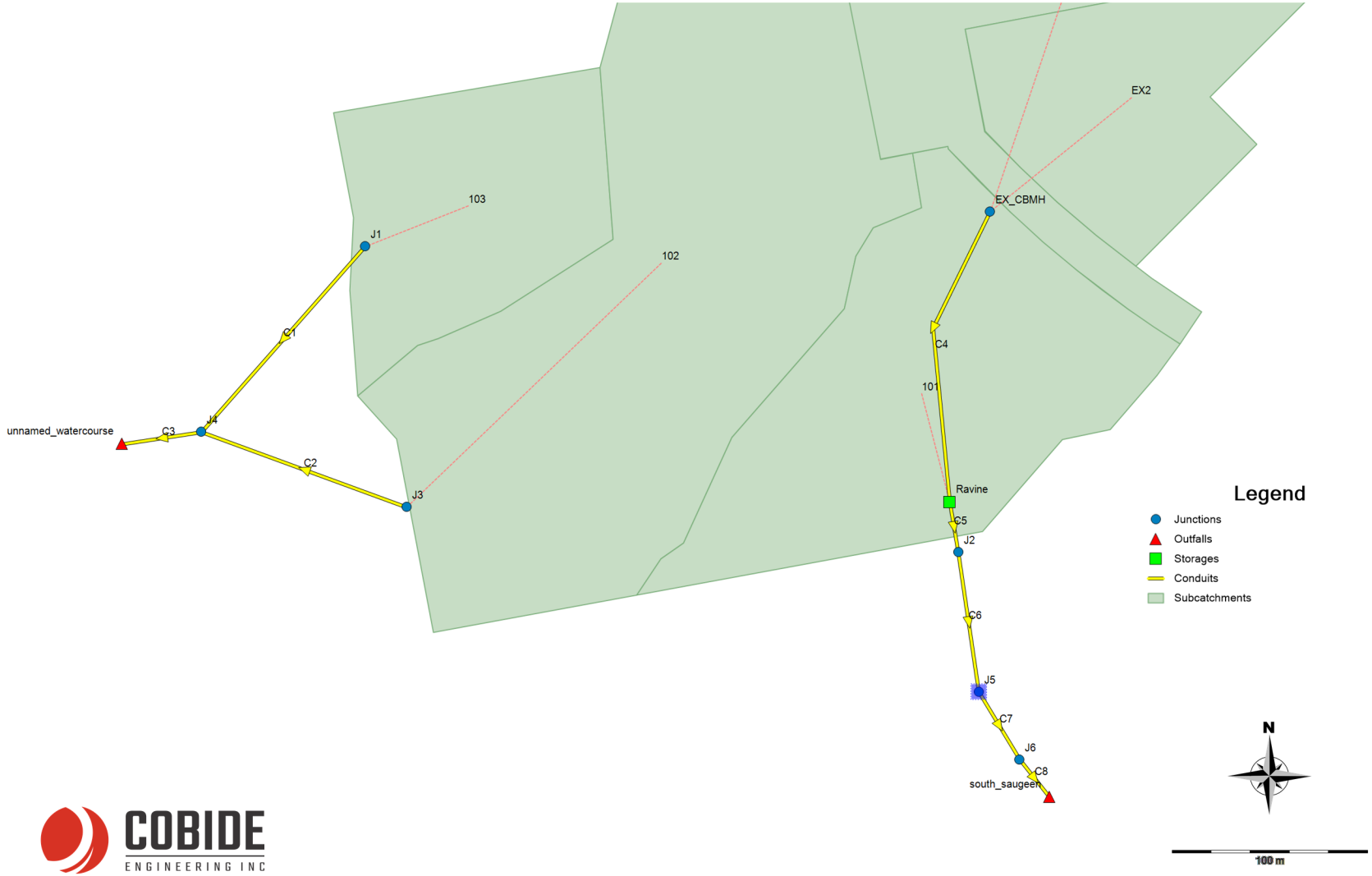
Catchment					Imperv. Area	Imperv %
101	0	m of	20	m wide ROW @ 45% imperv.	0.00 ha	0.0 %
	0	Impervious Area	814	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Roof Area	220	m^2 @ 100% imperv.	0.00 ha	0.0 %
					0.00 ha	
102	0	m of	10	m wide ROW @ 50% imperv.	0.00 ha	0.0 %
	0	Impervious Area	3490	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Roof Area	220	m^2 @ 100% imperv.	0.00 ha	0.0 %
					0.00 ha	
103	0	m of	20	m wide ROW @ 45% imperv.	0.00 ha	0.0 %
	0	Impervious Area	1826	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Roof Area	2025	m^2 @ 100% imperv.	0.00 ha	0.0 %
					0.00 ha	
EX1	1530	m of	20	m wide ROW @ 55% imperv.	1.68 ha	14.1 %
	70	Impervious Area	90	m^2 @ 100% imperv.	0.63 ha	5.3 %
	59	Impervious Area	75	m^2 @ 100% imperv.	0.44 ha	3.7 %
	13	Townhouse Roof Ar	130	m^2 @ 100% imperv.	0.17 ha	1.4 %
	46	Semi Roof Area	165	m^2 @ 100% imperv.	0.76 ha	6.4 %
	70	Single Roof Area	265	m^2 @ 100% imperv.	1.86 ha	15.5 %
					5.54 ha	
EX2	0	m of	20	m wide ROW @ 45% imperv.	0.00 ha	0.0 %
	0	Impervious Area	220	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Roof Area	250	m^2 @ 100% imperv.	0.00 ha	0.0 %
					0.00 ha	

Sunvale Homes - Mount Forest Subdivision
Pre Development Model Schematic



COBIDE ENGINEERING INC

Sunvale Mount Forest Subdivision - Outlet Schematic



COBIDE ENGINEERING INC

Sunvale Homes – Mount Forest Subdivision – Pre Development Model Details

[TITLE]

[OPTIONS]

;;Options	Value
FLOW_UNITS	LPS
INFILTRATION	CURVE_NUMBER
FLOW_ROUTING	DYNWAVE
START_DATE	9/10/2020
START_TIME	00:00
REPORT_START_DATE	9/10/2020
REPORT_START_TIME	00:00
END_DATE	9/11/2020
END_TIME	00:00
SWEEP_START	1/1
SWEEP_END	12/31
DRY_DAYS	0
REPORT_STEP	00:01:00
WET_STEP	00:05:00
DRY_STEP	00:05:00
ROUTING_STEP	5
ALLOW_PONDING	NO
INERTIAL_DAMPING	PARTIAL
VARIABLE_STEP	0.75
LENGTHENING_STEP	0
MIN_SURFAREA	0
NORMAL_FLOW_LIMITED	BOTH
SKIP_STEADY_STATE	NO
FORCE_MAIN_EQUATION	H-W
LINK_OFFSETS	ELEVATION
MIN_SLOPE	0
MAX_TRIALS	8
HEAD_TOLERANCE	0
SYS_FLOW_TOL	5
LAT_FLOW_TOL	5
MINIMUM_STEP	0.5
THREADS	2

[EVAPORATION]

;;Type	Parameters
CONSTANT	0.0
DRY_ONLY	NO

[RAINGAGES]

;;Name	Rain Type	Time Intrvl	Snow Catch	Data Source	
Hurricane_Hazel_(Southern_Ontario)	INTENSITY	1:00	1.0	TIMESERIES	Hurricane_Hazel_(Southern_Ontario)
SCS_6h_38.8mm_2yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_38.8mm_2yr
SCS_6h_49.4mm_5yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_49.4mm_5yr
SCS_6h_65.3mm_25yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_65.3mm_25yr
SCS_6h_71.9mm_50yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_71.9mm_50yr
SCS_6h_78.4mm_100yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_78.4mm_100yr
SCS_6h_88mm_MTO100Yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_88mm_MTO100Yr

[SUBCATCHMENTS]

;;Name	Raingage	Outlet	Total Area	Pcnt. Imperv	Width	Pcnt. Slope	Curb Length	Snow Pack
101	SCS_6h_38.8mm_2yr	Ravine	2.85	0	320	3	0	
102	SCS_6h_38.8mm_2yr	J3	5.52	0	320	3	0	
103	SCS_6h_38.8mm_2yr	J1	1.56	0	132	3	0	
EX1	SCS_6h_38.8mm_2yr	EX_CBMH	11.95	46.3	3060	2	0	
EX2	SCS_6h_38.8mm_2yr	EX_CBMH	1.52	0	150	2	0	

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
101	0.01	0.28	0.05	0.05	25	OUTLET	
102	0.01	0.17	0.05	0.05	25	OUTLET	
103	0.01	0.2	0.05	0.05	25	OUTLET	
EX1	0.01	0.25	0.05	0.05	25	OUTLET	

Sunvale Homes – Mount Forest Subdivision – Pre Development Model Details

```
EX2              0.01       0.3        0.05       0.05       25         OUTLET

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
101              72.3       0.5        7
102              76.4       0.5        7
103              75         0.5        7
EX1              77         0.5        7
EX2              72         0.5        7

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
EX_CBMH          409.13     1.98       0          0          0
J1               407.5      0.5        0          0          0
J2               406.3      1          0          0          0
J3               407        0.5        0          0          0
J4               406        0.5        0          0          0
J5               402.3      2.7        0          0          0
J6               401.8      1.7        0          0          0

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
south_saugeen    401.5      FREE                          NO
unnamed_watercourse 405.5   FREE                          NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                    Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                   Area     Frac.
Infiltration parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------
------------
Ravine           406.65   2.75     0        TABULAR    Ravine                   0        0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- -----
-----
C1               J1               J4               75         0.013      407.5      406        0          0
C2               J3               J4               111.98     0.013      407        406        0          0
C3               J4               unnamed_watercourse 40.99   0.013      406        405.5      0          0
C4               EX_CBMH          Ravine           100        0.03       409.13     408.15     0          0
C5               Ravine           J2               15         0.02       406.65     406.43     0          0
C6               J2               J5               45         0.03       406.3      404.2      0          0
C7               J5               J6               14.26      0.02       402.3      402.2      0          0
C8               J6               south_saugeen    10         0.03       401.8      401.5      0          0

[XSECTIONS]
;;Link            Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
C1               TRIANGULAR   0.5              35         0          0          1
C2               TRIANGULAR   0.5              45         0          0          1
C3               RECT_OPEN    0.5              50         0          0          1
C4               TRAPEZOIDAL  0.5              0.6        5          5          1
C5               CIRCULAR     0.75             0          0          0          1
C6               TRIANGULAR   0.8              5          0          0          1
C7               CIRCULAR     0.95             0          0          0          1
C8               TRAPEZOIDAL  0.8              3          1.2        2          1

[LOSSES]
;;Link            Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
;;Name            Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Ravine           Storage    0          0
Ravine                      0.35       9
Ravine                      .85        70
```

Sunvale Homes – Mount Forest Subdivision – Pre Development Model Details

```
Ravine                     1.35       345
Ravine                     1.85       1090
Ravine                     2.35       3710

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Hurricane Hazel (Southern Ontario) design storm for 0 - 25 km², total rainfall = 211 mm (100%), rain units =
mm/hr.
Hurricane_Hazel_(Southern_Ontario)

;SCS_6h_38.8mm design storm, total rainfall = 38.8 mm, rain units = mm/hr.
SCS_6h_38.8mm_2yr

;SCS_6h_49.4mm design storm, total rainfall = 49.4 mm, rain units = mm/hr.
SCS_6h_49.4mm_5yr

;SCS_6h_65.3mm design storm, total rainfall = 65.3 mm, rain units = mm/hr.
SCS_6h_65.3mm_25yr

;SCS_6h_71.9mm design storm, total rainfall = 71.9 mm, rain units = mm/hr.
SCS_6h_71.9mm_50yr

;SCS_6h_78.4mm design storm, total rainfall = 78.4 mm, rain units = mm/hr.
SCS_6h_78.4mm_100yr

;SCS_6h_88mm design storm, total rainfall = 88 mm, rain units = mm/hr.
SCS_6h_88mm_MTO100Yr

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       520101.080933305 4868406.19899591 520966.866164664 4869268.5705494
UNITS            Meters
```

Sunvale Homes – Mount Forest Subdivision – Pre Development – 2 Yr Storm Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 5
Number of nodes ........... 10
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Hurricane_Hazel_(Southern_Ontario) Hurricane_Hazel_(Southern_Ontario) INTENSITY   60 min.
SCS_6h_38.8mm_2yr    SCS_6h_38.8mm_2yr           INTENSITY    5 min.
SCS_6h_49.4mm_5yr    SCS_6h_49.4mm_5yr           INTENSITY    5 min.
SCS_6h_65.3mm_25yr   SCS_6h_65.3mm_25yr          INTENSITY    5 min.
SCS_6h_71.9mm_50yr   SCS_6h_71.9mm_50yr          INTENSITY    5 min.
SCS_6h_78.4mm_100yr  SCS_6h_78.4mm_100yr         INTENSITY    5 min.
SCS_6h_88mm_MTO100Yr SCS_6h_88mm_MTO100Yr        INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
101                         2.85    320.00      0.00    3.0000 SCS_6h_38.8mm_2yr    Ravine
102                         5.52    320.00      0.00    3.0000 SCS_6h_38.8mm_2yr    J3
103                         1.56    132.00      0.00    3.0000 SCS_6h_38.8mm_2yr    J1
EX1                        11.95   3060.00     46.30    2.0000 SCS_6h_38.8mm_2yr    EX_CBMH
EX2                         1.52    150.00      0.00    2.0000 SCS_6h_38.8mm_2yr    EX_CBMH


************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                 Type              Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------
EX_CBMH              JUNCTION         409.13      1.98       0.0
J1                   JUNCTION         407.50      0.50       0.0
J2                   JUNCTION         406.30      1.00       0.0
J3                   JUNCTION         407.00      0.50       0.0
J4                   JUNCTION         406.00      0.50       0.0
J5                   JUNCTION         402.30      2.70       0.0
J6                   JUNCTION         401.80      1.70       0.0
south_saugeen        OUTFALL          401.50      0.80       0.0
unnamed_watercourse  OUTFALL          405.50      0.50       0.0
Ravine               STORAGE          406.65      2.75       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1               J1               J4               CONDUIT           75.0    2.0004    0.0130
C2               J3               J4               CONDUIT          112.0    0.8931    0.0130
C3               J4               unnamed_watercourse CONDUIT          41.0    1.2199    0.0130
C4               EX_CBMH          Ravine           CONDUIT          100.0    0.9800    0.0300
C5               Ravine           J2               CONDUIT           15.0    1.4668    0.0200
C6               J2               J5               CONDUIT           45.0    4.6718    0.0300
C7               J5               J6               CONDUIT           14.3    0.7013    0.0200
C8               J6               south_saugeen    CONDUIT           10.0    3.0014    0.0300
```

Sunvale Homes – Mount Forest Subdivision – Pre Development – 2 Yr Storm Event

```
**********
Cross Section Summary
**********
```

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRAPEZOIDAL	0.50	1.55	0.27	5.60	1	2147.24
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01
C7	CIRCULAR	0.95	0.71	0.24	0.95	1	1138.29
C8	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71

```
*********************************************************
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
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 09/10/2020 00:00:00
Ending Date .............. 09/11/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 2
Head Tolerance ........... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.908	38.807
Evaporation Loss	0.000	0.000
Infiltration Loss	0.483	20.648
Surface Runoff	0.422	18.040
Final Storage	0.003	0.133
Continuity Error (%)	-0.036	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.422	4.222
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.422	4.221
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

Sunvale Homes – Mount Forest Subdivision – Pre Development – 2 Yr Storm Event

```
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.001
Continuity Error (%) .....         -0.001
```

```
**************************
Time-Step Critical Elements
**************************
Link C5 (21.18%)
```

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

```
************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.04 sec
Average Time Step           :     4.79 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101	38.81	0.00	0.00	28.64	9.98	0.28	21.15	0.257
102	38.81	0.00	0.00	27.08	11.52	0.64	46.72	0.297
103	38.81	0.00	0.00	27.43	11.20	0.17	13.89	0.289
EX1	38.81	0.00	0.00	13.79	24.99	2.99	569.35	0.644
EX2	38.81	0.00	0.00	29.29	9.25	0.14	9.34	0.238

```
******************
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
EX_CBMH	JUNCTION	0.05	0.29	409.42	0 02:25	0.29
J1	JUNCTION	0.01	0.03	407.53	0 02:45	0.03
J2	JUNCTION	0.07	0.31	406.61	0 02:26	0.31
J3	JUNCTION	0.02	0.05	407.05	0 02:47	0.05
J4	JUNCTION	0.00	0.00	406.00	0 02:48	0.00
J5	JUNCTION	0.08	0.46	402.76	0 02:26	0.46
J6	JUNCTION	0.02	0.13	401.93	0 02:26	0.13
south_saugeen	OUTFALL	0.02	0.13	401.63	0 02:26	0.13
unnamed_watercourse	OUTFALL	0.00	0.00	405.50	0 02:48	0.00
Ravine	STORAGE	0.08	0.45	407.10	0 02:25	0.45

```
******************
Node Inflow Summary
******************
```

