

**MISSISSAUGA BUS RAPID TRANSIT
WEST: WINSTON CHURCHILL BOULEVARD
TO ERIN MILLS PARKWAY**

**DRAINAGE AND STORMWATER
MANAGEMENT
DRAFT PRELIMINARY DESIGN
REPORT**



**McCormick Rankin Corporation
June 2008**

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Appendix A

1.0 INTRODUCTION

The City of Mississauga and GO Transit propose to develop a bus-only grade-separated busway in support of GO Transit's inter-regional bus services, Mississauga Transit's bus services, and the MTO's High Occupancy Vehicle lanes on the highway. This Preliminary Drainage and Stormwater Management report addresses the section of the proposed works (BRT west) between Winston Churchill Boulevard and Erin Mills Parkway, which will include two transit stations with parking facilities and approximately 1.5 km of busway.

The following report provides a preliminary design for the BRT drainage system and recommendations for stormwater management measures. The proposed design and recommendations are based on an evaluation of the existing drainage systems, including that of the adjacent Highway 403, and the proposed BRT profile. Areas contributing drainage to the BRT corridor have been delineated, design/evaluation criteria have been defined based on the current policy framework and hydrologic calculations and modeling have been completed to quantify flow contributions during various return period rainfall events.

2.0 STUDY AREA

BRT west is located within the hydro corridor north of Highway 403 and extends from Winston Churchill Boulevard to Erin Mills Parkway (see Exhibit 1). It is located within the limits of the Credit Valley Conservation Authority (CVC) and is within the catchment areas of Sawmill and Mullett Creeks, however there are no creek crossings within this section.

3.0 PURPOSE AND OBJECTIVE

Construction of the BRT will progress over the next several years. The purpose of this study is to identify existing and future drainage features and provide a preliminary and conceptual description of preferred locations and methods for stormwater management.

The key objective of this study is to develop a water resources management conceptual plan consistent with the recommendations of the 1992 Environmental Assessment (EA) and the 2004 EA Addendum, the current policies of the Credit Valley Conservation Authority (CVC), the City of Mississauga, Go Transit and MTO.



4.0 REVIEW OF BACKGROUND INFORMATION

4.1 Field Reconnaissance

Field inspections of the existing drainage features including culverts, water courses, sewer intakes and existing stormwater management facilities were conducted by the study team to observe the condition of the existing drainage systems and confirm the accuracy of topographic mapping and background information.

4.2 Background Studies and Information

Information reviewed as a part of this study includes:

- *Mississauga Transitway Environmental Assessment Report*, McCormick Rankin Corporation, January 1992;
- *Mississauga Transitway EA Addendum*, McCormick Rankin Corporation, October 2004;
- *Stormwater Management Design Brief Erin Mills Neighbourhood 408 Plan 21T-94025*, Earth Tech Canada Inc., August 2000;
- *Drainage and Stormwater Management Report – Highway 403 Widening from Highway 407 to Highway 401*, Winter Environmental Consulting, October 2001;
- *Highway 403 - Culvert Investigation Report from Highway 407 to Highway 401*, Winter Environmental Consulting, November 2000;
- MTO contract drawings Highway 403 – Contract 2003-2012, The Green Galloway Group Inc.;
- *City of Mississauga Development Requirements Manual*, Transportation and Works Department, January 2002;
- *MTO Highway Drainage Design Standards*, January 2008;
- *MOE Stormwater Management Planning and Design Manual*, March 2003;
- *Soil Survey of Ontario - Soil Map of Peel County*, Soil Survey Report No.18;
- OBM mapping and aerial photographs; and
- *Mississauga Storm Sewer Network*, Transportation and Works Department, 2003

5.0 DESIGN CRITERIA

5.1 Hydraulic Criteria

Based on discussions with City of Mississauga staff, the drainage system for the BRT is to be designed based on the *MTO Highway Drainage Design Standards* for a freeway. As such, the design criteria for this preliminary design are as follows:

- Minor system to be designed for the 10 year event;
- Major system to be designed for the 100 year event;
- Either an overland flow route (swale, ditch or realigned watercourse) or a storm sewer shall convey external runoff from the point of interception to the receiving watercourse. The capacity of this flow route shall be sufficient to convey the major system design flow; and
- Minimum culvert sizes are as follows:
 - 800 mm minimum diameter for circular culverts
 - 800 mm minimum rise for elliptical or arch culverts
 - 900 mm minimum rise for box culverts.

The criteria identified above allow for the preliminary design of conveyance systems within and external to the BRT and preliminary sizing of stormwater management measures. At the Final Design Stage, additional criteria/standards identified within the *MTO Highway Drainage Design Standards* must be applied to complete the detailed design of the BRT drainage system including but not limited to: storm sewer sizing, catchbasin spacing, bridge deck drainage, sag and spread analyses, and ditch and culvert sizing.

5.2 Stormwater Management Criteria

MTO requires that quantity control be provided for any new development prior to discharging to the Highway 403 drainage system. Furthermore, due to capacity restrictions, quantity control must be provided prior to discharging to any municipal sewer. As such, water quantity control is to be provided by reducing proposed conditions peak flows to existing rates for all storms up to and including the 100 year event.

In accordance with CVC requirements, Enhanced water quality control must be provided for any new development. Enhanced control is defined by the MOE Guidelines as requiring 80% or greater removal of suspended solids.

6.0 EXISTING CONDITIONS

The proposed BRT west lies within the hydro corridor. Surrounding land use varies from residential development, highway infrastructure and hydro corridor. Terrain is gently undulating and generally slopes from north to south. Based on the Soil Survey mapping, soils within the study area are predominantly clay loam consisting of shale and limestone with good to imperfect drainage.

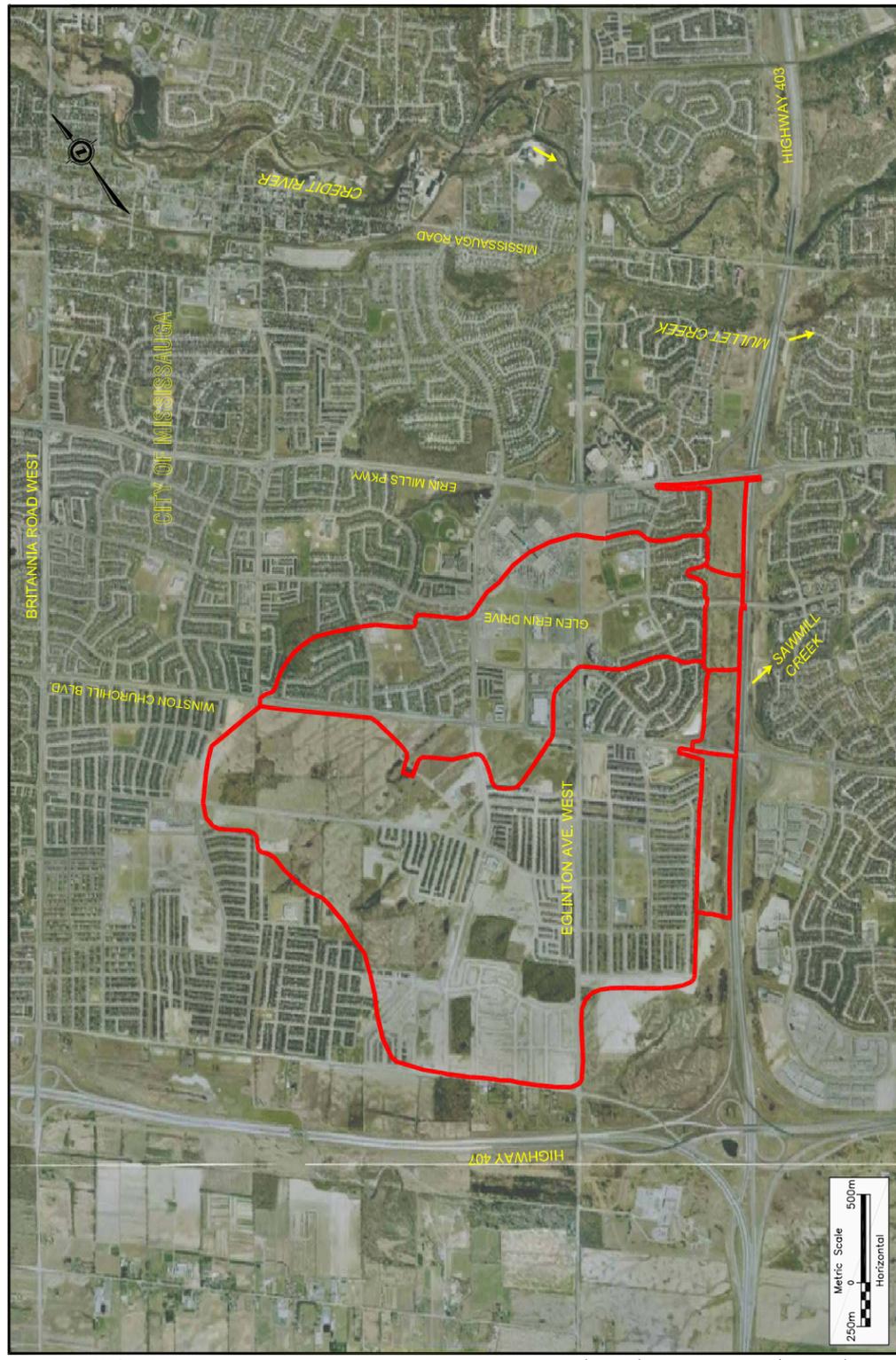
6.1 Existing Drainage Conditions

Exhibits 2 to 4 illustrate the drainage areas in the vicinity of the BRT west project limits. The existing drainage system consists primarily of open ditches, culverts and storm sewers. Three outlet points (Outlets 1, 2 and 3) were identified and the contributing drainage areas were divided according to these three outlet points. A summary of the three outlet points and their contributing drainage areas are summarized below:

- **Outlet 1 - twin 1200 mm diameter pipes (Outlet 1A) and Twin 2590 mm diameter trunk sewer (Outlet 1B):** Twin 1200 mm diameter pipes (Outlet 1A) cross Highway 403 just east of Winston Churchill Boulevard. The contributing drainage area to Outlet 1A is approximately 31.0 ha and consists entirely of Highway 403 and Hydro corridor areas. Runoff generated from the portion of this area located north of Highway 403 (21.2 ha - Catchments 1-1 to 1-3 on Exhibit 3) is conveyed by side ditches and culverts under the highway ramps to the upstream end of the twin 1200 mm pipes. Minor event runoff from this area combines with runoff from Highway 403 (9.80 ha - Catchment MTO 103) and is conveyed through the twin 1200 mm pipes to a ditch on the south side of Highway 403. The ditch runs easterly to MTO Pond 2 and discharge from this facility is conveyed to Sawmill Creek through twin 2590 mm diameter storm trunk sewer (Outlet 1B). The twin 1200 mm pipes have adequate capacity to convey major event runoff from Catchments 1-1 to 1-3 and the existing MTO Pond 2 is sized to accommodate major event flows from these areas; however the preliminary review of existing grades at the twin pipes inlet indicates that major event runoff from Catchments 1-1 to 1-3 continues eastward via ditch and culvert to Outlet 1B along with all runoff from Catchment 1-4. Major event runoff conditions for Catchments 1-1 to 1-3 will be confirmed at the detailed design stage. As a part of this preliminary study, it has been confirmed that the twin pipes and MTO Pond 2 have capacity for major flows from these areas, but it is assumed that they are conveyed to Outlet 1B.
- **Outlet 2 - twin 2400 mm diameter pipes:** Twin 2400 mm pipes run southerly and cross Highway 403 just east of Glen Erin Drive and ultimately discharge to Sawmill Creek. The approximate contributing drainage area to the twin pipes is 201 ha which includes a portion of the Highway 403 and Hydro corridors in addition to approximately 189 ha of residential lands north of the study area. Runoff generated within the Hydro corridor to the west and east of Glen Erin Drive is conveyed by natural watercourses, ditches and a culvert under Glen Erin Drive to a catchbasin and an inlet structure that discharge to the twin 2400 mm

pipes just north Highway 403.

- **Outlet 3 - culvert at Erin Mills Parkway:** This culvert conveys runoff from approximately 11.80 ha of Highway 403 and Hydro corridor lands. Runoff generated within the area west of Erin Mills Parkway is conveyed to Outlet 3 via side ditches and a culvert under the ramp located west of Erin Mills Parkway. Outflow from Outlet 3 is ultimately conveyed to Mullett Creek, east of Erin Mills Parkway, by highway ramp culverts and side ditches.



DRAWING NAME: K:\DRAWINGS\6900-6999\6964 - MISSISSAUGA BRT\DRAINAGE\K6964-DRAINAGE AREA - WEST SECTION WITH AIRPHOTO.DWG
 MODIFIED: Jun. 27, 2008 9:20 AM

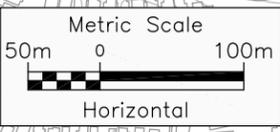
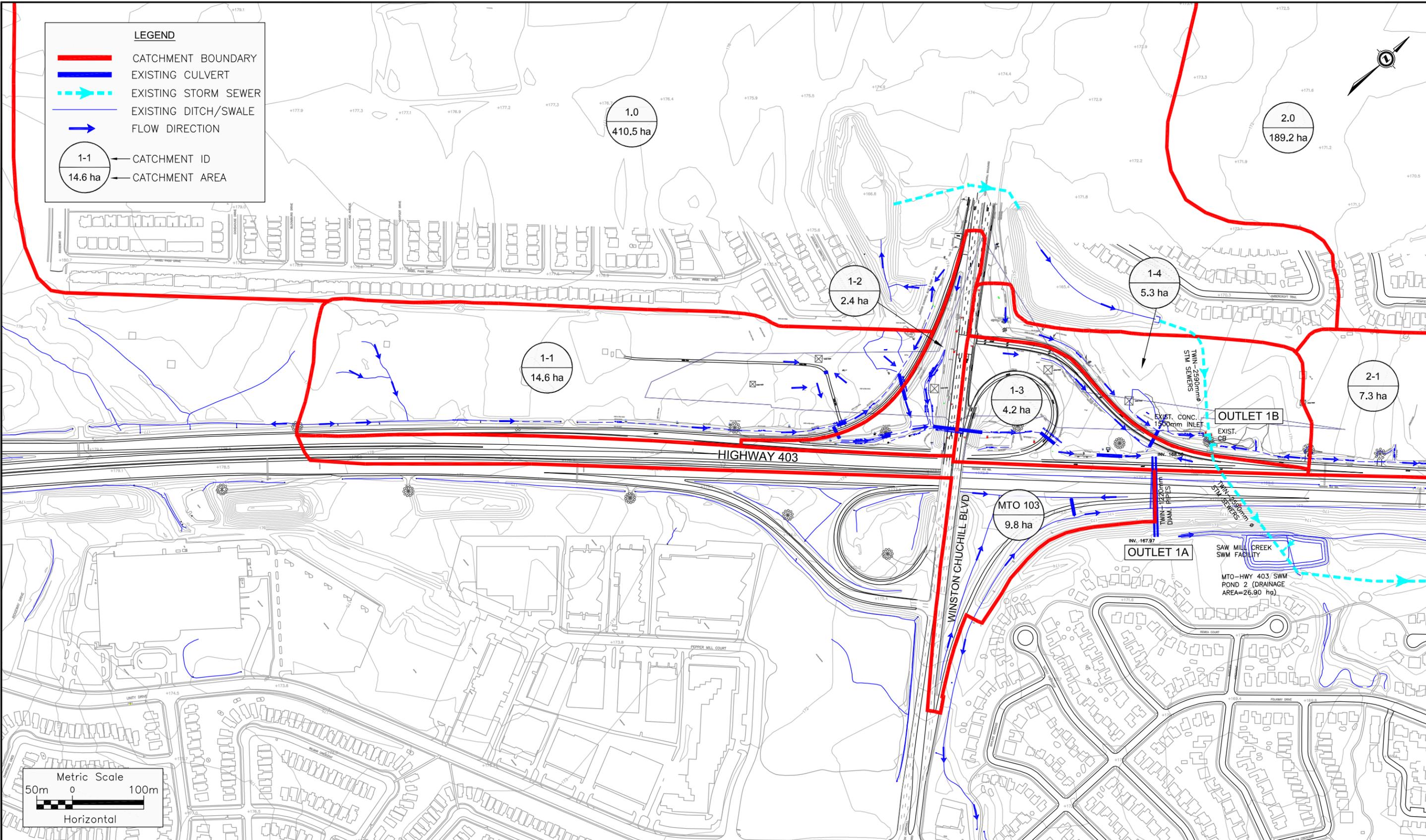
EXHIBIT	
2	
DRAINAGE AREAS BRT WEST	
MISSISSAUGA BRT	



LEGEND

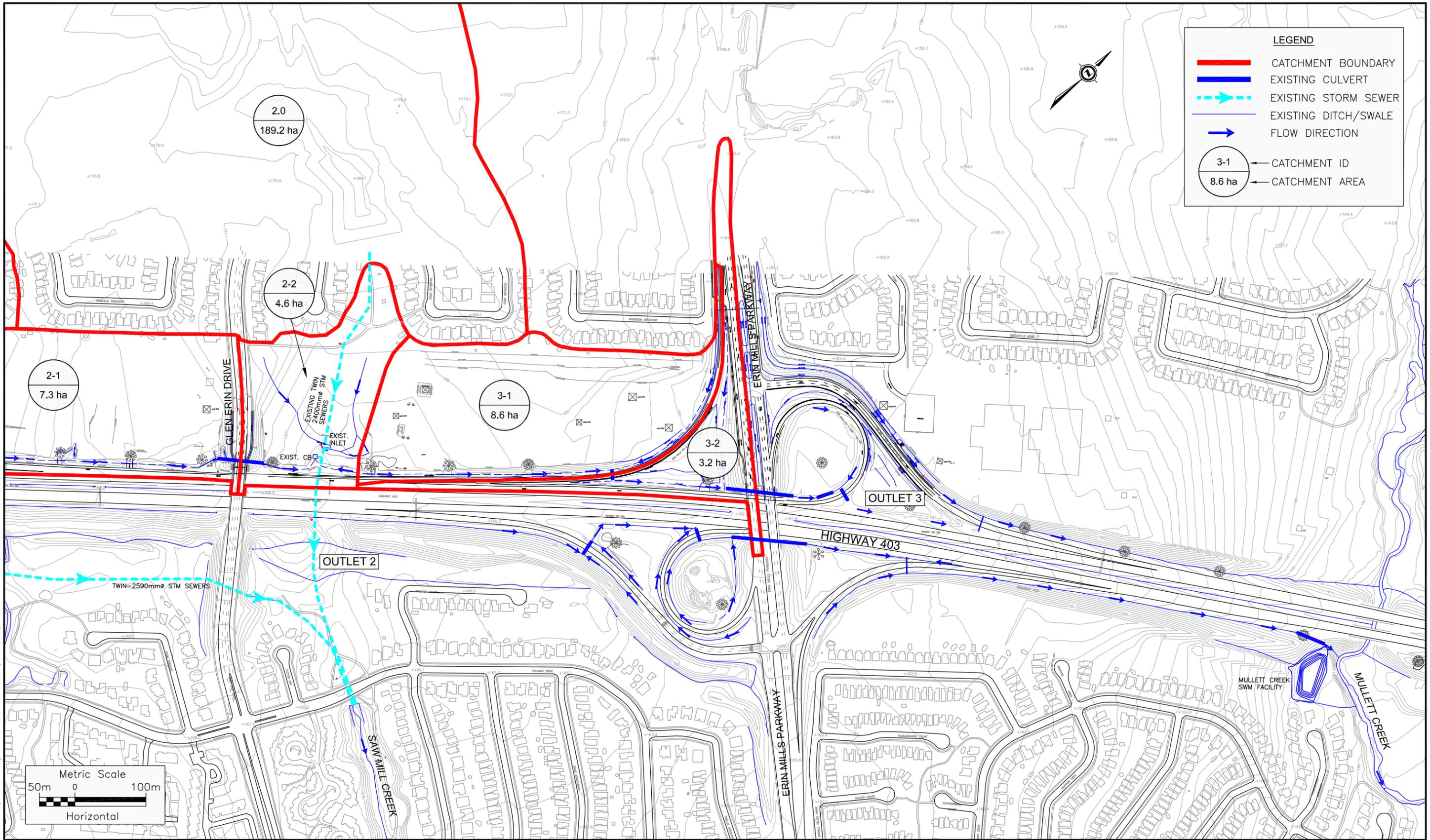
- CATCHMENT BOUNDARY
- EXISTING CULVERT
- - - EXISTING STORM SEWER
- EXISTING DITCH/SWALE
- FLOW DIRECTION

1-1 ← CATCHMENT ID
14.6 ha ← CATCHMENT AREA



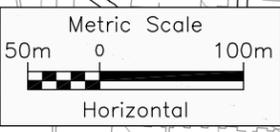
EXISTING CONDITIONS DRAINAGE MOSAIC - MAP 1

BRT WEST MISSISSAUGA



LEGEND

- CATCHMENT BOUNDARY
- EXISTING CULVERT
- - - EXISTING STORM SEWER
- EXISTING DITCH/SWALE
- FLOW DIRECTION
- 2-0 ← CATCHMENT ID
- 8.6 ha ← CATCHMENT AREA



EXISTING CONDITIONS DRAINAGE MOSAIC - MAP 2

BRT WEST MISSISSAUGA

7.0 PROPOSED CONDITIONS

The BRT west consists of stations (platforms, parking lots, access roads, passenger pick up / drop off areas, access paths) in the northwest quadrant of both the Erin Mills Parkway and Winston Churchill Boulevard interchanges with Highway 403, connected by a two lane two-way bus-only roadway over a distance of approximately 1.5 km. The initial development of the BRT stations will provide 100 spaces for Park and Ride/carpool use, with additional grading to accommodate another 100 parking spaces if demand warrants more capacity.

The 1.5 km busway link between the BRT Stations will provide grade-separated crossings of all roadways and interchange ramps. It will pass under the N-W interchange ramp at Winston Churchill Boulevard, Winston Churchill Boulevard itself, and Glen Erin Drive and it will pass over the S-W loop ramp and the E-N/S exit ramp at the Winston Churchill Boulevard interchange. Other than at road crossings, the busway will be constructed essentially at-grade.

The busway will be comprised of two 3.75m bus-only lanes, with an additional 2.75m paved maintenance strip adjacent to each lane. Where below-grade, the busway will largely be in open cut. However, in sections where there is a constrained right-of-way, retaining walls will be implemented to reduce the required width of the busway, creating an open trench. This configuration will be most predominant where the busway crosses the Winston Churchill Boulevard interchange.

7.1 Proposed Drainage Conditions

The proposed modifications to the existing drainage system include new ditches and culverts, flat bottom grassed swales, oil and grit separators, storm sewers and a new stormwater management facility located to the west of Erin Mills Parkway. These modifications are discussed in the following sections and illustrated on Exhibits 5 and 6. Per the hydraulic criteria identified in Section 5.1, all new culverts and ditches will be designed to convey the 100 year event. Additionally, catchbasin spacing and storm sewer sizing at sags within the BRT corridor must be sufficient to capture the 100 year event. A preliminary sizing estimate of all new culverts is provided in Section 10 of this report; however storm sewer sizing and catchbasin spacing will be designed at the detailed design stage and hence are not presented here within.

LEGEND

	CATCHMENT BOUNDARY
	FUTURE CULVERT
	FC1 FUTURE CULVERT I.D.
	FUTURE DITCH
	FUTURE FLAT BOTTOM GRASSED SWALE
	FUTURE STM SEWER
	OG1 FUTURE OIL AND GRIT SEPARATOR
	DI/CB FUTURE DITCH INLET OR CATCHBASIN
	EXISTING CULVERT
	EXISTING STORM SEWER
	EXISTING DITCH/SWALE
	EXISTING FLOW DIRECTION
	CATCHMENT ID 12.30 ha CATCHMENT AREA

1.0
410.5 ha

2.0
189.2 ha

-QUALITY CONTROL OF RUNOFF PROVIDED BY EITHER OIL AND GRIT SEPARATOR OR EXISTING SAW MILL SWM FACILITY.
-QUANTITY CONTROL PROVIDED ON-SITE (PARKING LOT) - 1500m³ STORAGE REQUIRED.

1-1
12.30 ha

1-11
2.80 ha

1-12
1.0 ha

1-3
1.20 ha

1-31
1.0 ha

1-4
4.30 ha

1-33
1.10 ha

1-41
0.60 ha

2-11
0.55 ha

2-1
5.20 ha

HIGHWAY 403

WINSTON CHURCHILL BLVD

MTO 103
9.8 ha

1-32
0.60 ha

1-13
0.50 ha

1-2
0.65 ha

OUTLET 1A

SAW MILL CREEK SWM FACILITY

MTO-HWY 403 SWM POND 2 (DRAINAGE AREA=26.90 ha)

FUTURE BRT STM SEWER OUTLET PIPE TO THE UPSTREAM END OF THE EXISTING TWIN 2400mm DIAM. STM SEWER (RD ELEV. AT SAG=171.70, TWIN PIPES INV. ELEV.=168.50). QUALITY AND QUANTITY CONTROL PROVIDED BY SAWMILLS CREEK SWM FACILITY.

