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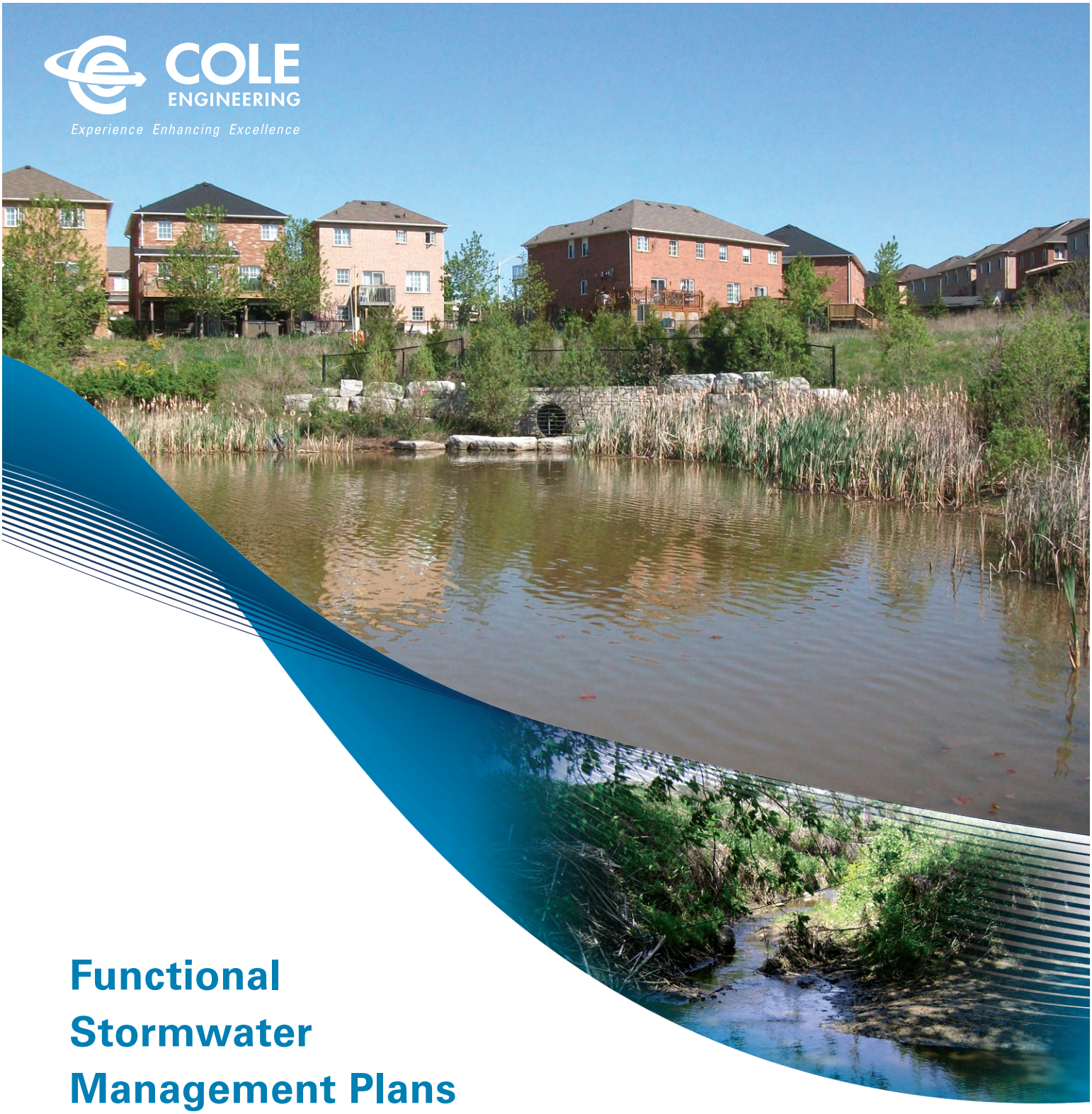

Functional Stormwater Management Plans

THE CITY OF VAUGHAN

JUNE 2014

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FUNCTIONAL STORMWATER MANAGEMENT PLANS

Yonge-Steeles

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1.0 Background

1.1. Study Area

The Yonge-Steeles Secondary Plan Area is located on the southeastern limit of the City of Vaughan (the City) in the community of Thornhill. The Plan Area is divided into two (2) study areas: 1) the North Study area; and, 2) the South Study Area. The North Study Area is bound by Yonge Street to the east, Longbridge Road to the north, the Thornhill Golf and Country Club to the south and by the existing residential lots facing Fairlea Avenue and Vistaview Boulevard to the west. In total, the North Study area is approximately 9.7 ha in size.

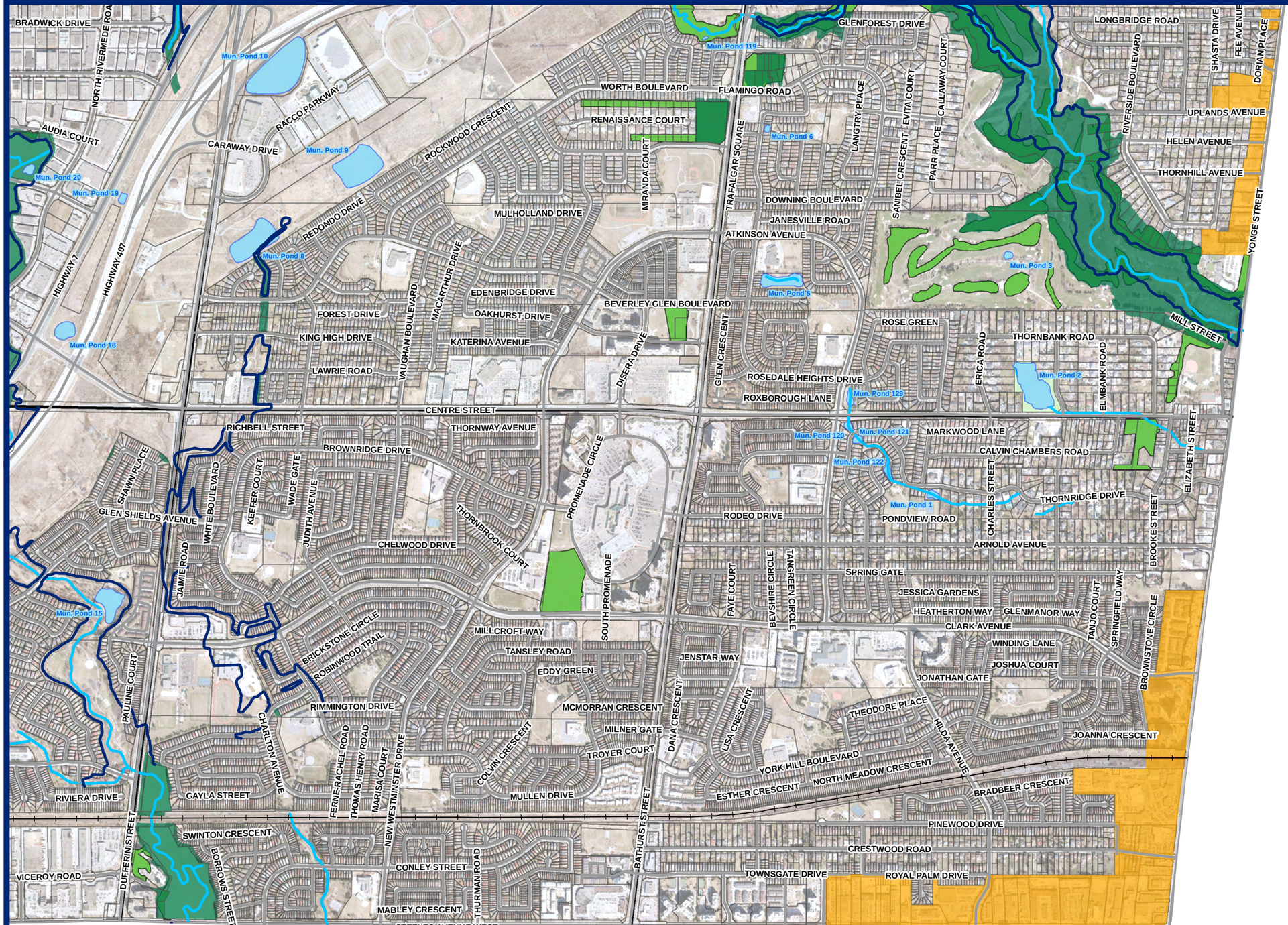
The South Study Area is bound by Yonge Street to the east, Palm Gate Boulevard to the west, Steeles Avenue to the south. The northern site boundary, which connects the westernmost and northernmost points of this area, follows an alignment of secondary and tertiary residential streets on the northern side of the CN railway line. The South Study Area is 45.8 ha in size. Refer to **Figure 1-1** for a location plan of the study area.

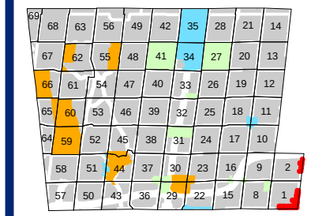
1.2. Existing Reports

The following reports were referenced in preparing this Functional Stormwater Management (SWM) Plan:

- Stormwater Management Planning and Design Manual (SWMP), Ministry of the Environment, 2003;
- Design Criteria and Standard Drawings (CVDC), City of Vaughan Engineering Department, March 2004;
- City-Wide Drainage and Stormwater Management Criteria Study, Clarifica Inc., August 2009;
- Yonge Street Study, Young+Wright, Dillon Consulting Ltd., GHK International Ltd., February 2010;
- Yonge Steeles Corridor Secondary Plan, Young+Wright, Dillon Consulting Ltd., GHK International Ltd., September 2010;
- Official Plan, City of Vaughan, September 2010; and,
- Stormwater Management Criteria, Toronto and Region Conservation Authority, August 2012.

Location Plan | Yonge-Steeles Secondary Plan Area





Legend

- TRCA Existing Floodlines
- Watercourse
- Secondary Plan Area
- Existing SWM Ponds
- Natural Areas
- TRCA Property
- Forested Area

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Yonge-Steeles Intensification Functional SWM Plan
November 2013

Location Plan

SCALE 1:15,000
0 55 110 220 330 440 Meters

FIGURE
1-1

2.0 Existing Conditions

2.1. Existing Land Use

The secondary plan area is approximately 58.5 ha in size. The site is split into the North Area (9.7 ha) and the South Area (48.8 ha). **Figure 1-1** above shows the location plan for the study area. The North study area, south of Bunker Road, is predominantly of low rise commercial properties. To the north of Bunker Road, there is a shift in land use low density residential lots. There is also an existing school located on the northwest corner of Uplands Avenue and Yonge Street. The South Study Area consists of a variety of land uses including: low-rise commercial, mixed residential-commercial, large format retail, residential, park area and institutional.

2.2. Existing Storm Drainage

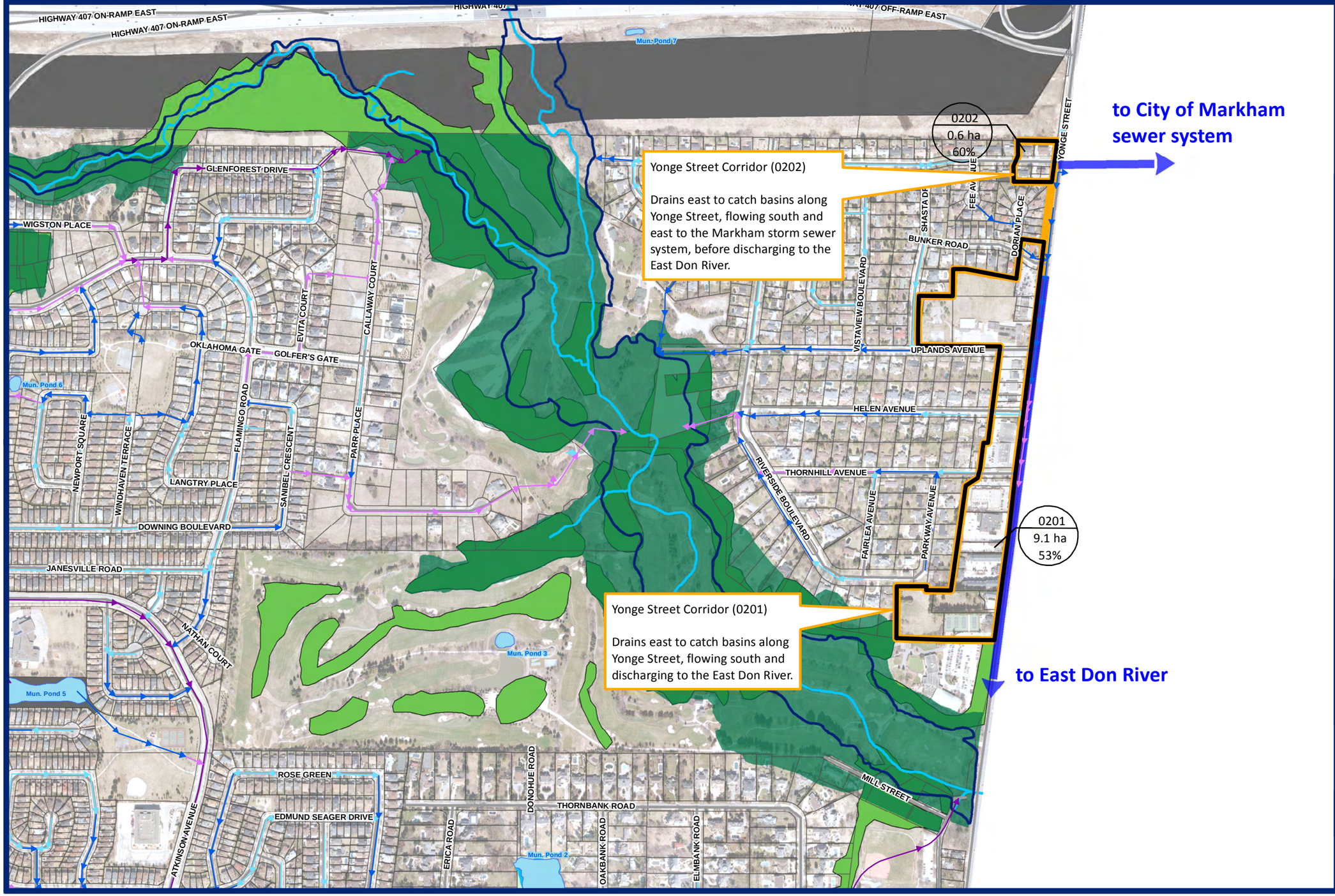
A Background Report titled *Yonge Street Study* was completed in February 2010 by Young+Wright, Dillon Consulting Ltd., and GHK International Ltd. The study described the existing drainage conditions for the study area. The following sections summarize the existing drainage for the Yonge-Steeles Corridor Secondary Plan.

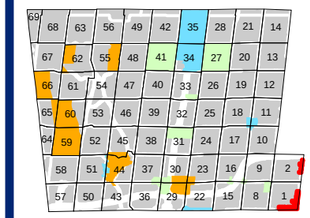
2.2.1. North Study Area

The major overland flow for the North Study Area drains directly west and discharges to the East Don River. The minor system drainage for redevelopment lands in the North Study Area discharges to two (2) different systems:

1) **North of Bunker Road**: The minor system which drains the area north of Bunker Road (0.6 ha) consists of road run-off from abutting external areas. It is captured by the City of Markham's stormwater collection system and presumably discharges to the East Don River further downstream; and,
2) **South of Bunker Road**: The minor system which drains the area south of Bunker Road (9.1 ha) discharges south into the Thornhill storm system and outlets to the East Don River. **Figure 2-1** shows the existing drainage area plan for the North Study Area.

Existing Drainage Area Plan | North Study Area





Legend

- TRCA Existing Floodlines
- Watercourse
- Existing and Approved SWM Ponds
- Natural Areas
- TRCA Property
- Forested Area
- Infrastructure and Utilities

Storm Sewers

Diameter (mm)

- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

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Yonge-Steeles Intensification Functional SWM Plan
November 2013

Existing Conditions Drainage Area Plan

SCALE 1:7,500
0 20 40 80 120 160 Meters

FIGURE
2-1

2.2.2. South Study Area

The major overland flow from the South Study Area drains to the southwest, towards the Newtonbrook neighbourhood and splits at Payson Avenue. As-built drawings indicate that the major overland flow west of Payson Avenue discharges West to the Don River. Flows east of Payson Avenue are directed across Steeles Avenue, into Newtonbrook and presumably to the West Don River system.

The minor system flows into one (1) of four (4) systems:

1) Properties along Steeles Avenue drain to the City's storm sewer system. The system drains towards Hilda Avenue, flowing north before turning west along Crestwood Road, than continues west at Bathurst along the south side of the CN Railway and discharges to West Don River at the intersection of Borrows Street and Swinton Crescent;
2) Properties fronting Yonge Street, between Pinewood Drive and Crestwood Road, drain to York Region's three-pipe sewer system. The most westerly pipe drains to the City's storm sewer system along Crestwood Road. The other two (2) pipes continue south into the City of Toronto's sewer system and discharges to a tributary of the East Don River at the open valley portion of the stream, near the intersection of Cummer Avenue and Willowdale Avenue;
3) Properties along Yonge Street, between CN Railway and Pinewood Drive Avenue, drain to York Region's storm sewer system. The system drains north along Yonge Street to a point just south of the CN Railway, then head east to the City of Markham's storm sewer system; and,
4) Properties north of the CN Railway flow north and west to the Brooke Street sewer, which discharges to the East Don River immediately north of Mill Street.

Figure 2-2 shows both the major and minor drainage areas for the south study areas.

There are no current SWM ponds within the secondary plan area. Due to the age of the developments in this area, it is also likely that there are no SWM measures implemented.

2.3. Existing Hydrological Conditions

The existing drainage areas for the North and South Study Areas are illustrated in **Figure 2-1** and **Figure 2-2** respectively. Due to existing commercial properties, the site surface is largely impervious for both study areas. The City's IDF data and the Toronto and Region Conservation Authority's (TRCA) 12 SCS storm distribution were used to determine the various flows through the site for the 2, 5, 10, 25, 50 and 100 year storms under existing conditions. Existing conditions were modelled in Visual OTTHYMO v2.4.0 (VO2) using STANDHYD commands.

Existing Drainage Area Plan | South Study Area

Existing Flooding Areas

Existing flooding has been reported in this Thornhill neighbourhood. The City had initiated a Schedule B Municipal Class EA in 2009 to construct a SWM Facility in Gallanough Park to alleviate flooding risks. Ongoing efforts by the City also include a drainage study to obtain further recommendations in solving existing flooding problems.

Yonge Street Corridor (0104)

Drainage from this area drains east to storm sewers along Yonge Street. The sewers head north and west through Gallanough Park, before heading north to the Brooke Street sewer and discharging to the East Don River.

Yonge Street Corridor (0103)

This area drains to the York Region sewer system along Yonge Street. The sewer flows north to almost the CN Railway before heading east into the City of Markham storm sewer system.

Yonge Street Corridor (0102)

This area drains to York Region's three-pipe sewer system on Yonge Street. The westerly pipe flows west to the Crestwood Road sewer. The two other pipes continue south into the City of Toronto's sewer system discharges to a tributary of the East Don River at the intersection of Cummer Ave and Willowdale Avenue.

Yonge Street Corridor (0101)

Drainage from this area drains west to the City of Vaughan's storm sewer system along Crestwood Road. The system continues west along the south side of the CN Railway before discharging to the West Don River west of Borrows Street.

to Brooke St sewer

to City of Markham sewer system

to West Don River

to City of Toronto sewer system

0104
10.5 ha
70%

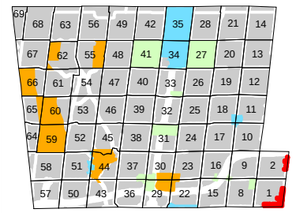
0103
7.5 ha
90%

0102
2.8 ha
90%

0101
27.7 ha
90%

Gallanough Park

THORNBURY CIRCLE
FAYE COURT
BEVSHIRE CIRCLE
TANGREEN CIRCLE
ATKINSON AVENUE
FRAMMORE CIRCLE
HALLMARK COURT
CLARK AVENUE
JENSTAR WAY
GAILCREST CIRCLE
MORTIMER COURT
LISA CRESCENT
LOMINY COURT
JONATHAN GATE
TANJO COURT
SPRINGFIELD WAY
YONGE STREET
BRADBEER CRESCENT
PORTOFINO COURT
PINEWOOD DRIVE
PAYSON AVENUE
CRESTWOOD ROAD
POWELL ROAD
TOWNSGATE DRIVE
ROYAL PALM DRIVE
PALM GATE BOULEVARD
STEELES AVENUE WEST



Legend

Storm Sewers

Diameter (mm)

- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

Reported Flooding Areas
August 19, 2005 Storm
(Clarifica, 2009)

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Yonge-Steeles Intensification Functional SWM Plan
November 2013

Existing Conditions Drainage Area Plan

SCALE 1:7,500
0 20 40 80 120 160 Meters

FIGURE
2-2

2.4. Model Parameters

Modeling parameters for the existing conditions model were established using the following information:

- Existing Land use was identified using 2010 aerial photographs provided by the City;
- Percent impervious (TIMP) and directly connected impervious (XIMP) values were calculated from 2010 aerial photographs provided by the City; and,
- Soil conditions of the site were established from the Ontario Soils Mapping. The site is considered to be predominantly clay. The Hydologic Soil Group (HSG C.) for the site is determined to be type C.

CN values were calculated using Ministry of Transportation Ontario (MTO) Design Charts 1.08 and 1.09 for pasture and other unimproved land. MTO Design Charts can be found under **Appendix A**.

Input parameters used to model the existing condition are provided below in **Table 2-1**.

Table 2-1 – Existing Conditions Input Parameters

Catchments	Drainage Area (ha)	TIMP	XIMP	CN
0101	28	0.90	0.90	74
0102	2.8	0.90	0.90	74
0103	7.5	0.90	0.90	74
0104	10.5	0.70	0.70	74
0201	9.1	0.53	0.45	74
0202	0.6	0.60	0.40	74

Modeling results for existing conditions are shown below in **Table 2-2**. The existing conditions model schematic can be found in **Appendix B**, a copy of the existing conditions VO2 model for the Yonge-Steeles Secondary Plan Area is located on the CD included with this report.

Table 2-2 – Existing Peak Flows

Catchment	Storm Distribution	Peak Flow (m^3/s)					
		2-year	5-year	10-year	25-year	50-year	100-year
0101	City IDF	4.76	6.89	8.45	10.15	12.31	13.33
	12-hour SCS	2.68	3.54	4.12	4.90	5.04	5.98
0102	City IDF	0.56	0.80	0.97	1.15	1.38	1.48
	12-hour SCS	0.28	0.37	0.43	0.50	0.54	0.61
0103	City IDF	1.43	2.03	2.50	2.98	3.59	3.87
	12-hour SCS	0.75	0.98	1.13	1.33	1.41	1.62
0104	City IDF	1.57	2.28	2.80	3.38	4.11	4.45
	12-hour SCS	0.88	1.17	1.39	1.65	1.71	2.04
0201	City IDF	0.99	1.48	1.85	2.26	2.80	3.06

Catchment	Storm Distribution	Peak Flow (m^3/s)					
		2-year	5-year	10-year	25-year	50-year	100-year
	12-hour SCS	0.60	0.83	1.00	1.25	1.26	1.58
0202	City IDF	0.07	0.11	0.13	0.18	0.22	0.24
	12-hour SCS	0.04	0.06	0.07	0.09	0.09	0.11

2.5. External Drainage Areas – Existing Flooding

In 2009, the City has initiated a Schedule "B" Municipal Class Environmental Assessment (Class EA) for constructing a SWMF in Gallanough Park in Thornhill. The SWM Facility is proposed to assist in alleviating the flooding issue that affect some residents in the Thornhill area, north of Gallanough Park. The flooding is largely due to the surcharging of Brooke Street Trunk Sewer which is located downstream of the Gallanough Park. The Park itself is approximately 2.16 ha in size and is located south of the east end of Spring Gate Boulevard and east of Springfield Way.

A portion of the storm drainage from the proposed development of the South Study Area discharges uncontrolled to the 3.0 m Brooke Street trunk sewer. During major storm events the Brooke Street Trunk Sewer is subject to significant surcharging. The majority of the flows in the Trunk Sewer originate from the drainage area runoff directed to Gallanough Park.

The proposed SWM Facility in the Park would detain runoff and regulate the discharge rates into the Trunk Sewer to reduce surcharging. This would then allow for stormwater in the area to the north of Gallanough Park to be captured and conveyed through the Trunk Sewer. The pond however does not regulate drainage from the proposed development in the North Study Area. It is not expected that the proposed development in the North Study Area will increase flooding in the Brooke Street trunk sewer as SWM controls will implemented to control post-development peak flows to existing levels.

3.0 Proposed Conditions

The proposed development will make use of the existing storm drainage infrastructure. The Yonge Street Study stated that the existing capacity for storm sewers servicing both the South and North Study areas are more than adequate for the proposed future redevelopment provided SWM techniques are implemented.

3.1. Proposed Land Use

The proposed land use for both the North and South study areas will be a combination of High-Rise, Mid-Rise and Low-Rise Mixed-Use, Low-Rise and Mid-Rise Residential, Parks and Private Open Spaces.

In the South Study Area, there will be an overall increase in the pervious area due to the proposed addition of parks and open space. Increasing the percentage of pervious cover has been shown to increase infiltration and reduce the peak flows and volume of storm water runoff, therefore it is not anticipated that post-development flows will exceed existing levels.

There will be an overall increase in impervious area in the North Study Area, which will require quantity control measures in order to reduce the post-development peak flows to existing levels. During the development of the site, existing drainage patterns on adjacent undeveloped properties will not be altered and stormwater runoff from the development will not be directed to drain onto adjacent undeveloped properties.

As there are likely no existing SWM practices implemented for the Yonge-Steeles corridor, on-site controls and Low Impact Development (LID) practices are recommended throughout the development to improve water quantity, water quality, and water balance for the proposed development.

3.2. Proposed Hydrological Conditions

A hydrologic model using Visual OTTHYMO v2.4 (VO2) was created for the post-development site conditions using the City's IDF data as well as the TRCA's 12-hour SCS storm. The post development drainage area plan for the North and South Study areas are shown below in **Figure 3-1** and **Figure 3-2** respectively.

Modeling parameters for the proposed conditions model were established using the following information:

- Proposed Land use was taken from the 2010 City official Plan;
- Percent impervious (TIMP) and directly connected impervious (XIMP) values were estimated based on proposed land use;
- Soil conditions of the site were established from the Ontario Soils Mapping. The site is considered to be predominantly clay. The Hydologic Soil Group for the site is determined to be type C; and,
- CN values were calculated using MTO Design Charts 1.08 and 1.09 for pasture and other unimproved land. MTO Design Charts can be found under **Appendix A**.

The STANDHYD input parameters used in the post-development conditions are summarized in Table **Table 3-1** below.

