Kurtz Municipal Drain Improvements
5782 6th Line East
Township of Guelph-Eramosa (Ariss)

GMBP File: 420099

July 2021

GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA

330 TRILLIUM DRIVE, UNIT D , KITCHENER ON N2E 3J2 P: 519-748-1440 WWW.GMBLUEPLAN.CA

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KURTZ MUNICIPAL DRAIN IMPROVEMENTS

5782 6TH LINE EAST

TOWNSHIP OF GUELPH-ERAMOSA (ARISS)

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1. INTRODUCTION

In response to the Drainage Act Petition filed for 5782 6th Line East in the Township of Guelph-Eramosa (Ariss), the intent of this report is to document and detail the proposed improvements and flood floodplain analysis completed for the Kurtz Municipal Drain which flows through the subject property. The Kurtz Municipal Drain Improvements have been completed based on the following information:

- Topographic Survey completed for 5782 6th Line East site by GM BluePlan Engineering Limited on March 12, 2020,
- Kurtz Municipal Drain Hydrologic and Hydraulic modelling completed as part of the Ussher's Creek Subdivision (GM BluePlan Engineering Limited, dated March 7, 2014), and;
- Kurtz Municipal Drain Report and Design Drawings (Gamsby and Mannerow Limited, dated 1969).

The Kurtz Municipal Drain was constructed in 1969 to provide a combination of open ditch and closed tile drainage for approximately 665-ha of land. The Kurtz Municipal Drain is comprised of several branches (Branch A through F) and extends approximately 2.2-km northwest of Ariss Valley Road (Highway 51) along 6th Line East to 4th Line East and 8th Line East to Highway 86 at the edge of the existing Ariss Valley Golf and Country Club at the lower limits.

2. KURTZ MUNICIPAL DRAIN

2.1 Parameters

Mass rainfall distribution curves were used in the MIDUSS models. A six-hour storm duration was used for the 5-year design storm event, 24-hour storm duration was used for the 100-year design storm event, and a 48-hour storm duration was used for the Regional storm. Table No. 1 identifies the parameters for the various design storms used in the drain system modelling.

Table No. 1: Design Storm Parameters

	5 Year	100 Year	Regional
Duration (minutes)	360	1440	2880
Rainfall Depth (mm)	46.00	101.50	285.18
Peak Rainfall Intensity (mm/hr)	33.718	124.236	53.000

The SCS infiltration method was used in the runoff calculations. The parameters used in MIDUSS are as follows:

Table No. 2: SCS Infiltration Numbers

	IMPERVIOUS AREAS	PERVIOUS AREAS
SCS Curve Number (pre-development)	98	74.3
SCS Curve Number (post-development)	98	73.5
Manning's 'n'	0.015	0.25
Initial Abstraction (pre-development)	0.52 mm	8.786 mm
Initial Abstraction (post-development)	0.52 mm	9.158 mm

2.2 Existing Conditions

2.2.1 Hydrologic Analysis

GM BluePlan Engineering Limited completed a topographic survey of the Kurtz Municipal Drain within the boundary of the subject site at 5782 6th Line East on March 12, 2020. From the topographic survey data collected, a series of cross-sections of Branch "A", Branch "C", Branch "E", and Branch "F" of the Kurtz Municipal Drain were generated. As noted previously, the site at 5782 6th Line East is a major junction for several Branches of the Kurtz Municipal Drain. Refer to Figure No. 1 which identifies the overall contributing drainage areas serviced by the Kurtz Municipal Drain under existing conditions.

Branch "A" (233.4-hectares, CN =75.6) is located along the southeast property line. Catchments contributing to Branch "A" include 100 (Branch "B"), 200, 300, 400, and 500 from Figure No. 1. Runoff conveyed by Branch "A" flows in a northwesterly direction where it merges with Branch "E" northwest of Ariss Glen Drive. Branch "A" is generally triangular (v=notch) in shape and approximately 1m in depth.

Branch "C" (79.4-hectares, CN = 75.5) begins west of the property. Catchments contributing to Branch "C" include 700 and 800 from Figure No. 1. Runoff conveyed by Branch "C" flows in an easterly direction where it merges with Branches "A", "E", and "F" near the east property line of the subject property. Branch "C" is generally trapezoidal in shape and approximately 1m in bottom width and 0.9m in depth.

Branch "E" (26-hectares, CN = 76.9) is located along the southeast property line, adjacent to the neighboring driveway. Catchment 600 from Figure No. 1 contributes to Branch "E", as well as private tile drainage from the property labelled 'C. Brohman' in Figure No. 1. Runoff conveyed by Branch "E" flows in a southeasterly direction towards the existing 800mm diameter culvert, where it merges with Branch "A" of the Kurtz Municipal Drain on the adjacent property. The tiled drain portion of Branch "E, comprised of 250mm diameter pipe, runs perpendicular to property line through the site. The open portion of Branch "E" is generally trapezoidal with a bottom width of 1.50 m and an approximate depth of 0.85 m.

Branch "F" (7.3-hectares, CN = 76.2) runs south to north along the east property line of the subject property. Catchment 801 from Figure No. 1 contributes to Branch "F". Runoff conveyed by Branch "F" flows in a northerly direction where it merges with Branches "A", "C" and "E" near the east property line of the subject property. Branch "F" is generally trapezoidal in shape with a 1.5m bottom width and an approximate depth of 0.85m.

Main Drain (376.8-hectares, CN = 75.6) refers to the channel downstream of the convergence of Branches "A", "C", "E", and "F" along the east property line as it continues past the subject property in an easterly direction towards Ariss Glen Drive and Wellington Road 86. Catchment 900 and 1000 from Figure No. 1 contributes to the Main Drain as it passes through the subject property and the existing residential development east of the site. The Main Drain is trapezoidal with a meandering low flow channel, a bottom width of approximately 14m and a depth of approximately 2m.

Table No. 3 summarizes the contributing drainage catchment areas and flow rates for each branch within the subject site.

Table No. 3 – Existing Condition Flow Rates for the Kurtz Municipal Drain

Branch No.	Catchment Numbers	Runoff Flow Rate		
		5-Year	100-Year	Regional
Branch "A"	100, 200, 300, 400, 500	1.369 m^3/s	8.229 m^3/s	8.229 m^3/s
Branch "E"	600	0.192 m^3/s	1.591 m^3/s	2.824 m^3/s
Branch "A" d/s "E"	100, 200, 300, 400, 500, Branch "E"	1.541 m^3/s	8.958 m^3/s	10.971 m^3/s
Branch "C"	700, 800	0.533 m^3/s	4.649 m^3/s	8.397 m^3/s
Branch "F"	801	0.082 m^3/s	0.760 m^3/s	0.840 m^3/s
Main Drain	Branches "A d/s E", "C", and "F"	2.095 m^3/s	12.113 m^3/s	19.619 m^3/s
	Branches "A", "C", "E", "F", and Catchment 900	2.182 m^3/s	12.678 m^3/s	20.908 m^3/s
	Branches "A", "C", "E", "F", Catchments 900 and 1000	2.255 m^3/s	13.652 m^3/s	29.749 m^3/s

The existing condition MIDUSS modelling files are included in Appendix A. The flowrates identified in the table above have been utilized in the hydraulic (HEC-RAS) analysis.

2.2.2 Hydraulic Analysis – Existing Conditions

The hydraulic model HEC-RAS was utilized to complete the floodplain model and analysis for Branches "A", "C", "E", and "F", and Main Drain of the Kurtz Municipal Drain close to the subject site, as summarized in Table No. 4 and Table No. 5.

Table No. 4 – Existing Channel Dimensions

Branch No.	Catchment Numbers	General Channel Dimensions		
		Depth	Bottom Width	Grade
Branch "A"	100, 200, 300, 400, 500	1.00m	0.00m	~ 0%
Branch "E"	600	1.35m	2.00m	~ 0%
Branch "A" d/s "E"	100, 200, 300, 400, 500, Branch "E"	1.60m	0.00m	0.30%
Branch "C"	700, 800	1.30m	1.50m	0.25%
Branch "F"	801	1.20m	1.50m	0.30%
Main Drain	Branches "A", "C", "E", "F"	2.00m	13.50m (with a triangular low flow channel)	~ 0%

Table No. 5 – Hydraulic Analysis Results for Kurtz Municipal Drain – Existing Conditions

Branch	HEC-RAS Section No.	Top of Channel Elevation (m)*	5-Year Design Storm Event		100-Year Design Storm Event		Regional Storm	
			Water Surface Elevation (m)	Floodplain Width (m)	Water Surface Elevation (m)	Floodplain Width (m)	Water Surface Elevation (m)	Floodplain Width (m)
A	1657	345.73 m	344.84 m	4.1 m	345.97 m	18.9 m	346.17 m	52.8 m
	1606	346.17 m	344.50 m	2.7 m	345.91 m	7.7 m	346.18 m	94.3 m
C	2063	345.70 m	344.81 m	2.8 m	345.98 m	74.8 m	346.19 m	266.3 m
	2000	345.52 m	344.61 m	2.9 m	345.98 m	273.7 m	346.19 m	292.0 m
E	4090	347.33 m	346.25 m	2.4 m	346.63 m	3.5 m	346.84 m	4.1 m
	4000	347.02 m	345.78 m	3.4 m	345.99 m	4.0 m	346.12 m	4.5 m
F	3290	347.09 m	346.17 m	1.3 m	346.38 m	2.0 m	346.40 m	2.1 m
	3032	345.20 m	344.63 m	3.7 m	345.98 m	105.7 m	346.19 m	106.1 m
Main Drain	3000	345.88 m	344.59 m	3.6 m	345.95 m	21.3 m	346.18 m	106.1 m
	1572	346.41 m	344.59 m	17.6 m	345.95 m	25.8 m	346.17 m	27.7 m
	1492	346.33 m	344.59 m	19.1 m	345.94 m	26.4 m	346.16 m	42.5 m
	1475	346.31 m	344.59 m	18.2 m	345.94 m	26.3 m	346.16 m	28.2 m

*Note: water surface elevations exceeding the Top of Channel Elevation are overtopping the channel into the adjacent floodplain area.

The HEC-RAS analysis results have been included in Appendix B. Branch “A”, Branch “C”, and Branch “F” do not have sufficient capacity to convey the 100-year design storm and Regional Storm flows within the existing channel limits. The open channel portion of Branch “E” does have sufficient capacity to convey the 100-year design storm event and Regional Storm flows within the existing channel limits.

2.3 Post Development Conditions and Drainage Improvements

2.3.1 Hydrologic Analysis

To reduce the limits of the floodplain on the subject site and to improve the conveyance capacity of the Kurtz Municipal Drain system during the 100-year design storm event and Regional Storm, the following amendments have been sized to convey the required flows. Refer to Figure No. 2 which identifies the overall contributing drainage areas serviced by the Kurtz Municipal Drain under post-development conditions.

Branch “A” (259.4-hectares, CN =75.6) is located along the southeast property line. Catchments contributing to Branch “A” include 100 (Branch “B”), 200, 300, 400, 500, and 600 from Figure No. 2. Runoff conveyed by Branch “A” flows in a northwesterly direction where it will converge with the Main Drain south of Street A, having previously collected runoff from Branches “C”, “E”, and “F”. The proposed channel improvements to the last 80m of the Branch “A” channel will widen the bottom width of the channel to 3m and angle the channel as it merges with the Main Drain to increase the angle between the channels from 90 degrees.

Branch “C” (77.3-hectares, CN = 75.5) begins west of the property. Catchments contributing to Branch “C” include 700 and 800 from Figure No. 1. Runoff conveyed by Branch “C” flows in an easterly direction where it merges with Branches “A”, “E”, and “F” near the east property line of the subject property. The proposed improvements to the channel widens the bottom width to 13.2m (approximately) with a typical depth of 1.25 m (approximately), and reroutes the last 110 m of the channel around Lot 7 on the subject property, aligning with the Main Drain into the existing Ariss Glenn Subdivision.

Branch “E” (Tile Drainage) will be relocated west of the proposed residential lots along Street A. The existing closed portion of Branch “E, comprised of 250mm diameter pipe discharging private tile drainage will be the only contributor to the revised Branch “E”. This contributing flow rate has been estimated at 0.047 m^3/s, based on the capacity of the existing 250mm diameter storm sewer at a grade of 0.57%.

The proposed Branch “E” extension will extend the existing storm sewer with an additional 260m of 250mm diameter storm sewer to convey runoff in a southerly direction behind the residential lots, where it will be discharged to a short section of open channel and converge with Branches “C” and “F”. The proposed channel has a bottom width of 6m (approximately) and a typical depth of 2.1m (approximately).

Branch “F” (9.4-hectares, CN = 76.2) will be relocated, continuing to run south to north but moved to the west of the proposed residential lots along Street A. Catchment 801 from Figure No. 2 will contribute to Branch “F”. Runoff conveyed by Branch “F” will flow in a northerly direction where it merges with Branches “C” and “E” west of the proposed residential lots along Street A. The proposed channel is trapezoidal in shape, with a typical depth of 0.5m (approximately) and bottom width of 6m (approximately).

The post-development conditions flow rates were calculated using MIDUSS software to route the hydrographs.

In summary, the post-development flows from the site are as follows:

Table No. 6 – Post-Development Condition Flow Rates for the Kurtz Municipal Drain

Branch No.	Contributing Areas	Runoff Flow Rate		
		5-Year	100-Year	Regional
Branch "A"	Catchments 100, 200, 300, 400, 500, 600	1.542 m^3/s	9.011 m^3/s	11.053 m^3/s
Branch "E"	Private Tile Drainage	0.047 m^3/s	0.047 m^3/s	0.047 m^3/s
Branch "C"	Catchments 700, 800	0.519 m^3/s	4.526 m^3/s	8.173 m^3/s
Branch "F"	Catchments 801	0.105 m^3/s	0.979 m^3/s	1.082 m^3/s
Main Drain	Branches "C", "E", "F"	0.633 m^3/s	5.080 m^3/s	9.302 m^3/s
	Branches "A", "C", "E", "F"	2.149 m^3/s	12.384 m^3/s	20.354 m^3/s
	Branches "A", "C", "E", "F", Catchment 900	2.235 m^3/s	13.087 m^3/s	22.054 m^3/s
	Branches "A", "C", "E", "F", Catchments 900, 1000	2.311 m^3/s	13.603 m^3/s	29.731 m^3/s

2.3.2 Hydraulic Analysis – Post-Development Conditions

The hydraulic model HEC-RAS was utilized to complete the floodplain model and analysis for the proposed improvements in Branches "A", "C", "E", and "F", and Main Drain of the Kurtz Municipal Drain close to the subject site, as summarized in Table No. 7.

Table No. 7 – Hydraulic Analysis Results for Kurtz Municipal Drain – Post-Development Conditions

Branch	HEC-RAS Section No. / Station No.	Top of Channel Elevation (m)*	5-Year Design Storm Event		100-Year Design Storm Event		Regional Storm	
			Water Surface Elevation (m)	Floodplain Width (m)	Water Surface Elevation (m)	Floodplain Width (m)	Water Surface Elevation (m)	Floodplain Width (m)
A	4060 / 5+075	345.42 m	344.62 m	6.2 m	345.60 m	18.7 m	346.01 m	33.2 m
	4050 / 5+050	344.61 m	344.48 m	5.8 m	345.59 m	22.3 m	346.00 m	42.1 m
	4020 / 5+025	344.63 m	344.35 m	6.4 m	345.58 m	30.8 m	346.00 m	32.5 m
C	2160 / 1+320	346.94 m	345.08 m	13.7 m	345.66 m	17.3 m	346.10 m	20.1 m
	2080 / 1+400	346.08 m	344.95 m	13.8 m	345.62 m	17.9 m	346.08 m	20.6 m
F	3290 / 1+760	347.60 m	347.27 m	6.8 m	347.37 m	9.4 m	347.39 m	10.0 m
	3200 / 1+840	346.50 m	345.21 m	6.5 m	345.63 m	10.4 m	346.07 m	14.6 m
	3080 / 1+920	345.61 m	344.92 m	6.6 m	345.62 m	12.4 m	346.07 m	47.2 m
	3020 / 1+980	345.59 m	344.74 m	10.4 m	345.61 m	19.6 m	346.07 m	62.4 m
E	3130 / 3+930	346.50 m	344.41 m	6.6 m	345.61 m	14.0 m	346.07 m	15.5 m
Main Drain	1600 / 2+080	346.50 m	344.38 m	15.0 m	345.61 m	23.9 m	346.06 m	27.1 m
	1492 / 5+000	346.33 m	344.36 m	17.9 m	345.58 m	24.5 m	345.99 m	26.7 m
	1475	346.31 m	344.36 m	16.8 m	345.58 m	24.1 m	345.99 m	26.6 m

*Note: water surface elevations exceeding the Top of Channel Elevation are overtopping the channel into the adjacent floodplain area.

A comparison between the results from the existing conditions and post-development conditions is summarized in Table No. 8.

Table No. 8 – Hydraulic Analysis Results - Comparison of Existing and Post-Development Conditions

Branch	Existing Conditions			Post-Development Conditions		
	Top of Channel Elevation (m)	Regional Storm Water Surface Elevation (m)	Floodplain Width (m)	Top of Channel Elevation (m)	Regional Storm Water Surface Elevation (m)	Floodplain Width (m)
A	345.73 m	346.17 m	52.8 m	344.61 m	346.00 m	42.1 m
C	345.52 m	346.19 m	292.0 m	346.08 m	346.08 m	20.6 m
F	345.20 m	346.19 m	106.1 m	345.59 m	346.07 m	62.4 m
E	347.02 m	346.12 m	4.5 m	346.50 m	346.07 m	15.5 m
Main Drain	345.88 m	346.18 m	106.1 m	346.31 m	345.99 m	26.6 m

The HEC-RAS analysis results have been included in Appendix B. The proposed changes to Branch “C” and Branch “E” provides sufficient capacity to convey the Regional Storm flows within the proposed channel limits. While runoff still exceeds channel limits after the proposed changes to Branch “F” and Branch “A”, the ponding extends into an existing field, does not exceed existing flooding elevations, and does not extend into the proposed residential lots.

3. CONCLUSIONS

From the foregoing analysis, the following conclusions are drawn:

- Under existing conditions, Branch “A”, Branch “C”, and Branch “F” do not have sufficient capacity to convey the Regional Storm flows within the existing channel limits. The open channel portion of Branch “E” does have sufficient capacity to convey the Regional Storm flows within the existing channel limits.
- The proposed Branch “A” channel improvements will widen the bottom width of the channel and angle the channel as it merges with the Main Drain to increase the angle between the channels.
- The proposed Branch “C” channel improvements widen the bottom width and reroutes the channel around Lot 7 on the subject property, aligning with the Main Drain into the existing Ariss Glenn Subdivision.
- The proposed Branch “E” extension will extend the existing storm sewer with an additional 260m of 250mm diameter storm sewer where it will be discharged to a short section of open channel and converge with Branches “C” and “F”.
- The proposed Branch “F” channel improvements will widen the bottom width and reroute the channel west of the proposed residential lots along Street A.
- The proposed changes to Branch “C” and Branch “E” provides sufficient capacity to convey the Regional Storm flows within the proposed channel limits. While runoff still exceeds channel limits after the proposed changes to Branch “F” and Branch “A”, the ponding extends into an existing field, does not exceed existing flooding elevations, and does not extend into the proposed residential lots.

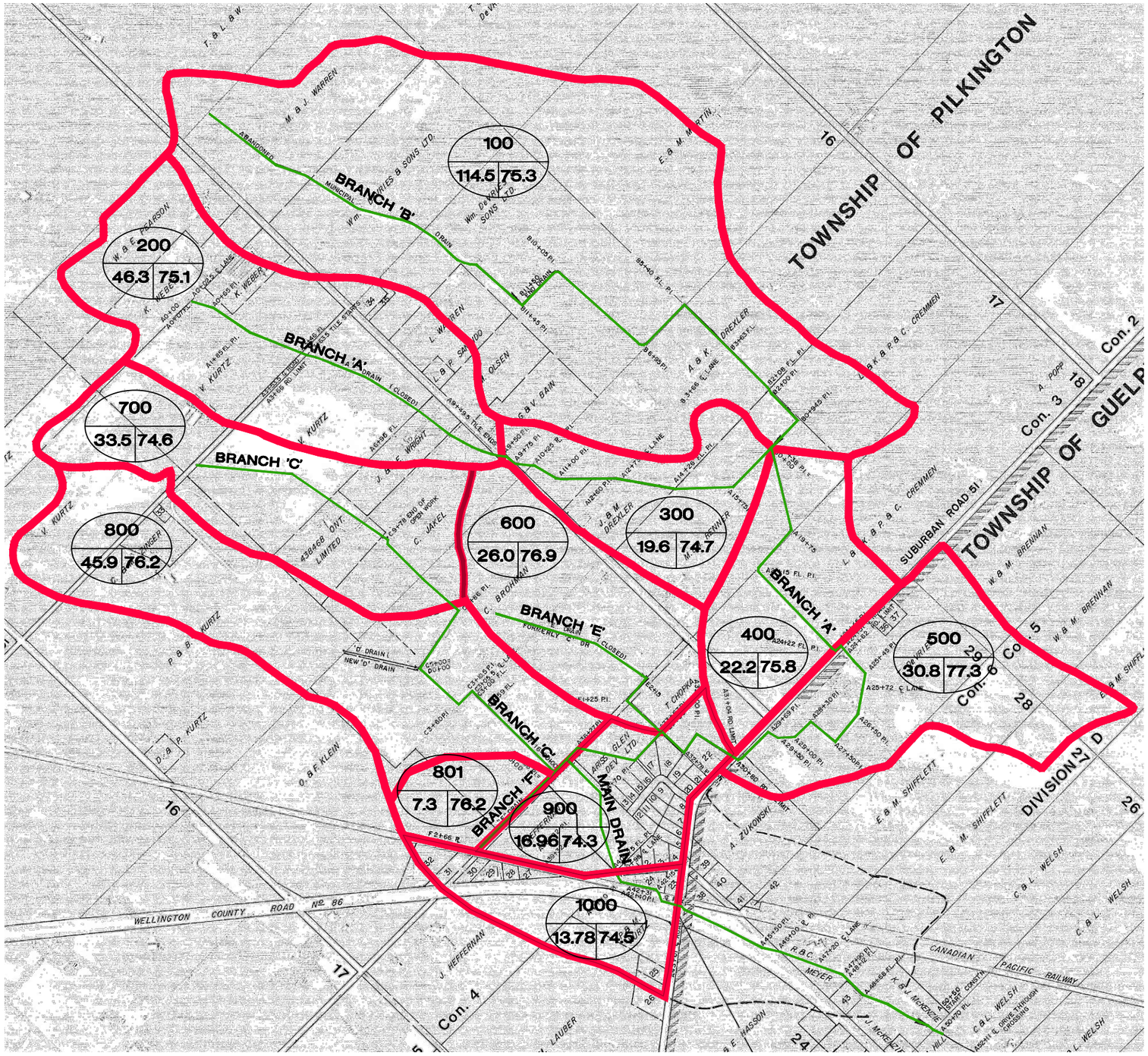
All of which is respectfully submitted.

GM BLUEPLAN ENGINEERING LIMITED

Per:

Angela Kroetsch, P.Eng.

W:\Kitchener\420-2020\420099 - Will O Homes 6th Line East Ariss\GMBP Reports - SWM, FSR, Design Brief, Etc\420099 - Floodplain Analysis Report_2021-07-22.Docx

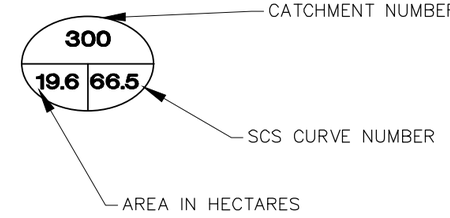


5782 6th LINE EAST TOWNSHIP OF GUELPH/ERAMOSA (ARISS)

LEGEND:

CATCHMENT AREA BOUNDARY

LOCATION OF MUNICIPAL BRANCH



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APRIL 2021

KURTZ MUNICIPAL DRAIN EXISTING CONDITION DRAINAGE AREAS

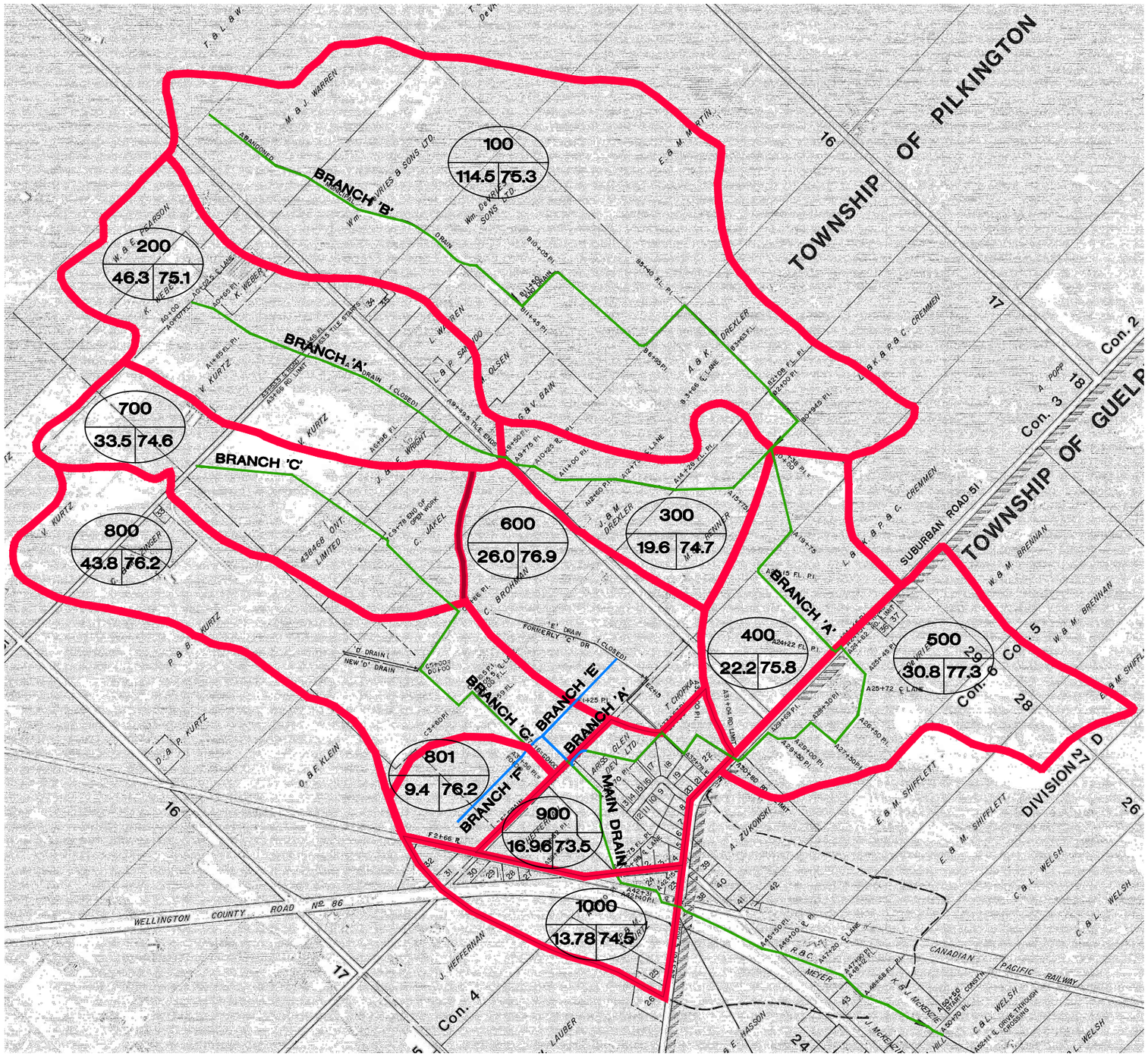
Figure No. 1

NOTE: BASE PLAN OBTAINED FROM THE KURTZ DRAINAGE WORKS REPAIR AND IMPROVEMENT PLAN CREATED BY GAMSBY AND MANNEROW LIMITED IN JUNE 1982.