EXISTING CB TO REMAIN IF NOT IMPACTED BY GRADING

MAINTAIN EXISTING DITCH

OUTLET 1B

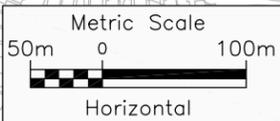
TWIN 2500mm STM SEWERS

10+400

10+500

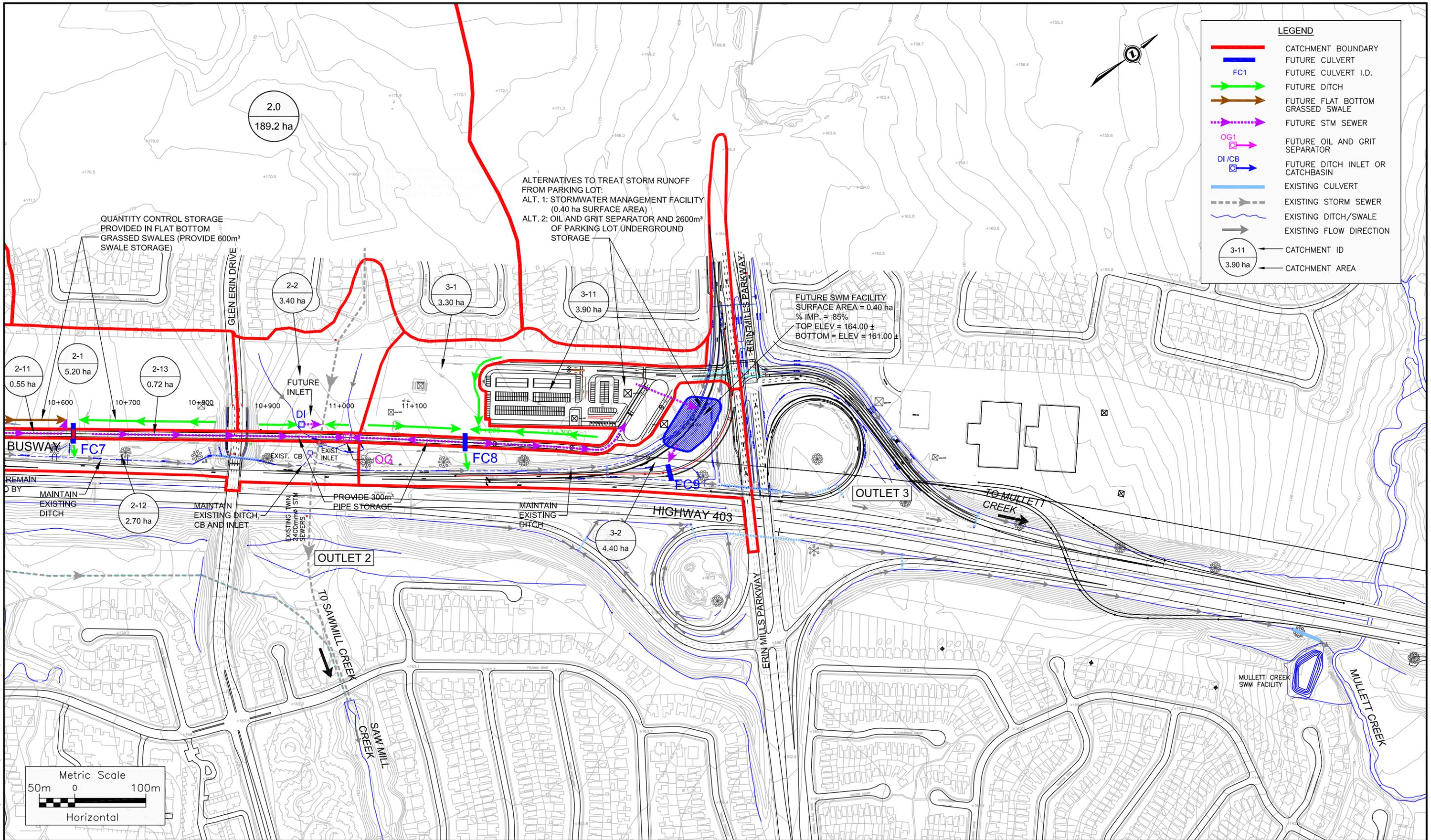
10+600

BUSWAY



FUTURE CONDITIONS DRAINAGE MOSAIC - MAP 1

MISSISSAUGA WEST BRT



LEGEND

	CATCHMENT BOUNDARY
	FUTURE CULVERT
	FUTURE DITCH
	FUTURE FLAT BOTTOM GRASSED SWALE
	FUTURE STM SEWER
	FUTURE OIL AND GRIT SEPARATOR
	FUTURE DITCH INLET OR CATCHBASIN
	EXISTING CULVERT
	EXISTING STORM SEWER
	EXISTING DITCH/SWALE
	EXISTING FLOW DIRECTION
	CATCHMENT ID CATCHMENT AREA

FUTURE CONDITIONS DRAINAGE MOSAIC - MAP 2

MISSISSAUGA WEST BRT



Runoff generated under proposed conditions will be conveyed to the same three outlets utilized under existing conditions.

7.1.1 Outlet 1 - Twin 1200 mm Pipes (Outlet 1A) & Twin 2590 mm Trunk Sewer (Outlet 1B)

The proposed BRT works in this area include a parking lot adjacent to Winston Churchill Boulevard and approximately 350 metres of the new BRT. The location of the E-NS, S-W, and N-W ramps at Winston Churchill Boulevard will be adjusted to accommodate the BRT.

The proposed drainage conditions to this outlet will not vary greatly from those under existing conditions, however the drainage area will decrease from 36.30 ha to 35.25 ha as a portion of the BRT within the existing catchment area will drain eastward to Outlet 2 under proposed conditions. Runoff will continue to be conveyed primarily by a series of side ditches and culverts under the highway ramps to Outlets 1A and 1B, as under existing conditions. Six new culverts (FC1 to FC6 on Exhibit 5) will be installed to replace existing culverts that must be relocated due to the new ramp locations.

Major and minor event runoff from the proposed parking area will be controlled on-site to existing rates via parking lot storage and discharged to Outlet 1 through flat bottomed grass swales, ditches and culverts. BRT drainage (minor and major) will be collected by a new storm sewer at the sag under Winston Churchill Boulevard and conveyed to Outlet 1.

As discussed in Section 6.1, major event runoff conditions for Catchments draining to the twin 1200 mm pipes must be confirmed. For the purposes of this preliminary study, it has been assumed that the twin 1200 mm pipes that represent Outlet 1A will only collect minor event runoff from north of Highway 401. Major event runoff will continue eastward to Outlet 1B. All runoff collected by Outlet 1A will discharge to the ditch and MTO Pond 2 on the south side of Highway Highway 403 as under existing conditions. Discharge from this facility will continue to be conveyed to Sawmill Creek through twin 2590 mm diameter storm trunk sewers. It should be noted that the twin 1200 mm pipes and MTO Pond 2 have adequate capacity for major event flows from Catchments 1-1 to 1-33 under proposed conditions if the quantity control measures identified above and discussed in Section 9.1 are implemented.

Details of the proposed stormwater management measures for the area discharging to Outlet 1 are discussed in Section 9.1.

7.1.2 Outlet 2 - Twin 2400 mm Diameter Pipes

The proposed BRT works in this area consist of approximately 970 metres of the BRT. The modifications to the existing drainage system will include a new culvert across the BRT, ditches, flat bottom grassed swales and storm sewers. As with Outlet 1, proposed drainage conditions to Outlet 2 will not be greatly altered from those under existing

conditions. The drainage area will increase slightly from 11.90 ha to 12.57 ha to accommodate portions of the BRT that lie within the existing Outlets 1 and 3 drainage areas. New ditches and one new culvert (FC7) will be installed to convey runoff from north of the BRT to the existing ditch and culvert system south of the BRT that discharges to Outlet 2. Minor event runoff from approximately 0.55 ha of the will be collected by the BRT storm sewer system and discharged to a flat bottom grass swale and the new culvert. Minor event runoff from the remaining BRT area and major event runoff from the entire BRT area will be conveyed by storm sewer and sheet flow, respectively to the sag just east of the twin 2400 mm diameter pipes and then discharged to Outlet 2. Proposed conditions flows will be controlled to existing rates prior to discharging to Outlet 2 via a combination of pipe and surface storage. Details of these controls along with quality control measures are discussed in Section 9.2.

7.1.3 Outlet 3 - Culvert at Erin Mills Parkway

The proposed works in this area consist of a approximately 200 m of the BRT and a new parking lot to the west of Erin Mills Parkway. The new parking lot will require the relocation of the S-W ramp at Erin Mills Parkway. The drainage area will decrease to 11.6 ha under proposed conditions (existing = 11.80 ha) due to the conveyance of runoff from the portion of the BRT within the existing Outlet 3 catchment area to Outlet 2. Modifications to the existing drainage system will include a new culvert across the BRT (FC8) and a second new culvert across the new S-W ramp at Erin Mills Parkway (FC9). New diversion ditches will be constructed along the perimeter of the parking lot and along the north edge of the BRT to prevent runoff from external areas from entering the BRT system. These ditches will direct flows to FC8 and the existing Highway 403 ditch and then eastward to FC9 and Outlet 3. Drainage from the parking lot will be controlled to existing rates via a new stormwater management pond and/or parking lot storage prior to discharging to FC9 and Outlet 3. Details of these quantity control measures along with the proposed quality control measures for this area are discussed in Section 9.3.

8.0 HYDROLOGIC ANALYSIS

A hydrologic analysis was completed using SWMHYMO to provide a basis for assessment of flow conditions within the BRT west tributary area and the response to various rainfall events under existing and proposed development conditions. Consistent with the *Drainage and Stormwater Management Report – Highway 403 Widening from Highway 407 to Highway 401*, the 12 hour SCS rainfall distribution was used for the 2 year to 100 year storm events. The 4 hour Chicago distribution was used for the 25 mm event. The rainfall depths associated with the various storm return intervals are listed in Table 1 and were developed from the IDF parameters for Toronto Pearson International Airport. Summaries of the parameters used within the existing and proposed conditions models are provided in Appendices A and B, respectively.

Table 1: Design Storm Rainfall Depth Summary

Storm Event Return Interval (years)	Rainfall Depth (mm)
25 mm	25
2	43.80
10	72.70
50	97.90
100	108.60

As a part of this analysis, a stage-storage-discharge relationship for MTO Pond 2 was developed based on the details provided within the *Drainage and Stormwater Management Report – Highway 403 Widening from Highway 407 to Highway 401* and the drawings for MTO Contract No.2003-2012. Calculations for this stage-storage-discharge relationship are provided in Appendix C.

The model results are provided in Appendices A and B and summarized in Table 2. The proposed conditions model includes preliminary stage-storage-discharge relationships of the quantity control measures discussed below in Section 9. As illustrated in the table below, the proposed flows generally match those of existing conditions. “Fine-tuning” of the stage-storage-discharge” relationships will be completed at the final design stage to ensure that proposed flow rates match, or are below, existing rates.

Table 2: SWMHYMO Output Summary

Storm Event	Flow (m ³ /s)							
	Outlet 1A		Outlet 1B		Outlet 2		Outlet 3	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
25 mm	1.19	1.14	0.05	0.04	0.08	0.11	0.11	0.12
2 year	1.06	1.07	0.13	0.18	0.22	0.24	0.25	0.25
10 year	1.70	1.70	0.72	0.73	0.58	0.56	0.61	0.59
50 year	2.27	2.27	1.35	1.30	0.94	0.93	0.98	0.91
100 year	2.51	2.51	1.63	1.55	1.11	1.09	1.14	1.05

9.0 PRELIMINARY STORMWATER MANAGEMENT PLAN

The preliminary stormwater management plan has been designed to meet the water quality and quantity control criteria identified in Section 5.2, above. The following discussion presents the preliminary design of the recommended measures for each outlet location.

9.1 Outlet 1 - Twin 1200 mm Pipes (Outlet 1A) & Twin 2590 mm Trunk Sewer (Outlet 1B)

The recommended stormwater management measures for the area draining to Outlet 1 are as follows:

- Water quantity control for the parking lot area will be provided by parking lot storage. Based on the results of the hydrologic modeling, approximately 1,500 m³ of storage is required with a maximum discharge rate of 0.15 m³/s during the 100 year event in order to match existing flow rates at Outlet 1. In the event that sufficient storage cannot be provided within the parking lot, additional storage can be provided within the proposed flat bottom grass swales located immediately downstream of the parking lot.
- Enhanced water quality control will be provided for the proposed parking lot via a treatment train consisting of one or more oil/grit separators (OGS) and flat bottom swales. Alternatively, the required water quality control for the parking lot can be provided by the Existing MTO Pond 2 (see Stormwater Quality Volumetric Requirements calculations in Appendix C).
- Water quantity and enhanced water quality control for the approximate 350 m of BRT within this catchment area will be provided by the existing MTO Pond 2. The proposed parking lot storage has been designed to slightly over-control runoff from the parking lot such that runoff from the BRT can be conveyed to Outlet 2 uncontrolled without increasing flow rates to that outlet. As previously discussed, a stage-storage-discharge relationship for MTO Pond 2 was developed for this study based on the details provided within the *Drainage and Stormwater Management Report – Highway 403 Widening from Highway 407 to Highway 401* and the drawings for MTO Contract No.2003-2012. Based on this assessment, the existing MTO Pond 2 has adequate capacity to provide the required water quantity and quality control for the approximate 350 m of BRT within this catchment area. MTO Pond 2 also has adequate capacity to provide the required quality control for the parking lot if the OGS and flat bottom grass swale treatment train is not deemed the preferred alternative. The MTO Pond 2 stage-storage-discharge relationship and a summary of its water quality requirements under existing and proposed conditions are provided in Appendix C.

9.2 Outlet 2 - Twin 2400 mm Diameter Pipes

The recommended stormwater management measures for the area draining to Outlet 2 are as follows:

- Enhanced water quantity control for approximately 350 m of BRT west of FC7 will be provided by a flat bottom grass swale.
- Quantity control for this reach of the BRT will be provided by attenuation storage within the flat bottom grass swale. Additional attenuation storage will be provided within the proposed ditch that runs westward along the north edge of the BRT for the undeveloped area within the Hydro corridor (Catchment 2-1) that will drain to FC7 to ensure there is no increase in downstream flows. Based on the hydrologic analysis, the combined volume requirement for the ditch and swale is approximately 600 m³ with a maximum discharge rate of 0.38 m³/s during the 100 year event.
- Enhanced water quality control for the remaining BRT area will be provided by an OGS. Quantity control for this area will be provided via pipe storage within the BRT right-of-way. Approximately 300 m³ of pipe storage with a maximum discharge rate of 0.14 m³/s during the 100 year event will be required to match existing flow rates at Outlet 2.

9.3 Outlet 3 – Culvert at Erin Mills Parkway

The recommended stormwater management measures for the area draining to Outlet 3 are as follows:

- Enhanced water quality control and water quantity control will be provided for the proposed parking lot by a wet pond stormwater management facility located between the Erin Mills Parkway / Highway 403 interchange and the parking lot. The pond will require approximately 0.40 ha of land and will provide a total volume of approximately 5,000 m³ (1,260 m³ of permanent pool, 2,850 m³ of extended detention and attenuation storage, and 900 m³ of freeboard) to meet the quality and quantity control requirements. The facility will discharge to the proposed new culvert, FC10.
- Alternatively, water quality and quantity control can be provided by one or more OGS units and parking lot storage, respectively. Approximately 2,600 m³ of parking lot storage will be required to meet the quantity control requirement. If this option is chosen, the OGS units should be designed to outlet to flat bottom grass swales to provide additional cleansing of runoff.

10.0 PRELIMINARY ASSESSMENT OF PROPOSED CULVERTS

The hydrologic modeling was used to estimate 100 year peak flows to each of the 9 proposed new culverts. As grading of the BRT has not been finalized, sizing of the culverts must be completed at the detailed design stage. In the meantime, the hydraulic criteria presented in Section 5.1 can be used as a guide.

Table 3: Proposed Culvert Assessment Summary

Proposed Culvert ID	Estimated 100 Year Flow (m ³ /s)
FC1 ⁽¹⁾	0.30
FC2 ⁽²⁾	0.67
FC3	0.50
FC4	0.71
FC5	0.68
FC6	0.97
FC7	0.40
FC8	0.30
FC9	0.15

Notes:

- (1) Assumes all flow from parking lot is conveyed to FC1.
(2) Assumes no flow from parking lot is conveyed to FC2

11.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the preceding report, the following conclusions can be made:

- BRT west will consist of two stations with associated parking areas and approximately 1.5 km of busway
- Three outlets have been identified under existing drainage conditions within the BRT west area including:
 1. twin 1200 mm diameter pipes (Outlet 1A) and Twin 2590 mm diameter trunk sewer (Outlet 1B);
 2. twin 2400 mm diameter pipes east of Glen Erin Drive; and
 3. culvert at Erin Mills Parkway.
- The same three outlets will be utilized under proposed drainage conditions and the existing drainage regime will not be greatly altered under proposed conditions
- Existing peak flow rates at each outlet will not be exceeded under proposed conditions
- Enhanced water quality control will be provided for all new development
- Construction of the BRT west will require installation of 9 new culverts and relocation of several ditches to maintain existing drainage across the BRT and the Highway 403 interchanges at Winston Churchill Boulevard and Erin Mills Parkway.

The principal recommendations of this report are:

- on-site controls such as parking lot storage be implemented to minimize the land requirement of stormwater management facilities;
- oil grit separators be used in combination with flat bottom grass swales to provide a treatment train and ensure that Enhanced water quality control is provided;
- details of major event runoff conditions for Catchments 1-1 to 1-3 that drain to Outlet 1 must be confirmed. This preliminary study assumes that major flows from these catchments drain to Outlet 1B (twin 2590 mm trunk sewer), however it has been confirmed that the twin 1200 mm pipes and MTO Pond 2 have adequate capacity to accommodate these flows.
- at the detailed design stage, catchbasin spacing and storm sewer sizing within the BRT be designed in accordance with the *MTO Highway Drainage Design Standards*; and
- sizing of each of the 10 proposed new culverts be re-examined at the final design stage as parking lot grading may require that additional flow be directed to some of them

All of which is respectfully submitted,
McCormick Rankin Corporation

Kate Macnaughton, P.Eng.

**APPENDIX A
EXISTING CONDITIONS SWMHYMO MODELING**

Summary of Hydrologic Modelling Parameters Existing Conditions BRT WEST																
Subcatchment I.D.	Instantaneous Unit Hydrograph Classification	Drainage Area (ha)	Imperviousness (%)			SCS Curve Number	Initial Abstraction (mm)		Manning's 'n'		Time to Peak (hours)	Number of Linear Reservoirs	Flow Length (m)		Slope (%)	
			Direct	Indirect	Total		Pervious	Impervious	Pervious	Impervious			Pervious	Impervious		
1.1	Nash	14.6	5	+	0 = 5	80	6.5	n/a	n/a	n/a	1.1	3	n/a	n/a	n/a	n/a
1.2	Nash	2.4	15	+	0 = 15	82	6.0	n/a	n/a	n/a	0.2	3	n/a	n/a	n/a	n/a
1.3	Standard	4.20	20	+	0 = 20	79	5.0	2.0	0.35	0.015	n/a	n/a	40	167	2.00	1.00
1.4	Nash	5.30	0	+	0 = 0	79	6.8	n/a	n/a	n/a	0.3	3	n/a	n/a	n/a	n/a
2.1	Nash	7.30	5	+	0 = 5	80	6.5	n/a	n/a	n/a	0.6	3	n/a	n/a	n/a	n/a
2.2	Nash	4.60	5	+	0 = 5	80	6.5	n/a	n/a	n/a	0.2	3	n/a	n/a	n/a	n/a
3.1	Nash	8.60	2	+	0 = 2	79	6.7	n/a	n/a	n/a	0.5	3	n/a	n/a	n/a	n/a
3.2	Standard	3.20	20	+	0 = 20	79	5.0	2.0	0.35	0.015	n/a	n/a	5	1,000	2.00	1.00
MTO103	Standard	9.80	80	+	0 = 80	79	5.0	2.0	0.35	0.015	n/a	n/a	40	256	2.00	1.00

Notes:
 Catchment MTO103 represents the portion of Catchment 103 identified in Highway 403 Drainage and SWM Report, (Winter Environmental Consulting, October 2001) that drains to the MTO Sawmill Creek SWM facility that is not accounted for in the catchments identified for this study.

```

00001> *
00002> * MISSISSAUGA BRT - WEST
00003> * Proposed CONDITIONS TO OUTLET #1
00004> *
00005> *
00006> *
00007> * - 2, 10, 50 and 100yr, 12hr Design Storms (SCS)
00008> * - 25 mm 4 hr Chicago
00009> * - Rainfall depths estimated based on Toronto Pearson
00010> * west of and including Toronto
00011> *
00012> * AS OF: June 27, 2008
00013> *
00014> *
00015> *
00016> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=001
00017> CHIC25mm.stm
00018> *
00019> READ STORM STORM_FILENAME="STORM.001"
00020> *
00021> CALIB STANDHYD ID=1 NHYD="1.11", DT=[2] (min), AREA=[2.8] (ha),
00022> XIMP=[0.99], TIMP=[0.99], DMF=[0] (cms), LOSS=[2],
00023> SCS curve number CN=[98],
00024> Pervious surfaces: IAPER=[5] (mm), SLP=[2] (%),
00025> Impervious surfaces: IAIMP=[2] (mm), SLP=[1] (%),
00026> LGP=[40] (m), MNI=[.35], SCP=[0] (min),
00027> LGI=[137] (m), MNI=[.015], SCI=[0] (min),
00028> RAINFALL=[ , , , ] (mm/hr), END=-1
00029> *
00030> COMPUTE VOLUME ID=1 STRATE=-100 RELRATE=0.0
00031> *
00032> *%-----
00033> * Parking lot storage
00034> *%-----
00035> ROUTE RESERVOIR IDOUT=[2], NHYD="110", IDIN=[1],
00036> RDT=[2] (min),
00037> TABLE of ( OUTFLOW-STORAGE ) values
00038> (cms) (ha-m)
00039> [ 0.0 , 0.0 ]
00040> [ 0.025 , 0.0250 ]
00041> [ 0.10 , 0.0500 ]
00042> [ 0.15 , 0.1500 ]
00043> [ 0.20 , 0.2000 ]
00044> [ -1 , -1 ] (max twenty pts)
00045> IDOVI=[], NHYDOVI=[""]
00046> *
00047> CALIB NASHYD ID=1 NHYD="1.12", DT=[2] (min), AREA=[1.0] (ha),
00048> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00049> N=[3], TP=[0.2] hrs,
00050> RAINFALL=[ , , , ] (mm/hr), END=-1
00051> *
00052> ADD HYD IDsum=[10], NHYD="810", IDs to add=[1,2]
00053> *
00054> CALIB NASHYD ID=1 NHYD="1.3", DT=[2] (min), AREA=[1.2] (ha),
00055> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00056> N=[3], TP=[0.1] hrs,
00057> RAINFALL=[ , , , ] (mm/hr), END=-1
00058> *
00059> ADD HYD IDsum=[9], NHYD="820", IDs to add=[1,10]
00060> *
00061> CALIB NASHYD ID=1 NHYD="1.11", DT=[2] (min), AREA=[1.0] (ha),
00062> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00063> N=[3], TP=[0.1] hrs,
00064> RAINFALL=[ , , , ] (mm/hr), END=-1
00065> *
00066> ADD HYD IDsum=[10], NHYD="830", IDs to add=[1,9]
00067> *
00068> CALIB NASHYD ID=1 NHYD="1.33", DT=[2] (min), AREA=[1.1] (ha),
00069> DMF=[0] (cms), CN/C=[82], IA=[6.5] (mm),
00070> N=[3], TP=[0.2] hrs,
00071> RAINFALL=[ , , , ] (mm/hr), END=-1
00072> *
00073> ADD HYD IDsum=[9], NHYD="840", IDs to add=[1,10]
00074> *
00075> CALIB NASHYD ID=1 NHYD="1.1", DT=[2] (min), AREA=[12.3] (ha),
00076> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00077> N=[3], TP=[1.1] hrs,
00078> RAINFALL=[ , , , ] (mm/hr), END=-1
00079> *
00080> CALIB NASHYD ID=2 NHYD="1.2", DT=[2] (min), AREA=[.65] (ha),
00081> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00082> N=[3], TP=[0.3] hrs,
00083> RAINFALL=[ , , , ] (mm/hr), END=-1
00084> *
00085> ADD HYD IDsum=[10], NHYD="850", IDs to add=[1,2]
00086> *
00087> CALIB NASHYD ID=1 NHYD="1.32", DT=[2] (min), AREA=[1.60] (ha),
00088> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00089> N=[3], TP=[0.2] hrs,
00090> RAINFALL=[ , , , ] (mm/hr), END=-1
00091> *
00092> ADD HYD IDsum=[8], NHYD="860", IDs to add=[1,10]
00093> *
00094> ADD HYD IDsum=[10], NHYD="870", IDs to add=[9,8]
00095> *
00096> *%-----
00097> * Majors to Outlet 1B
00098> * Minors to MTO Hwy 403 Twin Culverts - Same flow assumed as for existing condit
00099> *%-----
00100> COMPUTE DUALHYD IDIN=[10], CULVERT=[0.25] (cms), INLET=[1],
00101> MAJID=[7], MAJNHYD="870.1",
00102> MINID=[8], MINNHYD="870.2",
00103> TMSTO=[0] (cu-m)
00104> *
00105> CALIB NASHYD ID=1 NHYD="1.4", DT=[2] (min), AREA=[4.3] (ha),
00106> DMF=[0] (cms), CN/C=[79], IA=[6.8] (mm),
00107> N=[3], TP=[0.3] hrs, LGP=[40] (m), MNI=[.35], SCP=[0] (min),
00108> RAINFALL=[ , , , ] (mm/hr), END=-1
00109> *
00110> CALIB NASHYD ID=2 NHYD="1.41", DT=[2] (min), AREA=[0.6] (ha),
00111> DMF=[0] (cms), CN/C=[80], IA=[6.5] (mm),
00112> N=[3], TP=[0.1] hrs,
00113> RAINFALL=[ , , , ] (mm/hr), END=-1
00114> *
00115> *%-----
00116> * Total to Outlet 1B
00117> *%-----
00118> *
00119> ADD HYD IDsum=[10], NHYD="875", IDs to add=[1,2,7]
00120> *
00121> CALIB STANDHYD ID=1 NHYD="MTO103", DT=[1] (min), AREA=[9.8] (ha),
00122> XIMP=[0.8], TIMP=[0.8], DMF=[0] (cms), LOSS=[2],
00123> SCS curve number CN=[79],
00124> Pervious surfaces: IAPER=[5] (mm), SLP=[2] (%),
00125> Impervious surfaces: IAIMP=[2] (mm), SLP=[1] (%),
00126> LGP=[40] (m), MNI=[.35], SCP=[0] (min),
00127> LGI=[256] (m), MNI=[.015], SCI=[0] (min),
00128> RAINFALL=[ , , , ] (mm/hr), END=-1
00129> *
00130> ADD HYD IDsum=[9], NHYD="890", IDs to add=[8,1]
00131> *
00132> COMPUTE VOLUME ID=9 STRATE=-100 RELRATE=0.0
00133> *
00134> *%-----
00135> * Existing Sawmill Creek MTO Pond
  