Table 3-1 – Post-Development Condition Input Parameters

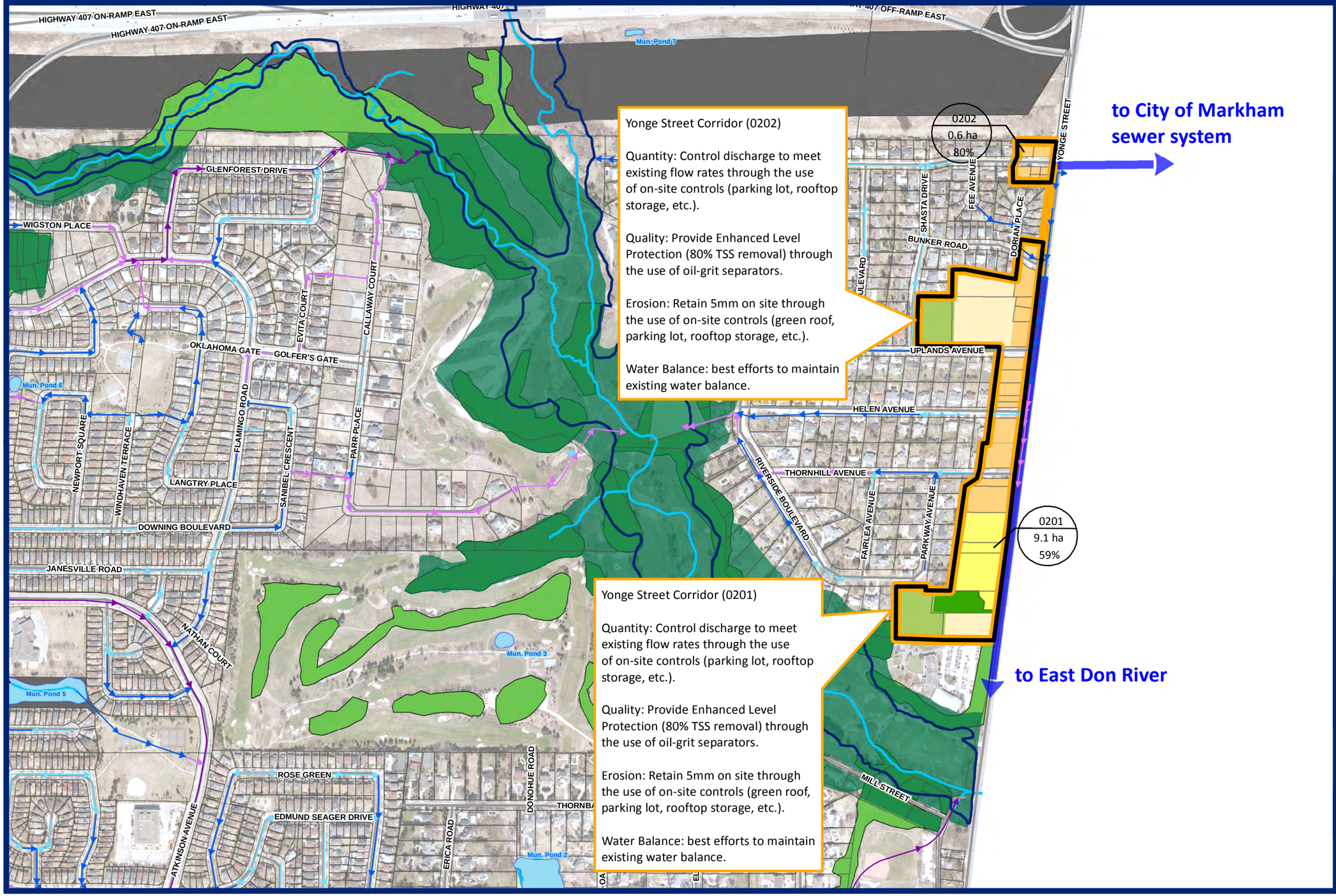
Catchments	Drainage Area (ha)	TIMP	XIMP	CN
0101	28	0.75	0.75	74
0102	2.8	0.84	0.84	74
0103	7.5	0.71	0.71	74
0104	10.5	0.70	0.70	74
0201	9.1	0.59	0.59	74
0202	0.6	0.80	0.80	74

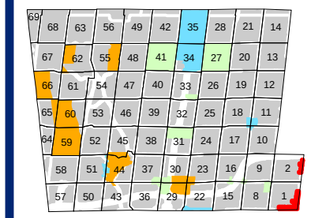
The post-development model schematic can be found in **Appendix B**, a copy of the post-development VO2 model for the Yonge-Steeles Secondary Plan Area is located on the CD included with this report. **Table 3-2** below summarizes the resulting peak flows under post development conditions.

Table 3-2 – Post-development Peak Flows

Catchment	Storm Distribution	Peak Flow (m^3/s)					
		2-year	5-year	10-year	25-year	50-year	100-year
0101	City IDF	4.09	5.97	7.37	8.90	10.87	11.80
	12-hour SCS	2.37	3.16	3.71	4.49	4.58	5.54
0102	City IDF	0.53	0.76	0.92	1.10	1.34	1.43
	12-hour SCS	0.27	0.35	0.41	0.48	0.51	0.59
0103	City IDF	1.17	1.69	2.07	2.5	3.15	3.42
	12-hour SCS	0.65	0.86	1.01	1.20	1.25	1.48
0104	City IDF	1.57	2.28	2.80	3.38	4.11	4.45
	12-hour SCS	0.88	1.17	1.39	1.65	1.71	2.04
0201	City IDF	1.20	1.76	2.17	2.63	3.21	3.50
	12-hour SCS	0.69	0.93	1.11	1.34	1.37	1.67
0202	City IDF	0.11	0.16	0.20	0.23	0.28	0.30
	12-hour SCS	0.06	0.07	0.09	0.10	0.11	0.13

Post-Development Drainage Area Plan | North Study Area





Legend

- TRCA Existing Floodlines
- Watercourse
- Existing and Approved SWM Ponds
- Natural Areas
- TRCA Property
- Forested Area

Proposed Land Use

- Parks
- Private Open Spaces
- Low-Rise Residential
- Low-Rise Mixed-Use
- Mid-Rise Mixed-Use

Storm Sewers

Diameter (mm)

- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

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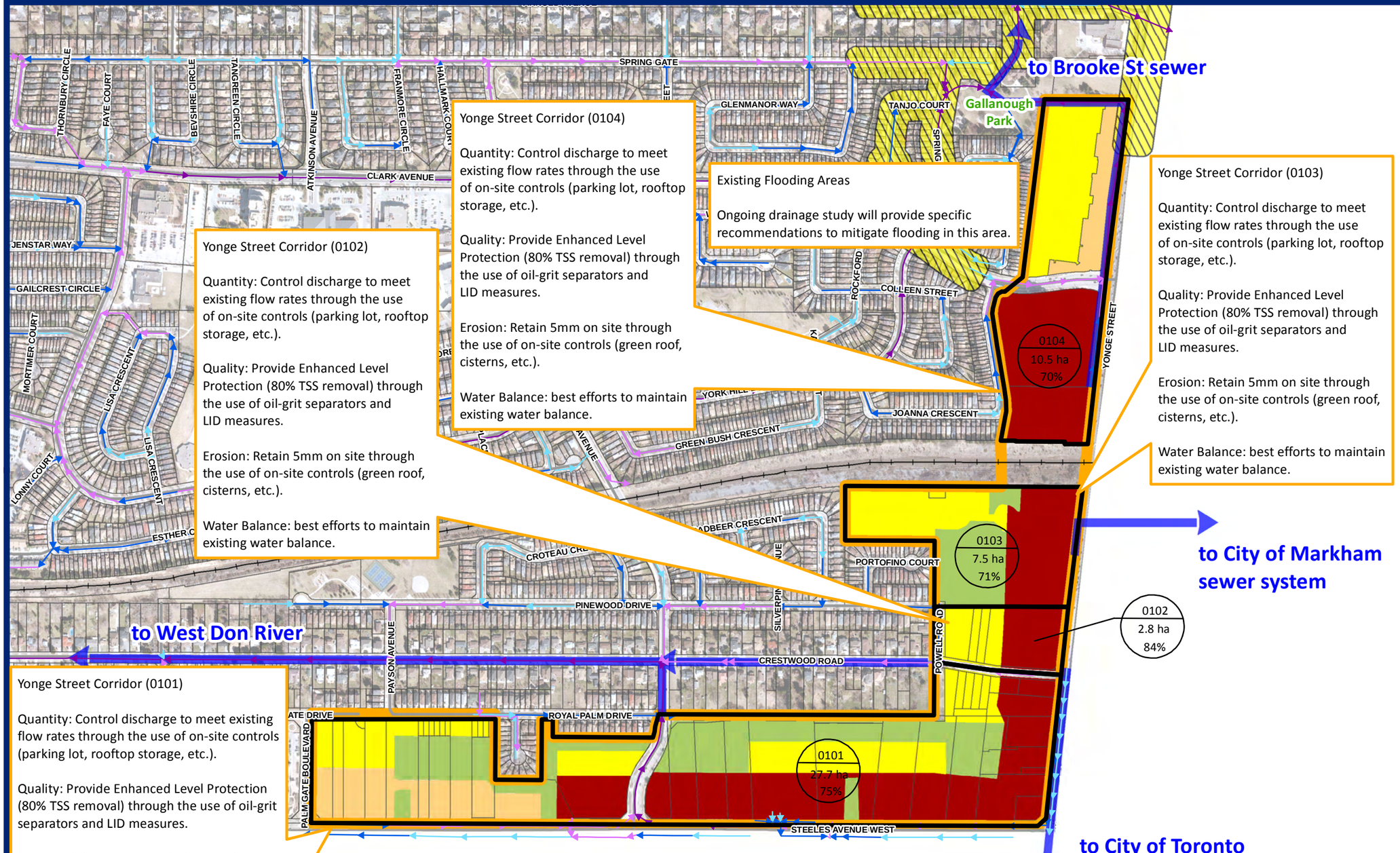
November 2013

Post-Development Drainage Area Plan

SCALE 1:7,500
0 20 40 80 120 160 Meters

FIGURE
3-1

Post-Development Drainage Area Plan | South Study Area



Yonge Street Corridor (0102)

Quantity: Control discharge to meet existing flow rates through the use of on-site controls (parking lot, rooftop storage, etc.).

Quality: Provide Enhanced Level Protection (80% TSS removal) through the use of oil-grit separators and LID measures.

Erosion: Retain 5mm on site through the use of on-site controls (green roof, cisterns, etc.).

Water Balance: best efforts to maintain existing water balance.

Yonge Street Corridor (0104)

Quantity: Control discharge to meet existing flow rates through the use of on-site controls (parking lot, rooftop storage, etc.).

Quality: Provide Enhanced Level Protection (80% TSS removal) through the use of oil-grit separators and LID measures.

Erosion: Retain 5mm on site through the use of on-site controls (green roof, cisterns, etc.).

Water Balance: best efforts to maintain existing water balance.

Existing Flooding Areas

Ongoing drainage study will provide specific recommendations to mitigate flooding in this area.

Yonge Street Corridor (0103)

Quantity: Control discharge to meet existing flow rates through the use of on-site controls (parking lot, rooftop storage, etc.).

Quality: Provide Enhanced Level Protection (80% TSS removal) through the use of oil-grit separators and LID measures.

Erosion: Retain 5mm on site through the use of on-site controls (green roof, cisterns, etc.).

Water Balance: best efforts to maintain existing water balance.

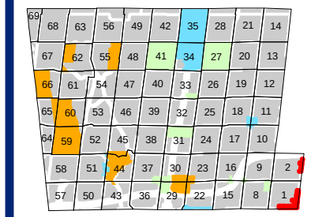
Yonge Street Corridor (0101)

Quantity: Control discharge to meet existing flow rates through the use of on-site controls (parking lot, rooftop storage, etc.).

Quality: Provide Enhanced Level Protection (80% TSS removal) through the use of oil-grit separators and LID measures.

Erosion: Retain 5mm on site through the use of on-site controls (green roof, cisterns, etc.).

Water Balance: best efforts to maintain existing water balance.



Legend

Proposed Land Use
- Parks
- Mid-Rise Residential
- Mid-Rise Mixed-Use
- High-Rise Mixed Use

Storm Sewers

Diameter (mm)
- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

Reported Flooding Areas August 19, 2005 Storm (Clarifica, 2009)

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November 2013

Post-Development Drainage Area Plan

SCALE 1:7,500
0 20 40 80 120 160 Meters

FIGURE
3-2

3.3. Stormwater Management Criteria

The City's Standards must be met to ensure that the existing City infrastructure will continue to have the capacity to handle flows from the site. As stormwater from the site will eventually be discharged to the Don River, TRCA SWM criteria for the site must also be met.

The TRCA SWM Criteria Document outlines specific criteria for development sites discharging to the Don River. The SWM criteria include quantity control requirements, quality control requirements, erosion control requirements, and water balance requirements.

The criteria for the development in the Yonge-Steels Secondary Plan Area are as follows:

- **Quantity Control** – Post-development peak flows for all events from the site should be controlled to the existing peak flows;
- **Quality Control** – Stormwater is to be treated to Enhanced Protection levels as defined in the MOE SWM Planning and Design Manual (2003);
- **Erosion Control** – 5 mm of on-site retention is to be provided; and,
- **Water Balance** – Provide best efforts to match the site's existing water budget.

To encourage the use of sustainable development technologies, all agencies recommend the use of Low Impact Development practices (LIDs). A feasibility analysis of LID strategies recommended for the site is discussed in **Section 3.8** of this report. The use of these LIDs will assist in meeting SWM requirements.

3.4. Stormwater Quantity Control

Due to the increase in imperviousness in the North Study Area, there is an increase in peak flows under post development conditions. In order to meet the target existing flows for catchments 0201 and 0202, quantity control measures will be required. There is an overall decrease in imperviousness in the south study under post-development conditions; therefore the post-development peak flows from the site should meet existing levels without additional SWM controls. In an effort to improve the existing stormwater quantity control throughout the secondary plan, various Low Impact Development practices have been proposed to further reduce peak flows from the proposed redevelopment. These are further discussed in **Section 3.8**.

Two (2) sets of storm data were analysed to calculate the required storage requirements for catchments 0201 and 0202 in the North Study Area. Models using the City's IDF data and the TRCA's 12-hour SCS storm resulted in approximately the same required storage volumes.

Table 3-3 and **Table 3-4** below show the storage requirements for catchments 0201 and 0202 respectively. The post-development model schematic can be found in **Appendix B** and a copy of the post-development VO2 model for the Yonge-Steeles Secondary Plan Area is located on the CD included with this report.

Table 3-3 – Post-Development Condition Storage Requirements 0201

Storm Event	Catchment	Existing Peak Flow (m3/s)	Uncontrolled Post-Development Peak Flow (m3/s)	Controlled Post-Development Peak Flow (m3/s)	Storage Required (m3)
2	City IDF	0.99	1.20	0.87	372
	12-hour SCS	0.60	0.69	0.55	471
5	City IDF	1.48	1.76	1.26	543
	12-hour SCS	0.83	0.93	0.73	637
10	City IDF	1.85	2.17	1.52	669
	12-hour SCS	1.00	1.11	0.89	767
25	City IDF	2.26	2.63	1.78	816
	12-hour SCS	1.25	1.34	1.15	888
50	City IDF	2.80	3.21	2.32	1011
	12-hour SCS	1.26	1.37	1.09	843
100	City IDF	3.06	3.50	2.51	1078
	12-hour SCS	1.58	1.67	1.26	1135

Table 3-4 – Post-Development Condition Storage Requirements 0202

Storm Event	Catchment	Existing Peak Flow (m3/s)	Uncontrolled Post-Development Peak Flow (m3/s)	Controlled Post-Development Peak Flow (m3/s)	Storage Required (m3)
2	City IDF	0.07	0.11	0.06	54
	12-hour SCS	0.04	0.06	0.037	62
5	City IDF	0.11	0.16	0.09	76
	12-hour SCS	0.06	0.07	0.055	79
10	City IDF	0.13	0.20	0.11	89
	12-hour SCS	0.07	0.09	0.063	89
25	City IDF	0.18	0.23	0.13	105
	12-hour SCS	0.09	0.10	0.072	106
50	City IDF	0.22	0.28	0.18	124
	12-hour SCS	0.09	0.11	0.069	99
100	City IDF	0.24	0.30	0.19	129
	12-hour SCS	0.11	0.13	0.093	128

Taking into account the required storage volumes for both catchments over the entire North Study Area, the total storage requirement for the North Study area is approximately 138 m^3/ha.

It is recommended that the required storage volumes be provided in the mixed use, park and open space areas. It should be noted that catchment 0201 has two (2) designated Park areas as well as a designated private open space area, which are practical locations for the implementation of various types of SWM. Various quantity control methods can be provided depending on the specific site plan; these include surface ponding, rooftop ponding and underground storage. The proposed storage method will have to be confirmed at the detailed design stage on a site plan basis.

3.5. Stormwater Quality Control

As per the TRCA's SWM Criteria document, stormwater treatment must meet Enhanced Protection Criteria as defined by the MOE SWM Planning & Design Manual (2003). The most practical and affordable method to meet MOE's Enhanced Level 1 requirement of 80% TSS removal using lot level controls is through the implementation of Oil-Grit Separator (OGS) units or other filtration systems in combination with Low Impact Development practices. These techniques and their applicability to the site are further described in **Section 3.8**.

Oil-Grit separator (OGS) units are proposed at the existing outlet locations of the development, with LID practices implemented throughout the development. Detailed grading and servicing conducted on an individual site plan basis may result in the need for additional OGS units throughout the development to meet Enhanced (Level 1) Protection.

3.6. Water Balance

A water balance assessment was completed for both the North and South Study Areas. Site and MOE parameters were used to determine the existing and post-development water balance for the Plan Area.

The majority of the site consists of clay soils with very low permeability. This land area is considered a low volume groundwater recharge area by the TRCA, and therefore matching existing infiltration rates may not be realistically achievable. During the detailed design stage, geotechnical investigations will be required along with consultation with the TRCA to refine the site specific water balance requirements.

The water budget for the site was calculated using the Thornthwaite and Mather water balance method outlined in Chapter 3 of the *MOE SWM Planning and Design Manual* (MOE, 2003). The method estimates yearly evapotranspiration, infiltration and runoff volumes based on soil types, vegetation cover, topography and annual precipitation. The result from the existing water budget calculation is summarized in **Table 3-5** and **Table 3-6**.

Table 3-5 – Water Balance Analysis Results, North Site

Parameters	Existing Water Balance (53% impervious area)		Post-development Water Balance (60% impervious area)		Change in Volume
	Pervious Area	Impervious Area	Pervious Area	Impervious Area	
Area (ha)	4.6	5.1	3.9	5.8	
Precipitation (mm)*	864	864	864	864	
Evapotranspiration (mm)**	536	259.2	536	259.2	
Surplus (mm)	328	604.8	328	604.8	
Total Infiltration (mm)	182	0	182	0	
Total Runoff (mm)	146	604.8	146	604.8	
Runoff (m^3)	37,561		40,772		**+3,212**
Evapotranspiration (m^3)	37,875		35,938		**-1,938**
Infiltration (m^3)	8,372		7,098		**-1,274**

*The yearly precipitation data used in the water balance analysis was obtained from the National Climate Data and Information Archive for Thornhill, located immediately north of Yonge and Steeles.
**Evapotranspiration is assumed to be 30% of precipitation for highly urbanized areas, as per the *Low-Impact Development Design Strategies: An Integrated Design Approach, Prince George's County, Maryland (1999).*

Table 3-6 – Water Balance Analysis Results, South Site

Parameters	Existing Water Balance (86% impervious area)		Post-development Water Balance (74% impervious area)		Change in Volume
	Pervious Area	Impervious Area	Pervious Area	Impervious Area	
Area (ha)	6.8	42.0	12.8	36.0	
Precipitation (mm)*	864	864	864	864	
Evapotranspiration (mm)**	536	259.2	536	259.2	
Surplus (mm)	328	604.8	328	604.8	
Total Infiltration (mm)	182	0	182	0	
Total Runoff (mm)	146	604.8	146	604.8	
Runoff (m^3)	263,944		236,416		**-27,528**
Evapotranspiration (m^3)	145,312		161,920		**+16,608**
Infiltration (m^3)	12,376		23,296		**+10,920**

*The yearly precipitation data used in the water balance analysis was obtained from the National Climate Data and Information Archive for Thornhill, located immediately north of Yonge and Steeles.
**Evapotranspiration is assumed to be 30% of precipitation for highly urbanized areas, as per the *Low-Impact Development Design Strategies: An Integrated Design Approach, Prince George's County, Maryland (1999).*

The water balance analysis shows that the change in land use will increase the runoff on the North Site by 3,212 m^3 a year, but reduce the runoff by 27,528 m^3 from the South Site. The proposed increase in park space in the South Site will increase evapotranspiration and infiltration for Yonge-Steeles Plan Area as a whole. This reduction in annual runoff from the Plan Area may help reduce erosion risk in the West Don River downstream.

3.7. Erosion Control

The TRCA erosion control requirement for all sites outletting to the Don River is a minimum 5 mm on-site retention. This requirement ensures that the volume of captured rainwater will not be discharged into receiving watercourses, and thus reducing downstream erosion risks.

In order to calculate the total volume of rainfall that must be captured to meet TRCA's erosion control requirement, the yearly number of rainfall events larger than 5 mm is required. The National Climate Data and Information Archive provides historic climate normal for rainfall data, showing that on average, from 1971-2000, the number of days in a year with rainfall exceeding 5 mm is 46 days in this area. Assuming that on these days 5 mm of runoff is thoroughly captured, the annual volume of rainfall captured for erosion control on the north side would be 35,420 m^3.

This volume is greater than the combined 3,212 m^3 of additional runoff yearly and the 1,274 m^3 of infiltration deficit yearly caused by intensification in this area. Although the soils in this area are not ideal for infiltration based SWM strategies, it may be possible to used infiltration in combination with water re-use methods to achieve the erosion criteria. This would allow developers to meet both erosion control and water balance criteria using the same infrastructure. **Table 3-7** below shows the erosion control and water balance volumes for Yonge-Steeles.

Table 3-7 – Erosion Control and Water Balance Volumes for Yonge-Steeles

		Erosion Control Requirements			Water Balance Requirements		
Area	Surface Area (ha)	Rainfall to be captured (mm)	Average Number of Days in a Year with Rainfall >5 mm	Annual Volume of Rainfall Captured (m^3)	Annual Volume of Infiltration Deficit (m^3)	Annual Volume of Increased Runoff (m^3)	Total Volume Required for Water Balance (m^3)
North Area	15.4	5	46	**35,420**	1,274	3,212	**4,486**
South Area	63.5	5	46	**146,050**	No deficit	No Increase	**0**

*The yearly precipitation data used in the water balance analysis was obtained from the National Climate Data and Information Archive for Thornhill, the nearest weather station.

It can be seen that through directing the first 5 mm of rainfall to a combination of water re-use and infiltration facilities, 35,420 m^3 of rainfall can be captured and thus easily meeting the water balance requirement for the north site. Soil testing must be done at the detailed stage of the development in order to confirm the feasibility of infiltration controls on site.

3.8. Low Impact Development (LID) Considerations

LIDs are recommended where possible in order to reduce the peak flows from a developed area. In addition, LIDs can improve water quality by developing an integrated treatment train approach on a site-specific basis. The LIDs are typically categorized as lot level, conveyance, or end-of-pipe controls.

The MOE SWMP (2003) suggests several LIDs for application at the lot level, in the conveyance system, or for multiple lot small drainage areas (less than 2 ha.). Potential lot level / conveyance LIDs for the development are listed below in **Table 3-8** for water quality, quantity, erosion and water balance controls.

Table 3-8 – Lot Level / Conveyance LID Analysis

LID	Primary Objective	Feasible	Rationale
Storage Controls			
Rooftop Storage	Peak Flow Control	Yes	▪ To assist with quantity control. ▪ Can be implemented on mixed use areas.
Parking Lot Storage	Peak Flow Control	Yes	▪ To assist with quantity control. ▪ Can be implemented on mixed use areas.
Superpipe Storage	Peak Flow Control	Yes	▪ To assist with quantity control.
Infiltration Controls			
Reduced Lot Grading	Water Balance	Possible	▪ Reduced lot grading will be implemented where available. ▪ Tentative depending on results of geotechnical report.
Green Roof	Water Balance Water Quantity Water Quality	Yes	▪ Green roofs can be implemented on mixed use areas.
Direct Roof Leaders to Soakaway Pits, Cisterns, or Rain Barrels (Rainwater Harvesting)	Water Balance	Possible, Limited	▪ Tentative depending on site layout design and results of geotechnical report.
Infiltration Trenches	Water Balance	Possible	▪ Tentative depending on results of geotechnical report.
Grassed Swales	Water Balance Water Quality	Possible	▪ Can be implemented on mixed use areas as well as between lots in residential areas. ▪ Space limitations in residential development.
Rain Garden	Water Balance Water Quality	Possible	▪ Tentative depending on site layout design, space restrictions, and neighbourhood approval.
Pervious Pipe System	Water Balance	Possible	▪ Tentative depending on site layout design and results from geotechnical report.

4.0 Conclusions and Recommendations

Development of the Yonge-Steeles Secondary Plan area will result in an increase in the impervious area of the North Study Area of the site and decrease the imperviousness of the South Study Area. In both cases, the existing hydrological conditions will be altered.

SWM controls have been proposed to mitigate the negative effects of development on stormwater runoff – such as increasing runoff, decreasing runoff quality, and increasing erosion risks. The SWM plan presented for the Yonge-Steeles Secondary Plan Area will allow for redevelopment of the site while meeting SWM criteria for this area. The plan includes the following SWM practices:

- **Quantity Control** – Post-development peak flows for all events from the site will be controlled to unit flow rate targets through the use of on-site storage;
- **Quality Control** – Stormwater is to be treated to Enhanced Level Protection (80% TSS removal) through a treatment train approach for the site, using a combination of oil-grit separators and LIDs such as bio swales and rain gardens;
- **Erosion Control** – 5 mm of on-site retention is to be provided through rainwater capturing systems, such as green roofs and cisterns; and,
- **Water Balance** – Best efforts to match the site's existing water balance are to be provided. Specific requirements may vary from site to site depending on the natural soil type. The soil type for each site should be verified prior to detailed design and the TRCA should be consulted regarding specific water balance requirements for that site.

APPENDIX A
MTO Design Charts

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

Sands, Sandy Loams and Gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium to Coarse Loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium Textured Loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt Loams, Some Loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, Clay Loams, Silty Clay Loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil/Land Use Curve Numbers

Land Use	Treatment or Practice	Hydrologic Condition[4]	Hydrologic Soil Group			
			A	B	C	D
Fallow	Straight row	—	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	" and terraced	Poor	66	74	8	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	" and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes[2] or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	" and terraced	Poor	63	73	80	83
	" and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
	Contoured	Good	39	61	74	80
	"	Poor	47	67	81	88
	"	Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		—	59	74	82	86
		—	72	82	87	89
		—	74	84	90	92

For average anticedent soil moisture condition (AMC II)
[2] Close-drilled or broadcast.

[4] The hydrologic condition of cropland is good if a good crop rotation practice is used; it is poor if one crop is grown continuously.

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil Conservation Service Curve Numbers (Continued)

Land Use or Surface	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66** (62)	70** (68)	74	78	82	84	86 AMC I
Pasture & other unimproved land	58* (38)	62* (51)	65	71	76	79	81
Woodlots and forest	50* (30)	54* (44)	58	65	71	74	77
Impervious areas (paved)							98
Bare bedrock draining directly to stream by surface flow							98
Bare bedrock draining indirectly to stream as groundwater (usual case)							70
Lakes and wetlands							50

Notes

(i) All values are based on AMC II except those marked by * (AMC III) or ** (mean of AMC II and AMC III).

(ii) Values in brackets are AMC II and are to be used only for special cases.