BluePlan ENGINEERING

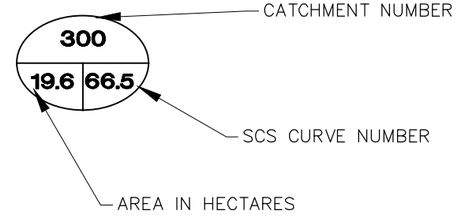
Plotted On: July 22, 2021 111070-Ex.Drain Areas.dwg

5782 6th LINE EAST TOWNSHIP OF GUELPH/ERAMOSA (ARISS)



LEGEND:

- CATCHMENT AREA BOUNDARY
- LOCATION OF EXISTING MUNICIPAL BRANCH
- LOCATION OF PROPOSED IMPROVEMENTS TO MUNICIPAL DRAIN



SCALE = 1:12500
APRIL 2021

KURTZ MUNICIPAL DRAIN POST DEVELOPMENT DRAINAGE AREAS

Figure No. 2

NOTE: BASE PLAN OBTAINED FROM THE KURTZ DRAINAGE WORKS REPAIR AND IMPROVEMENT PLAN CREATED BY GAMSBY AND MANNEROW LIMITED IN JUNE 1982.

BluePlan ENGINEERING

Plotted On: July 22, 2021 111070-Ex.Drain Areas.dwg

Appendix A

Runoff (MIDUSS) Analysis

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
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"                420099 - Will O Homes 6th Line East Ariss\Design Data\Modelling
Files\MIDUSS\2021-04-28"
"                Output filename:                          Kurtz - Ex__5yr.out"
"                Licensee name:                                          gmbp"
"                Company                                                 gmbp"
"                Date & Time last used:                4/28/2021 at 2:23:20 PM"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"       46.000   Rainfall depth"
"      360.000   Duration"
"           14   M:\SCS_6hr.mrd   SCS 6 hour distributionsssss"
"             Maximum intensity            33.718    mm/hr"
"             Total depth                  46.000    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          100   Flows to Branch B "
"        1.000   % Impervious"
"      114.500   Total Area"
"      530.000   Flow length"
"        2.000   Overland Slope"
"      113.355   Pervious Area"
"      530.000   Pervious length"
"        2.000   Pervious slope"
"        1.145   Impervious Area"
"      530.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.300   Pervious SCS Curve No."
"        0.255   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.332   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.882   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.628     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
```

```
"             Surface Area           113.355    1.145      114.500    hectare"
"             Time of concentration  176.516    19.572     171.215    minutes"
"             Time to Centroid       413.266    200.004    406.062    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        5.2143     0.0527     5.2670     ha-m"
"             Rainfall losses        34.273     5.413      33.984     mm"
"             Runoff depth           11.727     40.587     12.016     mm"
"             Runoff volume          1.3293     0.0465     1.3758     ha-m"
"             Runoff coefficient     0.255      0.882      0.261      "
"             Maximum flow           0.617      0.093      0.628      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.628     0.628     0.000     0.000"
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" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  0.628    c.m/sec"
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"                     0.628     0.628     0.628     0.628"
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" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
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"       46.300   Total Area"
"      380.000   Flow length"
"        2.000   Overland Slope"
"       45.837   Pervious Area"
"      380.000   Pervious length"
"        2.000   Pervious slope"
"        0.463   Impervious Area"
"      380.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.100   Pervious SCS Curve No."
"        0.252   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.422   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.282     0.000     0.628     0.628 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           45.837     0.463      46.300     hectare"
"             Time of concentration  145.295    16.031     140.866    minutes"
"             Time to Centroid       378.130    195.699    371.880    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        2.1085     0.0213     2.1298     ha-m"
"             Rainfall losses        34.408     5.286      34.117     mm"
"             Runoff depth           11.592     40.714     11.883     mm"
"             Runoff volume          5313.48    188.50     5501.98    c.m"
"             Runoff coefficient     0.252      0.885      0.258      "
"             Maximum flow           0.277      0.042      0.282      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.282     0.282     0.628     0.628"
" 52          CHANNEL DESIGN"
"        0.282   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.600   203.600"
"                205.200   405.200"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.275   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                0.263    metre"
"             Velocity                     0.473    m/sec"
"             Channel capacity           565.690    c.m/sec"
"             Critical depth               0.124    metre"
" 53          ROUTE    Channel Route 811"
"       811.00      Channel Route 811 Reach length   ( metre)"
"        0.430   X-factor <= 0.5"
"      642.342   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                 0.282    c.m/sec"
"                     0.282     0.282     0.282     0.628 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
```

```
"             Maximum flow                  0.908    c.m/sec"
"             Hydrograph volume         19259.789    c.m"
"                    0.282     0.282     0.282     0.908"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.282     0.000     0.282     0.908"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          300   Flow to Branch A "
"        1.000   % Impervious"
"       19.600   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       19.404   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.196   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.700   Pervious SCS Curve No."
"        0.246   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.603   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.122     0.000     0.282     0.908 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           19.404     0.196      19.600     hectare"
"             Time of concentration  134.846    14.730     130.650    minutes"
"             Time to Centroid       366.627    194.150    360.602    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        8925.84    90.16      9016.00    c.m"
"             Rainfall losses        34.670     5.398      34.377     mm"
"             Runoff depth           11.330     40.602     11.623     mm"
"             Runoff volume          2198.56    79.58      2278.14    c.m"
"             Runoff coefficient     0.246      0.883      0.253      "
"             Maximum flow           0.120      0.017      0.122      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.122     0.122     0.282     0.908"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.122     0.122     0.122     0.908"
" 40          HYDROGRAPH   Combine    1000"
```

```
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  1.025    c.m/sec"
"             Hydrograph volume         21537.928    c.m"
"                     0.122     0.122     0.122     1.025"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  1.025    c.m/sec"
"             Hydrograph volume         21537.928    c.m"
"                     0.122     1.025     0.122     0.000"
" 52          CHANNEL DESIGN"
"        1.025   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          14.   Define an arbitrary cross-section"
"                  0.000    19.320    38.370    77.930   117.760"
"                156.130   172.060   177.160   180.300   185.180"
"                190.360   227.800   247.150   269.760"
"                350.742   350.800   350.610   349.140   348.810"
"                349.380   349.250   347.190   347.190   348.890"
"                348.680   349.880   350.880   351.720"
"        3.552   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                0.453    metre"
"             Velocity                     0.521    m/sec"
"             Channel capacity           392.772    c.m/sec"
"             Critical depth               0.208    metre"
" 53          ROUTE    Channel Route 676"
"       676.00      Channel Route 676 Reach length   ( metre)"
"        0.297   X-factor <= 0.5"
"      486.914   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                 1.024    c.m/sec"
"                     0.122     1.025     1.024     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
```

```
"             Maximum flow                  1.024    c.m/sec"
"             Hydrograph volume          21537.932    c.m"
"                    0.122     1.025     1.024     1.024"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.122     0.000     1.024     1.024"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          400   Flows to Branch A "
"        1.000   % Impervious"
"       22.200   Total Area"
"      300.000   Flow length"
"        2.000   Overland Slope"
"       21.978   Pervious Area"
"      300.000   Pervious length"
"        2.000   Pervious slope"
"        0.222   Impervious Area"
"      300.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.800   Pervious SCS Curve No."
"        0.262   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.109   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.880   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.156     0.000     1.024     1.024 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           21.978     0.222      22.200     hectare"
"             Time of concentration  123.917    13.911     120.310    minutes"
"             Time to Centroid       353.458    193.216    348.204    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.0110     0.0102     1.0212     ha-m"
"             Rainfall losses        33.935     5.504      33.650     mm"
"             Runoff depth           12.065     40.496     12.350     mm"
"             Runoff volume          2651.71    89.90      2741.61    c.m"
"             Runoff coefficient     0.262      0.880      0.268      "
"             Maximum flow           0.153      0.019      0.156      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.156     0.156     1.024     1.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.156     0.156     0.156     1.024"
" 40          HYDROGRAPH   Combine    1000"
```

```
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                  1.162    c.m/sec"
"             Hydrograph volume         24279.529    c.m"
"                     0.156     0.156     0.156     1.162"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                "
"             Maximum flow                  1.162    c.m/sec"
"             Hydrograph volume         24279.531    c.m"
"                     0.156     1.162     0.156     0.000"
" 54          POND DESIGN"
"        1.162   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"      24279.5   Hydrograph volume    c.m"
"         14.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                347.150     0.000     0.000"
"                347.450    0.7235     7.359"
"                347.750     1.447    47.207"
"                348.050     2.170   144.134"
"                348.350     2.894   308.711"
"                348.650     6.471   548.365"
"                348.950     8.682   869.233"
"                349.250    10.434  2362.250"
"                349.550    11.932  6121.604"
"                349.850    13.262  12206.77"
"                350.150    14.470  33070.85"
"                350.450    15.584  74826.98"
"                350.710    16.489  122506.8"
"                350.810    20.279  147193.5"
"             Peak outflow                  1.162    c.m/sec"
"             Maximum level               347.632    metre"
"             Maximum storage              31.514    c.m"
"             Centroidal lag                6.785   hours"
"                  0.156     1.162     1.162     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow at Country Road 51 culvert, north crossing "
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.156     1.162     1.162     0.000"
" 52          CHANNEL DESIGN"
"        1.162   Current peak flow    c.m/sec"
```

```
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          25.   Define an arbitrary cross-section"
"                  1.000    16.530    19.970    37.290    43.570"
"                 49.300    91.100   100.500   141.000   178.700"
"                195.100   212.200   216.300   220.000   223.900"
"                256.700   279.900   315.000   328.900   331.400"
"                332.400   375.900   438.800   471.000   488.900"
"                347.640   347.810   347.850   347.500   347.650"
"                347.600   347.600   347.400   347.700   347.500"
"                347.000   346.900   345.000   345.000   346.500"
"                346.200   346.500   346.600   345.800   345.800"
"                345.900   348.000   348.100   348.900   350.000"
"        2.640   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                0.333    metre"
"             Velocity                     0.778    m/sec"
"             Channel capacity           316.790    c.m/sec"
"             Critical depth               0.206    metre"
" 53          ROUTE    Channel Route 700"
"       700.00      Channel Route 700 Reach length   ( metre)"
"        0.450   X-factor <= 0.5"
"      337.319   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                 1.162    c.m/sec"
"                    0.156     1.162     1.162     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Catchment 500 junction "
"             Maximum flow                 1.162    c.m/sec"
"             Hydrograph volume        24278.578    c.m"
"                    0.156     1.162     1.162     1.162"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.156     0.000     1.162     1.162"
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           1   Equal length"
```

```
"            1   SCS method"
"          500   Flows to Branch A "
"        1.000   % Impervious"
"       30.800   Total Area"
"      370.000   Flow length"
"        2.000   Overland Slope"
"       30.492   Pervious Area"
"      370.000   Pervious length"
"        2.000   Pervious slope"
"        0.308   Impervious Area"
"      370.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.300   Pervious SCS Curve No."
"        0.285   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.459   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.224     0.000     1.162     1.162 c.m/sec"
"             Catchment 500          Pervious   Impervious Total Area "
"             Surface Area           30.492     0.308      30.800     hectare"
"             Time of concentration  135.520    15.776     131.883    minutes"
"             Time to Centroid       365.459    195.469    360.296    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.4026     0.0142     1.4168     ha-m"
"             Rainfall losses        32.872     5.290      32.596     mm"
"             Runoff depth           13.128     40.710     13.404     mm"
"             Runoff volume          4003.03    125.39     4128.42    c.m"
"             Runoff coefficient     0.285      0.885      0.291      "
"             Maximum flow           0.220      0.026      0.224      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.224     0.224     1.162     1.162"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.224     0.224     0.224     1.162"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                  1.370    c.m/sec"
"             Hydrograph volume         28406.885    c.m"
"                     0.224     0.224     0.224     1.370"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
```

```
"               Catchment 500 junction "
"            Maximum flow                  1.370    c.m/sec"
"            Hydrograph volume         28406.881    c.m"
"                    0.224     1.370     0.224     0.000"
" 54         POND DESIGN"
"       1.370   Current peak flow    c.m/sec"
"       9.600   Target outflow    c.m/sec"
"     28406.9   Hydrograph volume    c.m"
"         10.   Number of stages"
"       0.000   Minimum water level    metre"
"       3.000   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               344.950     0.000     0.000"
"               345.200    0.8301     5.239"
"               345.500     1.660    42.997"
"               345.800     2.490   164.458"
"               346.100     3.320   577.883"
"               346.400     5.470  1685.267"
"               346.700     6.987  3745.496"
"               347.000     8.229  6888.433"
"               347.300    28.193  12080.62"
"               347.650    73.169  16004.75"
"            Peak outflow                  1.370    c.m/sec"
"            Maximum level               345.395    metre"
"            Maximum storage              29.789    c.m"
"            Centroidal lag                6.836   hours"
"                 0.224     1.370     1.370     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    0.224     1.370     1.370     0.000"
" 56         DIVERSION"
"        1000   Node number"
"       8.229   Overflow threshold"
"       1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         0.000    c.m/sec"
"            Volume of diverted flow       0.000    c.m"
"            DIV01000.005hyd"
"            Spill at 347.00 "
"                    0.224     1.370     1.370     0.000 c.m/sec"
" 81         ADD COMMENT================================================="
"          1  Lines of comment"
"            Flow at Country Road 51 culvert, south crossing "
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    0.224     1.370     1.370     0.000"
" 52         CHANNEL DESIGN"
"       1.370   Current peak flow    c.m/sec"
```

```
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   203.350   207.200"
"                210.580   213.580"
"                 10.000    10.000     7.000     6.200     6.300"
"                  8.420     9.000"
"        2.800   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 0.396    metre"
"             Velocity                      0.792    m/sec"
"             Channel capacity            306.274    c.m/sec"
"             Critical depth                0.266    metre"
" 53          ROUTE    Channel Route 267"
"       267.00      Channel Route 267 Reach length   ( metre)"
"        0.432   X-factor <= 0.5"
"      252.874   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.369    c.m/sec"
"                     0.224     1.370     1.369     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Combine at catchment 600 "
"             Maximum flow                  1.369    c.m/sec"
"             Hydrograph volume         28405.508    c.m"
"                     0.224     1.370     1.369     1.369"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.224     0.000     1.369     1.369"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         600   Flow to Branch E"
"        1.000   % Impervious"
"       26.000   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       25.740   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
```

```
"        0.260   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.900   Pervious SCS Curve No."
"        0.279   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.630   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.192     0.000     1.369     1.369 c.m/sec"
"             Catchment 600          Pervious   Impervious Total Area "
"             Surface Area           25.740     0.260      26.000     hectare"
"             Time of concentration  127.748    14.730     124.249    minutes"
"             Time to Centroid       356.877    194.150    351.839    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.1840     0.0120     1.1960     ha-m"
"             Rainfall losses        33.162     5.398      32.885     mm"
"             Runoff depth           12.838     40.602     13.115     mm"
"             Runoff volume          3304.42    105.56     3409.99    c.m"
"             Runoff coefficient     0.279      0.883      0.285      "
"             Maximum flow           0.188      0.022      0.192      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.192     0.192     1.369     1.369"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.192     0.192     0.192     1.369"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Combine at catchment 600 "
"             Maximum flow                  1.542    c.m/sec"
"             Hydrograph volume         31815.506    c.m"
"                     0.192     0.192     0.192     1.542"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Combine at catchment 600 "
"             Maximum flow                  1.542    c.m/sec"
"             Hydrograph volume         31815.502    c.m"
"                     0.192     1.542     0.192     0.000"
" 52          CHANNEL DESIGN"
"        1.542   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
```

```
"                 0.000     0.000   200.000   201.800   202.800"
"               204.600   404.600"
"                10.000    10.000     7.000     5.400     5.400"
"                 7.000    10.000"
"       4.600   Channel depth    metre"
"       0.520   Gradient   %"
"          0.   Variable roughness: 0=False; 1=True"
"                0.0400    0.0400    0.0400    0.0400    0.0400"
"                0.0400    0.0400"
"            Depth of flow                0.785    metre"
"            Velocity                     1.042    m/sec"
"            Channel capacity           767.253    c.m/sec"
"            Critical depth               0.511    metre"
" 53         ROUTE    Channel Route 252"
"       252.00      Channel Route 252 Reach length   ( metre)"
"        0.349   X-factor <= 0.5"
"      181.309   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"            Peak outflow                 1.541    c.m/sec"
"                    0.192     1.542     1.541     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1000"
"           6   Combine "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"            Maximum flow                 1.541    c.m/sec"
"            Hydrograph volume        31815.492    c.m"
"                    0.192     1.542     1.541     1.541"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.192     0.000     1.541     1.541"
" 33         CATCHMENT 700"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"          700   Flows to Branch C "
"        1.000   % Impervious"
"       33.500   Total Area"
"      280.000   Flow length"
"        2.000   Overland Slope"
"       33.165   Pervious Area"
"      280.000   Pervious length"
"        2.000   Pervious slope"
"        0.335   Impervious Area"
"      280.000   Impervious length"
"        2.000   Impervious slope"
```

```
"        0.250   Pervious Manning 'n'"
"       74.600   Pervious SCS Curve No."
"        0.245   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.648   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.879   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.220     0.000     1.541     1.541 c.m/sec"
"             Catchment 700          Pervious   Impervious Total Area "
"             Surface Area           33.165     0.335      33.500     hectare"
"             Time of concentration  122.494    13.347     118.677    minutes"
"             Time to Centroid       352.772    192.499    347.166    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.5256     0.0154     1.5410     ha-m"
"             Rainfall losses        34.735     5.584      34.444     mm"
"             Runoff depth           11.265     40.416     11.556     mm"
"             Runoff volume          3735.91    135.40     3871.31    c.m"
"             Runoff coefficient     0.245      0.879      0.251      "
"             Maximum flow           0.216      0.029      0.220      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.220     0.220     1.541     1.541"
" 52          CHANNEL DESIGN"
"        0.220   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                0.275    metre"
"             Velocity                     0.611    m/sec"
"             Channel capacity           767.253    c.m/sec"
"             Critical depth               0.160    metre"
" 53          ROUTE    Channel Route 733"
"       733.00      Channel Route 733 Reach length   ( metre)"
"        0.459   X-factor <= 0.5"
"      450.220   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
```

```
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                 0.220    c.m/sec"
"                    0.220     0.220     0.220     1.541 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.220     0.220     0.220     1.541"
" 33          CATCHMENT 800"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          800   Flow to Branch C "
"        1.000   % Impervious"
"       45.900   Total Area"
"      350.000   Flow length"
"        2.000   Overland Slope"
"       45.441   Pervious Area"
"      350.000   Pervious length"
"        2.000   Pervious slope"
"        0.459   Impervious Area"
"      350.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.268   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.314     0.220     0.220     1.541 c.m/sec"
"             Catchment 800          Pervious   Impervious Total Area "
"             Surface Area           45.441     0.459      45.900     hectare"
"             Time of concentration  134.601    15.259     130.758    minutes"
"             Time to Centroid       365.223    194.824    359.736    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        2.0903     0.0211     2.1114     ha-m"
"             Rainfall losses        33.659     5.346      33.376     mm"
"             Runoff depth           12.341     40.654     12.624     mm"
"             Runoff volume          5607.82    186.60     5794.42    c.m"
"             Runoff coefficient     0.268      0.884      0.274      "
"             Maximum flow           0.308      0.039      0.314      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.314     0.533     0.220     1.541"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.314     0.533     0.533     1.541"
" 40          HYDROGRAPH   Combine    2000"
"            6   Combine "
"         2000   Node #"
"                "
"             Maximum flow                  0.533    c.m/sec"
"             Hydrograph volume          9665.731    c.m"
"                    0.314     0.533     0.533     0.533"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.314     0.000     0.533     0.533"
" 33          CATCHMENT 801"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          801   Flow to Branch F"
"        1.000   % Impervious"
"        7.300   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        7.227   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.073   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.268   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.867   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.082     0.000     0.533     0.533 c.m/sec"
"             Catchment 801          Pervious   Impervious Total Area "
"             Surface Area           7.227      0.073      7.300      hectare"
"             Time of concentration  63.476     7.196      61.696     minutes"
"             Time to Centroid       284.683    185.137    281.535    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        3324.42    33.58      3358.00    c.m"
"             Rainfall losses        33.666     6.123      33.391     mm"
"             Runoff depth           12.334     39.877     12.609     mm"
"             Runoff volume          891.37     29.11      920.48     c.m"
"             Runoff coefficient     0.268      0.867      0.274      "
"             Maximum flow           0.080      0.006      0.082      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.082     0.082     0.533     0.533"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.082     0.082     0.082     0.533"
" 40          HYDROGRAPH   Combine    2000"
"            6   Combine "
"         2000   Node #"
"                "
"             Maximum flow                  0.585    c.m/sec"
"             Hydrograph volume         10586.213    c.m"
"                    0.082     0.082     0.082     0.585"
" 40          HYDROGRAPH   Confluence    2000"
"            7   Confluence "
"         2000   Node #"
"                "
"             Maximum flow                  0.585    c.m/sec"
"             Hydrograph volume         10586.214    c.m"
"                    0.082     0.585     0.082     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.082     0.585     0.585     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"             Maximum flow                  2.098    c.m/sec"
"             Hydrograph volume         42401.707    c.m"
"                    0.082     0.585     0.585     2.098"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"             Maximum flow                  2.098    c.m/sec"
"             Hydrograph volume         42401.707    c.m"
"                    0.082     2.098     0.585     0.000"
" 52          CHANNEL DESIGN"
"        2.098   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   202.600   205.200"
"                405.200   405.200"
"                 10.000    10.000     7.000     5.800     7.000"
"                 10.000    10.000"
"        4.200   Channel depth    metre"
"        0.243   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.321    metre"
```

```
"             Velocity                      0.444    m/sec"
"             Channel capacity            525.855    c.m/sec"
"             Critical depth                0.718    metre"
" 53          ROUTE    Channel Route 370"
"       370.00      Channel Route 370 Reach length   ( metre)"
"        0.339   X-factor <= 0.5"
"      625.285   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  2.095    c.m/sec"
"                     0.082     2.098     2.095     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Junction at catchment 900 and ex. drain"
"             Maximum flow                  2.095    c.m/sec"
"             Hydrograph volume         42401.711    c.m"
"                     0.082     2.098     2.095     2.095"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.082     0.000     2.095     2.095"
" 33          CATCHMENT 900"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         900   Ariss Glen and J.Hefferman properties "
"       1.000   % Impervious"
"      16.960   Total Area"
"     420.000   Flow length"
"       2.000   Overland Slope"
"      16.790   Pervious Area"
"     420.000   Pervious length"
"       2.000   Pervious slope"
"       0.170   Impervious Area"
"     420.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      73.500   Pervious SCS Curve No."
"       0.230   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       9.158   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.884   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
```

```
"                    0.089     0.000     2.095     2.095 c.m/sec"
"             Catchment 900          Pervious   Impervious Total Area "
"             Surface Area           16.790     0.170      16.960     hectare"
"             Time of concentration  160.680    17.023     155.303    minutes"
"             Time to Centroid       396.336    196.841    388.870    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        7723.58    78.02      7801.60    c.m"
"             Rainfall losses        35.432     5.320      35.131     mm"
"             Runoff depth           10.568     40.680     10.869     mm"
"             Runoff volume          1774.46    68.99      1843.45    c.m"
"             Runoff coefficient     0.230      0.884      0.236      "
"             Maximum flow           0.087      0.014      0.089      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.089     0.089     2.095     2.095"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.089     0.089     0.089     2.095"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 900 and ex. drain"
"             Maximum flow                  2.184    c.m/sec"
"             Hydrograph volume         44245.145    c.m"
"                    0.089     0.089     0.089     2.184"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Junction at catchment 900 and ex. drain"
"             Maximum flow                  2.184    c.m/sec"
"             Hydrograph volume         44245.133    c.m"
"                    0.089     2.184     0.089     0.000"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"             Flow At the Ariss Glen Subdivision  "
" 52          CHANNEL DESIGN"
"        2.184   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.500   202.700"
"                204.200   404.200"
"                 10.000    10.000     7.000     5.750     5.750"
"                  7.000    10.000"
"        4.250   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.407    metre"
```

```
"             Velocity                      0.384    m/sec"
"             Channel capacity            447.007    c.m/sec"
"             Critical depth                0.571    metre"
" 53          ROUTE    Channel Route 210"
"       210.00      Channel Route 210 Reach length   ( metre)"
"        0.167   X-factor <= 0.5"
"      409.968   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  2.182    c.m/sec"
"                     0.089     2.184     2.182     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Junction at catchment 9 "
"             Maximum flow                  2.182    c.m/sec"
"             Hydrograph volume         44245.105    c.m"
"                     0.089     2.184     2.182     2.182"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.089     0.000     2.182     2.182"
" 33          CATCHMENT 1000"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        1000   Flows to Main Drain"
"       1.000   % Impervious"
"      13.780   Total Area"
"     181.000   Flow length"
"       2.000   Overland Slope"
"      13.642   Pervious Area"
"     181.000   Pervious length"
"       2.000   Pervious slope"
"       0.138   Impervious Area"
"     181.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.500   Pervious SCS Curve No."
"       0.243   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.694   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.881   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
```

```
"                    0.105     0.000     2.182     2.182 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           13.642     0.138      13.780     hectare"
"             Time of concentration  94.520     10.273     91.548     minutes"
"             Time to Centroid       321.336    188.538    316.651    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        6275.41    63.39      6338.80    c.m"
"             Rainfall losses        34.802     5.459      34.509     mm"
"             Runoff depth           11.198     40.541     11.491     mm"
"             Runoff volume          1527.65    55.87      1583.52    c.m"
"             Runoff coefficient     0.243      0.881      0.250      "
"             Maximum flow           0.103      0.012      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.105     0.105     2.182     2.182"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.105     0.105     0.105     2.182"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                  2.260    c.m/sec"
"             Hydrograph volume         45828.645    c.m"
"                    0.105     0.105     0.105     2.260"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.105     0.000     0.105     2.260"
" 47          FILEI_O Read/Open DIV01000.005hyd"
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01000.005hyd"
"             Spill at 347.00 "
"             Total volume                  0.000    c.m"
"             Maximum flow                  0.000    c.m/sec"
"                  0.000     0.000     0.105     2.260 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.000     0.000     0.105     2.260"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.000     0.000     0.000     2.260"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                  2.260    c.m/sec"
"             Hydrograph volume         45828.648    c.m"
"                    0.000     0.000     0.000     2.260"
```