	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error

Sunvale Homes – Mount Forest Subdivision – Pre Development – 2 Yr Storm Event

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
EX_CBMH	JUNCTION	575.03	575.03	0 02:25	3.13	3.13	0.006
J1	JUNCTION	13.89	13.89	0 02:45	0.175	0.175	0.008
J2	JUNCTION	0.00	584.85	0 02:25	0	3.41	0.001
J3	JUNCTION	46.72	46.72	0 02:45	0.636	0.636	0.016
J4	JUNCTION	0.00	60.42	0 02:47	0	0.81	0.020
J5	JUNCTION	0.00	584.55	0 02:26	0	3.41	0.001
J6	JUNCTION	0.00	584.62	0 02:26	0	3.41	0.003
south_saugeen	OUTFALL	0.00	584.64	0 02:26	0	3.41	0.000
unnamed_watercourse	OUTFALL	0.00	60.38	0 02:48	0	0.81	0.000
Ravine	STORAGE	21.15	585.01	0 02:25	0.285	3.41	0.001

****
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 LPS
Ravine	0.000	0	0	0	0.003	0	0 02:25	584.85

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.62	50.09	584.64	3.411
unnamed_watercourse	95.04	11.25	60.38	0.810
System	97.33	61.34	625.66	4.221

****
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
C1	CONDUIT	13.86	0 02:46	1.19	0.00	0.04
C2	CONDUIT	46.59	0 02:48	1.22	0.00	0.06
C3	CONDUIT	60.38	0 02:48	0.25	0.00	0.01
C4	CONDUIT	569.33	0 02:25	1.06	0.27	0.55
C5	CONDUIT	584.85	0 02:25	2.12	0.67	0.60
C6	CONDUIT	584.55	0 02:26	2.00	0.08	0.38
C7	CONDUIT	584.62	0 02:26	1.77	0.51	0.47
C8	CONDUIT	584.64	0 02:26	1.40	0.04	0.16

Sunvale Homes – Mount Forest Subdivision – Pre Development – 2 Yr Storm Event

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
C1	1.00	0.03	0.00	0.00	0.01	0.96	0.00	0.00	0.00	0.00
C2	1.00	0.03	0.00	0.00	0.01	0.97	0.00	0.00	0.00	0.00
C3	1.00	0.04	0.00	0.00	0.76	0.20	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.72	0.28	0.00	0.00	0.02	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Dec 17 09:44:36 2021
Analysis ended on: Fri Dec 17 09:44:36 2021
Total elapsed time: < 1 sec

Sunvale Homes – Mount Forest Subdivision – Pre Development – 5 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 5
Number of nodes 10
Number of links 8
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101	2.85	320.00	0.00	3.0000	SCS_6h_49.4mm_5yr	Ravine
102	5.52	320.00	0.00	3.0000	SCS_6h_49.4mm_5yr	J3
103	1.56	132.00	0.00	3.0000	SCS_6h_49.4mm_5yr	J1
EX1	11.95	3060.00	46.30	2.0000	SCS_6h_49.4mm_5yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_49.4mm_5yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	406.30	1.00	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	402.30	2.70	0.0	
J6	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	EX_CBMH	Ravine	CONDUIT	100.0	0.9800	0.0300
C5	Ravine	J2	CONDUIT	15.0	1.4668	0.0200
C6	J2	J5	CONDUIT	45.0	4.6718	0.0300
C7	J5	J6	CONDUIT	14.3	0.7013	0.0200
C8	J6	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Pre Development – 5 Yr Storm Event

```
*********************
Cross Section Summary
*********************
                                    Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape             Depth     Area     Rad.    Width  Barrels     Flow
-------------------------------------------------------------------------------------
C1               TRIANGULAR         0.50     8.75     0.25    35.00        1 37770.94
C2               TRIANGULAR         0.50    11.25     0.25    45.00        1 32451.06
C3               RECT_OPEN          0.50    25.00     0.49    50.00        1 132058.05
C4               TRAPEZOIDAL        0.50     1.55     0.27     5.60        1  2147.24
C5               CIRCULAR           0.75     0.44     0.19     0.75        1   876.46
C6               TRIANGULAR         0.80     2.00     0.38     5.00        1  7573.01
C7               CIRCULAR           0.95     0.71     0.24     0.95        1  1138.29
C8               TRAPEZOIDAL        0.80     3.42     0.57     5.56        1 13546.71


*********************************************************
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
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 09/10/2020 00:00:00
Ending Date .............. 09/11/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 2
Head Tolerance ........... 0.001524 m


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.156        49.408
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.567        24.227
Surface Runoff ...........         0.586        25.064
Final Storage ............         0.003         0.134
Continuity Error (%) .....        -0.036


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.587         5.866
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.587         5.865
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
```

Sunvale Homes – Mount Forest Subdivision – Pre Development – 5 Yr Storm Event

```
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.000          0.001
Continuity Error (%) .....          0.000


**************************
Time-Step Critical Elements
**************************
Link C5 (25.29%)


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     2.45 sec
Average Time Step           :     4.69 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101	49.41	0.00	0.00	33.92	15.31	0.44	38.12	0.310
102	49.41	0.00	0.00	31.65	17.54	0.97	83.29	0.355
103	49.41	0.00	0.00	32.24	16.99	0.27	24.49	0.344
EX1	49.41	0.00	0.00	16.10	33.28	3.98	775.84	0.673
EX2	49.41	0.00	0.00	34.75	14.39	0.22	15.97	0.291

```
******************
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
EX_CBMH	JUNCTION	0.06	0.34	409.47	0 02:25	0.34
J1	JUNCTION	0.01	0.04	407.54	0 02:45	0.04
J2	JUNCTION	0.08	0.35	406.65	0 02:26	0.35
J3	JUNCTION	0.02	0.07	407.07	0 02:45	0.07
J4	JUNCTION	0.00	0.01	406.01	0 02:46	0.01
J5	JUNCTION	0.10	0.55	402.85	0 02:26	0.55
J6	JUNCTION	0.02	0.16	401.96	0 02:26	0.16
south_saugeen	OUTFALL	0.02	0.16	401.66	0 02:26	0.16
unnamed_watercourse	OUTFALL	0.00	0.01	405.51	0 02:46	0.01
Ravine	STORAGE	0.09	0.56	407.21	0 02:25	0.56

```
******************
Node Inflow Summary
******************
```

	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error

Sunvale Homes – Mount Forest Subdivision – Pre Development – 5 Yr Storm Event

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
EX_CBMH	JUNCTION	787.17	787.17	0 02:25	4.2	4.2	0.004
J1	JUNCTION	24.49	24.49	0 02:45	0.265	0.265	0.005
J2	JUNCTION	0.00	809.41	0 02:25	0	4.63	0.001
J3	JUNCTION	83.29	83.29	0 02:45	0.968	0.968	0.011
J4	JUNCTION	0.00	107.49	0 02:45	0	1.23	0.015
J5	JUNCTION	0.00	809.09	0 02:26	0	4.63	0.000
J6	JUNCTION	0.00	809.18	0 02:26	0	4.63	0.003
south_saugeen	OUTFALL	0.00	809.20	0 02:26	0	4.63	0.000
unnamed_watercourse	OUTFALL	0.00	107.40	0 02:46	0	1.23	0.000
Ravine	STORAGE	38.12	809.98	0 02:25	0.436	4.63	0.001

****
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 LPS
Ravine	0.000	0	0	0	0.006	0	0 02:25	809.41

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.66	73.14	809.20	4.632
unnamed_watercourse	95.86	18.43	107.40	1.233
System	97.76	91.57	891.35	5.865

****
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
C1	CONDUIT	24.47	0 02:45	1.35	0.00	0.05
C2	CONDUIT	83.04	0 02:45	1.39	0.00	0.07
C3	CONDUIT	107.40	0 02:46	0.31	0.00	0.01
C4	CONDUIT	779.38	0 02:25	1.15	0.36	0.63
C5	CONDUIT	809.41	0 02:25	2.29	0.92	0.75
C6	CONDUIT	809.09	0 02:26	2.16	0.11	0.43
C7	CONDUIT	809.18	0 02:26	1.96	0.71	0.56
C8	CONDUIT	809.20	0 02:26	1.58	0.06	0.20

Sunvale Homes – Mount Forest Subdivision – Pre Development – 5 Yr Storm Event

****
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	0.00	0.00	0.01	0.97	0.00	0.00	0.00	0.00
C2	1.00	0.02	0.00	0.00	0.00	0.97	0.00	0.00	0.00	0.00
C3	1.00	0.03	0.00	0.00	0.74	0.23	0.00	0.00	0.06	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.70	0.30	0.00	0.00	0.03	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Dec 17 09:43:47 2021
Analysis ended on: Fri Dec 17 09:43:48 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Pre Development – 25 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 5
Number of nodes 10
Number of links 8
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101	2.85	320.00	0.00	3.0000	SCS_6h_65.3mm_25yr	Ravine
102	5.52	320.00	0.00	3.0000	SCS_6h_65.3mm_25yr	J3
103	1.56	132.00	0.00	3.0000	SCS_6h_65.3mm_25yr	J1
EX1	11.95	3060.00	46.30	2.0000	SCS_6h_65.3mm_25yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_65.3mm_25yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	406.30	1.00	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	402.30	2.70	0.0	
J6	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	EX_CBMH	Ravine	CONDUIT	100.0	0.9800	0.0300
C5	Ravine	J2	CONDUIT	15.0	1.4668	0.0200
C6	J2	J5	CONDUIT	45.0	4.6718	0.0300
C7	J5	J6	CONDUIT	14.3	0.7013	0.0200
C8	J6	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Pre Development – 25 Yr Storm Event

```
**********
Cross Section Summary
**********
```

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRAPEZOIDAL	0.50	1.55	0.27	5.60	1	2147.24
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01
C7	CIRCULAR	0.95	0.71	0.24	0.95	1	1138.29
C8	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71

```
*********************************************************
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
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 09/10/2020 00:00:00
Ending Date .............. 09/11/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 2
Head Tolerance ........... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.528	65.310
Evaporation Loss	0.000	0.000
Infiltration Loss	0.671	28.659
Surface Runoff	0.855	36.540
Final Storage	0.003	0.135
Continuity Error (%)	-0.037	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.855	8.552
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.855	8.551
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

Sunvale Homes – Mount Forest Subdivision – Pre Development – 25 Yr Storm Event

```
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.000          0.001
Continuity Error (%) .....          0.000


**************************
Time-Step Critical Elements
**************************
Link C5 (30.01%)


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.45 sec
Average Time Step           :     4.54 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101	65.31	0.00	0.00	40.58	24.55	0.70	73.41	0.376
102	65.31	0.00	0.00	37.25	27.84	1.54	157.35	0.426
103	65.31	0.00	0.00	38.20	26.94	0.42	47.47	0.412
EX1	65.31	0.00	0.00	18.96	46.33	5.54	1114.10	0.709
EX2	65.31	0.00	0.00	41.54	23.50	0.36	30.85	0.360

```
******************
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
EX_CBMH	JUNCTION	0.08	0.39	409.52	0 02:25	0.39
J1	JUNCTION	0.02	0.05	407.55	0 02:31	0.05
J2	JUNCTION	0.10	0.40	406.70	0 02:26	0.40
J3	JUNCTION	0.03	0.08	407.08	0 02:32	0.08
J4	JUNCTION	0.00	0.01	406.01	0 02:32	0.01
J5	JUNCTION	0.13	0.69	402.99	0 02:26	0.69
J6	JUNCTION	0.03	0.20	402.00	0 02:26	0.20
south_saugeen	OUTFALL	0.03	0.20	401.70	0 02:26	0.20
unnamed_watercourse	OUTFALL	0.00	0.01	405.51	0 02:33	0.01
Ravine	STORAGE	0.12	0.84	407.49	0 02:26	0.84

```
******************
Node Inflow Summary
******************
```

	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error

Sunvale Homes – Mount Forest Subdivision – Pre Development – 25 Yr Storm Event

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
EX_CBMH	JUNCTION	1138.27	1138.27	0 02:25	5.89	5.89	0.002
J1	JUNCTION	47.47	47.47	0 02:30	0.42	0.42	0.002
J2	JUNCTION	0.00	1184.23	0 02:26	0	6.59	0.000
J3	JUNCTION	157.35	157.35	0 02:30	1.54	1.54	0.008
J4	JUNCTION	0.00	203.45	0 02:32	0	1.96	0.010
J5	JUNCTION	0.00	1183.99	0 02:26	0	6.59	0.000
J6	JUNCTION	0.00	1184.07	0 02:26	0	6.59	0.003
south_saugeen	OUTFALL	0.00	1184.09	0 02:26	0	6.59	0.000
unnamed_watercourse	OUTFALL	0.00	203.26	0 02:33	0	1.96	0.000
Ravine	STORAGE	73.41	1190.83	0 02:25	0.7	6.59	0.001

****
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 LPS
Ravine	0.001	0	0	0	0.021	1	0 02:26	1184.23

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.71	117.65	1184.09	6.594
unnamed_watercourse	96.62	32.59	203.26	1.957
System	98.16	150.25	1359.14	8.551

****
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
C1	CONDUIT	47.22	0 02:31	1.54	0.00	0.06
C2	CONDUIT	156.41	0 02:32	1.61	0.00	0.09
C3	CONDUIT	203.26	0 02:33	0.40	0.00	0.02
C4	CONDUIT	1127.56	0 02:25	1.25	0.53	0.74
C5	CONDUIT	1184.23	0 02:26	2.75	1.35	0.94
C6	CONDUIT	1183.99	0 02:26	2.38	0.16	0.50
C7	CONDUIT	1184.07	0 02:26	2.24	1.04	0.70
C8	CONDUIT	1184.09	0 02:26	1.81	0.09	0.25

Sunvale Homes – Mount Forest Subdivision – Pre Development – 25 Yr Storm Event

****
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	0.00	0.00	0.01	0.97	0.00	0.00	0.00	0.00
C2	1.00	0.02	0.00	0.00	0.01	0.98	0.00	0.00	0.00	0.00
C3	1.00	0.03	0.00	0.00	0.71	0.27	0.00	0.00	0.13	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.67	0.33	0.00	0.00	0.04	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.18	0.01	0.38	0.01
C7	0.01	0.01	0.01	0.10	0.01

Analysis begun on: Fri Dec 17 09:42:48 2021
Analysis ended on: Fri Dec 17 09:42:49 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Pre Development – 50 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 5
Number of nodes 10
Number of links 8
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101	2.85	320.00	0.00	3.0000	SCS_6h_71.9mm_50yr	Ravine
102	5.52	320.00	0.00	3.0000	SCS_6h_71.9mm_50yr	J3
103	1.56	132.00	0.00	3.0000	SCS_6h_71.9mm_50yr	J1
EX1	11.95	3060.00	46.30	2.0000	SCS_6h_71.9mm_50yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_71.9mm_50yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	406.30	1.00	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	402.30	2.70	0.0	
J6	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	EX_CBMH	Ravine	CONDUIT	100.0	0.9800	0.0300
C5	Ravine	J2	CONDUIT	15.0	1.4668	0.0200
C6	J2	J5	CONDUIT	45.0	4.6718	0.0300
C7	J5	J6	CONDUIT	14.3	0.7013	0.0200
C8	J6	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Pre Development – 50 Yr Storm Event

```
**********
Cross Section Summary
**********
```

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRAPEZOIDAL	0.50	1.55	0.27	5.60	1	2147.24
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01
C7	CIRCULAR	0.95	0.71	0.24	0.95	1	1138.29
C8	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71

```
*********************************************************
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date ..... 09/10/2020 00:00:00
Ending Date ..... 09/11/2020 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 2
Head Tolerance ..... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.683	71.911
Evaporation Loss	0.000	0.000
Infiltration Loss	0.707	30.194
Surface Runoff	0.974	41.607
Final Storage	0.003	0.136
Continuity Error (%)	-0.037	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.974	9.738
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.974	9.737
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

Sunvale Homes – Mount Forest Subdivision – Pre Development – 50 Yr Storm Event

```
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.001
Continuity Error (%) .....          0.001


**************************
Time-Step Critical Elements
**************************
Link C5 (31.21%)


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.63 sec
Average Time Step           :     4.47 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101	71.91	0.00	0.00	42.88	28.86	0.82	92.36	0.401
102	71.91	0.00	0.00	39.22	32.48	1.79	196.87	0.452
103	71.91	0.00	0.00	40.31	31.43	0.49	59.21	0.437
EX1	71.91	0.00	0.00	19.94	51.95	6.21	1262.17	0.722
EX2	71.91	0.00	0.00	43.88	27.76	0.42	38.33	0.386