(iii) Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

APPENDIX B
VO2 Model Schematics

W11-259
Functional Servicing
Yonge-Steeles Secondary Plan Area
Existing Conditions Model
November 2013

VO2 Model Schematic

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       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O    Company
        OOO     T      T    H   H    Y    M   M   OOO                Serial

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                    *****  D E T A I L E D    O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual Otthymo 3.0\VO2\voin.dat
  Output  filename: C:\Users\BAbadi\AppData\Local\Temp\ba67a4f3-cd04-4c6b-acfa-
cdfb3f067089\Scenario.out
  Summary filename: C:\Users\BAbadi\AppData\Local\Temp\ba67a4f3-cd04-4c6b-acfa-
cdfb3f067089\Scenario.sum


DATE: 01/14/2013                          TIME: 10:30:18

USER:


COMMENTS: _____________________________________________________


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  ****************************
  ** SIMULATION NUMBER:   1 **
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|    READ STORM    |    Filename: C:\Users\BAbadi\AppD
|                  |              ata\Local\Temp\
|                  |              ba67a4f3-cd04-4c6b-acfa-cdfb3f067089\1d4d557b
| Ptotal= 42.93 mm |    Comments: This 2-year, 12-hour Storm created from
-------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.03 |  3.25    1.89 |  6.25    7.73 |  9.25    1.55
                0.50    0.86 |  3.50    1.55 |  6.50    7.73 |  9.50    1.37
                0.75    0.52 |  3.75    1.89 |  6.75    3.43 |  9.75    1.03
                1.00    1.03 |  4.00    1.55 |  7.00    3.43 | 10.00    1.37
                1.25    0.86 |  4.25    3.26 |  7.25    2.40 | 10.25    1.03
                1.50    1.03 |  4.50    2.92 |  7.50    2.40 | 10.50    0.52
                1.75    0.52 |  4.75    2.92 |  7.75    2.92 | 10.75    1.03
                2.00    1.03 |  5.00    2.92 |  8.00    2.40 | 11.00    0.86
                2.25    1.89 |  5.25    5.32 |  8.25    1.89 | 11.25    1.03
                2.50    1.37 |  5.50    5.32 |  8.50    1.55 | 11.50    0.52
                2.75    2.06 |  5.75   38.46 |  8.75    1.89 | 11.75    0.86
                3.00    1.37 |  6.00   38.81 |  9.00    1.37 | 12.00    1.03

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| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  28.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      25.20         2.80
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     432.05        10.00
     Mannings n            =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083   1.03 | 3.083    1.89 | 6.083    7.73 |  9.08    1.55
                0.167   1.03 | 3.167    1.89 | 6.167    7.73 |  9.17    1.55
                0.250   1.03 | 3.250    1.89 | 6.250    7.73 |  9.25    1.55
                0.333   0.86 | 3.333    1.55 | 6.333    7.73 |  9.33    1.37
                0.417   0.86 | 3.417    1.55 | 6.417    7.73 |  9.42    1.37
                0.500   0.86 | 3.500    1.55 | 6.500    7.73 |  9.50    1.37
                0.583   0.52 | 3.583    1.89 | 6.583    3.43 |  9.58    1.03
                0.667   0.52 | 3.667    1.89 | 6.667    3.43 |  9.67    1.03
                0.750   0.52 | 3.750    1.89 | 6.750    3.43 |  9.75    1.03
                0.833   1.03 | 3.833    1.55 | 6.833    3.43 |  9.83    1.37
                0.917   1.03 | 3.917    1.55 | 6.917    3.43 |  9.92    1.37
                1.000   1.03 | 4.000    1.55 | 7.000    3.43 | 10.00    1.37
                1.083   0.86 | 4.083    3.26 | 7.083    2.40 | 10.08    1.03
                1.167   0.86 | 4.167    3.26 | 7.167    2.40 | 10.17    1.03
                1.250   0.86 | 4.250    3.26 | 7.250    2.40 | 10.25    1.03
                1.333   1.03 | 4.333    2.92 | 7.333    2.40 | 10.33    0.52
                1.417   1.03 | 4.417    2.92 | 7.417    2.40 | 10.42    0.52
                1.500   1.03 | 4.500    2.92 | 7.500    2.40 | 10.50    0.52
                1.583   0.52 | 4.583    2.92 | 7.583    2.92 | 10.58    1.03
                1.667   0.52 | 4.667    2.92 | 7.667    2.92 | 10.67    1.03
                1.750   0.52 | 4.750    2.92 | 7.750    2.92 | 10.75    1.03
                1.833   1.03 | 4.833    2.92 | 7.833    2.40 | 10.83    0.86
                1.917   1.03 | 4.917    2.92 | 7.917    2.40 | 10.92    0.86
                2.000   1.03 | 5.000    2.92 | 8.000    2.40 | 11.00    0.86
                2.083   1.89 | 5.083    5.32 | 8.083    1.89 | 11.08    1.03
                2.167   1.89 | 5.167    5.32 | 8.167    1.89 | 11.17    1.03
                2.250   1.89 | 5.250    5.32 | 8.250    1.89 | 11.25    1.03
                2.333   1.37 | 5.333    5.32 | 8.333    1.55 | 11.33    0.52
                2.417   1.37 | 5.417    5.32 | 8.417    1.55 | 11.42    0.52
                2.500   1.37 | 5.500    5.32 | 8.500    1.55 | 11.50    0.52
                2.583   2.06 | 5.583   38.46 | 8.583    1.89 | 11.58    0.86
                2.667   2.06 | 5.667   38.46 | 8.667    1.89 | 11.67    0.86
                2.750   2.06 | 5.750   38.46 | 8.750    1.89 | 11.75    0.86
                2.833   1.37 | 5.833   38.81 | 8.833    1.37 | 11.83    1.03
                2.917   1.37 | 5.917   38.81 | 8.917    1.37 | 11.92    1.03
                3.000   1.37 | 6.000   38.80 | 9.000    1.37 | 12.00    1.03

     Max.Eff.Inten.(mm/hr)=      38.81         15.25
               over (min)        10.00         15.00
     Storage Coeff.  (min)=       8.98 (ii)    10.84 (ii)
     Unit Hyd. Tpeak (min)=      10.00         15.00
     Unit Hyd. peak  (cms)=       0.12          0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.59          0.09      2.679 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.08      6.00
     RUNOFF VOLUME    (mm)=      41.93         13.13     39.05
     TOTAL RAINFALL   (mm)=      42.93         42.93     42.93
     RUNOFF COEFFICIENT   =       0.98          0.31      0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.52         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     136.63        10.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.81         15.25
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       4.50 (ii)    6.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.23          0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.27          0.01      0.282 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.00      6.00
     RUNOFF VOLUME    (mm)=      41.93         13.13     39.05
     TOTAL RAINFALL   (mm)=      42.93         42.93     42.93
     RUNOFF COEFFICIENT   =       0.98          0.31      0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0003)	Area (ha)= 7.50		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 90.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	6.75	0.75	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	223.61	10.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.81	15.25	
over (min)		5.00	10.00	
Storage Coeff. (min)=		6.05 (ii)	7.91 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.19	0.13	
				TOTALS
PEAK FLOW	(cms)=	0.72	0.03	0.750 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	41.93	13.13	39.05
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.31	0.91

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0004)	Area (ha)= 10.50		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 70.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	7.35	3.15	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	264.58	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.81	15.25	
over (min)		5.00	15.00	
Storage Coeff. (min)=		6.69 (ii)	11.53 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.18	0.09	
				TOTALS
PEAK FLOW	(cms)=	0.78	0.10	0.880 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	41.93	13.13	33.29
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.31	0.78

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0005)	Area (ha)= 9.10		
ID= 1 DT= 5.0 min	Total Imp(%)= 53.00	Dir. Conn.(%)= 45.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.82	4.28	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	246.31	15.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.81	19.92	
over (min)		5.00	15.00	
Storage Coeff. (min)=		6.41 (ii)	13.88 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.18	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.44	0.17	0.599 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	41.93	14.71	26.96
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.34	0.63

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0006)	Area (ha)= 0.60		
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00	Dir. Conn.(%)= 40.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.36	0.24	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	63.25	15.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.81	29.88	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.83 (ii)	9.19 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.28	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.02	0.043 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	41.93	17.33	27.16
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.40	0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

****
** SIMULATION NUMBER: 2 **
****

READ STORM	Filename: C:\Users\BAbadi\AppData\Local\Temp\ba67a4f3-cd04-4c6b-acfa-cdfb3f067089\733c5b1c
Ptotal= 55.37 mm	Comments: This 5-year, 12-hour Storm created from

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	1.33	3.25	2.44	6.25	9.97	9.25	1.99
0.50	1.11	3.50	1.99	6.50	9.97	9.50	1.77
0.75	0.66	3.75	2.44	6.75	4.43	9.75	1.33
1.00	1.33	4.00	1.99	7.00	4.43	10.00	1.77
1.25	1.11	4.25	4.21	7.25	3.10	10.25	1.33
1.50	1.33	4.50	3.77	7.50	3.10	10.50	0.66
1.75	0.66	4.75	3.77	7.75	3.77	10.75	1.33
2.00	1.33	5.00	3.77	8.00	3.10	11.00	1.11
2.25	2.44	5.25	6.87	8.25	2.44	11.25	1.33
2.50	1.77	5.50	6.87	8.50	1.99	11.50	0.66
2.75	2.66	5.75	49.61	8.75	2.44	11.75	1.11
3.00	1.77	6.00	50.06	9.00	1.77	12.00	1.33

CALIB			
STANDHYD (0001)	Area (ha)= 28.00		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 90.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	25.20	2.80
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.33	3.083	2.44	6.083	9.97	9.08	1.99
0.167	1.33	3.167	2.44	6.167	9.97	9.17	1.99
0.250	1.33	3.250	2.44	6.250	9.97	9.25	1.99
0.333	1.11	3.333	1.99	6.333	9.97	9.33	1.77
0.417	1.11	3.417	1.99	6.417	9.97	9.42	1.77
0.500	1.11	3.500	1.99	6.500	9.97	9.50	1.77
0.583	0.66	3.583	2.44	6.583	4.43	9.58	1.33
0.667	0.66	3.667	2.44	6.667	4.43	9.67	1.33
0.750	0.66	3.750	2.44	6.750	4.43	9.75	1.33
0.833	1.33	3.833	1.99	6.833	4.43	9.83	1.77
0.917	1.33	3.917	1.99	6.917	4.43	9.92	1.77
1.000	1.33	4.000	1.99	7.000	4.43	10.00	1.77
1.083	1.11	4.083	4.21	7.083	3.10	10.08	1.33
1.167	1.11	4.167	4.21	7.167	3.10	10.17	1.33
1.250	1.11	4.250	4.21	7.250	3.10	10.25	1.33
1.333	1.33	4.333	3.77	7.333	3.10	10.33	0.66
1.417	1.33	4.417	3.77	7.417	3.10	10.42	0.66
1.500	1.33	4.500	3.77	7.500	3.10	10.50	0.66
1.583	0.66	4.583	3.77	7.583	3.77	10.58	1.33
1.667	0.66	4.667	3.77	7.667	3.77	10.67	1.33
1.750	0.66	4.750	3.77	7.750	3.77	10.75	1.33
1.833	1.33	4.833	3.77	7.833	3.10	10.83	1.11
1.917	1.33	4.917	3.77	7.917	3.10	10.92	1.11
2.000	1.33	5.000	3.77	8.000	3.10	11.00	1.11
2.083	2.44	5.083	6.87	8.083	2.44	11.08	1.33
2.167	2.44	5.167	6.87	8.167	2.44	11.17	1.33
2.250	2.44	5.250	6.87	8.250	2.44	11.25	1.33
2.333	1.77	5.333	6.87	8.333	1.99	11.33	0.66
2.417	1.77	5.417	6.87	8.417	1.99	11.42	0.66
2.500	1.77	5.500	6.87	8.500	1.99	11.50	0.66
2.583	2.66	5.583	49.61	8.583	2.44	11.58	1.11
2.667	2.66	5.667	49.61	8.667	2.44	11.67	1.11
2.750	2.66	5.750	49.61	8.750	2.44	11.75	1.11
2.833	1.77	5.833	50.06	8.833	1.77	11.83	1.33
2.917	1.77	5.917	50.06	8.917	1.77	11.92	1.33
3.000	1.77	6.000	50.06	9.000	1.77	12.00	1.33

Max.Eff.Inten.(mm/hr)=	50.06	23.41	
over (min)	10.00	10.00	
Storage Coeff. (min)=	8.11 (ii)	9.79 (ii)	
Unit Hyd. Tpeak (min)=	10.00	10.00	
Unit Hyd. peak (cms)=	0.13	0.11	
			TOTALS
PEAK FLOW (cms)=	3.39	0.15	3.537 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	54.37	20.28	50.96
TOTAL RAINFALL (mm)=	55.37	55.37	55.37
RUNOFF COEFFICIENT =	0.98	0.37	0.92

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0002) | Area (ha)= 2.80
ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.52	0.28
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		50.06	23.41
over (min)		5.00	10.00
Storage Coeff. (min)=		4.06 (ii)	5.75 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.24	0.15
			TOTALS
PEAK FLOW (cms)=		0.35	0.02	0.367 (iii)
TIME TO PEAK (hrs)=		6.00	6.00	6.00
RUNOFF VOLUME (mm)=		54.37	20.28	50.96
TOTAL RAINFALL (mm)=		55.37	55.37	55.37
RUNOFF COEFFICIENT =		0.98	0.37	0.92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0003) | Area (ha)= 7.50
ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	6.75	0.75
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		50.06	23.41
over (min)		5.00	10.00
Storage Coeff. (min)=		5.46 (ii)	7.14 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.20	0.14
			TOTALS
PEAK FLOW (cms)=		0.93	0.04	0.978 (iii)
TIME TO PEAK (hrs)=		6.00	6.00	6.00
RUNOFF VOLUME (mm)=		54.37	20.28	50.96
TOTAL RAINFALL (mm)=		55.37	55.37	55.37
RUNOFF COEFFICIENT =		0.98	0.37	0.92

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0004) | Area (ha)= 10.50
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.35	3.15
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	264.58	20.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		50.06	23.41
over (min)		5.00	15.00
Storage Coeff. (min)=		6.04 (ii)	10.42 (ii)
Unit Hyd. Tpeak (min)=		5.00	15.00
Unit Hyd. peak (cms)=		0.19	0.09
			TOTALS
PEAK FLOW (cms)=		1.02	0.16	1.171 (iii)
TIME TO PEAK (hrs)=		6.00	6.08	6.00
RUNOFF VOLUME (mm)=		54.37	20.28	44.14
TOTAL RAINFALL (mm)=		55.37	55.37	55.37
RUNOFF COEFFICIENT =		0.98	0.37	0.80

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0005) | Area (ha)= 9.10
ID= 1 DT= 5.0 min | Total Imp(%)= 53.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	4.82	4.28
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	246.31	15.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	50.06	30.19	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.79 (ii)	12.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.20	0.09	
			TOTALS
PEAK FLOW (cms)=	0.57	0.27	0.829 (iii)
TIME TO PEAK (hrs)=	6.00	6.08	6.00
RUNOFF VOLUME (mm)=	54.37	22.44	36.81
TOTAL RAINFALL (mm)=	55.37	55.37	55.37
RUNOFF COEFFICIENT =	0.98	0.41	0.66

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 0.60
STANDHYD (0006)	Total Imp(%)= 60.00 Dir. Conn.(%)= 40.00
ID= 1 DT= 5.0 min	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.24
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	63.25	15.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	50.06	44.39	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.56 (ii)	7.98 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.29	0.13	
			TOTALS
PEAK FLOW (cms)=	0.03	0.03	0.060 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	54.37	25.96	37.32
TOTAL RAINFALL (mm)=	55.37	55.37	55.37
RUNOFF COEFFICIENT =	0.98	0.47	0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

** SIMULATION NUMBER: 3 **

READ STORM	Filename: C:\Users\BAbadi\AppData\Local\Temp\ba67a4f3-cd04-4c6b-acfa-cdfb3f067089\b2a609cc
Ptotal= 63.75 mm	Comments: This 10-year, 12-hour Storm created from

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	1.53	3.25	2.81	6.25	11.48	9.25	2.30
0.50	1.28	3.50	2.30	6.50	11.48	9.50	2.04
0.75	0.77	3.75	2.81	6.75	5.10	9.75	1.53
1.00	1.53	4.00	2.30	7.00	5.10	10.00	2.04
1.25	1.28	4.25	4.85	7.25	3.57	10.25	1.53
1.50	1.53	4.50	4.34	7.50	3.57	10.50	0.77
1.75	0.77	4.75	4.34	7.75	4.34	10.75	1.53
2.00	1.53	5.00	4.34	8.00	3.57	11.00	1.28
2.25	2.81	5.25	7.91	8.25	2.81	11.25	1.53
2.50	2.04	5.50	7.91	8.50	2.30	11.50	0.77
2.75	3.06	5.75	57.12	8.75	2.81	11.75	1.28
3.00	2.04	6.00	57.63	9.00	2.04	12.00	1.53

CALIB	Area (ha)= 28.00
STANDHYD (0001)	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00
ID= 1 DT= 5.0 min	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	25.20	2.80
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.53	3.083	2.81	6.083	11.48	9.08	2.30
0.167	1.53	3.167	2.81	6.167	11.48	9.17	2.30
0.250	1.53	3.250	2.81	6.250	11.48	9.25	2.30
0.333	1.28	3.333	2.30	6.333	11.48	9.33	2.04
0.417	1.28	3.417	2.30	6.417	11.48	9.42	2.04
0.500	1.28	3.500	2.30	6.500	11.48	9.50	2.04
0.583	0.77	3.583	2.81	6.583	5.10	9.58	1.53
0.667	0.77	3.667	2.81	6.667	5.10	9.67	1.53
0.750	0.77	3.750	2.81	6.750	5.10	9.75	1.53
0.833	1.53	3.833	2.30	6.833	5.10	9.83	2.04
0.917	1.53	3.917	2.30	6.917	5.10	9.92	2.04
1.000	1.53	4.000	2.30	7.000	5.10	10.00	2.04
1.083	1.28	4.083	4.85	7.083	3.57	10.08	1.53
1.167	1.28	4.167	4.85	7.167	3.57	10.17	1.53
1.250	1.28	4.250	4.85	7.250	3.57	10.25	1.53
1.333	1.53	4.333	4.34	7.333	3.57	10.33	0.77
1.417	1.53	4.417	4.34	7.417	3.57	10.42	0.77
1.500	1.53	4.500	4.34	7.500	3.57	10.50	0.77
1.583	0.77	4.583	4.34	7.583	4.34	10.58	1.53
1.667	0.77	4.667	4.34	7.667	4.34	10.67	1.53
1.750	0.77	4.750	4.34	7.750	4.34	10.75	1.53
1.833	1.53	4.833	4.34	7.833	3.57	10.83	1.28
1.917	1.53	4.917	4.34	7.917	3.57	10.92	1.28
2.000	1.53	5.000	4.34	8.000	3.57	11.00	1.28
2.083	2.81	5.083	7.91	8.083	2.81	11.08	1.53
2.167	2.81	5.167	7.91	8.167	2.81	11.17	1.53
2.250	2.81	5.250	7.91	8.250	2.81	11.25	1.53
2.333	2.04	5.333	7.91	8.333	2.30	11.33	0.77
2.417	2.04	5.417	7.91	8.417	2.30	11.42	0.77
2.500	2.04	5.500	7.91	8.500	2.30	11.50	0.77
2.583	3.06	5.583	57.12	8.583	2.81	11.58	1.28
2.667	3.06	5.667	57.12	8.667	2.81	11.67	1.28
2.750	3.06	5.750	57.12	8.750	2.81	11.75	1.28
2.833	2.04	5.833	57.63	8.833	2.04	11.83	1.53
2.917	2.04	5.917	57.63	8.917	2.04	11.92	1.53
3.000	2.04	6.000	57.63	9.000	2.04	12.00	1.53