```
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                  2.260    c.m/sec"
"             Hydrograph volume         45828.648    c.m"
"                     0.000     2.260     0.000     0.000"
" 52          CHANNEL DESIGN"
"        2.260   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   202.540   203.790"
"                206.330   406.330"
"                 10.000    10.000     7.000     5.630     5.630"
"                  7.000    10.000"
"        4.370   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.000    metre"
"             Velocity                      0.728    m/sec"
"             Channel capacity            463.642    c.m/sec"
"             Critical depth                0.531    metre"
" 53          ROUTE    Channel Route 654"
"       654.00      Channel Route 654 Reach length   ( metre)"
"        0.302   X-factor <= 0.5"
"      674.005   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  2.255    c.m/sec"
"                     0.000     2.260     2.255     0.000 c.m/sec"
" 38          START/RE-START TOTALS 1000"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    376.840    hectare"
"             Total Impervious area                     3.768    hectare"
"             Total % impervious                        1.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                          W:\Kitchener\420-2020\"
"                420099 - Will O Homes 6th Line East Ariss\Design Data\Modelling
Files\MIDUSS\2021-04-28"
"                Output filename:                        Kurtz - Ex_100yr.out"
"                Licensee name:                                          gmbp"
"                Company                                                 gmbp"
"                Date & Time last used:               4/28/2021 at 2:31:33 PM"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"     1440.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"      101.500   Rainfall depth"
"     1440.000   Duration"
"           21   M:\SCS_Type2_24hr.mrd   SCS 24 hour Type II storm"
"             Maximum intensity           124.236    mm/hr"
"             Total depth                 101.500    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          100   Flows to Branch B "
"        1.000   % Impervious"
"      114.500   Total Area"
"      530.000   Flow length"
"        2.000   Overland Slope"
"      113.355   Pervious Area"
"      530.000   Pervious length"
"        2.000   Pervious slope"
"        1.145   Impervious Area"
"      530.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.300   Pervious SCS Curve No."
"        0.484   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.332   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.940   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     5.193     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
```

```
"             Surface Area           113.355    1.145      114.500    hectare"
"             Time of concentration  75.659     11.426     74.423     minutes"
"             Time to Centroid       988.668    773.040    984.521    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        11.5055    0.1162     11.6217    ha-m"
"             Rainfall losses        52.345     6.074      51.883     mm"
"             Runoff depth           49.155     95.426     49.617     mm"
"             Runoff volume          5.5719     0.1093     5.6812     ha-m"
"             Runoff coefficient     0.484      0.940      0.489      "
"             Maximum flow           5.158      0.299      5.193      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     5.193     5.193     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     5.193     5.193     5.193     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  5.193    c.m/sec"
"             Hydrograph volume         56812.039    c.m"
"                     5.193     5.193     5.193     5.193"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     5.193     0.000     5.193     5.193"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   Runoff into Branch A "
"        1.000   % Impervious"
"       46.300   Total Area"
"      380.000   Flow length"
"        2.000   Overland Slope"
"       45.837   Pervious Area"
"      380.000   Pervious length"
"        2.000   Pervious slope"
"        0.463   Impervious Area"
"      380.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.100   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.422   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.943   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     2.527     0.000     5.193     5.193 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           45.837     0.463      46.300     hectare"
"             Time of concentration  62.121     9.358      61.096     minutes"
"             Time to Centroid       960.091    768.201    956.366    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        4.6525     0.0470     4.6995     ha-m"
"             Rainfall losses        52.660     5.766      52.191     mm"
"             Runoff depth           48.840     95.734     49.309     mm"
"             Runoff volume          2.2387     0.0443     2.2830     ha-m"
"             Runoff coefficient     0.481      0.943      0.486      "
"             Maximum flow           2.511      0.120      2.527      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.527     2.527     5.193     5.193"
" 52          CHANNEL DESIGN"
"        2.527   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.600   203.600"
"                205.200   405.200"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.275   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                0.934    metre"
"             Velocity                     0.922    m/sec"
"             Channel capacity           565.690    c.m/sec"
"             Critical depth               0.500    metre"
" 53          ROUTE    Channel Route 811"
"       811.00      Channel Route 811 Reach length   ( metre)"
"        0.385   X-factor <= 0.5"
"      659.357   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"             Peak outflow                 2.439    c.m/sec"
"                     2.527     2.527     2.439     5.193 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
```

```
"             Maximum flow                  7.632    c.m/sec"
"             Hydrograph volume          79642.164    c.m"
"                    2.527     2.527     2.439     7.632"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    2.527     0.000     2.439     7.632"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          300   Flow to Branch A "
"        1.000   % Impervious"
"       19.600   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       19.404   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.196   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.700   Pervious SCS Curve No."
"        0.475   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.603   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.940   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    1.093     0.000     2.439     7.632 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           19.404     0.196      19.600     hectare"
"             Time of concentration  57.364     8.599      56.407     minutes"
"             Time to Centroid       950.734    766.504    947.122    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        1.9695     0.0199     1.9894     ha-m"
"             Rainfall losses        53.323     6.099      52.851     mm"
"             Runoff depth           48.177     95.401     48.649     mm"
"             Runoff volume          9348.25    186.99     9535.23    c.m"
"             Runoff coefficient     0.475      0.940      0.479      "
"             Maximum flow           1.086      0.053      1.093      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.093     1.093     2.439     7.632"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.093     1.093     1.093     7.632"
" 40          HYDROGRAPH   Combine    1000"
```

```
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  8.607    c.m/sec"
"             Hydrograph volume         89177.438    c.m"
"                     1.093     1.093     1.093     8.607"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  8.607    c.m/sec"
"             Hydrograph volume         89177.438    c.m"
"                     1.093     8.607     1.093     0.000"
" 52          CHANNEL DESIGN"
"        8.607   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          14.   Define an arbitrary cross-section"
"                  0.000    19.320    38.370    77.930   117.760"
"                156.130   172.060   177.160   180.300   185.180"
"                190.360   227.800   247.150   269.760"
"                350.742   350.800   350.610   349.140   348.810"
"                349.380   349.250   347.190   347.190   348.890"
"                348.680   349.880   350.880   351.720"
"        3.552   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                 1.350    metre"
"             Velocity                      0.944    m/sec"
"             Channel capacity            392.772    c.m/sec"
"             Critical depth                0.737    metre"
" 53          ROUTE    Channel Route 676"
"       676.00      Channel Route 676 Reach length   ( metre)"
"        0.234   X-factor <= 0.5"
"      536.904   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  8.324    c.m/sec"
"                     1.093     8.607     8.324     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
```

```
"             Maximum flow                  8.324    c.m/sec"
"             Hydrograph volume         89177.414    c.m"
"                    1.093     8.607     8.324     8.324"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    1.093     0.000     8.324     8.324"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          400   Flows to Branch A "
"        1.000   % Impervious"
"       22.200   Total Area"
"      300.000   Flow length"
"        2.000   Overland Slope"
"       21.978   Pervious Area"
"      300.000   Pervious length"
"        2.000   Pervious slope"
"        0.222   Impervious Area"
"      300.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.800   Pervious SCS Curve No."
"        0.492   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.109   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.937   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    1.351     0.000     8.324     8.324 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           21.978     0.222      22.200     hectare"
"             Time of concentration  53.444     8.121      52.589     minutes"
"             Time to Centroid       940.203    765.413    936.906    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        2.2308     0.0225     2.2533     ha-m"
"             Rainfall losses        51.529     6.394      51.077     mm"
"             Runoff depth           49.971     95.106     50.423     mm"
"             Runoff volume          1.0983     0.0211     1.1194     ha-m"
"             Runoff coefficient     0.492      0.937      0.497      "
"             Maximum flow           1.343      0.061      1.351      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.351     1.351     8.324     8.324"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.351     1.351     1.351     8.324"
" 40          HYDROGRAPH   Combine    1000"
```

```
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                  9.323    c.m/sec"
"             Hydrograph volume        100371.234    c.m"
"                     1.351     1.351     1.351     9.323"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                "
"             Maximum flow                  9.323    c.m/sec"
"             Hydrograph volume        100371.234    c.m"
"                     1.351     9.323     1.351     0.000"
" 54          POND DESIGN"
"        9.323   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     100371.2   Hydrograph volume    c.m"
"          14.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                347.150     0.000     0.000"
"                347.450    0.7235     7.359"
"                347.750     1.447    47.207"
"                348.050     2.170   144.134"
"                348.350     2.894   308.711"
"                348.650     6.471   548.365"
"                348.950     8.682   869.233"
"                349.250    10.434  2362.250"
"                349.550    11.932  6121.604"
"                349.850    13.262  12206.77"
"                350.150    14.470  33070.85"
"                350.450    15.584  74826.98"
"                350.710    16.489  122506.8"
"                350.810    20.279  147193.5"
"             Peak outflow                  8.942    c.m/sec"
"             Maximum level               349.004    metre"
"             Maximum storage            1138.720    c.m"
"             Centroidal lag               16.346   hours"
"                  1.351     9.323     8.942     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow at Country Road 51 culvert, north crossing "
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     1.351     8.942     8.942     0.000"
" 52          CHANNEL DESIGN"
"        8.942   Current peak flow    c.m/sec"
```

```
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          25.   Define an arbitrary cross-section"
"                  1.000    16.530    19.970    37.290    43.570"
"                 49.300    91.100   100.500   141.000   178.700"
"                195.100   212.200   216.300   220.000   223.900"
"                256.700   279.900   315.000   328.900   331.400"
"                332.400   375.900   438.800   471.000   488.900"
"                347.640   347.810   347.850   347.500   347.650"
"                347.600   347.600   347.400   347.700   347.500"
"                347.000   346.900   345.000   345.000   346.500"
"                346.200   346.500   346.600   345.800   345.800"
"                345.900   348.000   348.100   348.900   350.000"
"        2.640   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                1.086    metre"
"             Velocity                     1.011    m/sec"
"             Channel capacity           316.790    c.m/sec"
"             Critical depth               0.716    metre"
" 53          ROUTE    Channel Route 700"
"       700.00      Channel Route 700 Reach length   ( metre)"
"        0.450   X-factor <= 0.5"
"      519.051   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      300.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 8.908    c.m/sec"
"                    1.351     8.942     8.908     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Catchment 500 junction "
"             Maximum flow                 8.908    c.m/sec"
"             Hydrograph volume        100361.313    c.m"
"                    1.351     8.942     8.908     8.908"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    1.351     0.000     8.908     8.908"
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           1   Equal length"
```

```
"            1   SCS method"
"          500   Flows to Branch A "
"        1.000   % Impervious"
"       30.800   Total Area"
"      370.000   Flow length"
"        2.000   Overland Slope"
"       30.492   Pervious Area"
"      370.000   Pervious length"
"        2.000   Pervious slope"
"        0.308   Impervious Area"
"      370.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.300   Pervious SCS Curve No."
"        0.517   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.459   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.943   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.861     0.000     8.908     8.908 c.m/sec"
"             Catchment 500          Pervious   Impervious Total Area "
"             Surface Area           30.492     0.308      30.800     hectare"
"             Time of concentration  59.525     9.210      58.614     minutes"
"             Time to Centroid       950.386    767.877    947.082    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        3.0949     0.0313     3.1262     ha-m"
"             Rainfall losses        49.064     5.793      48.631     mm"
"             Runoff depth           52.436     95.707     52.869     mm"
"             Runoff volume          1.5989     0.0295     1.6284     ha-m"
"             Runoff coefficient     0.517      0.943      0.521      "
"             Maximum flow           1.850      0.080      1.861      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.861     1.861     8.908     8.908"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.861     1.861     1.861     8.908"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 10.178    c.m/sec"
"             Hydrograph volume        116644.859    c.m"
"                     1.861     1.861     1.861    10.178"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
```

```
"               Catchment 500 junction "
"            Maximum flow                 10.178    c.m/sec"
"            Hydrograph volume        116644.859    c.m"
"                    1.861    10.178     1.861     0.000"
" 54         POND DESIGN"
"       10.178   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     116644.9   Hydrograph volume    c.m"
"          10.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"               344.950     0.000     0.000"
"               345.200    0.8301     5.239"
"               345.500     1.660    42.997"
"               345.800     2.490   164.458"
"               346.100     3.320   577.883"
"               346.400     5.470  1685.267"
"               346.700     6.987  3745.496"
"               347.000     8.229  6888.433"
"               347.300    28.193  12080.62"
"               347.650    73.169  16004.75"
"            Peak outflow                  9.522    c.m/sec"
"            Maximum level               347.021    metre"
"            Maximum storage            7243.274    c.m"
"            Centroidal lag               16.485   hours"
"                 1.861    10.178     9.522     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    1.861     9.522     9.522     0.000"
" 56         DIVERSION"
"         1000   Node number"
"        8.229   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         1.293    c.m/sec"
"            Volume of diverted flow    1341.291    c.m"
"            DIV01000.100hyd"
"            Spill at 347.00 "
"                    1.861     9.522     8.229     0.000 c.m/sec"
" 81         ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow at Country Road 51 culvert, south crossing "
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    1.861     8.229     8.229     0.000"
" 52         CHANNEL DESIGN"
"        8.229   Current peak flow    c.m/sec"
```

```
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   203.350   207.200"
"                210.580   213.580"
"                 10.000    10.000     7.000     6.200     6.300"
"                  8.420     9.000"
"        2.800   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.061    metre"
"             Velocity                      0.902    m/sec"
"             Channel capacity            306.274    c.m/sec"
"             Critical depth                0.693    metre"
" 53          ROUTE    Channel Route 267"
"       267.00      Channel Route 267 Reach length   ( metre)"
"        0.387   X-factor <= 0.5"
"      222.076   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  8.229    c.m/sec"
"                     1.861     8.229     8.229     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Combine at catchment 600 "
"             Maximum flow                  8.229    c.m/sec"
"             Hydrograph volume        115196.734    c.m"
"                     1.861     8.229     8.229     8.229"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     1.861     0.000     8.229     8.229"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         600   Flow to Branch E"
"        1.000   % Impervious"
"       26.000   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       25.740   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
```

```
"        0.260   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.900   Pervious SCS Curve No."
"        0.510   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.630   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.940   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.591     0.000     8.229     8.229 c.m/sec"
"             Catchment 600          Pervious   Impervious Total Area "
"             Surface Area           25.740     0.260      26.000     hectare"
"             Time of concentration  55.841     8.599      54.978     minutes"
"             Time to Centroid       943.270    766.504    940.039    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        2.6126     0.0264     2.6390     ha-m"
"             Rainfall losses        49.739     6.099      49.303     mm"
"             Runoff depth           51.761     95.401     52.197     mm"
"             Runoff volume          1.3323     0.0248     1.3571     ha-m"
"             Runoff coefficient     0.510      0.940      0.514      "
"             Maximum flow           1.581      0.070      1.591      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.591     1.591     8.229     8.229"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.591     1.591     1.591     8.229"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Combine at catchment 600 "
"             Maximum flow                  9.011    c.m/sec"
"             Hydrograph volume        128767.953    c.m"
"                     1.591     1.591     1.591     9.011"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Combine at catchment 600 "
"             Maximum flow                  9.011    c.m/sec"
"             Hydrograph volume        128767.953    c.m"
"                     1.591     9.011     1.591     0.000"
" 52          CHANNEL DESIGN"
"        9.011   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
```

```
"                 0.000     0.000   200.000   201.800   202.800"
"               204.600   404.600"
"                10.000    10.000     7.000     5.400     5.400"
"                 7.000    10.000"
"       4.600   Channel depth    metre"
"       0.520   Gradient   %"
"          0.   Variable roughness: 0=False; 1=True"
"                0.0400    0.0400    0.0400    0.0400    0.0400"
"                0.0400    0.0400"
"            Depth of flow                1.909    metre"
"            Velocity                     0.736    m/sec"
"            Channel capacity           767.253    c.m/sec"
"            Critical depth               1.297    metre"
" 53         ROUTE    Channel Route 252"
"      252.00      Channel Route 252 Reach length   ( metre)"
"       0.412   X-factor <= 0.5"
"     256.851   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"     300.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                 8.958    c.m/sec"
"                    1.591     9.011     8.958     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Link between previous catchments and 700, 800 "
"            Maximum flow                 8.958    c.m/sec"
"            Hydrograph volume        128767.914    c.m"
"                    1.591     9.011     8.958     8.958"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    1.591     0.000     8.958     8.958"
" 33         CATCHMENT 700"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         700   Flows to Branch C "
"       1.000   % Impervious"
"      33.500   Total Area"
"     280.000   Flow length"
"       2.000   Overland Slope"
"      33.165   Pervious Area"
"     280.000   Pervious length"
"       2.000   Pervious slope"
"       0.335   Impervious Area"
"     280.000   Impervious length"
"       2.000   Impervious slope"
```

```
"        0.250   Pervious Manning 'n'"
"       74.600   Pervious SCS Curve No."
"        0.473   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.648   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.934   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.016     0.000     8.958     8.958 c.m/sec"
"            Catchment 700          Pervious   Impervious Total Area "
"            Surface Area           33.165     0.335      33.500     hectare"
"            Time of concentration  52.043     7.792      51.178     minutes"
"            Time to Centroid       939.520    764.917    936.107    minutes"
"            Rainfall depth         101.500    101.500    101.500    mm"
"            Rainfall volume        3.3662     0.0340     3.4003     ha-m"
"            Rainfall losses        53.463     6.673      52.995     mm"
"            Runoff depth           48.037     94.827     48.505     mm"
"            Runoff volume          1.5932     0.0318     1.6249     ha-m"
"            Runoff coefficient     0.473      0.934      0.478      "
"            Maximum flow           2.004      0.093      2.016      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     2.016     2.016     8.958     8.958"
" 52         CHANNEL DESIGN"
"        2.016   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                0.898    metre"
"             Velocity                     1.117    m/sec"
"             Channel capacity           767.253    c.m/sec"
"             Critical depth               0.593    metre"
" 53         ROUTE    Channel Route 733"
"       733.00      Channel Route 733 Reach length   ( metre)"
"        0.442   X-factor <= 0.5"
"      492.324   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
```

```
"        0.500   Beta weighting factor"
"      300.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 1.961    c.m/sec"
"                    2.016     2.016     1.961     8.958 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    2.016     1.961     1.961     8.958"
" 33          CATCHMENT 800"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          800   Flow to Branch C "
"        1.000   % Impervious"
"       45.900   Total Area"
"      350.000   Flow length"
"        2.000   Overland Slope"
"       45.441   Pervious Area"
"      350.000   Pervious length"
"        2.000   Pervious slope"
"        0.459   Impervious Area"
"      350.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.499   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.942   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    2.688     1.961     1.961     8.958 c.m/sec"
"             Catchment 800          Pervious   Impervious Total Area "
"             Surface Area           45.441     0.459      45.900     hectare"
"             Time of concentration  58.338     8.908      57.412     minutes"
"             Time to Centroid       949.969    767.166    946.545    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        4.6123     0.0466     4.6589     ha-m"
"             Rainfall losses        50.896     5.896      50.446     mm"
"             Runoff depth           50.604     95.604     51.054     mm"
"             Runoff volume          2.2995     0.0439     2.3434     ha-m"
"             Runoff coefficient     0.499      0.942      0.503      "
"             Maximum flow           2.671      0.121      2.688      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    2.688     4.649     1.961     8.958"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    2.688     4.649     4.649     8.958"
" 40          HYDROGRAPH   Combine    2000"
"            6   Combine "
"         2000   Node #"
"                "
"             Maximum flow                 4.649    c.m/sec"
"             Hydrograph volume         39683.219    c.m"
"                    2.688     4.649     4.649     4.649"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    2.688     0.000     4.649     4.649"
" 33          CATCHMENT 801"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          801   Flow to Branch F"
"        1.000   % Impervious"
"        7.300   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        7.227   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.073   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.498   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.939   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.760     0.000     4.649     4.649 c.m/sec"
"             Catchment 801          Pervious   Impervious Total Area "
"             Surface Area           7.227      0.073      7.300      hectare"
"             Time of concentration  27.511     4.201      27.076     minutes"
"             Time to Centroid       884.014    756.469    881.633    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        7335.41    74.10      7409.50    c.m"
"             Rainfall losses        50.929     6.231      50.482     mm"
"             Runoff depth           50.571     95.269     51.018     mm"
"             Runoff volume          3654.77    69.55      3724.32    c.m"
"             Runoff coefficient     0.498      0.939      0.503      "
"             Maximum flow           0.757      0.022      0.760      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.760     0.760     4.649     4.649"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.760     0.760     0.760     4.649"
" 40          HYDROGRAPH   Combine    2000"
"            6   Combine "
"         2000   Node #"
"                "
"             Maximum flow                  5.042    c.m/sec"
"             Hydrograph volume         43407.531    c.m"
"                    0.760     0.760     0.760     5.042"
" 40          HYDROGRAPH   Confluence    2000"
"            7   Confluence "
"         2000   Node #"
"                "
"             Maximum flow                  5.042    c.m/sec"
"             Hydrograph volume         43407.535    c.m"
"                    0.760     5.042     0.760     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.760     5.042     5.042     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"             Maximum flow                 12.131    c.m/sec"
"             Hydrograph volume        172175.375    c.m"
"                    0.760     5.042     5.042    12.131"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"             Maximum flow                 12.131    c.m/sec"
"             Hydrograph volume        172175.359    c.m"
"                    0.760    12.131     5.042     0.000"
" 52          CHANNEL DESIGN"
"        12.131   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   202.600   205.200"
"                 405.200   405.200"
"                  10.000    10.000     7.000     5.800     7.000"
"                  10.000    10.000"
"         4.200   Channel depth    metre"
"         0.243   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400"
"              Depth of flow                 1.691    metre"
```

```
"             Velocity                      0.559    m/sec"
"             Channel capacity            525.855    c.m/sec"
"             Critical depth                1.441    metre"
" 53          ROUTE    Channel Route 370"
"       370.00      Channel Route 370 Reach length   ( metre)"
"        0.367   X-factor <= 0.5"
"      496.717   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 12.113    c.m/sec"
"                     0.760    12.131    12.113     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Junction at catchment 900 and ex. drain"
"             Maximum flow                 12.113    c.m/sec"
"             Hydrograph volume        172175.469    c.m"
"                     0.760    12.131    12.113    12.113"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.760     0.000    12.113    12.113"
" 33          CATCHMENT 900"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         900   Ariss Glen and J.Hefferman properties "
"        1.000   % Impervious"
"       16.960   Total Area"
"      420.000   Flow length"
"        2.000   Overland Slope"
"       16.790   Pervious Area"
"      420.000   Pervious length"
"        2.000   Pervious slope"
"        0.170   Impervious Area"
"      420.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       73.500   Pervious SCS Curve No."
"        0.457   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        9.158   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.944   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.788     0.000    12.113    12.113 c.m/sec"
"             Catchment 900          Pervious   Impervious Total Area "
"             Surface Area           16.790     0.170      16.960     hectare"
"             Time of concentration  67.307     9.938      66.134     minutes"
"             Time to Centroid       973.944    769.484    969.764    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        1.7042     0.0172     1.7214     ha-m"
"             Rainfall losses        55.145     5.716      54.650     mm"
"             Runoff depth           46.355     95.784     46.850     mm"
"             Runoff volume          7783.26    162.45     7945.71    c.m"
"             Runoff coefficient     0.457      0.944      0.462      "
"             Maximum flow           0.782      0.043      0.788      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.788     0.788    12.113    12.113"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.788     0.788     0.788    12.113"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 900 and ex. drain"
"             Maximum flow                12.729    c.m/sec"
"             Hydrograph volume        180121.031    c.m"
"                    0.788     0.788     0.788    12.729"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Junction at catchment 900 and ex. drain"
"             Maximum flow                12.729    c.m/sec"
"             Hydrograph volume        180121.063    c.m"
"                    0.788    12.729     0.788     0.000"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow At the Ariss Glen Subdivision  "
" 52          CHANNEL DESIGN"
"       12.729   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.500   202.700"
"                204.200   404.200"
"                 10.000    10.000     7.000     5.750     5.750"
"                  7.000    10.000"
"        4.250   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                1.793    metre"
```

```
"             Velocity                      0.503    m/sec"
"             Channel capacity            447.007    c.m/sec"
"             Critical depth                1.498    metre"
" 53          ROUTE    Channel Route 210"
"       210.00      Channel Route 210 Reach length   ( metre)"
"        0.161   X-factor <= 0.5"
"      313.150   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      300.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 12.678    c.m/sec"
"                     0.788    12.729    12.678     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Junction at catchment 9 "
"             Maximum flow                 12.678    c.m/sec"
"             Hydrograph volume        180121.172    c.m"
"                     0.788    12.729    12.678    12.678"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.788     0.000    12.678    12.678"
" 33          CATCHMENT 1000"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        1000   Flows to Main Drain"
"       1.000   % Impervious"
"      13.780   Total Area"
"     181.000   Flow length"
"       2.000   Overland Slope"
"      13.642   Pervious Area"
"     181.000   Pervious length"
"       2.000   Pervious slope"
"       0.138   Impervious Area"
"     181.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.500   Pervious SCS Curve No."
"       0.472   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.694   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.929   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
```

```
"                    1.001     0.000    12.678    12.678 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           13.642     0.138      13.780     hectare"
"             Time of concentration  40.107     5.997      39.442     minutes"
"             Time to Centroid       914.203    760.419    911.205    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        1.3847     0.0140     1.3987     ha-m"
"             Rainfall losses        53.609     7.244      53.146     mm"
"             Runoff depth           47.891     94.256     48.354     mm"
"             Runoff volume          6533.33    129.88     6663.22    c.m"
"             Runoff coefficient     0.472      0.929      0.476      "
"             Maximum flow           0.995      0.041      1.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.001     1.001    12.678    12.678"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.001     1.001     1.001    12.678"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                 13.000    c.m/sec"
"             Hydrograph volume        186784.375    c.m"
"                    1.001     1.001     1.001    13.000"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    1.001     0.000     1.001    13.000"
" 47          FILEI_O Read/Open DIV01000.100hyd"
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01000.100hyd"
"             Spill at 347.00 "
"             Total volume              1341.291    c.m"
"             Maximum flow                 1.293    c.m/sec"
"                  1.293     0.000     1.001    13.000 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.293     1.293     1.001    13.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.293     1.293     1.293    13.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                 14.162    c.m/sec"
"             Hydrograph volume        188125.609    c.m"
"                    1.293     1.293     1.293    14.162"
```

```
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                 14.162    c.m/sec"
"             Hydrograph volume         188125.609    c.m"
"                     1.293    14.162     1.293     0.000"
" 52          CHANNEL DESIGN"
"       14.162   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   202.540   203.790"
"                206.330   406.330"
"                 10.000    10.000     7.000     5.630     5.630"
"                  7.000    10.000"
"        4.370   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.895    metre"
"             Velocity                      0.526    m/sec"
"             Channel capacity            463.642    c.m/sec"
"             Critical depth                1.552    metre"
" 53          ROUTE    Channel Route 654"
"       654.00      Channel Route 654 Reach length   ( metre)"
"        0.262   X-factor <= 0.5"
"      466.233   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                 13.652    c.m/sec"
"                     1.293    14.162    13.652     0.000 c.m/sec"
" 38          START/RE-START TOTALS 1000"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    376.840    hectare"
"             Total Impervious area                     3.768    hectare"
"             Total % impervious                        1.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                          W:\Kitchener\420-2020\"
"                420099 - Will O Homes 6th Line East Ariss\Design Data\Modelling
Files\MIDUSS\2021-04-28"
"                Output filename:                            Kurtz - Ex_REG.out"
"                Licensee name:                                            gmbp"
"                Company                                                   gmbp"
"                Date & Time last used:               4/28/2021 at 2:39:50 PM"
" 31          TIME PARAMETERS"
"       60.000   Time Step"
"     2880.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Historic"
"            5   Historic"
"     2880.000   Duration"
"       48.000   Rainfall intensity values"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.026     2.026     2.026     2.028"
"                  2.026     6.000     4.000     6.000    13.000"
"                 17.000    13.000    23.000    13.000    13.000"
"                 53.000    38.000    13.000"
"             Maximum intensity            53.000    mm/hr"
"             Total depth                 285.000    mm"
"            6   000hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          100   Flows to Branch B "
"        1.000   % Impervious"
"      114.500   Total Area"
"      530.000   Flow length"
"        2.000   Overland Slope"
"      113.355   Pervious Area"
"      530.000   Pervious length"
"        2.000   Pervious slope"
"        1.145   Impervious Area"
"      530.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.300   Pervious SCS Curve No."
"        0.742   Pervious Runoff coefficient"
```