```
******************
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
EX_CBMH	JUNCTION	0.08	0.41	409.54	0 02:25	0.41
J1	JUNCTION	0.02	0.05	407.55	0 02:30	0.05
J2	JUNCTION	0.10	0.42	406.72	0 02:27	0.42
J3	JUNCTION	0.03	0.09	407.09	0 02:31	0.09
J4	JUNCTION	0.00	0.01	406.01	0 02:32	0.01
J5	JUNCTION	0.14	0.75	403.05	0 02:27	0.75
J6	JUNCTION	0.04	0.21	402.01	0 02:27	0.21
south_saugeen	OUTFALL	0.03	0.21	401.71	0 02:27	0.21
unnamed_watercourse	OUTFALL	0.00	0.01	405.51	0 02:32	0.01
Ravine	STORAGE	0.14	0.98	407.63	0 02:26	0.98

```
******************
Node Inflow Summary
******************
```

Node	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error

Sunvale Homes – Mount Forest Subdivision – Pre Development – 50 Yr Storm Event

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
EX_CBMH	JUNCTION	1293.21	1293.21	0 02:25	6.63	6.63	0.001
J1	JUNCTION	59.21	59.21	0 02:30	0.49	0.49	0.002
J2	JUNCTION	0.00	1342.71	0 02:26	0	7.45	0.000
J3	JUNCTION	196.87	196.87	0 02:30	1.79	1.79	0.007
J4	JUNCTION	0.00	253.96	0 02:31	0	2.28	0.009
J5	JUNCTION	0.00	1342.55	0 02:27	0	7.45	0.000
J6	JUNCTION	0.00	1342.61	0 02:27	0	7.45	0.003
south_saugeen	OUTFALL	0.00	1342.62	0 02:27	0	7.45	0.000
unnamed_watercourse	OUTFALL	0.00	253.64	0 02:32	0	2.28	0.000
Ravine	STORAGE	92.36	1361.81	0 02:25	0.822	7.45	0.001

****
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 LPS
Ravine	0.001	0	0	0	0.034	1	0 02:26	1342.71

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.73	140.12	1342.62	7.454
unnamed_watercourse	96.86	39.78	253.64	2.283
System	98.29	179.90	1569.63	9.737

****
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
C1	CONDUIT	58.86	0 02:30	1.61	0.00	0.06
C2	CONDUIT	195.28	0 02:31	1.69	0.01	0.10
C3	CONDUIT	253.64	0 02:32	0.44	0.00	0.02
C4	CONDUIT	1281.51	0 02:25	1.29	0.60	0.78
C5	CONDUIT	1342.71	0 02:26	3.08	1.53	0.96
C6	CONDUIT	1342.55	0 02:27	2.46	0.18	0.52
C7	CONDUIT	1342.61	0 02:27	2.36	1.18	0.75
C8	CONDUIT	1342.62	0 02:27	1.89	0.10	0.27

Sunvale Homes – Mount Forest Subdivision – Pre Development – 50 Yr Storm Event

****
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	0.00	0.00	0.01	0.98	0.00	0.00	0.00	0.00
C2	1.00	0.02	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C3	1.00	0.02	0.00	0.00	0.69	0.28	0.00	0.00	0.14	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.65	0.34	0.00	0.00	0.05	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.32	0.01	0.43	0.01
C7	0.01	0.01	0.01	0.27	0.01

Analysis begun on: Fri Dec 17 09:41:25 2021
Analysis ended on: Fri Dec 17 09:41:26 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Pre Development – 100 Yr Storm Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 5
Number of nodes ........... 10
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Hurricane_Hazel_(Southern_Ontario) Hurricane_Hazel_(Southern_Ontario) INTENSITY   60 min.
SCS_6h_38.8mm_2yr    SCS_6h_38.8mm_2yr           INTENSITY    5 min.
SCS_6h_49.4mm_5yr    SCS_6h_49.4mm_5yr           INTENSITY    5 min.
SCS_6h_65.3mm_25yr   SCS_6h_65.3mm_25yr          INTENSITY    5 min.
SCS_6h_71.9mm_50yr   SCS_6h_71.9mm_50yr          INTENSITY    5 min.
SCS_6h_78.4mm_100yr  SCS_6h_78.4mm_100yr         INTENSITY    5 min.
SCS_6h_88mm_MTO100Yr SCS_6h_88mm_MTO100Yr        INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------
101                         2.85    320.00      0.00    3.0000 SCS_6h_78.4mm_100yr  Ravine
102                         5.52    320.00      0.00    3.0000 SCS_6h_78.4mm_100yr  J3
103                         1.56    132.00      0.00    3.0000 SCS_6h_78.4mm_100yr  J1
EX1                        11.95   3060.00     46.30    2.0000 SCS_6h_78.4mm_100yr  EX_CBMH
EX2                         1.52    150.00      0.00    2.0000 SCS_6h_78.4mm_100yr  EX_CBMH


************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                 Type              Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------
EX_CBMH              JUNCTION         409.13      1.98       0.0
J1                   JUNCTION         407.50      0.50       0.0
J2                   JUNCTION         406.30      1.00       0.0
J3                   JUNCTION         407.00      0.50       0.0
J4                   JUNCTION         406.00      0.50       0.0
J5                   JUNCTION         402.30      2.70       0.0
J6                   JUNCTION         401.80      1.70       0.0
south_saugeen        OUTFALL          401.50      0.80       0.0
unnamed_watercourse  OUTFALL          405.50      0.50       0.0
Ravine               STORAGE          406.65      2.75       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1               J1               J4               CONDUIT           75.0    2.0004    0.0130
C2               J3               J4               CONDUIT          112.0    0.8931    0.0130
C3               J4               unnamed_watercourse CONDUIT          41.0    1.2199    0.0130
C4               EX_CBMH          Ravine           CONDUIT          100.0    0.9800    0.0300
C5               Ravine           J2               CONDUIT           15.0    1.4668    0.0200
C6               J2               J5               CONDUIT           45.0    4.6718    0.0300
C7               J5               J6               CONDUIT           14.3    0.7013    0.0200
C8               J6               south_saugeen    CONDUIT           10.0    3.0014    0.0300
```

Sunvale Homes – Mount Forest Subdivision – Pre Development – 100 Yr Storm Event

```
**********
Cross Section Summary
**********
```

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRAPEZOIDAL	0.50	1.55	0.27	5.60	1	2147.24
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01
C7	CIRCULAR	0.95	0.71	0.24	0.95	1	1138.29
C8	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71

```
*********************************************************
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date ..... 09/10/2020 00:00:00
Ending Date ..... 09/11/2020 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 2
Head Tolerance ..... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.835	78.413
Evaporation Loss	0.000	0.000
Infiltration Loss	0.740	31.619
Surface Runoff	1.092	46.687
Final Storage	0.003	0.136
Continuity Error (%)	-0.038	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.093	10.927
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.093	10.926
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

Sunvale Homes – Mount Forest Subdivision – Pre Development – 100 Yr Storm Event

```
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.001
Continuity Error (%) .....          0.001


**************************
Time-Step Critical Elements
**************************
Link C5 (33.55%)


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.49 sec
Average Time Step           :     4.41 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101	78.41	0.00	0.00	45.05	33.18	0.95	112.87	0.423
102	78.41	0.00	0.00	40.99	37.21	2.05	239.38	0.475
103	78.41	0.00	0.00	42.22	36.03	0.56	71.79	0.459
EX1	78.41	0.00	0.00	20.86	57.54	6.88	1411.46	0.734
EX2	78.41	0.00	0.00	46.10	32.05	0.49	46.29	0.409

```
******************
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
EX_CBMH	JUNCTION	0.09	0.43	409.56	0 02:25	0.43
J1	JUNCTION	0.02	0.06	407.56	0 02:30	0.06
J2	JUNCTION	0.11	0.44	406.74	0 02:27	0.44
J3	JUNCTION	0.03	0.10	407.10	0 02:31	0.10
J4	JUNCTION	0.00	0.01	406.01	0 02:31	0.01
J5	JUNCTION	0.15	0.81	403.11	0 02:27	0.81
J6	JUNCTION	0.04	0.23	402.03	0 02:27	0.23
south_saugeen	OUTFALL	0.04	0.23	401.73	0 02:27	0.23
unnamed_watercourse	OUTFALL	0.00	0.01	405.51	0 02:32	0.01
Ravine	STORAGE	0.15	1.11	407.76	0 02:27	1.11

```
******************
Node Inflow Summary
******************
```

	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error

Sunvale Homes – Mount Forest Subdivision – Pre Development – 100 Yr Storm Event

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
EX_CBMH	JUNCTION	1450.14	1450.14	0 02:25	7.36	7.36	0.001
J1	JUNCTION	71.79	71.79	0 02:30	0.562	0.562	0.001
J2	JUNCTION	0.00	1496.90	0 02:27	0	8.31	0.000
J3	JUNCTION	239.38	239.38	0 02:30	2.05	2.05	0.006
J4	JUNCTION	0.00	308.40	0 02:31	0	2.62	0.009
J5	JUNCTION	0.00	1496.79	0 02:27	0	8.31	0.000
J6	JUNCTION	0.00	1496.83	0 02:27	0	8.31	0.003
south_saugeen	OUTFALL	0.00	1496.84	0 02:27	0	8.31	0.000
unnamed_watercourse	OUTFALL	0.00	307.94	0 02:32	0	2.62	0.000
Ravine	STORAGE	112.87	1536.38	0 02:25	0.946	8.31	0.001

****
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 LPS
Ravine	0.002	0	0	0	0.059	2	0 02:27	1496.90

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.73	163.97	1496.84	8.310
unnamed_watercourse	97.03	47.65	307.94	2.616
System	98.38	211.62	1781.84	10.926

****
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
C1	CONDUIT	71.36	0 02:30	1.67	0.00	0.07
C2	CONDUIT	237.23	0 02:31	1.76	0.01	0.11
C3	CONDUIT	307.94	0 02:32	0.47	0.00	0.03
C4	CONDUIT	1437.44	0 02:25	1.33	0.67	0.82
C5	CONDUIT	1496.90	0 02:27	3.42	1.71	0.97
C6	CONDUIT	1496.79	0 02:27	2.52	0.20	0.54
C7	CONDUIT	1496.83	0 02:27	2.46	1.31	0.80
C8	CONDUIT	1496.84	0 02:27	1.96	0.11	0.28

Sunvale Homes – Mount Forest Subdivision – Pre Development – 100 Yr Storm Event

****
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	0.00	0.00	0.01	0.98	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.01	0.98	0.00	0.00	0.00	0.00
C3	1.00	0.02	0.00	0.00	0.68	0.30	0.00	0.00	0.15	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.64	0.35	0.00	0.00	0.05	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.40	0.01	0.47	0.01
C7	0.01	0.01	0.01	0.37	0.01

Analysis begun on: Fri Dec 17 09:37:28 2021
Analysis ended on: Fri Dec 17 09:37:29 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Pre Development – MTO 100 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 5
Number of nodes 10
Number of links 8
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101	2.85	320.00	0.00	3.0000	SCS_6h_88mm_MTO100Yr	Ravine
102	5.52	320.00	0.00	3.0000	SCS_6h_88mm_MTO100Yr	J3
103	1.56	132.00	0.00	3.0000	SCS_6h_88mm_MTO100Yr	J1
EX1	11.95	3060.00	46.30	2.0000	SCS_6h_88mm_MTO100Yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_88mm_MTO100Yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	406.30	1.00	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	402.30	2.70	0.0	
J6	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	EX_CBMH	Ravine	CONDUIT	100.0	0.9800	0.0300
C5	Ravine	J2	CONDUIT	15.0	1.4668	0.0200
C6	J2	J5	CONDUIT	45.0	4.6718	0.0300
C7	J5	J6	CONDUIT	14.3	0.7013	0.0200
C8	J6	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Pre Development – MTO 100 Yr Storm Event

```
*********************
Cross Section Summary
*********************
```

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRAPEZOIDAL	0.50	1.55	0.27	5.60	1	2147.24
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01
C7	CIRCULAR	0.95	0.71	0.24	0.95	1	1138.29
C8	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71

```
*********************************************************
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
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 09/10/2020 00:00:00
Ending Date .............. 09/11/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 2
Head Tolerance ........... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	2.059	88.013
Evaporation Loss	0.000	0.000
Infiltration Loss	0.784	33.487
Surface Runoff	1.274	54.423
Final Storage	0.003	0.137
Continuity Error (%)	-0.039	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.274	12.738
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.274	12.737
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

Sunvale Homes – Mount Forest Subdivision – Pre Development – MTO 100 Yr Storm Event

```
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.000          0.001
Continuity Error (%) .....          0.001


**************************
Time-Step Critical Elements
**************************
Link C5 (33.89%)
Link C7 (1.14%)


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.34 sec
Average Time Step           :     4.34 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101	88.01	0.00	0.00	47.95	39.89	1.14	146.20	0.453
102	88.01	0.00	0.00	43.32	44.48	2.46	308.02	0.505
103	88.01	0.00	0.00	44.75	43.10	0.67	92.00	0.490
EX1	88.01	0.00	0.00	22.03	65.97	7.88	1637.10	0.750
EX2	88.01	0.00	0.00	49.14	38.61	0.59	60.59	0.439

```
******************
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
EX_CBMH	JUNCTION	0.10	0.46	409.59	0 02:25	0.46
J1	JUNCTION	0.02	0.06	407.56	0 02:30	0.06
J2	JUNCTION	0.12	0.46	406.76	0 02:29	0.46
J3	JUNCTION	0.03	0.11	407.11	0 02:31	0.11
J4	JUNCTION	0.00	0.02	406.02	0 02:31	0.02
J5	JUNCTION	0.17	0.89	403.19	0 02:29	0.89
J6	JUNCTION	0.04	0.24	402.04	0 02:29	0.24
south_saugeen	OUTFALL	0.04	0.24	401.74	0 02:29	0.24
unnamed_watercourse	OUTFALL	0.00	0.02	405.52	0 02:31	0.02
Ravine	STORAGE	0.18	1.35	408.00	0 02:29	1.35