Max.Eff.Inten.(mm/hr)=	57.63	29.42	
over (min)	10.00	10.00	
Storage Coeff. (min)=	7.66 (ii)	9.25 (ii)	
Unit Hyd. Tpeak (min)=	10.00	10.00	
Unit Hyd. peak (cms)=	0.13	0.12	
			TOTALS
PEAK FLOW (cms)=	3.92	0.20	4.115 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	62.75	25.58	59.04
TOTAL RAINFALL (mm)=	63.75	63.75	63.75
RUNOFF COEFFICIENT =	0.98	0.40	0.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 2.80
STANDHYD (0002)	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00
ID= 1 DT= 5.0 min	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.52	0.28
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	57.63	29.42	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.84 (ii)	5.43 (ii)	

```
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.16
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.40         0.02          0.425 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      62.75        25.58          59.04
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.40           0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD  (0003) |   Area    (ha)=   7.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       6.75         0.75
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     223.61        10.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      57.63        29.42
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       5.16 (ii)    6.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.21         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.08         0.06          1.133 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      62.75        25.58          59.04
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.40           0.93


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD  (0004) |   Area    (ha)=  10.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.35         3.15
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     264.58        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      57.63        29.42
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       5.71 (ii)    9.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.20         0.11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.17         0.22          1.387 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      62.75        25.58          51.60
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.40           0.81


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD  (0005) |   Area    (ha)=   9.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  45.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.82         4.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     246.31        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      57.63        37.66
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.47 (ii)   10.44 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.65         0.35          1.000 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08           6.00
     RUNOFF VOLUME    (mm)=      62.75        28.13          43.71
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.44           0.69


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD  (0006) |   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  40.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.24
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      63.25        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      57.63        54.76
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.42 (ii)    7.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.03          0.072 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      62.75        32.21          44.42
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.51           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ** SIMULATION NUMBER:   4 **
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|    READ STORM    |    Filename: C:\Users\BAbadi\AppD
|                  |              ata\Local\Temp\
|                  |              ba67a4f3-cd04-4c6b-acfa-cdfb3f067089\8afea872
| Ptotal= 74.42 mm |    Comments: This 25-year, 12-hour Storm created from
-------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.79 |  3.25    3.27 |  6.25   13.40 |  9.25    2.68
                0.50    1.49 |  3.50    2.68 |  6.50   13.40 |  9.50    2.38
                0.75    0.89 |  3.75    3.27 |  6.75    5.95 |  9.75    1.79
                1.00    1.79 |  4.00    2.68 |  7.00    5.95 | 10.00    2.38
                1.25    1.49 |  4.25    5.66 |  7.25    4.17 | 10.25    1.79
                1.50    1.79 |  4.50    5.06 |  7.50    4.17 | 10.50    0.89
                1.75    0.89 |  4.75    5.06 |  7.75    5.06 | 10.75    1.79
                2.00    1.79 |  5.00    5.06 |  8.00    4.17 | 11.00    1.49
                2.25    3.27 |  5.25    9.23 |  8.25    3.27 | 11.25    1.79
                2.50    2.38 |  5.50    9.23 |  8.50    2.68 | 11.50    0.89
                2.75    3.57 |  5.75   66.68 |  8.75    3.27 | 11.75    1.49
                3.00    2.38 |  6.00   67.28 |  9.00    2.38 | 12.00    1.79
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CALIB	
STANDHYD (0001)	Area (ha)= 28.00
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	25.20	2.80
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.79	3.083	3.27	6.083	13.40	9.08	2.68
0.167	1.79	3.167	3.27	6.167	13.40	9.17	2.68
0.250	1.79	3.250	3.27	6.250	13.40	9.25	2.68
0.333	1.49	3.333	2.68	6.333	13.40	9.33	2.38
0.417	1.49	3.417	2.68	6.417	13.40	9.42	2.38
0.500	1.49	3.500	2.68	6.500	13.40	9.50	2.38
0.583	0.89	3.583	3.27	6.583	5.95	9.58	1.79
0.667	0.89	3.667	3.27	6.667	5.95	9.67	1.79
0.750	0.89	3.750	3.27	6.750	5.95	9.75	1.79
0.833	1.79	3.833	2.68	6.833	5.95	9.83	2.38
0.917	1.79	3.917	2.68	6.917	5.95	9.92	2.38
1.000	1.79	4.000	2.68	7.000	5.95	10.00	2.38
1.083	1.49	4.083	5.66	7.083	4.17	10.08	1.79
1.167	1.49	4.167	5.66	7.167	4.17	10.17	1.79
1.250	1.49	4.250	5.66	7.250	4.17	10.25	1.79
1.333	1.79	4.333	5.06	7.333	4.17	10.33	0.89
1.417	1.79	4.417	5.06	7.417	4.17	10.42	0.89
1.500	1.79	4.500	5.06	7.500	4.17	10.50	0.89
1.583	0.89	4.583	5.06	7.583	5.06	10.58	1.79
1.667	0.89	4.667	5.06	7.667	5.06	10.67	1.79
1.750	0.89	4.750	5.06	7.750	5.06	10.75	1.79
1.833	1.79	4.833	5.06	7.833	4.17	10.83	1.49
1.917	1.79	4.917	5.06	7.917	4.17	10.92	1.49
2.000	1.79	5.000	5.06	8.000	4.17	11.00	1.49
2.083	3.27	5.083	9.23	8.083	3.27	11.08	1.79
2.167	3.27	5.167	9.23	8.167	3.27	11.17	1.79
2.250	3.27	5.250	9.23	8.250	3.27	11.25	1.79
2.333	2.38	5.333	9.23	8.333	2.68	11.33	0.89
2.417	2.38	5.417	9.23	8.417	2.68	11.42	0.89
2.500	2.38	5.500	9.23	8.500	2.68	11.50	0.89
2.583	3.57	5.583	66.68	8.583	3.27	11.58	1.49
2.667	3.57	5.667	66.68	8.667	3.27	11.67	1.49
2.750	3.57	5.750	66.68	8.750	3.27	11.75	1.49
2.833	2.38	5.833	67.28	8.833	2.38	11.83	1.79
2.917	2.38	5.917	67.28	8.917	2.38	11.92	1.79
3.000	2.38	6.000	67.28	9.000	2.38	12.00	1.79

				TOTALS
Max.Eff.Inten.(mm/hr)=		67.28	37.52	
over (min)		5.00	10.00	
Storage Coeff. (min)=		7.20 (ii)	8.70 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.12	
PEAK FLOW	(cms)=	4.64	0.25	4.896 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	32.79	69.36
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.44	0.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0002)	Area (ha)= 2.80
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.52	0.28
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250

				TOTALS
Max.Eff.Inten.(mm/hr)=		67.28	37.52	
over (min)		5.00	10.00	
Storage Coeff. (min)=		3.61 (ii)	5.10 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.25	0.16	
PEAK FLOW	(cms)=	0.47	0.03	0.498 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	32.79	69.36
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.44	0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0003)	Area (ha)= 7.50
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	6.75	0.75
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250

				TOTALS
Max.Eff.Inten.(mm/hr)=		67.28	37.52	
over (min)		5.00	10.00	
Storage Coeff. (min)=		4.85 (ii)	6.35 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.22	0.15	
PEAK FLOW	(cms)=	1.26	0.07	1.331 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	32.79	69.36
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.44	0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0004)	Area (ha)= 10.50
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.35	3.15
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	264.58	20.00
Mannings n	=	0.013	0.250

				TOTALS
Max.Eff.Inten.(mm/hr)=		67.28	37.52	
over (min)		5.00	10.00	
Storage Coeff. (min)=		5.37 (ii)	9.25 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.21	0.12	
PEAK FLOW	(cms)=	1.37	0.28	1.651 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	32.79	61.23
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.44	0.82

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0005)	Area (ha)= 9.10		
ID= 1 DT= 5.0 min	Total Imp(%)= 53.00	Dir. Conn.(%)= 45.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.82	4.28	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	246.31	15.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		67.28	47.67	
over (min)		5.00	10.00	
Storage Coeff. (min)=		5.14 (ii)	9.81 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.21	0.11	
			TOTALS	
PEAK FLOW	(cms)=	0.76	0.48	1.247 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	35.81	52.73
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.48	0.71

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0006)	Area (ha)= 0.60		
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00	Dir. Conn.(%)= 40.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.36	0.24	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	63.25	15.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		67.28	68.46	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.27 (ii)	6.87 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.30	0.14	
			TOTALS	
PEAK FLOW	(cms)=	0.04	0.04	0.087 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	40.56	53.70
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.54	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

** SIMULATION NUMBER: 5 **

READ STORM	Filename: C:\Users\BAbadi\AppData\Local\Temp\ba67a4f3-cd04-4c6b-acfa-cdfb3f067089\2e86f72d
Ptotal= 80.61 mm	Comments: 50-YearSCSTypeII12HourStorm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.81	3.25	3.23	6.25	43.63	9.25	3.23
0.50	1.62	3.50	3.23	6.50	14.54	9.50	3.23
0.75	1.62	3.75	3.23	6.75	10.50	9.75	2.42
1.00	1.62	4.00	3.23	7.00	6.46	10.00	1.62
1.25	1.62	4.25	4.04	7.25	5.66	10.25	1.62
1.50	1.62	4.50	4.85	7.50	4.85	10.50	1.62
1.75	1.62	4.75	5.66	7.75	4.85	10.75	1.62
2.00	1.62	5.00	6.46	8.00	4.85	11.00	1.62
2.25	2.42	5.25	8.08	8.25	4.04	11.25	1.62
2.50	3.23	5.50	9.70	8.50	3.23	11.50	1.62
2.75	3.23	5.75	41.21	8.75	3.23	11.75	1.62
3.00	3.23	6.00	72.72	9.00	3.23	12.00	1.62

CALIB			
STANDHYD (0001)	Area (ha)= 28.00		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 90.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	25.20	2.80	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	432.05	10.00	
Mannings n	=	0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.81	3.083	3.23	6.083	43.63	9.08	3.23
0.167	0.81	3.167	3.23	6.167	43.63	9.17	3.23
0.250	0.81	3.250	3.23	6.250	43.63	9.25	3.23
0.333	1.62	3.333	3.23	6.333	14.54	9.33	3.23
0.417	1.62	3.417	3.23	6.417	14.54	9.42	3.23
0.500	1.62	3.500	3.23	6.500	14.54	9.50	3.23
0.583	1.62	3.583	3.23	6.583	10.50	9.58	2.42
0.667	1.62	3.667	3.23	6.667	10.50	9.67	2.42
0.750	1.62	3.750	3.23	6.750	10.50	9.75	2.42
0.833	1.62	3.833	3.23	6.833	6.46	9.83	1.62
0.917	1.62	3.917	3.23	6.917	6.46	9.92	1.62
1.000	1.62	4.000	3.23	7.000	6.46	10.00	1.62
1.083	1.62	4.083	4.04	7.083	5.66	10.08	1.62
1.167	1.62	4.167	4.04	7.167	5.66	10.17	1.62
1.250	1.62	4.250	4.04	7.250	5.66	10.25	1.62
1.333	1.62	4.333	4.85	7.333	4.85	10.33	1.62
1.417	1.62	4.417	4.85	7.417	4.85	10.42	1.62
1.500	1.62	4.500	4.85	7.500	4.85	10.50	1.62
1.583	1.62	4.583	5.66	7.583	4.85	10.58	1.62
1.667	1.62	4.667	5.66	7.667	4.85	10.67	1.62
1.750	1.62	4.750	5.66	7.750	4.85	10.75	1.62
1.833	1.62	4.833	6.46	7.833	4.85	10.83	1.62
1.917	1.62	4.917	6.46	7.917	4.85	10.92	1.62
2.000	1.62	5.000	6.46	8.000	4.85	11.00	1.62
2.083	2.42	5.083	8.08	8.083	4.04	11.08	1.62
2.167	2.42	5.167	8.08	8.167	4.04	11.17	1.62
2.250	2.42	5.250	8.08	8.250	4.04	11.25	1.62
2.333	3.23	5.333	9.70	8.333	3.23	11.33	1.62
2.417	3.23	5.417	9.70	8.417	3.23	11.42	1.62
2.500	3.23	5.500	9.70	8.500	3.23	11.50	1.62
2.583	3.23	5.583	41.21	8.583	3.23	11.58	1.62
2.667	3.23	5.667	41.21	8.667	3.23	11.67	1.62
2.750	3.23	5.750	41.21	8.750	3.23	11.75	1.62
2.833	3.23	5.833	72.72	8.833	3.23	11.83	1.62
2.917	3.23	5.917	72.72	8.917	3.23	11.92	1.62
3.000	3.23	6.000	72.72	9.000	3.23	12.00	1.62

Max.Eff.Inten.(mm/hr)=		72.72	37.92	
over (min)		5.00	10.00	
Storage Coeff. (min)=		6.98 (ii)	8.43 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.12	
			TOTALS	
PEAK FLOW	(cms)=	4.80	0.25	5.039 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	79.61	37.17	75.36
TOTAL RAINFALL	(mm)=	80.61	80.61	80.61
RUNOFF COEFFICIENT	=	0.99	0.46	0.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.52         0.28
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    136.63        10.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     72.72        37.92
               over (min)        5.00         5.00
     Storage Coeff.  (min)=     3.50 (ii)    4.95 (ii)
     Unit Hyd. Tpeak (min)=     5.00         5.00
     Unit Hyd. peak  (cms)=     0.26         0.22
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.51         0.03          0.535 (iii)
     TIME TO PEAK    (hrs)=     6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=    79.61        37.17         75.36
     TOTAL RAINFALL   (mm)=    80.61        80.61         80.61
     RUNOFF COEFFICIENT   =     0.99         0.46          0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   7.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      6.75         0.75
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    223.61        10.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     72.72        37.92
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     4.70 (ii)    6.15 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.22         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=     1.34         0.07          1.407 (iii)
     TIME TO PEAK    (hrs)=     6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=    79.61        37.17         75.36
     TOTAL RAINFALL   (mm)=    80.61        80.61         80.61
     RUNOFF COEFFICIENT   =     0.99         0.46          0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=  10.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      7.35         3.15
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    264.58        20.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     72.72        37.92
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     5.20 (ii)    8.97 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.21         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=     1.45         0.28          1.708 (iii)
     TIME TO PEAK    (hrs)=     6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=    79.61        37.17         66.88
     TOTAL RAINFALL   (mm)=    80.61        80.61         80.61
     RUNOFF COEFFICIENT   =     0.99         0.46          0.83

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0005) |   Area    (ha)=   9.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  45.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      4.82         4.28
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    246.31        15.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     72.72        48.47
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     4.98 (ii)    9.51 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.22         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.81         0.47          1.256 (iii)
     TIME TO PEAK    (hrs)=     6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=    79.61        40.44         58.07
     TOTAL RAINFALL   (mm)=    80.61        80.61         80.61
     RUNOFF COEFFICIENT   =     0.99         0.50          0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  40.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.36         0.24
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     63.25        15.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     72.72        70.26
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     2.20 (ii)    6.66 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.30         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.05         0.04          0.089 (iii)
     TIME TO PEAK    (hrs)=     6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=    79.61        45.56         59.17
     TOTAL RAINFALL   (mm)=    80.61        80.61         80.61
     RUNOFF COEFFICIENT   =     0.99         0.57          0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ** SIMULATION NUMBER:   6 **
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|    READ STORM    |    Filename: C:\Users\BAbadi\AppD
|                  |              ata\Local\Temp\
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	ba67a4f3-cd04-4c6b-acfa-cdfb3f067089\f80c0367
Ptotal= 89.92 mm	Comments: This 100-year, 12-hour Storm created fro

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	2.16	3.25	3.96	6.25	16.18	9.25	3.24
0.50	1.80	3.50	3.24	6.50	16.18	9.50	2.88
0.75	1.08	3.75	3.96	6.75	7.19	9.75	2.16
1.00	2.16	4.00	3.24	7.00	7.19	10.00	2.88
1.25	1.80	4.25	6.83	7.25	5.04	10.25	2.16
1.50	2.16	4.50	6.11	7.50	5.04	10.50	1.08
1.75	1.08	4.75	6.11	7.75	6.11	10.75	2.16
2.00	2.16	5.00	6.11	8.00	5.04	11.00	1.80
2.25	3.96	5.25	11.15	8.25	3.96	11.25	2.16
2.50	2.88	5.50	11.15	8.50	3.24	11.50	1.08
2.75	4.32	5.75	80.56	8.75	3.96	11.75	1.80
3.00	2.88	6.00	81.28	9.00	2.88	12.00	2.16

CALIB	
STANDHYD (0001)	Area (ha)= 28.00
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	25.20	2.80
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.16	3.083	3.96	6.083	16.18	9.08	3.24
0.167	2.16	3.167	3.96	6.167	16.18	9.17	3.24
0.250	2.16	3.250	3.96	6.250	16.18	9.25	3.24
0.333	1.80	3.333	3.24	6.333	16.18	9.33	2.88
0.417	1.80	3.417	3.24	6.417	16.18	9.42	2.88
0.500	1.80	3.500	3.24	6.500	16.18	9.50	2.88
0.583	1.08	3.583	3.96	6.583	7.19	9.58	2.16
0.667	1.08	3.667	3.96	6.667	7.19	9.67	2.16
0.750	1.08	3.750	3.96	6.750	7.19	9.75	2.16
0.833	2.16	3.833	3.24	6.833	7.19	9.83	2.88
0.917	2.16	3.917	3.24	6.917	7.19	9.92	2.88
1.000	2.16	4.000	3.24	7.000	7.19	10.00	2.88
1.083	1.80	4.083	6.83	7.083	5.04	10.08	2.16
1.167	1.80	4.167	6.83	7.167	5.04	10.17	2.16
1.250	1.80	4.250	6.83	7.250	5.04	10.25	2.16
1.333	2.16	4.333	6.11	7.333	5.04	10.33	1.08
1.417	2.16	4.417	6.11	7.417	5.04	10.42	1.08
1.500	2.16	4.500	6.11	7.500	5.04	10.50	1.08
1.583	1.08	4.583	6.11	7.583	6.11	10.58	2.16
1.667	1.08	4.667	6.11	7.667	6.11	10.67	2.16
1.750	1.08	4.750	6.11	7.750	6.11	10.75	2.16
1.833	2.16	4.833	6.11	7.833	5.04	10.83	1.80
1.917	2.16	4.917	6.11	7.917	5.04	10.92	1.80
2.000	2.16	5.000	6.11	8.000	5.04	11.00	1.80
2.083	3.96	5.083	11.15	8.083	3.96	11.08	2.16
2.167	3.96	5.167	11.15	8.167	3.96	11.17	2.16
2.250	3.96	5.250	11.15	8.250	3.96	11.25	2.16
2.333	2.88	5.333	11.15	8.333	3.24	11.33	1.08
2.417	2.88	5.417	11.15	8.417	3.24	11.42	1.08
2.500	2.88	5.500	11.15	8.500	3.24	11.50	1.08
2.583	4.32	5.583	80.56	8.583	3.96	11.58	1.80
2.667	4.32	5.667	80.56	8.667	3.96	11.67	1.80
2.750	4.32	5.750	80.56	8.750	3.96	11.75	1.80
2.833	2.88	5.833	81.28	8.833	2.88	11.83	2.16
2.917	2.88	5.917	81.28	8.917	2.88	11.92	2.16
3.000	2.88	6.000	81.28	9.000	2.88	12.00	2.16

Max.Eff.Inten.(mm/hr)=		81.28	49.99	
over (min)		5.00	10.00	
Storage Coeff. (min)=		6.68 (ii)	8.06 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.18	0.13	
				TOTALS
PEAK FLOW	(cms)=	5.63	0.35	5.977 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	88.92	44.00	84.42
TOTAL RAINFALL	(mm)=	89.92	89.92	89.92
RUNOFF COEFFICIENT	=	0.99	0.49	0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0002)	Area (ha)= 2.80
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.52	0.28
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		81.28	49.99
over (min)		5.00	5.00
Storage Coeff. (min)=		3.35 (ii)	4.73 (ii)
Unit Hyd. Tpeak (min)=		5.00	5.00
Unit Hyd. peak (cms)=		0.26	0.22
			TOTALS
PEAK FLOW	(cms)=	0.57	0.04 0.608 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00 6.00
RUNOFF VOLUME	(mm)=	88.92	44.00 84.42
TOTAL RAINFALL	(mm)=	89.92	89.92 89.92
RUNOFF COEFFICIENT	=	0.99	0.49 0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0003)	Area (ha)= 7.50
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	6.75	0.75
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		81.28	49.99
over (min)		5.00	10.00
Storage Coeff. (min)=		4.50 (ii)	5.88 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.23	0.15
			TOTALS
PEAK FLOW	(cms)=	1.52	0.10 1.619 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00 6.00
RUNOFF VOLUME	(mm)=	88.92	44.00 84.42
TOTAL RAINFALL	(mm)=	89.92	89.92 89.92
RUNOFF COEFFICIENT	=	0.99	0.49 0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0004)	Area (ha)= 10.50
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.35	3.15
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	264.58	20.00
Mannings n	=	0.013	0.250

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     Max.Eff.Inten.(mm/hr)=      81.28        49.99
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       4.98 (ii)    8.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.22         0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=       1.66         0.39          2.041 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      88.92        44.00          75.44
     TOTAL RAINFALL   (mm)=      89.92        89.92          89.92
     RUNOFF COEFFICIENT   =       0.99         0.49           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0005)  |   Area    (ha)=   9.10
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  53.00   Dir. Conn.(%)=  45.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.82         4.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     246.31        15.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.28        62.91
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       4.77 (ii)    9.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.22         0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.92         0.66          1.579 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      88.92        47.64          66.21
     TOTAL RAINFALL   (mm)=      89.92        89.92          89.92
     RUNOFF COEFFICIENT   =       0.99         0.53           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0006)  |   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  60.00   Dir. Conn.(%)=  40.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.24
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      63.25        15.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.28        89.04
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.11 (ii)    6.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.06          0.110 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      88.92        53.27          67.52
     TOTAL RAINFALL   (mm)=      89.92        89.92          89.92
     RUNOFF COEFFICIENT   =       0.99         0.59           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 FINISH
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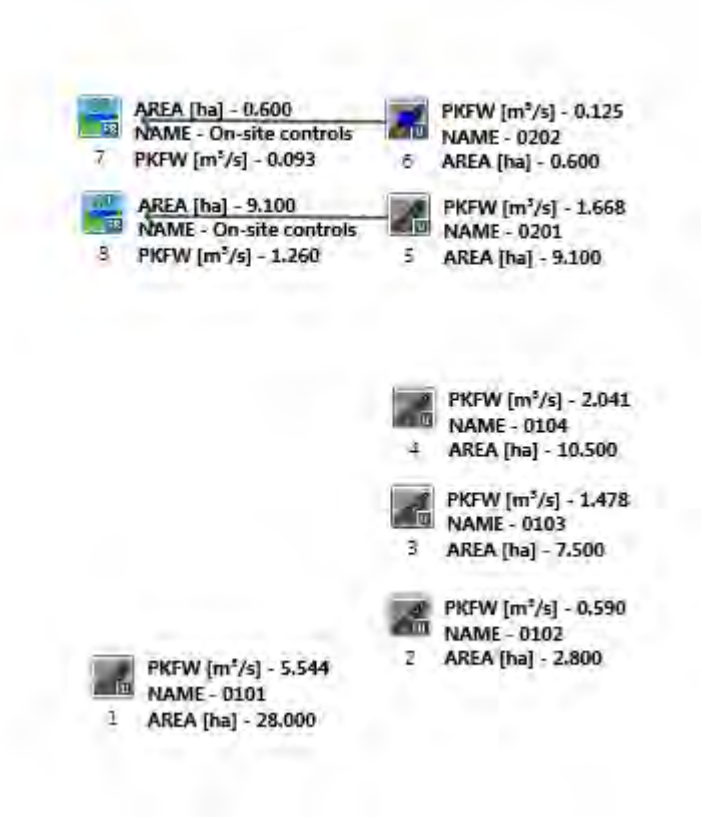
W11-259
Functional Servicing
Yonge-Steeles Secondary Plan Area
Post-Development Model
November 2013

VO2 Model Schematic



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================================================================================================
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       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O    Company
        OOO     T      T    H   H    Y    M   M   OOO                Serial

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                    *****  D E T A I L E D    O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual Otthymo 3.0\VO2\voin.dat
  Output  filename: C:\Users\BAbadi\AppData\Local\Temp\8eb77f18-ad3d-4eea-a164-
749261012da9\Scenario.out
  Summary filename: C:\Users\BAbadi\AppData\Local\Temp\8eb77f18-ad3d-4eea-a164-
749261012da9\Scenario.sum


DATE: 01/16/2013                          TIME: 09:24:36

USER:


COMMENTS: _____________________________________________________________


-------------------------------------------------------------------------------------------------------
-----
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************


-------------------
|    READ STORM    |    Filename: C:\Users\BAbadi\AppD
|                  |              ata\Local\Temp\
|                  |              8eb77f18-ad3d-4eea-a164-749261012da9\1d4d557b
| Ptotal= 42.93 mm |    Comments: This 2-year, 12-hour Storm created from
-------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.03 |  3.25    1.89 |  6.25    7.73 |  9.25    1.55
                0.50    0.86 |  3.50    1.55 |  6.50    7.73 |  9.50    1.37
                0.75    0.52 |  3.75    1.89 |  6.75    3.43 |  9.75    1.03
                1.00    1.03 |  4.00    1.55 |  7.00    3.43 | 10.00    1.37
                1.25    0.86 |  4.25    3.26 |  7.25    2.40 | 10.25    1.03
                1.50    1.03 |  4.50    2.92 |  7.50    2.40 | 10.50    0.52
                1.75    0.52 |  4.75    2.92 |  7.75    2.92 | 10.75    1.03
                2.00    1.03 |  5.00    2.92 |  8.00    2.40 | 11.00    0.86
                2.25    1.89 |  5.25    5.32 |  8.25    1.89 | 11.25    1.03
                2.50    1.37 |  5.50    5.32 |  8.50    1.55 | 11.50    0.52
                2.75    2.06 |  5.75   38.46 |  8.75    1.89 | 11.75    0.86
                3.00    1.37 |  6.00   38.81 |  9.00    1.37 | 12.00    1.03

-------------------------------------------------------------------------------

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| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  28.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      21.00         7.00
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     432.05        10.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083   1.03 | 3.083    1.89 | 6.083    7.73 |  9.08    1.55
                0.167   1.03 | 3.167    1.89 | 6.167    7.73 |  9.17    1.55
                0.250   1.03 | 3.250    1.89 | 6.250    7.73 |  9.25    1.55
                0.333   0.86 | 3.333    1.55 | 6.333    7.73 |  9.33    1.37
                0.417   0.86 | 3.417    1.55 | 6.417    7.73 |  9.42    1.37
                0.500   0.86 | 3.500    1.55 | 6.500    7.73 |  9.50    1.37
                0.583   0.52 | 3.583    1.89 | 6.583    3.43 |  9.58    1.03
                0.667   0.52 | 3.667    1.89 | 6.667    3.43 |  9.67    1.03
                0.750   0.52 | 3.750    1.89 | 6.750    3.43 |  9.75    1.03
                0.833   1.03 | 3.833    1.55 | 6.833    3.43 |  9.83    1.37
                0.917   1.03 | 3.917    1.55 | 6.917    3.43 |  9.92    1.37
                1.000   1.03 | 4.000    1.55 | 7.000    3.43 | 10.00    1.37
                1.083   0.86 | 4.083    3.26 | 7.083    2.40 | 10.08    1.03
                1.167   0.86 | 4.167    3.26 | 7.167    2.40 | 10.17    1.03
                1.250   0.86 | 4.250    3.26 | 7.250    2.40 | 10.25    1.03
                1.333   1.03 | 4.333    2.92 | 7.333    2.40 | 10.33    0.52
                1.417   1.03 | 4.417    2.92 | 7.417    2.40 | 10.42    0.52
                1.500   1.03 | 4.500    2.92 | 7.500    2.40 | 10.50    0.52
                1.583   0.52 | 4.583    2.92 | 7.583    2.92 | 10.58    1.03
                1.667   0.52 | 4.667    2.92 | 7.667    2.92 | 10.67    1.03
                1.750   0.52 | 4.750    2.92 | 7.750    2.92 | 10.75    1.03
                1.833   1.03 | 4.833    2.92 | 7.833    2.40 | 10.83    0.86
                1.917   1.03 | 4.917    2.92 | 7.917    2.40 | 10.92    0.86
                2.000   1.03 | 5.000    2.92 | 8.000    2.40 | 11.00    0.86
                2.083   1.89 | 5.083    5.32 | 8.083    1.89 | 11.08    1.03
                2.167   1.89 | 5.167    5.32 | 8.167    1.89 | 11.17    1.03
                2.250   1.89 | 5.250    5.32 | 8.250    1.89 | 11.25    1.03
                2.333   1.37 | 5.333    5.32 | 8.333    1.55 | 11.33    0.52
                2.417   1.37 | 5.417    5.32 | 8.417    1.55 | 11.42    0.52
                2.500   1.37 | 5.500    5.32 | 8.500    1.55 | 11.50    0.52
                2.583   2.06 | 5.583   38.46 | 8.583    1.89 | 11.58    0.86
                2.667   2.06 | 5.667   38.46 | 8.667    1.89 | 11.67    0.86
                2.750   2.06 | 5.750   38.46 | 8.750    1.89 | 11.75    0.86
                2.833   1.37 | 5.833   38.81 | 8.833    1.37 | 11.83    1.03
                2.917   1.37 | 5.917   38.81 | 8.917    1.37 | 11.92    1.03
                3.000   1.37 | 6.000   38.80 | 9.000    1.37 | 12.00    1.03

     Max.Eff.Inten.(mm/hr)=      38.81        15.25
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       8.98 (ii)   11.87 (ii)
     Unit Hyd. Tpeak (min)=      10.00        15.00
     Unit Hyd. peak  (cms)=       0.12         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.16         0.22         2.371 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=      41.93        13.13        34.73
     TOTAL RAINFALL   (mm)=      42.93        42.93        42.93
     RUNOFF COEFFICIENT   =       0.98         0.31         0.81

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   2.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         0.45
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     136.63        10.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.81        15.25
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       4.50 (ii)    6.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.23         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.02         0.270 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00         6.00
     RUNOFF VOLUME    (mm)=      41.93        13.13        37.32
     TOTAL RAINFALL   (mm)=      42.93        42.93        42.93
     RUNOFF COEFFICIENT   =       0.98         0.31         0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0003)	Area (ha)= 7.50			
ID= 1 DT= 5.0 min	Total Imp(%)= 71.00	Dir. Conn.(%)= 71.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.32	2.18
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	38.81	15.25
over (min)		5.00	10.00
Storage Coeff. (min)	=	6.05 (ii)	9.18 (ii)
Unit Hyd. Tpeak (min)	=	5.00	10.00
Unit Hyd. peak (cms)	=	0.19	0.12

		TOTALS
PEAK FLOW	(cms)=	0.57	0.08	0.648 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	41.93	13.13	33.58
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.31	0.78

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0004)	Area (ha)= 10.50			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 70.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.35	3.15
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	264.58	20.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	38.81	15.25
over (min)		5.00	15.00
Storage Coeff. (min)	=	6.69 (ii)	11.53 (ii)
Unit Hyd. Tpeak (min)	=	5.00	15.00
Unit Hyd. peak (cms)	=	0.18	0.09

		TOTALS
PEAK FLOW	(cms)=	0.78	0.10	0.880 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	41.93	13.13	33.29
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.31	0.78

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0006)	Area (ha)= 0.60			
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00	Dir. Conn.(%)= 80.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.48	0.12
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	63.25	15.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	38.81	15.25
over (min)		5.00	10.00
Storage Coeff. (min)	=	2.83 (ii)	6.12 (ii)
Unit Hyd. Tpeak (min)	=	5.00	10.00
Unit Hyd. peak (cms)	=	0.28	0.15

TOTALS

PEAK FLOW	(cms)=	0.05	0.00	0.056 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	41.93	13.13	36.16
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.31	0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0007)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0900	0.0120
	0.0400	0.0065	0.0900	0.0120
	0.0600	0.0080	0.1100	0.0140
	0.0700	0.0100	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.600	0.056	6.00	36.16
OUTFLOW: ID= 1 (0007)	0.600	0.037	6.08	36.10

PEAK FLOW REDUCTION [Qout/Qin](%)= 65.30
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0062

CALIB				
STANDHYD (0005)	Area (ha)= 9.10			
ID= 1 DT= 5.0 min	Total Imp(%)= 59.00	Dir. Conn.(%)= 59.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.37	3.73
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	246.31	15.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	38.81	15.25
over (min)		5.00	15.00
Storage Coeff. (min)	=	6.41 (ii)	11.35 (ii)
Unit Hyd. Tpeak (min)	=	5.00	15.00
Unit Hyd. peak (cms)	=	0.18	0.09

		TOTALS
PEAK FLOW	(cms)=	0.57	0.12	0.688 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	41.93	13.13	30.12
TOTAL RAINFALL	(mm)=	42.93	42.93	42.93
RUNOFF COEFFICIENT	=	0.98	0.31	0.70

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0008)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.2500	0.0900
	0.6000	0.0500	1.2600	0.1100
	0.8300	0.0700	1.5800	0.1200
	1.0000	0.0800	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	9.100	0.688	6.00	30.12
OUTFLOW: ID= 1 (0008)	9.100	0.547	6.08	30.12

PEAK FLOW REDUCTION [Qout/Qin](%)= 79.45
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0471

****
** SIMULATION NUMBER: 2 **
****

READ STORM | Filename: C:\Users\BAbadi\AppData\Local\Temp\8eb77f18-ad3d-4eea-a164-749261012da9\733c5b1c
Ptotal= 55.37 mm | Comments: This 5-year, 12-hour Storm created from

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	1.33	3.25	2.44	6.25	9.97	9.25	1.99
0.50	1.11	3.50	1.99	6.50	9.97	9.50	1.77
0.75	0.66	3.75	2.44	6.75	4.43	9.75	1.33
1.00	1.33	4.00	1.99	7.00	4.43	10.00	1.77
1.25	1.11	4.25	4.21	7.25	3.10	10.25	1.33
1.50	1.33	4.50	3.77	7.50	3.10	10.50	0.66
1.75	0.66	4.75	3.77	7.75	3.77	10.75	1.33
2.00	1.33	5.00	3.77	8.00	3.10	11.00	1.11
2.25	2.44	5.25	6.87	8.25	2.44	11.25	1.33
2.50	1.77	5.50	6.87	8.50	1.99	11.50	0.66
2.75	2.66	5.75	49.61	8.75	2.44	11.75	1.11
3.00	1.77	6.00	50.06	9.00	1.77	12.00	1.33

CALIB | STANDHYD (0001) | ID= 1 DT= 5.0 min | Area (ha)= 28.00 Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	21.00	7.00
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.33	3.083	2.44	6.083	9.97	9.08	1.99
0.167	1.33	3.167	2.44	6.167	9.97	9.17	1.99
0.250	1.33	3.250	2.44	6.250	9.97	9.25	1.99
0.333	1.11	3.333	1.99	6.333	9.97	9.33	1.77
0.417	1.11	3.417	1.99	6.417	9.97	9.42	1.77
0.500	1.11	3.500	1.99	6.500	9.97	9.50	1.77
0.583	0.66	3.583	2.44	6.583	4.43	9.58	1.33
0.667	0.66	3.667	2.44	6.667	4.43	9.67	1.33
0.750	0.66	3.750	2.44	6.750	4.43	9.75	1.33
0.833	1.33	3.833	1.99	6.833	4.43	9.83	1.77
0.917	1.33	3.917	1.99	6.917	4.43	9.92	1.77
1.000	1.33	4.000	1.99	7.000	4.43	10.00	1.77
1.083	1.11	4.083	4.21	7.083	3.10	10.08	1.33
1.167	1.11	4.167	4.21	7.167	3.10	10.17	1.33
1.250	1.11	4.250	4.21	7.250	3.10	10.25	1.33
1.333	1.33	4.333	3.77	7.333	3.10	10.33	0.66
1.417	1.33	4.417	3.77	7.417	3.10	10.42	0.66
1.500	1.33	4.500	3.77	7.500	3.10	10.50	0.66
1.583	0.66	4.583	3.77	7.583	3.77	10.58	1.33
1.667	0.66	4.667	3.77	7.667	3.77	10.67	1.33
1.750	0.66	4.750	3.77	7.750	3.77	10.75	1.33
1.833	1.33	4.833	3.77	7.833	3.10	10.83	1.11
1.917	1.33	4.917	3.77	7.917	3.10	10.92	1.11
2.000	1.33	5.000	3.77	8.000	3.10	11.00	1.11
2.083	2.44	5.083	6.87	8.083	2.44	11.08	1.33
2.167	2.44	5.167	6.87	8.167	2.44	11.17	1.33
2.250	2.44	5.250	6.87	8.250	2.44	11.25	1.33
2.333	1.77	5.333	6.87	8.333	1.99	11.33	0.66
2.417	1.77	5.417	6.87	8.417	1.99	11.42	0.66
2.500	1.77	5.500	6.87	8.500	1.99	11.50	0.66
2.583	2.66	5.583	49.61	8.583	2.44	11.58	1.11
2.667	2.66	5.667	49.61	8.667	2.44	11.67	1.11
2.750	2.66	5.750	49.61	8.750	2.44	11.75	1.11
2.833	1.77	5.833	50.06	8.833	1.77	11.83	1.33
2.917	1.77	5.917	50.06	8.917	1.77	11.92	1.33
3.000	1.77	6.000	50.06	9.000	1.77	12.00	1.33

Max.Eff.Inten.(mm/hr)=		50.06	23.41
over (min)		10.00	15.00
Storage Coeff. (min)=		8.11 (ii)	10.72 (ii)
Unit Hyd. Tpeak (min)=		10.00	15.00
Unit Hyd. peak (cms)=		0.13	0.09
			TOTALS
PEAK FLOW	(cms)=	2.82	0.35 3.163 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08 6.00
RUNOFF VOLUME	(mm)=	54.37	20.28 45.85
TOTAL RAINFALL	(mm)=	55.37	55.37 55.37
RUNOFF COEFFICIENT	=	0.98	0.37 0.83

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | STANDHYD (0002) | ID= 1 DT= 5.0 min | Area (ha)= 2.80 Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.35	0.45
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		50.06	23.41
over (min)		5.00	10.00
Storage Coeff. (min)=		4.06 (ii)	6.15 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.24	0.15
			TOTALS
PEAK FLOW	(cms)=	0.33	0.03 0.353 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00 6.00
RUNOFF VOLUME	(mm)=	54.37	20.28 48.92
TOTAL RAINFALL	(mm)=	55.37	55.37 55.37
RUNOFF COEFFICIENT	=	0.98	0.37 0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | STANDHYD (0003) | ID= 1 DT= 5.0 min | Area (ha)= 7.50 Total Imp(%)= 71.00 Dir. Conn.(%)= 71.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.32	2.18
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		50.06	23.41
over (min)		5.00	10.00
Storage Coeff. (min)=		5.46 (ii)	8.29 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.20	0.13
			TOTALS
PEAK FLOW	(cms)=	0.74	0.12 0.860 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00 6.00
RUNOFF VOLUME	(mm)=	54.37	20.28 44.48
TOTAL RAINFALL	(mm)=	55.37	55.37 55.37
RUNOFF COEFFICIENT	=	0.98	0.37 0.80

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | STANDHYD (0004) | Area (ha)= 10.50

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	7.35	3.15
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	1.00	2.00
Length (m)=	264.58	20.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	50.06	23.41
over (min)	5.00	15.00
Storage Coeff. (min)=	6.04 (ii)	10.42 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.19	0.09
		TOTALS
PEAK FLOW (cms)=	1.02	0.16 1.171 (iii)
TIME TO PEAK (hrs)=	6.00	6.08 6.00
RUNOFF VOLUME (mm)=	54.37	20.28 44.14
TOTAL RAINFALL (mm)=	55.37	55.37 55.37
RUNOFF COEFFICIENT =	0.98	0.37 0.80

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0006)	Area (ha)= 0.60
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.48	0.12
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	1.00	2.00
Length (m)=	63.25	15.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	50.06	23.41
over (min)	5.00	10.00
Storage Coeff. (min)=	2.56 (ii)	5.53 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.29	0.16
		TOTALS
PEAK FLOW (cms)=	0.07	0.01 0.074 (iii)
TIME TO PEAK (hrs)=	6.00	6.00 6.00
RUNOFF VOLUME (mm)=	54.37	20.28 47.55
TOTAL RAINFALL (mm)=	55.37	55.37 55.37
RUNOFF COEFFICIENT =	0.98	0.37 0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0007)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0900	0.0120
	0.0400	0.0065	0.0900	0.0120
	0.0600	0.0080	0.1100	0.0140
	0.0700	0.0100	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.600	0.074	6.00	47.55
OUTFLOW: ID= 1 (0007)	0.600	0.055	6.00	47.49

PEAK FLOW REDUCTION [Qout/Qin](%)= 73.71
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0079

CALIB	
STANDHYD (0005)	Area (ha)= 9.10
ID= 1 DT= 5.0 min	Total Imp(%)= 59.00 Dir. Conn.(%)= 59.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	5.37	3.73
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	1.00	2.00
Length (m)=	246.31	15.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	50.06	23.41
over (min)	5.00	15.00
Storage Coeff. (min)=	5.79 (ii)	10.25 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.20	0.09
		TOTALS
PEAK FLOW (cms)=	0.74	0.19 0.927 (iii)
TIME TO PEAK (hrs)=	6.00	6.08 6.00
RUNOFF VOLUME (mm)=	54.37	20.28 40.39
TOTAL RAINFALL (mm)=	55.37	55.37 55.37
RUNOFF COEFFICIENT =	0.98	0.37 0.73

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0008)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.2500	0.0900
	0.6000	0.0500	1.2600	0.1100
	0.8300	0.0700	1.5800	0.1200
	1.0000	0.0800	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	9.100	0.927	6.00	40.39
OUTFLOW: ID= 1 (0008)	9.100	0.733	6.08	40.39

PEAK FLOW REDUCTION [Qout/Qin](%)= 79.02
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0637

****
** SIMULATION NUMBER: 3 **
****

READ STORM	Filename: C:\Users\BAbadi\AppData\Local\Temp\8eb77f18-ad3d-4eea-a164-749261012da9\b2a609cc
Ptotal= 63.75 mm	Comments: This 10-year, 12-hour Storm created from

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	1.53	3.25	2.81	6.25	11.48	9.25	2.30
0.50	1.28	3.50	2.30	6.50	11.48	9.50	2.04
0.75	0.77	3.75	2.81	6.75	5.10	9.75	1.53
1.00	1.53	4.00	2.30	7.00	5.10	10.00	2.04
1.25	1.28	4.25	4.85	7.25	3.57	10.25	1.53
1.50	1.53	4.50	4.34	7.50	3.57	10.50	0.77
1.75	0.77	4.75	4.34	7.75	4.34	10.75	1.53
2.00	1.53	5.00	4.34	8.00	3.57	11.00	1.28
2.25	2.81	5.25	7.91	8.25	2.81	11.25	1.53
2.50	2.04	5.50	7.91	8.50	2.30	11.50	0.77
2.75	3.06	5.75	57.12	8.75	2.81	11.75	1.28
3.00	2.04	6.00	57.63	9.00	2.04	12.00	1.53

CALIB	
STANDHYD (0001)	Area (ha)= 28.00
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	21.00	7.00
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	1.00	2.00
Length (m)=	432.05	10.00

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.53	3.083	2.81	6.083	11.48	9.08	2.30
0.167	1.53	3.167	2.81	6.167	11.48	9.17	2.30
0.250	1.53	3.250	2.81	6.250	11.48	9.25	2.30
0.333	1.28	3.333	2.30	6.333	11.48	9.33	2.04
0.417	1.28	3.417	2.30	6.417	11.48	9.42	2.04
0.500	1.28	3.500	2.30	6.500	11.48	9.50	2.04
0.583	0.77	3.583	2.81	6.583	5.10	9.58	1.53
0.667	0.77	3.667	2.81	6.667	5.10	9.67	1.53
0.750	0.77	3.750	2.81	6.750	5.10	9.75	1.53
0.833	1.53	3.833	2.30	6.833	5.10	9.83	2.04
0.917	1.53	3.917	2.30	6.917	5.10	9.92	2.04
1.000	1.53	4.000	2.30	7.000	5.10	10.00	2.04
1.083	1.28	4.083	4.85	7.083	3.57	10.08	1.53
1.167	1.28	4.167	4.85	7.167	3.57	10.17	1.53
1.250	1.28	4.250	4.85	7.250	3.57	10.25	1.53
1.333	1.53	4.333	4.34	7.333	3.57	10.33	0.77
1.417	1.53	4.417	4.34	7.417	3.57	10.42	0.77
1.500	1.53	4.500	4.34	7.500	3.57	10.50	0.77
1.583	0.77	4.583	4.34	7.583	4.34	10.58	1.53
1.667	0.77	4.667	4.34	7.667	4.34	10.67	1.53
1.750	0.77	4.750	4.34	7.750	4.34	10.75	1.53
1.833	1.53	4.833	4.34	7.833	3.57	10.83	1.28
1.917	1.53	4.917	4.34	7.917	3.57	10.92	1.28
2.000	1.53	5.000	4.34	8.000	3.57	11.00	1.28
2.083	2.81	5.083	7.91	8.083	2.81	11.08	1.53
2.167	2.81	5.167	7.91	8.167	2.81	11.17	1.53
2.250	2.81	5.250	7.91	8.250	2.81	11.25	1.53
2.333	2.04	5.333	7.91	8.333	2.30	11.33	0.77
2.417	2.04	5.417	7.91	8.417	2.30	11.42	0.77
2.500	2.04	5.500	7.91	8.500	2.30	11.50	0.77
2.583	3.06	5.583	57.12	8.583	2.81	11.58	1.28
2.667	3.06	5.667	57.12	8.667	2.81	11.67	1.28
2.750	3.06	5.750	57.12	8.750	2.81	11.75	1.28
2.833	2.04	5.833	57.63	8.833	2.04	11.83	1.53
2.917	2.04	5.917	57.63	8.917	2.04	11.92	1.53
3.000	2.04	6.000	57.63	9.000	2.04	12.00	1.53

Max.Eff.Inten.(mm/hr)=	57.63	29.42	
over (min)	10.00	15.00	
Storage Coeff. (min)=	7.66 (ii)	10.13 (ii)	
Unit Hyd. Tpeak (min)=	10.00	15.00	
Unit Hyd. peak (cms)=	0.13	0.10	
			TOTALS
PEAK FLOW (cms)=	3.27	0.45	3.709 (iii)
TIME TO PEAK (hrs)=	6.00	6.08	6.00
RUNOFF VOLUME (mm)=	62.75	25.58	53.46
TOTAL RAINFALL (mm)=	63.75	63.75	63.75
RUNOFF COEFFICIENT =	0.98	0.40	0.84

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0002) | Area (ha)= 2.80
ID= 1 DT= 5.0 min | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.35	0.45
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	57.63	29.42	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.84 (ii)	5.81 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.25	0.15	
			TOTALS
PEAK FLOW (cms)=	0.38	0.03	0.410 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	62.75	25.58	56.81
TOTAL RAINFALL (mm)=	63.75	63.75	63.75
RUNOFF COEFFICIENT =	0.98	0.40	0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0003) | Area (ha)= 7.50
ID= 1 DT= 5.0 min | Total Imp(%)= 71.00 Dir. Conn.(%)= 71.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.32	2.18
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	57.63	29.42	
over (min)	5.00	10.00	
Storage Coeff. (min)=	5.16 (ii)	7.84 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.21	0.13	
			TOTALS
PEAK FLOW (cms)=	0.85	0.16	1.007 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	62.75	25.58	51.97
TOTAL RAINFALL (mm)=	63.75	63.75	63.75
RUNOFF COEFFICIENT =	0.98	0.40	0.82

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0004) | Area (ha)= 10.50
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.35	3.15
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	264.58	20.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	57.63	29.42	
over (min)	5.00	10.00	
Storage Coeff. (min)=	5.71 (ii)	9.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.20	0.11	
			TOTALS
PEAK FLOW (cms)=	1.17	0.22	1.387 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	62.75	25.58	51.60
TOTAL RAINFALL (mm)=	63.75	63.75	63.75
RUNOFF COEFFICIENT =	0.98	0.40	0.81

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0006) | Area (ha)= 0.60
ID= 1 DT= 5.0 min | Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.48	0.12
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	63.25	15.00

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      57.63        29.42
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.42 (ii)    5.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.16
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.01          0.086 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      62.75        25.58          55.32
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.40           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |  0.0900      0.0120
                         0.0400     0.0065   |  0.0900      0.0120
                         0.0600     0.0080   |  0.1100      0.0140
                         0.0700     0.0100   |  0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0006)     0.600     0.086      6.00       55.32
     OUTFLOW: ID= 1 (0007)     0.600     0.063      6.00       55.26

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 73.24
                    TIME SHIFT OF PEAK FLOW         (min)=  0.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0089

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-------------------
| CALIB             |
| STANDHYD  (0005)  |   Area    (ha)=   9.10
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  59.00   Dir. Conn.(%)=  59.00
-------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.37         3.73
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     246.31        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      57.63        29.42
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       5.47 (ii)    9.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.20         0.11
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.86         0.26          1.114 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      62.75        25.58          47.51
     TOTAL RAINFALL   (mm)=      63.75        63.75          63.75
     RUNOFF COEFFICIENT   =       0.98         0.40           0.75


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (0008) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |  1.2500      0.0900
                         0.6000     0.0500   |  1.2600      0.1100
                         0.8300     0.0700   |  1.5800      0.1200
                         1.0000     0.0800   |  0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0005)     9.100     1.114      6.00       47.51
     OUTFLOW: ID= 1 (0008)     9.100     0.892      6.08       47.51

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 80.09
                    TIME SHIFT OF PEAK FLOW         (min)=  5.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0767

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\BAbadi\AppD
|                  |              ata\Local\Temp\
|                  |              8eb77f18-ad3d-4eea-a164-749261012da9\8afea872
| Ptotal= 74.42 mm |    Comments: This 25-year, 12-hour Storm created from
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.79 |  3.25    3.27 |  6.25   13.40 |  9.25    2.68
                0.50    1.49 |  3.50    2.68 |  6.50   13.40 |  9.50    2.38
                0.75    0.89 |  3.75    3.27 |  6.75    5.95 |  9.75    1.79
                1.00    1.79 |  4.00    2.68 |  7.00    5.95 | 10.00    2.38
                1.25    1.49 |  4.25    5.66 |  7.25    4.17 | 10.25    1.79
                1.50    1.79 |  4.50    5.06 |  7.50    4.17 | 10.50    0.89
                1.75    0.89 |  4.75    5.06 |  7.75    5.06 | 10.75    1.79
                2.00    1.79 |  5.00    5.06 |  8.00    4.17 | 11.00    1.49
                2.25    3.27 |  5.25    9.23 |  8.25    3.27 | 11.25    1.79
                2.50    2.38 |  5.50    9.23 |  8.50    2.68 | 11.50    0.89
                2.75    3.57 |  5.75   66.68 |  8.75    3.27 | 11.75    1.49
                3.00    2.38 |  6.00   67.28 |  9.00    2.38 | 12.00    1.79

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| CALIB             |
| STANDHYD  (0001)  |   Area    (ha)=  28.00
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
-------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      21.00         7.00
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     432.05        10.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.79 | 3.083    3.27 | 6.083   13.40 |  9.08    2.68
               0.167    1.79 | 3.167    3.27 | 6.167   13.40 |  9.17    2.68
               0.250    1.79 | 3.250    3.27 | 6.250   13.40 |  9.25    2.68
               0.333    1.49 | 3.333    2.68 | 6.333   13.40 |  9.33    2.38
               0.417    1.49 | 3.417    2.68 | 6.417   13.40 |  9.42    2.38
               0.500    1.49 | 3.500    2.68 | 6.500   13.40 |  9.50    2.38
               0.583    0.89 | 3.583    3.27 | 6.583    5.95 |  9.58    1.79
               0.667    0.89 | 3.667    3.27 | 6.667    5.95 |  9.67    1.79
               0.750    0.89 | 3.750    3.27 | 6.750    5.95 |  9.75    1.79
               0.833    1.79 | 3.833    2.68 | 6.833    5.95 |  9.83    2.38
               0.917    1.79 | 3.917    2.68 | 6.917    5.95 |  9.92    2.38
               1.000    1.79 | 4.000    2.68 | 7.000    5.95 | 10.00    2.38
               1.083    1.49 | 4.083    5.66 | 7.083    4.17 | 10.08    1.79
               1.167    1.49 | 4.167    5.66 | 7.167    4.17 | 10.17    1.79
               1.250    1.49 | 4.250    5.66 | 7.250    4.17 | 10.25    1.79
               1.333    1.79 | 4.333    5.06 | 7.333    4.17 | 10.33    0.89
               1.417    1.79 | 4.417    5.06 | 7.417    4.17 | 10.42    0.89
               1.500    1.79 | 4.500    5.06 | 7.500    4.17 | 10.50    0.89
               1.583    0.89 | 4.583    5.06 | 7.583    5.06 | 10.58    1.79
               1.667    0.89 | 4.667    5.06 | 7.667    5.06 | 10.67    1.79
               1.750    0.89 | 4.750    5.06 | 7.750    5.06 | 10.75    1.79
               1.833    1.79 | 4.833    5.06 | 7.833    4.17 | 10.83    1.49
               1.917    1.79 | 4.917    5.06 | 7.917    4.17 | 10.92    1.49
               2.000    1.79 | 5.000    5.06 | 8.000    4.17 | 11.00    1.49
               2.083    3.27 | 5.083    9.23 | 8.083    3.27 | 11.08    1.79
               2.167    3.27 | 5.167    9.23 | 8.167    3.27 | 11.17    1.79
               2.250    3.27 | 5.250    9.23 | 8.250    3.27 | 11.25    1.79
               2.333    2.38 | 5.333    9.23 | 8.333    2.68 | 11.33    0.89
               2.417    2.38 | 5.417    9.23 | 8.417    2.68 | 11.42    0.89
               2.500    2.38 | 5.500    9.23 | 8.500    2.68 | 11.50    0.89
               2.583    3.57 | 5.583   66.68 | 8.583    3.27 | 11.58    1.49
```