```
"        0.100   Pervious Ia/S coefficient"
"        8.332   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    11.983     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           113.355    1.145      114.500    hectare"
"             Time of concentration  89.884     16.022     88.923     minutes"
"             Time to Centroid       2637.039   2318.856   2632.897   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        32.3062    0.3263     32.6325    ha-m"
"             Rainfall losses        73.389     8.724      72.742     mm"
"             Runoff depth           211.611    276.276    212.258    mm"
"             Runoff volume          23.9872    0.3163     24.3035    ha-m"
"             Runoff coefficient     0.742      0.969      0.745      "
"             Maximum flow           11.856     0.136      11.983     c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    11.983    11.983     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    11.983    11.983    11.983     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 11.983    c.m/sec"
"             Hydrograph volume        243035.047    c.m"
"                    11.983    11.983    11.983    11.983"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    11.983     0.000    11.983    11.983"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   Runoff into Branch A "
"        1.000   % Impervious"
"       46.300   Total Area"
"      380.000   Flow length"
"        2.000   Overland Slope"
"       45.837   Pervious Area"
"      380.000   Pervious length"
"        2.000   Pervious slope"
"        0.463   Impervious Area"
"      380.000   Impervious length"
"        2.000   Impervious slope"
```

```
"        0.250   Pervious Manning 'n'"
"       75.100   Pervious SCS Curve No."
"        0.737   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.422   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.955   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     4.819     0.000    11.983    11.983 c.m/sec"
"            Catchment 200          Pervious   Impervious Total Area "
"            Surface Area           45.837     0.463      46.300     hectare"
"            Time of concentration  73.663     13.123     72.881     minutes"
"            Time to Centroid       2613.995   2316.056   2610.145   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        13.0635    0.1320     13.1955    ha-m"
"            Rainfall losses        74.938     12.760     74.317     mm"
"            Runoff depth           210.062    272.240    210.683    mm"
"            Runoff volume          9.6286     0.1260     9.7546     ha-m"
"            Runoff coefficient     0.737      0.955      0.739      "
"            Maximum flow           4.770      0.056      4.819      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     4.819     4.819    11.983    11.983"
" 52         CHANNEL DESIGN"
"        4.819   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.600   203.600"
"                205.200   405.200"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.275   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"            Depth of flow                1.757    metre"
"            Velocity                     0.587    m/sec"
"            Channel capacity           565.690    c.m/sec"
"            Critical depth               0.737    metre"
" 53         ROUTE    Channel Route 811"
"       811.00      Channel Route 811 Reach length   ( metre)"
"        0.391   X-factor <= 0.5"
"     1036.522   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
```

```
"        0.500   Beta weighting factor"
"     1200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  4.475    c.m/sec"
"                     4.819     4.819     4.475    11.983 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                16.210    c.m/sec"
"             Hydrograph volume        340581.469    c.m"
"                     4.819     4.819     4.475    16.210"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     4.819     0.000     4.475    16.210"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          300   Flow to Branch A "
"        1.000   % Impervious"
"       19.600   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       19.404   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.196   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.700   Pervious SCS Curve No."
"        0.733   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.603   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.944   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.092     0.000     4.475    16.210 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           19.404     0.196      19.600     hectare"
"             Time of concentration  67.768     12.058     67.053     minutes"
"             Time to Centroid       2608.437   2317.349   2604.700   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        5.5301     0.0559     5.5860     ha-m"
"             Rainfall losses        75.963     15.898     75.363     mm"
"             Runoff depth           209.037    269.102    209.637    mm"
"             Runoff volume          4.0562     0.0527     4.1089     ha-m"
```

```
"             Runoff coefficient     0.733      0.944      0.736      "
"             Maximum flow           2.072      0.024      2.092      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.092     2.092     4.475    16.210"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     2.092     2.092     2.092    16.210"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 18.302    c.m/sec"
"             Hydrograph volume         381670.438    c.m"
"                     2.092     2.092     2.092    18.302"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 18.302    c.m/sec"
"             Hydrograph volume         381670.438    c.m"
"                     2.092    18.302     2.092     0.000"
" 52          CHANNEL DESIGN"
"       18.302   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          14.   Define an arbitrary cross-section"
"                  0.000    19.320    38.370    77.930   117.760"
"                156.130   172.060   177.160   180.300   185.180"
"                190.360   227.800   247.150   269.760"
"                350.742   350.800   350.610   349.140   348.810"
"                349.380   349.250   347.190   347.190   348.890"
"                348.680   349.880   350.880   351.720"
"        3.552   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                1.983    metre"
"             Velocity                     0.527    m/sec"
"             Channel capacity           392.772    c.m/sec"
"             Critical depth               1.108    metre"
" 53          ROUTE    Channel Route 676"
"       676.00      Channel Route 676 Reach length   ( metre)"
"        0.394   X-factor <= 0.5"
"      962.609   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
```

```
"        0.500   Beta weighting factor"
"      900.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 17.279    c.m/sec"
"                     2.092    18.302    17.279     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                 17.279    c.m/sec"
"             Hydrograph volume        381670.656    c.m"
"                     2.092    18.302    17.279    17.279"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     2.092     0.000    17.279    17.279"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          400   Flows to Branch A "
"        1.000   % Impervious"
"       22.200   Total Area"
"      300.000   Flow length"
"        2.000   Overland Slope"
"       21.978   Pervious Area"
"      300.000   Pervious length"
"        2.000   Pervious slope"
"        0.222   Impervious Area"
"      300.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.800   Pervious SCS Curve No."
"        0.747   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.109   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.939   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.429     0.000    17.279    17.279 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           21.978     0.222      22.200     hectare"
"             Time of concentration  63.788     11.388     63.131     minutes"
"             Time to Centroid       2597.446   2315.648   2593.911   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        6.2637     0.0633     6.3270     ha-m"
"             Rainfall losses        72.105     17.290     71.557     mm"
"             Runoff depth           212.895    267.710    213.443    mm"
"             Runoff volume          4.6790     0.0594     4.7384     ha-m"
```

```
"             Runoff coefficient     0.747      0.939      0.749      "
"             Maximum flow           2.407      0.027      2.429      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.429     2.429    17.279    17.279"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     2.429     2.429     2.429    17.279"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                19.204    c.m/sec"
"             Hydrograph volume        429055.000    c.m"
"                     2.429     2.429     2.429    19.204"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                "
"             Maximum flow                19.204    c.m/sec"
"             Hydrograph volume        429054.969    c.m"
"                     2.429    19.204     2.429     0.000"
" 54          POND DESIGN"
"       19.204   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     429055.0   Hydrograph volume    c.m"
"          14.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                347.150     0.000     0.000"
"                347.450    0.7235     7.359"
"                347.750     1.447    47.207"
"                348.050     2.170   144.134"
"                348.350     2.894   308.711"
"                348.650     6.471   548.365"
"                348.950     8.682   869.233"
"                349.250    10.434  2362.250"
"                349.550    11.932  6121.604"
"                349.850    13.262  12206.77"
"                350.150    14.470  33070.85"
"                350.450    15.584  74826.98"
"                350.710    16.489  122506.8"
"                350.810    20.279  147193.5"
"             Peak outflow                14.495    c.m/sec"
"             Maximum level              350.169    metre"
"             Maximum storage          35748.004    c.m"
"             Centroidal lag              44.216   hours"
```

```
"                  2.429    19.204    14.495     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"              Flow at Country Road 51 culvert, north crossing "
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                    2.429    14.495    14.495     0.000"
" 52          CHANNEL DESIGN"
"        14.495   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"           25.   Define an arbitrary cross-section"
"                   1.000    16.530    19.970    37.290    43.570"
"                  49.300    91.100   100.500   141.000   178.700"
"                 195.100   212.200   216.300   220.000   223.900"
"                 256.700   279.900   315.000   328.900   331.400"
"                 332.400   375.900   438.800   471.000   488.900"
"                 347.640   347.810   347.850   347.500   347.650"
"                 347.600   347.600   347.400   347.700   347.500"
"                 347.000   346.900   345.000   345.000   346.500"
"                 346.200   346.500   346.600   345.800   345.800"
"                 345.900   348.000   348.100   348.900   350.000"
"         2.640   Channel depth    metre"
"         0.540   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"              Depth of flow                 1.346    metre"
"              Velocity                      0.815    m/sec"
"              Channel capacity            316.790    c.m/sec"
"              Critical depth                1.003    metre"
" 53          ROUTE    Channel Route 700"
"        700.00      Channel Route 700 Reach length   ( metre)"
"         0.456   X-factor <= 0.5"
"       643.792   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"       600.000   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"              Peak outflow                 14.462    c.m/sec"
"                     2.429    14.495    14.462     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"             6   Combine "
"          1000   Node #"
"                 Catchment 500 junction "
```

```
"             Maximum flow                 14.462    c.m/sec"
"             Hydrograph volume        429934.063    c.m"
"                    2.429    14.495    14.462    14.462"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    2.429     0.000    14.462    14.462"
" 33          CATCHMENT 500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          500   Flows to Branch A "
"        1.000   % Impervious"
"       30.800   Total Area"
"      370.000   Flow length"
"        2.000   Overland Slope"
"       30.492   Pervious Area"
"      370.000   Pervious length"
"        2.000   Pervious slope"
"        0.308   Impervious Area"
"      370.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.300   Pervious SCS Curve No."
"        0.760   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.459   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.953   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    3.281     0.000    14.462    14.462 c.m/sec"
"             Catchment 500          Pervious   Impervious Total Area "
"             Surface Area           30.492     0.308      30.800     hectare"
"             Time of concentration  72.032     12.914     71.292     minutes"
"             Time to Centroid       2598.062   2316.181   2594.533   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        8.6902     0.0878     8.7780     ha-m"
"             Rainfall losses        68.470     13.290     67.919     mm"
"             Runoff depth           216.530    271.710    217.081    mm"
"             Runoff volume          6.6024     0.0837     6.6861     ha-m"
"             Runoff coefficient     0.760      0.953      0.762      "
"             Maximum flow           3.249      0.038      3.281      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    3.281     3.281    14.462    14.462"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    3.281     3.281     3.281    14.462"
" 40          HYDROGRAPH   Combine    1000"
```

```
"            6   Combine "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 17.011    c.m/sec"
"             Hydrograph volume        496795.125    c.m"
"                     3.281     3.281     3.281    17.011"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 17.011    c.m/sec"
"             Hydrograph volume        496795.125    c.m"
"                     3.281    17.011     3.281     0.000"
" 54          POND DESIGN"
"       17.011   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     496795.1   Hydrograph volume    c.m"
"          10.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                344.950     0.000     0.000"
"                345.200    0.8301     5.239"
"                345.500     1.660    42.997"
"                345.800     2.490   164.458"
"                346.100     3.320   577.883"
"                346.400     5.470  1685.267"
"                346.700     6.987  3745.496"
"                347.000     8.229  6888.433"
"                347.300    28.193  12080.62"
"                347.650    73.169  16004.75"
"             Peak outflow                 16.934    c.m/sec"
"             Maximum level               347.131    metre"
"             Maximum storage            9157.636    c.m"
"             Centroidal lag               44.407   hours"
"                  3.281    17.011    16.934     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     3.281    16.934    16.934     0.000"
" 56          DIVERSION"
"         1000   Node number"
"        8.229   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         8.705    c.m/sec"
"             Volume of diverted flow  126952.883    c.m"
"             DIV01000.000hyd"
"             Spill at 347.00 "
```

```
"                    3.281    16.934     8.229     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"              Flow at Country Road 51 culvert, south crossing "
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                    3.281     8.229     8.229     0.000"
" 52          CHANNEL DESIGN"
"         8.229   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   203.350   207.200"
"                 210.580   213.580"
"                  10.000    10.000     7.000     6.200     6.300"
"                   8.420     9.000"
"         2.800   Channel depth    metre"
"         0.540   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400"
"              Depth of flow                1.061    metre"
"              Velocity                     0.902    m/sec"
"              Channel capacity           306.274    c.m/sec"
"              Critical depth               0.693    metre"
" 53          ROUTE    Channel Route 267"
"        267.00      Channel Route 267 Reach length   ( metre)"
"         0.387   X-factor <= 0.5"
"       222.076   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"       257.143   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"              Peak outflow                 8.229    c.m/sec"
"                    3.281     8.229     8.229     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Combine at catchment 600 "
"              Maximum flow                 8.229    c.m/sec"
"              Hydrograph volume        373274.063    c.m"
"                    3.281     8.229     8.229     8.229"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    3.281     0.000     8.229     8.229"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           1   Equal length"
```

```
"            1   SCS method"
"          600   Flow to Branch E"
"        1.000   % Impervious"
"       26.000   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       25.740   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.260   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.900   Pervious SCS Curve No."
"        0.757   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.630   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.944   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.824     0.000     8.229     8.229 c.m/sec"
"             Catchment 600          Pervious   Impervious Total Area "
"             Surface Area           25.740     0.260      26.000     hectare"
"             Time of concentration  67.328     12.058     66.640     minutes"
"             Time to Centroid       2594.695   2317.349   2591.244   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        7.3359     0.0741     7.4100     ha-m"
"             Rainfall losses        69.269     15.898     68.735     mm"
"             Runoff depth           215.731    269.102    216.265    mm"
"             Runoff volume          5.5529     0.0700     5.6229     ha-m"
"             Runoff coefficient     0.757      0.944      0.759      "
"             Maximum flow           2.797      0.032      2.824      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.824     2.824     8.229     8.229"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     2.824     2.824     2.824     8.229"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Combine at catchment 600 "
"             Maximum flow                 11.053    c.m/sec"
"             Hydrograph volume        429502.875    c.m"
"                     2.824     2.824     2.824    11.053"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
```

```
"               Combine at catchment 600 "
"             Maximum flow                 11.053    c.m/sec"
"             Hydrograph volume        429502.906    c.m"
"                     2.824    11.053     2.824     0.000"
" 52          CHANNEL DESIGN"
"       11.053   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                1.956    metre"
"             Velocity                     0.759    m/sec"
"             Channel capacity           767.253    c.m/sec"
"             Critical depth               1.756    metre"
" 53          ROUTE    Channel Route 252"
"       252.00      Channel Route 252 Reach length   ( metre)"
"        0.411   X-factor <= 0.5"
"      248.935   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      276.923   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                10.971    c.m/sec"
"                     2.824    11.053    10.971     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Link between previous catchments and 700, 800 "
"             Maximum flow                10.971    c.m/sec"
"             Hydrograph volume        429502.969    c.m"
"                     2.824    11.053    10.971    10.971"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     2.824     0.000    10.971    10.971"
" 33          CATCHMENT 700"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         700   Flows to Branch C "
"        1.000   % Impervious"
```

```
"       33.500   Total Area"
"      280.000   Flow length"
"        2.000   Overland Slope"
"       33.165   Pervious Area"
"      280.000   Pervious length"
"        2.000   Pervious slope"
"        0.335   Impervious Area"
"      280.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.600   Pervious SCS Curve No."
"        0.735   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.648   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.938   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     3.668     0.000    10.971    10.971 c.m/sec"
"             Catchment 700          Pervious   Impervious Total Area "
"             Surface Area           33.165     0.335      33.500     hectare"
"             Time of concentration  61.425     10.926     60.783     minutes"
"             Time to Centroid       2601.727   2311.798   2598.039   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        9.4520     0.0955     9.5475     ha-m"
"             Rainfall losses        75.469     17.765     74.892     mm"
"             Runoff depth           209.531    267.235    210.108    mm"
"             Runoff volume          6.9491     0.0895     7.0386     ha-m"
"             Runoff coefficient     0.735      0.938      0.737      "
"             Maximum flow           3.634      0.042      3.668      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     3.668     3.668    10.971    10.971"
" 52          CHANNEL DESIGN"
"        3.668   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                1.201    metre"
"             Velocity                     1.299    m/sec"
```

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"             Channel capacity            767.253    c.m/sec"
"             Critical depth                0.819    metre"
" 53          ROUTE    Channel Route 733"
"       733.00      Channel Route 733 Reach length   ( metre)"
"        0.425   X-factor <= 0.5"
"      423.161   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      450.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  3.493    c.m/sec"
"                     3.668     3.668     3.493    10.971 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     3.668     3.493     3.493    10.971"
" 33          CATCHMENT 800"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          800   Flow to Branch C "
"        1.000   % Impervious"
"       45.900   Total Area"
"      350.000   Flow length"
"        2.000   Overland Slope"
"       45.441   Pervious Area"
"      350.000   Pervious length"
"        2.000   Pervious slope"
"        0.459   Impervious Area"
"      350.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.749   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.949   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     4.904     3.493     3.493    10.971 c.m/sec"
"             Catchment 800          Pervious   Impervious Total Area "
"             Surface Area           45.441     0.459      45.900     hectare"
"             Time of concentration  69.887     12.491     69.162     minutes"
"             Time to Centroid       2601.921   2316.617   2598.314   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        12.9507    0.1308     13.0815    ha-m"
"             Rainfall losses        71.582     14.489     71.011     mm"
```