```
******************
Node Inflow Summary
******************
```

	Maximum Lateral	Maximum Total	Time of Max	Lateral Inflow	Total Inflow	Flow Balance

Sunvale Homes – Mount Forest Subdivision – Pre Development – MTO 100 Yr Storm Event

Node	Type	Inflow LPS	Inflow LPS	Occurrence days	hr:min	Volume 10^6 ltr	Volume 10^6 ltr	Error Percent
EX_CBMH	JUNCTION	1688.59	1688.59	0	02:25	8.47	8.47	0.001
J1	JUNCTION	92.00	92.00	0	02:30	0.672	0.673	0.001
J2	JUNCTION	0.00	1691.87	0	02:29	0	9.61	0.000
J3	JUNCTION	308.02	308.02	0	02:30	2.46	2.46	0.005
J4	JUNCTION	0.00	396.42	0	02:31	0	3.13	0.008
J5	JUNCTION	0.00	1691.80	0	02:29	0	9.61	0.000
J6	JUNCTION	0.00	1691.83	0	02:29	0	9.61	0.003
south_saugeen	OUTFALL	0.00	1691.84	0	02:29	0	9.61	0.000
unnamed_watercourse	OUTFALL	0.00	395.76	0	02:31	0	3.13	0.000
Ravine	STORAGE	146.20	1804.19	0	02:25	1.14	9.61	0.001

****
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 LPS
Ravine	0.004	0	0	0	0.125	3	0	02:29	1691.87

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.75	196.51	1691.84	9.609
unnamed_watercourse	97.26	59.56	395.76	3.128
System	98.50	256.07	2080.11	12.737

****
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
C1	CONDUIT	91.46	0	02:30	1.75	0.00	0.08
C2	CONDUIT	305.14	0	02:31	1.87	0.01	0.12
C3	CONDUIT	395.76	0	02:31	0.52	0.00	0.03
C4	CONDUIT	1674.60	0	02:25	1.38	0.78	0.87
C5	CONDUIT	1691.87	0	02:29	3.83	1.93	1.00
C6	CONDUIT	1691.80	0	02:29	2.60	0.22	0.57
C7	CONDUIT	1691.83	0	02:29	2.59	1.49	0.87
C8	CONDUIT	1691.84	0	02:29	2.04	0.12	0.31

Sunvale Homes – Mount Forest Subdivision – Pre Development – MTO 100 Yr Storm Event

****
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	0.01	0.98	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C3	1.00	0.02	0.00	0.00	0.67	0.31	0.00	0.00	0.15	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.63	0.37	0.00	0.00	0.06	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.11	0.47	0.11	0.64	0.11
C7	0.01	0.01	0.01	0.45	0.01

Analysis begun on: Fri Dec 17 09:35:19 2021
Analysis ended on: Fri Dec 17 09:35:20 2021
Total elapsed time: 00:00:01

Appendix E

POST DEVELOPMENT MODEL PARAMETERS AND OUTPUT

STORMWATER MANAGEMENT REPORT

SUNVALE HOMES MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

Table B.1 Parameter Summary Table

Proposed Conditions										
Outlet Location	**Model Catchment ID**	**Description**	**Area (ha)**	**Drainage Channel (m)**	**Flow Length (m)**	**Gradient (%)**	**Total Imperv. (%)**	**Not Connected Imperv. (%)**	**Manning's 'n' (Perv.)**	**CN (Perv.)**
South Saugeen	201	Majority of Development	7.84	2525	31	2.0	59.7	51.7	0.25	77.0
South Saugeen	202	Southeast corner of Development	1.37	600	23	3.0	21.9	61.6	0.31	73.0
Unnamed Watercourse	203	Rear Yards on Northwest corner of Development	0.37	140	26	4.0	21.5	100.0	0.28	75.1
Unnamed Watercourse	204	Rear Yards on Southwest corner of Development	0.25	120	21	4.0	31.8	100.0	0.26	76.3
South Saugeen	EX1	Van Den Broek Subdivision	12.02	3060	39	2.0	46.2	50.4	0.25	77.0
South Saugeen	EX2	Betty Dee Property	1.52	150	101	2.0	0.0	0.0	0.30	72.0

Table B.2 Site Soils: (as per Ontario Soil Survey Report No. 35 for Wellington County)

Soil Type
Listowel Silt Loam

Hydologic Soil Group
BC

TABLE OF CURVE NUMBERS (CN's)									
Land Use	Hydrologic Soil Type								
	A	AB	B	BC	C	CD	D	Manning's 'n'	
Meadow	50	54	58	64.5	71	74.5	78	0.4	continuous grass
Woodlot	50	55.3	60.5	67	73.5	76.8	80	0.4	forests
Long Grass	55	60	65	72	79	81.5	84	0.3	natural, not maintained
Lawns	60	65.5	71	77	83	86	89	0.25	maintained
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	farm pasture
Crop	66	70	74	78	82	84	86	0.13	farm land
Fallow (bare)	77	82	86	89	91	93	94	0.05	idle farm land (bare)
Built-up	60	65.5	71	77	83	89	89	0.25	Lawns Proposed
Streets, paved	98	98	98	98	98	98	98	0.01	

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
201	0	0	0	100	0	0	0	100
202	0	0	0	100	0	0	0	100
203	0	0	0	100	0	0	0	100
204	0	0	0	100	0	0	0	100
EX1	0	0	0	100	0	0	0	100
EX2	0	0	0	100	0	0	0	100

LAND USE (%) - Proposed Conditions										
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Imperv. Not Connected (Rooftops)	Imperv. Connected	Total
201	0	0	0	40	0	0	0	30.9	28.9	100
202	0	30	3	45	0	0	0	13.5	8.4	100
203	0	15	0	63.5	0	0	0	21.5	0.0	100
204	0	5	0	63	0	0	0	31.8	0.0	100
EX1	0	0	0	54	0	0	0	23.3	22.9	100
EX2	0	0	100	0	0	0	0	0.0	0.0	100

CURVE NUMBER (CN) - Proposed Conditions											
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Built-up	Imperv. Not Connected (Rooftops)	Weighted CN - Pervious	Manning's 'n'
201	65	67	72	77	70.5	78	89	77	90	77.0	0.25
202	65	67.0	72	77	70.5	78	89	77.0	90	73.0	0.31
203	65	67	72	77	70.5	78	89	77	90	75.1	0.28
204	65	67	72	77	70.5	78	89	77	90	76.3	0.26
EX1	65	67	72	77	70.5	78	89	77	90	77.0	0.25
EX2	65	67	72	77	70.5	78	89	77	90	72.0	0.30

Table B.3: Impervious Area Determination for Subcatchments 201 - 203

Proposed Conditions

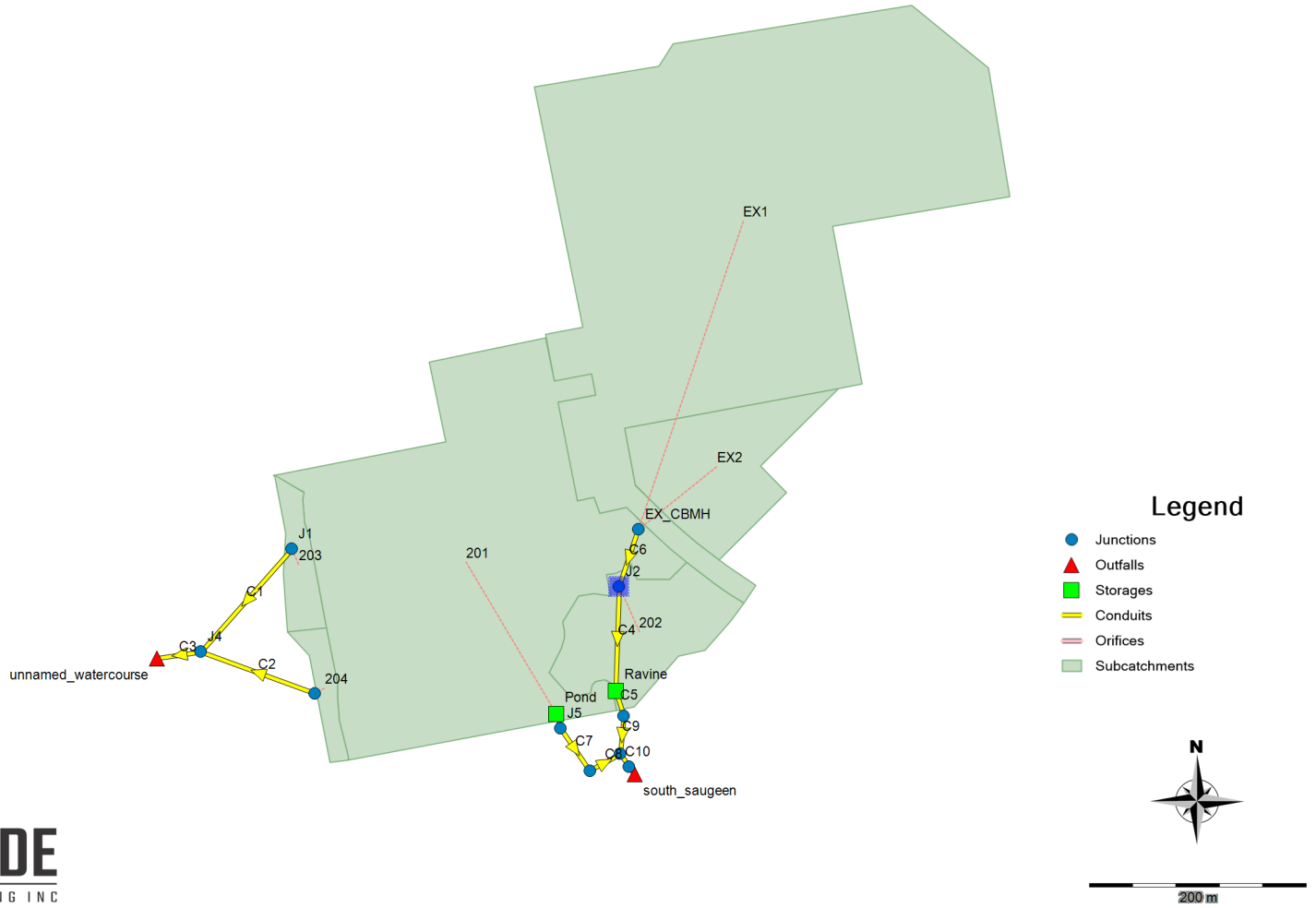
Area of Concern	Total Area (ha)	Impervious Area Connected		Impervious Area Not Connected (Rooftops)		Total (%)
		(ha)	(%)	(ha)	(%)	
201	7.84	2.26	28.9	2.42	30.9	59.7
202	1.37	0.12	8.4	0.19	13.5	21.9
203	0.37	0.00	0.0	0.08	21.5	21.5
204	0.25	0.00	0.0	0.08	31.8	31.8
EX1	12.02	2.76	22.9	2.80	23.3	46.2
EX2	1.52	0.00	0.0	0.00	0.0	0.0

Table B.3 - Impervious Area Determination for Proposed Catchments 201 - 203

Catchment					Imperv. Area	Imperv %
201	1100	m of	20	m wide ROW @ 55% imperv.	1.21 ha	15.4 %
	62	driveways @	90	m^2 @ 100% imperv.	0.56 ha	7.1 %
	66	driveways @	75	m^2 @ 100% imperv.	0.50 ha	6.3 %
	55	single res. homes with roof area of	265	m^2	1.46 ha	18.6 %
	30	Duplex unit with roof area of	165	m^2	0.50 ha	6.3 %
	36	Multi-family units with roof area of	130	m^2	0.47 ha	6.0 %
					4.68 ha	
202	110	m of	6.1	m wide ROW @ 100% imperv.	0.07 ha	4.9 %
	12	driveways @	40	m^2 @ 100% imperv.	0.05 ha	3.5
	2	single res. homes with roof area of	265	m^2	0.05 ha	3.9
		Duplex unit with roof area of	145	m^2	0.00 ha	0.0
	12	Multi-family units with roof area of	110	m^2	0.13 ha	9.6
					0.30 ha	
203		m of	20	m wide ROW @ 55% imperv.	0.00 ha	0.0 %
		driveways @	1826	m^2 @ 100% imperv.	0.00 ha	0.0 %
	3	single res. homes with roof area of	265	m^2	0.08 ha	21.5 %
		Duplex unit with roof area of	145	m^2	0.00 ha	0.0 %
		Multi-family units with roof area of	120	m^2	0.00 ha	0.0 %
					0.08 ha	
204		m of	20	m wide ROW @ 55% imperv.	0.00 ha	0.0 %
		driveways @	90	m^2 @ 100% imperv.	0.00 ha	0.0 %
	3	single res. homes with roof area of	265	m^2	0.08 ha	31.8 %
		Duplex unit with roof area of	250	m^2	0.00 ha	0.0 %
		Multi-family Blocks with roof area of	750	m^2	0.00 ha	0.0 %
					0.08 ha	
EX1	1530	m of	20	m wide ROW @ 55% imperv.	1.68 ha	14.0 %
	70	driveways @	90	m^2 @ 100% imperv.	0.63 ha	5.2 %
	59	driveways @	75	m^2 @ 100% imperv.	0.44 ha	3.7 %
	70.5	single res. homes with roof area of	265	m^2	1.87 ha	15.5 %
	46	Duplex unit with roof area of	165	m^2	0.76 ha	6.3 %
	13	Multi-family Blocks with roof area of	130	m^2	0.17 ha	1.4 %
					5.55 ha	

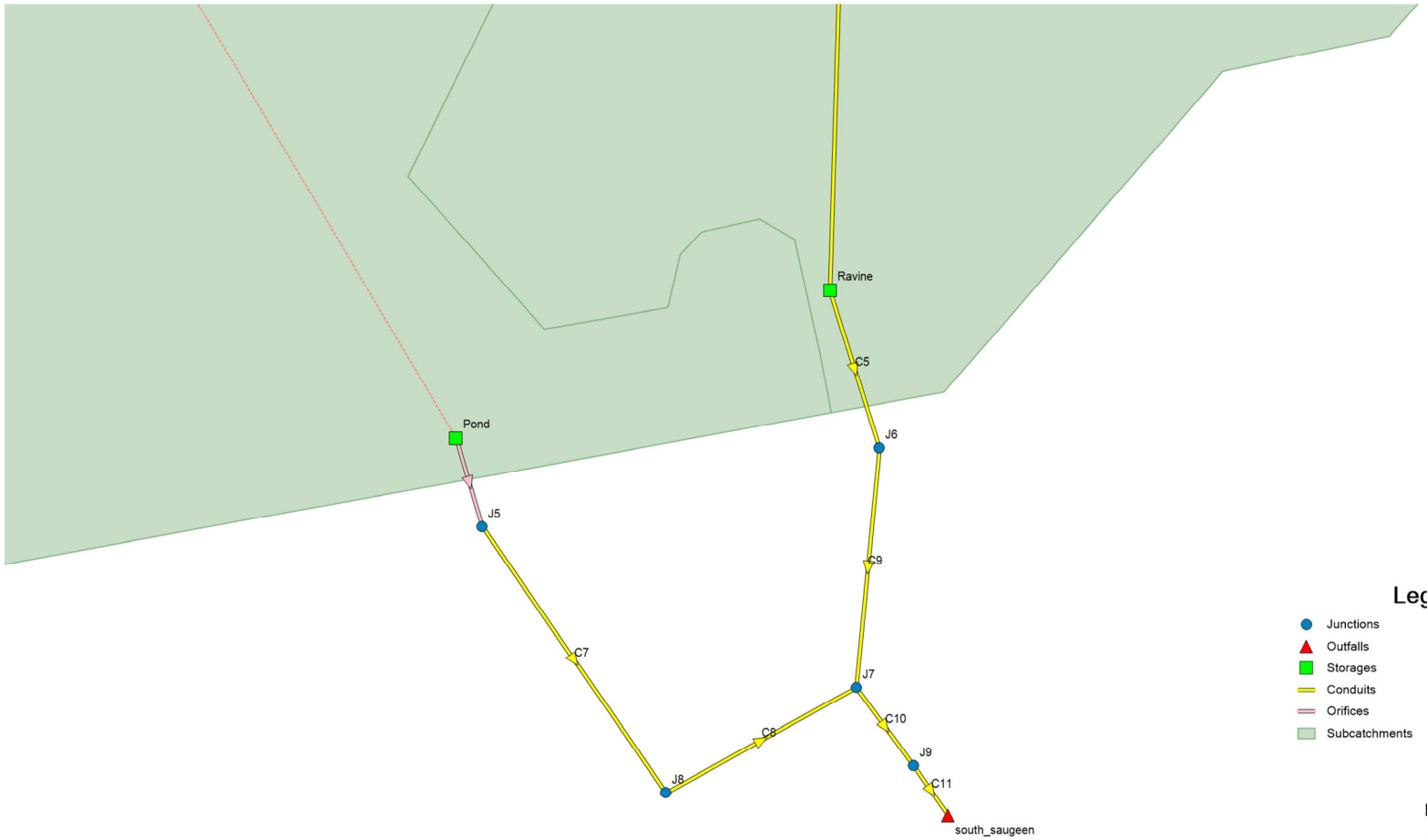
EX2	m of	20	m wide ROW @ 55% imperv.	0.00 ha	0.0 %
	driveways @	90	m^2 @ 100% imperv.	0.00 ha	0.0 %
	single res. homes with roof area of		200 m^2	0.00 ha	0.0 %
	Duplex unit with roof area of		250 m^2	0.00 ha	0.0 %
	Multi-family Blocks with roof area of		750 m^2	0.00 ha	0.0 %
				0.00 ha	

Sunvale Homes - Mount Forest Subdivision
Post Development Model Schematic



COBIDE ENGINEERING INC

Sunvale Homes Mount Forest Subdivision - Outlet Schematic



Legend

- Junctions
- Outfalls
- Storages
- Conduits
- Orifices
- Subcatchments

N

35 m

COBIDE ENGINEERING INC

Sunvale Homes – Mount Forest Subdivision – Post Development – Model Details

[TITLE]

[OPTIONS]

;;Options	Value
FLOW_UNITS	LPS
INFILTRATION	CURVE_NUMBER
FLOW_ROUTING	DYNWAVE
START_DATE	9/10/2020
START_TIME	00:00
REPORT_START_DATE	9/10/2020
REPORT_START_TIME	00:00
END_DATE	9/11/2020
END_TIME	00:00
SWEEP_START	1/1
SWEEP_END	12/31
DRY_DAYS	0
REPORT_STEP	00:01:00
WET_STEP	00:05:00
DRY_STEP	00:05:00
ROUTING_STEP	5
ALLOW_PONDING	NO
INERTIAL_DAMPING	PARTIAL
VARIABLE_STEP	0.75
LENGTHENING_STEP	0
MIN_SURFAREA	0
NORMAL_FLOW_LIMITED	BOTH
SKIP_STEADY_STATE	NO
FORCE_MAIN_EQUATION	H-W
LINK_OFFSETS	ELEVATION
MIN_SLOPE	0
MAX_TRIALS	8
HEAD_TOLERANCE	0
SYS_FLOW_TOL	5
LAT_FLOW_TOL	5
MINIMUM_STEP	0.5
THREADS	2

[EVAPORATION]

;;Type	Parameters
CONSTANT	0.0
DRY_ONLY	NO

[RAINGAGES]

;;Name	Rain Type	Time Intrvl	Snow Catch	Data Source	
Hurricane_Hazel_(Southern_Ontario)	INTENSITY	1:00	1.0	TIMESERIES	Hurricane_Hazel_(Southern_Ontario)
SCS_6h_38.8mm_2yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_38.8mm_2yr
SCS_6h_49.4mm_5yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_49.4mm_5yr
SCS_6h_65.3mm_25yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_65.3mm_25yr
SCS_6h_71.9mm_50yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_71.9mm_50yr
SCS_6h_78.4mm_100yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_78.4mm_100yr
SCS_6h_88mm_MTO100Yr	INTENSITY	0:05	1.0	TIMESERIES	SCS_6h_88mm_MTO100Yr

[SUBCATCHMENTS]

;;Name	Raingage	Outlet	Total Area	Pcnt. Imperv	Width	Pcnt. Slope	Curb Length	Snow Pack
201	Hurricane_Hazel_(Southern_Ontario)	Pond	7.84	59.7	2525	2	0	
202	Hurricane_Hazel_(Southern_Ontario)	J2	1.37	21.9	600	3	0	
203	Hurricane_Hazel_(Southern_Ontario)	J1	0.37	21.5	140	4	0	
204	Hurricane_Hazel_(Southern_Ontario)	J3	0.25	31.8	120	4	0	
EX1	Hurricane_Hazel_(Southern_Ontario)	EX_CBMH	12.02	46.2	3060	2	0	
EX2	Hurricane_Hazel_(Southern_Ontario)	EX_CBMH	1.52	0	150	2	0	

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
201	0.01	0.25	0.05	0.05	25	OUTLET	
202	0.01	0.31	0.05	0.05	25	OUTLET	
203	0.01	0.28	0.05	0.05	25	OUTLET	

Sunvale Homes – Mount Forest Subdivision – Post Development – Model Details