```


00541- IMPERVIOUS PERVIOUS (i)
00542- Surface Area (ha)= 7.84 1.96
00543- Dep. Storage (mm)= 2.00 5.00
00544- Average Slope (%)= 1.00 2.00
00545- Length (m)= 256.00 49.00
00546- Mannings n = .015 .350
00547- Max. eff. Inten. (mm/hr)= 37.49 12.29
00548- over (min)= 8.00 28.00
00549- Storage Coeff. (min)= 7.24 (ii) 27.22 (iii)
00550- Unit Hyd. Tpeak (min)= 8.00 28.00
00551- Unit Hyd. peak (cms)= .15 .04
00552- PEAK FLOW (cms)= .80 .21 (iii)
00553- TIME TO PEAK (hrs)= 6.00 6.00
00554- RUNOFF VOLUME (mm)= 41.80 14.16
00555- TOTAL RAINFALL (mm)= 43.80 43.80
00556- RUNOFF COEFFICIENT = .95 .32

00676- TIME RAIN TIME RAIN TIME RAIN TIME RAIN
00677- hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
00678- .17 2.181 3.17 2.908 6.17 15.849 9.17 2.181
00679- .33 2.181 3.33 2.908 6.33 15.849 9.33 2.181
00680- .50 2.181 3.50 2.908 6.50 15.849 9.50 2.181
00681- .67 1.018 3.67 2.908 6.67 9.979 9.67 1.745
00682- .83 1.018 3.83 2.908 6.83 9.979 9.83 1.745
00683- 1.00 1.018 4.00 2.908 7.00 9.979 10.00 1.745
00684- 1.17 1.890 4.17 3.926 7.17 4.653 10.17 2.472
00685- 1.33 1.890 4.33 3.926 7.33 4.653 10.33 2.472
00686- 1.50 1.890 4.50 3.926 7.50 4.653 10.50 2.472
00687- 1.67 1.890 4.67 4.944 7.67 4.071 10.67 1.599
00688- 1.83 1.890 4.83 4.944 7.83 4.071 10.83 1.599
00689- 2.00 1.890 5.00 4.944 8.00 4.071 11.00 1.599
00690- 2.17 2.472 5.17 7.852 8.17 3.199 11.17 1.454
00691- 2.33 2.472 5.33 7.852 8.33 3.199 11.33 1.454
00692- 2.50 2.472 5.50 7.852 8.50 3.199 11.50 1.454
00693- 2.67 2.181 5.67 62.231 8.67 3.144 11.67 1.454
00694- 2.83 2.181 5.83 62.231 8.83 3.144 11.83 1.454
00695- 3.00 2.181 6.00 62.231 9.00 3.144 12.00 1.454

00811- *
00812- *
00813- CALIB NASHVD Area (ha)= 5.30 Curve Number (CN)=79.00
00814- 01:1.4 DT= 2.00 Ia (mm)= 6.900 # of Linear Res. (N)= 3.00
00815- U.H. Tp(hrs)= 1.100
00816- Unit Hyd Tpeak (cms)= .675
00817- PEAK FLOW (cms)= .338 (i)
00818- TIME TO PEAK (hrs)= 6.167
00819- RUNOFF VOLUME (mm)= 32.500
00820- TOTAL RAINFALL (mm)= 72.700
00821- RUNOFF COEFFICIENT = .448
00822- *
00823- *
00824- *
00825- *
00826- *
00827- *
00828- *
00829- *
00830- *
00831- ADD HYD (800) ID: NHYD AREA OPEAK TPEAK R.V. DWF
00832- ID1 01:1.4 5.30 .338 6.17 32.55 .000
00833- ID2 07:810.1 6.79 .397 6.03 35.56 .000
00834- SUM 10:820 12.09 .720 6.13 34.24 .000
00835- *
00836- *
00837- *
00838- *
00839- *
00840- *
00841- *
00842- *
00843- *
00844- CALIB STANDHYD Area (ha)= 9.80 Dir. Conn.(%)= 80.00
00845- 01:MTD10 DT= 2.00 Total Imp(%)= 80.00
00846- *
00847- IMPERVIOUS PERVIOUS (i)
00848- Surface Area (ha)= 7.84 1.96
00849- Dep. Storage (mm)= 2.00 5.00
00850- Average Slope (%)= 1.00 2.00
00851- Length (m)= 256.00 49.00
00852- Mannings n = .015 .350
00853- Max. eff. Inten. (mm/hr)= 62.23 33.75
00854- over (min)= 6.00 20.00
00855- Storage Coeff. (min)= 5.92 (ii) 19.25 (iii)
00856- Unit Hyd. Tpeak (min)= 6.00 20.00
00857- Unit Hyd. peak (cms)= .19 .06
00858- PEAK FLOW (cms)= 1.34 .12 *TOTALS*
00859- TIME TO PEAK (hrs)= 6.00 6.00 1.445 (iii)
00860- RUNOFF VOLUME (mm)= 70.70 33.89 63.339
00861- TOTAL RAINFALL (mm)= 72.70 72.70 72.700
00862- RUNOFF COEFFICIENT = .97 .47 .81
00863- *
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00947- ** END OF RUN : 9
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01081- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
01082- CN* = 79.0 Ia = Dep. Storage (Above)
01083- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01084- THAN THE STORAGE COEFFICIENT.
01085- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01086-
01087-
01088- 010:0007
01089-
01090-
01091- | ADD HYD (810 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01092- | (ha) (cms) (hrs) (mm) (cms)
01093- | ID1 10:800 17.00 .735 7.03 54.39 .000
01094- | ID2 01:1.3 4.20 .560 6.00 62.22 .000
01095- | SUM 09:810 21.20 1.295 6.03 55.94 .000
01096-
01097-
01098- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01099-
01100-
01101- 010:0008
01102-
01103-
01104- | COMPUTE DUALHYD | Average inlet capacities [CINLET] = .252 (cms)
01105- | TotalHyd 09:810 | Number of inlets in system [MINLET] = 1
01106- | Total minor system capacity = .252 (cms)
01107- | Total major system storage [TMASTO] = 0 (cu.m.)
01108-
01109- ID: NHYD AREA OPEAK TPEAK R.V. DWF
01110- (ha) (cms) (hrs) (mm) (cms)
01111- | TOTAL HYD. 09:810 21.20 1.093 6.03 55.94 .000
01112-
01113- MAJOR SYST 07:810.1 10.28 .832 6.03 55.94 .000
01114- MINOR SYST 08:810.2 10.92 .252 5.600 55.94 .000
01115-
01116-
01117- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01118-
01119- 010:0009
01120-
01121-
01122- | CALIB NASHYD | Area (ha)= 5.30 Curve Number (CN)=79.00
01123- | 01:1.4 DT= 2.00 | Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
01124- | U.H. Tp(hrs)= .300 # of Linear Res. (N)= 3.00
01125-
01126- Unit Hyd Opeak (cms)= .675
01127-
01128- PEAK FLOW (cms)= .552 (i)
01129- TIME TO PEAK (hrs)= 6.167
01130- RUNOFF VOLUME (mm)= 52.322
01131- TOTAL RAINFALL (mm)= 97.900
01132- RUNOFF COEFFICIENT = .534
01133-
01134- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01135-
01136-
01137- 010:0010
01138-
01139-
01140- | ADD HYD (820 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01141- | (ha) (cms) (hrs) (mm) (cms)
01142- | ID1 01:1.4 5.30 .552 6.17 52.32 .000
01143- | ID2 07:810.1 10.28 .831 6.03 55.94 .000
01144- | SUM 10:820 15.58 1.383 6.10 54.71 .000
01145-
01146-
01147- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01148-
01149-
01150- 010:0011
01151-
01152-
01153- | CALIB STANDHYD | Area (ha)= 9.80 Dir. Conn. (%)= 80.00
01154- | 01:MT0103 DT= 2.00 | Total Imp (%)= 80.00
01155-
01156- IMPERVIOUS PERVIOUS (i)
01157- Surface Area (ha)= 7.84 1.96
01158- Dep. Storage (mm)= 2.00 5.00
01159- Average Slope (%)= 1.00 2.00
01160- Length (m)= 256.00 40.00
01161- Mannings n = .015 .350
01162-
01163- Max. eff. Inten. (mm/hr)= 83.80 55.27
01164- over (min)= 6.00 16.00
01165- Storage Coeff. (min)= 5.25 (ii) 16.20 (ii)
01166- Unit Hyd. Tpeak (cms)= 6.00 16.00
01167- Unit Hyd. peak (cms)= .20 .07
01168-
01169- PEAK FLOW (cms)= 1.82 .22 *TOTALS*
01170- TIME TO PEAK (hrs)= 6.00 6.13 6.000
01171- RUNOFF VOLUME (mm)= 95.90 53.80 87.480
01172- TOTAL RAINFALL (mm)= 97.90 97.90 97.900
01173- RUNOFF COEFFICIENT = .98 894
01174-
01175- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
01176- CN* = 79.0 Ia = Dep. Storage (Above)
01177- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01178- THAN THE STORAGE COEFFICIENT.
01179- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01180-
01181-
01182- 010:0012
01183-
01184-
01185- | ADD HYD (830 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01186- | (ha) (cms) (hrs) (mm) (cms)
01187- | ID1 01:MT0103 9.80 2.018 6.00 87.48 .000
01188- | ID2 08:810.2 10.92 .252 5.60 55.94 .000
01189- | SUM 09:830 20.72 2.266 6.00 70.86 .000
01190-
01191-
01192- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01193-
01194-
01195- 010:0013
01196-
01197-
01198- | COMPUTE VOLUME | DISCHARGE TIME
01199- | ID:09 (830 ) | (cms) (hrs)
01200- | START CONTROLLING AT .000 .733
01201- | INFLOW HYD. PEAKS AT 2.266 6.000
01202- | STOP CONTROLLING AT .000 17.700
01203-
01204-
01205- REQUIRED STORAGE VOLUME (ha.m.) = 1.4683
01206- TOTAL HYDROGRAPH VOLUME (ha.m.) = 1.4683
01207- % OF HYDROGRAPH TO STORE = 99.9997
01208-
01209- NOTE: Storage was computed to reduce the Inflow
01210-
01211-
01212- 010:0014
01213-
01214- * Existing Sawmill Creek MTO Pond
01215-

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01216- ROUTE RESERVOIR Requested routing time step = 2.0 min.
01217- IN:09 (830 )
01218- OUT:07 (700 )
01219- ***** OUTFLOW STORAGE TABLE *****
01220- OUTFLOW STORAGE OUTFLOW STORAGE
01221- (cms) (ha.m.) (cms) (ha.m.)
01222- .000 .0000E+00 2.863 .6631E+00
01223- .008 .2389E+00 3.937 .8236E+00
01224-
01225- ROUTING RESULTS AREA OPEAK TPEAK R.V.
01226- (ha) (cms) (hrs) (mm)
01227- INFLOW :09: (830 ) 20.72 2.266 6.000 70.857
01228- OUTFLOW:07: (700 ) 20.72 1.439 6.133 70.824
01229- OVERFLOW:02: (701 ) .00 .000 .000 .000
01230-
01231- TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
01232- CUMULATIVE TIME OF OVERFLOWS (hours) = .00
01233- PERCENTAGE OF TIME OVERFLOWING (%) = .00
01234-
01235- PEAK FLOW REDUCTION [Qout/Qin] (%) = 62.625
01236- TIME SHIFT OF PEAK FLOW (min) = 8.00
01237- MAXIMUM STORAGE USED (ha.m.) = 4.4882E+00
01238-
01239-
01240- 010:0015
01241-
01242-
01243- | COMPUTE VOLUME | DISCHARGE TIME
01244- | ID:02 (701 ) | (cms) (hrs)
01245- | ** WARNING: No storage required, RelRate > Inflow Op.
01246-
01247-
01248- 010:0016
01249-
01250-
01251- 010:0002
01252-
01253- 010:0002
01254- 010:0002
01255-
01256- 010:0002
01257- 010:0002
01258-
01259- ** END OF RUN : 10
01260-
01261-
01262-
01263-
01264-
01265-
01266-
01267-
01268- | START | Project dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
01269- | Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
01270- | TZERO = .00 hrs on 0
01271- | METOUT= 2 (output = METRIC)
01272- | NROW = 011
01273- | NETORM = 1
01274- | # 1-lscsh.stm
01275-
01276- 011:0002
01277-
01278- * MISSISSAUGA BRT - WEST JOB: 06964
01279- * EXISTING CONDITIONS TO OUTLET 1
01280-
01281- *
01282- * 2, 10, 50 and 100yr, 12hr Design Storms (SCS)
01283- * 25 mm 4 hr Chl-csd
01284- * Rainfall depths from Pearson International IDF Parameters
01285- * K. Macnaughton
01286- * As of: June 24, 2008
01287- *
01288- *
01289- *
01290- *
01291- 011:0002
01292- *
01293- *
01294- | READ STORM | Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\1
01295- | Ptotal= 108.60 mm | Comments: 100 Yr-12hr SCS
01296-
01297- TIME RAIN TIME RAIN TIME RAIN TIME RAIN
01298- hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
01299- .17 3.258 3.17 4.344 6.17 23.675 9.17 3.258
01300- .33 3.258 3.33 4.344 6.33 23.675 9.33 3.258
01301- .50 3.258 3.50 4.344 6.50 23.675 9.50 3.258
01302- .67 1.520 3.67 4.344 6.67 10.426 9.67 2.606
01303- .83 1.520 3.83 4.344 6.83 10.426 9.83 2.606
01304- 1.00 1.520 4.00 4.344 7.00 10.426 10.00 2.606
01305- 1.17 2.824 4.17 5.864 7.17 6.950 10.17 3.692
01306- 1.33 2.824 4.33 5.864 7.33 6.950 10.33 3.692
01307- 1.50 2.824 4.50 5.864 7.50 6.950 10.50 3.692
01308- 1.67 2.824 4.67 7.385 7.67 6.082 10.67 2.389
01309- 1.83 2.824 4.83 7.385 7.83 6.082 10.83 2.389
01310- 2.00 2.824 5.00 7.385 8.00 6.082 11.00 2.389
01311- 2.17 3.692 5.17 11.729 8.17 4.778 11.17 2.172
01312- 2.33 3.692 5.33 11.729 8.33 4.778 11.33 2.172
01313- 2.50 3.692 5.50 11.729 8.50 4.778 11.50 2.172
01314- 2.67 3.258 5.67 92.962 8.67 4.996 11.67 2.172
01315- 2.83 3.258 5.83 92.962 8.83 4.996 11.83 2.172
01316- 3.00 3.258 6.00 92.962 9.00 4.996 12.00 2.172
01317-
01318-
01319- 011:0003
01320-
01321-
01322- | CALIB NASHYD | Area (ha)= 14.60 Curve Number (CN)=80.00
01323- | 01:1.1 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
01324- | U.H. Tp(hrs)= 1.100
01325-
01326- Unit Hyd Opeak (cms)= .507
01327-
01328- PEAK FLOW (cms)= .798 (i)
01329- TIME TO PEAK (hrs)= 7.100
01330- RUNOFF VOLUME (mm)= 62.949
01331- TOTAL RAINFALL (mm)= 108.600
01332- RUNOFF COEFFICIENT = .580
01333-
01334- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01335-
01336-
01337- 011:0004
01338-
01339-
01340- | CALIB NASHYD | Area (ha)= 2.40 Curve Number (CN)=82.00
01341- | 02:1.2 DT= 2.00 | Ia (mm)= 6.000 # of Linear Res. (N)= 3.00
01342- | U.H. Tp(hrs)= .200
01343-
01344- Unit Hyd Opeak (cms)= .458
01345-
01346- PEAK FLOW (cms)= .389 (i)
01347- TIME TO PEAK (hrs)= 6.067
01348- RUNOFF VOLUME (mm)= 66.475
01349- TOTAL RAINFALL (mm)= 108.600
01350- RUNOFF COEFFICIENT = .612

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01351-
01352- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01353-
01354-
01355- 011:0005
01356-
01357-
01358- | ADD HYD (800 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01359- | (ha) (cms) (hrs) (mm) (cms)
01360- | ID1 01:1.1 14.60 .798 7.10 62.95 .000
01361- | ID2 02:1.2 2.40 .389 6.07 66.48 .000
01362- | SUM 10:800 17.00 .860 7.03 63.45 .000
01363-
01364-
01365- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01366-
01367-
01368- 011:0006
01369-
01370-
01371- | CALIB STANDHYD | Area (ha)= 4.20
01372- | 01:1.3 DT= 2.00 | Total Imp (%)= 20.00 Dir. Conn. (%)= 20.00
01373-
01374-
01375- IMPERVIOUS PERVIOUS (i)
01376- Surface Area (ha)= .84 3.36
01377- Dep. Storage (mm)= 2.00 5.00
01378- Average Slope (%)= 1.00 2.00
01379- Length (m)= 167.00 40.00
01380- Mannings n = .015 .350
01381-
01382- Max. eff. Inten. (mm/hr)= 92.96 65.04
01383- over (min)= 6.00 16.00
01384- Storage Coeff. (min)= 5.25 (iii) 15.35 (ii)
01385- Unit Hyd. Tpeak (cms)= 6.00 16.00
01386- Unit Hyd. peak (cms)= .28 .08
01387-
01388- PEAK FLOW (cms)= .22 .46 *TOTALS*
01389- TIME TO PEAK (hrs)= 6.00 6.10 6.000
01390- RUNOFF VOLUME (mm)= 106.60 62.72 71.498
01391- TOTAL RAINFALL (mm)= 108.60 108.60 108.600
01392- RUNOFF COEFFICIENT = .98 .58 .658
01393-
01394-
01395- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
01396- CN* = 79.0 Ia = Dep. Storage (Above)
01397- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01398- THAN THE STORAGE COEFFICIENT.
01399- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01400-
01401-
01402-
01403- 011:0007
01404-
01405-
01406- | ADD HYD (810 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01407- | (ha) (cms) (hrs) (mm) (cms)
01408- | ID1 10:800 17.00 .860 7.03 63.45 .000
01409- | ID2 01:1.3 4.20 .389 6.07 66.48 .000
01410- | SUM 09:810 21.20 1.270 6.03 65.04 .000
01411-
01412-
01413- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01414-
01415-
01416- 011:0008
01417-
01418-
01419- | COMPUTE DUALHYD | Average inlet capacities [CINLET] = .252 (cms)
01420- | TotalHyd 09:810 | Number of inlets in system [MINLET] = 1
01421- | Total minor system capacity = .252 (cms)
01422- | Total major system storage [TMASTO] = 0 (cu.m.)
01423-
01424- ID: NHYD AREA OPEAK TPEAK R.V. DWF
01425- (ha) (cms) (hrs) (mm) (cms)
01426- | TOTAL HYD. 09:810 21.20 1.273 6.03 65.04 .000
01427-
01428- MAJOR SYST 07:810.1 10.28 .832 6.03 55.94 .000
01429- MINOR SYST 08:810.2 9.95 .252 5.567 65.04 .000
01430-
01431-
01432- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01433-
01434-
01435- 011:0009
01436-
01437-
01438- | CALIB NASHYD | Area (ha)= 5.30 Curve Number (CN)=79.00
01439- | 01:1.4 DT= 2.00 | Ia (mm)= 6.800 # of Linear Res. (N)= 3.00
01440- | U.H. Tp(hrs)= .300
01441-
01442- Unit Hyd Opeak (cms)= .675
01443-
01444- PEAK FLOW (cms)= .648 (i)
01445- TIME TO PEAK (hrs)= 6.133
01446- RUNOFF VOLUME (mm)= 61.205
01447- TOTAL RAINFALL (mm)= 108.600
01448- RUNOFF COEFFICIENT = .564
01449-
01450- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01451-
01452-
01453-
01454- | ADD HYD (820 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01455- | (ha) (cms) (hrs) (mm) (cms)
01456- | ID1 01:1.4 5.30 .648 6.13 61.21 .000
01457- | ID2 07:810.1 11.25 1.021 6.03 65.04 .000
01458- | SUM 10:820 16.55 1.629 6.10 63.81 .000
01459-
01460-
01461- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01462-
01463-
01464- 011:0011
01465-
01466-
01467- | CALIB STANDHYD | Area (ha)= 9.80 Dir. Conn. (%)= 80.00
01468- | 01:MT0103 DT= 2.00 | Total Imp (%)= 80.00
01469-
01470- IMPERVIOUS PERVIOUS (i)
01471- Surface Area (ha)= 7.84 1.96
01472- Dep. Storage (mm)= 2.00 5.00
01473- Average Slope (%)= 1.00 2.00
01474- Length (m)= 256.00 40.00
01475- Mannings n = .015 .350
01476-
01477- Max. eff. Inten. (mm/hr)= 92.96 64.25
01478- over (min)= 6.00 16.00
01479- Storage Coeff. (min)= 5.04 (ii) 15.35 (ii)
01480- Unit Hyd. Tpeak (cms)= 6.00 16.00
01481- Unit Hyd. peak (cms)= .21 .07
01482-
01483- PEAK FLOW (cms)= 2.02 .36 *TOTALS*
01484- TIME TO PEAK (hrs)= 6.00 6.10 6.000
01485- RUNOFF VOLUME (mm)= 106.60 62.72 97.824
01486- TOTAL RAINFALL (mm)= 108.60 108.60 108.600
01487- RUNOFF COEFFICIENT = .98 .58 .901

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01488-
01489- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
01490- CN* = 79.0 Ia = Dep. Storage (Above)
01491- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01492- THAN THE STORAGE COEFFICIENT.
01493- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01494-
01495-
01496-
01497- | ADD HYD (830 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01498- | (ha) (cms) (hrs) (mm) (cms)
01499- | ID1 01:MT0103 9.80 2.255 6.00 97.82 .000
01500- | ID2 08:810.2 10.95 .252 5.57 65.04 .000
01501- | SUM 09:830 19.75 2.507 6.00 81.31 .000
01502-
01503-
01504- NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01505-
01506-
01507- 011:0013
01508-
01509-
01510- | COMPUTE VOLUME | DISCHARGE TIME
01511- | ID:09 (830 ) | (cms) (hrs)
01512- | START CONTROLLING AT .000 .733
01513- | INFLOW HYD. PEAKS AT 2.507 6.068
01514- | STOP CONTROLLING AT .000 17.700
01515-
01516-
01517- REQUIRED STORAGE VOLUME (ha.m.) = 1.6059
01518- TOTAL HYDROGRAPH VOLUME (ha.m.) = 1.6059
01519- % OF HYDROGRAPH TO STORE = 99.9997
01520-
01521-
01522- NOTE: Storage was computed to reduce the Inflow
01523-
01524-
01525- 011:0014
01526-
01527-
01528- * Existing Sawmill Creek MTO Pond
01529-
01530-
01531- Requested routing time step = 2.0 min.
01532- ROUTE RESERVOIR
01533- IN:09 (830 )
01534- OUT:07 (700 )
01535- ***** OUTFLOW STORAGE TABLE *****
01536- OUTFLOW STORAGE OUTFLOW STORAGE
01537- (cms) (ha.m.) (cms) (ha.m.)
01538- .000 .0000E+00 2.863 .6631E+00
01539- .008 .2389E+00 3.937 .8236E+00
01540-
01541- ROUTING RESULTS AREA OPEAK TPEAK R.V.
01542- (ha) (cms) (hrs) (mm) (cms)
01543- INFLOW :09: (830 ) 19.75 2.507 6.000 81.309
01544- OUTFLOW:07: (700 ) 19.75 1.611 6.131 81.274
01545- OVERFLOW:02: (701 ) .00 .000 .000 .000
01546-
01547- TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
01548- CUMULATIVE TIME OF OVERFLOWS (hours) = .00
01549- PERCENTAGE OF TIME OVERFLOWING (%) = .00
01550-
01551- PEAK FLOW REDUCTION [Qout/Qin] (%) = 65.081
01552- TIME SHIFT OF PEAK FLOW (min) = 8.00
01553- MAXIMUM STORAGE USED (ha.m.) = 4.4872E+00
01554-
01555-
01556- 011:0015
01557-
01558-
01559- | COMPUTE VOLUME | DISCHARGE TIME
01560- | ID:02 (701 ) | (cms) (hrs)
01561- | ** WARNING: No storage required, RelRate > Inflow Op.
01562-
01563-
01564- 011:0016
01565-
01566-
01567-
01568-
01569-
01570-
01571-
01572- 011:0002
01573-
01574-
01575- FINISH
01576-
01577-
01578-
01579- 001:0015 COMPUTE VOLUME
01580-
01581- ** WARNING: No storage required, RelRate > Inflow Op.
01582- ** WARNING: No storage required, RelRate > Inflow Op.
01583- ** WARNING: No storage required, RelRate > Inflow Op.
01584- ** WARNING: No storage required, RelRate > Inflow Op.
01585- Simulation ended on 2008-07-03 at 10:33:55
01586-
01587-

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00001> Metric units
00002> *****
00003> # Project Name: BRT WEST JOB NUMBER: [6964]
00004> # Date : JUNE-25-2008
00005> # Modeller : [jrm]
00006> # Company : McCormick Rankin Corporation
00007> # License # : 4313781
00008> #
00009> #
00010> # EXISTING DRAINAGE CONDITIONS TO OUTLET 2
00011> # 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00012> #
00013> #
00014> #
00015> #
00016> #
00017> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=001
00018> CHIC25mm.stm
00019> #
00020> READ STORM STORM_FILENAME="STORM.001"
00021> #
00022> ***** EXISTING PEAK FLOWS *****
00023> #
00024> #
00025> #
00026> #
00027> #
00028> #
00029> #
00030> #
00031> COMPUTE VOLUME ID=1, STRATE=(-100) (cms), RELRATE=[0] (cms)
00032> #
00033> #
00034> CALIB NASHYD ID=1, NHYD=[2.1], DT=[2]min, AREA=[7.30] (ha),
00035> DMF=[0.00] (cms), CN/C=[80], IA=[6.5] (mm),
00036> N=[3], TP=[0.60]hrs,
00037> END=-1
00038> #
00039> #
00040> #
00041> # "OUT2" IS THE FLOW THAT ENTERS THE EXISTING TWIN 2400mm DIAM. STORM SEWER
00042> #
00043> #
00044> #
00045> ADD HYD IDsum=[7], NHYD=["OUT2"],
00046> IDs to add=1,2
00047> #
00048> #
00049> COMPUTE VOLUME ID=2 STRATE=-100 RELRATE=0.0
00050> #
00051> #
00052> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=008
00053> 12hrscs2.stm
00054> #
00055> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=009
00056> 12hrscs10.stm
00057> #
00058> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=010
00059> 12hrscs50.stm
00060> #
00061> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=011
00062> 12scsh.stm
00063> #
00064> #
00065> FINISH
00066> #
00067> #
00068> #
00069> #
00070> #