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"             Runoff depth           213.418    270.511    213.989    mm"
"             Runoff volume          9.6979     0.1242     9.8221     ha-m"
"             Runoff coefficient     0.749      0.949      0.751      "
"             Maximum flow           4.856      0.056      4.904      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     4.904     8.397     3.493    10.971"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     4.904     8.397     8.397    10.971"
" 40          HYDROGRAPH   Combine    2000"
"            6   Combine "
"         2000   Node #"
"                "
"             Maximum flow                  8.397    c.m/sec"
"             Hydrograph volume        168607.266    c.m"
"                     4.904     8.397     8.397     8.397"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     4.904     0.000     8.397     8.397"
" 33          CATCHMENT 801"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          801   Flow to Branch F"
"        1.000   % Impervious"
"        7.300   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        7.227   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.073   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.745   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.840     0.000     8.397     8.397 c.m/sec"
"             Catchment 801          Pervious   Impervious Total Area "
"             Surface Area           7.227      0.073      7.300      hectare"
"             Time of concentration  32.958     5.891      32.637     minutes"
"             Time to Centroid       2548.900   2260.661   2545.486   minutes"
```

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"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2.0597     0.0208     2.0805     ha-m"
"             Rainfall losses        72.711     33.040     72.314     mm"
"             Runoff depth           212.289    251.960    212.686    mm"
"             Runoff volume          1.5342     0.0184     1.5526     ha-m"
"             Runoff coefficient     0.745      0.884      0.746      "
"             Maximum flow           0.834      0.009      0.840      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.840     0.840     8.397     8.397"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.840     0.840     0.840     8.397"
" 40          HYDROGRAPH   Combine    2000"
"            6   Combine "
"         2000   Node #"
"                "
"             Maximum flow                  9.237    c.m/sec"
"             Hydrograph volume        184133.344    c.m"
"                    0.840     0.840     0.840     9.237"
" 40          HYDROGRAPH   Confluence    2000"
"            7   Confluence "
"         2000   Node #"
"                "
"             Maximum flow                  9.237    c.m/sec"
"             Hydrograph volume        184133.344    c.m"
"                    0.840     9.237     0.840     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.840     9.237     9.237     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"             Maximum flow                 20.209    c.m/sec"
"             Hydrograph volume        613636.375    c.m"
"                    0.840     9.237     9.237    20.209"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Link between previous catchments and 700, 800 "
"             Maximum flow                 20.209    c.m/sec"
"             Hydrograph volume        613636.250    c.m"
"                    0.840    20.209     9.237     0.000"
" 52          CHANNEL DESIGN"
"        20.209   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   202.600   205.200"
```

```
"                405.200   405.200"
"                 10.000    10.000     7.000     5.800     7.000"
"                 10.000    10.000"
"        4.200   Channel depth    metre"
"        0.243   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.823    metre"
"             Velocity                      0.627    m/sec"
"             Channel capacity            525.855    c.m/sec"
"             Critical depth                1.546    metre"
" 53          ROUTE    Channel Route 370"
"       370.00      Channel Route 370 Reach length   ( metre)"
"        0.344   X-factor <= 0.5"
"      442.537   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      514.286   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 19.619    c.m/sec"
"                     0.840    20.209    19.619     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 900 and ex. drain"
"             Maximum flow                 19.619    c.m/sec"
"             Hydrograph volume        613636.438    c.m"
"                     0.840    20.209    19.619    19.619"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.840     0.000    19.619    19.619"
" 33          CATCHMENT 900"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          900   Ariss Glen and J.Hefferman properties "
"        1.000   % Impervious"
"       16.960   Total Area"
"      420.000   Flow length"
"        2.000   Overland Slope"
"       16.790   Pervious Area"
"      420.000   Pervious length"
"        2.000   Pervious slope"
"        0.170   Impervious Area"
"      420.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       73.500   Pervious SCS Curve No."
"        0.720   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        9.158   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.961   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.699     0.000    19.619    19.619 c.m/sec"
"             Catchment 900          Pervious   Impervious Total Area "
"             Surface Area           16.790     0.170      16.960     hectare"
"             Time of concentration  78.620     13.935     77.759     minutes"
"             Time to Centroid       2630.440   2316.065   2626.256   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        4.7853     0.0483     4.8336     ha-m"
"             Rainfall losses        79.813     11.044     79.125     mm"
"             Runoff depth           205.187    273.956    205.875    mm"
"             Runoff volume          3.4452     0.0465     3.4916     ha-m"
"             Runoff coefficient     0.720      0.961      0.722      "
"             Maximum flow           1.681      0.021      1.699      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.699     1.699    19.619    19.619"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.699     1.699     1.699    19.619"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Junction at catchment 900 and ex. drain"
"             Maximum flow                 21.318    c.m/sec"
"             Hydrograph volume        648552.875    c.m"
"                     1.699     1.699     1.699    21.318"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"          1000   Node #"
"                 Junction at catchment 900 and ex. drain"
"             Maximum flow                 21.318    c.m/sec"
"             Hydrograph volume        648552.938    c.m"
"                     1.699    21.318     1.699     0.000"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"             Flow At the Ariss Glen Subdivision  "
" 52          CHANNEL DESIGN"
"       21.318   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.500   202.700"
```

```
"                204.200   404.200"
"                 10.000    10.000     7.000     5.750     5.750"
"                  7.000    10.000"
"        4.250   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.936    metre"
"             Velocity                      0.566    m/sec"
"             Channel capacity            447.007    c.m/sec"
"             Critical depth                1.607    metre"
" 53          ROUTE    Channel Route 210"
"       210.00      Channel Route 210 Reach length   ( metre)"
"        0.101   X-factor <= 0.5"
"      278.283   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      450.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 20.908    c.m/sec"
"                    1.699    21.318    20.908     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                 20.908    c.m/sec"
"             Hydrograph volume        648552.938    c.m"
"                    1.699    21.318    20.908    20.908"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    1.699     0.000    20.908    20.908"
" 33          CATCHMENT 1000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Flows to Main Drain"
"        1.000   % Impervious"
"       13.780   Total Area"
"      181.000   Flow length"
"        2.000   Overland Slope"
"       13.642   Pervious Area"
"      181.000   Pervious length"
"        2.000   Pervious slope"
"        0.138   Impervious Area"
"      181.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       74.500   Pervious SCS Curve No."
"        0.723   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.694   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.921   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.555     0.000    20.908    20.908 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           13.642     0.138      13.780     hectare"
"             Time of concentration  47.293     8.409      46.799     minutes"
"             Time to Centroid       2578.655   2285.975   2574.939   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        3.8880     0.0393     3.9273     ha-m"
"             Rainfall losses        78.822     22.551     78.259     mm"
"             Runoff depth           206.178    262.449    206.741    mm"
"             Runoff volume          2.8127     0.0362     2.8489     ha-m"
"             Runoff coefficient     0.723      0.921      0.725      "
"             Maximum flow           1.542      0.017      1.555      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.555     1.555    20.908    20.908"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.555     1.555     1.555    20.908"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Junction at catchment 9 "
"             Maximum flow                 22.462    c.m/sec"
"             Hydrograph volume        677041.813    c.m"
"                     1.555     1.555     1.555    22.462"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     1.555     0.000     1.555    22.462"
" 47          FILEI_O Read/Open DIV01000.000hyd"
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01000.000hyd"
"             Spill at 347.00 "
"             Total volume             126952.883    c.m"
"             Maximum flow                  8.705    c.m/sec"
"                  8.705     0.000     1.555    22.462 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     8.705     8.705     1.555    22.462"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                    8.705     8.705     8.705    22.462"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                 29.851    c.m/sec"
"             Hydrograph volume        803994.625    c.m"
"                    8.705     8.705     8.705    29.851"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Junction at catchment 9 "
"             Maximum flow                 29.851    c.m/sec"
"             Hydrograph volume        803994.625    c.m"
"                    8.705    29.851     8.705     0.000"
" 52          CHANNEL DESIGN"
"        29.851   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   202.540   203.790"
"                 206.330   406.330"
"                  10.000    10.000     7.000     5.630     5.630"
"                   7.000    10.000"
"         4.370   Channel depth    metre"
"         0.180   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400"
"             Depth of flow                 2.127    metre"
"             Velocity                      0.619    m/sec"
"             Channel capacity            463.642    c.m/sec"
"             Critical depth                1.752    metre"
" 53          ROUTE    Channel Route 654"
"        654.00      Channel Route 654 Reach length   ( metre)"
"         0.353   X-factor <= 0.5"
"       791.822   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"       900.000   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"              Peak outflow                 29.749    c.m/sec"
"                     8.705    29.851    29.749     0.000 c.m/sec"
" 38          START/RE-START TOTALS 1000"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    376.840    hectare"
"             Total Impervious area                     3.768    hectare"
```

```
"             Total % impervious                          1.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                             W:\Kitchener\420-2020\"
"                420099 - Will O Homes 6th Line East Ariss\Design Data\Modelling
Files\MIDUSS\2021-04-28"
"                Output filename:                         Kurtz - Post__5yr.out"
"                Licensee name:                                             gmbp"
"                Company                                                    gmbp"
"                Date & Time last used:                 4/28/2021 at 3:04:05 PM"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"       46.000   Rainfall depth"
"      360.000   Duration"
"           41   C:\Program Files (x86)\MIDUSS\SCS_6hr.mrd   SCS 6 hour
distributionsssss"
"            Maximum intensity            33.718    mm/hr"
"            Total depth                  46.000    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          100   Flows to Branch B "
"        1.000   % Impervious"
"      114.500   Total Area"
"      530.000   Flow length"
"        2.000   Overland Slope"
"      113.355   Pervious Area"
"      530.000   Pervious length"
"        2.000   Pervious slope"
"        1.145   Impervious Area"
"      530.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.300   Pervious SCS Curve No."
"        0.255   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.332   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.882   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.628     0.000     0.000     0.000 c.m/sec"
```

```
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           113.355    1.145      114.500    hectare"
"             Time of concentration  176.516    19.572     171.215    minutes"
"             Time to Centroid       413.266    200.004    406.062    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        5.2143     0.0527     5.2670     ha-m"
"             Rainfall losses        34.273     5.413      33.984     mm"
"             Runoff depth           11.727     40.587     12.016     mm"
"             Runoff volume          1.3293     0.0465     1.3758     ha-m"
"             Runoff coefficient     0.255      0.882      0.261      "
"             Maximum flow           0.617      0.093      0.628      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.628     0.628     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.628     0.628     0.628     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  0.628    c.m/sec"
"             Hydrograph volume         13757.808    c.m"
"                     0.628     0.628     0.628     0.628"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.628     0.000     0.628     0.628"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   Runoff into Branch A "
"        1.000   % Impervious"
"       46.300   Total Area"
"      380.000   Flow length"
"        2.000   Overland Slope"
"       45.837   Pervious Area"
"      380.000   Pervious length"
"        2.000   Pervious slope"
"        0.463   Impervious Area"
"      380.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.100   Pervious SCS Curve No."
"        0.252   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.422   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.282     0.000     0.628     0.628 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           45.837     0.463      46.300     hectare"
"             Time of concentration  145.295    16.031     140.866    minutes"
"             Time to Centroid       378.130    195.699    371.880    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        2.1085     0.0213     2.1298     ha-m"
"             Rainfall losses        34.408     5.286      34.117     mm"
"             Runoff depth           11.592     40.714     11.883     mm"
"             Runoff volume          5313.48    188.50     5501.98    c.m"
"             Runoff coefficient     0.252      0.885      0.258      "
"             Maximum flow           0.277      0.042      0.282      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.282     0.282     0.628     0.628"
" 52          CHANNEL DESIGN"
"        0.282   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.600   203.600"
"                205.200   405.200"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.275   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 0.263    metre"
"             Velocity                      0.473    m/sec"
"             Channel capacity            565.690    c.m/sec"
"             Critical depth                0.124    metre"
" 53          ROUTE    Channel Route 811"
"       811.00      Channel Route 811 Reach length   ( metre)"
"        0.430   X-factor <= 0.5"
"      642.342   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                  0.282    c.m/sec"
"                     0.282     0.282     0.282     0.628 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
```

```
"               Flow into Drain A "
"             Maximum flow                  0.908    c.m/sec"
"             Hydrograph volume         19259.789    c.m"
"                     0.282     0.282     0.282     0.908"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.282     0.000     0.282     0.908"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          300   Flow to Branch A "
"        1.000   % Impervious"
"       19.600   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       19.404   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.196   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.700   Pervious SCS Curve No."
"        0.246   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.603   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.122     0.000     0.282     0.908 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           19.404     0.196      19.600     hectare"
"             Time of concentration  134.846    14.730     130.650    minutes"
"             Time to Centroid       366.627    194.150    360.602    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        8925.84    90.16      9016.00    c.m"
"             Rainfall losses        34.670     5.398      34.377     mm"
"             Runoff depth           11.330     40.602     11.623     mm"
"             Runoff volume          2198.56    79.58      2278.14    c.m"
"             Runoff coefficient     0.246      0.883      0.253      "
"             Maximum flow           0.120      0.017      0.122      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.122     0.122     0.282     0.908"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.122     0.122     0.122     0.908"
```

```
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  1.025    c.m/sec"
"             Hydrograph volume         21537.928    c.m"
"                     0.122     0.122     0.122     1.025"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  1.025    c.m/sec"
"             Hydrograph volume         21537.928    c.m"
"                     0.122     1.025     0.122     0.000"
" 52          CHANNEL DESIGN"
"        1.025   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          14.   Define an arbitrary cross-section"
"                  0.000    19.320    38.370    77.930   117.760"
"                156.130   172.060   177.160   180.300   185.180"
"                190.360   227.800   247.150   269.760"
"                350.742   350.800   350.610   349.140   348.810"
"                349.380   349.250   347.190   347.190   348.890"
"                348.680   349.880   350.880   351.720"
"        3.552   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                 0.453    metre"
"             Velocity                      0.521    m/sec"
"             Channel capacity            392.772    c.m/sec"
"             Critical depth                0.208    metre"
" 53          ROUTE    Channel Route 676"
"       676.00      Channel Route 676 Reach length   ( metre)"
"        0.297   X-factor <= 0.5"
"      486.914   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                  1.024    c.m/sec"
"                     0.122     1.025     1.024     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
```

```
"               "
"             Maximum flow                  1.024    c.m/sec"
"             Hydrograph volume         21537.932    c.m"
"                     0.122     1.025     1.024     1.024"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.122     0.000     1.024     1.024"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          400   Flows to Branch A "
"        1.000   % Impervious"
"       22.200   Total Area"
"      300.000   Flow length"
"        2.000   Overland Slope"
"       21.978   Pervious Area"
"      300.000   Pervious length"
"        2.000   Pervious slope"
"        0.222   Impervious Area"
"      300.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.800   Pervious SCS Curve No."
"        0.262   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.109   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.880   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.156     0.000     1.024     1.024 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           21.978     0.222      22.200     hectare"
"             Time of concentration  123.917    13.911     120.310    minutes"
"             Time to Centroid       353.458    193.216    348.204    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.0110     0.0102     1.0212     ha-m"
"             Rainfall losses        33.935     5.504      33.650     mm"
"             Runoff depth           12.065     40.496     12.350     mm"
"             Runoff volume          2651.71    89.90      2741.61    c.m"
"             Runoff coefficient     0.262      0.880      0.268      "
"             Maximum flow           0.153      0.019      0.156      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.156     0.156     1.024     1.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.156     0.156     0.156     1.024"
```

```
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                  1.162    c.m/sec"
"             Hydrograph volume          24279.529    c.m"
"                     0.156     0.156     0.156     1.162"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                "
"             Maximum flow                  1.162    c.m/sec"
"             Hydrograph volume          24279.531    c.m"
"                     0.156     1.162     0.156     0.000"
" 54          POND DESIGN"
"        1.162   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"      24279.5   Hydrograph volume    c.m"
"         14.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                347.150     0.000     0.000"
"                347.450    0.7235     7.359"
"                347.750     1.447    47.207"
"                348.050     2.170   144.134"
"                348.350     2.894   308.711"
"                348.650     6.471   548.365"
"                348.950     8.682   869.233"
"                349.250    10.434  2362.250"
"                349.550    11.932  6121.604"
"                349.850    13.262  12206.77"
"                350.150    14.470  33070.85"
"                350.450    15.584  74826.98"
"                350.710    16.489  122506.8"
"                350.810    20.279  147193.5"
"             Peak outflow                  1.162    c.m/sec"
"             Maximum level               347.632    metre"
"             Maximum storage              31.514    c.m"
"             Centroidal lag                6.785   hours"
"                  0.156     1.162     1.162     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow at Country Road 51 culvert, north crossing "
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.156     1.162     1.162     0.000"
" 52          CHANNEL DESIGN"
```

```
"        1.162   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          25.   Define an arbitrary cross-section"
"                  1.000    16.530    19.970    37.290    43.570"
"                 49.300    91.100   100.500   141.000   178.700"
"                195.100   212.200   216.300   220.000   223.900"
"                256.700   279.900   315.000   328.900   331.400"
"                332.400   375.900   438.800   471.000   488.900"
"                347.640   347.810   347.850   347.500   347.650"
"                347.600   347.600   347.400   347.700   347.500"
"                347.000   346.900   345.000   345.000   346.500"
"                346.200   346.500   346.600   345.800   345.800"
"                345.900   348.000   348.100   348.900   350.000"
"        2.640   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                 0.333    metre"
"             Velocity                      0.778    m/sec"
"             Channel capacity            316.790    c.m/sec"
"             Critical depth                0.206    metre"
" 53          ROUTE    Channel Route 700"
"       700.00      Channel Route 700 Reach length   ( metre)"
"        0.450   X-factor <= 0.5"
"      337.319   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                  1.162    c.m/sec"
"                     0.156     1.162     1.162     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Catchment 500 junction "
"             Maximum flow                  1.162    c.m/sec"
"             Hydrograph volume         24278.578    c.m"
"                     0.156     1.162     1.162     1.162"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.156     0.000     1.162     1.162"
" 33          CATCHMENT 500"
"           1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          500   Flows to Branch A "
"        1.000   % Impervious"
"       30.800   Total Area"
"      370.000   Flow length"
"        2.000   Overland Slope"
"       30.492   Pervious Area"
"      370.000   Pervious length"
"        2.000   Pervious slope"
"        0.308   Impervious Area"
"      370.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.300   Pervious SCS Curve No."
"        0.285   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.459   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.224     0.000     1.162     1.162 c.m/sec"
"             Catchment 500          Pervious   Impervious Total Area "
"             Surface Area           30.492     0.308      30.800     hectare"
"             Time of concentration  135.520    15.776     131.883    minutes"
"             Time to Centroid       365.459    195.469    360.296    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.4026     0.0142     1.4168     ha-m"
"             Rainfall losses        32.872     5.290      32.596     mm"
"             Runoff depth           13.128     40.710     13.404     mm"
"             Runoff volume          4003.03    125.39     4128.42    c.m"
"             Runoff coefficient     0.285      0.885      0.291      "
"             Maximum flow           0.220      0.026      0.224      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.224     0.224     1.162     1.162"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.224     0.224     0.224     1.162"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                  1.370    c.m/sec"
"             Hydrograph volume         28406.885    c.m"
"                     0.224     0.224     0.224     1.370"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
```

```
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                  1.370    c.m/sec"
"             Hydrograph volume         28406.881    c.m"
"                     0.224     1.370     0.224     0.000"
" 54          POND DESIGN"
"        1.370   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"      28406.9   Hydrograph volume    c.m"
"         10.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                344.950     0.000     0.000"
"                345.200    0.8301     5.239"
"                345.500     1.660    42.997"
"                345.800     2.490   164.458"
"                346.100     3.320   577.883"
"                346.400     5.470  1685.267"
"                346.700     6.987  3745.496"
"                347.000     8.229  6888.433"
"                347.300    28.193  12080.62"
"                347.650    73.169  16004.75"
"             Peak outflow                  1.370    c.m/sec"
"             Maximum level               345.395    metre"
"             Maximum storage              29.789    c.m"
"             Centroidal lag                6.836   hours"
"                  0.224     1.370     1.370     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.224     1.370     1.370     0.000"
" 56          DIVERSION"
"         1000   Node number"
"        8.229   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.000    c.m/sec"
"             Volume of diverted flow       0.000    c.m"
"             DIV01000.005hyd"
"             Spill at 347.00 "
"                     0.224     1.370     1.370     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow at Country Road 51 culvert, south crossing "
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.224     1.370     1.370     0.000"
" 52          CHANNEL DESIGN"
```

```
"        1.370   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   203.350   207.200"
"                210.580   213.580"
"                 10.000    10.000     7.000     6.200     6.300"
"                  8.420     9.000"
"        2.800   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 0.396    metre"
"             Velocity                      0.792    m/sec"
"             Channel capacity            306.274    c.m/sec"
"             Critical depth                0.266    metre"
" 53          ROUTE    Channel Route 267"
"       267.00      Channel Route 267 Reach length   ( metre)"
"        0.432   X-factor <= 0.5"
"      252.874   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.369    c.m/sec"
"                     0.224     1.370     1.369     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    275"
"           6   Combine "
"         275   Node #"
"               Branch 'A'"
"             Maximum flow                  1.369    c.m/sec"
"             Hydrograph volume         28405.508    c.m"
"                     0.224     1.370     1.369     1.369"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.224     0.000     1.369     1.369"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         600   Flow to Branch A "
"        1.000   % Impervious"
"       26.000   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       25.740   Pervious Area"
"      330.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.260   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.900   Pervious SCS Curve No."
"        0.279   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.630   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.192     0.000     1.369     1.369 c.m/sec"
"             Catchment 600          Pervious   Impervious Total Area "
"             Surface Area           25.740     0.260      26.000     hectare"
"             Time of concentration  127.748    14.730     124.249    minutes"
"             Time to Centroid       356.877    194.150    351.839    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.1840     0.0120     1.1960     ha-m"
"             Rainfall losses        33.162     5.398      32.885     mm"
"             Runoff depth           12.838     40.602     13.115     mm"
"             Runoff volume          3304.42    105.56     3409.99    c.m"
"             Runoff coefficient     0.279      0.883      0.285      "
"             Maximum flow           0.188      0.022      0.192      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.192     0.192     1.369     1.369"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.192     0.192     0.192     1.369"
" 40          HYDROGRAPH   Combine    275"
"            6   Combine "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                  1.542    c.m/sec"
"             Hydrograph volume         31815.506    c.m"
"                     0.192     0.192     0.192     1.542"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.192     0.000     0.192     1.542"
" 33          CATCHMENT 700"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          700   Flows to Branch C "
"        1.000   % Impervious"
"       33.500   Total Area"
"      280.000   Flow length"
```

```
"        2.000   Overland Slope"
"       33.165   Pervious Area"
"      280.000   Pervious length"
"        2.000   Pervious slope"
"        0.335   Impervious Area"
"      280.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.600   Pervious SCS Curve No."
"        0.245   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.648   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.879   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.220     0.000     0.192     1.542 c.m/sec"
"             Catchment 700          Pervious   Impervious Total Area "
"             Surface Area           33.165     0.335      33.500     hectare"
"             Time of concentration  122.494    13.347     118.677    minutes"
"             Time to Centroid       352.772    192.499    347.166    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.5256     0.0154     1.5410     ha-m"
"             Rainfall losses        34.735     5.584      34.444     mm"
"             Runoff depth           11.265     40.416     11.556     mm"
"             Runoff volume          3735.91    135.40     3871.31    c.m"
"             Runoff coefficient     0.245      0.879      0.251      "
"             Maximum flow           0.216      0.029      0.220      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.220     0.220     0.192     1.542"
" 52          CHANNEL DESIGN"
"        0.220   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 0.275    metre"
"             Velocity                      0.611    m/sec"
"             Channel capacity            767.253    c.m/sec"
"             Critical depth                0.160    metre"
```

```
" 53          ROUTE    Channel Route 733"
"       733.00      Channel Route 733 Reach length   ( metre)"
"        0.459   X-factor <= 0.5"
"      450.220   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                  0.220    c.m/sec"
"                     0.220     0.220     0.220     1.542 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.220     0.220     0.220     1.542"
" 33          CATCHMENT 800"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          800   Flow to Branch C "
"        1.000   % Impervious"
"       43.800   Total Area"
"      350.000   Flow length"
"        2.000   Overland Slope"
"       43.362   Pervious Area"
"      350.000   Pervious length"
"        2.000   Pervious slope"
"        0.438   Impervious Area"
"      350.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.268   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.299     0.220     0.220     1.542 c.m/sec"
"             Catchment 800          Pervious   Impervious Total Area "
"             Surface Area           43.362     0.438      43.800     hectare"
"             Time of concentration  134.601    15.259     130.758    minutes"
"             Time to Centroid       365.223    194.824    359.736    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        1.9947     0.0201     2.0148     ha-m"
"             Rainfall losses        33.659     5.346      33.376     mm"
"             Runoff depth           12.341     40.654     12.624     mm"
"             Runoff volume          5351.25    178.07     5529.32    c.m"
```

```
"             Runoff coefficient     0.268      0.884      0.274      "
"             Maximum flow           0.294      0.037      0.299      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.299     0.519     0.220     1.542"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.299     0.519     0.519     1.542"
" 40          HYDROGRAPH   Combine    225"
"            6   Combine "
"          225   Node #"
"                Branch 'C'"
"             Maximum flow                  0.519    c.m/sec"
"             Hydrograph volume          9400.627    c.m"
"                    0.299     0.519     0.519     0.519"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.299     0.000     0.519     0.519"
" 33          CATCHMENT 801"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          801   Flow to Branch F"
"        1.000   % Impervious"
"        9.400   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        9.306   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.094   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.268   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.867   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.105     0.000     0.519     0.519 c.m/sec"
"             Catchment 801          Pervious   Impervious Total Area "
"             Surface Area           9.306      0.094      9.400      hectare"
"             Time of concentration  63.476     7.196      61.696     minutes"
"             Time to Centroid       284.683    185.137    281.535    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        4280.76    43.24      4324.00    c.m"
```

```
"            Rainfall losses        33.666     6.123      33.391     mm"
"            Runoff depth           12.334     39.877     12.609     mm"
"            Runoff volume          1147.79    37.48      1185.27    c.m"
"            Runoff coefficient     0.268      0.867      0.274      "
"            Maximum flow           0.103      0.008      0.105      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.105     0.105     0.519     0.519"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.105     0.105     0.105     0.519"
" 40         HYDROGRAPH   Combine    200"
"           6   Combine "
"          200   Node #"
"                Branch 'F'"
"            Maximum flow                  0.105    c.m/sec"
"            Hydrograph volume          1185.274    c.m"
"                    0.105     0.105     0.105     0.105"
" 40         HYDROGRAPH   Confluence    200"
"           7   Confluence "
"          200   Node #"
"                Branch 'F'"
"            Maximum flow                  0.105    c.m/sec"
"            Hydrograph volume          1185.274    c.m"
"                    0.105     0.105     0.105     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.105     0.105     0.105     0.000"
" 40         HYDROGRAPH   Combine    225"
"           6   Combine "
"          225   Node #"
"                Branch 'C'"
"            Maximum flow                  0.586    c.m/sec"
"            Hydrograph volume         10585.897    c.m"
"                    0.105     0.105     0.105     0.586"
" 40         HYDROGRAPH   Confluence    225"
"           7   Confluence "
"          225   Node #"
"                Branch 'C'"
"            Maximum flow                  0.586    c.m/sec"
"            Hydrograph volume         10585.897    c.m"
"                    0.105     0.586     0.105     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.105     0.586     0.586     0.000"
" 40         HYDROGRAPH   Combine    275"
"           6   Combine "
"          275   Node #"
"                Branch 'A'"
"            Maximum flow                  2.102    c.m/sec"
```

```
"             Hydrograph volume         42401.398    c.m"
"                     0.105     0.586     0.586     2.102"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.105     0.000     0.586     2.102"
" 33          CATCHMENT 900"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          900   Ariss Glen and J.Hefferman properties "
"        1.000   % Impervious"
"       16.968   Total Area"
"      420.000   Flow length"
"        2.000   Overland Slope"
"       16.798   Pervious Area"
"      420.000   Pervious length"
"        2.000   Pervious slope"
"        0.170   Impervious Area"
"      420.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       73.500   Pervious SCS Curve No."
"        0.230   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        9.158   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.089     0.000     0.586     2.102 c.m/sec"
"             Catchment 900          Pervious   Impervious Total Area "
"             Surface Area           16.798     0.170      16.968     hectare"
"             Time of concentration  160.680    17.023     155.303    minutes"
"             Time to Centroid       396.336    196.841    388.870    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        7727.23    78.05      7805.28    c.m"
"             Rainfall losses        35.432     5.320      35.131     mm"
"             Runoff depth           10.568     40.680     10.869     mm"
"             Runoff volume          1775.30    69.03      1844.32    c.m"
"             Runoff coefficient     0.230      0.884      0.236      "
"             Maximum flow           0.087      0.014      0.089      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.089     0.089     0.586     2.102"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.089     0.089     0.089     2.102"
" 40          HYDROGRAPH   Combine    275"
"            6   Combine "
```

```
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                  2.190    c.m/sec"
"             Hydrograph volume         44245.688    c.m"
"                     0.089     0.089     0.089     2.190"
" 40          HYDROGRAPH   Confluence    275"
"            7   Confluence "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                  2.190    c.m/sec"
"             Hydrograph volume         44245.688    c.m"
"                     0.089     2.190     0.089     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.089     2.190     2.190     0.000"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow At the Ariss Glen Subdivision  "
" 40          HYDROGRAPH   Combine    300"
"            6   Combine "
"          300   Node #"
"                Main Drain"
"             Maximum flow                  2.190    c.m/sec"
"             Hydrograph volume         44245.688    c.m"
"                     0.089     2.190     2.190     2.190"
" 40          HYDROGRAPH   Confluence    300"
"            7   Confluence "
"          300   Node #"
"                Main Drain"
"             Maximum flow                  2.190    c.m/sec"
"             Hydrograph volume         44245.688    c.m"
"                     0.089     2.190     2.190     0.000"
" 52          CHANNEL DESIGN"
"         2.190   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   201.500   202.700"
"                 204.200   404.200"
"                  10.000    10.000     7.000     5.750     5.750"
"                   7.000    10.000"
"         4.250   Channel depth    metre"
"         0.180   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400"
"             Depth of flow                 1.408    metre"
"             Velocity                      0.384    m/sec"
"             Channel capacity            447.007    c.m/sec"
"             Critical depth                0.572    metre"
```

```
" 53          ROUTE    Channel Route 210"
"       210.00      Channel Route 210 Reach length   ( metre)"
"        0.168   X-factor <= 0.5"
"      410.098   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  2.188    c.m/sec"
"                     0.089     2.190     2.188     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                  2.188    c.m/sec"
"             Hydrograph volume         44245.719    c.m"
"                     0.089     2.190     2.188     2.188"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.089     0.000     2.188     2.188"
" 33          CATCHMENT 1000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Flows to Main Drain"
"        1.000   % Impervious"
"       13.788   Total Area"
"      181.000   Flow length"
"        2.000   Overland Slope"
"       13.650   Pervious Area"
"      181.000   Pervious length"
"        2.000   Pervious slope"
"        0.138   Impervious Area"
"      181.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.500   Pervious SCS Curve No."
"        0.243   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.694   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.881   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.105     0.000     2.188     2.188 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           13.650     0.138      13.788     hectare"
```

```
"             Time of concentration  94.520     10.273     91.548     minutes"
"             Time to Centroid       321.336    188.538    316.651    minutes"
"             Rainfall depth         46.000     46.000     46.000     mm"
"             Rainfall volume        6279.06    63.42      6342.48    c.m"
"             Rainfall losses        34.802     5.459      34.509     mm"
"             Runoff depth           11.198     40.541     11.491     mm"
"             Runoff volume          1528.54    55.90      1584.44    c.m"
"             Runoff coefficient     0.243      0.881      0.250      "
"             Maximum flow           0.103      0.012      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.105     0.105     2.188     2.188"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.105     0.105     0.105     2.188"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                  2.267    c.m/sec"
"             Hydrograph volume         45830.141    c.m"
"                     0.105     0.105     0.105     2.267"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.105     0.000     0.105     2.267"
" 47          FILEI_O Read/Open DIV01000.005hyd"
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01000.005hyd"
"             Spill at 347.00 "
"             Total volume                  0.000    c.m"
"             Maximum flow                  0.000    c.m/sec"
"                  0.000     0.000     0.105     2.267 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.000     0.000     0.105     2.267"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.000     0.000     2.267"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                  2.267    c.m/sec"
"             Hydrograph volume         45830.145    c.m"
"                     0.000     0.000     0.000     2.267"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
```

```
"               Junction to 1000"
"            Maximum flow                  2.267    c.m/sec"
"            Hydrograph volume         45830.145    c.m"
"                    0.000     2.267     0.000     0.000"
" 52         CHANNEL DESIGN"
"       2.267   Current peak flow    c.m/sec"
"       0.040   Manning 'n'"
"          1.   Cross-section type: 0=trapezoidal; 1=general"
"          7.   Define an arbitrary cross-section"
"                 0.000     0.000   200.000   202.540   203.790"
"               206.330   406.330"
"                10.000    10.000     7.000     5.630     5.630"
"                 7.000    10.000"
"       4.370   Channel depth    metre"
"       0.180   Gradient   %"
"          0.   Variable roughness: 0=False; 1=True"
"                0.0400    0.0400    0.0400    0.0400    0.0400"
"                0.0400    0.0400"
"            Depth of flow                 1.002    metre"
"            Velocity                      0.728    m/sec"
"            Channel capacity            463.642    c.m/sec"
"            Critical depth                0.532    metre"
" 53         ROUTE    Channel Route 654"
"       654.00      Channel Route 654 Reach length   ( metre)"
"        0.302   X-factor <= 0.5"
"      673.471   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"            Peak outflow                  2.264    c.m/sec"
"                    0.000     2.267     2.264     0.000 c.m/sec"
" 38         START/RE-START TOTALS 1000"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    376.856    hectare"
"            Total Impervious area                     3.769    hectare"
"            Total % impervious                        1.000"
" 19         EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                             W:\Kitchener\420-2020\"
"                420099 - Will O Homes 6th Line East Ariss\Design Data\Modelling
Files\MIDUSS\2021-04-28"
"                Output filename:                        Kurtz - Post_100yr.out"
"                Licensee name:                                            gmbp"
"                Company                                                   gmbp"
"                Date & Time last used:                 4/28/2021 at 3:09:53 PM"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"     1440.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"      101.500   Rainfall depth"
"     1440.000   Duration"
"           48   C:\Program Files (x86)\MIDUSS\SCS_Type2_24hr.mrd   SCS 24 hour Type
II storm"
"             Maximum intensity          124.236    mm/hr"
"             Total depth                101.500    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          100   Flows to Branch B "
"        1.000   % Impervious"
"      114.500   Total Area"
"      530.000   Flow length"
"        2.000   Overland Slope"
"      113.355   Pervious Area"
"      530.000   Pervious length"
"        2.000   Pervious slope"
"        1.145   Impervious Area"
"      530.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.300   Pervious SCS Curve No."
"        0.484   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.332   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.940   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     5.193     0.000     0.000     0.000 c.m/sec"
```

```
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           113.355    1.145      114.500    hectare"
"             Time of concentration  75.659     11.426     74.423     minutes"
"             Time to Centroid       988.668    773.040    984.521    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        11.5055    0.1162     11.6217    ha-m"
"             Rainfall losses        52.345     6.074      51.883     mm"
"             Runoff depth           49.155     95.426     49.617     mm"
"             Runoff volume          5.5719     0.1093     5.6812     ha-m"
"             Runoff coefficient     0.484      0.940      0.489      "
"             Maximum flow           5.158      0.299      5.193      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    5.193     5.193     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    5.193     5.193     5.193     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 5.193    c.m/sec"
"             Hydrograph volume         56812.039    c.m"
"                    5.193     5.193     5.193     5.193"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    5.193     0.000     5.193     5.193"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   Runoff into Branch A "
"        1.000   % Impervious"
"       46.300   Total Area"
"      380.000   Flow length"
"        2.000   Overland Slope"
"       45.837   Pervious Area"
"      380.000   Pervious length"
"        2.000   Pervious slope"
"        0.463   Impervious Area"
"      380.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.100   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.422   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.943   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.527     0.000     5.193     5.193 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           45.837     0.463      46.300     hectare"
"             Time of concentration  62.121     9.358      61.096     minutes"
"             Time to Centroid       960.091    768.201    956.366    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        4.6525     0.0470     4.6995     ha-m"
"             Rainfall losses        52.660     5.766      52.191     mm"
"             Runoff depth           48.840     95.734     49.309     mm"
"             Runoff volume          2.2387     0.0443     2.2830     ha-m"
"             Runoff coefficient     0.481      0.943      0.486      "
"             Maximum flow           2.511      0.120      2.527      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.527     2.527     5.193     5.193"
" 52          CHANNEL DESIGN"
"        2.527   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.600   203.600"
"                205.200   405.200"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.275   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 0.934    metre"
"             Velocity                      0.922    m/sec"
"             Channel capacity            565.690    c.m/sec"
"             Critical depth                0.500    metre"
" 53          ROUTE    Channel Route 811"
"       811.00      Channel Route 811 Reach length   ( metre)"
"        0.385   X-factor <= 0.5"
"      659.357   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  2.439    c.m/sec"
"                     2.527     2.527     2.439     5.193 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
```

```
"               Flow into Drain A "
"             Maximum flow                  7.632    c.m/sec"
"             Hydrograph volume          79642.164    c.m"
"                     2.527     2.527     2.439     7.632"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     2.527     0.000     2.439     7.632"
" 33          CATCHMENT 300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           300   Flow to Branch A "
"         1.000   % Impervious"
"        19.600   Total Area"
"       330.000   Flow length"
"         2.000   Overland Slope"
"        19.404   Pervious Area"
"       330.000   Pervious length"
"         2.000   Pervious slope"
"         0.196   Impervious Area"
"       330.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.700   Pervious SCS Curve No."
"         0.475   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.603   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.940   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     1.093     0.000     2.439     7.632 c.m/sec"
"              Catchment 300          Pervious   Impervious Total Area "
"              Surface Area           19.404     0.196      19.600     hectare"
"              Time of concentration  57.364     8.599      56.407     minutes"
"              Time to Centroid       950.734    766.504    947.122    minutes"
"              Rainfall depth         101.500    101.500    101.500    mm"
"              Rainfall volume        1.9695     0.0199     1.9894     ha-m"
"              Rainfall losses        53.323     6.099      52.851     mm"
"              Runoff depth           48.177     95.401     48.649     mm"
"              Runoff volume          9348.25    186.99     9535.23    c.m"
"              Runoff coefficient     0.475      0.940      0.479      "
"              Maximum flow           1.086      0.053      1.093      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     1.093     1.093     2.439     7.632"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     1.093     1.093     1.093     7.632"
```

```
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  8.607    c.m/sec"
"             Hydrograph volume         89177.438    c.m"
"                     1.093     1.093     1.093     8.607"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                  8.607    c.m/sec"
"             Hydrograph volume         89177.438    c.m"
"                     1.093     8.607     1.093     0.000"
" 52          CHANNEL DESIGN"
"        8.607   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          14.   Define an arbitrary cross-section"
"                  0.000    19.320    38.370    77.930   117.760"
"                156.130   172.060   177.160   180.300   185.180"
"                190.360   227.800   247.150   269.760"
"                350.742   350.800   350.610   349.140   348.810"
"                349.380   349.250   347.190   347.190   348.890"
"                348.680   349.880   350.880   351.720"
"        3.552   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                 1.350    metre"
"             Velocity                      0.944    m/sec"
"             Channel capacity            392.772    c.m/sec"
"             Critical depth                0.737    metre"
" 53          ROUTE    Channel Route 676"
"       676.00      Channel Route 676 Reach length   ( metre)"
"        0.234   X-factor <= 0.5"
"      536.904   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  8.324    c.m/sec"
"                     1.093     8.607     8.324     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
```

```
"               "
"             Maximum flow                  8.324    c.m/sec"
"             Hydrograph volume         89177.414    c.m"
"                     1.093     8.607     8.324     8.324"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     1.093     0.000     8.324     8.324"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          400   Flows to Branch A "
"        1.000   % Impervious"
"       22.200   Total Area"
"      300.000   Flow length"
"        2.000   Overland Slope"
"       21.978   Pervious Area"
"      300.000   Pervious length"
"        2.000   Pervious slope"
"        0.222   Impervious Area"
"      300.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.800   Pervious SCS Curve No."
"        0.492   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.109   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.937   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.351     0.000     8.324     8.324 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           21.978     0.222      22.200     hectare"
"             Time of concentration  53.444     8.121      52.589     minutes"
"             Time to Centroid       940.203    765.413    936.906    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        2.2308     0.0225     2.2533     ha-m"
"             Rainfall losses        51.529     6.394      51.077     mm"
"             Runoff depth           49.971     95.106     50.423     mm"
"             Runoff volume          1.0983     0.0211     1.1194     ha-m"
"             Runoff coefficient     0.492      0.937      0.497      "
"             Maximum flow           1.343      0.061      1.351      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.351     1.351     8.324     8.324"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.351     1.351     1.351     8.324"
```

```
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                  9.323    c.m/sec"
"             Hydrograph volume        100371.234    c.m"
"                     1.351     1.351     1.351     9.323"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                "
"             Maximum flow                  9.323    c.m/sec"
"             Hydrograph volume        100371.234    c.m"
"                     1.351     9.323     1.351     0.000"
" 54          POND DESIGN"
"        9.323   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     100371.2   Hydrograph volume    c.m"
"          14.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                347.150     0.000     0.000"
"                347.450    0.7235     7.359"
"                347.750     1.447    47.207"
"                348.050     2.170   144.134"
"                348.350     2.894   308.711"
"                348.650     6.471   548.365"
"                348.950     8.682   869.233"
"                349.250    10.434  2362.250"
"                349.550    11.932  6121.604"
"                349.850    13.262  12206.77"
"                350.150    14.470  33070.85"
"                350.450    15.584  74826.98"
"                350.710    16.489  122506.8"
"                350.810    20.279  147193.5"
"             Peak outflow                  8.942    c.m/sec"
"             Maximum level               349.004    metre"
"             Maximum storage            1138.720    c.m"
"             Centroidal lag               16.346   hours"
"                  1.351     9.323     8.942     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow at Country Road 51 culvert, north crossing "
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     1.351     8.942     8.942     0.000"
" 52          CHANNEL DESIGN"
```

```
"        8.942   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          25.   Define an arbitrary cross-section"
"                  1.000    16.530    19.970    37.290    43.570"
"                 49.300    91.100   100.500   141.000   178.700"
"                195.100   212.200   216.300   220.000   223.900"
"                256.700   279.900   315.000   328.900   331.400"
"                332.400   375.900   438.800   471.000   488.900"
"                347.640   347.810   347.850   347.500   347.650"
"                347.600   347.600   347.400   347.700   347.500"
"                347.000   346.900   345.000   345.000   346.500"
"                346.200   346.500   346.600   345.800   345.800"
"                345.900   348.000   348.100   348.900   350.000"
"        2.640   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                 1.086    metre"
"             Velocity                      1.011    m/sec"
"             Channel capacity            316.790    c.m/sec"
"             Critical depth                0.716    metre"
" 53          ROUTE    Channel Route 700"
"       700.00      Channel Route 700 Reach length   ( metre)"
"        0.450   X-factor <= 0.5"
"      519.051   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      300.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  8.908    c.m/sec"
"                     1.351     8.942     8.908     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"           6   Combine "
"        1000   Node #"
"               Catchment 500 junction "
"             Maximum flow                  8.908    c.m/sec"
"             Hydrograph volume        100361.313    c.m"
"                     1.351     8.942     8.908     8.908"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     1.351     0.000     8.908     8.908"
" 33          CATCHMENT 500"
"           1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          500   Flows to Branch A "
"        1.000   % Impervious"
"       30.800   Total Area"
"      370.000   Flow length"
"        2.000   Overland Slope"
"       30.492   Pervious Area"
"      370.000   Pervious length"
"        2.000   Pervious slope"
"        0.308   Impervious Area"
"      370.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.300   Pervious SCS Curve No."
"        0.517   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.459   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.943   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.861     0.000     8.908     8.908 c.m/sec"
"             Catchment 500          Pervious   Impervious Total Area "
"             Surface Area           30.492     0.308      30.800     hectare"
"             Time of concentration  59.525     9.210      58.614     minutes"
"             Time to Centroid       950.386    767.877    947.082    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        3.0949     0.0313     3.1262     ha-m"
"             Rainfall losses        49.064     5.793      48.631     mm"
"             Runoff depth           52.436     95.707     52.869     mm"
"             Runoff volume          1.5989     0.0295     1.6284     ha-m"
"             Runoff coefficient     0.517      0.943      0.521      "
"             Maximum flow           1.850      0.080      1.861      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.861     1.861     8.908     8.908"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.861     1.861     1.861     8.908"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 10.178    c.m/sec"
"             Hydrograph volume        116644.859    c.m"
"                     1.861     1.861     1.861    10.178"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
```

```
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 10.178    c.m/sec"
"             Hydrograph volume        116644.859    c.m"
"                     1.861    10.178     1.861     0.000"
" 54          POND DESIGN"
"       10.178   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     116644.9   Hydrograph volume    c.m"
"          10.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                344.950     0.000     0.000"
"                345.200    0.8301     5.239"
"                345.500     1.660    42.997"
"                345.800     2.490   164.458"
"                346.100     3.320   577.883"
"                346.400     5.470  1685.267"
"                346.700     6.987  3745.496"
"                347.000     8.229  6888.433"
"                347.300    28.193  12080.62"
"                347.650    73.169  16004.75"
"             Peak outflow                  9.522    c.m/sec"
"             Maximum level               347.021    metre"
"             Maximum storage            7243.274    c.m"
"             Centroidal lag               16.485   hours"
"                  1.861    10.178     9.522     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     1.861     9.522     9.522     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         8.229   Overflow threshold"
"         1.000   Required diverted fraction"
"             0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         1.293    c.m/sec"
"             Volume of diverted flow    1341.291    c.m"
"             DIV01000.100hyd"
"             Spill at 347.00 "
"                     1.861     9.522     8.229     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"              Flow at Country Road 51 culvert, south crossing "
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     1.861     8.229     8.229     0.000"
" 52          CHANNEL DESIGN"
```

```
"        8.229   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   203.350   207.200"
"                210.580   213.580"
"                 10.000    10.000     7.000     6.200     6.300"
"                  8.420     9.000"
"        2.800   Channel depth    metre"
"        0.540   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 1.061    metre"
"             Velocity                      0.902    m/sec"
"             Channel capacity            306.274    c.m/sec"
"             Critical depth                0.693    metre"
" 53          ROUTE    Channel Route 267"
"       267.00      Channel Route 267 Reach length   ( metre)"
"        0.387   X-factor <= 0.5"
"      222.076   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  8.229    c.m/sec"
"                     1.861     8.229     8.229     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    275"
"           6   Combine "
"         275   Node #"
"               Branch 'A'"
"             Maximum flow                  8.229    c.m/sec"
"             Hydrograph volume        115196.734    c.m"
"                     1.861     8.229     8.229     8.229"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     1.861     0.000     8.229     8.229"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         600   Flow to Branch A "
"        1.000   % Impervious"
"       26.000   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       25.740   Pervious Area"
"      330.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.260   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.900   Pervious SCS Curve No."
"        0.510   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.630   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.940   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.591     0.000     8.229     8.229 c.m/sec"
"             Catchment 600          Pervious   Impervious Total Area "
"             Surface Area           25.740     0.260      26.000     hectare"
"             Time of concentration  55.841     8.599      54.978     minutes"
"             Time to Centroid       943.270    766.504    940.039    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        2.6126     0.0264     2.6390     ha-m"
"             Rainfall losses        49.739     6.099      49.303     mm"
"             Runoff depth           51.761     95.401     52.197     mm"
"             Runoff volume          1.3323     0.0248     1.3571     ha-m"
"             Runoff coefficient     0.510      0.940      0.514      "
"             Maximum flow           1.581      0.070      1.591      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.591     1.591     8.229     8.229"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.591     1.591     1.591     8.229"
" 40          HYDROGRAPH   Combine    275"
"            6   Combine "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                  9.011    c.m/sec"
"             Hydrograph volume        128767.953    c.m"
"                     1.591     1.591     1.591     9.011"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     1.591     0.000     1.591     9.011"
" 33          CATCHMENT 700"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          700   Flows to Branch C "
"        1.000   % Impervious"
"       33.500   Total Area"
"      280.000   Flow length"
```