```
204              0.01       0.26       0.05       0.05       25         OUTLET
EX1              0.01       0.25       0.05       0.05       25         OUTLET
EX2              0.01       0.3        0.05       0.05       25         OUTLET

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
201              77         0.5        7
202              73         0.5        7
203              75.1       0.5        7
204              76.3       0.5        7
EX1              77         0.5        7
EX2              72         0.5        7

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
EX_CBMH          409.13     1.98       0          0          0
J1               407.5      0.5        0          0          0
J2               408.7      2.1        0          0          0
J3               407        0.5        0          0          0
J4               406        0.5        0          0          0
J5               405.97     3.03       0          0          0
J6               406.3      1          0          0          0
J7               402.3      2.7        0          0          0
J8               404.8      2.12       0          0          0
J9               401.8      1.7        0          0          0

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
south_saugeen    401.5      FREE                          NO
unnamed_watercourse 405.5   FREE                          NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                    Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                   Area     Frac.
Infiltration parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------
------------
Pond             408.14   0.86     0        TABULAR    Pond                     0        0
Ravine           406.65   2.75     0        TABULAR    Ravine                   0        0

[CONDUITS]
;;               Inlet            Outlet                     Manning    Inlet      Outlet     Init.      Max.
;;Name           Node             Node             Length    N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- -----
-----
C1               J1               J4               75         0.013      407.5      406        0          0
C10              J7               J9               14.26      0.013      402.3      402.2      0          0
C11              J9               south_saugeen    10         0.03       401.8      401.5      0          0
C2               J3               J4               111.98     0.013      407        406        0          0
C3               J4               unnamed_watercourse 40.99   0.013      406        405.5      0          0
C4               J2               Ravine           50         0.03       408.7      408.15     0          0
C5               Ravine           J6               15         0.02       406.65     406.43     0          0
C6               EX_CBMH          J2               55.51      0.013      409.13     408.7      0          0
C7               J5               J8               103        0.013      405.97     404.91     0          0
C8               J8               J7               46         0.013      404.8      402.62     0          0
C9               J6               J7               45         0.03       406.3      404.2      0          0

[ORIFICES]
;;               Inlet            Outlet           Orifice      Crest      Disch.     Flap Open/Close
;;Name           Node             Node             Type         Height     Coeff.     Gate Time
;;-------------- ---------------- ---------------- ------------ ---------- ---------- ---- ----------
OR1              Pond             J5               BOTTOM       408.14     0.65       NO   0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
C1               TRIANGULAR   0.5              35         0          0          1
C10              CIRCULAR     1.2              0          0          0          1
C11              TRAPEZOIDAL  0.8              3          1.2        2          1
```

Sunvale Homes – Mount Forest Subdivision – Post Development – Model Details

```
C2               TRIANGULAR   0.5              45         0          0          1
C3               RECT_OPEN    0.5              50         0          0          1
C4               TRIANGULAR   0.4              12         0          0          1
C5               CIRCULAR     0.75             0          0          0          1
C6               CIRCULAR     0.9              0          0          0          1
C7               CIRCULAR     0.9              0          0          0          1
C8               CIRCULAR     0.9              0          0          0          1
C9               TRIANGULAR   0.8              5          0          0          1
OR1              RECT_CLOSED  0.9              1.2        0          0

[LOSSES]
;;Link            Inlet      Outlet     Average    Flap Gate  SeepageRate
;;--------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
;;Name            Type       X-Value    Y-Value
;;--------------- ---------- ---------- ----------
Pond             Storage    0          0
Pond                        0.3        575
Pond                        .9         1000

Ravine           Storage    0          0
Ravine                      0.35       9
Ravine                      .85        70
Ravine                      1.35       345
Ravine                      1.85       1090
Ravine                      2.35       3710

[TIMESERIES]
;;Name            Date       Time       Value
;;--------------- ---------- ---------- ----------
;Hurricane Hazel (Southern Ontario) design storm for 0 - 25 km², total rainfall = 211 mm (100%), rain units =
mm/hr.
Hurricane_Hazel_(Southern_Ontario)

;SCS_6h_38.8mm design storm, total rainfall = 38.8 mm, rain units = mm/hr.
SCS_6h_38.8mm_2yr

;SCS_6h_49.4mm design storm, total rainfall = 49.4 mm, rain units = mm/hr.
SCS_6h_49.4mm_5yr

;SCS_6h_65.3mm design storm, total rainfall = 65.3 mm, rain units = mm/hr.
SCS_6h_65.3mm_25yr

;SCS_6h_71.9mm design storm, total rainfall = 71.9 mm, rain units = mm/hr.
SCS_6h_71.9mm_50yr

;SCS_6h_78.4mm design storm, total rainfall = 78.4 mm, rain units = mm/hr.
SCS_6h_78.4mm_100yr

;SCS_6h_88mm design storm, total rainfall = 88 mm, rain units = mm/hr.
SCS_6h_88mm_MTO100Yr

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       520101.080933305 4868483.6378922  520966.866164664 4869264.88298291
UNITS            Meters
```

Sunvale Homes – Mount Forest Subdivision – Post Development – 2 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 6
Number of nodes 14
Number of links 12
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	7.84	2525.00	59.70	2.0000	SCS_6h_38.8mm_2yr	Pond
202	1.37	600.00	21.90	3.0000	SCS_6h_38.8mm_2yr	J2
203	0.37	140.00	21.50	4.0000	SCS_6h_38.8mm_2yr	J1
204	0.25	120.00	31.80	4.0000	SCS_6h_38.8mm_2yr	J3
EX1	12.02	3060.00	46.20	2.0000	SCS_6h_38.8mm_2yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_38.8mm_2yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	408.70	2.10	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	405.97	3.03	0.0	
J6	JUNCTION	406.30	1.00	0.0	
J7	JUNCTION	402.30	2.70	0.0	
J8	JUNCTION	404.80	2.12	0.0	
J9	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Pond	STORAGE	408.14	0.86	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C10	J7	J9	CONDUIT	14.3	0.7013	0.0130
C11	J9	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Post Development – 2 Yr Storm Event

C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.907	38.807
Evaporation Loss	0.000	0.000
Infiltration Loss	0.333	14.258
Surface Runoff	0.573	24.505
Final Storage	0.002	0.067
Continuity Error (%)	-0.059	

Sunvale Homes – Mount Forest Subdivision – Post Development – 2 Yr Storm Event

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.573	5.728
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.573	5.729
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 (%)	-0.026	

Highest Continuity Errors

Node J4 (-1.19%)

Time-Step Critical Elements

Link C10 (18.17%)
Link C5 (4.69%)

Highest Flow Instability Indexes

Link C3 (5)

Routing Time Step Summary

Minimum Time Step	:	1.22 sec
Average Time Step	:	4.69 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	38.81	0.00	0.00	10.35	28.44	2.23	454.50	0.733
202	38.81	0.00	0.00	21.45	17.31	0.24	41.20	0.446
203	38.81	0.00	0.00	20.85	17.90	0.07	11.78	0.461
204	38.81	0.00	0.00	17.74	21.03	0.05	10.40	0.542
EX1	38.81	0.00	0.00	13.81	24.96	3.00	571.47	0.643
EX2	38.81	0.00	0.00	29.29	9.25	0.14	9.34	0.238

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

Sunvale Homes – Mount Forest Subdivision – Post Development – 2 Yr Storm Event

EX_CBMH	JUNCTION	0.07	0.37	409.50	0	02:25	0.37
J1	JUNCTION	0.01	0.03	407.53	0	02:25	0.03
J2	JUNCTION	0.06	0.23	408.93	0	02:25	0.23
J3	JUNCTION	0.01	0.03	407.03	0	02:26	0.03
J4	JUNCTION	0.00	0.00	406.00	0	02:27	0.00
J5	JUNCTION	0.05	0.30	406.27	0	02:25	0.30
J6	JUNCTION	0.07	0.31	406.61	0	02:26	0.31
J7	JUNCTION	0.08	0.47	402.77	0	02:25	0.47
J8	JUNCTION	0.03	0.21	405.01	0	02:25	0.21
J9	JUNCTION	0.03	0.19	401.99	0	02:26	0.19
south_saugeen	OUTFALL	0.03	0.19	401.69	0	02:26	0.19
unnamed_watercourse	OUTFALL	0.00	0.00	405.50	0	02:27	0.00
Pond	STORAGE	0.02	0.15	408.29	0	02:25	0.15
Ravine	STORAGE	0.08	0.46	407.11	0	02:25	0.46

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	577.16	577.16	0 02:25	3.14	3.14	-0.002
J1	JUNCTION	11.78	11.78	0 02:25	0.0663	0.0663	-0.001
J2	JUNCTION	41.20	617.96	0 02:25	0.237	3.38	0.004
J3	JUNCTION	10.40	10.40	0 02:25	0.0526	0.0526	-0.013
J4	JUNCTION	0.00	21.78	0 02:25	0	0.119	-1.177
J5	JUNCTION	0.00	451.74	0 02:25	0	2.23	-0.001
J6	JUNCTION	0.00	613.99	0 02:25	0	3.38	0.001
J7	JUNCTION	0.00	1064.87	0 02:25	0	5.61	0.000
J8	JUNCTION	0.00	451.31	0 02:25	0	2.23	-0.000
J9	JUNCTION	0.00	1065.09	0 02:26	0	5.61	0.003
south_saugeen	OUTFALL	0.00	1065.13	0 02:26	0	5.61	0.000
unnamed_watercourse	OUTFALL	0.00	21.59	0 02:27	0	0.12	0.000
Pond	STORAGE	454.50	454.50	0 02:25	2.23	2.23	-0.001
Ravine	STORAGE	0.00	614.31	0 02:25	0	3.38	0.000

****
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 LPS
Pond	0.001	0	0	0	0.022	4	0 02:25	451.74
Ravine	0.000	0	0	0	0.003	0	0 02:25	613.99

****
Outfall Loading Summary
****

Sunvale Homes – Mount Forest Subdivision – Post Development – 2 Yr Storm Event

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.81	91.42	1065.13	5.609
unnamed_watercourse	52.12	3.71	21.59	0.120
System	75.96	95.13	1086.57	5.729

****
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
C1	CONDUIT	11.64	0	02:25	1.23	0.00	0.03
C10	CONDUIT	1065.09	0	02:26	2.58	0.33	0.39
C11	CONDUIT	1065.13	0	02:26	1.74	0.08	0.23
C2	CONDUIT	10.15	0	02:26	0.83	0.00	0.03
C3	CONDUIT	21.59	0	02:27	0.00	0.00	0.01
C4	CONDUIT	614.31	0	02:25	0.87	0.21	0.54
C5	CONDUIT	613.99	0	02:25	2.15	0.70	0.62
C6	CONDUIT	576.84	0	02:25	3.07	0.36	0.34
C7	CONDUIT	451.31	0	02:25	2.39	0.25	0.34
C8	CONDUIT	451.34	0	02:25	4.12	0.11	0.23
C9	CONDUIT	613.62	0	02:26	2.02	0.08	0.39
OR1	ORIFICE	451.74	0	02:25			

****
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	0.00	0.00	0.00	0.05	0.95	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.70	0.30	0.00	0.00	0.03	0.00
C2	1.00	0.00	0.00	0.00	0.20	0.80	0.00	0.00	0.04	0.00
C3	1.00	0.25	0.01	0.00	0.73	0.02	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.66	0.34	0.00	0.00	0.75	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Dec 17 09:53:05 2021
Analysis ended on: Fri Dec 17 09:53:06 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Post Development – 5 Yr Storm Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 6
Number of nodes ........... 14
Number of links ........... 12
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Hurricane_Hazel_(Southern_Ontario) Hurricane_Hazel_(Southern_Ontario) INTENSITY   60 min.
SCS_6h_38.8mm_2yr    SCS_6h_38.8mm_2yr           INTENSITY    5 min.
SCS_6h_49.4mm_5yr    SCS_6h_49.4mm_5yr           INTENSITY    5 min.
SCS_6h_65.3mm_25yr   SCS_6h_65.3mm_25yr          INTENSITY    5 min.
SCS_6h_71.9mm_50yr   SCS_6h_71.9mm_50yr          INTENSITY    5 min.
SCS_6h_78.4mm_100yr  SCS_6h_78.4mm_100yr         INTENSITY    5 min.
SCS_6h_88mm_MTO100Yr SCS_6h_88mm_MTO100Yr        INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------
201                         7.84   2525.00     59.70    2.0000 SCS_6h_49.4mm_5yr    Pond
202                         1.37    600.00     21.90    3.0000 SCS_6h_49.4mm_5yr    J2
203                         0.37    140.00     21.50    4.0000 SCS_6h_49.4mm_5yr    J1
204                         0.25    120.00     31.80    4.0000 SCS_6h_49.4mm_5yr    J3
EX1                        12.02   3060.00     46.20    2.0000 SCS_6h_49.4mm_5yr    EX_CBMH
EX2                         1.52    150.00      0.00    2.0000 SCS_6h_49.4mm_5yr    EX_CBMH


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------
EX_CBMH              JUNCTION       409.13      1.98       0.0
J1                   JUNCTION       407.50      0.50       0.0
J2                   JUNCTION       408.70      2.10       0.0
J3                   JUNCTION       407.00      0.50       0.0
J4                   JUNCTION       406.00      0.50       0.0
J5                   JUNCTION       405.97      3.03       0.0
J6                   JUNCTION       406.30      1.00       0.0
J7                   JUNCTION       402.30      2.70       0.0
J8                   JUNCTION       404.80      2.12       0.0
J9                   JUNCTION       401.80      1.70       0.0
south_saugeen        OUTFALL        401.50      0.80       0.0
unnamed_watercourse  OUTFALL        405.50      0.50       0.0
Pond                 STORAGE        408.14      0.86       0.0
Ravine               STORAGE        406.65      2.75       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1               J1               J4               CONDUIT           75.0    2.0004    0.0130
C10              J7               J9               CONDUIT           14.3    0.7013    0.0130
C11              J9               south_saugeen    CONDUIT           10.0    3.0014    0.0300
```

Sunvale Homes – Mount Forest Subdivision – Post Development – 5 Yr Storm Event

C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.155	49.408
Evaporation Loss	0.000	0.000
Infiltration Loss	0.390	16.695
Surface Runoff	0.764	32.672
Final Storage	0.002	0.068
Continuity Error (%)	-0.056	

Sunvale Homes – Mount Forest Subdivision – Post Development – 5 Yr Storm Event

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.764	7.637
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.764	7.638
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 (%)	-0.017	

Time-Step Critical Elements

Link C10 (25.02%)
Link C5 (3.89%)

Highest Flow Instability Indexes

Link C3 (5)

Routing Time Step Summary

Minimum Time Step	:	2.20 sec
Average Time Step	:	4.56 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	49.41	0.00	0.00	12.06	37.34	2.93	604.65	0.756
202	49.41	0.00	0.00	25.29	24.07	0.33	60.13	0.487
203	49.41	0.00	0.00	24.44	24.92	0.09	17.25	0.504
204	49.41	0.00	0.00	20.72	28.65	0.07	14.62	0.580
EX1	49.41	0.00	0.00	16.13	33.25	4.00	778.88	0.673
EX2	49.41	0.00	0.00	34.75	14.39	0.22	15.97	0.291