2.667	3.57	5.667	66.68	8.667	3.27	11.67	1.49
2.750	3.57	5.750	66.68	8.750	3.27	11.75	1.49
2.833	2.38	5.833	67.28	8.833	2.38	11.83	1.79
2.917	2.38	5.917	67.28	8.917	2.38	11.92	1.79
3.000	2.38	6.000	67.28	9.000	2.38	12.00	1.79

			TOTALS
Max.Eff.Inten.(mm/hr)=	67.28	37.52	
over (min)	5.00	10.00	
Storage Coeff. (min)=	7.20 (ii)	9.52 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.17	0.12	
PEAK FLOW (cms)=	3.87	0.62	4.492 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	73.42	32.79	63.26
TOTAL RAINFALL (mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT =	0.99	0.44	0.85

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0002) | Area (ha)= 2.80
ID= 1 DT= 5.0 min | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		2.35	0.45
Dep. Storage (mm)=		1.00	1.50
Average Slope (%)=		1.00	2.00
Length (m)=		136.63	10.00
Mannings n =		0.013	0.250

			TOTALS
Max.Eff.Inten.(mm/hr)=	67.28	37.52	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.61 (ii)	5.46 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.25	0.16	
PEAK FLOW (cms)=	0.44	0.04	0.483 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	73.42	32.79	66.92
TOTAL RAINFALL (mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT =	0.99	0.44	0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0003) | Area (ha)= 7.50
ID= 1 DT= 5.0 min | Total Imp(%)= 71.00 Dir. Conn.(%)= 71.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		5.32	2.18
Dep. Storage (mm)=		1.00	1.50
Average Slope (%)=		1.00	2.00
Length (m)=		223.61	10.00
Mannings n =		0.013	0.250

			TOTALS
Max.Eff.Inten.(mm/hr)=	67.28	37.52	
over (min)	5.00	10.00	
Storage Coeff. (min)=	4.85 (ii)	7.37 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.22	0.13	
PEAK FLOW (cms)=	0.99	0.20	1.197 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	73.42	32.79	61.64
TOTAL RAINFALL (mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT =	0.99	0.44	0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0004) | Area (ha)= 10.50
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		7.35	3.15
Dep. Storage (mm)=		1.00	1.50
Average Slope (%)=		1.00	2.00
Length (m)=		264.58	20.00
Mannings n =		0.013	0.250

			TOTALS
Max.Eff.Inten.(mm/hr)=	67.28	37.52	
over (min)	5.00	10.00	
Storage Coeff. (min)=	5.37 (ii)	9.25 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.21	0.12	
PEAK FLOW (cms)=	1.37	0.28	1.651 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	73.42	32.79	61.23
TOTAL RAINFALL (mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT =	0.99	0.44	0.82

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0006) | Area (ha)= 0.60
ID= 1 DT= 5.0 min | Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.48	0.12
Dep. Storage (mm)=		1.00	1.50
Average Slope (%)=		1.00	2.00
Length (m)=		63.25	15.00
Mannings n =		0.013	0.250

			TOTALS
Max.Eff.Inten.(mm/hr)=	67.28	37.52	
over (min)	5.00	5.00	
Storage Coeff. (min)=	2.27 (ii)	4.91 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.30	0.22	
PEAK FLOW (cms)=	0.09	0.01	0.102 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	73.42	32.79	65.29
TOTAL RAINFALL (mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT =	0.99	0.44	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0007)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0900	0.0120
0.0400	0.0065	0.0900	0.0120
0.0600	0.0080	0.1100	0.0140
0.0700	0.0100	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.600	0.102	6.00	65.29
OUTFLOW: ID= 1 (0007)	0.600	0.072	6.00	65.23

PEAK FLOW REDUCTION [Qout/Qin](%)= 70.32
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0106

CALIB	STANDHYD (0005)	ID= 1 DT= 5.0 min	Area (ha)= 9.10	Total Imp(%)= 59.00	Dir. Conn.(%)= 59.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.37	3.73
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	246.31	15.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		67.28	37.52
over (min)		5.00	10.00
Storage Coeff. (min)=		5.14 (ii)	9.11 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.21	0.12

		TOTALS
PEAK FLOW	(cms)=	1.00 (iii)	0.34	1.336 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	73.42	32.79	56.76
TOTAL RAINFALL	(mm)=	74.42	74.42	74.42
RUNOFF COEFFICIENT	=	0.99	0.44	0.76

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR (0008) | IN= 2---> OUT= 1 | DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.2500	0.0900
0.6000	0.0500	1.2600	0.1100
0.8300	0.0700	1.5800	0.1200
1.0000	0.0800	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	9.100	1.336	6.00	56.76
OUTFLOW: ID= 1 (0008)	9.100	1.150	6.00	56.76

PEAK FLOW REDUCTION [Qout/Qin](%)= 86.10
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0888

****
** SIMULATION NUMBER: 5 **
****

READ STORM	Ptotal= 80.61 mm

Filename: C:\Users\BAbadi\AppData\Local\Temp\8eb77f18-ad3d-4eea-a164-749261012da9\2e86f72d
Comments: 50-YearSCSTypeII12HourStorm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.81	3.25	3.23	6.25	43.63	9.25	3.23
0.50	1.62	3.50	3.23	6.50	14.54	9.50	3.23
0.75	1.62	3.75	3.23	6.75	10.50	9.75	2.42
1.00	1.62	4.00	3.23	7.00	6.46	10.00	1.62
1.25	1.62	4.25	4.04	7.25	5.66	10.25	1.62
1.50	1.62	4.50	4.85	7.50	4.85	10.50	1.62
1.75	1.62	4.75	5.66	7.75	4.85	10.75	1.62
2.00	1.62	5.00	6.46	8.00	4.85	11.00	1.62
2.25	2.42	5.25	8.08	8.25	4.04	11.25	1.62
2.50	3.23	5.50	9.70	8.50	3.23	11.50	1.62
2.75	3.23	5.75	41.21	8.75	3.23	11.75	1.62
3.00	3.23	6.00	72.72	9.00	3.23	12.00	1.62

CALIB	STANDHYD (0001)	ID= 1 DT= 5.0 min	Area (ha)= 28.00	Total Imp(%)= 75.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	21.00	7.00
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.81	3.083	3.23	6.083	43.63	9.08	3.23
0.167	0.81	3.167	3.23	6.167	43.63	9.17	3.23
0.250	0.81	3.250	3.23	6.250	43.63	9.25	3.23
0.333	1.62	3.333	3.23	6.333	14.54	9.33	3.23
0.417	1.62	3.417	3.23	6.417	14.54	9.42	3.23
0.500	1.62	3.500	3.23	6.500	14.54	9.50	3.23
0.583	1.62	3.583	3.23	6.583	10.50	9.58	2.42
0.667	1.62	3.667	3.23	6.667	10.50	9.67	2.42
0.750	1.62	3.750	3.23	6.750	10.50	9.75	2.42
0.833	1.62	3.833	3.23	6.833	6.46	9.83	1.62
0.917	1.62	3.917	3.23	6.917	6.46	9.92	1.62
1.000	1.62	4.000	3.23	7.000	6.46	10.00	1.62
1.083	1.62	4.083	4.04	7.083	5.66	10.08	1.62
1.167	1.62	4.167	4.04	7.167	5.66	10.17	1.62
1.250	1.62	4.250	4.04	7.250	5.66	10.25	1.62
1.333	1.62	4.333	4.85	7.333	4.85	10.33	1.62
1.417	1.62	4.417	4.85	7.417	4.85	10.42	1.62
1.500	1.62	4.500	4.85	7.500	4.85	10.50	1.62
1.583	1.62	4.583	5.66	7.583	4.85	10.58	1.62
1.667	1.62	4.667	5.66	7.667	4.85	10.67	1.62
1.750	1.62	4.750	5.66	7.750	4.85	10.75	1.62
1.833	1.62	4.833	6.46	7.833	4.85	10.83	1.62
1.917	1.62	4.917	6.46	7.917	4.85	10.92	1.62
2.000	1.62	5.000	6.46	8.000	4.85	11.00	1.62
2.083	2.42	5.083	8.08	8.083	4.04	11.08	1.62
2.167	2.42	5.167	8.08	8.167	4.04	11.17	1.62
2.250	2.42	5.250	8.08	8.250	4.04	11.25	1.62
2.333	3.23	5.333	9.70	8.333	3.23	11.33	1.62
2.417	3.23	5.417	9.70	8.417	3.23	11.42	1.62
2.500	3.23	5.500	9.70	8.500	3.23	11.50	1.62
2.583	3.23	5.583	41.21	8.583	3.23	11.58	1.62
2.667	3.23	5.667	41.21	8.667	3.23	11.67	1.62
2.750	3.23	5.750	41.21	8.750	3.23	11.75	1.62
2.833	3.23	5.833	72.72	8.833	3.23	11.83	1.62
2.917	3.23	5.917	72.72	8.917	3.23	11.92	1.62
3.000	3.23	6.000	72.72	9.000	3.23	12.00	1.62

Max.Eff.Inten.(mm/hr)=		72.72	37.92
over (min)		5.00	10.00
Storage Coeff. (min)=		6.98 (ii)	9.23 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.17	0.12

		TOTALS
PEAK FLOW	(cms)=	4.00	0.61	4.577 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	79.61	37.17	69.00
TOTAL RAINFALL	(mm)=	80.61	80.61	80.61
RUNOFF COEFFICIENT	=	0.99	0.46	0.86

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	STANDHYD (0002)	ID= 1 DT= 5.0 min	Area (ha)= 2.80	Total Imp(%)= 84.00	Dir. Conn.(%)= 84.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.35	0.45
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      72.72        37.92
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      3.50 (ii)    5.30 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.26         0.16
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.47         0.04         0.514 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=     79.61        37.17        72.82
     TOTAL RAINFALL   (mm)=     80.61        80.61        80.61
     RUNOFF COEFFICIENT   =      0.99         0.46         0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD  (0003) |   Area    (ha)=   7.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  71.00   Dir. Conn.(%)=  71.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      5.32         2.18
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    223.61        10.00
     Mannings n             =   0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.72        37.92
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      4.70 (ii)    7.14 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.22         0.14
                                                    *TOTALS*
     PEAK FLOW       (cms)=      1.06         0.20         1.248 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=     79.61        37.17        67.30
     TOTAL RAINFALL   (mm)=     80.61        80.61        80.61
     RUNOFF COEFFICIENT   =      0.99         0.46         0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD  (0004) |   Area    (ha)=  10.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      7.35         3.15
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    264.58        20.00
     Mannings n             =   0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.72        37.92
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      5.20 (ii)    8.97 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.21         0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=      1.45         0.28         1.708 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=     79.61        37.17        66.88
     TOTAL RAINFALL   (mm)=     80.61        80.61        80.61
     RUNOFF COEFFICIENT   =      0.99         0.46         0.83


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| STANDHYD  (0006) |   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.48         0.12
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     63.25        15.00
     Mannings n             =   0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.72        37.92
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      2.20 (ii)    4.76 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=      0.30         0.22
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.10         0.01         0.109 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.00         6.00
     RUNOFF VOLUME    (mm)=     79.61        37.17        71.12
     TOTAL RAINFALL   (mm)=     80.61        80.61        80.61
     RUNOFF COEFFICIENT   =      0.99         0.46         0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0900     0.0120
                         0.0400     0.0065   |   0.0900     0.0120
                         0.0600     0.0080   |   0.1100     0.0140
                         0.0700     0.0100   |   0.0000     0.0000

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0006)     0.600     0.109      6.00      71.12
     OUTFLOW: ID= 1 (0007)     0.600     0.069      6.17      71.06

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 63.44
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0099

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-------------------
| CALIB           |
| STANDHYD  (0005) |   Area    (ha)=   9.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=  59.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      5.37         3.73
     Dep. Storage     (mm)=      1.00         1.50
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    246.31        15.00
     Mannings n             =   0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.72        37.92
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      4.98 (ii)    8.83 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.22         0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=      1.06         0.33         1.371 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.08         6.00
     RUNOFF VOLUME    (mm)=     79.61        37.17        62.21
     TOTAL RAINFALL   (mm)=     80.61        80.61        80.61
     RUNOFF COEFFICIENT   =      0.99         0.46         0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0008) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |
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OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.2500	0.0900
0.6000	0.0500	1.2600	0.1100
0.8300	0.0700	1.5800	0.1200
1.0000	0.0800	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	9.100	1.371	6.00	62.21
OUTFLOW: ID= 1 (0008)	9.100	1.094	6.08	62.21

PEAK FLOW REDUCTION [Qout/Qin](%)= 79.82
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0843

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  ***************************
  ** SIMULATION NUMBER:   6 **
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|    READ STORM     |    Filename: C:\Users\BAbadi\AppD
|                   |              ata\Local\Temp\
|                   |              8eb77f18-ad3d-4eea-a164-749261012da9\f80c0367
| Ptotal= 89.92 mm  |    Comments: This 100-year, 12-hour Storm created fro
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```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	2.16	3.25	3.96	6.25	16.18	9.25	3.24
0.50	1.80	3.50	3.24	6.50	16.18	9.50	2.88
0.75	1.08	3.75	3.96	6.75	7.19	9.75	2.16
1.00	2.16	4.00	3.24	7.00	7.19	10.00	2.88
1.25	1.80	4.25	6.83	7.25	5.04	10.25	2.16
1.50	2.16	4.50	6.11	7.50	5.04	10.50	1.08
1.75	1.08	4.75	6.11	7.75	6.11	10.75	2.16
2.00	2.16	5.00	6.11	8.00	5.04	11.00	1.80
2.25	3.96	5.25	11.15	8.25	3.96	11.25	2.16
2.50	2.88	5.50	11.15	8.50	3.24	11.50	1.08
2.75	4.32	5.75	80.56	8.75	3.96	11.75	1.80
3.00	2.88	6.00	81.28	9.00	2.88	12.00	2.16