00001> *****
00002> *****
00003> SSSSS W W M M H H Y Y M M O O 9 9 9 9 *****
00004> S W W M M M H H Y Y M M O O 9 9 9 9 *****
00005> SSSSS W W M M M H H Y Y M M O O # 9 9 9 9 Ver. 4.02
00006> S W W M M M H H Y Y M M O O 9 9 9 9 July 1999
00007> SSSSS W W M M M H H Y Y M M O O 9 9 9 9 *****
00008> StormWater Management Hydrologic Model 9 9 9 9 # 4313781
00009> *****
00010> *****
00011> *****
00012> *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HYMO and its successors *****
00015> ***** OTTHYMO-83 and OTTHYMO-89 *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 727-5199 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> ***** E-Mail: swmymod@isa.com *****
00021> *****
00022> *****
00023> *****
00024> ***** Licensed user: McCormick Rankin Corporation *****
00025> ***** Kitchener SERIAL#:4313781 *****
00026> *****
00027> *****
00028> *****
00029> ***** ***** PROGRAM ARRAY DIMENSIONS ***** *****
00030> ***** Maximum value for ID numbers : 10 *****
00031> ***** Max. number of rainfall points: 15000 *****
00032> ***** Max. number of flow points : 15000 *****
00033> *****
00034> *****
00035> *****
00036> ***** D E T A I L E D O U T P U T *****
00037> *****
00038> ***** DATE: 2008-07-03 TIME: 10:35:25 RUN COUNTER: 000199 *****
00039> *****
00040> ***** Input filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\EXWest2.dat *****
00041> ***** Output filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\EXWest2.out *****
00042> ***** Summary filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\EXWest2.sum *****
00043> ***** User comments: *****
00044> ***** 1: *****
00045> ***** 2: *****
00046> ***** 3: *****
00047> *****
00048> *****
00049> *****
00050> *****
00051> *****
00052> ***** Project Name: BRT WEST JOB NUMBER: [6964] *****
00053> ***** Date : JUNE-25-2008 *****
00054> ***** Modeller : [jrm] *****
00055> ***** Company : McCormick Rankin Corporation *****
00056> ***** License # : 4313781 *****
00057> *****
00058> *****
00059> ***** EXISTING DRAINAGE CONDITIONS TO OUTLET 2 *****
00060> ***** 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms *****
00061> *****
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00134> *****
00135> *****

00136> PEAK FLOW (cms)= .059 (i)
00137> TIME TO PEAK (hrs)= 1.900
00138> RUNOFF VOLUME (mm)= 4.174
00139> TOTAL RAINFALL (mm)= 25.000
00140> RUNOFF COEFFICIENT = .167
00141> *****
00142> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00143> *****
00144> *****
00145> *****
00146> *****
00147> *****
00148> *****
00149> ***** "OUT2" IS THE FLOW THAT ENTERS THE EXISTING TWIN 2400mm DIAM. STORM SEWER *****
00150> *****
00151> *****
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00269> *****
00270> *****

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00271> START CONTROLLING AT .000 4.500
00272> INFLOW HYD. PEAKS AT .124 6.600
00273> STOP CONTROLLING AT .000
00274>
00275> REQUIRED STORAGE VOLUME (ha.m.) = 1.008
00276> TOTAL HYDROGRAPH VOLUME (ha.m.) = 10.08
00277> % OF HYDROGRAPH TO STORE = 99.9996
00278>
00279> NOTE: Storage was computed to reduce the Inflow
00280>
00281>
00282> 008:0005
00283>
00284>
00285>
00286> CALIB NASHYD | Area (ha)= 4.60 Curve Number (CN)=80.00
00287> 02:2.2 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
00288> U.H. Tp(hrs)= .200
00289>
00290> Unit Hyd Opeak (cms)= .878
00291>
00292> PEAK FLOW (cms)= .147 (i)
00293> TIME TO PEAK (hrs)= 6.067
00294> RUNOFF VOLUME (mm)= 13.802
00295> TOTAL RAINFALL (mm)= 43.799
00296> RUNOFF COEFFICIENT = .315
00297>
00298> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00299>
00300>
00301> 008:0006
00302>
00303>
00304>
00305> *OUT2* IS THE FLOW THAT ENTERS THE EXISTING TWIN 240mm DIAM. STORM SEWER
00306>
00307>
00308>
00309>
00310> ADD HYD (OUT2 ) | ID: NHYD AREA OPEAK TPEAK R.V. DMF
00311> (ha) (cms) (hrs) (mm) (cms)
00312> ID1 01:2.1 7.30 .124 6.60 13.80 .000
00313> ID2 02:2.2 4.60 .147 6.07 13.80 .000
00314>
00315> SUM 07:OUT2 11.90 .221 6.13 13.80 .000
00316>
00317> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00318>
00319>
00320> 008:0007
00321>
00322>
00323>
00324> COMPUTE VOLUME | DISCHARGE TIME
00325> | ID:02 (2.2 ) | (cms) (hrs)
00326> START CONTROLLING AT .000 4.500
00327> INFLOW HYD. PEAKS AT .147 6.067
00328> STOP CONTROLLING AT .000
00329>
00330> REQUIRED STORAGE VOLUME (ha.m.) = .0635
00331> TOTAL HYDROGRAPH VOLUME (ha.m.) = .0635
00332> % OF HYDROGRAPH TO STORE = 99.9996
00333>
00334> NOTE: Storage was computed to reduce the Inflow
00335>
00336>
00337>
00338> 008:0008
00339>
00340>
00341>
00342> 008:0002
00343>
00344> ** END OF RUN : 8
00345>
00346>
00347>
00348>
00349>
00350>
00351>
00352>
00353>
00354> START | Project dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00355> Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00356> TZERO = .00 hrs on 0
00357> METOUT= 2 (output = METRIC)
00358> NRUN = 009
00359> NSTORM= 1
00360> # 1-12scs10.stm
00361>
00362> 009:0002
00363>
00364>
00365>
00366>
00367>
00368>
00369>
00370>
00371> EXISTING DRAINAGE CONDITIONS TO OUTLET 2
00372> 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00373>
00374>
00375>
00376>
00377>
00378> 009:0002
00379>
00380>
00381> READ STORM | Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00382> | Ptotal= 72.70 mm | Comments: 10 Yr-12hr SCS
00383>
00384>
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00406> 009:0003
00407> ** EXISTING PEAK FLOWS **
00408>
00409>
00410> CALIB NASHYD | Area (ha)= 7.30 Curve Number (CN)=80.00
00411> 01:2.1 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
00412> U.H. Tp(hrs)= .600
00413>
00414> Unit Hyd Opeak (cms)= .465
00415>
00416> PEAK FLOW (cms)= .318 (i)
00417> TIME TO PEAK (hrs)= 6.567
00418> RUNOFF VOLUME (mm)= 33.789
00419> TOTAL RAINFALL (mm)= 72.700
00420> RUNOFF COEFFICIENT = .465
00421>
00422> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00423>
00424>
00425> 009:0004
00426>
00427> COMPUTE VOLUME | DISCHARGE TIME
00428> | ID:01 (2.1 ) | (cms) (hrs)
00429>
00430> START CONTROLLING AT .000 3.233
00431> INFLOW HYD. PEAKS AT .318 6.567
00432> STOP CONTROLLING AT .000 .900
00433>
00434> REQUIRED STORAGE VOLUME (ha.m.) = 2467
00435> TOTAL HYDROGRAPH VOLUME (ha.m.) = 2467
00436> % OF HYDROGRAPH TO STORE = 99.9997
00437>
00438> NOTE: Storage was computed to reduce the Inflow
00439>
00440>
00441> 009:0005
00442>
00443>
00444>
00445> CALIB NASHYD | Area (ha)= 4.60 Curve Number (CN)=80.00
00446> 02:2.2 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
00447> U.H. Tp(hrs)= .200
00448>
00449> Unit Hyd Opeak (cms)= .878
00450>
00451> PEAK FLOW (cms)= .374 (i)
00452> TIME TO PEAK (hrs)= 6.067
00453> RUNOFF VOLUME (mm)= 33.789
00454> TOTAL RAINFALL (mm)= 72.700
00455> RUNOFF COEFFICIENT = .465
00456>
00457> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00458>
00459>
00460> 009:0006
00461>
00462>
00463>
00464> *OUT2* IS THE FLOW THAT ENTERS THE EXISTING TWIN 240mm DIAM. STORM SEWER
00465>
00466>
00467>
00468>
00469> ADD HYD (OUT2 ) | ID: NHYD AREA OPEAK TPEAK R.V. DMF
00470> (ha) (cms) (hrs) (mm) (cms)
00471> ID1 01:2.1 7.30 .124 6.60 13.80 .000
00472> ID2 02:2.2 4.60 .147 6.07 13.80 .000
00473>
00474> SUM 07:OUT2 11.90 .221 6.13 13.80 .000
00475>
00476> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00477>
00478>
00479> 009:0007
00480>
00481>
00482>
00483> COMPUTE VOLUME | DISCHARGE TIME
00484> | ID:02 (2.2 ) | (cms) (hrs)
00485>
00486> START CONTROLLING AT .000 3.233
00487> INFLOW HYD. PEAKS AT .374 6.067
00488> STOP CONTROLLING AT .000 .000
00489>
00490> REQUIRED STORAGE VOLUME (ha.m.) = 1554
00491> TOTAL HYDROGRAPH VOLUME (ha.m.) = 1554
00492> % OF HYDROGRAPH TO STORE = 99.9996
00493>
00494> NOTE: Storage was computed to reduce the Inflow
00495>
00496>
00497> 009:0008
00498>
00499>
00500>
00501> 009:0002
00502>
00503>
00504> 009:0002
00505>
00506> ** END OF RUN : 9
00507>
00508>
00509>
00510>
00511>
00512>
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00514>
00515> START | Project dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00516> Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00517> TZERO = .00 hrs on 0
00518> METOUT= 2 (output = METRIC)
00519> NRUN = 010
00520> NSTORM= 1
00521> # 1-12scs50.stm
00522>
00523> 010:0002
00524>
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00541> 010:0002
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00541>
00542>
00543>
00544> READ STORM | Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00545> | Ptotal= 97.90 mm | Comments: 50 Yr-12hr SCS
00546>
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00587> 010:0004
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00811> | ID:02 (2.2 ) | DISCHARGE TIME
00812> ----- (cms) hrs
00813> START CONTROLLING AT .000 2.333
00814> INFLOW HYD. PEAKS AT .704 6.067
00815> STOP CONTROLLING AT .000 .000
00816>
00817> REQUIRED STORAGE VOLUME (ha.m.) = .2896
00818> TOTAL HYDROGRAPH VOLUME (ha.m.) = .2896
00819> % OF HYDROGRAPH TO STORE = 99.9997
00820>
00821> NOTE: Storage was computed to reduce the Inflow
00822>
00823> -----
00824> 011:0008-----
00825> *
00826> *
00827> -----
00828> 011:0002-----
00829> *
00830> *
00831> 011:0002-----
00832> *
00833> *
00834> 011:0002-----
00835> *
00836> *
00837> 011:0002-----
00838> *
00839> FINISH
00840> -----
00841> -----
00842> WARNINGS / ERRORS / NOTES
00843> -----
00844> Simulation ended on 2008-07-03 at 10:35:26
00845> -----
00846>

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00901> 2 Metric units
00902> -----
00903> *# Project Name: BRT WEST - Outlet 3 JOB NUMBER: 6964 *
00904> *# Date : JUNE-25-2008 *
00905> *# Modeler : [jrm] *
00906> *# Company : McCormick Rankin Corporation *
00907> *# License # : 4313781 *
00908> *# *
00909> *# *
00910> *# EXISTING DRAINAGE CONDITIONS TO OUTLET 3 *
00911> *# 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms *
00912> *# *
00913> *# -----
00914> *# -----
00915> *#
00916> *#
00917> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=001*
00918> CHIC25mm.stm
00919> *
00920> READ STORM STORM_FILENAME='STORM.001'
00921> *
00922> *
00923> *
00924> *
00925> CALIB NASHYD ID=[1], NHYD=['3.1'], DT=[2]min, AREA=[8.60] (ha),
00926> DWP=[0.60] (cms), CN/Cr=[79], IA=[6.70] (mm),
00927> N=[1], TP=[0.50] hrs,
00928> END=-1
00929> *
00930> CALIB STANDHYD ID=[2], NHYD=['3.2'], DT=[2] (min), AREA=[3.2] (ha),
00931> XIMP=[0.20], TIMP=[0.20], DWF=[0] (cms), LOSS=[2],
00932> SCS curve number CN=[79],
00933> Pervious surfaces: IAPer=[5.0] (mm), SLP=[2.0] (%),
00934> PerVIOUS surfaces: LQP=[5] (m), MNP=[0.35], SCP=[0] (min),
00935> Impervious surfaces: IAImp=[2] (mm), SLP1=[1.0] (%),
00936> LGI=[1000] (m), MNI=[0.015], SCI=[0] (min)
00937> END=-1
00938> *
00939> ADD HYD IDsum=[9], NHYD=['OUT3'],
00940> IDa to add=1.2
00941> *
00942> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=008
00943> 12hrsCS2.stm
00944> *
00945> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=009
00946> 12hrsCS10.stm
00947> *
00948> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=010
00949> 12hrsCS50.stm
00950> *
00951> START TIME= 0 METOUT= 0 NSTORM=1 NRUN=011
00952> 12scsh.stm
00953> *
00954> *
00955> FINISH
00956>
00957>
00958>
00959>
00960>
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00541> ID1 01:3.1 8.60 .659 6.40 52.40 .000
00542> +ID2 02:3.2 3.20 .418 6.07 62.22 .000
00543> *****
00544> SUM 09:OUT3 11.80 .977 6.20 55.07 .000
00545>
00546> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00547>
00548>
00549> 010:0006-----
00550>
00551> 010:0002-----
00552> *
00553>
00554> 010:0002-----
00555> *
00556>
00557> 010:0002-----
00558> *
00559> ** END OF RUN : 10
00560>
00561> *****
00562>
00563>
00564>
00565>
00566>
00567>
00568> | START | Project dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00569> | Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00570> TZERO = 00 hrs on 0
00571> METOUT= 2 (output = METRIC)
00572> NRUN = 011
00573> NSTORM= 1
00574> # 1:12scsh.stm
00575>
00576> 011:0002-----
00577> *****
00578> # Project Name: BRT WEST - Outlet 3 JOB NUMBER: [6964] *
00579> # Date : JUNE-25-2008 *
00580> # Modeller : [jrm] *
00581> # Company : McCormick Rankin Corporation *
00582> # License # : 413781 *
00583> # *
00584> # *
00585> # EXISTING DRAINAGE CONDITIONS TO OUTLET 3
00586> # 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00587> # *
00588> # *
00589> # *
00590> *
00591> *
00592>
00593> 011:0002-----
00594> *
00595> *
00596> | READ STORM | Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\1
00597> | Ptotal= 108.60 mm | Comments: 100 Yr-12hr SCS
00598>
00599>
00600>
00601> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00602> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00603> .17 3.258 | 3.17 4.344 | 6.17 23.675 | 9.17 3.258
00604> .33 3.258 | 3.33 4.344 | 6.33 23.675 | 9.33 3.258
00605> .50 3.258 | 3.50 4.344 | 6.50 23.675 | 9.50 3.258
00606> .67 3.520 | 3.67 4.344 | 6.67 10.426 | 9.67 2.606
00607> .83 3.520 | 3.83 4.344 | 6.83 10.426 | 9.83 2.606
00608> 1.00 3.520 | 4.00 4.344 | 7.00 10.426 | 10.00 2.606
00609> 1.17 2.824 | 4.17 5.864 | 7.17 6.950 | 10.17 3.692
00610> 1.33 2.824 | 4.33 5.864 | 7.33 6.950 | 10.33 3.692
00611> 1.50 2.824 | 4.50 5.864 | 7.50 6.950 | 10.50 3.692
00612> 1.67 2.824 | 4.67 7.385 | 7.67 6.082 | 10.67 2.389
00613> 1.83 2.824 | 4.83 7.385 | 7.83 6.082 | 10.83 2.389
00614> 2.00 2.824 | 5.00 7.385 | 8.00 6.082 | 11.00 2.389
00615> 2.17 3.692 | 5.17 11.729 | 8.17 6.778 | 11.17 2.172
00616> 2.33 3.692 | 5.33 11.729 | 8.33 4.778 | 11.33 2.172
00617> 2.50 3.692 | 5.50 11.729 | 8.50 4.778 | 11.50 2.172
00618> 2.67 3.258 | 5.67 92.962 | 8.67 4.996 | 11.67 2.172
00619> 2.83 3.258 | 5.83 92.962 | 8.83 4.996 | 11.83 2.172
00620> 3.00 3.258 | 6.00 92.962 | 9.00 4.996 | 12.00 2.172
00621>
00622>
00623>
00624>
00625> | CALIB NASHVD | Area (ha)= 8.60 Curve Number (CN)=79.00
00626> | 01:3.1 DT= 2.00 | Ia (mm)= 6.700 # of Linear Res.(N)= 3.00
00627> | U.H. Tp(hrs)= .500
00628>
00629>
00630> Unit Hyd Qpeak (cms)= .657
00631>
00632> PEAK FLOW (cms)= .774 (i)
00633> TIME TO PEAK (hrs)= 6.400
00634> RUNOFF VOLUME (mm)= 61.289
00635> TOTAL RAINFALL (mm)= 108.600
00636> RUNOFF COEFFICIENT = .564
00637>
00638> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00639>
00640>
00641> 011:0004-----
00642> *
00643>
00644> | CALIB STANHYD | Area (ha)= 3.20
00645> | 02:3.2 DT= 2.00 | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00
00646>
00647>
00648> IMPERVIOUS PERVIOUS (i)
00649> Surface Area (ha)= .64 2.56
00650> Dep. Storage (mm)= 2.00 5.00
00651> Average Slope (V)= 1.00 2.00
00652> Length (m)= 1000.00 5.00
00653> Mannings n = .015 .350
00654>
00655> Max. eff. Inten. (mm/hr)= 92.96 65.04
00656> over (min) over (min) 12.00 14.00
00657> Storage Coeff. (min)= 11.41 (ii) 14.36 (ii)
00658> Unit Hyd. Tpeak (min)= 12.00 14.00
00659> Unit Hyd. peak (cms)= .10 .08
00660>
00661> PEAK FLOW (cms)= .15 .35 *TOTALS*
00662> TIME TO PEAK (hrs)= 6.03 6.10 6.067
00663> RUNOFF VOLUME (mm)= 106.60 62.72 71.498
00664> TOTAL RAINFALL (mm)= 108.60 108.60 108.600
00665> RUNOFF COEFFICIENT = .98 .58 .658
00666>
00667> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES.
00668> CN= 79.0 Ia = Dep. Storage (Above)
00669> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00670> THAN THE STORAGE COEFFICIENT.
00671> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00672>
00673>
00674>
00675>

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00676> | ADD HYD (OUT3 ) | ID: NHYD AREA OPEAK TPEAK R.V. DMF
00677> (ha) (cms) (hrs) (mm) (cms)
00678> ID1 01:3.1 8.60 .774 6.40 61.29 .000
00679> +ID2 02:3.2 3.20 .497 6.07 71.50 .000
00680> *****
00681> SUM 09:OUT3 11.80 1.339 6.17 64.06 .000
00682>
00683> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00684>
00685>
00686> 011:0006-----
00687>
00688> 011:0002-----
00689> *
00690>
00691> 011:0002-----
00692> *
00693>
00694> 011:0002-----
00695> *
00696>
00697> 011:0002-----
00698> *
00699> FINISH
00700>
00701> *****
00702> WARNINGS / ERRORS / NOTES
00703>
00704> Simulation ended on 2008-07-03 at 10:38:23
00705>
00706>

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**APPENDIX B
PROPOSED CONDITIONS SWMHYMO MODELING**

Subcatchment I.D.	Instantaneous Unit Hydrograph Classification	Drainage Area (ha)	Imperviousness (%)		SCS Curve Number	Initial Abstraction (mm)		Manning's 'n'		Time to Peak (hours)	Number of Linear Reservoirs	Flow Length (m)		Slope (%)	
			Direct	Indirect		Total	Impervious	Pervious	Impervious			Pervious	Impervious	Pervious	
			5	0		=	6.5	n/a	n/a			1.1	3	n/a	n/a
1.10	Nash	12.3	5	0	=	5	6.5	n/a	n/a	1.1	3	n/a	n/a	n/a	n/a
1.11	Standard	2.8	99	0	=	99	5.0	0.015	0.015	n/a	n/a	40	137	2.00	1.00
1.12	Nash	1.00	5	0	=	5	6.5	n/a	n/a	0.2	3	n/a	n/a	n/a	n/a
1.13	Standard	0.50	99	0	=	99	5.0	0.015	0.015	n/a	n/a	5	330	2.00	1.00
1.20	Nash	0.65	5	0	=	5	6.5	n/a	n/a	0.3	3	n/a	n/a	n/a	n/a
1.30	Nash	1.20	5	0	=	5	6.5	n/a	n/a	0.1	3	n/a	n/a	n/a	n/a
1.31	Nash	1.00	5	0	=	5	6.5	n/a	n/a	0.1	3	n/a	n/a	n/a	n/a
1.32	Nash	0.60	5	0	=	5	6.5	n/a	n/a	0.2	3	n/a	n/a	n/a	n/a
1.33	Nash	1.10	15	0	=	15	6.0	n/a	n/a	0.2	3	n/a	n/a	n/a	n/a
1.40	Nash	4.30	0	0	=	0	6.8	n/a	n/a	0.3	3	n/a	n/a	n/a	n/a
1.41	Nash	0.60	5	0	=	5	6.5	n/a	n/a	0.1	3	n/a	n/a	n/a	n/a
2.10	Nash	5.20	2	0	=	2	6.7	n/a	n/a	0.5	3	n/a	n/a	n/a	n/a
2.11	Standard	0.55	99	0	=	99	5.0	0.015	0.015	n/a	n/a	40	61	2.00	1.00
2.12	Nash	2.70	15	0	=	15	6.0	n/a	n/a	0.5	3	n/a	n/a	n/a	n/a
2.13	Standard	0.72	99	0	=	99	5.0	0.015	0.015	n/a	n/a	5	550	2.00	1.00
2.20	Nash	3.40	0	0	=	0	6.8	n/a	n/a	0.2	3	n/a	n/a	n/a	n/a
3.10	Nash	3.30	0	0	=	0	6.8	n/a	n/a	0.5	3	n/a	n/a	n/a	n/a
3.11	Standard	3.90	99	0	=	99	5.0	0.015	0.015	n/a	n/a	5	40	2.00	1.00
3.20	Standard	4.40	20	0	=	20	5.0	0.015	0.015	n/a	n/a	5	1,000	2.00	1.00
MTO103	Standard	9.80	70	0	=	70	5.0	0.015	0.015	n/a	n/a	40	256	2.00	1.00

Notes:
 Catchment MTO103 represents the portion of Catchment 103 identified in Highway 403 Drainage and SWM Report, (Winter Environmental Consulting, October 2001) that drains to the MTO Sawmill Creek SWM facility that is not accounted for in the catchments identified for this study.