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
EX_CBMH	JUNCTION	0.08	0.45	409.58	0 02:25	0.45
J1	JUNCTION	0.01	0.03	407.53	0 02:25	0.03
J2	JUNCTION	0.06	0.26	408.96	0 02:25	0.26
J3	JUNCTION	0.01	0.03	407.03	0 02:25	0.03
J4	JUNCTION	0.00	0.00	406.00	0 02:27	0.00
J5	JUNCTION	0.06	0.35	406.32	0 02:25	0.35

Sunvale Homes – Mount Forest Subdivision – Post Development – 5 Yr Storm Event

J6	JUNCTION	0.08	0.35	406.65	0	02:26	0.35
J7	JUNCTION	0.10	0.56	402.86	0	02:26	0.56
J8	JUNCTION	0.04	0.24	405.04	0	02:25	0.24
J9	JUNCTION	0.03	0.22	402.02	0	02:26	0.22
south_saugeen	OUTFALL	0.03	0.22	401.72	0	02:26	0.22
unnamed_watercourse	OUTFALL	0.00	0.00	405.50	0	02:27	0.00
Pond	STORAGE	0.02	0.18	408.32	0	02:25	0.18
Ravine	STORAGE	0.10	0.58	407.23	0	02:25	0.58

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	790.21	790.21	0 02:25	4.22	4.22	-0.001
J1	JUNCTION	17.25	17.25	0 02:25	0.0922	0.0922	-0.001
J2	JUNCTION	60.13	849.37	0 02:25	0.33	4.55	0.002
J3	JUNCTION	14.62	14.62	0 02:25	0.0717	0.0717	-0.013
J4	JUNCTION	0.00	31.34	0 02:25	0	0.164	-0.849
J5	JUNCTION	0.00	600.31	0 02:25	0	2.93	-0.001
J6	JUNCTION	0.00	843.66	0 02:25	0	4.55	0.000
J7	JUNCTION	0.00	1442.76	0 02:25	0	7.47	-0.000
J8	JUNCTION	0.00	599.87	0 02:25	0	2.93	0.000
J9	JUNCTION	0.00	1443.07	0 02:26	0	7.47	0.003
south_saugeen	OUTFALL	0.00	1443.12	0 02:26	0	7.47	0.000
unnamed_watercourse	OUTFALL	0.00	31.11	0 02:27	0	0.165	0.000
Pond	STORAGE	604.65	604.65	0 02:25	2.93	2.93	-0.001
Ravine	STORAGE	0.00	844.61	0 02:25	0	4.55	0.000

****
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 LPS
Pond	0.002	0	0	0	0.032	6	0 02:25	600.31
Ravine	0.000	0	0	0	0.007	0	0 02:25	843.66

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.83	129.97	1443.12	7.473
unnamed_watercourse	54.02	5.27	31.11	0.165

Sunvale Homes – Mount Forest Subdivision – Post Development – 5 Yr Storm Event

System	76.92	135.25	1474.09	7.638

****
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
C1	CONDUIT	17.05	0	02:25	1.35	0.00	0.04
C10	CONDUIT	1443.07	0	02:26	2.80	0.44	0.47
C11	CONDUIT	1443.12	0	02:26	1.94	0.11	0.28
C2	CONDUIT	14.29	0	02:26	0.90	0.00	0.04
C3	CONDUIT	31.11	0	02:27	0.19	0.00	0.01
C4	CONDUIT	844.61	0	02:25	0.94	0.29	0.61
C5	CONDUIT	843.66	0	02:25	2.32	0.96	0.77
C6	CONDUIT	789.30	0	02:25	3.41	0.50	0.39
C7	CONDUIT	599.87	0	02:25	2.58	0.33	0.39
C8	CONDUIT	599.87	0	02:25	4.47	0.15	0.26
C9	CONDUIT	843.26	0	02:26	2.19	0.11	0.44
OR1	ORIFICE	600.31	0	02:25			

****
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	0.00	0.00	0.00	0.04	0.96	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.67	0.32	0.00	0.00	0.04	0.00
C2	1.00	0.00	0.00	0.00	0.19	0.81	0.00	0.00	0.04	0.00
C3	1.00	0.23	0.01	0.00	0.72	0.04	0.00	0.00	0.01	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.64	0.36	0.00	0.00	0.76	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Dec 17 09:56:12 2021
Analysis ended on: Fri Dec 17 09:56:13 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Post Development – 25 Yr Storm Event

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 6
Number of nodes ........... 14
Number of links ........... 12
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Hurricane_Hazel_(Southern_Ontario) Hurricane_Hazel_(Southern_Ontario) INTENSITY   60 min.
SCS_6h_38.8mm_2yr    SCS_6h_38.8mm_2yr           INTENSITY    5 min.
SCS_6h_49.4mm_5yr    SCS_6h_49.4mm_5yr           INTENSITY    5 min.
SCS_6h_65.3mm_25yr   SCS_6h_65.3mm_25yr          INTENSITY    5 min.
SCS_6h_71.9mm_50yr   SCS_6h_71.9mm_50yr          INTENSITY    5 min.
SCS_6h_78.4mm_100yr  SCS_6h_78.4mm_100yr         INTENSITY    5 min.
SCS_6h_88mm_MTO100Yr SCS_6h_88mm_MTO100Yr        INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                         Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------
201                          7.84   2525.00     59.70    2.0000 SCS_6h_65.3mm_25yr   Pond
202                          1.37    600.00     21.90    3.0000 SCS_6h_65.3mm_25yr   J2
203                          0.37    140.00     21.50    4.0000 SCS_6h_65.3mm_25yr   J1
204                          0.25    120.00     31.80    4.0000 SCS_6h_65.3mm_25yr   J3
EX1                         12.02   3060.00     46.20    2.0000 SCS_6h_65.3mm_25yr   EX_CBMH
EX2                          1.52    150.00      0.00    2.0000 SCS_6h_65.3mm_25yr   EX_CBMH


************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                 Type              Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------
EX_CBMH              JUNCTION         409.13      1.98       0.0
J1                   JUNCTION         407.50      0.50       0.0
J2                   JUNCTION         408.70      2.10       0.0
J3                   JUNCTION         407.00      0.50       0.0
J4                   JUNCTION         406.00      0.50       0.0
J5                   JUNCTION         405.97      3.03       0.0
J6                   JUNCTION         406.30      1.00       0.0
J7                   JUNCTION         402.30      2.70       0.0
J8                   JUNCTION         404.80      2.12       0.0
J9                   JUNCTION         401.80      1.70       0.0
south_saugeen        OUTFALL          401.50      0.80       0.0
unnamed_watercourse  OUTFALL          405.50      0.50       0.0
Pond                 STORAGE          408.14      0.86       0.0
Ravine               STORAGE          406.65      2.75       0.0


************
Link Summary
************
Name              From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1                J1               J4               CONDUIT           75.0    2.0004    0.0130
C10               J7               J9               CONDUIT           14.3    0.7013    0.0130
C11               J9               south_saugeen    CONDUIT           10.0    3.0014    0.0300
```

Sunvale Homes – Mount Forest Subdivision – Post Development – 25 Yr Storm Event

C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.526	65.310
Evaporation Loss	0.000	0.000
Infiltration Loss	0.461	19.718
Surface Runoff	1.065	45.559
Final Storage	0.002	0.068
Continuity Error (%)	-0.054	

Sunvale Homes – Mount Forest Subdivision – Post Development – 25 Yr Storm Event

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.065	10.650
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.065	10.650
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

Link C10 (29.14%)
Link C5 (2.97%)

Highest Flow Instability Indexes

Link C3 (5)

Routing Time Step Summary

Minimum Time Step	:	1.76 sec
Average Time Step	:	4.39 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	65.31	0.00	0.00	14.17	51.13	4.01	842.21	0.783
202	65.31	0.00	0.00	30.22	35.04	0.48	93.14	0.537
203	65.31	0.00	0.00	28.94	36.33	0.13	26.67	0.556
204	65.31	0.00	0.00	24.37	40.91	0.10	21.58	0.626
EX1	65.31	0.00	0.00	19.00	46.29	5.56	1118.79	0.709
EX2	65.31	0.00	0.00	41.54	23.50	0.36	30.85	0.360

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
EX_CBMH	JUNCTION	0.10	0.56	409.69	0 02:25	0.56
J1	JUNCTION	0.01	0.04	407.54	0 02:25	0.04
J2	JUNCTION	0.08	0.30	409.00	0 02:25	0.30
J3	JUNCTION	0.01	0.04	407.04	0 02:25	0.04
J4	JUNCTION	0.00	0.00	406.00	0 02:26	0.00
J5	JUNCTION	0.07	0.43	406.40	0 02:25	0.43

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J6	JUNCTION	0.10	0.40	406.70	0	02:26	0.40
J7	JUNCTION	0.12	0.69	402.99	0	02:26	0.69
J8	JUNCTION	0.05	0.28	405.08	0	02:25	0.28
J9	JUNCTION	0.04	0.27	402.07	0	02:26	0.27
south_saugeen	OUTFALL	0.04	0.27	401.77	0	02:26	0.27
unnamed_watercourse	OUTFALL	0.00	0.00	405.50	0	02:26	0.00
Pond	STORAGE	0.03	0.23	408.37	0	02:25	0.23
Ravine	STORAGE	0.12	0.87	407.52	0	02:26	0.87

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	1142.95	1142.95	0 02:25	5.92	5.92	-0.001
J1	JUNCTION	26.67	26.67	0 02:25	0.134	0.134	-0.001
J2	JUNCTION	93.14	1234.56	0 02:25	0.48	6.4	0.002
J3	JUNCTION	21.58	21.58	0 02:25	0.102	0.102	-0.012
J4	JUNCTION	0.00	47.58	0 02:25	0	0.237	-0.587
J5	JUNCTION	0.00	835.26	0 02:25	0	4.01	-0.001
J6	JUNCTION	0.00	1219.50	0 02:26	0	6.4	0.000
J7	JUNCTION	0.00	2052.04	0 02:26	0	10.4	-0.002
J8	JUNCTION	0.00	834.85	0 02:25	0	4.01	0.008
J9	JUNCTION	0.00	2052.34	0 02:26	0	10.4	0.004
south_saugeen	OUTFALL	0.00	2052.39	0 02:26	0	10.4	0.000
unnamed_watercourse	OUTFALL	0.00	47.27	0 02:26	0	0.238	0.000
Pond	STORAGE	842.21	842.21	0 02:25	4.01	4.01	-0.001
Ravine	STORAGE	0.00	1228.23	0 02:25	0	6.4	0.000

****
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 LPS
Pond	0.003	1	0	0	0.050	10	0 02:25	835.26
Ravine	0.001	0	0	0	0.023	1	0 02:26	1219.50

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.85	198.25	2052.39	10.412
unnamed_watercourse	56.15	8.04	47.27	0.238

Sunvale Homes – Mount Forest Subdivision – Post Development – 25 Yr Storm Event

System	78.00	206.30	2099.61	10.650

****
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
C1	CONDUIT	26.41	0	02:25	1.49	0.00	0.05
C10	CONDUIT	2052.34	0	02:26	3.05	0.63	0.58
C11	CONDUIT	2052.39	0	02:26	2.18	0.15	0.34
C2	CONDUIT	21.17	0	02:25	0.98	0.00	0.04
C3	CONDUIT	47.27	0	02:26	0.22	0.00	0.01
C4	CONDUIT	1228.23	0	02:25	1.03	0.43	0.70
C5	CONDUIT	1219.50	0	02:26	2.82	1.39	0.94
C6	CONDUIT	1141.51	0	02:25	3.80	0.72	0.48
C7	CONDUIT	834.85	0	02:25	2.82	0.45	0.47
C8	CONDUIT	834.84	0	02:25	4.48	0.21	0.36
C9	CONDUIT	1219.23	0	02:26	2.40	0.16	0.50
OR1	ORIFICE	835.26	0	02:25			

****
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	0.00	0.00	0.00	0.04	0.96	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.65	0.35	0.00	0.00	0.05	0.00
C2	1.00	0.00	0.00	0.00	0.18	0.82	0.00	0.00	0.04	0.00
C3	1.00	0.22	0.01	0.00	0.71	0.06	0.00	0.00	0.02	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.61	0.39	0.00	0.00	0.76	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.04	0.00	0.96	0.02	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.21	0.01	0.39	0.01

Analysis begun on: Fri Dec 17 09:58:09 2021
Analysis ended on: Fri Dec 17 09:58:09 2021
Total elapsed time: < 1 sec

Sunvale Homes – Mount Forest Subdivision – Post Development – 50 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 6
Number of nodes 14
Number of links 12
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	7.84	2525.00	59.70	2.0000	SCS_6h_71.9mm_50yr	Pond
202	1.37	600.00	21.90	3.0000	SCS_6h_71.9mm_50yr	J2
203	0.37	140.00	21.50	4.0000	SCS_6h_71.9mm_50yr	J1
204	0.25	120.00	31.80	4.0000	SCS_6h_71.9mm_50yr	J3
EX1	12.02	3060.00	46.20	2.0000	SCS_6h_71.9mm_50yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_71.9mm_50yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	408.70	2.10	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	405.97	3.03	0.0	
J6	JUNCTION	406.30	1.00	0.0	
J7	JUNCTION	402.30	2.70	0.0	
J8	JUNCTION	404.80	2.12	0.0	
J9	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Pond	STORAGE	408.14	0.86	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C10	J7	J9	CONDUIT	14.3	0.7013	0.0130
C11	J9	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Post Development – 50 Yr Storm Event

C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.681	71.911
Evaporation Loss	0.000	0.000
Infiltration Loss	0.485	20.761
Surface Runoff	1.195	51.119
Final Storage	0.002	0.068
Continuity Error (%)	-0.053	

Sunvale Homes – Mount Forest Subdivision – Post Development – 50 Yr Storm Event

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.195	11.949
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.195	11.950
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 (%)	-0.008	

Time-Step Critical Elements

Link C10 (28.84%)
Link C5 (5.37%)

Highest Flow Instability Indexes

Link C3 (5)

Routing Time Step Summary

Minimum Time Step	:	1.60 sec
Average Time Step	:	4.34 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	71.91	0.00	0.00	14.91	57.00	4.47	944.03	0.793
202	71.91	0.00	0.00	31.95	39.92	0.55	108.12	0.555
203	71.91	0.00	0.00	30.57	41.30	0.15	30.92	0.574
204	71.91	0.00	0.00	25.66	46.23	0.12	24.64	0.643
EX1	71.91	0.00	0.00	19.98	51.92	6.24	1267.62	0.722
EX2	71.91	0.00	0.00	43.88	27.76	0.42	38.33	0.386

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
EX_CBMH	JUNCTION	0.11	0.62	409.75	0 02:25	0.62
J1	JUNCTION	0.01	0.04	407.54	0 02:25	0.04
J2	JUNCTION	0.08	0.31	409.01	0 02:25	0.31
J3	JUNCTION	0.01	0.04	407.04	0 02:25	0.04
J4	JUNCTION	0.00	0.00	406.00	0 02:26	0.00
J5	JUNCTION	0.08	0.46	406.43	0 02:25	0.45

J6	JUNCTION	0.10	0.42	406.72	0	02:26	0.42
J7	JUNCTION	0.13	0.74	403.04	0	02:26	0.74
J8	JUNCTION	0.05	0.30	405.10	0	02:25	0.30
J9	JUNCTION	0.05	0.29	402.09	0	02:26	0.29
south_saugeen	OUTFALL	0.05	0.29	401.79	0	02:26	0.29
unnamed_watercourse	OUTFALL	0.00	0.00	405.50	0	02:26	0.00
Pond	STORAGE	0.03	0.25	408.39	0	02:25	0.25
Ravine	STORAGE	0.14	1.00	407.65	0	02:26	1.00

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	1298.66	1298.66	0 02:25	6.66	6.66	-0.001
J1	JUNCTION	30.92	30.92	0 02:25	0.153	0.153	-0.001
J2	JUNCTION	108.12	1404.91	0 02:25	0.547	7.21	0.001
J3	JUNCTION	24.64	24.64	0 02:25	0.116	0.116	-0.012
J4	JUNCTION	0.00	54.82	0 02:25	0	0.268	-0.509
J5	JUNCTION	0.00	935.97	0 02:25	0	4.47	-0.000
J6	JUNCTION	0.00	1374.76	0 02:26	0	7.21	0.000
J7	JUNCTION	0.00	2305.11	0 02:26	0	11.7	-0.001
J8	JUNCTION	0.00	935.56	0 02:25	0	4.47	0.008
J9	JUNCTION	0.00	2305.36	0 02:26	0	11.7	0.004
south_saugeen	OUTFALL	0.00	2305.40	0 02:26	0	11.7	0.000
unnamed_watercourse	OUTFALL	0.00	54.49	0 02:26	0	0.27	0.000
Pond	STORAGE	944.03	944.03	0 02:25	4.47	4.47	-0.001
Ravine	STORAGE	0.00	1398.09	0 02:25	0	7.21	0.000

****
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 LPS
Pond	0.004	1	0	0	0.058	11	0 02:25	935.97
Ravine	0.001	0	0	0	0.038	1	0 02:26	1374.76

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.85	232.58	2305.40	11.680
unnamed_watercourse	56.69	9.46	54.49	0.270

Sunvale Homes – Mount Forest Subdivision – Post Development – 50 Yr Storm Event

System	78.27	242.04	2359.88	11.950

****
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
C1	CONDUIT	30.63	0	02:25	1.54	0.00	0.05
C10	CONDUIT	2305.36	0	02:26	3.13	0.71	0.62
C11	CONDUIT	2305.40	0	02:26	2.27	0.17	0.37
C2	CONDUIT	24.20	0	02:25	1.01	0.00	0.05
C3	CONDUIT	54.49	0	02:26	0.24	0.00	0.01
C4	CONDUIT	1398.09	0	02:25	1.06	0.49	0.74
C5	CONDUIT	1374.76	0	02:26	3.15	1.57	0.96
C6	CONDUIT	1296.90	0	02:25	3.93	0.81	0.52
C7	CONDUIT	935.56	0	02:25	2.90	0.51	0.51
C8	CONDUIT	935.54	0	02:25	4.46	0.24	0.40
C9	CONDUIT	1374.59	0	02:26	2.47	0.18	0.53
OR1	ORIFICE	935.97	0	02:25			

****
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	0.00	0.00	0.00	0.04	0.96	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.64	0.36	0.00	0.00	0.05	0.00
C2	1.00	0.00	0.00	0.00	0.18	0.82	0.00	0.00	0.03	0.00
C3	1.00	0.22	0.01	0.00	0.70	0.08	0.00	0.00	0.02	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.60	0.40	0.00	0.00	0.76	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.04	0.00	0.95	0.02	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.35	0.01	0.43	0.01

Analysis begun on: Fri Dec 17 09:59:08 2021
Analysis ended on: Fri Dec 17 09:59:08 2021
Total elapsed time: < 1 sec

Sunvale Homes – Mount Forest Subdivision – Post Development – 100 Yr Storm Event

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 6
Number of nodes ........... 14
Number of links ........... 12
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Hurricane_Hazel_(Southern_Ontario) Hurricane_Hazel_(Southern_Ontario) INTENSITY   60 min.
SCS_6h_38.8mm_2yr    SCS_6h_38.8mm_2yr           INTENSITY    5 min.
SCS_6h_49.4mm_5yr    SCS_6h_49.4mm_5yr           INTENSITY    5 min.
SCS_6h_65.3mm_25yr   SCS_6h_65.3mm_25yr          INTENSITY    5 min.
SCS_6h_71.9mm_50yr   SCS_6h_71.9mm_50yr          INTENSITY    5 min.
SCS_6h_78.4mm_100yr  SCS_6h_78.4mm_100yr         INTENSITY    5 min.
SCS_6h_88mm_MTO100Yr SCS_6h_88mm_MTO100Yr        INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------
201                         7.84   2525.00     59.70    2.0000 SCS_6h_78.4mm_100yr  Pond
202                         1.37    600.00     21.90    3.0000 SCS_6h_78.4mm_100yr  J2
203                         0.37    140.00     21.50    4.0000 SCS_6h_78.4mm_100yr  J1
204                         0.25    120.00     31.80    4.0000 SCS_6h_78.4mm_100yr  J3
EX1                        12.02   3060.00     46.20    2.0000 SCS_6h_78.4mm_100yr  EX_CBMH
EX2                         1.52    150.00      0.00    2.0000 SCS_6h_78.4mm_100yr  EX_CBMH


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------
EX_CBMH              JUNCTION       409.13      1.98       0.0
J1                   JUNCTION       407.50      0.50       0.0
J2                   JUNCTION       408.70      2.10       0.0
J3                   JUNCTION       407.00      0.50       0.0
J4                   JUNCTION       406.00      0.50       0.0
J5                   JUNCTION       405.97      3.03       0.0
J6                   JUNCTION       406.30      1.00       0.0
J7                   JUNCTION       402.30      2.70       0.0
J8                   JUNCTION       404.80      2.12       0.0
J9                   JUNCTION       401.80      1.70       0.0
south_saugeen        OUTFALL        401.50      0.80       0.0
unnamed_watercourse  OUTFALL        405.50      0.50       0.0
Pond                 STORAGE        408.14      0.86       0.0
Ravine               STORAGE        406.65      2.75       0.0


************
Link Summary
************
Name              From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1                J1               J4               CONDUIT           75.0    2.0004    0.0130
C10               J7               J9               CONDUIT           14.3    0.7013    0.0130
C11               J9               south_saugeen    CONDUIT           10.0    3.0014    0.0300
```