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| CALIB             |
| STANDHYD  (0001)  |   Area    (ha)=  28.00
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
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		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	21.00	7.00
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	432.05	10.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.16	3.083	3.96	6.083	16.18	9.08	3.24
0.167	2.16	3.167	3.96	6.167	16.18	9.17	3.24
0.250	2.16	3.250	3.96	6.250	16.18	9.25	3.24
0.333	1.80	3.333	3.24	6.333	16.18	9.33	2.88
0.417	1.80	3.417	3.24	6.417	16.18	9.42	2.88
0.500	1.80	3.500	3.24	6.500	16.18	9.50	2.88
0.583	1.08	3.583	3.96	6.583	7.19	9.58	2.16
0.667	1.08	3.667	3.96	6.667	7.19	9.67	2.16
0.750	1.08	3.750	3.96	6.750	7.19	9.75	2.16
0.833	2.16	3.833	3.24	6.833	7.19	9.83	2.88
0.917	2.16	3.917	3.24	6.917	7.19	9.92	2.88
1.000	2.16	4.000	3.24	7.000	7.19	10.00	2.88
1.083	1.80	4.083	6.83	7.083	5.04	10.08	2.16
1.167	1.80	4.167	6.83	7.167	5.04	10.17	2.16
1.250	1.80	4.250	6.83	7.250	5.04	10.25	2.16
1.333	2.16	4.333	6.11	7.333	5.04	10.33	1.08
1.417	2.16	4.417	6.11	7.417	5.04	10.42	1.08
1.500	2.16	4.500	6.11	7.500	5.04	10.50	1.08
1.583	1.08	4.583	6.11	7.583	6.11	10.58	2.16
1.667	1.08	4.667	6.11	7.667	6.11	10.67	2.16
1.750	1.08	4.750	6.11	7.750	6.11	10.75	2.16
1.833	2.16	4.833	6.11	7.833	5.04	10.83	1.80
1.917	2.16	4.917	6.11	7.917	5.04	10.92	1.80
2.000	2.16	5.000	6.11	8.000	5.04	11.00	1.80
2.083	3.96	5.083	11.15	8.083	3.96	11.08	2.16
2.167	3.96	5.167	11.15	8.167	3.96	11.17	2.16
2.250	3.96	5.250	11.15	8.250	3.96	11.25	2.16
2.333	2.88	5.333	11.15	8.333	3.24	11.33	1.08
2.417	2.88	5.417	11.15	8.417	3.24	11.42	1.08
2.500	2.88	5.500	11.15	8.500	3.24	11.50	1.08
2.583	4.32	5.583	80.56	8.583	3.96	11.58	1.80
2.667	4.32	5.667	80.56	8.667	3.96	11.67	1.80
2.750	4.32	5.750	80.56	8.750	3.96	11.75	1.80
2.833	2.88	5.833	81.28	8.833	2.88	11.83	2.16
2.917	2.88	5.917	81.28	8.917	2.88	11.92	2.16
3.000	2.88	6.000	81.28	9.000	2.88	12.00	2.16

Max.Eff.Inten.(mm/hr)=	81.28	49.99	
over (min)	5.00	10.00	
Storage Coeff. (min)=	6.68 (ii)	8.83 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.18	0.12	
			TOTALS
PEAK FLOW (cms)=	4.69	0.85	5.544 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	88.92	44.00	77.69
TOTAL RAINFALL (mm)=	89.92	89.92	89.92
RUNOFF COEFFICIENT =	0.99	0.49	0.86

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB             |
| STANDHYD  (0002)  |   Area    (ha)=   2.80
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
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		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.35	0.45
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	136.63	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	81.28	49.99	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.35 (ii)	5.07 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.26	0.16	
			TOTALS
PEAK FLOW (cms)=	0.53	0.06	0.590 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	88.92	44.00	81.73
TOTAL RAINFALL (mm)=	89.92	89.92	89.92
RUNOFF COEFFICIENT =	0.99	0.49	0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB             |
| STANDHYD  (0003)  |   Area    (ha)=   7.50
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  71.00   Dir. Conn.(%)=  71.00
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		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.32	2.18
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	223.61	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	81.28	49.99
over (min)	5.00	10.00
Storage Coeff. (min)=	4.50 (ii)	6.83 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00

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     Unit Hyd. peak  (cms)=       0.23         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.20         0.28          1.478 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      88.92        44.00         75.89
     TOTAL RAINFALL   (mm)=      89.92        89.92         89.92
     RUNOFF COEFFICIENT   =       0.99         0.49          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB           |
| STANDHYD  (0004) |   Area    (ha)=  10.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.35         3.15
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     264.58        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.28        49.99
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       4.98 (ii)    8.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.22         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.66         0.39          2.041 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      88.92        44.00         75.44
     TOTAL RAINFALL   (mm)=      89.92        89.92         89.92
     RUNOFF COEFFICIENT   =       0.99         0.49          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD  (0006) |   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.12
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      63.25        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.28        49.99
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       2.11 (ii)    4.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.31         0.23
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.02          0.125 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      88.92        44.00         79.93
     TOTAL RAINFALL   (mm)=      89.92        89.92         89.92
     RUNOFF COEFFICIENT   =       0.99         0.49          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0900      0.0120
                         0.0400     0.0065   |   0.0900      0.0120
                         0.0600     0.0080   |   0.1100      0.0140
                         0.0700     0.0100   |   0.0000      0.0000

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0006)    0.600     0.125      6.00      79.93
     OUTFLOW: ID= 1 (0007)    0.600     0.093      6.00      79.86

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 74.34
                TIME SHIFT OF PEAK FLOW         (min)=  0.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0128

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD  (0005) |   Area    (ha)=   9.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=  59.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.37         3.73
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     246.31        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.28        49.99
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       4.77 (ii)    8.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.22         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.21         0.46          1.668 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      88.92        44.00         70.50
     TOTAL RAINFALL   (mm)=      89.92        89.92         89.92
     RUNOFF COEFFICIENT   =       0.99         0.49          0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (0008) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   1.2500      0.0900
                         0.6000     0.0500   |   1.2600      0.1100
                         0.8300     0.0700   |   1.5800      0.1200
                         1.0000     0.0800   |   0.0000      0.0000

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0005)    9.100     1.668      6.00      70.50
     OUTFLOW: ID= 1 (0008)    9.100     1.260      6.08      70.50

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 75.50
                TIME SHIFT OF PEAK FLOW         (min)=  5.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.1135

--------------------------------------------------------------------------------

 FINISH
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FUNCTIONAL STORMWATER MANAGEMENT PLANS

Woodbridge Core Secondary Plan Area

Table of Contents

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LIST OF APPENDICES

1.0 Background

1.1. Study Area

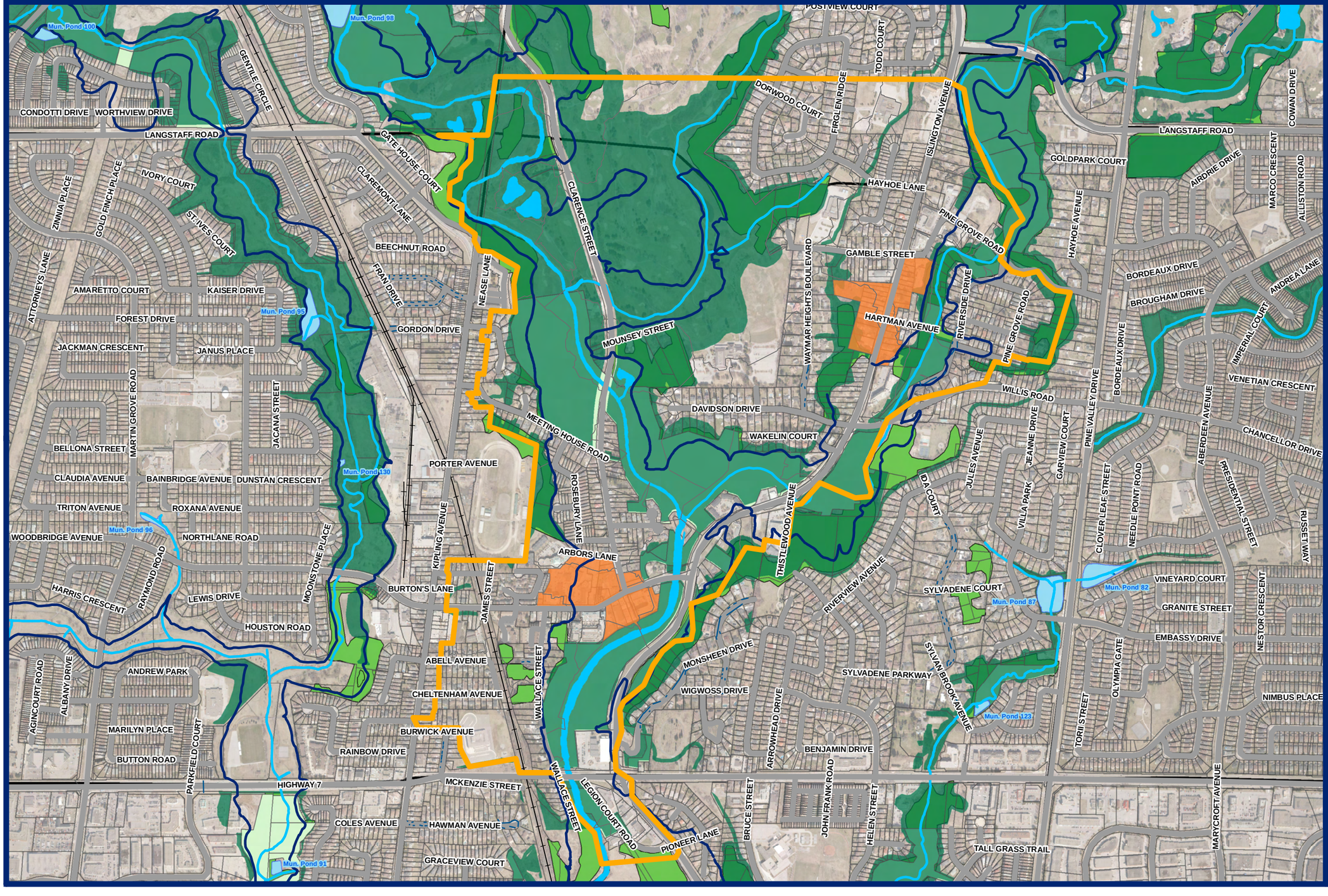
The Woodbridge Core Secondary Plan Area covers approximately 271 ha and is located in the community of Woodbridge in the City of Vaughan (the City). The Plan Area is located primarily in Block 44, and is roughly bound by the East Humber River valley to the east, Highway 7 to the south, Kipling Avenue to the west, and the Board of Trade Golf Course to the north. Refer to **Figure 1-1** for a location plan of the Plan Area.

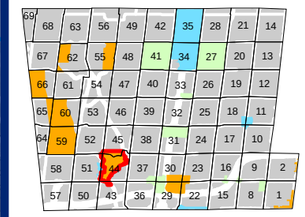
1.2. Existing Reports

In preparing this section, the following reports are referenced:

- Humber River Watershed Hydrology Update, Aquafor Beech Ltd., November 2002;
- Stormwater Management Planning and Design Manual (SWMP), Ministry of the Environment (MOE), 2003;
- Design Criteria and Standard Drawings (CVDC), City of Vaughan Engineering Department, March 2004;
- City-Wide Drainage and Stormwater Management Criteria Study, Clarifica, August 2009;
- Woodbridge Centre Secondary Plan, Office for Urbanism, September 2010;
- Official Plan, City of Vaughan, September 2010; and,
- Stormwater Management Criteria, Toronto and Region Conservation Authority (TRCA), August 2012.

Location Plan | Woodbridge Core





Legend

- Secondary Plan Area Boundary
- TRCA Existing Floodlines
- Watercourse
- Areas Changing in Imperviousness
- Existing SWM Pond
- Natural Areas
- TRCA Property
- Forested Area

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Location Plan

SCALE 1:12,000
0 30 60 120 180 240 Meters

FIGURE **1-1**

2.0 Existing Conditions

2.1. Existing Land Use

The Woodbridge community has been built within the Humber River Valley, characterized by rolling topography covered by large matured trees. Existing developments consists primarily of low-rise detached residential units. Pockets of mid-rise residential units and commercial properties are present along Islington Avenue. A commercial downtown core is present along Woodbridge Avenue.

2.2. Existing Storm Drainage

The current drainage pattern of Woodbridge has runoff conveyed through storm sewers and road right of ways to the nearest watercourse. The East and Main branches of the Humber River run through the Plan Area and converge just upstream of Highway 7. Storm sewers in this area were constructed mainly through the 1970s and 1980s, and there are currently no existing stormwater management (SWM) ponds within Woodbridge Core. Due to the age of the developments, it is likely that most properties within the Plan Area have no SWM practices in place to provide quality, quantity or erosion control to the Humber River. **Figure 2-1** illustrates existing storm sewer network in place, as well as the location of the minor and major system outlets to the Humber River. All minor and major system outlets from the Woodbridge community discharge untreated and uncontrolled runoff.

There are several external drainage areas draining into the Woodbridge Core Secondary Plan Area. Runoff from these external drainage areas is largely conveyed through road allowances, discharging a short distance later to the Humber River without affecting any of the Woodbridge catchment areas.

2.3. Existing Flooding Risks

As Woodbridge is an older development community within the City, a large number of properties have been built within the flood plain. These properties have been given a Special Policy Areas designation in the Official Plan (OP) due to flooding risks associated with development within the flood plain. Specific policies pertaining to development in these areas are further outlined in **Section 5.7**. Refer to **Figure 2-2** for the location of these Special Policy Areas.

In addition to the Special Policy Areas, several other areas have been identified as drainage areas of concern by the City-Wide Drainage and Stormwater Management Criteria Study (Clarifica, 2009). These sites were identified as areas of concern as they experienced flooding during an exceptionally large storm event on August 19, 2005. These six (6) areas include:

1) 91 Davidson Drive, located south of the golf course. Flooding likely due to the property being at a low point on Davidson Drive and having a reverse slope driveway;
2) Memorial Hill Park, located south of Woodbridge Avenue east of Canadian Pacific Railway. Flooding likely due to high runoff from the steep Humber Valley immediately west of the Park, as well as the lack of storm sewers in the area;
3) 33 James Street, located north of Woodbridge Avenue east of Canadian Pacific Railway. Flooding likely due to the properties location on a major system flow path, which drains runoff from both sides of the railway. The property also has a reverse slope driveway;

4) 38 William Street, also located north of Woodbridge Avenue east of Canadian Pacific Railway (CPR). Flooding likely due to the property being located on a major system flow path draining runoff from the east side of the railway, including the Woodbridge Fairgrounds immediately north of the property;

5) Properties west of Fairground Lane and east of James Street. The same major system flow path flooding 33 James Street flows through this area before being conveyed by Fairground Lane and Woodbridge Avenue; and,

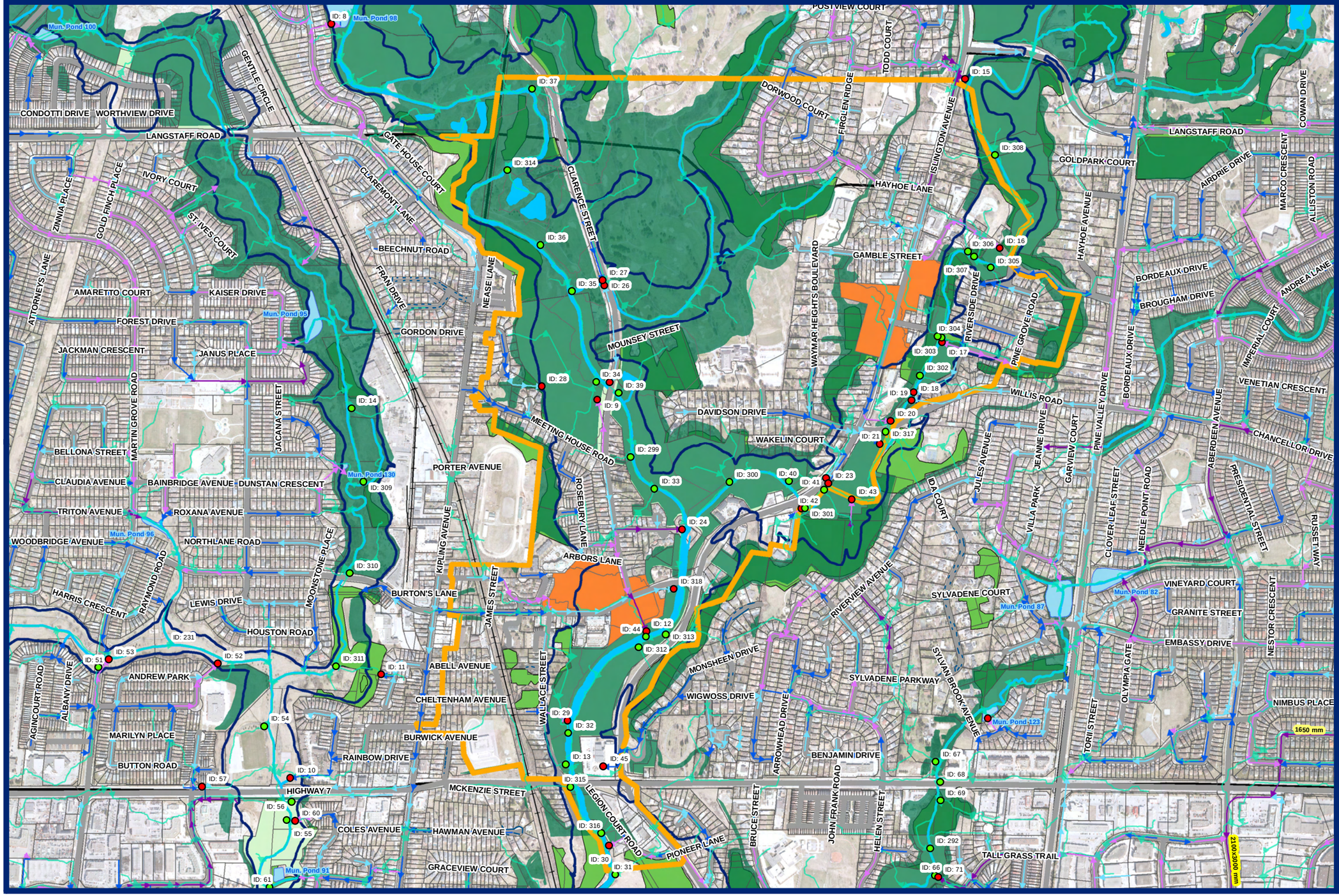
6) Kipling Avenue approximately between Abell Avenue and 8060 Kipling Avenue, James Street, and William Street. Flooding in these areas was reported along with 33 James Street. Insufficient sewer capacity is likely the cause of flooding.

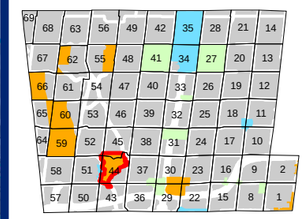
Refer to **Figure 2-2** for the location of these areas.

2.4. Proposed Conditions

The proposed intensification within the Woodbridge Core Secondary Plan Area will occur along two (2) corridors: 1) Woodbridge Avenue between Kipling Avenue and Islington Avenue; and, 2) Islington Avenue between Gamble Street and Davidson Drive. The Secondary Plan calls for changes in land use to achieve an increase of 600 dwelling units along Woodbridge Avenue, and an increase of 276 residential units along Islington Avenue.

Outlet Locations | Woodbridge Core





Legend

- Secondary Plan Area Boundary
- TRCA Existing Floodlines
- Watercourse
- Areas Changing in Imperviousness
- Existing SWM Pond
- Natural Areas
- TRCA Property
- Forested Area
- Conditioned Overland Flow Route

System Outlets

- Overland Flow
- Piped STM Outlet

Storm Sewers

Diameter (mm)

- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

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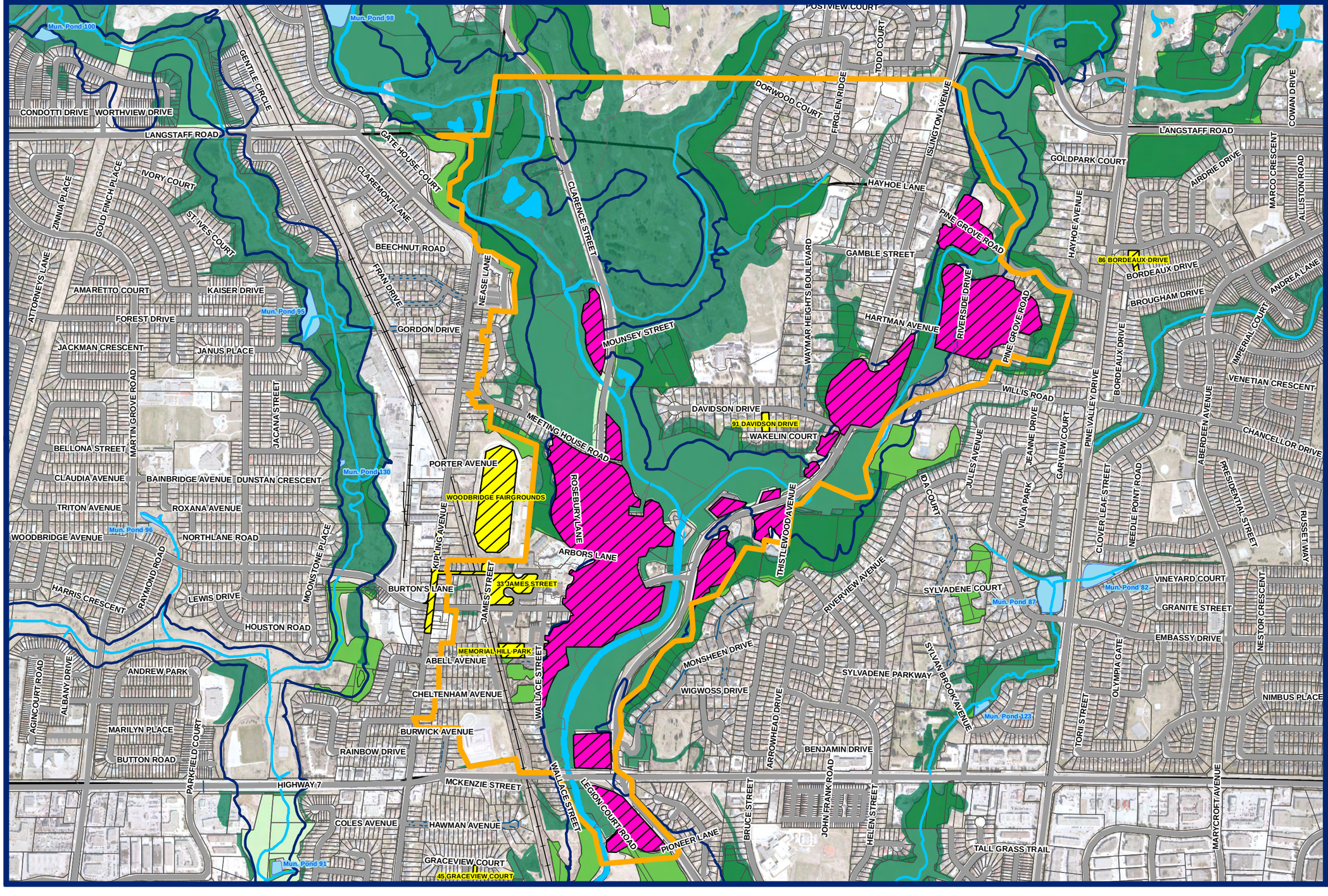
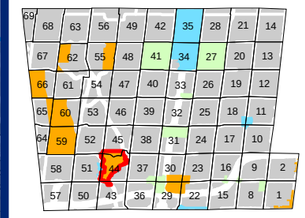
Outlet Locations

SCALE 1:12,000
0 30 60 120 180 240 Meters

FIGURE **2-1**

Flooding Risks | Woodbridge Core





Legend

- Secondary Plan Area Boundary
- TRCA Existing Floodlines
- Watercourse
- Existing SWM Pond
- Natural Areas
- TRCA Property
- Forested Area

Flooding Risks

- Reported Flooding - August 19, 2005
- Special Policy Area

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Flooding Risks

SCALE 1:12,000
0 30 60 120 180 240 Meters

FIGURE **2-2**

3.0 Stormwater Management Criteria

The change of land use as a result of the proposed development and redevelopment within the Woodbridge Core Secondary Plan Area has the potential to increase volume and runoff rate from the site. The change in land use could also decrease water quality and increase downstream erosion potential. As such, a stormwater management plan is required to manage the increased runoff and mitigate water quality and erosion issues.

The proposed development and redevelopment for the Woodbridge Core Secondary Plan Area is focussed along Islington Avenue and Woodbridge Avenue. Stormwater from the Islington Avenue Corridor (Area 4414a and Area 4414b) flows south and east to the East Humber River, while stormwater from the Woodbridge Avenue Corridor (Area 4407a and Area 4407b) flows south and east to the Humber River, just south of where the Main and East Humber Rivers converge. As the Humber River is a TRCA regulated watercourse, TRCA requirements for the Plan Area are to be respected.

Conveyance of stormwater from the site will utilize City infrastructure in the form of storm sewers and overland flows routes, mostly road right of ways. As such, it is also important that the City's Engineering Design Standards are respected.

SWM Criteria to be applied to the Woodbridge Avenue and Islington Avenue intensification corridors are as follows:

- **Quantity Control** – No quantity control is required for this area, as per the TRCA's SWM Guidelines;
- **Quality Control** – Stormwater is to be treated to Enhanced Protection levels as defined in the MOE SWM Planning and Design Manual (2003);
- **Erosion Control** – 5 mm of on-site retention is to be provided for all storm events for the purpose of erosion control; and,
- **Water Balance** – Provide best efforts to maintain existing water balance using low impact development practices.

To encourage the use of sustainable development technologies, all agencies recommend the use of Low Impact Development measures (LIDs). A feasibility analysis of LID strategies recommended for the site is discussed in **Section 5.6** of this report. The use of these LIDs will assist in meeting SWM requirements listed above.

4.0 Target Flows

4.1. Existing Hydrological Conditions

The soils in the Woodbridge Core are primarily sandy loam, with an area west of Wallace Street which has clayey soils. Confirmation of the soil type and corresponding curve number values must be provided during detailed design of each site;

The existing drainage areas are illustrated in **Figure 4-1**. Existing conditions were modelled in Visual OTTHYMO v.2.4 (VO2) using a mix of STANDHYD and NASHYD commands.

The following design parameters were used for the VO2 model:

- **Curve Number**: The curve number value is based off the Ontario Soils Map and MTO Design Charts 1.08 and 1.09, which can be found in **Appendix A**. The Hydrologic Soil Group for the soils in the four (4) intensification areas are Sandy loam, with urban lawns as cover, the CN value used was that for pasture in good condition, as there is no value given for urban lawns. The soils for the remaining areas have been determined to be HSG A (Sandy loam) and HSG C (Clay);
- Percent imperviousness of the catchments were calculated using typical values for various land uses outlined in the VO2 manual; and,
- The 6 and 12-hour AES storms used in the analysis were provided by the TRCA. The City's IDF was taken from the City of Vaughan's Engineering Department Design Criteria and Standard Drawings.

As outlined in both the Woodbridge Secondary Plan and the 2010 City of Vaughan OPA, intensification will occur along Woodbridge Avenue and Islington Avenue to develop "Character Areas" within Woodbridge neighbourhood. These areas include catchments 4407a and 4407b for intensification areas along Woodbridge Avenue, and catchments 4414a and 4414b for intensification areas on Islington Avenue. The Secondary Plan calls for the remainder of the Plan Area are to remain as Stable Residential Neighbourhoods. Parameters used to model these intensification areas are summarized below in **Table 4-1** the existing conditions for the remaining drainage areas are provided in **Appendix B**.