K:\Projects\6900-6999\6964 - Mississauga BRT Preliminary Design\21 - Hydrology\6964-WEST Proposed SWMHYMO Parameters\km-24\June2008.xls

K:\Projects\6900-6999\6964 - Mississauga BRT Preliminary Des		6964 - BRT WEST - Proposed Outlet 1	
00001	2	00136	(cms) - (ha-m)
00002	*****	00137	[0.0, 0.0]
00003	MISSISSAUGA BRT - EAST	00138	[0.004, 0.0160]
00004	PROPOSED CONDITIONS	00139	[0.009, 0.1804]
00005	*****	00140	[1.011, 0.2654]
00006	*****	00141	[2.144, 0.3589]
00007	2, 5, 10, 25, 50 and 100yr, 3hr Design Storms (Chicago)	00142	[1, 1, 1] (max twenty pts)
00008	2, 15, 50 and 100yr, 12hr Design Storms (SCS)	00143	IDOVF=[8], NHYDOV=[19,1]
00009	25 mm 4 hr Chicago	00144	*****
00010	Rainfall depths estimated based on MTO Toronto(A)- applicable to basins	00145	COMPUTE VOLUME
00011	west of and including Toronto	00146	ID=9 STRATE=100 RELRATE=0.0
00012	*****	00147	CALIB STANDHYD
00013	*****	00148	ID=1 NHYD=[5.5], DT=[2] (min), AREA=[377.4] (ha),
00014	*****	00149	XIMP=[0.48], TIMP=[0.60], DWF=[0] (cms), LOSS=[2],
00015	*****	00150	SCS curve number CN=[83],
00016	*****	00151	Pervious surfaces: IAPER=[5] (mm), SLPP=[2] (%),
00017	*****	00152	LOP=[10] (m), MNP=[.35], SCP=[0] (min),
00018	*****	00153	Pervious surfaces: IAPER=[2] (mm), SLPP=[1] (%),
00019	*****	00154	LOP=[10] (m), MNP=[.35], SCP=[0] (min),
00020	*****	00155	RAINFALL=[. . .] (mm/hr), END=-1
00021	*****	00156	*****
00022	*****	00157	*****
00023	*****	00158	*****
00024	*****	00159	*****
00025	CALIB NASHYD	00160	START
00026	ID=1 NHYD=[5.1], DT=[2] (min), AREA=[24.1] (ha),	00161	CH12yr.stm
00027	DWF=[0] (cms), CN/C=[82], IA=[6.0] (mm),	00162	*****
00028	M=[3], TP=[0.3] hrs,	00163	START
00029	*****	00164	TIME=0 METOUT=0 NSTORM=1 NRUN=003
00030	CALIB STANDHYD	00165	CH15yr.stm
00031	ID=2 NHYD=[5.2], DT=[2] (min), AREA=[3.48] (ha),	00166	START
00032	XIMP=[0.45], TIMP=[0.45], DWF=[0] (cms), LOSS=[2],	00167	TIME=0 METOUT=0 NSTORM=1 NRUN=004
00033	SCS curve number CN=[79],	00168	CH15yr.stm
00034	Pervious surfaces: IAPER=[5] (mm), SLPP=[2] (%),	00169	START
00035	LOP=[5] (m), MNP=[.35], SCP=[0] (min),	00170	TIME=0 METOUT=0 NSTORM=1 NRUN=005
00036	Impervious surfaces: IAPER=[2] (mm), SLPP=[1] (%),	00171	CH15yr.stm
00037	LOP=[1000] (m), MNP=[.015], SCI=[0] (min),	00172	START
00038	RAINFALL=[. . .] (mm/hr), END=-1	00173	TIME=0 METOUT=0 NSTORM=1 NRUN=006
00039	CALIB NASHYD	00174	CH15yr.stm
00040	ID=3 NHYD=[5.2], DT=[2] (min), AREA=[2.69] (ha),	00175	START
00041	DWF=[0] (cms), CN/C=[79], IA=[6.8] (mm),	00176	TIME=0 METOUT=0 NSTORM=1 NRUN=007
00042	M=[3], TP=[0.3] hrs,	00177	CH100yr.stm
00043	*****	00178	START
00044	CALIB NASHYD	00179	TIME=0 METOUT=0 NSTORM=1 NRUN=008
00045	ID=4 NHYD=[5.2], DT=[2] (min), AREA=[0.64] (ha),	00180	12hrsc2.stm
00046	DWF=[0] (cms), CN/C=[79], IA=[6.8] (mm),	00181	START
00047	M=[3], TP=[0.3] hrs,	00182	TIME=0 METOUT=0 NSTORM=1 NRUN=009
00048	*****	00183	12hrsc10.stm
00049	ADD HYD	00184	START
00050	IDsum=[10], NHYD=[800], IDs to add=[1,2,3,4]	00185	TIME=0 METOUT=0 NSTORM=1 NRUN=010
00051	CALIB STANDHYD	00186	12hrsc5.stm
00052	ID=1 NHYD=[5.2], DT=[2] (min), AREA=[1.15] (ha),	00187	START
00053	XIMP=[0.99], TIMP=[0.99], DWF=[0] (cms), LOSS=[2],	00188	TIME=0 METOUT=0 NSTORM=1 NRUN=011
00054	SCS curve number CN=[79],	00189	12hrsc8.stm
00055	Pervious surfaces: IAPER=[0.3] (mm), SLPP=[2] (%),	00190	START
00056	LOP=[5] (m), MNP=[.35], SCP=[0] (min),	00191	TIME=0 METOUT=0 NSTORM=1 NRUN=012
00057	Impervious surfaces: IAPER=[2] (mm), SLPP=[1] (%),	00192	12hrsc9.stm
00058	LOP=[1000] (m), MNP=[.015], SCI=[0] (min),	00193	FINISH
00059	*****	00194	*****
00060	COMPUTE DUALHYD	00195	*****
00061	IDIN=[1], CINLET=[0.17] (cms), NINLET=[1],	00196	*****
00062	MNID=[9], MANNHYD=[5.2],	00197	*****
00063	MNID=[1], MANNHYD=[5.2],	00198	*****
00064	*****	00199	*****
00065	*****	00200	*****
00066	*****	00201	*****
00067	*****	00202	*****
00068	*****	00203	*****
00069	*****	00204	*****
00070	*****	00205	*****
00071	*****	00206	*****
00072	*****	00207	*****
00073	*****	00208	*****
00074	*****	00209	*****
00075	*****	00210	*****
00076	*****	00211	*****
00077	ADD HYD	00212	*****
00078	*****	00213	*****
00079	CALIB NASHYD	00214	*****
00080	ID=1 NHYD=[5.4], DT=[2] (min), AREA=[2.35] (ha),	00215	*****
00081	DWF=[0] (cms), CN/C=[79], IA=[6.8] (mm),	00216	*****
00082	M=[3], TP=[0.3] hrs,	00217	*****
00083	*****	00218	*****
00084	CALIB NASHYD	00219	*****
00085	ID=2 NHYD=[5.4], DT=[2] (min), AREA=[0.55] (ha),	00220	*****
00086	DWF=[0] (cms), CN/C=[79], IA=[6.8] (mm),	00221	*****
00087	M=[3], TP=[0.3] hrs,	00222	*****
00088	*****	00223	*****
00089	CALIB NASHYD	00224	*****
00090	ID=3 NHYD=[5.4], DT=[2] (min), AREA=[1.72] (ha),	00225	*****
00091	DWF=[0] (cms), CN/C=[82], IA=[6.0] (mm),	00226	*****
00092	M=[3], TP=[0.3] hrs,	00227	*****
00093	*****	00228	*****
00094	CALIB NASHYD	00229	*****
00095	ID=4 NHYD=[5.4], DT=[2] (min), AREA=[8.31] (ha),	00230	*****
00096	DWF=[0] (cms), CN/C=[79], IA=[6.8] (mm),	00231	*****
00097	M=[3], TP=[0.3] hrs,	00232	*****
00098	*****	00233	*****
00099	CALIB STANDHYD	00234	*****
00100	ID=5 NHYD=[5.3], DT=[2] (min), AREA=[3.38] (ha),	00235	*****
00101	XIMP=[0.99], TIMP=[0.99], DWF=[0] (cms), LOSS=[2],	00236	*****
00102	SCS curve number CN=[79],	00237	*****
00103	Pervious surfaces: IAPER=[5] (mm), SLPP=[2] (%),	00238	*****
00104	LOP=[5] (m), MNP=[.35], SCP=[0] (min),	00239	*****
00105	Impervious surfaces: IAPER=[2] (mm), SLPP=[1] (%),	00240	*****
00106	LOP=[1000] (m), MNP=[.015], SCI=[0] (min),	00241	*****
00107	RAINFALL=[. . .] (mm/hr), END=-1	00242	*****
00108	CALIB NASHYD	00243	*****
00109	ID=6 NHYD=[5.3], DT=[2] (min), AREA=[0.98] (ha),	00244	*****
00110	DWF=[0] (cms), CN/C=[79], IA=[6.8] (mm),	00245	*****
00111	M=[3], TP=[0.3] hrs,	00246	*****
00112	*****	00247	*****
00113	ADD HYD	00248	*****
00114	*****	00249	*****
00115	CALIB STANDHYD	00250	*****
00116	ID=1 NHYD=[5.3], DT=[2] (min), AREA=[1.04] (ha),	00251	*****
00117	XIMP=[0.99], TIMP=[0.99], DWF=[0] (cms), LOSS=[2],	00252	*****
00118	SCS curve number CN=[79],	00253	*****
00119	Pervious surfaces: IAPER=[5] (mm), SLPP=[2] (%),	00254	*****
00120	LOP=[2] (m), MNP=[.35], SCP=[0] (min),	00255	*****
00121	Impervious surfaces: IAPER=[2] (mm), SLPP=[1] (%),	00256	*****
00122	LOP=[1000] (m), MNP=[.015], SCI=[0] (min),	00257	*****
00123	RAINFALL=[. . .] (mm/hr), END=-1	00258	*****
00124	ADD HYD	00259	*****
00125	*****	00260	*****
00126	ADD HYD	00261	*****
00127	*****	00262	*****
00128	COMPUTE VOLUME	00263	*****
00129	ID=6 STRATE=100 RELRATE=0.0	00264	*****
00130	*****	00265	*****
00131	*****	00266	*****
00132	*****	00267	*****
00133	*****	00268	*****
00134	*****	00269	*****
00135	*****	00270	*****


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00541> NRUN - oos
00542> HSTORAK # 12hrs2.stm
00543>
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00545> 008:002
00546>
00547> MISSISSAUGA BRT WEST
00548> Proposed CONDITIONS TO OUTLET #1 JOB: 0694
00549>
00550>
00551> 2, 10, 50 and 100yr, 12hr Design Storms (SCS)
00552> 25 mm 4 hr Chicago
00553> Rainfall depths estimated based on Toronto Pearson
00554> west of and including Toronto
00555> K. Macnaughton
00556> As of: June 27, 2008
00557>
00558>
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00560>
00561> 008:002
00562>
00563>
00564> READ STORM Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\1
00565> Ptotal= 43.80 mm Comments: 2 Yr-12hr SCS
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00811> PEAK FLOW (cms) = .917 (i)
00812> TIME TO PEAK (hrs) = 6.167
00813> RUNOFF VOLUME (mm) = 13.802
00814> TOTAL RAINFALL (mm) = 43.799
00815> RUNOFF COEFFICIENT = .315
00816>
00817> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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01081	1.83	1.890	4.83	4.944	7.83	4.071	10.83	1.599	
01082	2.00	1.890	5.00	4.944	8.00	4.071	11.00	1.599	
01083	2.17	2.472	5.17	7.852	8.17	3.199	11.17	1.454	
01084	2.33	2.472	5.33	7.852	8.33	3.199	11.33	1.454	
01085	2.50	2.472	5.50	7.852	8.50	3.199	11.50	1.454	
01086	2.67	2.181	5.67	62.231	8.67	3.344	11.67	1.454	
01087	2.83	2.181	5.83	62.231	8.83	3.344	11.83	1.454	
01088	3.00	2.181	6.00	62.231	9.00	3.344	12.00	1.454	
01089									
01090									
01091	009:0003								
01092									
01093									
01094	CALIB STANDHYD								
01095	01:11.11	DT= 2.00	Area (ha)=	2.80	Curve Number (CN)=80.00	Total Imp(%)=	99.00	Dir. Conn.(%)=	99.00
01096	IMPERVIOUS PERVIOUS (I)								
01097	Surface Area (ha)=	2.77	.03						
01098	Dep. Storage (mm)=	2.00	5.00						
01099	Average Slope (%)=	1.00	2.00						
01100	Length (m)=	137.00	40.00						
01101	Manning's n =	.015	.350						
01102									
01103	Max. eff. Inten. (mm/hr)=	62.23	61.23						
01104	over (min)=	4.00	14.00						
01105	Storage Coeff. (min)=	4.06 (ii)	14.58 (ii)						
01106	Unit Hyd. Tpeak (min)=	4.00	14.00						
01107	Unit Hyd. Tpeak (min)=	.28	.08						
01108									
01109									
01110	PEAK FLOW (cms)=	.48	.00	.483 (iii)					
01111	TIME TO PEAK (hrs)=	6.00	6.00						
01112	RUNOFF VOLUME (mm)=	70.70	62.89	70.42					
01113	TOTAL RAINFALL (mm)=	72.70	72.70	72.70					
01114	RUNOFF COEFFICIENT =	.97	.47						
01115									
01116	(i) ON PROCEDURE SELECTED FOR PVIOUS LOSSES.								
01117	CN = 79.0 I = Dep. Storage (Above)								
01118	(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL								
01119	THAN THE STORAGE COEFFICIENT.								
01120	(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.								
01121									
01122	009:0004								
01123									
01124									
01125	COMPUTE VOLUME								
01126	01:01	DT= 1.11	DISCHARGE	TIME					
01127	(cms)	(hrs)							
01128	START CONTROLLING AT	.000	1.390						
01129	INFLOW HYD. PEAK AT	.483	6.000						
01130	STOP CONTROLLING AT	.000	.000						
01131	REQUIRED STORAGE VOLUME (ha.m.)=	1.977							
01132	TOTAL HYDROGRAPH VOLUME (ha.m.)=	1.977							
01133	% OF HYDROGRAPH TO STORE =	99.9996							
01134									
01135									
01136	NOTE: Storage was computed to reduce the Inflow								
01137									
01138									
01139									
01140	009:0005								
01141	Parking lot storage								
01142	Requested routing time step = 2.0 min.								
01143	ROUTE RESERVOIR								
01144	01:01	DT= 1.11	OUTFLOW STORAGE TABLE						
01145	(cms)	(ha.m.)	OUTFLOW STORAGE	OUTFLOW STORAGE					
01146	.000	.0000E+00	150	1500E+00					
01147	.025	2.500E-01	200	2000E+00					
01148	.100	1.000E-01	800	8000E+00					
01149									
01150									
01151	ROUTING RESULTS								
01152	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)					
01153	INFLW @01 (1.11)	2.80	4.83	6.000	70.622				
01154	OUTFLOW@01 (7.10)	2.80	1.23	6.500	70.622				
01155									
01156	PEAK FLOW REDUCTION [Qout/Qin] (%) =	35.43							
01157	TIME SHIFT OF PEAK FLOW (min) =	20.00							
01158	MAXIMUM STORAGE USED (ha.m.) =	.95398-01							
01159									
01160									
01161									
01162	009:0006								
01163									
01164									
01165	CALIB NASHYD								
01166	01:11.12	DT= 2.00	Area (ha)=	1.00	Curve Number (CN)=80.00	Total Imp(%)=	99.00	Dir. Conn.(%)=	99.00
01167	IMPERVIOUS PERVIOUS (I)								
01168	Surface Area (ha)=	.99	.01						
01169	Dep. Storage (mm)=	.081	1.00						
01170	Average Slope (%)=	1.00	2.00						
01171	Length (m)=	33.789	40.00						
01172	Manning's n =	.015	.350						
01173	Max. eff. Inten. (mm/hr)=	62.23	61.23						
01174	over (min)=	4.00	14.00						
01175	Storage Coeff. (min)=	4.06 (ii)	14.58 (ii)						
01176	Unit Hyd. Tpeak (min)=	4.00	14.00						
01177	Unit Hyd. Tpeak (min)=	.28	.08						
01178									
01179									
01180	PEAK FLOW (cms)=	.081 (i)							
01181	TIME TO PEAK (hrs)=	6.007							
01182	RUNOFF VOLUME (mm)=	33.789							
01183	TOTAL RAINFALL (mm)=	72.700							
01184	RUNOFF COEFFICIENT =	.465							
01185									
01186	(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.								
01187									
01188									
01189									
01190									
01191									
01192									
01193	009:0008								
01194									
01195									
01196	CALIB NASHYD								
01197	01:1.1	DT= 2.00	Area (ha)=	1.20	Curve Number (CN)=80.00	Total Imp(%)=	99.00	Dir. Conn.(%)=	99.00
01198	IMPERVIOUS PERVIOUS (I)								
01199	Surface Area (ha)=	1.19	.01						
01200	Dep. Storage (mm)=	1.13	1.00						
01201	Average Slope (%)=	1.00	2.00						
01202	Length (m)=	113 (i)	40.00						
01203	Manning's n =	.015	.350						
01204	Max. eff. Inten. (mm/hr)=	62.23	61.23						
01205	over (min)=	4.00	14.00						
01206	Storage Coeff. (min)=	4.06 (ii)	14.58 (ii)						
01207	Unit Hyd. Tpeak (min)=	4.00	14.00						
01208	Unit Hyd. Tpeak (min)=	.28	.08						
01209									
01210	PEAK FLOW (cms)=	.458							
01211	TIME TO PEAK (hrs)=	6.000							
01212	RUNOFF VOLUME (mm)=	33.789							
01213	TOTAL RAINFALL (mm)=	72.700							
01214	RUNOFF COEFFICIENT =	.465							
01215									
01216	(i) ON PROCEDURE SELECTED FOR PVIOUS LOSSES.								
01217	CN = 79.0 I = Dep. Storage (Above)								
01218	(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL								
01219	THAN THE STORAGE COEFFICIENT.								
01220	(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.								
01221									
01222									
01223									
01224	009:0010								
01225									
01226									
01227	CALIB NASHYD								
01228	01:1.1	DT= 2.00	Area (ha)=	1.00	Curve Number (CN)=80.00	Total Imp(%)=	99.00	Dir. Conn.(%)=	99.00
01229	IMPERVIOUS PERVIOUS (I)								
01230	Surface Area (ha)=	.99	.01						
01231	Dep. Storage (mm)=	.081	1.00						
01232	Average Slope (%)=	1.00	2.00						
01233	Length (m)=	33.789	40.00						
01234	Manning's n =	.015	.350						
01235	Max. eff. Inten. (mm/hr)=	62.23	61.23						
01236	over (min)=	4.00	14.00						
01237	Storage Coeff. (min)=	4.06 (ii)	14.58 (ii)						
01238	Unit Hyd. Tpeak (min)=	4.00	14.00						
01239	Unit Hyd. Tpeak (min)=	.28	.08						
01240									
01241									
01242	PEAK FLOW (cms)=	.098 (i)							
01243	TIME TO PEAK (hrs)=	6.000							
01244	RUNOFF VOLUME (mm)=	33.789							
01245	TOTAL RAINFALL (mm)=	72.700							
01246	RUNOFF COEFFICIENT =	.465							
01247									
01248	(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.								
01249									
01250									
01251									
01252									
01253									
01254									
01255	009:0012								
01256									
01257									
01258	CALIB NASHYD								
01259	01:1.1	DT= 2.00	Area (ha)=	1.10	Curve Number (CN)=82.00	Total Imp(%)=	99.00	Dir. Conn.(%)=	99.00
01260	IMPERVIOUS PERVIOUS (I)								
01261	Surface Area (ha)=	1.09	.01						
01262	Dep. Storage (mm)=	.081	1.00						
01263	Average Slope (%)=	1.00	2.00						
01264	Length (m)=	33.789	40.00						
01265	Manning's n =	.015	.350						
01266	Max. eff. Inten. (mm/hr)=	62.23	61.23						
01267	over (min)=	4.00	14.00						