Sunvale Homes – Mount Forest Subdivision – Post Development – 100 Yr Storm Event

C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.833	78.413
Evaporation Loss	0.000	0.000
Infiltration Loss	0.508	21.729
Surface Runoff	1.324	56.657
Final Storage	0.002	0.068
Continuity Error (%)	-0.052	

Sunvale Homes – Mount Forest Subdivision – Post Development – 100 Yr Storm Event

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.324	13.244
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.324	13.244
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 (%)	-0.005	

Time-Step Critical Elements

Link C10 (29.08%)
Link C5 (6.45%)

Highest Flow Instability Indexes

Link C3 (5)

Routing Time Step Summary

Minimum Time Step	:	1.47 sec
Average Time Step	:	4.28 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	78.41	0.00	0.00	15.57	62.85	4.93	1045.73	0.801
202	78.41	0.00	0.00	33.52	44.86	0.61	123.48	0.572
203	78.41	0.00	0.00	32.00	46.38	0.17	35.25	0.592
204	78.41	0.00	0.00	26.87	51.52	0.13	27.73	0.657
EX1	78.41	0.00	0.00	20.90	57.50	6.91	1417.68	0.733
EX2	78.41	0.00	0.00	46.10	32.05	0.49	46.29	0.409

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
EX_CBMH	JUNCTION	0.12	0.68	409.81	0 02:25	0.68
J1	JUNCTION	0.01	0.05	407.55	0 02:25	0.05
J2	JUNCTION	0.08	0.32	409.02	0 02:25	0.32
J3	JUNCTION	0.01	0.04	407.04	0 02:25	0.04
J4	JUNCTION	0.00	0.00	406.00	0 02:26	0.00
J5	JUNCTION	0.08	0.48	406.45	0 02:25	0.48

Sunvale Homes – Mount Forest Subdivision – Post Development – 100 Yr Storm Event

J6	JUNCTION	0.11	0.44	406.74	0	02:27	0.44
J7	JUNCTION	0.14	0.80	403.10	0	02:26	0.80
J8	JUNCTION	0.06	0.31	405.11	0	02:25	0.31
J9	JUNCTION	0.05	0.31	402.11	0	02:26	0.31
south_saugeen	OUTFALL	0.05	0.31	401.81	0	02:26	0.31
unnamed_watercourse	OUTFALL	0.00	0.00	405.50	0	02:26	0.00
Pond	STORAGE	0.04	0.26	408.40	0	02:25	0.26
Ravine	STORAGE	0.16	1.14	407.79	0	02:27	1.14

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	1456.37	1456.37	0 02:25	7.4	7.4	-0.001
J1	JUNCTION	35.25	35.25	0 02:25	0.172	0.172	-0.001
J2	JUNCTION	123.48	1577.61	0 02:25	0.615	8.02	0.001
J3	JUNCTION	27.73	27.73	0 02:25	0.129	0.129	-0.012
J4	JUNCTION	0.00	62.19	0 02:25	0	0.301	-0.453
J5	JUNCTION	0.00	1036.58	0 02:25	0	4.93	-0.000
J6	JUNCTION	0.00	1525.51	0 02:27	0	8.01	0.000
J7	JUNCTION	0.00	2552.29	0 02:26	0	12.9	0.001
J8	JUNCTION	0.00	1036.22	0 02:25	0	4.93	0.009
J9	JUNCTION	0.00	2552.51	0 02:26	0	12.9	0.004
south_saugeen	OUTFALL	0.00	2552.55	0 02:26	0	12.9	0.000
unnamed_watercourse	OUTFALL	0.00	61.83	0 02:26	0	0.302	0.000
Pond	STORAGE	1045.73	1045.73	0 02:25	4.93	4.93	-0.001
Ravine	STORAGE	0.00	1570.32	0 02:25	0	8.01	0.000

****
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 LPS
Pond	0.005	1	0	0	0.066	13	0 02:25	1036.58
Ravine	0.002	0	0	0	0.065	2	0 02:27	1525.51

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.87	268.77	2552.55	12.942
unnamed_watercourse	57.40	10.92	61.83	0.302

System	78.63	279.69	2614.38	13.244

****
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
C1	CONDUIT	34.93	0	02:25	1.59	0.00	0.05
C10	CONDUIT	2552.51	0	02:26	3.19	0.78	0.67
C11	CONDUIT	2552.55	0	02:26	2.35	0.19	0.39
C2	CONDUIT	27.26	0	02:25	1.03	0.00	0.05
C3	CONDUIT	61.83	0	02:26	0.25	0.00	0.01
C4	CONDUIT	1570.32	0	02:25	1.09	0.55	0.77
C5	CONDUIT	1525.51	0	02:27	3.48	1.74	0.97
C6	CONDUIT	1454.25	0	02:25	4.01	0.91	0.56
C7	CONDUIT	1036.22	0	02:25	2.97	0.56	0.54
C8	CONDUIT	1036.20	0	02:25	4.45	0.26	0.44
C9	CONDUIT	1525.39	0	02:27	2.54	0.20	0.55
OR1	ORIFICE	1036.58	0	02:25			

****
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	0.00	0.00	0.00	0.04	0.96	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.63	0.37	0.00	0.00	0.06	0.00
C2	1.00	0.00	0.00	0.00	0.17	0.83	0.00	0.00	0.04	0.00
C3	1.00	0.22	0.01	0.00	0.69	0.09	0.00	0.00	0.02	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.59	0.41	0.00	0.00	0.76	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.95	0.02	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.41	0.01	0.47	0.01

Analysis begun on: Fri Dec 17 10:00:38 2021
Analysis ended on: Fri Dec 17 10:00:38 2021
Total elapsed time: < 1 sec

Sunvale Homes – Mount Forest Subdivision – Post Development – MTO 100 Yr Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 6
Number of nodes 14
Number of links 12
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	7.84	2525.00	59.70	2.0000	SCS_6h_88mm_MTO100Yr	Pond
202	1.37	600.00	21.90	3.0000	SCS_6h_88mm_MTO100Yr	J2
203	0.37	140.00	21.50	4.0000	SCS_6h_88mm_MTO100Yr	J1
204	0.25	120.00	31.80	4.0000	SCS_6h_88mm_MTO100Yr	J3
EX1	12.02	3060.00	46.20	2.0000	SCS_6h_88mm_MTO100Yr	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	SCS_6h_88mm_MTO100Yr	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	408.70	2.10	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	405.97	3.03	0.0	
J6	JUNCTION	406.30	1.00	0.0	
J7	JUNCTION	402.30	2.70	0.0	
J8	JUNCTION	404.80	2.12	0.0	
J9	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Pond	STORAGE	408.14	0.86	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130
C10	J7	J9	CONDUIT	14.3	0.7013	0.0130
C11	J9	south_saugeen	CONDUIT	10.0	3.0014	0.0300

Sunvale Homes – Mount Forest Subdivision – Post Development – MTO 100 Yr Storm Event

C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	2.057	88.013
Evaporation Loss	0.000	0.000
Infiltration Loss	0.538	23.012
Surface Runoff	1.519	64.978
Final Storage	0.002	0.068
Continuity Error (%)	-0.051	

Sunvale Homes – Mount Forest Subdivision – Post Development – MTO 100 Yr Storm Event

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.519	15.189
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.519	15.189
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 (%)	0.000	

Time-Step Critical Elements

Link C10 (32.45%)
Link C5 (4.38%)

Highest Flow Instability Indexes

Link C3 (5)
Link C6 (1)

Routing Time Step Summary

Minimum Time Step	:	1.34 sec
Average Time Step	:	4.21 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	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	88.01	0.00	0.00	16.48	71.54	5.61	1198.07	0.813
202	88.01	0.00	0.00	35.70	52.29	0.72	147.07	0.594
203	88.01	0.00	0.00	33.97	54.02	0.20	41.87	0.614
204	88.01	0.00	0.00	28.42	59.57	0.15	32.40	0.677
EX1	88.01	0.00	0.00	22.07	65.93	7.92	1644.54	0.749
EX2	88.01	0.00	0.00	49.14	38.61	0.59	60.59	0.439

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
EX_CBMH	JUNCTION	0.13	0.77	409.90	0 02:25	0.77
J1	JUNCTION	0.01	0.05	407.55	0 02:25	0.05
J2	JUNCTION	0.09	0.34	409.04	0 02:25	0.34
J3	JUNCTION	0.01	0.05	407.05	0 02:25	0.05
J4	JUNCTION	0.00	0.01	406.01	0 02:26	0.01

J5	JUNCTION	0.09	0.53	406.50	0	02:25	0.53
J6	JUNCTION	0.12	0.46	406.76	0	02:28	0.46
J7	JUNCTION	0.16	0.88	403.18	0	02:26	0.88
J8	JUNCTION	0.06	0.34	405.14	0	02:25	0.34
J9	JUNCTION	0.06	0.33	402.13	0	02:26	0.33
south_saugeen	OUTFALL	0.06	0.33	401.83	0	02:26	0.33
unnamed_watercourse	OUTFALL	0.00	0.01	405.51	0	02:26	0.01
Pond	STORAGE	0.04	0.29	408.43	0	02:25	0.29
Ravine	STORAGE	0.18	1.37	408.02	0	02:28	1.37

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	1696.03	1696.03	0	02:25	8.51	8.51	-0.000
J1	JUNCTION	41.87	41.87	0	02:25	0.2	0.2	-0.001
J2	JUNCTION	147.07	1880.66	0	02:25	0.717	9.23	0.000
J3	JUNCTION	32.40	32.40	0	02:25	0.149	0.149	-0.012
J4	JUNCTION	0.00	73.42	0	02:25	0	0.349	-0.393
J5	JUNCTION	0.00	1187.34	0	02:25	0	5.61	-0.000
J6	JUNCTION	0.00	1717.53	0	02:28	0	9.23	-0.000
J7	JUNCTION	0.00	2878.31	0	02:26	0	14.8	0.005
J8	JUNCTION	0.00	1186.94	0	02:25	0	5.61	0.009
J9	JUNCTION	0.00	2878.50	0	02:26	0	14.8	0.003
south_saugeen	OUTFALL	0.00	2878.54	0	02:26	0	14.8	0.000
unnamed_watercourse	OUTFALL	0.00	73.04	0	02:26	0	0.35	0.000
Pond	STORAGE	1198.07	1198.07	0	02:25	5.61	5.61	-0.001
Ravine	STORAGE	0.00	1833.53	0	02:25	0	9.23	0.001

****
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 LPS
Pond	0.006	1	0	0	0.079	15	0	02:25	1187.34
Ravine	0.005	0	0	0	0.134	4	0	02:28	1717.53

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.87	315.14	2878.54	14.839

unnamed_watercourse	58.21	12.80	73.04	0.350
System	79.04	327.94	2951.49	15.189

****
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
C1	CONDUIT	41.52	0 02:25	1.65	0.00	0.05
C10	CONDUIT	2878.50	0 02:26	3.26	0.88	0.73
C11	CONDUIT	2878.54	0 02:26	2.45	0.21	0.42
C2	CONDUIT	31.90	0 02:25	1.07	0.00	0.05
C3	CONDUIT	73.04	0 02:26	0.27	0.00	0.01
C4	CONDUIT	1833.53	0 02:25	1.13	0.64	0.82
C5	CONDUIT	1717.53	0 02:28	3.89	1.96	1.00
C6	CONDUIT	1733.80	0 02:25	4.19	1.09	0.62
C7	CONDUIT	1186.94	0 02:25	3.07	0.65	0.59
C8	CONDUIT	1186.93	0 02:25	4.45	0.30	0.50
C9	CONDUIT	1717.46	0 02:28	2.61	0.23	0.57
OR1	ORIFICE	1187.34	0 02:25			