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"        2.000   Overland Slope"
"       33.165   Pervious Area"
"      280.000   Pervious length"
"        2.000   Pervious slope"
"        0.335   Impervious Area"
"      280.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.600   Pervious SCS Curve No."
"        0.473   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.648   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.934   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.016     0.000     1.591     9.011 c.m/sec"
"             Catchment 700          Pervious   Impervious Total Area "
"             Surface Area           33.165     0.335      33.500     hectare"
"             Time of concentration  52.043     7.792      51.178     minutes"
"             Time to Centroid       939.520    764.917    936.107    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        3.3662     0.0340     3.4003     ha-m"
"             Rainfall losses        53.463     6.673      52.995     mm"
"             Runoff depth           48.037     94.827     48.505     mm"
"             Runoff volume          1.5932     0.0318     1.6249     ha-m"
"             Runoff coefficient     0.473      0.934      0.478      "
"             Maximum flow           2.004      0.093      2.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.016     2.016     1.591     9.011"
" 52          CHANNEL DESIGN"
"        2.016   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 0.898    metre"
"             Velocity                      1.117    m/sec"
"             Channel capacity            767.253    c.m/sec"
"             Critical depth                0.593    metre"
```

```
" 53          ROUTE    Channel Route 733"
"       733.00      Channel Route 733 Reach length   ( metre)"
"        0.442   X-factor <= 0.5"
"      492.324   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      300.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.961    c.m/sec"
"                     2.016     2.016     1.961     9.011 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     2.016     1.961     1.961     9.011"
" 33          CATCHMENT 800"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          800   Flow to Branch C "
"        1.000   % Impervious"
"       43.800   Total Area"
"      350.000   Flow length"
"        2.000   Overland Slope"
"       43.362   Pervious Area"
"      350.000   Pervious length"
"        2.000   Pervious slope"
"        0.438   Impervious Area"
"      350.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.499   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.942   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.565     1.961     1.961     9.011 c.m/sec"
"             Catchment 800          Pervious   Impervious Total Area "
"             Surface Area           43.362     0.438      43.800     hectare"
"             Time of concentration  58.338     8.908      57.412     minutes"
"             Time to Centroid       949.969    767.166    946.546    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        4.4012     0.0445     4.4457     ha-m"
"             Rainfall losses        50.896     5.896      50.446     mm"
"             Runoff depth           50.604     95.604     51.054     mm"
"             Runoff volume          2.1943     0.0419     2.2362     ha-m"
```

```
"             Runoff coefficient     0.499      0.942      0.503      "
"             Maximum flow           2.549      0.116      2.565      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    2.565     4.526     1.961     9.011"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    2.565     4.526     4.526     9.011"
" 40          HYDROGRAPH   Combine    225"
"            6   Combine "
"          225   Node #"
"                Branch 'C'"
"             Maximum flow                  4.526    c.m/sec"
"             Hydrograph volume         38611.078    c.m"
"                    2.565     4.526     4.526     4.526"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    2.565     0.000     4.526     4.526"
" 33          CATCHMENT 801"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          801   Flow to Branch F"
"        1.000   % Impervious"
"        9.400   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        9.306   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.094   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.498   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.939   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.979     0.000     4.526     4.526 c.m/sec"
"             Catchment 801          Pervious   Impervious Total Area "
"             Surface Area           9.306      0.094      9.400      hectare"
"             Time of concentration  27.511     4.201      27.076     minutes"
"             Time to Centroid       884.013    756.469    881.631    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        9445.59    95.41      9541.00    c.m"
```

```
"            Rainfall losses        50.929     6.231      50.482     mm"
"            Runoff depth           50.571     95.269     51.018     mm"
"            Runoff volume          4706.15    89.55      4795.70    c.m"
"            Runoff coefficient     0.498      0.939      0.503      "
"            Maximum flow           0.975      0.028      0.979      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.979     0.979     4.526     4.526"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.979     0.979     0.979     4.526"
" 40         HYDROGRAPH   Combine    200"
"           6   Combine "
"          200   Node #"
"                Branch 'F'"
"            Maximum flow                  0.979    c.m/sec"
"            Hydrograph volume          4795.703    c.m"
"                    0.979     0.979     0.979     0.979"
" 40         HYDROGRAPH   Confluence    200"
"           7   Confluence "
"          200   Node #"
"                Branch 'F'"
"            Maximum flow                  0.979    c.m/sec"
"            Hydrograph volume          4795.703    c.m"
"                    0.979     0.979     0.979     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.979     0.979     0.979     0.000"
" 40         HYDROGRAPH   Combine    225"
"           6   Combine "
"          225   Node #"
"                Branch 'C'"
"            Maximum flow                  5.033    c.m/sec"
"            Hydrograph volume         43406.781    c.m"
"                    0.979     0.979     0.979     5.033"
" 40         HYDROGRAPH   Confluence    225"
"           7   Confluence "
"          225   Node #"
"                Branch 'C'"
"            Maximum flow                  5.033    c.m/sec"
"            Hydrograph volume         43406.777    c.m"
"                    0.979     5.033     0.979     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.979     5.033     5.033     0.000"
" 40         HYDROGRAPH   Combine    275"
"           6   Combine "
"          275   Node #"
"                Branch 'A'"
"            Maximum flow                 12.337    c.m/sec"
```

```
"             Hydrograph volume        172174.609    c.m"
"                    0.979     5.033     5.033    12.337"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.979     0.000     5.033    12.337"
" 33          CATCHMENT 900"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          900   Ariss Glen and J.Hefferman properties "
"        1.000   % Impervious"
"       16.968   Total Area"
"      420.000   Flow length"
"        2.000   Overland Slope"
"       16.798   Pervious Area"
"      420.000   Pervious length"
"        2.000   Pervious slope"
"        0.170   Impervious Area"
"      420.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       73.500   Pervious SCS Curve No."
"        0.457   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        9.158   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.944   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.788     0.000     5.033    12.337 c.m/sec"
"             Catchment 900          Pervious   Impervious Total Area "
"             Surface Area           16.798     0.170      16.968     hectare"
"             Time of concentration  67.307     9.938      66.134     minutes"
"             Time to Centroid       973.944    769.484    969.764    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        1.7050     0.0172     1.7223     ha-m"
"             Rainfall losses        55.145     5.716      54.650     mm"
"             Runoff depth           46.355     95.784     46.850     mm"
"             Runoff volume          7786.93    162.53     7949.45    c.m"
"             Runoff coefficient     0.457      0.944      0.462      "
"             Maximum flow           0.782      0.043      0.788      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.788     0.788     5.033    12.337"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.788     0.788     0.788    12.337"
" 40          HYDROGRAPH   Combine    275"
"            6   Combine "
```

```
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                 13.101    c.m/sec"
"             Hydrograph volume        180124.000    c.m"
"                     0.788     0.788     0.788    13.101"
" 40          HYDROGRAPH   Confluence    275"
"             7   Confluence "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                 13.101    c.m/sec"
"             Hydrograph volume        180124.000    c.m"
"                     0.788    13.101     0.788     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.788    13.101    13.101     0.000"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow At the Ariss Glen Subdivision  "
" 40          HYDROGRAPH   Combine    300"
"             6   Combine "
"          300   Node #"
"                Main Drain"
"             Maximum flow                 13.101    c.m/sec"
"             Hydrograph volume        180124.000    c.m"
"                     0.788    13.101    13.101    13.101"
" 40          HYDROGRAPH   Confluence    300"
"             7   Confluence "
"          300   Node #"
"                Main Drain"
"             Maximum flow                 13.101    c.m/sec"
"             Hydrograph volume        180124.000    c.m"
"                     0.788    13.101    13.101     0.000"
" 52          CHANNEL DESIGN"
"        13.101   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   201.500   202.700"
"                 204.200   404.200"
"                  10.000    10.000     7.000     5.750     5.750"
"                   7.000    10.000"
"         4.250   Channel depth    metre"
"         0.180   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400"
"             Depth of flow                 1.800    metre"
"             Velocity                      0.506    m/sec"
"             Channel capacity            447.007    c.m/sec"
"             Critical depth                1.504    metre"
```

```
" 53          ROUTE    Channel Route 210"
"       210.00      Channel Route 210 Reach length   ( metre)"
"        0.158   X-factor <= 0.5"
"      311.138   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      300.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 13.040    c.m/sec"
"                     0.788    13.101    13.040     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                 13.040    c.m/sec"
"             Hydrograph volume        180124.109    c.m"
"                     0.788    13.101    13.040    13.040"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.788     0.000    13.040    13.040"
" 33          CATCHMENT 1000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Flows to Main Drain"
"        1.000   % Impervious"
"       13.788   Total Area"
"      181.000   Flow length"
"        2.000   Overland Slope"
"       13.650   Pervious Area"
"      181.000   Pervious length"
"        2.000   Pervious slope"
"        0.138   Impervious Area"
"      181.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.500   Pervious SCS Curve No."
"        0.472   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.694   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.929   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.001     0.000    13.040    13.040 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           13.650     0.138      13.788     hectare"
```

```
"             Time of concentration  40.107     5.997      39.442     minutes"
"             Time to Centroid       914.203    760.419    911.204    minutes"
"             Rainfall depth         101.500    101.500    101.500    mm"
"             Rainfall volume        1.3855     0.0140     1.3995     ha-m"
"             Rainfall losses        53.609     7.244      53.146     mm"
"             Runoff depth           47.891     94.256     48.354     mm"
"             Runoff volume          6537.13    129.96     6667.09    c.m"
"             Runoff coefficient     0.472      0.929      0.476      "
"             Maximum flow           0.996      0.041      1.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.001     1.001    13.040    13.040"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.001     1.001     1.001    13.040"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                 13.537    c.m/sec"
"             Hydrograph volume        186791.219    c.m"
"                     1.001     1.001     1.001    13.537"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     1.001     0.000     1.001    13.537"
" 47          FILEI_O Read/Open DIV01000.100hyd"
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01000.100hyd"
"             Spill at 347.00 "
"             Total volume              1341.291    c.m"
"             Maximum flow                 1.293    c.m/sec"
"                  1.293     0.000     1.001    13.537 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.293     1.293     1.001    13.537"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.293     1.293     1.293    13.537"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                 14.082    c.m/sec"
"             Hydrograph volume        188132.500    c.m"
"                     1.293     1.293     1.293    14.082"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
```

```
"               Junction to 1000"
"             Maximum flow                 14.082    c.m/sec"
"             Hydrograph volume        188132.500    c.m"
"                     1.293    14.082     1.293     0.000"
" 52          CHANNEL DESIGN"
"       14.082   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   202.540   203.790"
"                206.330   406.330"
"                 10.000    10.000     7.000     5.630     5.630"
"                  7.000    10.000"
"        4.370   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                1.894    metre"
"             Velocity                     0.525    m/sec"
"             Channel capacity           463.642    c.m/sec"
"             Critical depth               1.550    metre"
" 53          ROUTE    Channel Route 654"
"       654.00      Channel Route 654 Reach length   ( metre)"
"        0.263   X-factor <= 0.5"
"      466.777   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      600.000   Routing time step   ( seconds)"
"            2   No. of sub-reaches"
"             Peak outflow                13.556    c.m/sec"
"                     1.293    14.082    13.556     0.000 c.m/sec"
" 38          START/RE-START TOTALS 1000"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    376.856    hectare"
"             Total Impervious area                     3.769    hectare"
"             Total % impervious                        1.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                          W:\Kitchener\420-2020\"
"                420099 - Will O Homes 6th Line East Ariss\Design Data\Modelling
Files\MIDUSS\2021-04-28"
"                Output filename:                        Kurtz - Post_REG.out"
"                Licensee name:                                          gmbp"
"                Company                                                 gmbp"
"                Date & Time last used:               4/28/2021 at 3:16:13 PM"
" 31          TIME PARAMETERS"
"       60.000   Time Step"
"     2880.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Historic"
"            5   Historic"
"     2880.000   Duration"
"       48.000   Rainfall intensity values"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.026     2.026     2.026     2.028"
"                  2.026     6.000     4.000     6.000    13.000"
"                 17.000    13.000    23.000    13.000    13.000"
"                 53.000    38.000    13.000"
"             Maximum intensity            53.000    mm/hr"
"             Total depth                 285.000    mm"
"            6   000hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          100   Flows to Branch B "
"        1.000   % Impervious"
"      114.500   Total Area"
"      530.000   Flow length"
"        2.000   Overland Slope"
"      113.355   Pervious Area"
"      530.000   Pervious length"
"        2.000   Pervious slope"
"        1.145   Impervious Area"
"      530.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.300   Pervious SCS Curve No."
"        0.742   Pervious Runoff coefficient"
```

```
"        0.100   Pervious Ia/S coefficient"
"        8.332   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    11.983     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           113.355    1.145      114.500    hectare"
"             Time of concentration  89.884     16.022     88.923     minutes"
"             Time to Centroid       2637.039   2318.856   2632.897   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        32.3062    0.3263     32.6325    ha-m"
"             Rainfall losses        73.389     8.724      72.742     mm"
"             Runoff depth           211.611    276.276    212.258    mm"
"             Runoff volume          23.9872    0.3163     24.3035    ha-m"
"             Runoff coefficient     0.742      0.969      0.745      "
"             Maximum flow           11.856     0.136      11.983     c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    11.983    11.983     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    11.983    11.983    11.983     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 11.983    c.m/sec"
"             Hydrograph volume        243035.047    c.m"
"                    11.983    11.983    11.983    11.983"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    11.983     0.000    11.983    11.983"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          200   Runoff into Branch A "
"        1.000   % Impervious"
"       46.300   Total Area"
"      380.000   Flow length"
"        2.000   Overland Slope"
"       45.837   Pervious Area"
"      380.000   Pervious length"
"        2.000   Pervious slope"
"        0.463   Impervious Area"
"      380.000   Impervious length"
"        2.000   Impervious slope"
```

```
"        0.250   Pervious Manning 'n'"
"       75.100   Pervious SCS Curve No."
"        0.737   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.422   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.955   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     4.819     0.000    11.983    11.983 c.m/sec"
"            Catchment 200          Pervious   Impervious Total Area "
"            Surface Area           45.837     0.463      46.300     hectare"
"            Time of concentration  73.663     13.123     72.881     minutes"
"            Time to Centroid       2613.995   2316.056   2610.145   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        13.0635    0.1320     13.1955    ha-m"
"            Rainfall losses        74.938     12.760     74.317     mm"
"            Runoff depth           210.062    272.240    210.683    mm"
"            Runoff volume          9.6286     0.1260     9.7546     ha-m"
"            Runoff coefficient     0.737      0.955      0.739      "
"            Maximum flow           4.770      0.056      4.819      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     4.819     4.819    11.983    11.983"
" 52         CHANNEL DESIGN"
"        4.819   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.600   203.600"
"                205.200   405.200"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
"        0.275   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"            Depth of flow                1.757    metre"
"            Velocity                     0.587    m/sec"
"            Channel capacity           565.690    c.m/sec"
"            Critical depth               0.737    metre"
" 53         ROUTE    Channel Route 811"
"       811.00      Channel Route 811 Reach length   ( metre)"
"        0.391   X-factor <= 0.5"
"     1036.522   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
```

```
"        0.500   Beta weighting factor"
"     1200.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  4.475    c.m/sec"
"                     4.819     4.819     4.475    11.983 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                16.210    c.m/sec"
"             Hydrograph volume        340581.469    c.m"
"                     4.819     4.819     4.475    16.210"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     4.819     0.000     4.475    16.210"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          300   Flow to Branch A "
"        1.000   % Impervious"
"       19.600   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       19.404   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.196   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.700   Pervious SCS Curve No."
"        0.733   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.603   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.944   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.092     0.000     4.475    16.210 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           19.404     0.196      19.600     hectare"
"             Time of concentration  67.768     12.058     67.053     minutes"
"             Time to Centroid       2608.437   2317.349   2604.700   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        5.5301     0.0559     5.5860     ha-m"
"             Rainfall losses        75.963     15.898     75.363     mm"
"             Runoff depth           209.037    269.102    209.637    mm"
"             Runoff volume          4.0562     0.0527     4.1089     ha-m"
```