Table 4-1 – Existing Condition Input Parameters (Intensification Areas)

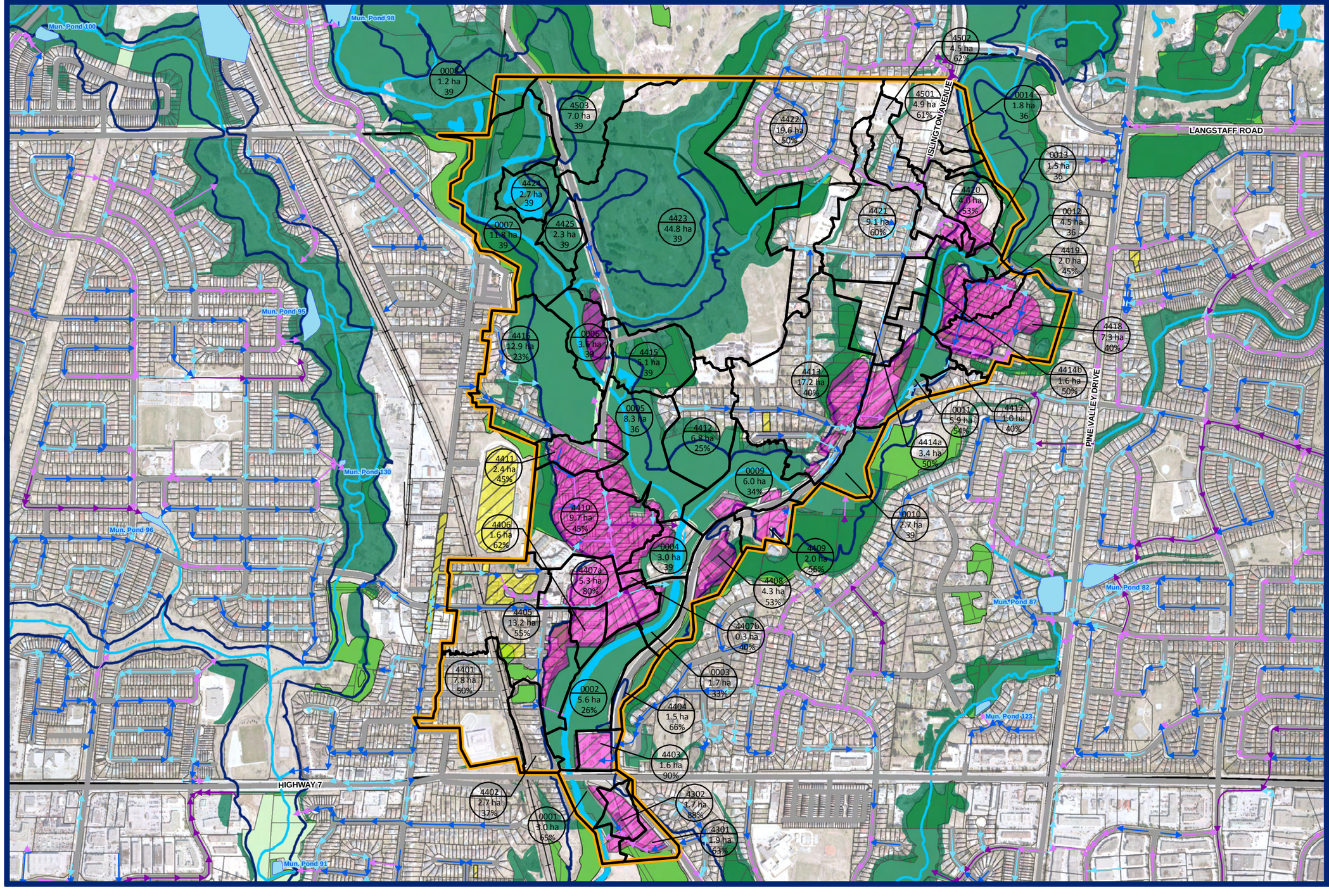
Catchments	Drainage Area (ha)	TIMP	XIMP	CN
4407a	5.3	0.80	0.80	39
4407b	0.3	0.40	0.35	39
4414a	3.4	0.50	0.30	39
4414b	1.6	0.50	0.30	39

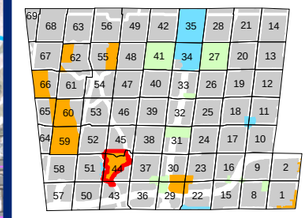
Modeling results for existing conditions along the intensification corridors are shown in **Table 4-2**. Results for the remaining areas are located in **Appendix C**, a copy of the existing conditions Woodbridge Core Secondary Plan Area VO2 model can be found on the CD included with this report.

Table 4-2 – Existing Peak Flows for Woodbridge and Islington Avenue Intensification

Catchments	Storm Distribution	Peak Flow (m^3/s)		
		2-year	5-year	100-year
4407a + 4407b	6-hour AES	0.41	0.55	0.94
4407a + 4407b	12-hour AES	0.24	0.31	0.52
4414a + 4414b	6-hour AES	0.15	0.20	0.39
4414a + 4414b	12-hour AES	0.09	0.13	0.25

Pre-Development Drainage Area Plan | Woodbridge Core





Legend

- TRCA Existing Floodlines
- Watercourse
- Existing SWM Ponds
- Natural Areas
- TRCA Property
- Forested Area

Storm Sewers

Diameter (mm)

- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

Flooding Risks

- Reported Flooding - August 19, 2005
- Special Policy Area

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Pre-Development Drainage Area Plan

SCALE 1:12,000
0 37.5 75 150 225 300 Meters

FIGURE
4-1

5.0 Proposed Conditions

Intensification along Woodbridge Avenue will be achieved by redeveloping properties fronting Woodbridge Avenue between Clarence Street and Wallace Street, portions of Market Lane Square, and a property on the northeast corner of the Woodbridge Avenue / Clarence Street intersection. As illustrated in the Woodbridge Core Secondary Plan and the Official Plan, the properties east of Market Square Lane, currently low-rise residential developments, will be redeveloped as low and mid-rise mixed use. The proposed mixed-use areas will have maximum lot coverage of 50%. It is assumed that the additional parking spaces and pedestrian walkways proposed within the existing development will increase the imperviousness of the existing properties to 80%. A 0.3 ha portion of the parking lot within Market Lane Square will also be redeveloped as a public square with a mix of landscaping and hardscaping. It is assumed that 50% of the public square surface will be impervious.

Intensification along Islington Avenue will be achieved by redeveloping properties between Davidson Drive and Gamble Street. The corridor, currently lined primarily with single dwelling residential homes, will be redeveloped with townhouses to support the 276 additional residential units as per the Woodbridge Secondary Plan. The proposed low rise residential land use calls for a maximum lot coverage of 50%. With driveways and pedestrian walkways, it is assumed that the imperviousness in these properties will be 80%.

It is noted that while intensification will occur in areas along Woodbridge Avenue and Islington Avenue, the majority of the Woodbridge Core Secondary Plan Area will remain unchanged.

5.1. Proposed Hydrological Conditions

Visual OTTHYMO v.2.4 (VO2) was used to determine the post-development peak runoff rates. Through the use of aerial photography and the proposed land use schedule from the Secondary Plan document, percent imperviousness of the catchments were calculated using typical values for various land uses outlined in the VO2 manual. The input parameters for the Woodbridge and Islington Avenue Corridors are shown in **Table 5-1** below, model input parameters for the remaining areas are summarized in **Appendix D**. Refer to **Figure 5-1** for the post-development drainage area plan.

Table 5-1 – Post-Development Condition Input Parameters (STANDHYD Commands)

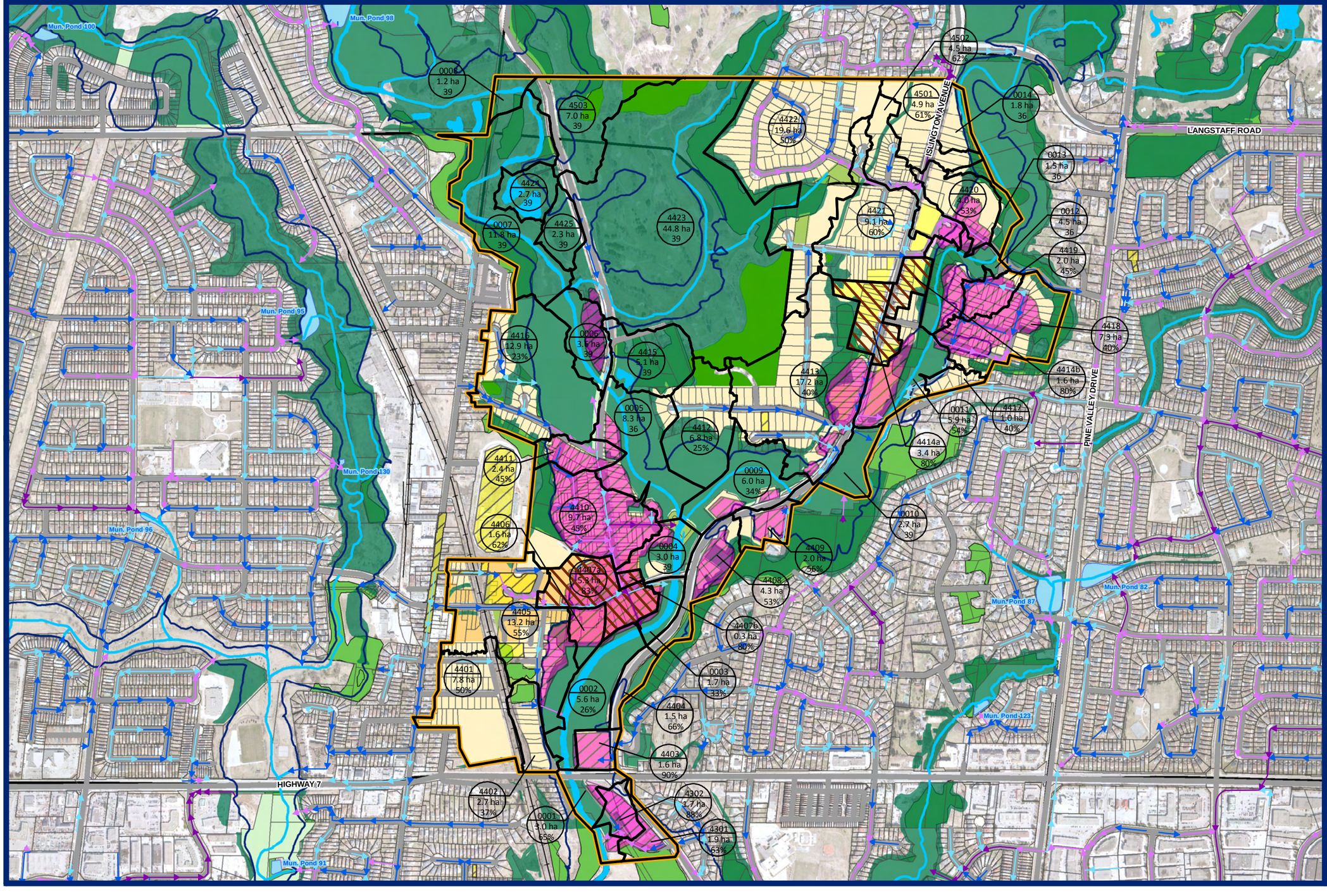
Catchments	Drainage Area (ha)	TIMP	XIMP	CN
4407a	5.3	0.85	0.83	39
4407b	0.3	0.80	0.80	39
4414a	3.4	0.80	0.65	39
4414b	1.6	0.80	0.65	39

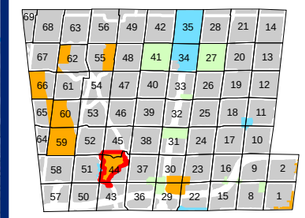
The results of the post development model for Woodbridge Avenue and Islington Avenue are summarized below in **Table 5-2**, detailed results for the remaining areas and different design storms can be found in **Appendix E**. A copy of the Post-development Woodbridge Core Secondary Plan Area VO2 model can be found on the CD included with this report.

Table 5-2 – Post-Development Peak flow for Woodbridge Avenue and Islington Avenue

Catchments	Storm Distribution	Peak Flow (m^3/s)		
		2-year	5-year	100-year
4407a + 4407b	6-hour AES	0.43	0.58	0.99
4407a + 4407b	12-hour AES	0.26	0.33	0.55
4414a + 4414b	6-hour AES	0.30	0.41	0.73
4414a + 4414b	12-hour AES	0.18	0.24	0.42

Post-Development Drainage Area Plan | Woodbridge Core





Legend

- TRCA Existing Floodlines
- Watercourse
- Areas Changing in Imperviousness
- Existing SWM Pond
- Natural Areas
- TRCA Property
- Forested Area

Proposed Land Use

- Parks
- Private Open Spaces
- Low-Rise Residential
- Low-Rise Mixed-Use
- Mid-Rise Mixed-Use
- Commercial Mixed-Use

Storm Sewers

Diameter (mm)

- 0 - 375
- 375 - 600
- 600 - 1200
- 1200 - 3660

Flooding Risks

- Reported Flooding - August 19, 2005
- Special Policy Area

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Post-Development Drainage Area Plan

SCALE 1:12,000
0 40 80 160 240 320 Meters

FIGURE
5-1

5.2. Stormwater Quantity Control

As previously mentioned, quantity control is not required for the Secondary Plan Area. However, flow attenuation may be required based on the limitations or capacity constraints of the receiving infrastructure.

5.3. Stormwater Quality Control

Stormwater treatment in any redevelopment areas must meet Enhanced (Level 1) Protection criteria (80% TSS removal) as defined by the MOE SWMPD Manual (2003). As there are no end-of-pipe control opportunities for either of the intensification areas, TSS removal shall be achieved by a combination of oil-grit separators and Low Impact Development measures (detailed further in **Section 5.6**).

5.4. Erosion Control

The TRCA requires a minimum erosion control of retention of the first 5mm of every rainfall event. This requirement reduces the volume of runoff discharged into receiving watercourses, and thus reduces downstream erosion risks.

This requirement can be met by using a combination of on site water re-use and infiltration facilities. Soil testing must be done at the detailed stage of the development in order to confirm the feasibility of infiltration controls on site. Refer to **Section 5.6** for LIDs applicable to the site.

In order to calculate the total volume of rainfall that must be captured to meet TRCA's erosion control requirement, the yearly number of rainfall events larger than 5 mm is required. The National Climate Data and Information Archive provides historic climate normals for rainfall data, showing that on average, from 1971 – 2000, the number of days in a year with rainfall exceeding 5 mm is 44.5 days in this area. Assuming that on these days 5 mm of runoff is thoroughly captured, the annual volume of rainfall captured by meeting erosion control requirements in the Woodbridge Avenue intensification area would be 12,460 m^3. The annual volume of rainfall captured for Islington Avenue corridor would be 11,125 m^3.

The volume of captured stormwater can be used to improving water balance of the site. See **Section 5.5** below.

5.5. Water Balance

Calculations were done to determine the effects of the proposed intensification within Woodbridge on the site's water balance. An increase in impervious surfaces will decrease infiltration and increase runoff from the site. These changes to the hydrologic cycle can be mitigated by capturing rainwater from the site and directing them to water re-use systems or to infiltration controls.

The Thornthwaite and Mather water balance method, outlined in Chapter 3 of the MOE's SWM Planning and Design Manual, was used to calculate the infiltration and evapotranspiration deficits in the post-development scenario. Soil types, vegetation, topography, and annual precipitation are considered with the water balance method. The result of the exercise is summarized below in **Table 5-3**.

Table 5-3 – Water Balance Analysis for Woodbridge Avenue Intensification

Parameters	Existing Water Budget (78% impervious area)		Post-development Water Balance (82% impervious area)		Post-development Water Balance with Erosion Control (82% impervious area)	
	Pervious Area	Impervious Area	Pervious Area	Impervious Area	Pervious Area	Impervious Area
Area (ha)	1.2	4.4	1.0	4.6	1.0	4.6
Precipitation (mm)*	798	798	798	798	798	798
Evapotranspiration (mm)	515	279.3	515	279.3	515	279.3
Surplus (mm)	283	518.7	283	518.7	283	518.7
Total Infiltration (mm)	220.8	0	220.8	0	220.8	0
Total Runoff (mm)	62.2	518.7	62.2	518.7	62.2	518.7
Onsite Retention (mm)					223	223
	Total		**Total**	**Change in Volume**	**Total**	**Change in Volume**
Onsite Retention (mm)					12,460	
Runoff (m^3)	23,569		24,482	+913	12,022	-11,547
Evapotranspiration (m^3)	18,469		17,998	-471	17,998	-471
Infiltration (m^3)	2,650		2,208	-442	14,668	+12,018

*The yearly precipitation data used in the water balance analysis was obtained from the National Climate Data and Information Archive for Woodbridge.
**Evapotranspiration is assumed to be 30% of precipitation for highly urbanized areas, as per the *Low-Impact Development Design Strategies: An Integrated Design Approach, Prince George's County, Maryland (1999).*

Table 5-4 – Water Balance Analysis for Islington Avenue Intensification

Parameters	Existing Water Balance (78% impervious area)		Post-development Water Balance (82% impervious area)		Post-development Water Balance with Erosion Control (82% impervious area)	
	Pervious Area	Impervious Area	Pervious Area	Imperviou s Area	Pervious Area	Impervious Area
Area (ha)	2.5	2.5	1.0	4	1.0	4.6
Precipitation (mm)*	798	798	798	798	798	798
Evapotranspiration (mm)	515	279.3	515	279.3	515	279.3
Surplus (mm)	283	518.7	283	518.7	283	518.7
Total Infiltration (mm)	220.8	0	220.8	0	220.8	0
Total Runoff (mm)	62.2	518.7	62.2	518.7	62.2	518.7
Onsite Retention (mm)					223	223
	Total		**Total**	**Change in Volume**	**Total**	**Change in Volume**
Onsite Retention (mm)					11,125	
Runoff (m^3)	14,523		21,370	6,847	10,245	-4,278
Evapotranspiration (m^3)	19,858		16,322	-3,536	16,322	-3,536
Infiltration (m^3)	5,520		2,208	-3,312	13,333	7,813

*The yearly precipitation data used in the water balance analysis was obtained from the National Climate Data and Information Archive for Woodbridge.
**Evapotranspiration is assumed to be 30% of precipitation for highly urbanized areas, as per the *Low-Impact Development Design Strategies: An Integrated Design Approach, Prince George's County, Maryland (1999).*

The analysis shows two (2) post-development conditions – one (1) with the erosion control requirement accounted for (assuming the additional 5 mm is infiltrated), and one (1) without. Results of the water balance analysis indicate that in order to match existing infiltration rates, an additional 442 m^3 and 3,312 m^3 of infiltration must be provided within the Woodbridge Avenue and Islington Avenue intensification areas, respectively.

As previously mentioned, the TRCA requires a minimum of 5 mm on-site retention of runoff from all storm events. Due to the well-draining soil within the Woodbridge intensification areas, infiltration measures can be utilized to mitigate the water balance deficit created through development of the site. It may be possible to combine the erosion control criteria to serve a dual purpose of reducing erosion potential and promoting infiltration. It is proposed that the first 5 mm of rainfall be directed to infiltration controls, which would reduce the erosion potential as well as improve the water balance of the site. During the detailed design stage, geotechnical investigations will be required along with consultation with the TRCA to refine the site specific water balance requirements.

5.6. Low Impact Development Considerations

Low Impact Development (LIDs) measures are recommended where possible in order to reduce the peak flows from a developed area. In addition, LIDs can improve water quality by developing an integrated treatment train approach on a site-specific basis. The LIDs are typically categorized as lot level, conveyance, or end-of-pipe controls.

LIDs can be used at the lot level, in the conveyance system, or for multiple lot small drainage areas (less than 2 ha.). Potential lot level / conveyance LIDs for the development are listed below in **Table 5-5** for water quality, quantity, erosion and water balance controls.

Soil in Woodbridge is predominantly Fox sandy loam with good drainage (HSG AB), with some Peel clay present on the west side of Woodbridge (HSG D).

Table 5-5 – Low Impact Development measures Analysis

LID	Primary Objective	Feasibility	Rationale
Lot Level / Conveyance Storage Controls			
Rooftop Storage	Peak Flow Control	Feasible	▪ Assists quantity control. ▪ Feasible in mid-rise mixed-use intensification area along Woodbridge Avenue.
Parking Lot Storage	Peak Flow Control	Feasible	▪ Possible to implement in commercial and mixed use areas.
Superpipe Storage	Peak Flow Control	Possible	▪ Possible, will require further study and consideration.
Rear Yard Storage	Peak Flow Control	Possible	▪ Good draining soil allows for infiltration, however unmanaged ponded water will likely be unacceptable.
Lot Level / Conveyance Infiltration Controls			
Reduced Lot Grading	Water Balance	Not Feasible	▪ Area already at risk for flooding, undesirable or unmanaged ponded water in private properties will not be acceptable.
Green Roof	Water Balance, Water Quality, Water Quantity	Feasible	▪ Feasibility limited to mid-rise mixed-use developments and townhouse units with flat roofs.
Disconnect Roof Leaders	Water Balance	Feasible	▪ Directing roof leaders to pervious areas would increase infiltration and decrease runoff from the site.
Rain Barrels / Cisterns	Water Balance	Feasible	▪ Rain barrels are suitable for use in residential areas within Woodbridge. ▪ Cisterns can be used in commercial or mixed use areas for water re-use and watering lawns.
Infiltration Trenches	Water Balance	Feasible	▪ Good-draining soil in Woodbridge is suitable for infiltration trenches.
Grassed or Dry Swales	Water Balance, Water Quality	Limited	▪ Not enough land in existing development areas to implement swales. ▪ May be possible to implement in the Islington corridor for roadside drainage along Islington Avenue.
Rain Garden	Water Balance	Limited	▪ Encourage installation of rain gardens in residential yards for small amounts of infiltration and aesthetics.
Pervious Pipe Systems	Water Balance	Feasible	▪ Sandy loam soil present in Woodbridge has good infiltration potential.
Vegetated Filter Strips	Water Balance, Water Quality	Not Feasible	▪ Not feasible due to large space requirements.

LID	Primary Objective	Feasibility	Rationale
Stream and Valley Corridor Buffer Strips	Water Balance, Water Quality	Not Feasible	▪ Areas around streams in Woodbridge have mostly been developed.
Permeable Pavement	Water Balance	Feasible	▪ Permeable pavers could be installed in low traffic areas or as walkways, in areas with well-draining soil.
End-of-Pipe Controls			
Wet Ponds	Water Balance, Water Quality	Not Feasible	▪ No room in Woodbridge to implement wet ponds.
Dry Ponds	Water Balance	Not Feasible	▪ Little room in Woodbridge to implement dry ponds.
Wetlands	Water Balance	Not Feasible	▪ No room in Woodbridge to implement wetlands.
Infiltration Basin	Water Balance	Not Feasible	▪ No room in Woodbridge to implement infiltration basins.

As intensification within Woodbridge will occur within the flood plain, LID practices should be implemented carefully, so as not to increase the risk of localized flooding for any property. The well-draining soil present in Woodbridge is ideal for implementing infiltration controls, which will reduce runoff volume and may reduce flooding. A geotechnical report must be provided at the detailed design stage of each site to confirm feasibility of infiltration.

5.7. Special Policy Areas

As outlined in Section 3.6.3 in the City's OP, all developments or redevelopments occurring in the Special Policy Areas outlined in Schedule 8 of the 2010 OPA have to propose flood reduction measures which satisfy of both the City of Vaughan and the TRCA prior to any works. The intensification areas along Woodbridge Avenue and Islington Avenue are included within these Special Policy Areas.

As outlined in Section 3.6.3 of the Official Plan, the following policies apply to any redevelopment within the Special Policy Area:

- Proposed development or redevelopment is protected to the Regulatory Flood, to the satisfaction of the City and the TRCA. Where it is technically impractical to implement such measures the City, in consultation with the TRCA, may permit flood protection to a minimum of the 1:350 year flood;
- No buildings or structures other than for conservation or flood control projects will be permitted within the floodway as defined by the TRCA;
- No new buildings, structures, or additions are permitted in lands located between Islington Avenue and Legion Court Road until these lands are removed from the floodway through remedial measures;
- Applications for development approvals are to be accompanied by engineering studies. These studies are to detail flood frequency, velocity and depth of flows, proposed flood damage reduction details, SWM techniques, along with other studies or information that may be required by the City and the TRCA;

- Prior to any development or redevelopment, TRCA along with the City must approve any proposed flood damage reduction measures, including determining setbacks from floodway, use of fill, columns, use of waterproof seals at joints, berms, strengthening foundation walls, installation of backwater valves and sump pumps, etc;
- Dry, passive floodproofing measures shall be implemented to the extent technically and practically feasible. The use of fill as a method of flood damage reduction is to be minimized;
- The TRCA and the City may require a letter from an OLS or Professional Engineer upon the completion of the foundation for any building or structure; and,
- Ingress and egress for all buildings should be safe, pursuant to the Provincial floodproofing standards, and achieve the maximum level of flood protection determined by the TRCA and City to be feasible and practical.

Developments or redevelopments within the Special Policy Area will be prohibited if:

- Flood reduction measures fail to remove the proposed building of structure from a 1:350 year flood;
- Development will be subject to flows for which velocities and/or water depth would be hazardous to life or property as a result of flooding due to the regulatory storm; or,
- The necessary flood damage reduction will increase flooding and erosion on adjacent properties.

The detailed design of these flood reduction measures are to be done on a site plan basis. As mentioned above, the implementation of flood proofing and any other measures required by the TRCA will be a condition of the City for developments or redevelopments within the Special Policy Area.

6.0 Conclusions and Recommendations

Due to the well-draining sandy loam soil present in most areas within the Woodbridge Secondary Plan Area, it is recommended that LID controls be implemented for future development and redevelopment sites. LID controls will greatly help with the water balance for smaller storm events, as well as provide quality control for runoff from the sites.

The SWM plan presented for the Woodbridge Core Secondary Plan Area will allow for redevelopment of the site while meeting stormwater management criteria for this area. The plan includes the following stormwater management practices:

- **Quantity Control** – None required;
- **Quality Control** – Stormwater is to be treated to Enhanced Level Protection (80% TSS removal) through a treatment train approach for the site, using a combination of oil-grit separators and LIDs such as bio swales and rain gardens;
- **Erosion Control** – 5 mm of on-site retention is to be provided through either infiltration systems or rainwater capturing systems, such as green roofs and cisterns. Due to the well draining soils of the site, infiltration methods will likely be feasible; and,
- **Water Balance** – Best efforts to match the site's existing water balance are to be provided. The TRCA must be consulted for each development site as specific requirements may vary.

As previously mentioned, a significant number of existing developments in Woodbridge are located within the flood plain. Because there are flooding risks associated with properties located in the flood plain, these properties have been designated as Special Policy Areas in the 2010 City of Vaughan Official Plan and are subject to additional development restrictions.

Other areas in Woodbridge have reported flooding from the recent August 19, 2005 storm. It is recommended that further flooding studies be completed in this area to remove or reduce flooding risks to these properties.

APPENDIX A
MTO Design Charts

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

Sands, Sandy Loams and Gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium to Coarse Loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium Textured Loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt Loams, Some Loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, Clay Loams, Silty Clay Loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil/Land Use Curve Numbers

Land Use	Treatment or Practice	Hydrologic Condition[4]	Hydrologic Soil Group			
			A	B	C	D
Fallow	Straight row	—	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	" and terraced	Poor	66	74	8	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	" and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes[2] or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	" and terraced	Poor	63	73	80	83
	" and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
	Contoured	Good	39	61	74	80
	"	Poor	47	67	81	88
	"	Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		—	59	74	82	86
		—	72	82	87	89
		—	74	84	90	92

For average anticedent soil moisture condition (AMC II)
[2] Close-drilled or broadcast.

[4] The hydrologic condition of cropland is good if a good crop rotation practice is used; it is poor if one crop is grown continuously.

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil Conservation Service Curve Numbers (Continued)

Land Use or Surface	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66** (62)	70** (68)	74	78	82	84	86 AMC I
Pasture & other unimproved land	58* (38)	62* (51)	65	71	76	79	81
Woodlots and forest	50* (30)	54* (44)	58	65	71	74	77
Impervious areas (paved)							98
Bare bedrock draining directly to stream by surface flow							98
Bare bedrock draining indirectly to stream as groundwater (usual case)							70
Lakes and wetlands							50

Notes

(i) All values are based on AMC II except those marked by * (AMC III) or ** (mean of AMC II and AMC III).

(ii) Values in brackets are AMC II and are to be used only for special cases.