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01621 (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
01622 CN = 98.0 Ia = Dep. Storage (Above)
01623 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01624 THAN THE STORAGE COEFFICIENT.
01625 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01626
01627
01628 010:0004
01629
01630
01631 COMPUTE VOLUME
01632 ID:01 (1.11 ) DISCHARGE TIME
01633 (cms) (hrs)
01634 START CONTROLLING AT .000 .867
01635 INFLOW HYD. PEAKS AT .651 6.000
01636 STOP CONTROLLING AT .000 .000
01637
01638 REQUIRED STORAGE VOLUME (ha.m.) = 2683
01639 TOTAL HYDROGRAPH VOLUME (ha.m.) = 2683
01640 V OF HYDROGRAPH TO STORE = 99.9996
01641
01642 NOTE: Storage was computed to reduce the Inflow
01643
01644
01645 010:0005
01646 Parking lot storage
01647
01648 ROUTE RESERVOIR Requested routing time step = 2.0 min.
01649 IN=01 (1.11 )
01650 OUT=02 (1.00 )
01651 ***** OUTFLOW STORAGE TABLE *****
01652 OUTFLOW STORAGE OUTFLOW STORAGE
01653 (cms) (ha.m.) (cms) (ha.m.)
01654 .000 .000E+00 .000 .1500E+00
01655 .025 .250E+01 .200 .2000E+00
01656 .100 .500E+01 .000 .0000E+00
01657
01658 ROUTING RESULTS AREA OPEAK TPEAK R.V.
01659 (ha) (cms) (hrs) (mm) (cms)
01660 INFLOW >=1: (1.11 ) 2.80 .451 6.000 95.821
01661 OUTFLOW <=1: (1.00 ) 2.80 .142 6.533 95.821
01662
01663 PEAK FLOW REDUCTION (Out/In) (%) = 21.835
01664 TIME SHIFT OF PEAK FLOW (min) = 32.00
01665 MAXIMUM STORAGE USED (ha.m.) = 13425.00
01666
01667 010:0006
01668
01669 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01670 ID: 01:1.12 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01671 U.H. Tp(hrs) = .200
01672
01673 Unit Hyd Opeak (cms) = .193
01674
01675 PEAK FLOW (cms) = .133 (i)
01676 TIME TO PEAK (hrs) = 6.067
01677 RUNOFF VOLUME (mm) = 53.931
01678 TOTAL RAINFALL (mm) = 97.900
01679 RUNOFF COEFFICIENT = .551
01680
01681 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01682
01683
01684 010:0007
01685 ADD HYD (810 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01686 (ha) (cms) (hrs) (mm) (cms)
01687 ID: 01:1.12 1.20 .133 6.07 53.93 .000
01688 -ID: 02:7:10 2.80 .142 6.53 95.82 .000
01689 SUM 10:810 3.80 .268 6.07 84.80 .000
01690
01691 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01692
01693
01694 010:0008
01695 CALIB NASHYD Area (ha) = 1.20 Curve Number (CN) = 80.00
01696 ID: 01:1.12 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01697 U.H. Tp(hrs) = .100
01698
01699 Unit Hyd Opeak (cms) = .458
01700
01701 PEAK FLOW (cms) = .186 (i)
01702 TIME TO PEAK (hrs) = 6.000
01703 RUNOFF VOLUME (mm) = 53.931
01704 TOTAL RAINFALL (mm) = 97.900
01705 RUNOFF COEFFICIENT = .551
01706
01707 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01708
01709
01710 010:0009
01711 ADD HYD (820 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01712 (ha) (cms) (hrs) (mm) (cms)
01713 ID: 01:1.12 1.20 .186 6.07 53.93 .000
01714 -ID: 10:810 3.80 .268 6.07 84.80 .000
01715 SUM 09:820 5.00 .444 6.03 77.39 .000
01716
01717 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01718
01719
01720 010:0010
01721 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01722 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01723 U.H. Tp(hrs) = .100
01724
01725 Unit Hyd Opeak (cms) = .382
01726
01727 PEAK FLOW (cms) = .155 (i)
01728 TIME TO PEAK (hrs) = 6.000
01729 RUNOFF VOLUME (mm) = 53.931
01730 TOTAL RAINFALL (mm) = 97.900
01731 RUNOFF COEFFICIENT = .551
01732
01733 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01734
01735
01736 010:0011
01737 ADD HYD (830 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01738 (ha) (cms) (hrs) (mm) (cms)
01739 ID: 01:1.31 1.00 .155 6.00 53.93 .000
01740 -ID: 09:820 5.00 .444 6.03 77.39 .000
01741 SUM 10:830 6.00 .599 6.03 73.48 .000
01742
01743 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01744
01745
01746 010:0012
01747 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01748 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01749 U.H. Tp(hrs) = .100
01750
01751 Unit Hyd Opeak (cms) = .382
01752
01753 PEAK FLOW (cms) = .155 (i)
01754 TIME TO PEAK (hrs) = 6.000
01755 RUNOFF VOLUME (mm) = 53.931
01756 TOTAL RAINFALL (mm) = 97.900
01757 RUNOFF COEFFICIENT = .551
01758
01759 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01760
01761
01762 010:0013
01763 ADD HYD (840 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01764 (ha) (cms) (hrs) (mm) (cms)
01765 ID: 01:1.33 1.10 .152 6.07 56.77 .000
01766 -ID: 10:830 6.00 .599 6.00 73.48 .000
01767 SUM 09:840 7.10 .745 6.00 70.89 .000
01768
01769 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01770
01771
01772 010:0014
01773 CALIB NASHYD Area (ha) = 12.30 Curve Number (CN) = 80.00
01774 ID: 01:1.1 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01775 U.H. Tp(hrs) = 1.100
01776
01777 Unit Hyd Opeak (cms) = .427
01778
01779 PEAK FLOW (cms) = .574 (i)
01780 TIME TO PEAK (hrs) = 7.133
01781 RUNOFF VOLUME (mm) = 53.931
01782 TOTAL RAINFALL (mm) = 97.900
01783 RUNOFF COEFFICIENT = .551
01784
01785 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01786
01787
01788 010:0015
01789 CALIB NASHYD Area (ha) = .65 Curve Number (CN) = 80.00
01790 ID: 01:1.2 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01791 U.H. Tp(hrs) = .300
01792
01793 Unit Hyd Opeak (cms) = .083
01794
01795 PEAK FLOW (cms) = .070 (i)
01796 TIME TO PEAK (hrs) = 6.133
01797 RUNOFF VOLUME (mm) = 53.931
01798 TOTAL RAINFALL (mm) = 97.900
01799 RUNOFF COEFFICIENT = .551
01800
01801 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01802
01803
01804 010:0016
01805 ADD HYD (850 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01806 (ha) (cms) (hrs) (mm) (cms)
01807 ID: 01:1.1 12.30 .574 7.13 53.93 .000
01808 -ID: 02:1:2 2.00 .142 6.53 95.82 .000
01809 SUM 10:850 14.30 .716 7.07 53.93 .000
01810
01811 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01812
01813
01814 010:0017
01815 CALIB NASHYD Area (ha) = .65 Curve Number (CN) = 80.00
01816 ID: 01:1.2 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01817 U.H. Tp(hrs) = .300
01818
01819 Unit Hyd Opeak (cms) = .083
01820
01821 PEAK FLOW (cms) = .070 (i)
01822 TIME TO PEAK (hrs) = 6.133
01823 RUNOFF VOLUME (mm) = 53.931
01824 TOTAL RAINFALL (mm) = 97.900
01825 RUNOFF COEFFICIENT = .551
01826
01827 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01828
01829
01830 010:0018
01831 ADD HYD (860 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01832 (ha) (cms) (hrs) (mm) (cms)
01833 ID: 01:1.1 12.30 .574 7.13 53.93 .000
01834 -ID: 02:1:2 2.00 .142 6.53 95.82 .000
01835 SUM 09:860 14.30 .716 7.07 53.93 .000
01836
01837 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01838
01839
01840 010:0019
01841 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01842 ID: 01:1.32 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01843 U.H. Tp(hrs) = .200
01844
01845 Unit Hyd Opeak (cms) = .115
01846
01847 PEAK FLOW (cms) = .079 (i)
01848 TIME TO PEAK (hrs) = 6.067
01849 RUNOFF VOLUME (mm) = 53.931
01850 TOTAL RAINFALL (mm) = 97.900
01851 RUNOFF COEFFICIENT = .551
01852
01853 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01854
01855
01856 010:0020
01857 ADD HYD (870 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01858 (ha) (cms) (hrs) (mm) (cms)
01859 ID: 01:1.32 1.00 .115 6.00 53.93 .000
01860 -ID: 10:860 6.00 .599 6.03 73.48 .000
01861 SUM 09:870 7.00 .714 6.03 59.76 .000
01862
01863 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01864
01865
01866 010:0021
01867 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01868 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01869 U.H. Tp(hrs) = .100
01870
01871 Unit Hyd Opeak (cms) = .382
01872
01873 PEAK FLOW (cms) = .155 (i)
01874 TIME TO PEAK (hrs) = 6.000
01875 RUNOFF VOLUME (mm) = 53.931
01876 TOTAL RAINFALL (mm) = 97.900
01877 RUNOFF COEFFICIENT = .551
01878
01879 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01880
01881
01882 010:0022
01883 ADD HYD (880 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01884 (ha) (cms) (hrs) (mm) (cms)
01885 ID: 01:1.31 1.00 .155 6.00 53.93 .000
01886 -ID: 09:870 6.00 .599 6.03 73.48 .000
01887 SUM 10:880 7.00 .714 6.03 59.76 .000
01888
01889 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01890
01891
01892 010:0023
01893 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01894 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01895 U.H. Tp(hrs) = .100
01896
01897 Unit Hyd Opeak (cms) = .382
01898
01899 PEAK FLOW (cms) = .155 (i)
01900 TIME TO PEAK (hrs) = 6.000
01901 RUNOFF VOLUME (mm) = 53.931
01902 TOTAL RAINFALL (mm) = 97.900
01903 RUNOFF COEFFICIENT = .551
01904
01905 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01906
01907
01908 010:0024
01909 ADD HYD (890 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01910 (ha) (cms) (hrs) (mm) (cms)
01911 ID: 01:1.31 1.00 .155 6.00 53.93 .000
01912 -ID: 09:880 6.00 .599 6.03 73.48 .000
01913 SUM 10:890 7.00 .714 6.03 59.76 .000
01914
01915 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01916
01917
01918 010:0025
01919 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01920 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01921 U.H. Tp(hrs) = .100
01922
01923 Unit Hyd Opeak (cms) = .382
01924
01925 PEAK FLOW (cms) = .155 (i)
01926 TIME TO PEAK (hrs) = 6.000
01927 RUNOFF VOLUME (mm) = 53.931
01928 TOTAL RAINFALL (mm) = 97.900
01929 RUNOFF COEFFICIENT = .551
01930
01931 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01932
01933
01934 010:0026
01935 ADD HYD (900 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01936 (ha) (cms) (hrs) (mm) (cms)
01937 ID: 01:1.31 1.00 .155 6.00 53.93 .000
01938 -ID: 09:890 6.00 .599 6.03 73.48 .000
01939 SUM 10:900 7.00 .714 6.03 59.76 .000
01940
01941 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01942
01943
01944 010:0027
01945 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01946 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01947 U.H. Tp(hrs) = .100
01948
01949 Unit Hyd Opeak (cms) = .382
01950
01951 PEAK FLOW (cms) = .155 (i)
01952 TIME TO PEAK (hrs) = 6.000
01953 RUNOFF VOLUME (mm) = 53.931
01954 TOTAL RAINFALL (mm) = 97.900
01955 RUNOFF COEFFICIENT = .551
01956
01957 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01958
01959
01960 010:0028
01961 ADD HYD (910 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01962 (ha) (cms) (hrs) (mm) (cms)
01963 ID: 01:1.31 1.00 .155 6.00 53.93 .000
01964 -ID: 09:900 6.00 .599 6.03 73.48 .000
01965 SUM 10:910 7.00 .714 6.03 59.76 .000
01966
01967 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01968
01969
01970 010:0029
01971 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01972 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01973 U.H. Tp(hrs) = .100
01974
01975 Unit Hyd Opeak (cms) = .382
01976
01977 PEAK FLOW (cms) = .155 (i)
01978 TIME TO PEAK (hrs) = 6.000
01979 RUNOFF VOLUME (mm) = 53.931
01980 TOTAL RAINFALL (mm) = 97.900
01981 RUNOFF COEFFICIENT = .551
01982
01983 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01984
01985
01986 010:0030
01987 ADD HYD (920 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
01988 (ha) (cms) (hrs) (mm) (cms)
01989 ID: 01:1.31 1.00 .155 6.00 53.93 .000
01990 -ID: 09:910 6.00 .599 6.03 73.48 .000
01991 SUM 10:920 7.00 .714 6.03 59.76 .000
01992
01993 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01994
01995
01996 010:0031
01997 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
01998 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
01999 U.H. Tp(hrs) = .100
02000
02001 Unit Hyd Opeak (cms) = .382
02002
02003 PEAK FLOW (cms) = .155 (i)
02004 TIME TO PEAK (hrs) = 6.000
02005 RUNOFF VOLUME (mm) = 53.931
02006 TOTAL RAINFALL (mm) = 97.900
02007 RUNOFF COEFFICIENT = .551
02008
02009 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02010
02011
02012 010:0032
02013 ADD HYD (930 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02014 (ha) (cms) (hrs) (mm) (cms)
02015 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02016 -ID: 09:920 6.00 .599 6.03 73.48 .000
02017 SUM 10:930 7.00 .714 6.03 59.76 .000
02018
02019 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02020
02021
02022 010:0033
02023 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02024 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02025 U.H. Tp(hrs) = .100
02026
02027 Unit Hyd Opeak (cms) = .382
02028
02029 PEAK FLOW (cms) = .155 (i)
02030 TIME TO PEAK (hrs) = 6.000
02031 RUNOFF VOLUME (mm) = 53.931
02032 TOTAL RAINFALL (mm) = 97.900
02033 RUNOFF COEFFICIENT = .551
02034
02035 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02036
02037
02038 010:0034
02039 ADD HYD (940 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02040 (ha) (cms) (hrs) (mm) (cms)
02041 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02042 -ID: 09:930 6.00 .599 6.03 73.48 .000
02043 SUM 10:940 7.00 .714 6.03 59.76 .000
02044
02045 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02046
02047
02048 010:0035
02049 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02050 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02051 U.H. Tp(hrs) = .100
02052
02053 Unit Hyd Opeak (cms) = .382
02054
02055 PEAK FLOW (cms) = .155 (i)
02056 TIME TO PEAK (hrs) = 6.000
02057 RUNOFF VOLUME (mm) = 53.931
02058 TOTAL RAINFALL (mm) = 97.900
02059 RUNOFF COEFFICIENT = .551
02060
02061 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02062
02063
02064 010:0036
02065 ADD HYD (950 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02066 (ha) (cms) (hrs) (mm) (cms)
02067 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02068 -ID: 09:940 6.00 .599 6.03 73.48 .000
02069 SUM 10:950 7.00 .714 6.03 59.76 .000
02070
02071 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02072
02073
02074 010:0037
02075 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02076 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02077 U.H. Tp(hrs) = .100
02078
02079 Unit Hyd Opeak (cms) = .382
02080
02081 PEAK FLOW (cms) = .155 (i)
02082 TIME TO PEAK (hrs) = 6.000
02083 RUNOFF VOLUME (mm) = 53.931
02084 TOTAL RAINFALL (mm) = 97.900
02085 RUNOFF COEFFICIENT = .551
02086
02087 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02088
02089
02090 010:0038
02091 ADD HYD (960 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02092 (ha) (cms) (hrs) (mm) (cms)
02093 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02094 -ID: 09:950 6.00 .599 6.03 73.48 .000
02095 SUM 10:960 7.00 .714 6.03 59.76 .000
02096
02097 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02098
02099
02100 010:0039
02101 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02102 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02103 U.H. Tp(hrs) = .100
02104
02105 Unit Hyd Opeak (cms) = .382
02106
02107 PEAK FLOW (cms) = .155 (i)
02108 TIME TO PEAK (hrs) = 6.000
02109 RUNOFF VOLUME (mm) = 53.931
02110 TOTAL RAINFALL (mm) = 97.900
02111 RUNOFF COEFFICIENT = .551
02112
02113 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02114
02115
02116 010:0040
02117 ADD HYD (970 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02118 (ha) (cms) (hrs) (mm) (cms)
02119 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02120 -ID: 09:960 6.00 .599 6.03 73.48 .000
02121 SUM 10:970 7.00 .714 6.03 59.76 .000
02122
02123 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02124
02125
02126 010:0041
02127 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02128 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02129 U.H. Tp(hrs) = .100
02130
02131 Unit Hyd Opeak (cms) = .382
02132
02133 PEAK FLOW (cms) = .155 (i)
02134 TIME TO PEAK (hrs) = 6.000
02135 RUNOFF VOLUME (mm) = 53.931
02136 TOTAL RAINFALL (mm) = 97.900
02137 RUNOFF COEFFICIENT = .551
02138
02139 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02140
02141
02142 010:0042
02143 ADD HYD (980 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02144 (ha) (cms) (hrs) (mm) (cms)
02145 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02146 -ID: 09:970 6.00 .599 6.03 73.48 .000
02147 SUM 10:980 7.00 .714 6.03 59.76 .000
02148
02149 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02150
02151
02152 010:0043
02153 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02154 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02155 U.H. Tp(hrs) = .100
02156
02157 Unit Hyd Opeak (cms) = .382
02158
02159 PEAK FLOW (cms) = .155 (i)
02160 TIME TO PEAK (hrs) = 6.000
02161 RUNOFF VOLUME (mm) = 53.931
02162 TOTAL RAINFALL (mm) = 97.900
02163 RUNOFF COEFFICIENT = .551
02164
02165 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02166
02167
02168 010:0044
02169 ADD HYD (990 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02170 (ha) (cms) (hrs) (mm) (cms)
02171 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02172 -ID: 09:980 6.00 .599 6.03 73.48 .000
02173 SUM 10:990 7.00 .714 6.03 59.76 .000
02174
02175 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02176
02177
02178 010:0045
02179 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02180 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02181 U.H. Tp(hrs) = .100
02182
02183 Unit Hyd Opeak (cms) = .382
02184
02185 PEAK FLOW (cms) = .155 (i)
02186 TIME TO PEAK (hrs) = 6.000
02187 RUNOFF VOLUME (mm) = 53.931
02188 TOTAL RAINFALL (mm) = 97.900
02189 RUNOFF COEFFICIENT = .551
02190
02191 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02192
02193
02194 010:0046
02195 ADD HYD (1000 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02196 (ha) (cms) (hrs) (mm) (cms)
02197 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02198 -ID: 09:990 6.00 .599 6.03 73.48 .000
02199 SUM 10:1000 7.00 .714 6.03 59.76 .000
02200
02201 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02202
02203
02204 010:0047
02205 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02206 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02207 U.H. Tp(hrs) = .100
02208
02209 Unit Hyd Opeak (cms) = .382
02210
02211 PEAK FLOW (cms) = .155 (i)
02212 TIME TO PEAK (hrs) = 6.000
02213 RUNOFF VOLUME (mm) = 53.931
02214 TOTAL RAINFALL (mm) = 97.900
02215 RUNOFF COEFFICIENT = .551
02216
02217 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02218
02219
02220 010:0048
02221 ADD HYD (1010 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02222 (ha) (cms) (hrs) (mm) (cms)
02223 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02224 -ID: 09:1000 6.00 .599 6.03 73.48 .000
02225 SUM 10:1010 7.00 .714 6.03 59.76 .000
02226
02227 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02228
02229
02230 010:0049
02231 CALIB NASHYD Area (ha) = 1.00 Curve Number (CN) = 80.00
02232 ID: 01:1.31 DT = 2.00 Ia (mm) = 6.500 # of Linear Res. (N) = 3.00
02233 U.H. Tp(hrs) = .100
02234
02235 Unit Hyd Opeak (cms) = .382
02236
02237 PEAK FLOW (cms) = .155 (i)
02238 TIME TO PEAK (hrs) = 6.000
02239 RUNOFF VOLUME (mm) = 53.931
02240 TOTAL RAINFALL (mm) = 97.900
02241 RUNOFF COEFFICIENT = .551
02242
02243 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02244
02245
02246 010:0050
02247 ADD HYD (1020 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
02248 (ha) (cms) (hrs) (mm) (cms)
02249 ID: 01:1.31 1.00 .155 6.00 53.93 .000
02250 -ID: 09:1010 6.00 .599 6.03 73.48 .000

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02161> .000 .000E+00 .150 .150E+00
02162> .025 .250E-01 .200 .200E+00
02163> .100 .100E-01 .000 .000E+00
02164>
02165> ROUTING RESULTS AREA OPEAK TPEAK R.V.
02166> (ha) (cms) (hrs) (mm)
02167> INFLOW @01 (1.11 ) 2.80 .722 6.000 106.521
02168> OUTFLOW@02 (710 ) 2.80 .150 6.533 106.520
02169>
02170> PEAK FLOW REDUCTION [Qout/Qin] (%) = 20.83
02171> TIME SHIFT OF PEAK FLOW (min) = 32.00
02172> MAXIMUM STORAGE USED (ha.m.) = 15058.00
02173>
02174>
02175> 011:0006-----
02176>
02177>
02178> | CALIB NASHYD | Area (ha)= 1.00 Curve Number (CN)=80.00
02179> | 01:1.12 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
02180> | U.H. Tp(hrs)= .200
02181>
02182> Unit Hyd Opeak (cms)= .191
02183>
02184> PEAK FLOW (cms)= .153 (i)
02185> TIME TO PEAK (hrs)= 6.067
02186> RUNOFF VOLUME (mm)= 62.949
02187> TOTAL RAINFALL (mm)= 108.600
02188> RUNOFF COEFFICIENT = .580
02189>
02190> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02191>
02192>
02193> 011:0007-----
02194>
02195>
02196> | ADD HYD (810 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02197> (ha) (cms) (hrs) (mm) (cms)
02198> ID1 01:1.12 1.00 .153 6.07 62.95 .000
02199> ID2 02:710 2.80 .150 6.53 106.52 .000
02200> SUM 10:810 3.80 .297 6.27 95.05 .000
02201>
02202>
02203> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02204>
02205>
02206> 011:0008-----
02207>
02208>
02209> | CALIB NASHYD | Area (ha)= 1.20 Curve Number (CN)=80.00
02210> | 01:1.3 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
02211> | U.H. Tp(hrs)= .100
02212>
02213> Unit Hyd Opeak (cms)= .458
02214>
02215> PEAK FLOW (cms)= .216 (i)
02216> TIME TO PEAK (hrs)= 6.000
02217> RUNOFF VOLUME (mm)= 62.949
02218> TOTAL RAINFALL (mm)= 108.600
02219> RUNOFF COEFFICIENT = .580
02220>
02221> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02222>
02223> 011:0009-----
02224>
02225>
02226> | ADD HYD (820 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02227> (ha) (cms) (hrs) (mm) (cms)
02228> ID1 01:1.3 1.20 .216 6.00 62.95 .000
02229> ID2 10:810 2.80 .297 6.07 95.05 .000
02230> SUM 09:820 5.00 .502 6.00 87.35 .000
02231>
02232>
02233> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02234>
02235>
02236> 011:0010-----
02237>
02238>
02239> | CALIB NASHYD | Area (ha)= 1.00 Curve Number (CN)=80.00
02240> | 01:1.31 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
02241> | U.H. Tp(hrs)= .100
02242>
02243> Unit Hyd Opeak (cms)= .382
02244>
02245> PEAK FLOW (cms)= .180 (i)
02246> TIME TO PEAK (hrs)= 6.000
02247> RUNOFF VOLUME (mm)= 62.949
02248> TOTAL RAINFALL (mm)= 108.600
02249> RUNOFF COEFFICIENT = .580
02250>
02251> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02252>
02253>
02254> 011:0011-----
02255>
02256>
02257>
02258> | ADD HYD (830 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02259> (ha) (cms) (hrs) (mm) (cms)
02260> ID1 01:1.31 1.00 .180 6.00 62.95 .000
02261> ID2 09:820 5.00 .502 6.00 87.35 .000
02262> SUM 10:830 6.00 .682 6.00 83.28 .000
02263>
02264>
02265> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02266>
02267>
02268> 011:0012-----
02269>
02270>
02271> | CALIB NASHYD | Area (ha)= 1.10 Curve Number (CN)=82.00
02272> | 01:1.33 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
02273> | U.H. Tp(hrs)= .100
02274>
02275> Unit Hyd Opeak (cms)= .210
02276>
02277> PEAK FLOW (cms)= .177 (i)
02278> TIME TO PEAK (hrs)= 6.067
02279> RUNOFF VOLUME (mm)= 66.037
02280> TOTAL RAINFALL (mm)= 108.600
02281> RUNOFF COEFFICIENT = .608
02282>
02283> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02284>
02285>
02286> 011:0013-----
02287>
02288>
02289> | ADD HYD (840 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02290> (ha) (cms) (hrs) (mm) (cms)
02291> ID1 01:1.33 1.10 .177 6.07 66.04 .000
02292> ID2 10:810 6.00 .682 6.00 83.28 .000
02293> SUM 09:840 7.10 .853 6.00 80.61 .000
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02431> *
02432>
02433> | CALIB NASHYD | Area (ha)= .60 Curve Number (CN)=80.00
02434> | 02:1.41 DT= 2.00 | Ia (mm)= 6.500 # of Linear Res. (N)= 3.00
02435> | U.H. Tp(hrs)= .100
02436>
02437> Unit Hyd Opeak (cms)= .229
02438>
02439> PEAK FLOW (cms)= .108 (i)
02440> TIME TO PEAK (hrs)= 6.000
02441> RUNOFF VOLUME (mm)= 62.949
02442> TOTAL RAINFALL (mm)= 108.600
02443> RUNOFF COEFFICIENT = .580
02444>
02445> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02446>
02447>
02448> 011:0023-----
02449>
02450> * Total to Outlet 1B
02451>
02452>
02453> | ADD HYD (875 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02454> (ha) (cms) (hrs) (mm) (cms)
02455> ID1 01:1.4 4.30 .526 6.13 61.21 .000
02456> ID2 02:1.41 .60 .108 6.00 62.95 .000
02457> ID3 07:870.1 10.76 .969 6.03 69.02 .000
02458> SUM 10:875 15.66 1.552 6.07 66.64 .000
02459>
02460>
02461> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02462>
02463>
02464> 011:0024-----
02465>
02466>
02467> | CALIB STANHYD | Area (ha)= 9.80 Dir. Conn. (N)= 80.00
02468> | 01:MD103 DT= 2.00 | Total Imp(N)= 80.00
02469>
02470>
02471> Surface Area (ha)= 7.84 IMPERVIOUS PERCENT (i)
02472> Dep. Storage (mm)= 2.00 5.00
02473> Average Slope (ft)= 1.00 2.00
02474> Length (m)= 256.00 40.00
02475> Mannings n = .015 .150
02476>
02477> Max. eff. Inten. (mm/hr)= 92.96 64.25
02478> Storage (mm)= 15.00 15.00
02479> Storage Coeff. (min)= 5.04 (ii) 15.35 (iii)
02480> Unit Hyd. Tpeak (min)= 6.00 16.00
02481> Unit Hyd. peak (cms)= .21 .07
02482>
02483> PEAK FLOW (cms)= .26 *TOTALS*
02484> TIME TO PEAK (hrs)= 6.00 6.10 6.000
02485> RUNOFF VOLUME (mm)= 106.60 62.72 97.824
02486> TOTAL RAINFALL (mm)= 108.60 108.60 108.600
02487> RUNOFF COEFFICIENT = .98 .58 .901
02488>
02489> (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES.
02490> CN = 79.0 Ia = Dep. Storage (Above)
02491> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02492> THAN THE STORAGE COEFFICIENT.
02493> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02494>
02495>
02496> 011:0025-----
02497>
02498>
02499> | ADD HYD (890 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02500> (ha) (cms) (hrs) (mm) (cms)
02501> ID1 08:870.2 9.80 .252 5.60 69.02 .000
02502> ID2 01:MD103 9.80 2.255 6.00 97.82 .000
02503> SUM 09:890 19.69 2.507 6.00 83.16 .000
02504>
02505>
02506> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02507>
02508>
02509> 011:0026-----
02510>
02511> *COMPUTE VOLUME ID=3 STRATE=100 RELRATE=0.0
02512>
02513> Existing Sawmill Creek MTD Pond
02514>
02515> ROUTE RESERVOIR | Requested routing time step = 2.0 min.
02516> IN:09:180 |
02517> OUT:01:170 | ***** OUTFLOW STORAGE TABLE *****
02518> OUTFLOW STORAGE | OUTFLOW STORAGE
02519> (cms) (ha.m.) (cms) (ha.m.)
02520> .000 .000E+00 | 2.863 6631E+00
02521> .008 2389E+00 | 3.937 8236E+00
02522>
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00001> Metric units
00002> *****
00003> # Project Name BRT WEST - Outlet 2 JOB NUMBER: [6964]
00004> # Date : JUNE 25-2008
00005> # Modeler : [JRM]
00006> # Company : McCormick Rankin Corporation
00007> # License # : 4313781
00008> #
00009> #
00010> # FUTURE DRAINAGE CONDITIONS TO OUTLET 2
00011> # 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00012> #
00013> #
00014> #
00015> #
00016> #
00017> START TIME= 0 METOUT= 0 NFORM=1 NRUN=001
00018> CHIC25m.stm
00019> #
00020> READ STORM STORM_FILENAME="STORM_001"
00021> #
00022> #
00023> #
00024> # ** FUTURE CONTROLLED PEAK FLOWS **
00025> #
00026> #
00027> CALIB NASHYD ID=[1], NHYD=[*2.1*], DT=[3]min, AREA=[5.20] (ha),
00028> DWP=[0.00] (cms), CN/C=[79], IA=[6.70] (mm),
00029> N=[3], TP=[0.50]hrs,
00030> END=1
00031> COMPUTE VOLUME ID=[1], STRATE=[-100] (cms), RELRATE=[0] (cms)
00032> #
00033> #
00034> #
00035> #
00036> # Attenuation storage in ditch for Catchment 2.1 to offset peak flows
00037> #
00038> ROUTE RESERVOIR IDOUT=[5], NHYD=[*700*], IDIN=[1],
00039> RDT=[3] (min),
00040> #
00041> # TABLE of (OUTFLOW-STORAGE) values
00042> # (cms) - (ha-m)
00043> # [0.0 , 0.0]
00044> # [0.40, 0.000]
00045> # [-1 , -1] (max twenty pts)
00046> #
00047> # IDOV=[1], NHYDOV=[**]
00048> #
00049> #
00050> CALIB STANDHYD ID=[2], NHYD=[*2.11*], DT=[2] (min), AREA=[0.55] (ha),
00051> XIMP=[0.99], TIMP=[0.99], DWP=[0] (cms), LOSS=[2],
00052> SCS curve number CN=[99],
00053> # Pervious surfaces: IAPER=[5.0] (mm), SLPP=[2.0] (1),
00054> LOP=[0] (mm), MNP=[0.35], SCP=[0] (min),
00055> # Imperious surfaces: IALPP=[2] (mm), SLPI=[1.0] (1),
00056> LOP=[390] (mm), MNI=[0.015], SCI=[0] (min)
00057> # END=1
00058> # COMPUTE DUALHYD IDIN=[2], CINLET=[.092] (cms), MINLET=[1],
00059> MAJHYD=[3], MAJNHYD=[*2.111*],
00060> # MINHYD=[4], MINNHYD=[*2.112*],
00061> # TMJSTO=[0] (cu-m)
00062> # COMPUTE VOLUME ID=[4], STRATE=[-100] (cms), RELRATE=[0] (cms)
00063> #
00064> #
00065> # *FCB* IS THE FLOW AT NEW CULVERT PCB
00066> #
00067> #
00068> #
00069> #
00070> ADD HYD IDsum=[10], NHYD=[*FCB*],
00071> #
00072> #
00073> #
00074> #
00075> CALIB NASHYD ID=[1], NHYD=[*2.12*], DT=[2]min, AREA=[2.70] (ha),
00076> DWP=[0.00] (cms), CN/C=[182], IA=[6.00] (mm),
00077> N=[3], TP=[0.50]hrs,
00078> END=1
00079> #
00080> #
00081> # *CBI* IS THE FLOW AT THE EXISTING CB TO THE EXISTING
00082> # TWIN 2400mm DIAM. STORM SEWER
00083> #
00084> #
00085> #
00086> #
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00101> #
00102> ADD HYD IDsum=[10], NHYD=[*800*],
00103> #
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00273 001:0013
00274
00275
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00277
00278
00279
00280 CALIB STANDHYD Area (ha)= .72
00281 01:2.13 DT= 2.00 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00
00282
00283 IMPERVIOUS PERVIOUS (I)
00284 Surface Area (ha)= .71 .01
00285 Dep. Storage (mm)= 2.00 5.00
00286 Average Slope (%)= 1.00 2.00
00287 Length (m)= 550.00 5.00
00288 Mannings n = .35 .350
00289
00290 Max. eff. Inten. (mm/hr)= 41.50 7.64
00291 over (min)= 10.00 16.00
00292 Storage Coeff. (min)= 9.40 (ii) 16.24 (ii)
00293 Unit Hyd. Tpeak (cms)= 10.00 16.00
00294 Unit Hyd. peak (cms)= .12 .07
00295
00296 PEAK FLOW (cms)= .00 .00 *TOTALS*
00297 TIME TO PEAK (hrs)= 1.73 1.90
00298 RUNOFF VOLUME (mm)= 23.00 4.57
00299 TOTAL RAINFALL (mm)= 25.00 25.00
00300 RUNOFF COEFFICIENT = .92 .81
00301
00302 (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
00303 CN = 79.0 Ia = Dep. Storage (Above)
00304 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00305 THAN THE STORAGE COEFFICIENT.
00306 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00307
00308
00309
00310
00311 ADD HYD (800 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
00312 (ha) (cms) (hrs) (mm) (cms)
00313
00314 ID1 01:2.13 .72 .076 1.73 22.82 .000
00315 ID2 01:2.11 .00 .000 .00 .00 .000
00316
00317 SUM 10:800 .72 .076 1.73 22.82 .000
00318
00319 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00320
00321
00322 001:0014
00323
00324 Pipe and/or ditch storage Catchment 2.13
00325
00326 ROUTE RESERVOIR Requested routing time step = 2.0 min.
00327 IN-10 (800 )
00328
00329 OUTFLOW STORAGE TABLE
00330
00331 OUTFLOW STORAGE
00332 (cms) (ha.m.) (cms) (ha.m.)
00333 .000 .000E+00 .150 .300E+01
00334 .050 .100E+01 .000 .000E+00
00335
00336 ROUTING RESULTS AREA OPEAK TPEAK R.V.
00337 (ha) (cms) (hrs) (mm)
00338 INFLOW #10 (800 ) 7.2 .076 1.73 22.816
00339 OUTFLOW#01 (710 ) .72 .021 2.167 22.815
00340
00341 PEAK FLOW REDUCTION [out/qln] (%) = 38.357
00342 TIME SHIFT OF PEAK FLOW (min) = 26.00
00343 MAXIMUM STORAGE USED (ha.m.) = 8581E-02
00344
00345
00346
00347 001:0015
00348
00349 CALIB NASHYD Area (ha)= 3.40 Curve Number (CN)=79.00
00350 02:2.2 DT= 2.00 Ia (mm)= 6.800 # of Linear Res. (N)= 3.00
00351 U.H. Tp(hrs)= .300
00352
00353 Unit Hyd Opeak (cms)= .649
00354
00355 PEAK FLOW (cms)= .040 (i)
00356 TIME TO PEAK (hrs)= 1.900
00357 RUNOFF VOLUME (mm)= 3.864
00358 TOTAL RAINFALL (mm)= 25.000
00359 RUNOFF COEFFICIENT = .155
00360
00361 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00362
00363
00364 001:0016
00365
00366 ADD HYD (810 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
00367 (ha) (cms) (hrs) (mm) (cms)
00368
00369 ID1 01:710 .72 .021 2.17 22.82 .000
00370 ID2 02:2.2 3.40 .040 1.90 3.86 .000
00371
00372 SUM 10:810 4.12 .068 1.93 7.18 .000
00373
00374 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00375
00376
00377 001:0017
00378
00379 "out2" IS THE TOTAL FLOW TO OUTLET #2
00380
00381
00382
00383 ADD HYD (002 ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
00384 (ha) (cms) (hrs) (mm) (cms)
00385
00386 ID1 09:CB1 8.45 .070 1.73 5.44 .000
00387 ID2 10:OUT2 4.12 .058 1.93 7.18 .000
00388
00389 SUM 10:OUT2 12.57 .111 1.87 6.01 .000
00390
00391 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00392
00393
00394 ** END OF RUN : 7
00395
00396
00397
00398
00399
00400
00401
00402
00403 Project dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00404 Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00405 TZERO = .00 hrs on 0
00406
00407 METOUT= 2 (output = METRIC)
00408 NRUN = 008
00409 NSTORM = 1
00410 # 1=12hrscc10.stm
00411
00412
00413 Project Name: BRT WEST - Outlet 2 JOB NUMBER: [6964]
00414 Date: JUNE-25-2008
00415 Modeller: [jrm]
00416 Company: McCormick Rankin Corporation
00417 License #: 4313781
00418
00419
00420 FUTURE DRAINAGE CONDITIONS TO OUTLET 2
00421 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00422
00423
00424
00425
00426
00427
00428
00429
00430
00431 READ STORM | Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00432 | Ptotal: 43.80 mm | Comments: 2 Yr-12hr SCS
00433
00434 TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00435 hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00436 .17 1.314 3.17 1.752 6.37 9.548 9.17 3.314
00437 .33 1.314 3.33 1.752 6.33 9.548 9.33 3.314
00438 .50 1.314 3.50 1.752 6.50 9.548 9.50 3.314
00439 .67 1.314 3.67 1.752 6.67 9.548 9.67 3.314
00440 .83 .613 3.83 1.752 6.83 4.205 9.83 1.051
00441 1.00 .613 4.00 1.752 7.00 4.205 10.00 1.051
00442 1.17 1.139 4.17 2.365 7.17 2.803 10.17 1.489
00443 1.33 1.139 4.33 2.365 7.33 2.803 10.33 1.489
00444 1.50 1.139 4.50 2.365 7.50 2.803 10.50 1.489
00445 1.67 1.139 4.67 2.978 7.67 2.453 10.67 .964
00446 1.83 1.139 4.83 2.978 7.83 2.453 10.83 .964
00447 2.00 1.139 5.00 2.978 8.00 2.453 11.00 .964
00448 2.17 1.489 5.17 4.730 8.17 1.927 11.17 .876
00449 2.33 1.489 5.33 4.730 8.33 1.927 11.33 .876
00450 2.50 1.489 5.50 4.730 8.50 1.927 11.50 .876
00451 2.67 1.314 5.67 37.493 8.67 2.015 11.67 .876
00452 2.83 1.314 5.83 37.493 8.83 1.833 11.83 .876
00453 3.00 1.314 6.00 37.493 9.00 2.015 11.00 .876
00454
00455
00456
00457
00458 ** FUTURE CONTROLLED PEAK FLOWS **
00459
00460
00461 CALIB NASHYD Area (ha)= 5.20 Curve Number (CN)=79.00
00462 01:2.1 DT= 2.00 Ia (mm)= 6.700 # of Linear Res. (N)= 3.00
00463 U.H. Tp(hrs)= .300
00464
00465 Unit Hyd Opeak (cms)= .397
00466
00467 PEAK FLOW (cms)= .093 (i)
00468 TIME TO PEAK (hrs)= 6.467
00469 RUNOFF VOLUME (mm)= 13.156
00470 TOTAL RAINFALL (mm)= 43.799
00471 RUNOFF COEFFICIENT = .308
00472
00473 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00474
00475
00476
00477 COMPUTE VOLUME | DISCHARGE TIME
00478 | ID: 01 (2.1 ) | (cms) (hrs)
00479
00480 START CONTROLLING AT .000 4.567
00481 INFLOW HYD. PEAKS AT .000 6.467
00482 STOP CONTROLLING AT .000 .000
00483
00484 REQUIRED STORAGE VOLUME (ha.m.) = .0684
00485 TOTAL HYDROGRAPH VOLUME (ha.m.) = .0684
00486 % OF HYDROGRAPH TO STORE = 99.9984
00487
00488 NOTE: Storage was computed to reduce the Inflow
00489
00490
00491 008:0005
00492
00493 ATTENUATION STORAGE IN DITCH FOR CATCHMENT 2.1 TO OFFSET PEAK FLOWS
00494
00495 ROUTE RESERVOIR Requested routing time step = 2.0 min.
00496 IN=01 (2.1 )
00497
00498 OUTFLOW STORAGE TABLE
00499
00500 OUTFLOW STORAGE
00501 (cms) (ha.m.) (cms) (ha.m.)
00502 .000 .000E+00 .400 .800E+01
00503
00504 ROUTING RESULTS AREA OPEAK TPEAK R.V.
00505 (ha) (cms) (hrs) (mm)
00506 INFLOW #01 (2.1 ) 5.20 .093 6.467 33.156
00507 OUTFLOW#05 (700 ) 5.20 .076 6.467 33.156
00508
00509 PEAK FLOW REDUCTION [out/qln] (%) = 81.559
00510 TIME SHIFT OF PEAK FLOW (min) = 24.00
00511 MAXIMUM STORAGE USED (ha.m.) = 1141E-01
00512
00513
00514
00515
00516 CALIB STANDHYD Area (ha)= .55
00517 02:2.11 DT= 2.00 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00
00518
00519 IMPERVIOUS PERVIOUS (I)
00520 Surface Area (ha)= .54 .01
00521 Dep. Storage (mm)= 2.00 5.00
00522 Average Slope (%)= 1.00 2.00
00523 Length (m)= 390.00 5.00
00524 Mannings n = .35 .350
00525
00526 Max. eff. Inten. (mm/hr)= 37.49 14.60
00527 over (min)= 10.00 14.00
00528 Storage Coeff. (min)= 9.33 (ii) 13.02 (ii)
00529 Unit Hyd. Tpeak (min)= 10.00 14.00
00530 Unit Hyd. peak (cms)= .12 .09
00531
00532 PEAK FLOW (cms)= .05 .04 *TOTALS*
00533 TIME TO PEAK (hrs)= 6.00 6.03
00534 RUNOFF VOLUME (mm)= 41.80 36.39
00535 TOTAL RAINFALL (mm)= 43.80 43.80
00536 RUNOFF COEFFICIENT = .95 .83
00537
00538 (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
00539 CN = 99.0 Ia = Dep. Storage (Above)
00540