```
"             Runoff coefficient     0.733      0.944      0.736      "
"             Maximum flow           2.072      0.024      2.092      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.092     2.092     4.475    16.210"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     2.092     2.092     2.092    16.210"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 18.302    c.m/sec"
"             Hydrograph volume         381670.438    c.m"
"                     2.092     2.092     2.092    18.302"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Flow into Drain A "
"             Maximum flow                 18.302    c.m/sec"
"             Hydrograph volume         381670.438    c.m"
"                     2.092    18.302     2.092     0.000"
" 52          CHANNEL DESIGN"
"       18.302   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"          14.   Define an arbitrary cross-section"
"                  0.000    19.320    38.370    77.930   117.760"
"                156.130   172.060   177.160   180.300   185.180"
"                190.360   227.800   247.150   269.760"
"                350.742   350.800   350.610   349.140   348.810"
"                349.380   349.250   347.190   347.190   348.890"
"                348.680   349.880   350.880   351.720"
"        3.552   Channel depth    metre"
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400    0.0400    0.0400"
"             Depth of flow                1.983    metre"
"             Velocity                     0.527    m/sec"
"             Channel capacity           392.772    c.m/sec"
"             Critical depth               1.108    metre"
" 53          ROUTE    Channel Route 676"
"       676.00      Channel Route 676 Reach length   ( metre)"
"        0.394   X-factor <= 0.5"
"      962.609   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
```

```
"        0.500   Beta weighting factor"
"      900.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 17.279    c.m/sec"
"                     2.092    18.302    17.279     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                 17.279    c.m/sec"
"             Hydrograph volume        381670.656    c.m"
"                     2.092    18.302    17.279    17.279"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     2.092     0.000    17.279    17.279"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          400   Flows to Branch A "
"        1.000   % Impervious"
"       22.200   Total Area"
"      300.000   Flow length"
"        2.000   Overland Slope"
"       21.978   Pervious Area"
"      300.000   Pervious length"
"        2.000   Pervious slope"
"        0.222   Impervious Area"
"      300.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.800   Pervious SCS Curve No."
"        0.747   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.109   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.939   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.429     0.000    17.279    17.279 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           21.978     0.222      22.200     hectare"
"             Time of concentration  63.788     11.388     63.131     minutes"
"             Time to Centroid       2597.446   2315.648   2593.911   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        6.2637     0.0633     6.3270     ha-m"
"             Rainfall losses        72.105     17.290     71.557     mm"
"             Runoff depth           212.895    267.710    213.443    mm"
"             Runoff volume          4.6790     0.0594     4.7384     ha-m"
```

```
"             Runoff coefficient     0.747      0.939      0.749      "
"             Maximum flow           2.407      0.027      2.429      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.429     2.429    17.279    17.279"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     2.429     2.429     2.429    17.279"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                "
"             Maximum flow                19.204    c.m/sec"
"             Hydrograph volume        429055.000    c.m"
"                     2.429     2.429     2.429    19.204"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                "
"             Maximum flow                19.204    c.m/sec"
"             Hydrograph volume        429054.969    c.m"
"                     2.429    19.204     2.429     0.000"
" 54          POND DESIGN"
"       19.204   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     429055.0   Hydrograph volume    c.m"
"          14.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                347.150     0.000     0.000"
"                347.450    0.7235     7.359"
"                347.750     1.447    47.207"
"                348.050     2.170   144.134"
"                348.350     2.894   308.711"
"                348.650     6.471   548.365"
"                348.950     8.682   869.233"
"                349.250    10.434  2362.250"
"                349.550    11.932  6121.604"
"                349.850    13.262  12206.77"
"                350.150    14.470  33070.85"
"                350.450    15.584  74826.98"
"                350.710    16.489  122506.8"
"                350.810    20.279  147193.5"
"             Peak outflow                14.495    c.m/sec"
"             Maximum level              350.169    metre"
"             Maximum storage          35748.004    c.m"
"             Centroidal lag              44.216   hours"
```

```
"                  2.429    19.204    14.495     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"              Flow at Country Road 51 culvert, north crossing "
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                    2.429    14.495    14.495     0.000"
" 52          CHANNEL DESIGN"
"        14.495   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"           25.   Define an arbitrary cross-section"
"                   1.000    16.530    19.970    37.290    43.570"
"                  49.300    91.100   100.500   141.000   178.700"
"                 195.100   212.200   216.300   220.000   223.900"
"                 256.700   279.900   315.000   328.900   331.400"
"                 332.400   375.900   438.800   471.000   488.900"
"                 347.640   347.810   347.850   347.500   347.650"
"                 347.600   347.600   347.400   347.700   347.500"
"                 347.000   346.900   345.000   345.000   346.500"
"                 346.200   346.500   346.600   345.800   345.800"
"                 345.900   348.000   348.100   348.900   350.000"
"         2.640   Channel depth    metre"
"         0.540   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"              Depth of flow                 1.346    metre"
"              Velocity                      0.815    m/sec"
"              Channel capacity            316.790    c.m/sec"
"              Critical depth                1.003    metre"
" 53          ROUTE    Channel Route 700"
"        700.00      Channel Route 700 Reach length   ( metre)"
"         0.456   X-factor <= 0.5"
"       643.792   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"       600.000   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"              Peak outflow                 14.462    c.m/sec"
"                     2.429    14.495    14.462     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"             6   Combine "
"          1000   Node #"
"                 Catchment 500 junction "
```

```
"             Maximum flow                 14.462    c.m/sec"
"             Hydrograph volume        429934.063    c.m"
"                    2.429    14.495    14.462    14.462"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    2.429     0.000    14.462    14.462"
" 33          CATCHMENT 500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          500   Flows to Branch A "
"        1.000   % Impervious"
"       30.800   Total Area"
"      370.000   Flow length"
"        2.000   Overland Slope"
"       30.492   Pervious Area"
"      370.000   Pervious length"
"        2.000   Pervious slope"
"        0.308   Impervious Area"
"      370.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.300   Pervious SCS Curve No."
"        0.760   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.459   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.953   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    3.281     0.000    14.462    14.462 c.m/sec"
"             Catchment 500          Pervious   Impervious Total Area "
"             Surface Area           30.492     0.308      30.800     hectare"
"             Time of concentration  72.032     12.914     71.292     minutes"
"             Time to Centroid       2598.062   2316.181   2594.533   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        8.6902     0.0878     8.7780     ha-m"
"             Rainfall losses        68.470     13.290     67.919     mm"
"             Runoff depth           216.530    271.710    217.081    mm"
"             Runoff volume          6.6024     0.0837     6.6861     ha-m"
"             Runoff coefficient     0.760      0.953      0.762      "
"             Maximum flow           3.249      0.038      3.281      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    3.281     3.281    14.462    14.462"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    3.281     3.281     3.281    14.462"
" 40          HYDROGRAPH   Combine    1000"
```

```
"            6   Combine "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 17.011    c.m/sec"
"             Hydrograph volume        496795.125    c.m"
"                     3.281     3.281     3.281    17.011"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Catchment 500 junction "
"             Maximum flow                 17.011    c.m/sec"
"             Hydrograph volume        496795.125    c.m"
"                     3.281    17.011     3.281     0.000"
" 54          POND DESIGN"
"       17.011   Current peak flow    c.m/sec"
"        9.600   Target outflow    c.m/sec"
"     496795.1   Hydrograph volume    c.m"
"          10.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                344.950     0.000     0.000"
"                345.200    0.8301     5.239"
"                345.500     1.660    42.997"
"                345.800     2.490   164.458"
"                346.100     3.320   577.883"
"                346.400     5.470  1685.267"
"                346.700     6.987  3745.496"
"                347.000     8.229  6888.433"
"                347.300    28.193  12080.62"
"                347.650    73.169  16004.75"
"             Peak outflow                 16.934    c.m/sec"
"             Maximum level               347.131    metre"
"             Maximum storage            9157.636    c.m"
"             Centroidal lag               44.407   hours"
"                  3.281    17.011    16.934     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     3.281    16.934    16.934     0.000"
" 56          DIVERSION"
"         1000   Node number"
"        8.229   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         8.705    c.m/sec"
"             Volume of diverted flow  126952.883    c.m"
"             DIV01000.000hyd"
"             Spill at 347.00 "
```

```
"                    3.281    16.934     8.229     0.000 c.m/sec"
" 81          ADD COMMENT================================================="
"           1  Lines of comment"
"              Flow at Country Road 51 culvert, south crossing "
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                    3.281     8.229     8.229     0.000"
" 52          CHANNEL DESIGN"
"         8.229   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   203.350   207.200"
"                 210.580   213.580"
"                  10.000    10.000     7.000     6.200     6.300"
"                   8.420     9.000"
"         2.800   Channel depth    metre"
"         0.540   Gradient   %"
"            0.   Variable roughness: 0=False; 1=True"
"                  0.0400    0.0400    0.0400    0.0400    0.0400"
"                  0.0400    0.0400"
"              Depth of flow                1.061    metre"
"              Velocity                     0.902    m/sec"
"              Channel capacity           306.274    c.m/sec"
"              Critical depth               0.693    metre"
" 53          ROUTE    Channel Route 267"
"        267.00      Channel Route 267 Reach length   ( metre)"
"         0.387   X-factor <= 0.5"
"       222.076   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"       257.143   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"              Peak outflow                 8.229    c.m/sec"
"                    3.281     8.229     8.229     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    275"
"             6   Combine "
"           275   Node #"
"                 Branch 'A'"
"              Maximum flow                 8.229    c.m/sec"
"              Hydrograph volume        373274.063    c.m"
"                    3.281     8.229     8.229     8.229"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    3.281     0.000     8.229     8.229"
" 33          CATCHMENT 600"
"             1   Triangular SCS"
"             1   Equal length"
```

```
"            1   SCS method"
"          600   Flow to Branch A "
"        1.000   % Impervious"
"       26.000   Total Area"
"      330.000   Flow length"
"        2.000   Overland Slope"
"       25.740   Pervious Area"
"      330.000   Pervious length"
"        2.000   Pervious slope"
"        0.260   Impervious Area"
"      330.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.900   Pervious SCS Curve No."
"        0.757   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.630   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.944   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     2.824     0.000     8.229     8.229 c.m/sec"
"             Catchment 600          Pervious   Impervious Total Area "
"             Surface Area           25.740     0.260      26.000     hectare"
"             Time of concentration  67.328     12.058     66.640     minutes"
"             Time to Centroid       2594.695   2317.349   2591.244   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        7.3359     0.0741     7.4100     ha-m"
"             Rainfall losses        69.269     15.898     68.735     mm"
"             Runoff depth           215.731    269.102    216.265    mm"
"             Runoff volume          5.5529     0.0700     5.6229     ha-m"
"             Runoff coefficient     0.757      0.944      0.759      "
"             Maximum flow           2.797      0.032      2.824      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     2.824     2.824     8.229     8.229"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     2.824     2.824     2.824     8.229"
" 40          HYDROGRAPH   Combine    275"
"            6   Combine "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                 11.053    c.m/sec"
"             Hydrograph volume        429502.875    c.m"
"                     2.824     2.824     2.824    11.053"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     2.824     0.000     2.824    11.053"
```

```
" 33          CATCHMENT 700"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          700   Flows to Branch C "
"        1.000   % Impervious"
"       33.500   Total Area"
"      280.000   Flow length"
"        2.000   Overland Slope"
"       33.165   Pervious Area"
"      280.000   Pervious length"
"        2.000   Pervious slope"
"        0.335   Impervious Area"
"      280.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.600   Pervious SCS Curve No."
"        0.735   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.648   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.938   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     3.668     0.000     2.824    11.053 c.m/sec"
"             Catchment 700          Pervious   Impervious Total Area "
"             Surface Area           33.165     0.335      33.500     hectare"
"             Time of concentration  61.425     10.926     60.783     minutes"
"             Time to Centroid       2601.727   2311.798   2598.039   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        9.4520     0.0955     9.5475     ha-m"
"             Rainfall losses        75.469     17.765     74.892     mm"
"             Runoff depth           209.531    267.235    210.108    mm"
"             Runoff volume          6.9491     0.0895     7.0386     ha-m"
"             Runoff coefficient     0.735      0.938      0.737      "
"             Maximum flow           3.634      0.042      3.668      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     3.668     3.668     2.824    11.053"
" 52          CHANNEL DESIGN"
"        3.668   Current peak flow    c.m/sec"
"        0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   201.800   202.800"
"                204.600   404.600"
"                 10.000    10.000     7.000     5.400     5.400"
"                  7.000    10.000"
"        4.600   Channel depth    metre"
```

```
"        0.520   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                0.0400    0.0400    0.0400    0.0400    0.0400"
"                0.0400    0.0400"
"             Depth of flow                1.201    metre"
"             Velocity                     1.299    m/sec"
"             Channel capacity           767.253    c.m/sec"
"             Critical depth               0.819    metre"
" 53          ROUTE    Channel Route 733"
"       733.00      Channel Route 733 Reach length   ( metre)"
"        0.425   X-factor <= 0.5"
"      423.161   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      450.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 3.493    c.m/sec"
"                    3.668     3.668     3.493    11.053 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    3.668     3.493     3.493    11.053"
" 33          CATCHMENT 800"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          800   Flow to Branch C "
"        1.000   % Impervious"
"       43.800   Total Area"
"      350.000   Flow length"
"        2.000   Overland Slope"
"       43.362   Pervious Area"
"      350.000   Pervious length"
"        2.000   Pervious slope"
"        0.438   Impervious Area"
"      350.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.749   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.949   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    4.680     3.493     3.493    11.053 c.m/sec"
"             Catchment 800          Pervious   Impervious Total Area "
```

```
"             Surface Area           43.362     0.438      43.800     hectare"
"             Time of concentration  69.887     12.491     69.162     minutes"
"             Time to Centroid       2601.921   2316.617   2598.314   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        12.3582    0.1248     12.4830    ha-m"
"             Rainfall losses        71.582     14.489     71.011     mm"
"             Runoff depth           213.418    270.511    213.989    mm"
"             Runoff volume          9.2542     0.1185     9.3727     ha-m"
"             Runoff coefficient     0.749      0.949      0.751      "
"             Maximum flow           4.634      0.054      4.680      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     4.680     8.173     3.493    11.053"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     4.680     8.173     8.173    11.053"
" 40          HYDROGRAPH   Combine    225"
"            6   Combine "
"          225   Node #"
"                Branch 'C'"
"             Maximum flow                  8.173    c.m/sec"
"             Hydrograph volume        164113.469    c.m"
"                     4.680     8.173     8.173     8.173"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     4.680     0.000     8.173     8.173"
" 33          CATCHMENT 801"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          801   Flow to Branch F"
"        1.000   % Impervious"
"        9.400   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        9.306   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.094   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       76.200   Pervious SCS Curve No."
"        0.745   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.933   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     1.082     0.000     8.173     8.173 c.m/sec"
"             Catchment 801          Pervious   Impervious Total Area "
"             Surface Area           9.306      0.094      9.400      hectare"
"             Time of concentration  32.958     5.891      32.637     minutes"
"             Time to Centroid       2548.901   2260.661   2545.486   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2.6522     0.0268     2.6790     ha-m"
"             Rainfall losses        72.711     33.040     72.314     mm"
"             Runoff depth           212.289    251.960    212.686    mm"
"             Runoff volume          1.9756     0.0237     1.9992     ha-m"
"             Runoff coefficient     0.745      0.884      0.746      "
"             Maximum flow           1.074      0.012      1.082      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     1.082     1.082     8.173     8.173"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                     1.082     1.082     1.082     8.173"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               Branch 'F'"
"             Maximum flow                  1.082    c.m/sec"
"             Hydrograph volume         19992.486    c.m"
"                     1.082     1.082     1.082     1.082"
" 40          HYDROGRAPH   Confluence    200"
"           7   Confluence "
"         200   Node #"
"               Branch 'F'"
"             Maximum flow                  1.082    c.m/sec"
"             Hydrograph volume         19992.486    c.m"
"                     1.082     1.082     1.082     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                     1.082     1.082     1.082     0.000"
" 40          HYDROGRAPH   Combine    225"
"           6   Combine "
"         225   Node #"
"               Branch 'C'"
"             Maximum flow                  9.255    c.m/sec"
"             Hydrograph volume        184105.953    c.m"
"                     1.082     1.082     1.082     9.255"
" 40          HYDROGRAPH   Confluence    225"
"           7   Confluence "
"         225   Node #"
"               Branch 'C'"
"             Maximum flow                  9.255    c.m/sec"
"             Hydrograph volume        184105.953    c.m"
"                     1.082     9.255     1.082     0.000"
```

```
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      1.082     9.255     9.255     0.000"
" 40          HYDROGRAPH   Combine    275"
"             6   Combine "
"           275   Node #"
"                 Branch 'A'"
"              Maximum flow                  20.307    c.m/sec"
"              Hydrograph volume         613609.000    c.m"
"                      1.082     9.255     9.255    20.307"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                      1.082     0.000     9.255    20.307"
" 33          CATCHMENT 900"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           900   Ariss Glen and J.Hefferman properties "
"         1.000   % Impervious"
"        16.968   Total Area"
"       420.000   Flow length"
"         2.000   Overland Slope"
"        16.798   Pervious Area"
"       420.000   Pervious length"
"         2.000   Pervious slope"
"         0.170   Impervious Area"
"       420.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        73.500   Pervious SCS Curve No."
"         0.720   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         9.158   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.961   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                      1.700     0.000     9.255    20.307 c.m/sec"
"              Catchment 900          Pervious   Impervious Total Area "
"              Surface Area           16.798     0.170      16.968     hectare"
"              Time of concentration  78.620     13.935     77.759     minutes"
"              Time to Centroid       2630.440   2316.065   2626.257   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        4.7875     0.0484     4.8359     ha-m"
"              Rainfall losses        79.813     11.044     79.125     mm"
"              Runoff depth           205.187    273.956    205.875    mm"
"              Runoff volume          3.4468     0.0465     3.4933     ha-m"
"              Runoff coefficient     0.720      0.961      0.722      "
"              Maximum flow           1.682      0.021      1.700      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.700     1.700     9.255    20.307"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.700     1.700     1.700    20.307"
" 40          HYDROGRAPH   Combine    275"
"            6   Combine "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                 22.007    c.m/sec"
"             Hydrograph volume        648541.813    c.m"
"                    1.700     1.700     1.700    22.007"
" 40          HYDROGRAPH   Confluence    275"
"            7   Confluence "
"          275   Node #"
"                Branch 'A'"
"             Maximum flow                 22.007    c.m/sec"
"             Hydrograph volume        648541.875    c.m"
"                    1.700    22.007     1.700     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.700    22.007    22.007     0.000"
" 81          ADD COMMENT================================================="
"          1  Lines of comment"
"             Flow At the Ariss Glen Subdivision  "
" 40          HYDROGRAPH   Combine    300"
"            6   Combine "
"          300   Node #"
"                Main Drain"
"             Maximum flow                 22.007    c.m/sec"
"             Hydrograph volume        648541.875    c.m"
"                    1.700    22.007    22.007    22.007"
" 40          HYDROGRAPH   Confluence    300"
"            7   Confluence "
"          300   Node #"
"                Main Drain"
"             Maximum flow                 22.007    c.m/sec"
"             Hydrograph volume        648541.875    c.m"
"                    1.700    22.007    22.007     0.000"
" 52          CHANNEL DESIGN"
"        22.007   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"            1.   Cross-section type: 0=trapezoidal; 1=general"
"            7.   Define an arbitrary cross-section"
"                   0.000     0.000   200.000   201.500   202.700"
"                 204.200   404.200"
"                  10.000    10.000     7.000     5.750     5.750"
"                   7.000    10.000"
"         4.250   Channel depth    metre"
```

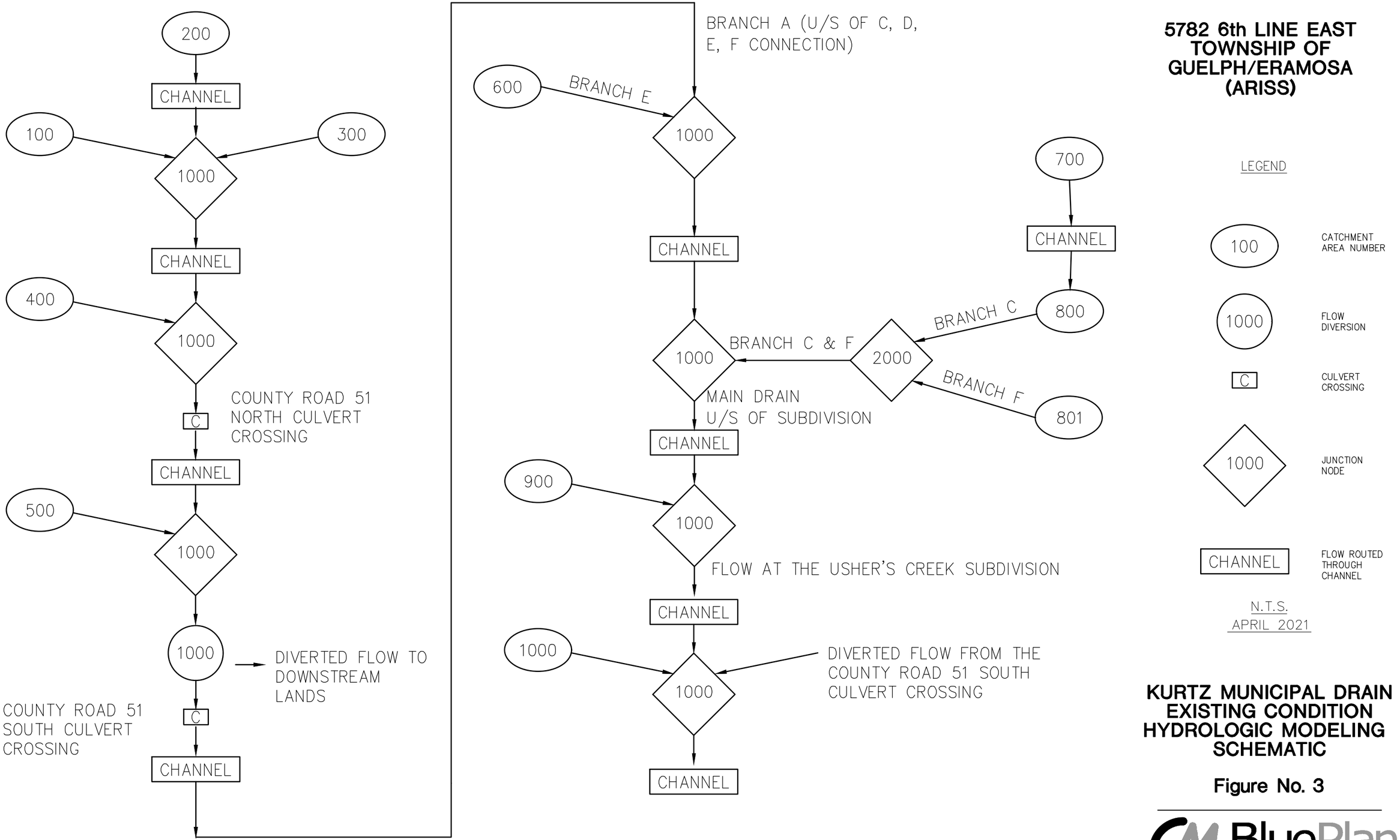
```
"        0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                0.0400    0.0400    0.0400    0.0400    0.0400"
"                0.0400    0.0400"
"             Depth of flow                1.946    metre"
"             Velocity                     0.570    m/sec"
"             Channel capacity           447.007    c.m/sec"
"             Critical depth               1.614    metre"
" 53          ROUTE    Channel Route 210"
"       210.00      Channel Route 210 Reach length   ( metre)"
"        0.097   X-factor <= 0.5"
"      276.222   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      450.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                21.583    c.m/sec"
"                     1.700    22.007    21.583     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                21.583    c.m/sec"
"             Hydrograph volume        648542.000    c.m"
"                     1.700    22.007    21.583    21.583"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     1.700     0.000    21.583    21.583"
" 33          CATCHMENT 1000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Flows to Main Drain"
"        1.000   % Impervious"
"       13.788   Total Area"
"      181.000   Flow length"
"        2.000   Overland Slope"
"       13.650   Pervious Area"
"      181.000   Pervious length"
"        2.000   Pervious slope"
"        0.138   Impervious Area"
"      181.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.500   Pervious SCS Curve No."
"        0.723   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.694   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.921   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.556     0.000    21.583    21.583 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           13.650     0.138      13.788     hectare"
"             Time of concentration  47.293     8.409      46.799     minutes"
"             Time to Centroid       2578.655   2285.975   2574.939   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        3.8903     0.0393     3.9296     ha-m"
"             Rainfall losses        78.822     22.551     78.259     mm"
"             Runoff depth           206.178    262.449    206.741    mm"
"             Runoff volume          2.8144     0.0362     2.8505     ha-m"
"             Runoff coefficient     0.723      0.921      0.725      "
"             Maximum flow           1.543      0.017      1.556      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.556     1.556    21.583    21.583"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     1.556     1.556     1.556    21.583"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Junction to 1000"
"             Maximum flow                 23.139    c.m/sec"
"             Hydrograph volume        677047.313    c.m"
"                     1.556     1.556     1.556    23.139"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     1.556     0.000     1.556    23.139"
" 47          FILEI_O Read/Open DIV01000.000hyd"
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01000.000hyd"
"             Spill at 347.00 "
"             Total volume             126952.883    c.m"
"             Maximum flow                  8.705    c.m/sec"
"                  8.705     0.000     1.556    23.139 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     8.705     8.705     1.556    23.139"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     8.705     8.705     8.705    23.139"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
```