(iii) Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

APPENDIX B
Existing Conditions Model Parameters

Table A1 - Existing Condition Input Parameters (STANDHYD Commands)

Catchments	Drainage Area (ha)	TIMP	XIMP	CN
0001	3.0	0.65	0.65	39
0002	5.6	0.26	0.26	39
0003	1.7	0.33	0.33	39
0009	6.0	0.60	0.50	39
0011	5.9	0.54	0.10	39
4301	1.9	0.63	0.63	39
4302	1.7	0.88	0.88	39
4401	7.8	0.50	0.25	74
4402	2.7	0.37	0.15	74
4403	1.6	0.90	0.90	39
4404	1.5	0.66	0.66	39
4405	13.2	0.55	0.50	74
4406	1.6	0.62	0.62	39
4407a	5.3	0.80	0.80	39
4407b	0.3	0.40	0.35	39
4408	4.3	0.53	0.50	39
4409	2.0	0.56	0.56	39
4410	9.7	0.45	0.20	39
4411	2.4	0.45	0.20	39
4412	6.8	0.25	0.15	39
4413	17.2	0.45	0.23	39
4414a	3.4	0.50	0.30	39
4414b	1.6	0.50	0.30	39
4416	12.9	0.23	0.12	39
4417	1.0	0.40	0.20	39
4418	7.3	0.40	0.20	39
4419	2.0	0.45	0.22	39
4420	4.0	0.53	0.30	39
4421	9.1	0.60	0.45	39
4422	19.6	0.50	0.25	39
4501	4.9	0.61	0.61	39
4502	4.5	0.62	0.45	39

Table A2 - Existing Condition Input Parameters (NASHYD Commands)

Catchments	Drainage Area (ha)	Runoff Coefficient	Curve Number	Slope (%)	Tp (hours)
0004	1.5	0.25	39	2.3	0.15
0005	8.3	0.3	36	32.5	0.08
0006	3.6	0.25	39	4.7	0.12
0007	11.8	0.25	39	3.8	0.23
0008	1.2	0.25	39	6.2	0.14
0010	2.7	0.25	39	2.4	0.15
0012	4.5	0.25	36	6.1	0.12
0013	1.5	0.25	36	6.9	0.09
0014	1.8	0.3	36	10.7	0.11
4415	5.1	0.25	36	3.2	0.29
4423	44.8	0.25	36	3.2	0.31
4424	2.7	0.25	36	0.7	0.41
4425	2.3	0.25	36	0.8	0.37
4503	7	0.25	36	2.2	0.61

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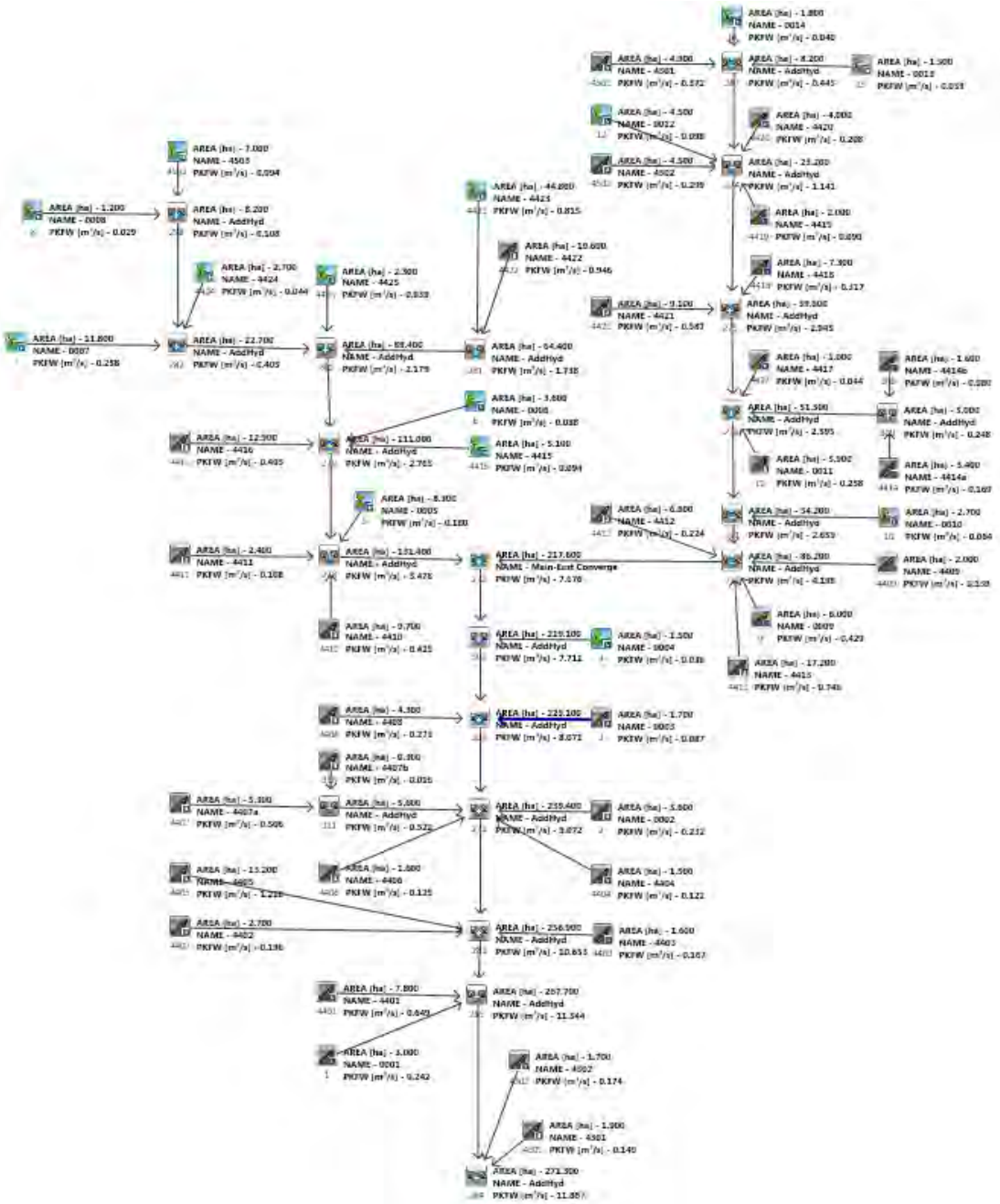
Existing Conditions Model Output
November 2013

VO2 Model Schematic



APPENDIX C
Existing Conditions Model Results

Existing Conditions Model Results - 6 hour AES						
Area ID	Peak Flow (m^3/s)					
	2 year	5 year	10 year	25 year	50 year	100 year
0001	0.181	0.245	0.287	0.343	0.384	0.425
0002	0.138	0.19	0.228	0.282	0.32	0.37
0003	0.054	0.076	0.09	0.112	0.127	0.143
0004	0.009	0.018	0.024	0.034	0.042	0.051
0005	0.053	0.098	0.135	0.188	0.233	0.281
0006	0.025	0.046	0.063	0.088	0.108	0.131
0007	0.062	0.116	0.161	0.225	0.28	0.339
0008	0.008	0.014	0.02	0.028	0.035	0.042
0009	0.299	0.414	0.492	0.594	0.672	0.75
0010	0.017	0.032	0.044	0.061	0.076	0.092
0011	0.09	0.151	0.194	0.255	0.306	0.386
0012	0.027	0.051	0.07	0.098	0.121	0.146
0013	0.01	0.018	0.024	0.034	0.042	0.051
0014	0.011	0.021	0.028	0.04	0.049	0.06
4301	0.111	0.15	0.176	0.209	0.236	0.261
4302	0.139	0.186	0.217	0.257	0.286	0.316
4401	0.294	0.467	0.584	0.74	0.907	1.037
4402	0.069	0.116	0.148	0.208	0.246	0.286
4403	0.134	0.178	0.208	0.246	0.274	0.302
4404	0.092	0.124	0.146	0.174	0.195	0.216
4405	0.766	1.113	1.344	1.644	1.874	2.105
4406	0.093	0.125	0.147	0.176	0.197	0.218
4407a	0.397	0.531	0.622	0.738	0.824	0.91
4407b	0.01	0.014	0.017	0.021	0.024	0.027
4408	0.199	0.267	0.314	0.374	0.421	0.467
4409	0.104	0.139	0.163	0.194	0.217	0.242
4410	0.208	0.306	0.375	0.49	0.57	0.654
4411	0.052	0.076	0.094	0.122	0.142	0.163
4412	0.102	0.149	0.188	0.234	0.285	0.327
4413	0.386	0.551	0.681	0.868	1.001	1.138
4414a	0.098	0.137	0.167	0.202	0.237	0.268
4414b	0.046	0.065	0.079	0.096	0.112	0.126
4415	0.021	0.039	0.055	0.077	0.096	0.116
4416	0.162	0.249	0.308	0.41	0.482	0.559
4417	0.021	0.031	0.04	0.05	0.058	0.07
4418	0.155	0.227	0.278	0.361	0.42	0.481
4419	0.045	0.067	0.082	0.106	0.123	0.141
4420	0.117	0.167	0.2	0.25	0.287	0.334
4421	0.389	0.533	0.64	0.77	0.886	0.991
4422	0.488	0.721	0.882	1.129	1.305	1.487
4423	0.177	0.334	0.464	0.654	0.815	0.988
4424	0.009	0.017	0.024	0.034	0.042	0.051
4425	0.008	0.016	0.022	0.03	0.038	0.046
4501	0.277	0.372	0.438	0.523	0.586	0.649
4502	0.196	0.271	0.327	0.395	0.448	0.511
4503	0.019	0.036	0.05	0.071	0.088	0.107

Existing Conditions Model Results - 12 hour AES						
Area ID	Peak Flow (m3/s)					
	2 year	5 year	10 year	25 year	50 year	100 year
0001	0.108	0.142	0.165	0.196	0.218	0.242
0002	0.086	0.119	0.144	0.177	0.202	0.232
0003	0.034	0.046	0.056	0.067	0.076	0.087
0004	0.008	0.014	0.018	0.025	0.03	0.036
0005	0.04	0.069	0.091	0.124	0.151	0.18
0006	0.02	0.033	0.045	0.061	0.074	0.088
0007	0.056	0.097	0.13	0.178	0.216	0.258
0008	0.006	0.011	0.015	0.02	0.024	0.029
0009	0.179	0.243	0.286	0.341	0.386	0.429
0010	0.014	0.024	0.033	0.044	0.054	0.064
0011	0.07	0.111	0.141	0.188	0.222	0.258
0012	0.022	0.037	0.05	0.068	0.082	0.098
0013	0.007	0.013	0.017	0.023	0.028	0.033
0014	0.009	0.015	0.02	0.027	0.033	0.04
4301	0.066	0.087	0.102	0.12	0.134	0.149
4302	0.082	0.106	0.123	0.143	0.159	0.174
4401	0.218	0.324	0.397	0.501	0.574	0.649
4402	0.058	0.09	0.116	0.147	0.171	0.196
4403	0.078	0.102	0.118	0.137	0.152	0.167
4404	0.055	0.072	0.084	0.099	0.11	0.122
4405	0.489	0.671	0.797	0.961	1.084	1.218
4406	0.055	0.073	0.085	0.101	0.112	0.125
4407a	0.234	0.305	0.354	0.415	0.46	0.506
4407b	0.006	0.009	0.01	0.013	0.014	0.016
4408	0.119	0.157	0.184	0.219	0.246	0.273
4409	0.062	0.081	0.095	0.112	0.126	0.139
4410	0.142	0.206	0.252	0.321	0.372	0.425
4411	0.035	0.051	0.064	0.08	0.093	0.108
4412	0.07	0.104	0.13	0.167	0.195	0.224
4413	0.259	0.367	0.452	0.569	0.656	0.746
4414a	0.062	0.087	0.106	0.129	0.149	0.169
4414b	0.03	0.041	0.05	0.062	0.071	0.08
4415	0.02	0.035	0.047	0.065	0.079	0.094
4416	0.117	0.178	0.222	0.29	0.341	0.405
4417	0.014	0.021	0.026	0.032	0.038	0.044
4418	0.105	0.151	0.188	0.235	0.272	0.317
4419	0.031	0.044	0.054	0.069	0.079	0.09
4420	0.076	0.106	0.13	0.158	0.184	0.208
4421	0.24	0.324	0.385	0.466	0.526	0.587
4422	0.334	0.475	0.576	0.724	0.833	0.946
4423	0.174	0.303	0.407	0.557	0.681	0.815
4424	0.009	0.016	0.022	0.03	0.037	0.044
4425	0.008	0.014	0.019	0.027	0.033	0.039
4501	0.165	0.217	0.254	0.301	0.335	0.372
4502	0.122	0.165	0.196	0.235	0.268	0.299
4503	0.02	0.035	0.047	0.064	0.079	0.094
4407a	0.234	0.305	0.354	0.415	0.46	0.506
4407b	0.006	0.009	0.01	0.013	0.014	0.016
4414a	0.062	0.087	0.106	0.129	0.149	0.169
4414b	0.03	0.041	0.05	0.062	0.071	0.08

Existing Conditions Model Results - 6 hour AES						
Area ID	Peak Flow (m^3/s)					
	2 year	5 year	10 year	25 year	50 year	100 year
0001	0.425	0.61	0.74	0.881	1.056	1.138
0002	0.309	0.44	0.535	0.638	0.773	0.834
0003	0.125	0.177	0.215	0.256	0.312	0.337
0004	0.01	0.02	0.028	0.039	0.055	0.065
0005	0.067	0.138	0.202	0.281	0.397	0.462
0006	0.026	0.052	0.075	0.102	0.145	0.17
0007	0.061	0.122	0.172	0.232	0.331	0.392
0008	0.008	0.016	0.023	0.032	0.046	0.054
0009	0.66	0.949	1.162	1.397	1.695	1.837
0010	0.017	0.035	0.051	0.07	0.099	0.116
0011	0.139	0.216	0.296	0.375	0.478	0.533
0012	0.028	0.058	0.083	0.113	0.161	0.19
0013	0.011	0.023	0.034	0.048	0.067	0.078
0014	0.012	0.023	0.035	0.048	0.068	0.08
4301	0.265	0.371	0.447	0.546	0.654	0.704
4302	0.334	0.468	0.565	0.67	0.798	0.858
4401	0.471	0.761	0.961	1.186	1.485	1.977
4402	0.103	0.163	0.207	0.256	0.365	0.418
4403	0.322	0.451	0.543	0.643	0.767	0.823
4404	0.224	0.315	0.38	0.452	0.541	0.582
4405	1.524	2.273	2.839	3.473	4.294	4.696
4406	0.221	0.316	0.382	0.455	0.545	0.587
4407a	0.907	1.286	1.571	1.873	2.248	2.422
4407b	0.024	0.033	0.041	0.048	0.059	0.063
4408	0.461	0.65	0.787	0.935	1.119	1.204
4409	0.247	0.346	0.417	0.494	0.59	0.634
4410	0.407	0.592	0.742	0.898	1.157	1.265
4411	0.108	0.157	0.193	0.231	0.294	0.323
4412	0.216	0.312	0.382	0.465	0.579	0.632
4413	0.783	1.135	1.405	1.693	2.107	2.292
4414a	0.222	0.315	0.383	0.459	0.558	0.603
4414b	0.107	0.151	0.183	0.219	0.266	0.287
4415	0.02	0.041	0.057	0.077	0.11	0.131
4416	0.317	0.463	0.58	0.702	0.894	0.978
4417	0.046	0.066	0.081	0.1	0.122	0.134
4418	0.313	0.458	0.563	0.679	0.87	0.951
4419	0.099	0.141	0.175	0.21	0.264	0.287
4420	0.261	0.371	0.453	0.547	0.661	0.715
4421	0.845	1.209	1.481	1.771	2.135	2.342
4422	0.965	1.429	1.762	2.132	2.719	2.97
4423	0.172	0.344	0.485	0.65	0.931	1.11
4424	0.009	0.017	0.024	0.032	0.046	0.055
4425	0.008	0.016	0.022	0.03	0.042	0.051
4501	0.637	0.9	1.091	1.297	1.606	1.732
4502	0.438	0.623	0.757	0.917	1.171	1.27
4503	0.018	0.035	0.048	0.064	0.091	0.109

APPENDIX D
Post-development Model Parameters

COLE ENGINEERING

Experience Enhancing Excellence

W11-259
Functional Servicing
Woodbridge Secondary Plan Area
Post-Development Model Output
November 2013

VO2 Model Schematic

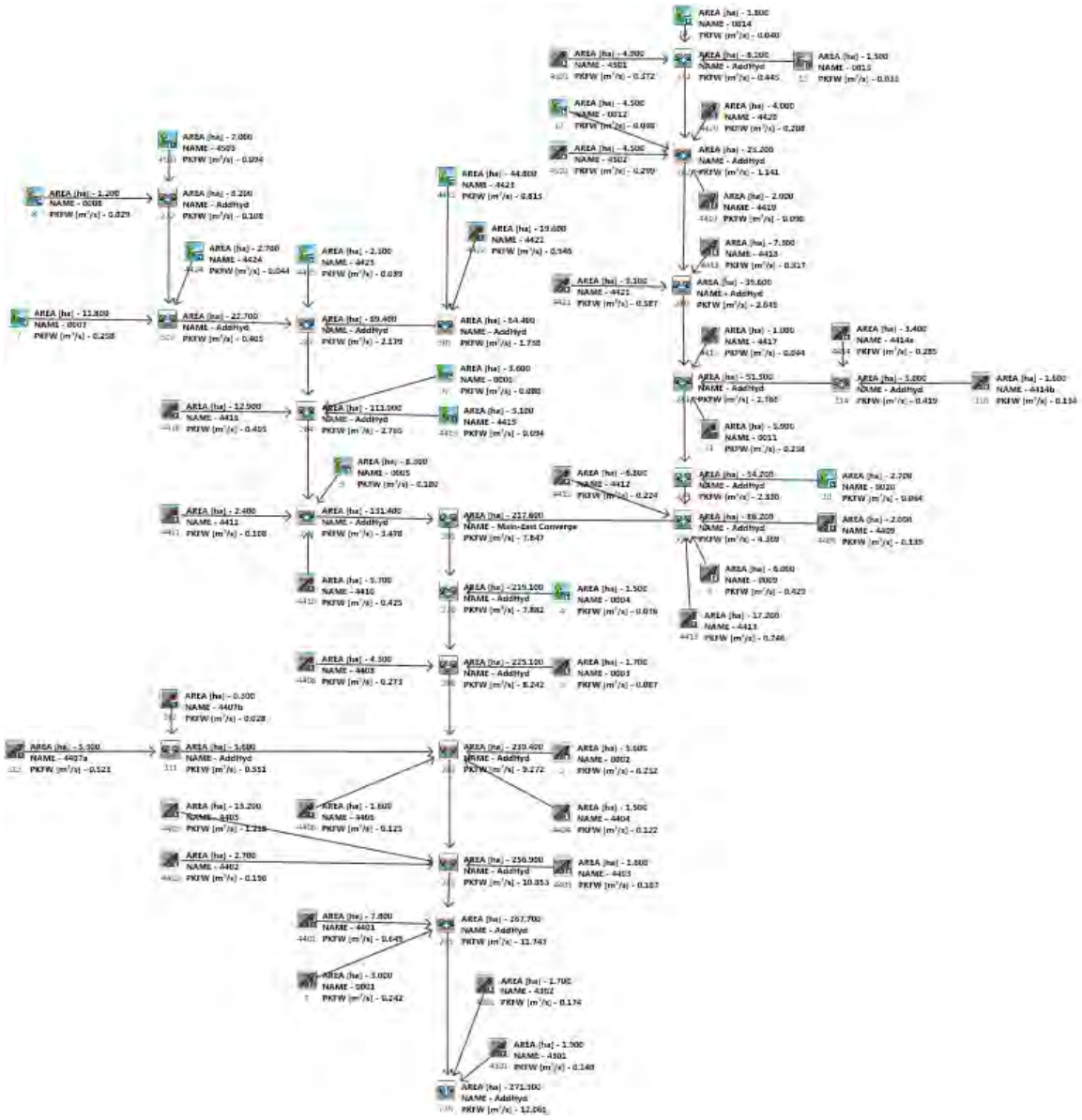


Table B1 - Post-Development Condition Input Parameters (STANDHYD Commands)

Catchments	Drainage Area (ha)	TIMP	XIMP
1	3.0	0.65	0.65
2	5.6	0.26	0.26
3	1.7	0.33	0.33
9	6.0	0.60	0.50
4301	1.9	0.63	0.63
4302	1.7	0.88	0.88
4401	7.8	0.50	0.25
4402	2.7	0.37	0.15
4403	1.6	0.90	0.90
4404	1.5	0.66	0.66
4405	13.2	0.55	0.50
4406	1.6	0.62	0.62
4407a	5.3	0.85	0.83
4407b	0.3	0.80	0.80
4408	4.3	0.53	0.50
4409	2.0	0.56	0.56
4410	9.7	0.45	0.20
4411	2.4	0.45	0.20
4412	6.8	0.25	0.15
4413	19.1	0.48	0.25
4414a	3.4	0.80	0.65
4414b	1.6	0.80	0.65
4416	12.9	0.23	0.12
4417	1.1	0.40	0.20
4418	7.3	0.40	0.20
4419	2.0	0.45	0.22
4420	4.0	0.53	0.30
4421	9.3	0.63	0.48
4422	19.6	0.50	0.25
4501	4.9	0.61	0.61
4502	4.5	0.62	0.45

Table B2 - Post-Development Condition Input Parameters (NASHYD Commands)

Catchments	Drainage Area (ha)	Runoff Coefficient	Curve Number	Slope (%)	Tp (hours)
4	0004	0.25	39	2.3	0.15
5	0005	0.3	36	32.5	0.08
6	0006	0.25	39	4.7	0.12
7	0007	0.25	39	3.8	0.23
8	0008	0.25	39	6.2	0.14
10	0010	0.25	39	2.4	0.15
12	0012	0.25	36	6.1	0.12
13	0013	0.25	36	6.9	0.09
14	0014	0.3	36	10.7	0.11
4415	4415	0.25	36	3.2	0.29
4423	4423	0.25	36	3.2	0.31
4424	4424	0.25	36	0.7	0.41
4425	4425	0.25	36	0.8	0.37
4503	4503	0.25	36	2.2	0.61

APPENDIX E
Post-development Model Results

Post-development Model Results - 6 hour AES						
Area ID	Peak Flow (m^3/s)					
	2 year	5 year	10 year	25 year	50 year	100 year
0001	0.181	0.245	0.287	0.343	0.384	0.425
0002	0.138	0.190	0.228	0.282	0.320	0.370
0003	0.054	0.076	0.090	0.112	0.127	0.143
0004	0.009	0.018	0.024	0.034	0.042	0.051
0005	0.053	0.098	0.135	0.188	0.233	0.281
0006	0.025	0.046	0.063	0.088	0.108	0.131
0007	0.062	0.116	0.161	0.225	0.280	0.339
0008	0.008	0.014	0.020	0.028	0.035	0.042
0009	0.299	0.414	0.492	0.594	0.672	0.750
0010	0.017	0.032	0.044	0.061	0.076	0.092
0011	0.090	0.151	0.194	0.255	0.306	0.386
0012	0.027	0.051	0.070	0.098	0.121	0.146
0013	0.010	0.018	0.024	0.034	0.042	0.051
0014	0.011	0.021	0.028	0.040	0.049	0.060
4301	0.111	0.150	0.176	0.209	0.236	0.261
4302	0.139	0.186	0.217	0.257	0.286	0.316
4401	0.294	0.467	0.584	0.740	0.907	1.037
4402	0.069	0.116	0.148	0.208	0.246	0.286
4403	0.134	0.178	0.208	0.246	0.274	0.302
4404	0.092	0.124	0.146	0.174	0.195	0.216
4405	0.766	1.113	1.344	1.644	1.874	2.105
4406	0.090	0.121	0.142	0.171	0.192	0.213
4407a	0.411	0.550	0.644	0.763	0.852	0.941
4407b	0.022	0.030	0.035	0.042	0.047	0.052
4408	0.199	0.267	0.314	0.374	0.421	0.467
4409	0.104	0.139	0.163	0.194	0.217	0.242
4410	0.208	0.306	0.375	0.490	0.570	0.654
4411	0.052	0.076	0.094	0.122	0.142	0.163
4412	0.102	0.149	0.188	0.234	0.285	0.327
4413	0.386	0.551	0.681	0.868	1.001	1.138
4414a	0.207	0.280	0.329	0.395	0.443	0.496
4414b	0.097	0.132	0.156	0.186	0.211	0.234
4415	0.021	0.039	0.055	0.077	0.096	0.116
4416	0.162	0.249	0.308	0.410	0.482	0.559
4417	0.021	0.031	0.040	0.050	0.058	0.070
4418	0.155	0.227	0.278	0.361	0.420	0.481
4419	0.045	0.067	0.082	0.106	0.123	0.141
4420	0.117	0.167	0.200	0.250	0.287	0.334
4421	0.389	0.533	0.640	0.770	0.886	0.991
4422	0.488	0.721	0.882	1.129	1.305	1.487
4423	0.177	0.334	0.464	0.654	0.815	0.988
4424	0.009	0.017	0.024	0.034	0.042	0.051
4425	0.008	0.016	0.022	0.030	0.038	0.046
4501	0.277	0.372	0.438	0.523	0.586	0.649
4502	0.196	0.271	0.327	0.395	0.448	0.511
4503	0.019	0.036	0.050	0.071	0.088	0.107

Post-development Model Results - 12 hour AES						
Area ID	Peak Flow (m^3/s)					
	2 year	5 year	10 year	25 year	50 year	100 year
0001	0.108	0.142	0.165	0.196	0.218	0.242
0002	0.086	0.119	0.144	0.177	0.202	0.232
0003	0.034	0.046	0.056	0.067	0.076	0.087
0004	0.008	0.014	0.018	0.025	0.030	0.036
0005	0.040	0.069	0.091	0.124	0.151	0.180
0006	0.020	0.033	0.045	0.061	0.074	0.088
0007	0.056	0.097	0.130	0.178	0.216	0.258
0008	0.006	0.011	0.015	0.020	0.024	0.029
0009	0.179	0.243	0.286	0.341	0.386	0.429
0010	0.014	0.024	0.033	0.044	0.054	0.064
0011	0.070	0.111	0.141	0.188	0.222	0.258
0012	0.022	0.037	0.050	0.068	0.082	0.098
0013	0.007	0.013	0.017	0.023	0.028	0.033
0014	0.009	0.015	0.020	0.027	0.033	0.040
4301	0.066	0.087	0.102	0.120	0.134	0.149
4302	0.082	0.106	0.123	0.143	0.159	0.174
4401	0.218	0.324	0.397	0.501	0.574	0.649
4402	0.058	0.090	0.116	0.147	0.171	0.196
4403	0.078	0.102	0.118	0.137	0.152	0.167
4404	0.055	0.072	0.084	0.099	0.110	0.122
4405	0.489	0.671	0.797	0.961	1.084	1.218
4406	0.055	0.073	0.085	0.101	0.112	0.125
4407a	0.242	0.316	0.366	0.429	0.476	0.523
4407b	0.013	0.017	0.020	0.023	0.026	0.028
4408	0.119	0.157	0.184	0.219	0.246	0.273
4409	0.062	0.081	0.095	0.112	0.126	0.139
4410	0.142	0.206	0.252	0.321	0.372	0.425
4411	0.035	0.051	0.064	0.080	0.093	0.108
4412	0.070	0.104	0.130	0.167	0.195	0.224
4413	0.259	0.367	0.452	0.569	0.656	0.746
4414a	0.125	0.165	0.193	0.229	0.257	0.285
4414b	0.059	0.078	0.091	0.108	0.121	0.134
4415	0.020	0.035	0.047	0.065	0.079	0.094
4416	0.117	0.178	0.222	0.290	0.341	0.405
4417	0.014	0.021	0.026	0.032	0.038	0.044
4418	0.105	0.151	0.188	0.235	0.272	0.317
4419	0.031	0.044	0.054	0.069	0.079	0.090
4420	0.076	0.106	0.130	0.158	0.184	0.208
4421	0.240	0.324	0.385	0.466	0.526	0.587
4422	0.334	0.475	0.576	0.724	0.833	0.946
4423	0.174	0.303	0.407	0.557	0.681	0.815
4424	0.009	0.016	0.022	0.030	0.037	0.044
4425	0.008	0.014	0.019	0.027	0.033	0.039
4501	0.165	0.217	0.254	0.301	0.335	0.372
4502	0.122	0.165	0.196	0.235	0.268	0.299
4503	0.020	0.035	0.047	0.064	0.079	0.094