****
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	0.00	0.00	0.00	0.03	0.97	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.61	0.39	0.00	0.00	0.06	0.00
C2	1.00	0.00	0.00	0.00	0.17	0.83	0.00	0.00	0.04	0.00
C3	1.00	0.21	0.01	0.00	0.66	0.12	0.00	0.00	0.03	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.57	0.43	0.00	0.00	0.76	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.03	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.14	0.47	0.14	0.57	0.14
C6	0.01	0.01	0.01	0.12	0.01

Analysis begun on: Fri Dec 17 10:01:33 2021
Analysis ended on: Fri Dec 17 10:01:34 2021
Total elapsed time: 00:00:01

Sunvale Homes – Mount Forest Subdivision – Post Development – Hurricane Hazel Storm Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 6
Number of nodes 14
Number of links 12
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
SCS_6h_38.8mm_2yr	SCS_6h_38.8mm_2yr	INTENSITY	5 min.
SCS_6h_49.4mm_5yr	SCS_6h_49.4mm_5yr	INTENSITY	5 min.
SCS_6h_65.3mm_25yr	SCS_6h_65.3mm_25yr	INTENSITY	5 min.
SCS_6h_71.9mm_50yr	SCS_6h_71.9mm_50yr	INTENSITY	5 min.
SCS_6h_78.4mm_100yr	SCS_6h_78.4mm_100yr	INTENSITY	5 min.
SCS_6h_88mm_MTO100Yr	SCS_6h_88mm_MTO100Yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	7.84	2525.00	59.70	2.0000	Hurricane_Hazel_(Southern_Ontario)	Pond
202	1.37	600.00	21.90	3.0000	Hurricane_Hazel_(Southern_Ontario)	J2
203	0.37	140.00	21.50	4.0000	Hurricane_Hazel_(Southern_Ontario)	J1
204	0.25	120.00	31.80	4.0000	Hurricane_Hazel_(Southern_Ontario)	J3
EX1	12.02	3060.00	46.20	2.0000	Hurricane_Hazel_(Southern_Ontario)	EX_CBMH
EX2	1.52	150.00	0.00	2.0000	Hurricane_Hazel_(Southern_Ontario)	EX_CBMH

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX_CBMH	JUNCTION	409.13	1.98	0.0	
J1	JUNCTION	407.50	0.50	0.0	
J2	JUNCTION	408.70	2.10	0.0	
J3	JUNCTION	407.00	0.50	0.0	
J4	JUNCTION	406.00	0.50	0.0	
J5	JUNCTION	405.97	3.03	0.0	
J6	JUNCTION	406.30	1.00	0.0	
J7	JUNCTION	402.30	2.70	0.0	
J8	JUNCTION	404.80	2.12	0.0	
J9	JUNCTION	401.80	1.70	0.0	
south_saugeen	OUTFALL	401.50	0.80	0.0	
unnamed_watercourse	OUTFALL	405.50	0.50	0.0	
Pond	STORAGE	408.14	0.86	0.0	
Ravine	STORAGE	406.65	2.75	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J4	CONDUIT	75.0	2.0004	0.0130

Sunvale Homes – Mount Forest Subdivision – Post Development – Hurricane Hazel Storm Event

C10	J7	J9	CONDUIT	14.3	0.7013	0.0130
C11	J9	south_saugeen	CONDUIT	10.0	3.0014	0.0300
C2	J3	J4	CONDUIT	112.0	0.8931	0.0130
C3	J4	unnamed_watercourse	CONDUIT	41.0	1.2199	0.0130
C4	J2	Ravine	CONDUIT	50.0	1.1001	0.0300
C5	Ravine	J6	CONDUIT	15.0	1.4668	0.0200
C6	EX_CBMH	J2	CONDUIT	55.5	0.7747	0.0130
C7	J5	J8	CONDUIT	103.0	1.0292	0.0130
C8	J8	J7	CONDUIT	46.0	4.7445	0.0130
C9	J6	J7	CONDUIT	45.0	4.6718	0.0300
OR1	Pond	J5	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	8.75	0.25	35.00	1	37770.94
C10	CIRCULAR	1.20	1.13	0.30	1.20	1	3265.09
C11	TRAPEZOIDAL	0.80	3.42	0.57	5.56	1	13546.71
C2	TRIANGULAR	0.50	11.25	0.25	45.00	1	32451.06
C3	RECT_OPEN	0.50	25.00	0.49	50.00	1	132058.05
C4	TRIANGULAR	0.40	2.40	0.20	12.00	1	2865.52
C5	CIRCULAR	0.75	0.44	0.19	0.75	1	876.46
C6	CIRCULAR	0.90	0.64	0.23	0.90	1	1593.44
C7	CIRCULAR	0.90	0.64	0.23	0.90	1	1836.64
C8	CIRCULAR	0.90	0.64	0.23	0.90	1	3943.42
C9	TRIANGULAR	0.80	2.00	0.38	5.00	1	7573.01

****
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
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date 09/10/2020 00:00:00
Ending Date 09/11/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 2
Head Tolerance ..... 0.001524 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	4.931	211.000
Evaporation Loss	0.000	0.000
Infiltration Loss	0.748	31.991

Sunvale Homes – Mount Forest Subdivision – Post Development – Hurricane Hazel Storm Event

```
Surface Runoff ...........          4.184       179.023
Final Storage ............          0.002         0.085
Continuity Error (%) .....         -0.047

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......          0.000         0.000
Wet Weather Inflow .......          4.184        41.838
Groundwater Inflow .......          0.000         0.000
RDII Inflow ..............          0.000         0.000
External Inflow ..........          0.000         0.000
External Outflow .........          4.184        41.837
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 (%) .....          0.003

***************************
Time-Step Critical Elements
***************************
Link C10 (53.06%)
Link C5 (12.20%)

*******************************
Highest Flow Instability Indexes
*******************************
Link C6 (5)
Link C4 (2)
Link C3 (1)

************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.53 sec
Average Time Step           :     3.42 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.00

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

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
201	211.00	0.00	0.00	22.61	188.46	14.78	1098.64	0.893
202	211.00	0.00	0.00	51.24	159.74	2.19	178.07	0.757
203	211.00	0.00	0.00	47.66	163.33	0.60	48.88	0.774
204	211.00	0.00	0.00	39.38	171.64	0.43	33.80	0.813
EX1	211.00	0.00	0.00	30.34	180.69	21.72	1656.34	0.856
EX2	211.00	0.00	0.00	71.05	139.55	2.12	168.51	0.661

```
******************
Node Depth Summary
******************
```

	Average Depth	Maximum Depth	Maximum HGL	Time of Max Occurrence	Reported Max Depth

Sunvale Homes – Mount Forest Subdivision – Post Development – Hurricane Hazel Storm Event

Node	Type	Meters	Meters	Meters	days	hr:min	Meters
EX_CBMH	JUNCTION	0.28	0.82	409.95	0	09:56	0.81
J1	JUNCTION	0.02	0.05	407.55	0	10:00	0.05
J2	JUNCTION	0.16	0.35	409.05	0	09:59	0.35
J3	JUNCTION	0.02	0.05	407.05	0	10:00	0.05
J4	JUNCTION	0.00	0.01	406.01	0	10:00	0.01
J5	JUNCTION	0.19	0.50	406.47	0	10:00	0.50
J6	JUNCTION	0.22	0.48	406.78	0	10:01	0.48
J7	JUNCTION	0.33	0.92	403.22	0	10:00	0.92
J8	JUNCTION	0.13	0.32	405.12	0	10:00	0.32
J9	JUNCTION	0.12	0.35	402.15	0	10:00	0.34
south_saugeen	OUTFALL	0.12	0.34	401.84	0	10:00	0.34
unnamed_watercourse	OUTFALL	0.00	0.01	405.51	0	10:00	0.01
Pond	STORAGE	0.09	0.27	408.41	0	10:00	0.27
Ravine	STORAGE	0.41	1.63	408.28	0	10:01	1.63

****
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	Flow Balance Error Percent
EX_CBMH	JUNCTION	1824.86	1824.86	0	10:00	23.8	23.8	0.008
J1	JUNCTION	48.88	48.88	0	10:00	0.604	0.604	-0.001
J2	JUNCTION	178.07	2090.82	0	09:56	2.19	26	-0.007
J3	JUNCTION	33.80	33.80	0	10:00	0.429	0.429	-0.005
J4	JUNCTION	0.00	82.62	0	10:00	0	1.03	-0.038
J5	JUNCTION	0.00	1098.07	0	10:00	0	14.8	-0.000
J6	JUNCTION	0.00	1963.32	0	10:01	0	26	0.000
J7	JUNCTION	0.00	3059.80	0	10:00	0	40.8	0.002
J8	JUNCTION	0.00	1097.96	0	10:00	0	14.8	0.003
J9	JUNCTION	0.00	3059.84	0	10:00	0	40.8	0.002
south_saugeen	OUTFALL	0.00	3059.86	0	10:00	0	40.8	0.000
unnamed_watercourse	OUTFALL	0.00	82.57	0	10:00	0	1.03	0.000
Pond	STORAGE	1098.64	1098.64	0	10:00	14.8	14.8	-0.000
Ravine	STORAGE	0.00	2003.63	0	10:00	0	26	0.000

****
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 LPS
Pond	0.015	3	0	0	0.071	14	0	10:00	1098.07
Ravine	0.023	1	0	0	0.283	8	0	10:01	1963.32

****

Sunvale Homes – Mount Forest Subdivision – Post Development – Hurricane Hazel Storm Event

Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
south_saugeen	99.90	781.55	3059.86	40.803
unnamed_watercourse	82.09	24.47	82.57	1.034
System	91.00	806.01	3142.37	41.836

****
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
C1	CONDUIT	48.85	0	10:00	1.72	0.00	0.06
C10	CONDUIT	3059.84	0	10:00	3.28	0.94	0.77
C11	CONDUIT	3059.86	0	10:00	2.50	0.23	0.43
C2	CONDUIT	33.76	0	10:00	1.08	0.00	0.05
C3	CONDUIT	82.57	0	10:00	0.28	0.00	0.01
C4	CONDUIT	2003.63	0	10:00	1.16	0.70	0.85
C5	CONDUIT	1963.32	0	10:01	4.44	2.24	1.00
C6	CONDUIT	1913.38	0	09:56	4.44	1.20	0.65
C7	CONDUIT	1097.96	0	10:00	3.01	0.60	0.56
C8	CONDUIT	1097.96	0	10:00	4.25	0.28	0.52
C9	CONDUIT	1963.29	0	10:01	2.70	0.26	0.60
OR1	ORIFICE	1098.07	0	10:00			

****
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	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.32	0.68	0.00	0.00	0.07	0.00
C2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C3	1.00	0.02	0.00	0.00	0.67	0.31	0.00	0.00	0.05	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.28	0.72	0.00	0.00	0.57	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.18	0.00	0.82	0.09	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.95	2.01	0.95	2.06	0.95
C6	0.01	0.01	0.01	0.77	0.01

Sunvale Homes – Mount Forest Subdivision – Post Development – Hurricane Hazel Storm Event

```
Analysis begun on:  Fri Dec 17 10:36:04 2021
Analysis ended on:  Fri Dec 17 10:36:05 2021
Total elapsed time: 00:00:01
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Appendix F

OGS SIZING

STORMWATER MANAGEMENT REPORT

SUNVALE HOMES MOUNT FOREST SUBDIVISION

TOWNSHIP OF WELLINGTON NORTH

ADS OGS Sizing Summary

Project Name: Sunvale Subdivision

Consulting Engineer: Cobide Engineering

Location: Mount Forest, ON

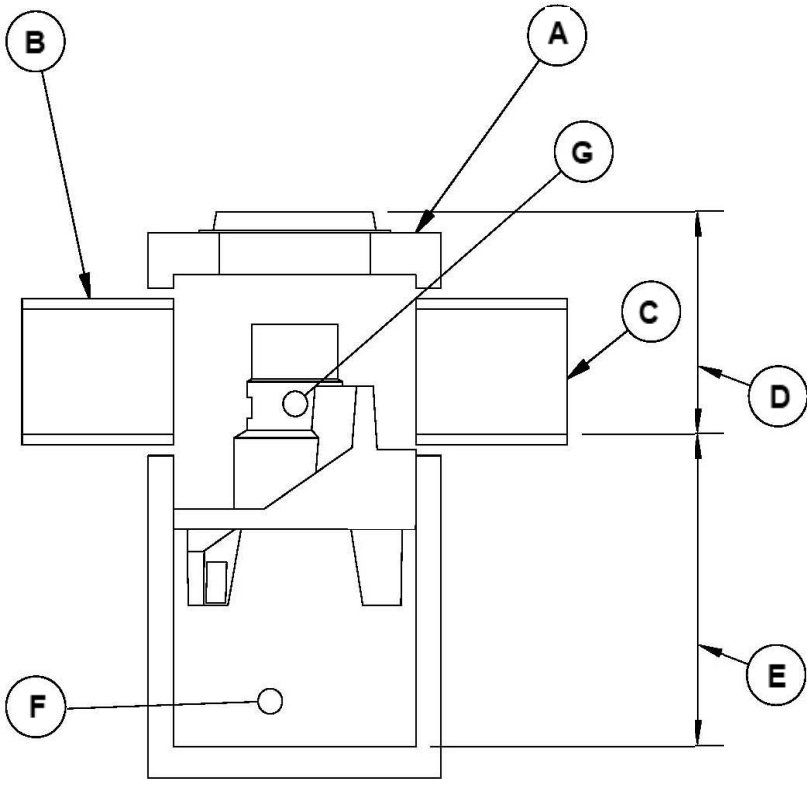
Sizing Completed By: C. Neath **Email:** cody.neath@ads-pipe.com

Treatment Requirements		
Treatment Goal:	Enhanced (MOE)	
Selected Parameters:	80% TSS	90% Volume
Selected Unit:	**ADS FD-8HC**	

Site Details	
Site Area:	6.97 ha
% Impervious:	59%
Rational C:	0.79
Rainfall Station:	Owen Sound
Particle Size Distribution:	Fine
Peak Flowrate:	931 L/s

Summary of Results		
Model	TSS Removal	Volume Treated
ADS FD-4HC	72.0%	87.5%
ADS FD-5HC	75.4%	94.2%
ADS FD-6HC	77.7%	97.2%
ADS FD-8HC	81.9%	98.9%

ADS FD-8HC Specification	
Unit Diameter (A):	2,400 mm
Inlet Pipe Diameter (B):	900 mm
Outlet Pipe Diameter (C):	900 mm
Height,T/G to Outlet Invert (D):	1600 mm
Height, Outlet Invert to Sump (E):	2,200 mm
Sediment Storage Capacity (F):	2.1 m³
Oil Storage Capacity (G):	4,239 L
Max. Pipe Diameter:	1,200 mm
Peak Flow Capacity:	1,415 L/s



Site Elevations:	
Rim Elevation:	100.00
Inlet Pipe Elevation:	98.40
Outlet Pipe Elevation:	98.40

Notes:

Removal efficiencies are based on NJDEP Test Protocols and independently verified.

All units supplied by ADS have numerous local, provincial, and international certifications (copies of which can be provided upon request). The design engineer is responsible for ensuring compliance with applicable regulations.

Project Name:	Sunvale Subdivision
Consulting Engineer:	Cobide Engineering
Location:	Mount Forest, ON

Net Annual Removal Efficiency Summary: ADS FD-8HC

Rainfall Intensity[1]	Fraction of Rainfall[1]	ADS FD-8HC Removal Efficiency[2]	Weighted Net-Annual Removal Efficiency
mm/hr	%	%	%
0.50	10.1%	98.0%	9.9%
1.00	10.7%	91.9%	9.8%
1.50	10.0%	88.5%	8.8%
2.00	8.4%	86.1%	7.2%
2.50	6.6%	84.3%	5.6%
3.00	6.2%	82.9%	5.1%
3.60	4.1%	81.5%	3.3%
4.10	4.2%	80.6%	3.4%
4.60	3.7%	79.7%	2.9%
5.10	3.8%	78.9%	3.0%
6.40	6.4%	77.3%	4.9%
7.60	4.6%	76.1%	3.5%
8.90	3.3%	75.0%	2.5%
10.20	2.4%	74.0%	1.8%
11.40	2.6%	73.2%	1.9%
12.70	1.5%	72.5%	1.1%
15.20	2.1%	71.3%	1.5%
19.10	2.3%	69.8%	1.6%
25.40	3.9%	68.0%	2.7%
38.10	1.4%	65.5%	0.9%
50.80	0.6%	63.7%	0.4%
		Total Net Annual Removal Efficiency:	81.9%
		Total Runoff Volume Treated:	98.9%

Notes:

(1) Rainfall data based on 37 years of rainfall data for Canada Station Owen Sound, Owen Sound, Ontario, Canada.

(2) Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution

(3) Rainfall adjusted to 5 min peak intensity based on hourly average.