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00541 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00542 THAN THE STORAGE COEFFICIENT.
00543 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00544
00545
00546
00547 COMPUTE DUALHYD | Average inlet capacities [INLET] = .091 (cms)
00548 TotalHyd 02:2.11 | Number of inlets in system [INLET] = 1
00549 Total minor system capacity = .091 (cms)
00550 Total major system storage [TMASTO] = 0. [cu.m.]
00551
00552 ID: NHYD AREA OPEAK TPEAK R.V. DWF
00553 (ha) (cms) (hrs) (mm) (cms)
00554
00555 TOTAL HYD. 02:2.11 .55 .054 6.00 41.745 .000
00556
00557 MAJOR SYST 02:2.111 .00 .000 .000 .000 .000
00558 MINOR SYST 04:2.112 .55 .054 6.00 41.745 .000
00559
00560 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00561
00562
00563 COMPUTE VOLUME | DISCHARGE TIME
00564 | ID: 04 (2.112 ) | (cms) (hrs)
00565
00566 START CONTROLLING AT .000 1.900
00567 INFLOW HYD. PEAKS AT .000 6.000
00568 STOP CONTROLLING AT .000 13.400
00569
00570 REQUIRED STORAGE VOLUME (ha.m.) = .0210
00571 TOTAL HYDROGRAPH VOLUME (ha.m.) = .0210
00572 % OF HYDROGRAPH TO STORE = 99.9984
00573
00574 NOTE: Storage was computed to reduce the Inflow
00575
00576
00577
00578
00579
00580
00581
00582
00583 *FCB* IS THE FLOW AT NEW CULVERT FCB
00584
00585
00586
00587
00588 ADD HYD (PCA ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
00589 (ha) (cms) (hrs) (mm) (cms)
00590
00591 ID1 05:700 8.45 .070 1.73 5.44 .000
00592 ID2 04:2.112 .55 .054 6.00 41.75 .000
00593
00594 SUM 10:PCA 8.45 6.77 15.89 .000
00595
00596 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00597
00598
00599
00600
00601 CALIB NASHYD Area (ha)= 2.70 Curve Number (CN)=82.00
00602 01:2.12 DT= 2.00 Ia (mm)= 6.000 # of Linear Res. (N)= 3.00
00603 U.H. Tp(hrs)= .300
00604
00605 Unit Hyd Opeak (cms)= .206
00606
00607 PEAK FLOW (cms)= .057 (i)
00608 TIME TO PEAK (hrs)= 6.467
00609 RUNOFF VOLUME (mm)= 15.272
00610 TOTAL RAINFALL (mm)= 43.799
00611 RUNOFF COEFFICIENT = .349
00612
00613 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00614
00615
00616
00617
00618
00619
00620
00621
00622 *CB* IS THE FLOW AT THE EXISTING CB TO THE EXISTING
00623 TWIN 2400mm DIAM. STORM SEWER
00624
00625
00626
00627
00628
00629
00630
00631
00632
00633 ADD HYD (CB ) ID: NHYD AREA OPEAK TPEAK R.V. DWF
00634 (ha) (cms) (hrs) (mm) (cms)
00635
00636 ID1 99:CB1 8.45 .140 6.60 15.69 .000
00637 ID2 10:OUT2 4.12 .125 6.10 18.07 .000
00638
00639 SUM 10:OUT2 12.57 .218 6.13 16.47 .000
00640
00641 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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00811> 1.33 1.890 4.33 3.926 7.33 4.453 10.33 2.472
00812> 1.50 1.890 4.50 3.926 7.50 4.453 10.50 2.472
00813> 1.67 1.890 4.67 3.944 7.67 4.471 10.67 1.599
00814> 1.83 1.890 4.83 4.944 7.83 4.971 10.83 1.599
00815> 2.00 1.890 5.00 4.944 8.00 4.971 11.00 1.599
00816> 2.17 2.472 5.17 7.852 8.17 3.199 11.17 1.454
00817> 2.33 2.472 5.33 7.852 8.33 3.199 11.33 1.454
00818> 2.50 2.472 5.50 7.852 8.50 3.199 11.50 1.454
00819> 2.67 2.181 5.67 62.231 8.67 3.344 11.67 1.454
00820> 2.83 2.181 5.83 62.231 8.83 3.344 11.83 1.454
00821> 3.00 2.181 6.00 62.231 9.00 3.344 12.00 1.454
00822>
00823>
00824> 009:0009
00825>
00826> ** FUTURE CONTROLLED PEAK FLOWS **
00827>
00828>
00829> | CALIB NASHYD | Area (ha)= 5.20 Curve Number (CN)=79.00
00830> | 01:2.1 DT= 2.00 | Ia (mm)= 6.700 # of Linear Res. (N)= 3.00
00831> | U.H. Tp(hrs)= .300
00832>
00833> Unit Hyd Opeak (cms)= .397
00834>
00835> PEAK FLOW (cms)= .244 (I)
00836> TIME TO PEAK (hrs)= 6.433
00837> RUMOFF VOLUME (mm)= 32.425
00838> TOTAL RAINFALL (mm)= 72.700
00839> RUNOFF COEFFICIENT = .448
00840>
00841> (I) PEAK FLOW DOES NOT INCLUDE BASEFLOWS IF ANY.
00842>
00843>
00844> | COMPUTE VOLUME | DISCHARGE TIME
00845> | ID:01 (2.1) | (cms) (hrs)
00846> | START CONTROLLING AT | .000 1.300
00847> | INFLOW HYD. PEAKS AT | .244 6.433
00848> | STOP CONTROLLING AT | .000
00849>
00850> REQUIRED STORAGE VOLUME (ha.m.)= .1697
00851> TOTAL HYDROGRAPH VOLUME (ha.m.)= .1697
00852> % OF HYDROGRAPH TO STORE = 99.9996
00853>
00854> NOTE: Storage was computed to reduce the Inflow
00855>
00856>
00857>
00858>
00859>
00860> 009:0008
00861>
00862> Attenuation Storage in ditch for Catchment 2.1 to offset peak flows
00863>
00864> | ROUTE RESERVOIR | Requested routing time step = 2.0 min.
00865> | IN=01 (2.1) |
00866> | OUT=05 (700) | ***** OUTFLOW STORAGE TABLE *****
00867> | | OUTFLOW STORAGE | OUTFLOW STORAGE
00868> | (cms) (ha.m.) | (cms) (ha.m.)
00869> | .000 .0000E+00 | .400 .6000E-01
00870>
00871>
00872> | ROUTING RESULTS | AREA OPEAK TPEAK R.V. DWF
00873> | ID:01 (2.1) | (ha) (cms) (hrs) (mm) (cms)
00874> | IN=01 (2.1) | 5.20 2.44 6.433 32.425
00875> | OUTFLOW=05 (700) | 5.20 1.98 6.833 32.425
00876>
00877> PEAK FLOW REDUCTION [Out/In] (%)= 43.174
00878> TIME SHIFT OF PEAK FLOW (min)= 24.00
00879> MAXIMUM STORAGE USED (ha.m.)= .29478-01
00880>
00881> 009:0006
00882>
00883>
00884>
00885> | CALIB STANDHYD | Area (ha)= .55
00886> | 02:2.11 DT= 2.00 | Total Imp (%)= 99.00 Dir. Conn. (%)= 99.00
00887>
00888>
00889> | IMPERVIOUS PERVIOUS (I)
00890> | Surface Area (ha)= .71 5.00
00891> | Dep. Storage (mm)= 2.00 0.00
00892> | Average Slope (ft)= 1.00 2.00
00893> | Length (m)= 390.00 5.00
00894> | Mannings n = .015 .350
00895>
00896> | Max. eff. Inten. (mm/hr)= 62.23 43.98
00897> | over (min)= 8.00 10.00
00898> | Storage Coeff. (min)= 7.61 (I) 10.62 (II)
00899> | Unit Hyd. Tpeak (min)= 8.00 10.00
00900> | Unit Hyd. peak (cms)= .15 .11
00901>
00902> *TOTALS*
00903> | PEAK FLOW (cms)= .09 .00 .092 (III)
00904> | TIME TO PEAK (hrs)= 6.00 6.00
00905> | RUNOFF VOLUME (mm)= 70.70 65.33 70.646
00906> | TOTAL RAINFALL (mm)= 72.70 72.70 72.700
00907> | RUNOFF COEFFICIENT = .97 .92
00908>
00909> (I) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
00910> CN* = 99.0 Ia = Dep. Storage (Above)
00911> (II) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00912> THAN THE STORAGE COEFFICIENT.
00913> (III) PEAK FLOW DOES NOT INCLUDE BASEFLOWS IF ANY.
00914>
00915>
00916> | COMPUTE DUALHYD | Average inlet capacities [CINLET] = .092 (cms)
00917> | TotalHyd 02:2.11 | Number of inlets in system [MINLET] = 1
00918> | Total minor system capacity = .092 (cms)
00919> | Total major system storage [TMSTO] = 0 (cu.m.)
00920>
00921>
00922> | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00923> | (ha) (cms) (hrs) (mm) (cms)
00924> | TOTAL HYD. 02:2.11 .55 .092 6.000 70.646 .000
00925> | MAJOR SYST 02:2.11 .00 .000 6.000 70.646 .000
00926> | MINOR SYST 04:2.112 .55 .092 6.000 70.646 .000
00927>
00928> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00929>
00930>
00931> 009:0008
00932>
00933> | COMPUTE VOLUME | DISCHARGE TIME
00934> | ID:04 (2.112) | (cms) (hrs)
00935> | START CONTROLLING AT | .000 1.300
00936> | INFLOW HYD. PEAKS AT | .092 6.000
00937> | STOP CONTROLLING AT | .000 13.333
00938>
00939> REQUIRED STORAGE VOLUME (ha.m.)= .0389
00940> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0389
00941> % OF HYDROGRAPH TO STORE = 99.9996
00942>
00943> NOTE: Storage was computed to reduce the Inflow
00944>
00945>
00946>
00947>
00948>
00949>
00950>
00951> | CALIB NASHYD | Area (ha)= 3.40 Curve Number (CN)=79.00
00952> | 01:2.12 DT= 2.00 | Ia (mm)= 6.800 # of Linear Res. (N)= 3.00
00953> | U.H. Tp(hrs)= .300
00954>
00955> Unit Hyd Opeak (cms)= .449
00956>
00957> PEAK FLOW (cms)= .265 (I)
00958> TIME TO PEAK (hrs)= 6.667
00959> RUNOFF VOLUME (mm)= 32.550
00960> TOTAL RAINFALL (mm)= 72.700
00961> RUNOFF COEFFICIENT = .448
00962>
00963> (I) PEAK FLOW DOES NOT INCLUDE BASEFLOWS IF ANY.
00964>
00965>
00966>
00967>
00968> | ADD HYD (PCB ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00969> | ID: 05:700 | (ha) (cms) (hrs) (mm) (cms)
00970> | +ID: 04:2.112 | .55 .092 6.00 70.65 .000
00971> | SUM 10:PCB | 5.75 .111 6.77 36.26 .000
00972>
00973> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00974>
00975>
00976>
00977>
00978> | CALIB NASHYD | Area (ha)= 2.70 Curve Number (CN)=82.00
00979> | 01:2.12 DT= 2.00 | Ia (mm)= 6.000 # of Linear Res. (N)= 3.00
00980> | U.H. Tp(hrs)= .300
00981>
00982> Unit Hyd Opeak (cms)= .206
00983>
00984> PEAK FLOW (cms)= .143 (I)
00985> TIME TO PEAK (hrs)= 6.400
00986> RUNOFF VOLUME (mm)= 36.331
00987> TOTAL RAINFALL (mm)= 72.700
00988> RUNOFF COEFFICIENT = .500
00989>
00990> (I) PEAK FLOW DOES NOT INCLUDE BASEFLOWS IF ANY.
00991>
00992>
00993>
00994>
00995> 009:0011
00996>
00997> Attenuation Storage in ditch for Catchment 2.1 to offset peak flows
00998>
00999> | ROUTE RESERVOIR | Requested routing time step = 2.0 min.
1000> | IN=01 (2.1) |
1001> | OUT=05 (700) | ***** OUTFLOW STORAGE TABLE *****
1002> | | OUTFLOW STORAGE | OUTFLOW STORAGE
1003> | (cms) (ha.m.) | (cms) (ha.m.)
1004> | .000 .0000E+00 | .400 .6000E-01
1005>
1006>
1007> | ROUTING RESULTS | AREA OPEAK TPEAK R.V. DWF
1008> | ID:01 (2.1) | (ha) (cms) (hrs) (mm) (cms)
1009> | IN=01 (2.1) | 5.20 2.44 6.433 32.425
1010> | OUTFLOW=05 (700) | 5.20 1.98 6.833 32.425
1011>
1012> PEAK FLOW REDUCTION [Out/In] (%)= 43.174
1013> TIME SHIFT OF PEAK FLOW (min)= 24.00
1014> MAXIMUM STORAGE USED (ha.m.)= .29478-01
1015>
1016>
1017>
1018> | CALIB STANDHYD | Area (ha)= .72
1019> | 01:2.13 DT= 2.00 | Total Imp (%)= 99.00 Dir. Conn. (%)= 99.00
1020>
1021>
1022> | IMPERVIOUS PERVIOUS (I)
1023> | Surface Area (ha)= .71 5.00
1024> | Dep. Storage (mm)= 2.00 0.00
1025> | Average Slope (ft)= 1.00 2.00
1026> | Length (m)= 390.00 5.00
1027> | Mannings n = .015 .350
1028>
1029> | Max. eff. Inten. (mm/hr)= 62.23 43.98
1030> | over (min)= 8.00 10.00
1031> | Storage Coeff. (min)= 7.61 (I) 10.62 (II)
1032> | Unit Hyd. Tpeak (min)= 8.00 10.00
1033> | Unit Hyd. peak (cms)= .15 .11
1034>
1035> *TOTALS*
1036> | PEAK FLOW (cms)= .12 .00 .126 (III)
1037> | TIME TO PEAK (hrs)= 6.00 6.00
1038> | RUNOFF VOLUME (mm)= 70.70 33.90 70.332
1039> | TOTAL RAINFALL (mm)= 72.70 72.70 72.700
1040> | RUNOFF COEFFICIENT = .97 .67
1041>
1042> (I) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
1043> CN* = 79.0 Ia = Dep. Storage (Above)
1044> (II) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
1045> THAN THE STORAGE COEFFICIENT.
1046> (III) PEAK FLOW DOES NOT INCLUDE BASEFLOWS IF ANY.
1047>
1048>
1049> | COMPUTE DUALHYD | Average inlet capacities [CINLET] = .092 (cms)
1050> | TotalHyd 02:2.11 | Number of inlets in system [MINLET] = 1
1051> | Total minor system capacity = .092 (cms)
1052> | Total major system storage [TMSTO] = 0 (cu.m.)
1053>
1054>
1055> | ID: NHYD AREA OPEAK TPEAK R.V. DWF
1056> | (ha) (cms) (hrs) (mm) (cms)
1057> | TOTAL HYD. 02:2.11 .55 .092 6.000 70.646 .000
1058> | MAJOR SYST 02:2.112 .00 .000 6.000 70.646 .000
1059> | MINOR SYST 04:2.112 .55 .092 6.000 70.646 .000
1060>
1061> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
1062>
1063>
1064> | ROUTE RESERVOIR | Requested routing time step = 2.0 min.
1065> | IN=01 (800) |
1066> | OUT=01 (710) | ***** OUTFLOW STORAGE TABLE *****
1067> | | OUTFLOW STORAGE | OUTFLOW STORAGE
1068> | (cms) (ha.m.) | (cms) (ha.m.)
1069> | .000 .0000E+00 | .150 .3000E-01
1070>
1071>
1072> | ROUTING RESULTS | AREA OPEAK TPEAK R.V. DWF
1073> | ID:04 (2.112) | (ha) (cms) (hrs) (mm) (cms)
1074> | IN=01 (800) | 72 .117 6.000 70.332
1075> | OUTFLOW=01 (710) | 72 .047 6.167 70.332
1076>
1077> PEAK FLOW REDUCTION [Out/In] (%)= 40.334
1078> TIME SHIFT OF PEAK FLOW (min)= 22.00
1079> MAXIMUM STORAGE USED (ha.m.)= .18818-01
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01351> RUNOFF VOLUME (mm) = 57.198
01352> TOTAL RAINFALL (mm) = 97.900
01353> RUNOFF COEFFICIENT = .584
01354>
01355> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01356>
01358> 010:0011
01359>
01360>
01361> *CBI* IS THE FLOW AT THE EXISTING CB TO THE EXISTING
01362> TWIN 2400mm DIAM. STORM SEWER
01363>
01364>
01365>
01366> [ ADD HYD (CB1 ) ] ID: NHYD AREA OPEAK TPEAK R.V. DWF
01367> (ha) (cms) (hrs) (mm) (cms)
01368> ID1 01:2.12 2.70 228 6.49 57.20 .000
01369> +ID2 10:FCB 5.71 339 6.77 56.10 .000
01370>
01371> SUM 10:CB1 8.41 568 6.57 56.59 .000
01372>
01373>
01374> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-----
01375>
01376> 010:0012
01377>
01378>
01379>
01380>
01381>
01382>
01383>
01384> [ CALIB STANDHYD ] Area (ha)= .72
01385> 01:2.13 DT= 2.00 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00
01386>
01387> IMPERVIOUS PREVIOUS (i)
01388> Surface Area (ha)= .71 .01
01389> Dep. Storage (mm)= 2.00 5.00
01390> Average Slope (%)= 1.00 2.00
01391> Length (m)= 550.00 5.00
01392> Mannings n = .015 .350
01393>
01394> Max. eff. Inten. (mm/hr)= 83.80 56.71
01395> over (min) 8.00 12.00
01396> Storage Coef. (min)= 8.31 (iii) 11.42 (iii)
01397> Unit Hyd. Tpeak (hrs)= 8.00 12.00
01398> Unit Hyd. Tpeak (cms)= .14 .10
01399>
01400> PEAK FLOW (cms)= .16 .00 *TOTALS*
01401> TIME TO PEAK (hrs)= 6.00 6.07 (iii)
01402> RUNOFF VOLUME (mm)= 95.90 53.80 95.479
01403> TOTAL RAINFALL (mm)= 97.90 97.90
01404> RUNOFF COEFFICIENT = .98 .55
01405>
01406> (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
01407> CN = 79.0 Ia = Dep. Storage (Above)
01408> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01409> THAN THE STORAGE COEFFICIENT.
01410> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01411>
01412>
01413> 010:0013
01414>
01415>
01416>
01417> [ ADD HYD (800 ) ] ID: NHYD AREA OPEAK TPEAK R.V. DWF
01418> (ha) (cms) (hrs) (mm) (cms)
01419> ID1 01:2.13 2.70 228 6.49 57.20 .000
01420> +ID2 01:2.13 2.70 228 6.49 57.20 .000
01421>
01422> SUM 10:800 5.40 456 6.00 95.50 .000
01423>
01424> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-----
01425>
01426> 010:0014
01427>
01428> * Pipe and/or ditch storage Catchment 2.13
01429>
01430> ROUTE RESERVOIR Requested routing time step = 2.0 min.
01431> IN:10:(800 )
01432>
01433> ***** OUTFLOW STORAGE TABLE *****
01434> OUTFLOW STORAGE OUTFLOW STORAGE
01435> (cms) (ha.m.) (cms) (ha.m.)
01436> .000 .0000E+00 .150 .0000E+00
01437>
01438> ROUTING RESULTS AREA OPEAK TPEAK R.V.
01439> (ha) (cms) (hrs) (mm)
01440> INFLOW >10:(800 ) .76 .135 6.000 95.497
01441> OUTFLOW<01:(710 ) .76 .106 6.167 95.497
01442>
01443> PEAK FLOW REDUCTION (Out/Gin)(%) = 54.432
01444> TIME SHIFT OF PEAK FLOW (min)= 10.00
01445> MAXIMUM STORAGE USED (ha.m.)=.25648-01
01446>
01447>
01448> 010:0015
01449>
01450>
01451>
01452> [ CALIB NASHYD ] Area (ha)= 3.40 Curve Number (CN)=79.00
01453> 02:2.2 DT= 2.00 Ia (mm)= 6.800 # of Linear Res.(LN)= 3.00
01454> U.H. Tp(hrs)= .200
01455>
01456> Unit Hyd Opeak (cms)= .649
01457>
01458> PEAK FLOW (cms)= .431 (i)
01459> TIME TO PEAK (hrs)= 6.067
01460> RUNOFF VOLUME (mm)= 52.322
01461> TOTAL RAINFALL (mm)= 97.900
01462> RUNOFF COEFFICIENT = .534
01463>
01464> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01465>
01466>
01467> 010:0016
01468>
01469>
01470> [ ADD HYD (810 ) ] ID: NHYD AREA OPEAK TPEAK R.V. DWF
01471> (ha) (cms) (hrs) (mm) (cms)
01472> ID1 01:710 7.6 106 6.17 69.50 .000
01473> +ID2 02:2.2 3.40 431 6.07 52.32 .000
01474>
01475> SUM 10:810 4.16 529 6.07 60.19 .000
01476>
01477> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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01478>
01479>
01480> 010:0017
01481>
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01486>
01487> [ ADD HYD (OUT2 ) ] ID: NHYD AREA OPEAK TPEAK R.V. DWF
01488> (ha) (cms) (hrs) (mm) (cms)
01489> ID1 09:CB1 8.41 568 6.57 56.59 .000
01490> +ID2 10:OUT2 4.16 529 6.07 60.19 .000
01491>
01492> SUM 10:OUT2 12.57 1096 6.10 57.78 .000
01493>
01494> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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01495>
01496>
01497> 010:0018
01498>
01499>
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01507> ** END OF RUN : 10
01508>
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01515>
01516> [ START ] Project dir.: K:\Projects\6900-6-1\6964-M-1\11-HYD-1\
01517> Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\11-HYD-1\
01518> TZERO = .00 hrs on 0
01519> METOUT= 2 (output = METRIC)
01520> NRUN = 011
01521> NSTORMS = 1
01522> # 1-12scsb.stm
01523>
01524> 011:0002
01525>
01526> * Project Name: BRT WEST - Outlet 2 JOB NUMBER: [6964] *
01527> * Date: JUNE 25-2008 *
01528> * Modeler: [jrm] *
01529> * Company: McCormick Rankin Corporation *
01530> * License #: 4113781 *
01531> *
01532> *
01533> * FUTURE DRAINAGE CONDITIONS TO OUTLET 2 *
01534> * 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms *
01535> *
01536> *
01537>
01538>
01539>
01540>
01541> 011:0002
01542>
01543>
01544> [ READ STORM ] Filename: K:\Projects\6900-6-1\6964-M-1\11-HYD-1\1
01545> [ Total= 109.60 mm ] Comments: 100 Yr-12hr SCS
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01621>
01622> PEAK FLOW REDUCTION (Out/Gin)(%) = 80.903
01623> TIME SHIFT OF PEAK FLOW (min)= 24.00
01624> MAXIMUM STORAGE USED (ha.m.)=.56818-01
01625>
01626>
01627>
01628>
01629>
01630> [ CALIB STANDHYD ] Area (ha)= 55
01631> 02:2.11 DT= 2.00 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00
01632>
01633> IMPERVIOUS PREVIOUS (i)
01634> Surface Area (ha)= .54 .01
01635> Dep. Storage (mm)= 2.00 5.00
01636> Average Slope (%)= 1.00 2.00
01637> Length (m)= 390.00 5.00
01638> Mannings n = .015 .350
01639>
01640> Max. eff. Inten. (mm/hr)= 92.96 92.80
01641> over (min) 6.00 10.00
01642> Storage Coef. (min)= 6.49 (ii) 9.04 (iii)
01643> Unit Hyd. Tpeak (hrs)= 6.00 10.00
01644> Unit Hyd. Tpeak (cms)= .18 .12
01645>
01646> PEAK FLOW (cms)= .34 .00 *TOTALS*
01647> TIME TO PEAK (hrs)= 6.00 6.00 6.000
01648> RUNOFF VOLUME (mm)= 106.60 101.10 104.545
01649> TOTAL RAINFALL (mm)= 108.60 108.60 108.600
01650> RUNOFF COEFFICIENT = .98 .93
01651>
01652> (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
01653> CN = 79.0 Ia = Dep. Storage (Above)
01654> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01655> THAN THE STORAGE COEFFICIENT.
01656> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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01659> 011:0007
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00001 2 Metric units
00002 *****
00003 # Project Name: BRT WEST - Outlet 3 JOB NUMBER: [6964]
00004 # Date : JUNE-25-2008
00005 # Modeller : [jrm]
00006 # Company : McCormick Rankin Corporation
00007 # License # : 4313781
00008 #
00009 #
00010 # FUTURE DRAINAGE CONDITIONS TO OUTLET 3
00011 # 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00012 #
00013 #
00014 #
00015 #
00016 #
00017 START TIME= 0 METOUT= 0 NSTORM=1 NRUN=001
00018 CHIC25mm.stm
00019 #
00020 #
00021 #
00022 #
00023 CALIB NASHYD ID= [1], NHYD= [3.1], DT= [2] (min), AREA= [3.30] (ha),
DWP= [0.00] (cms), CN/C= [79], IA= [6.80] (mm),
N= [1], TP= [0.50] (hrs),
END= 1
00024 #
00025 #
00026 #
00027 #
00028 CALIB STANDHYD ID= [4], NHYD= [3.1], DT= [2] (min), AREA= [3.30] (ha),
XIMP= [0.99], TIMP= [0.99], DWP= [0] (cms), LOGS= [2],
SCS curve number CN= [79],
Previous surfaces: Iaper= [5.0] (mm), SLPP= [2.0] (%),
LGP= [5] (m), MNP= [0.35], SCP= [0] (min),
Impervious surfaces: IImp= [2] (mm), SLPI= [1.0] (%),
LGI= [40] (m), MMI= [0.015], SCL= [0] (min),
END= 1
00029 #
00030 # Proposed pond storage for Erin Mills parking area
00031 # PROVIDES ENHANCED WATER QUALITY CONTROL & QUANTITY CONTROL
00032 #
00033 ROUTE RESERVOIR IDout= [3], NHYD= [700], IDin= [2],
RDT= [2] (min),
TABLE OF (OUTFLOW-STORAGE) values
(cms) - (ha-m)
00034 [0.0 , 0.0]
00035 [0.003 , 0.018]
00036 [0.006 , 0.058]
00037 [0.007 , 0.078]
00038 [0.047 , 0.098]
00039 [0.090 , 0.149]
00040 [0.130 , 0.225]
00041 [0.141 , 0.254]
00042 [0.160 , 0.315]
00043 [. , .] (max twenty pts)
IDov= [1], NHYDov= [**]
00044 #
00045 #
00046 #
00047 #
00048 #
00049 #
00050 #
00051 #
00052 #
00053 #
00054 #
00055 #
00056 ADD HYD IDsum= [0], NHYD= [800],
IDS to add= 1,3
00057 #
00058 #
00059 CALIB STANDHYD ID= [4], NHYD= [3.2], DT= [2] (min), AREA= [4.4] (ha),
XIMP= [0.99], TIMP= [0.20], DWP= [0] (cms), LOGS= [2],
SCS curve number CN= [79],
Previous surfaces: Iaper= [5.0] (mm), SLPP= [2.0] (%),
LGP= [5] (m), MNP= [0.35], SCP= [0] (min),
Impervious surfaces: IImp= [2] (mm), SLPI= [1.0] (%),
LGI= [1800] (m), MMI= [0.015], SCL= [0] (min),
END= 1
00060 #
00061 #
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00269 *****
00270 *****


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00811> RUNOFF VOLUME (mm) = 95.90 53.80 62.219
00812> TOTAL RAINFALL (mm) = 97.90 57.90 57.900
00813> RUNOFF COEFFICIENT = .98 .55 .636
00814>
00815> (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
00816> CN = 79.0 Ia = Dep. Storage (Above)
00817> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00818> THAN THE STORAGE COEFFICIENT.
00819> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00820>
00821>
00822> 010:0008
00823>
00824>
00825> | ADD HYD (OUT3 ) | ID: NHYD AREA OPEAK TPEAK R.V. DMF
00826> | (ha) (cms) (hrs) (mm) (cms)
00827> ID1 10:800 7.20 .386 6.40 75.70 .000
00828> ID2 04:3.2 4.40 .575 6.07 62.22 .000
00829>
00830> SUM 09:OUT3 11.60 .905 6.13 70.58 .000
00831>
00832> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00833>
00834>
00835> 010:0009
00836>
00837> 010:0002
00838>
00839>
00840> 010:0002
00841>
00842>
00843> 010:0002
00844>
00845> ** END OF RUN : 10
00846>
00847>
00848>
00849>
00850>
00851>
00852>
00853>
00854> | START | Project dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00855> | Rainfall dir.: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00856> TZERO = .00 hrs on 0
00857> METHOD = 2 (output = METRIC)
00858> NFORM = 011
00859> NFORM = 1
00860> # 1-12acch.sm
00861>
00862> 011:0002
00863>
00864> # Project Name: BRT WEST - Outlet 3 JOB NUMBER: [6964]
00865> # Date: JUNE-25-2008
00866> # Modeler: [J]
00867> # Company: McCormick Rankin Corporation
00868> # License #: 4317781
00869>
00870>
00871> # FUTURE DRAINAGE CONDITIONS TO OUTLET 3
00872> # 25 mm 4 hour - Chicago and 12 hour SCS 2 to 100 Year Storms
00873>
00874>
00875>
00876>
00877>
00878>
00879>
00880>
00881>
00882> | HEAD STORM | Filename: K:\Projects\6900-6-1\6964-M-1\21-HYD-1\
00883> | Pctal: 100.00 mm | Comments: 100 Yr-12hr SCS
00884>
00885>
00886> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00887> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00888> .33 3.258 | 3.33 4.344 | 6.33 23.675 | 9.33 3.258
00889> .50 3.258 | 3.50 4.344 | 6.50 23.675 | 9.50 3.258
00890> .67 3.258 | 3.67 4.344 | 6.67 23.675 | 9.67 3.258
00891> .83 3.258 | 3.83 4.344 | 6.83 23.675 | 9.83 3.258
00892> 1.00 3.258 | 4.00 4.344 | 7.00 23.675 | 10.00 3.258
00893> 1.17 2.824 | 4.17 5.864 | 7.17 6.950 | 10.17 3.692
00894> 1.33 2.824 | 4.33 5.864 | 7.33 6.950 | 10.33 3.692
00895> 1.50 2.824 | 4.50 5.864 | 7.50 6.950 | 10.50 3.692
00896> 1.67 2.824 | 4.67 7.385 | 7.67 6.082 | 10.67 2.389
00897> 1.83 2.824 | 4.83 7.385 | 7.83 6.082 | 10.83 2.389
00898> 2.00 2.824 | 5.00 7.385 | 8.00 6.082 | 11.00 2.389
00899> 2.17 3.692 | 5.17 11.729 | 8.17 4.778 | 11.17 2.172
00900> 2.33 3.692 | 5.33 11.729 | 8.33 4.778 | 11.33 2.172
00901> 2.50 3.692 | 5.50 11.729 | 8.50 4.778 | 11.50 2.172
00902> 2.67 3.258 | 5.67 92.962 | 8.67 4.996 | 11.67 2.172
00903> 2.83 3.258 | 5.83 92.962 | 8.83 4.996 | 11.83 2.172
00904> 3.00 3.258 | 6.00 92.962 | 9.00 4.996 | 12.00 2.172
00905>
00906>
00907> 011:0003
00908>
00909>
00910> | CALIB STANDHYD | Area (ha) = 3.90 Curve Number (CN) = 79.00
00911> | 01:3.1 DT = 2.00 | Ia (cms) = 6.800 # of Linear Res. (N) = 3.00
00912> | U.N. Tp(hrs) = .500
00913>
00914> Unit Hyd Opeak (cms) = .252
00915>
00916> PEAK FLOW (cms) = .297 (i)
00917> TIME TO PEAK (hrs) = 6.400
00918> RUNOFF VOLUME (mm) = 61.205
00919> TOTAL RAINFALL (mm) = 108.600
00920> RUNOFF COEFFICIENT = .564
00921>
00922> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00923>
00924>
00925> 011:0004
00926>
00927>
00928> | CALIB STANDHYD | Area (ha) = 3.90 Dir. Conn. (%) = 99.00
00929> | 02:3.11 DT = 2.00 | Total Imp (%) = 99.00
00930>
00931>
00932> IMPERVIOUS PERVIOUS (i)
00933> Surface Area (ha) = 3.88 .04
00934> Dep. Storage (mm) = 2.00 5.00
00935> Average Slope (%) = 1.00 2.00
00936> Length (m) = 40.00 5.00
00937> Mannings n = .015 .350
00938>
00939> Max. eff. Inten. (mm/hr) = 92.96 48.41
00940> over (min) = 2.00 4.00
00941> Storage Coeff. (min) = 1.65 (iii) 4.84 (iii)
00942> Unit Hyd. Tpeak (cms) = 2.00 4.00
00943> Unit Hyd. peak (cms) = .60 .26
00944>
00945> PEAK FLOW (cms) = 1.00 .01 *TOTALS*
00946> TIME TO PEAK (hrs) = 5.97 6.00 6.000

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00946> RUNOFF VOLUME (mm) = 106.60 62.72 106.161
00947> TOTAL RAINFALL (mm) = 108.60 108.60 108.600
00948> RUNOFF COEFFICIENT = .98 .58 .978
00949> *** WARNING: Storage Coefficient is smaller than DT:
00950> Use a smaller DT or a larger area.
00951>
00952> (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
00953> CN = 79.0 Ia = Dep. Storage (Above)
00954> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00955> THAN THE STORAGE COEFFICIENT.
00956> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00957>
00958>
00959> 011:0005
00960>
00961> Proposed pond storage for Erin Mills parking area
00962> PROVIDES ENHANCED WATER QUALITY CONTROL & QUANTITY CONTROL
00963>
00964>
00965> | ROUTE RESERVOIR | Requested routing time step = 2.0 min.
00966> | 10:02:13.11 |
00967> | OUT:03:700 | ----- OUTFLOW STORAGE TABLE -----
00968>
00969> OUTFLOW STORAGE | OUTFLOW STORAGE
00970> (cms) (ha.m.) | (cms) (ha.m.)
00971> .000 8000E+00 | .090 1469E+00
00972> .003 1800E+01 | .130 2259E+00
00973> .006 5690E+01 | .141 2544E+00
00974> .007 7780E+01 | .140 1351E+00
00975> .047 3930E+01 | .000 0000E+00
00976>
00977> ROUTING RESULTS AREA OPEAK TPEAK R.V.
00978> (ha) (cms) (hrs) (mm)
00979> INFLOW 02: 13.11 | 3.90 1.004 6.050 106.161
00980> OUTFLOW 03: 700 | 3.90 .145 6.533 106.159
00981>
00982> PEAK FLOW REDUCTION [Qout/Qin] (%) = 14.461
00983> TIME SHIFT OF PEAK FLOW (min) = 32.00
00984> MAXIMUM STORAGE USED (ha.m.) = 2679E+00
00985>
00986> 011:0006
00987>
00988>
00989> | ADD HYD (800 ) | ID: NHYD AREA OPEAK TPEAK R.V. DMF
00990> | (ha) (cms) (hrs) (mm) (cms)
00991> ID1 01:3.1 3.30 .297 6.40 61.21 .000
00992> ID2 03:700 3.90 .145 6.53 106.16 .000
00993>
00994> SUM 10:800 7.20 .440 6.40 85.56 .000
00995>
00996> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00997>
00998>
00999> 011:0007
01000>
01001>
01002> | CALIB STANDHYD | Area (ha) = 4.40 Dir. Conn. (%) = 20.00
01003> | 04:3.2 DT = 2.00 | Total Imp (%) = 20.00
01004>
01005>
01006> IMPERVIOUS PERVIOUS (i)
01007> Surface Area (ha) = .88 3.52
01008> Dep. Storage (mm) = 2.00 5.00
01009> Average Slope (%) = 1.00 2.00
01010> Length (m) = 1000.00 5.00
01011> Mannings n = .015 .350
01012>
01013> Max. eff. Inten. (mm/hr) = 92.96 65.04
01014> over (min) = 12.00 14.00
01015> Storage Coeff. (min) = 11.41 (iii) 14.36 (iii)
01016> Unit Hyd. Tpeak (min) = 12.00 14.00
01017> Unit Hyd. peak (cms) = .10 .08
01018>
01019> PEAK FLOW (cms) = .20 .48 *TOTALS*
01020> TIME TO PEAK (hrs) = 6.53 6.10 6.067
01021> TOTAL RAINFALL (mm) = 108.60 108.60 108.600
01022> RUNOFF COEFFICIENT = .98 .58 .658
01023>
01024> (i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
01025> CN = 79.0 Ia = Dep. Storage (Above)
01026> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01027> THAN THE STORAGE COEFFICIENT.
01028> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01029>
01030>
01031> 011:0008
01032>
01033>
01034> | ADD HYD (OUT3 ) | ID: NHYD AREA OPEAK TPEAK R.V. DMF
01035> | (ha) (cms) (hrs) (mm) (cms)
01036> ID1 10:800 7.20 .440 6.40 85.56 .000
01037> ID2 04:3.2 4.40 .693 6.07 71.50 .000
01038>
01039> SUM 09:OUT3 11.60 1.058 6.10 80.22 .000
01040>
01041> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01042>
01043>
01044> 011:0009
01045>
01046> 011:0002
01047>
01048>
01049> 011:0004
01050>
01051>
01052> 011:0002
01053>
01054>
01055> 011:0002
01056>
01057> FINISH
01058>
01059>
01060> WARNINGS / ERRORS / NOTES
01061>
01062> 001:0004 CALIB STANDHYD
01063> *** WARNING: Storage Coefficient is smaller than DT:
01064> Use a smaller DT or a larger area.
01065> *** WARNING: Storage Coefficient is smaller than DT:
01066> Use a smaller DT or a larger area.
01067> *** WARNING: Storage Coefficient is smaller than DT:
01068> Use a smaller DT or a larger area.
01069> *** WARNING: Storage Coefficient is smaller than DT:
01070> Use a smaller DT or a larger area.
01071> Simulation ended on 2008-07-03 at 11:33:16
01072>
01073>

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APPENDIX C
PRELIMINARY STORMWATER MANAGEMENT CALCULATIONS

6964 - Mississauga BRT WEST
 Stage-Storage-Discharge Summary - Proposed Erin Mills Facility

Stage (m)	Discharge (m³/s)	Storage		Stage (m)	Forebays			Main Pool (Excluding Forebays)		Storage		Estimated Detention Time (hrs)
		Active (m³)	Total (m³)		Area (m²)	Incremental Volume (m³)	Accumulated Volume (m³)	Area (m²)	Incremental Volume (m³)	Sediment (m³)	Total (m³)	
0.00	0.000	0	0	0.00				0	0	0	0	
0.10	0.000	0	49	0.10				978	49	49	0	
0.20	0.000	0	150	0.20				1,054	102	150	0	
0.30	0.000	0	280	0.30				1,134	109	260	0	
0.40	0.000	0	377	0.40				1,216	118	377	0	
0.50	0.000	0	503	0.50				1,300	126	503	0	
0.60	0.000	0	637	0.60				1,386	134	637	0	
0.70	0.000	0	780	0.70				1,474	143	780	0	
0.80	0.000	0	932	0.80				1,564	152	932	0	
0.90	0.000	0	1,093	0.90				1,655	161	1,093	0	
1.00	0.000	0	1,264	1.00				1,750	170	1,264	0	
1.10	0.003	180	1,443	1.10				1,846	180	1,443	0	
1.20	0.005	369	1,633	1.20				1,944	190	1,633	0	
1.30	0.008	599	1,832	1.30				2,044	199	1,832	0	
1.40	0.007	778	2,042	1.40				2,146	210	2,042	0	
1.50	0.047	998	2,262	1.50				2,250	220	2,262	0	
1.60	0.072	1,228	2,492	1.60				2,356	230	2,492	0	
1.70	0.096	1,468	2,733	1.70				2,464	241	2,733	0	
1.80	0.105	1,721	2,985	1.80				2,574	252	2,985	0	
1.90	0.118	1,984	3,248	1.90				2,686	263	3,248	0	
2.00	0.130	2,259	3,522	2.00				2,800	274	3,522	0	
2.10	0.141	2,544	3,808	2.10				2,916	286	3,808	0	
2.20	0.150	2,842	4,105	2.20				3,034	298	4,105	0	
2.30	0.151	3,151	4,415	2.30				3,154	309	4,415	0	
2.40	0.093	3,473	4,736	2.40				3,276	322	4,736	0	
2.50	1.000	3,907	5,070	2.50				3,400	334	5,070	0	

To be designed at final design stage

6964 - Mississauga BRT WEST
 Detailed Outlet Structure Discharge Calculations

Elevation (m)	Discharge (m³/s)							Parameters				
	Spillway			Outlet Riser			D/CB	Total Discharge	Overflow Weir 1		Orifice 1	
	Weir 1	Weir 2	Total	Orifice 1	Weir 1	Orifice 2			Total	Crest Elevation	Orifice Centre	Perimeter
0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.2 m	1.0375 m	236 mm	
0.10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Crest Width	Orifice Invert	Area	
0.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4 m	1.0 m	4,419 mm²	
0.30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Slope (z:1)	Orifice Diameter	Orifice Coeff	
0.40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Weir Coeff	75 mm	0.6	
0.50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Weir Top Width (m)	Orientation		
0.60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.000	Vertical		
0.70	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Overflow Weir 2	Weir 1		
0.80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Crest Elevation			
0.90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9999 m	Top of Weir Structure	Max Perimeter	
1.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Crest Width	9999.00 m	0 mm	
1.10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Crest Width	Weir Crest Invert	Max Open Area	
1.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0 m	9999.00 m	0 mm²	
1.30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Slope (z:1)	Weir Coeff	0.6	
1.40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Weir Coeff	1.670		
1.50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Weir Top Width (m)	Weir Dimensions (Height x Length)		
1.60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0 mm Height	0 mm L	
1.70	0.000	0.000	0.000	0.010	0.000	0.081	0.090	0.000	D/CB	Side Walls	Weir Coeff	
1.80	0.000	0.000	0.000	0.010	0.000	0.095	0.105	0.000	T/C Invert	Vertical	1.670	
1.90	0.000	0.000	0.000	0.011	0.000	0.107	0.118	0.000	CE Size	Orifice Centre	Perimeter	
2.00	0.000	0.000	0.000	0.012	0.000	0.118	0.130	0.000	600 mm	1.44 m	864 mm	
2.10	0.000	0.000	0.000	0.012	0.000	0.128	0.141	0.000	by	Orifice Invert	Area	
2.20	0.000	0.000	0.000	0.013	0.000	0.138	0.150	0.000	600 mm	1.2 m	89,396 mm²	
2.30	0.251	0.000	0.251	0.013	0.000	0.147	0.160	0.000	Grate Slope	Orifice Diameter	Orifice Coeff	
2.40	0.824	0.000	0.824	0.014	0.000	0.155	0.169	0.000	4.1	275 mm	0.6	
2.50	1.723	0.000	1.723	0.014	0.000	0.163	0.177	0.000	Area (m²)	0.360	Operates Above (m)	
									Perimeter (m)	2.400	Vertical	1.64

$$Q = CA \sqrt{2g(h_2 - h_1 + \frac{D}{2000})}$$

$$Q = CL(h_2 - h_1)^{1.5} + 1.268z(h_2 - h_1)^{2.5}$$

Where: h2 = elevation at stage 2 (m)
 h1 = elevation at stage 1 (m)
 D = orifice diameter (mm)
 C = orifice coefficient
 A = orifice open area (m²)

h2 = elevation at stage 2 (m)
 h1 = elevation at stage 1 (m)
 L = weir crest length (m)
 C = weir coefficient
 z = weir side slope (z:1)