```
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                 30.528    c.m/sec"
"             Hydrograph volume         804000.125    c.m"
"                     8.705     8.705     8.705    30.528"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Junction to 1000"
"             Maximum flow                 30.528    c.m/sec"
"             Hydrograph volume         804000.188    c.m"
"                     8.705    30.528     8.705     0.000"
" 52          CHANNEL DESIGN"
"        30.528   Current peak flow    c.m/sec"
"         0.040   Manning 'n'"
"           1.   Cross-section type: 0=trapezoidal; 1=general"
"           7.   Define an arbitrary cross-section"
"                  0.000     0.000   200.000   202.540   203.790"
"                206.330   406.330"
"                 10.000    10.000     7.000     5.630     5.630"
"                  7.000    10.000"
"         4.370   Channel depth    metre"
"         0.180   Gradient   %"
"           0.   Variable roughness: 0=False; 1=True"
"                 0.0400    0.0400    0.0400    0.0400    0.0400"
"                 0.0400    0.0400"
"             Depth of flow                 2.135    metre"
"             Velocity                      0.623    m/sec"
"             Channel capacity            463.642    c.m/sec"
"             Critical depth                1.758    metre"
" 53          ROUTE    Channel Route 654"
"        654.00      Channel Route 654 Reach length   ( metre)"
"         0.352   X-factor <= 0.5"
"       787.768   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"       900.000   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"             Peak outflow                 29.684    c.m/sec"
"                     8.705    30.528    29.684     0.000 c.m/sec"
" 38          START/RE-START TOTALS 1000"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    376.856    hectare"
"             Total Impervious area                     3.769    hectare"
"             Total % impervious                        1.000"
" 19          EXIT"
```

Appendix B

Floodplain (HEC-RAS) Analysis



5782 6th LINE EAST TOWNSHIP OF GUELPH/ERAMOSA (ARISS)

LEGEND

100	CATCHMENT AREA NUMBER
1000	FLOW DIVERSION
C	CULVERT CROSSING
1000	JUNCTION NODE
CHANNEL	FLOW ROUTED THROUGH CHANNEL

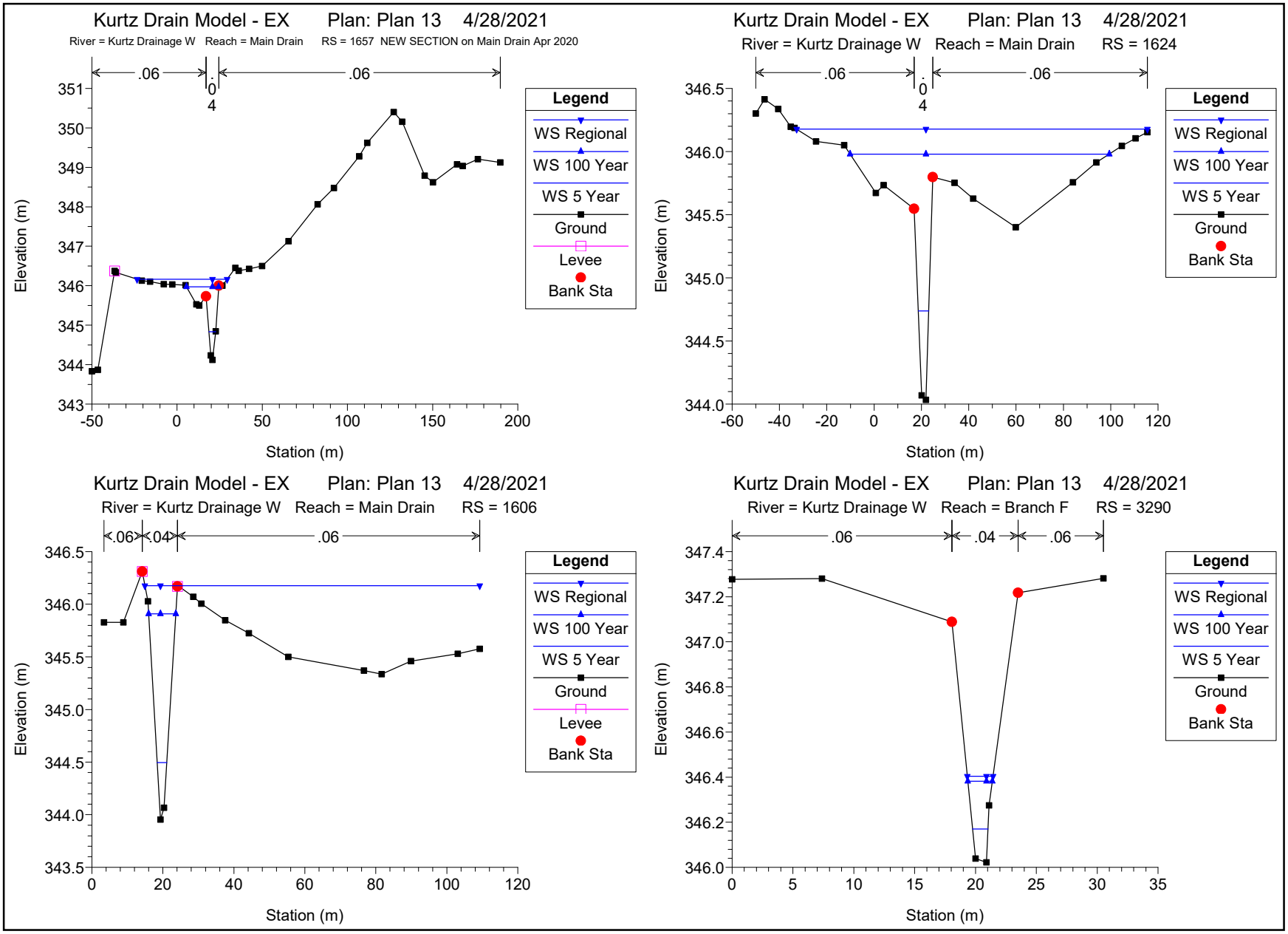
N.T.S.
APRIL 2021

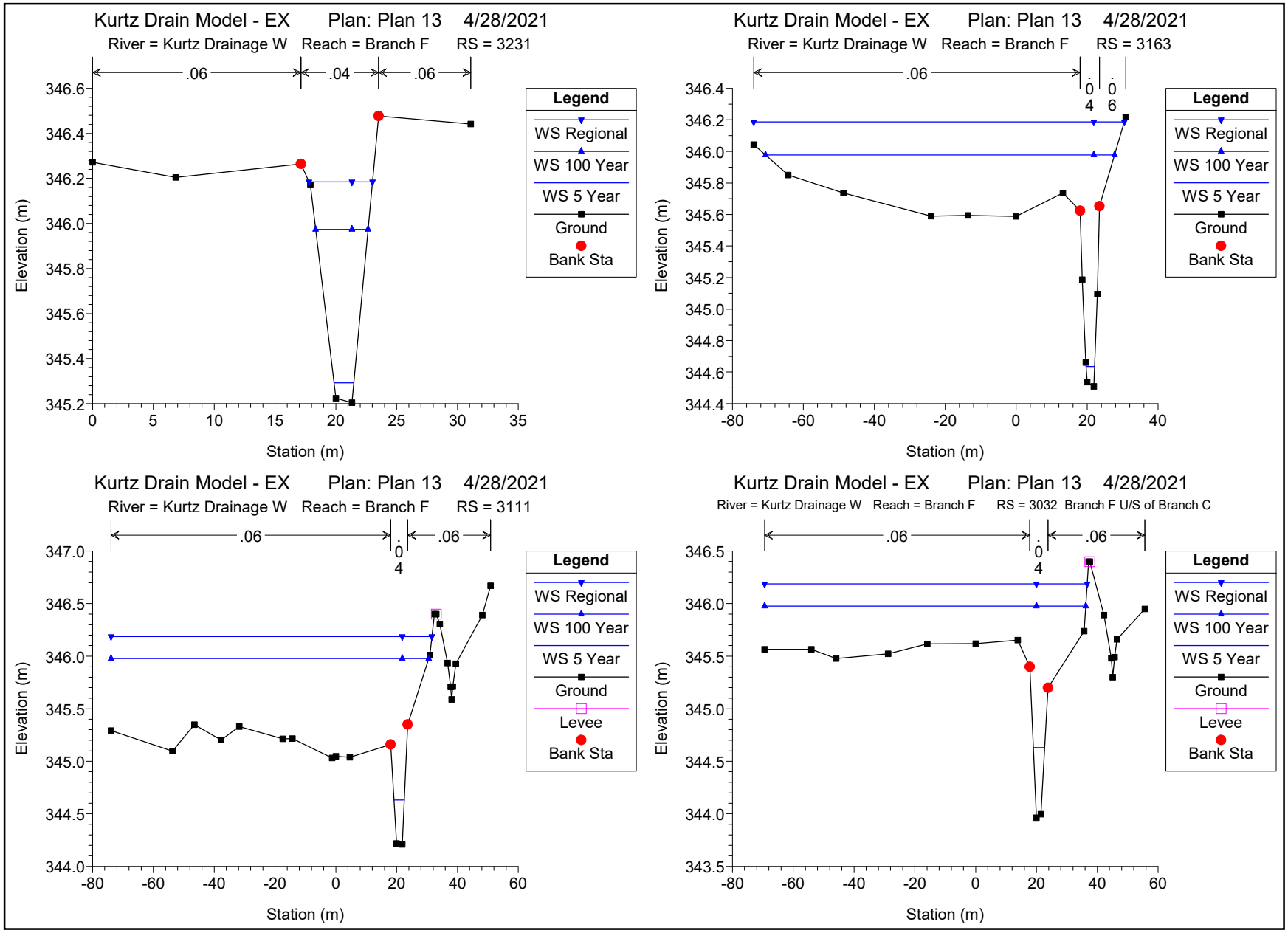
KURTZ MUNICIPAL DRAIN EXISTING CONDITION HYDROLOGIC MODELING SCHEMATIC

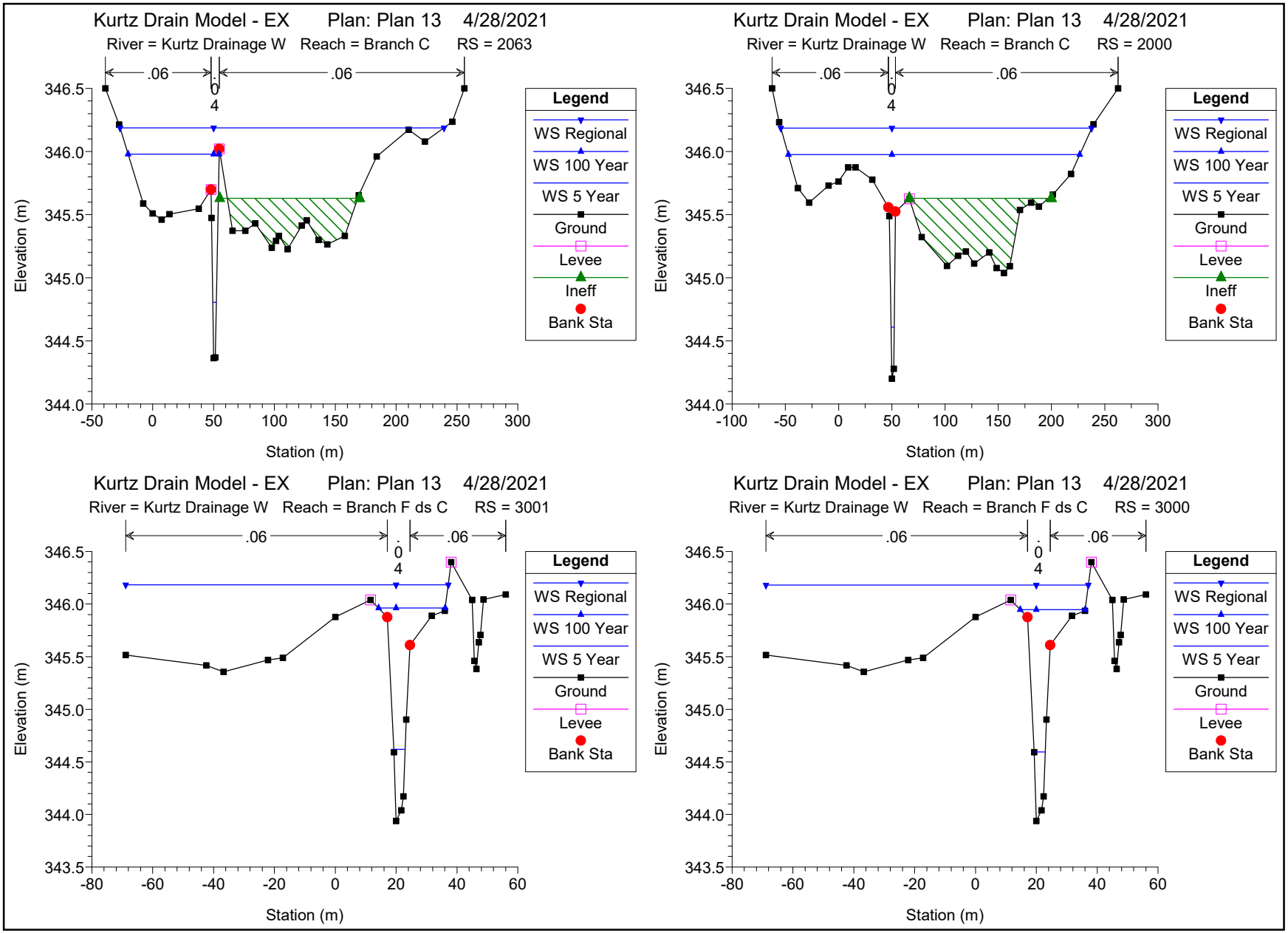
Figure No. 3

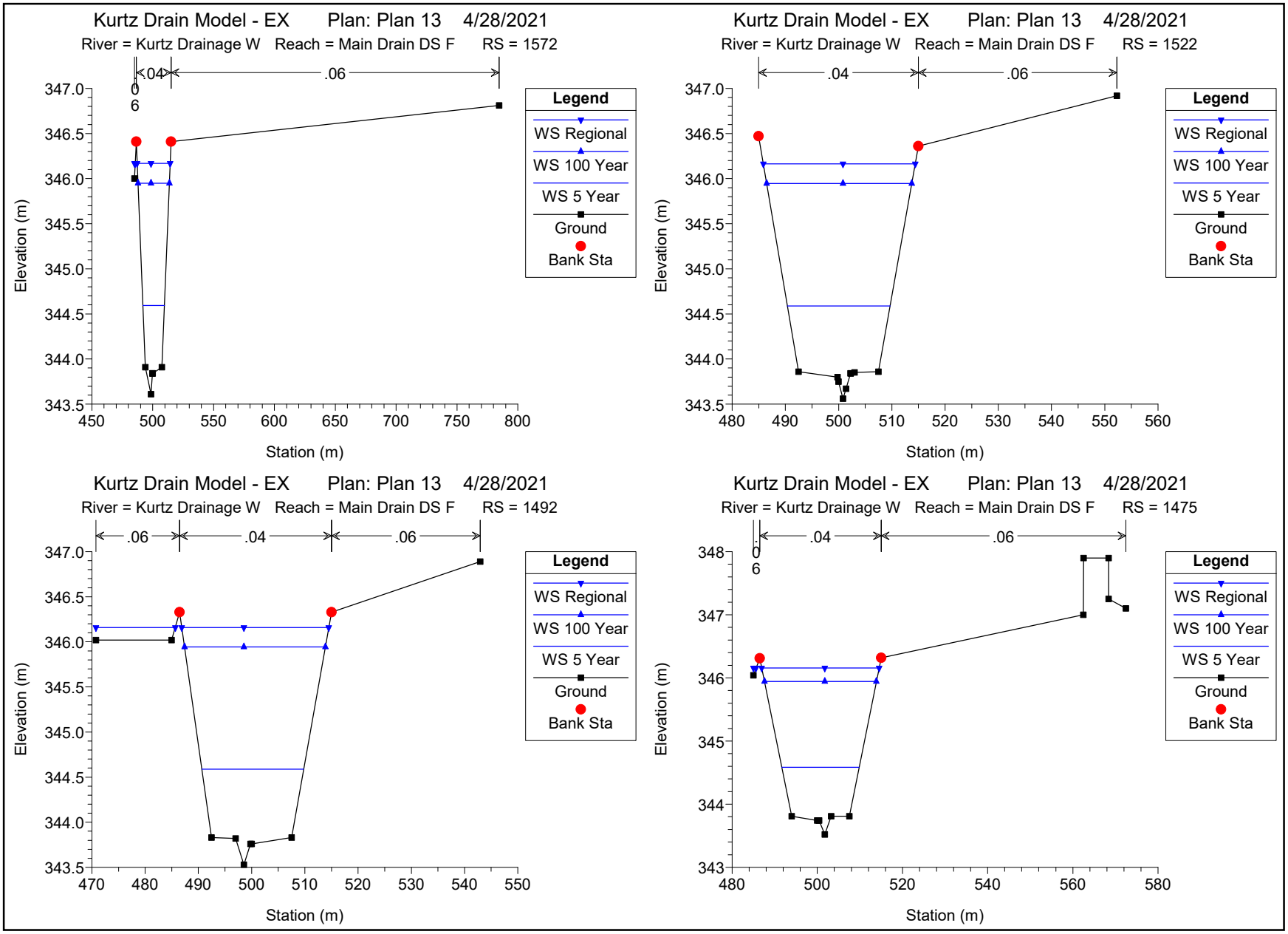
BluePlan ENGINEERING

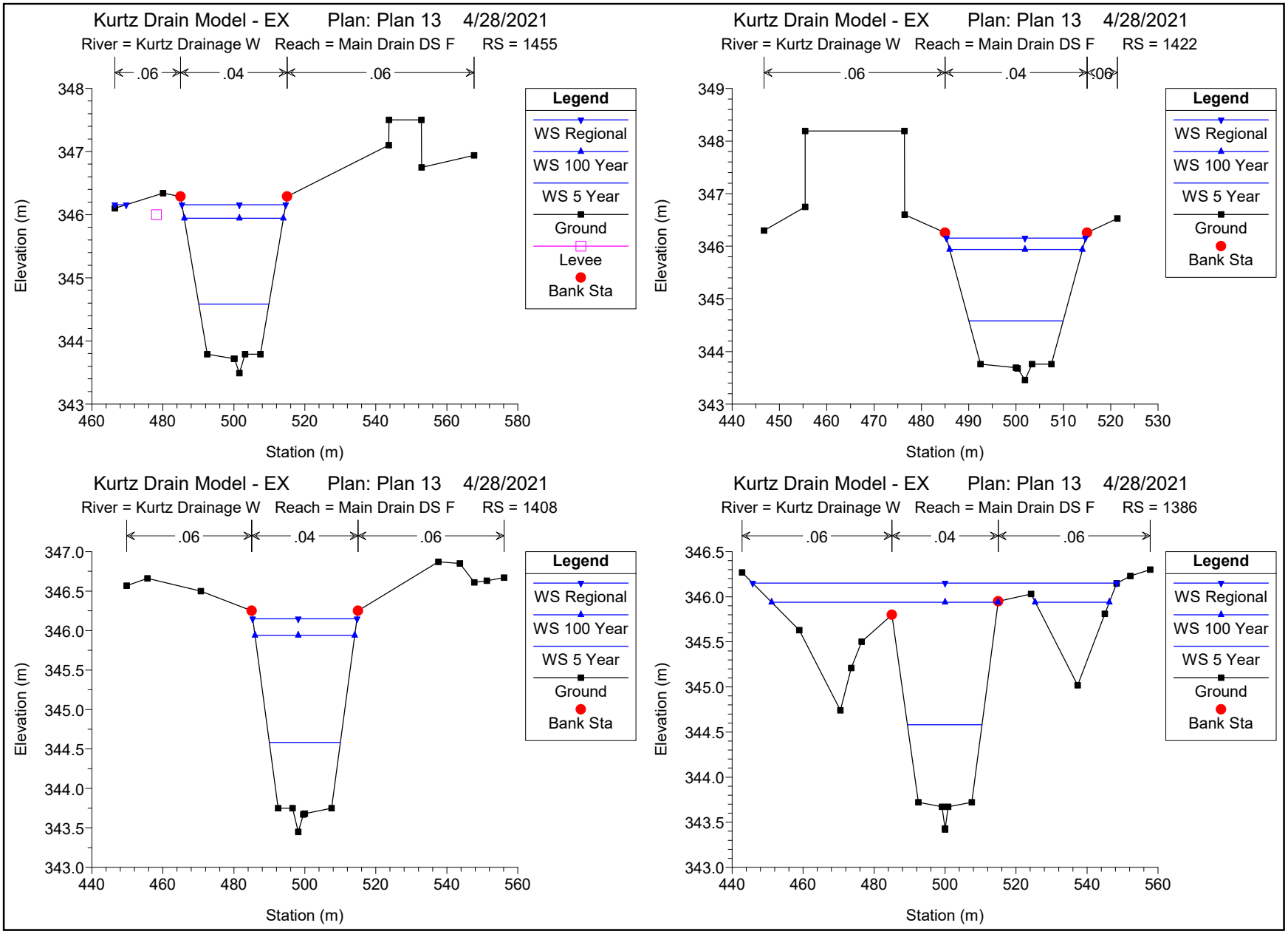
Plotted On: July 22, 2021 111070-Model Schematic.dwg

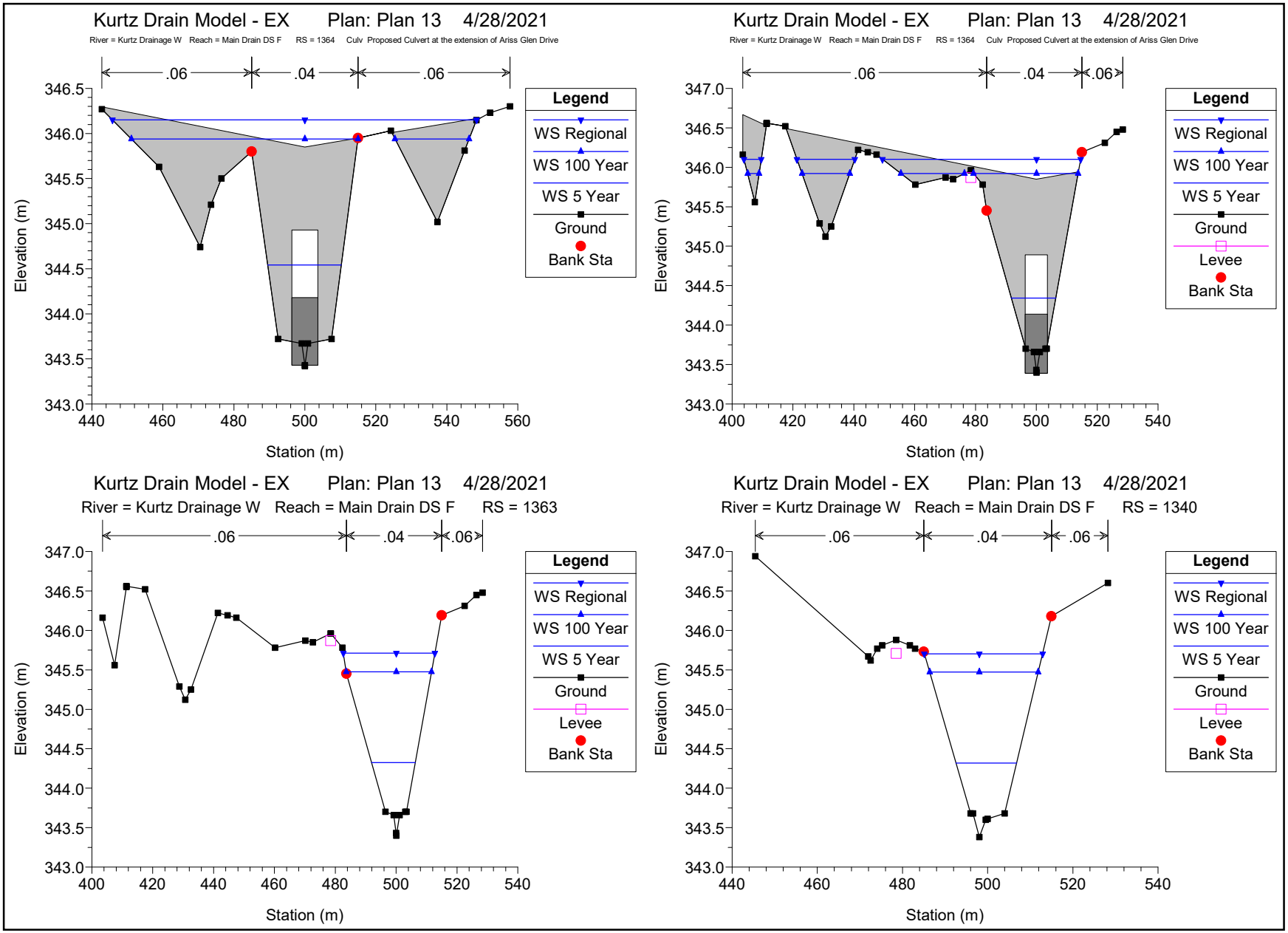

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain RS = 1657 NEW SECTION on Main Drain Apr 2020
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain RS = 1624
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain RS = 1606
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F RS = 3290
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

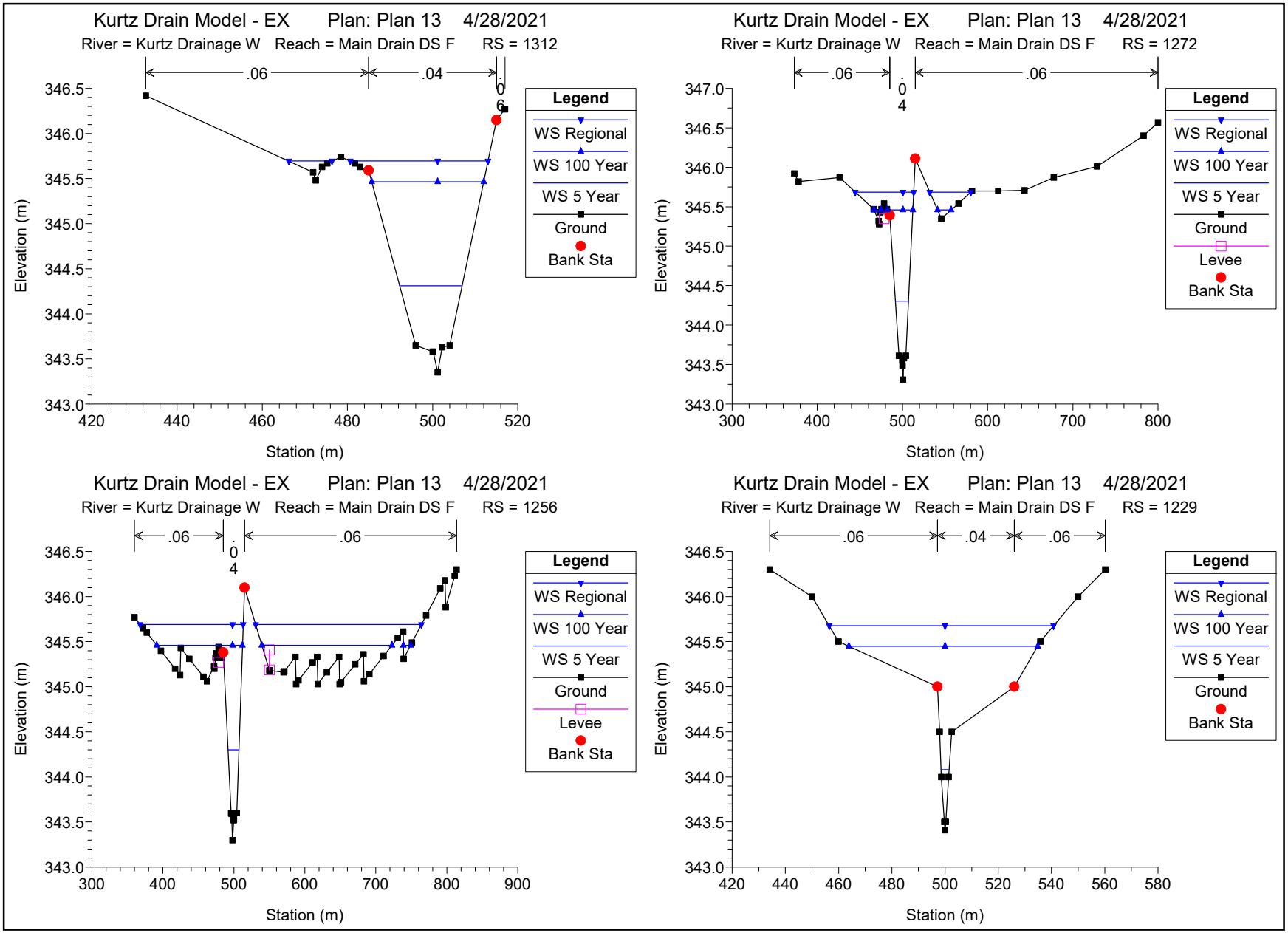

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F RS = 3231
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F RS = 3163
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F RS = 3111
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F RS = 3032 Branch F U/S of Branch C
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta

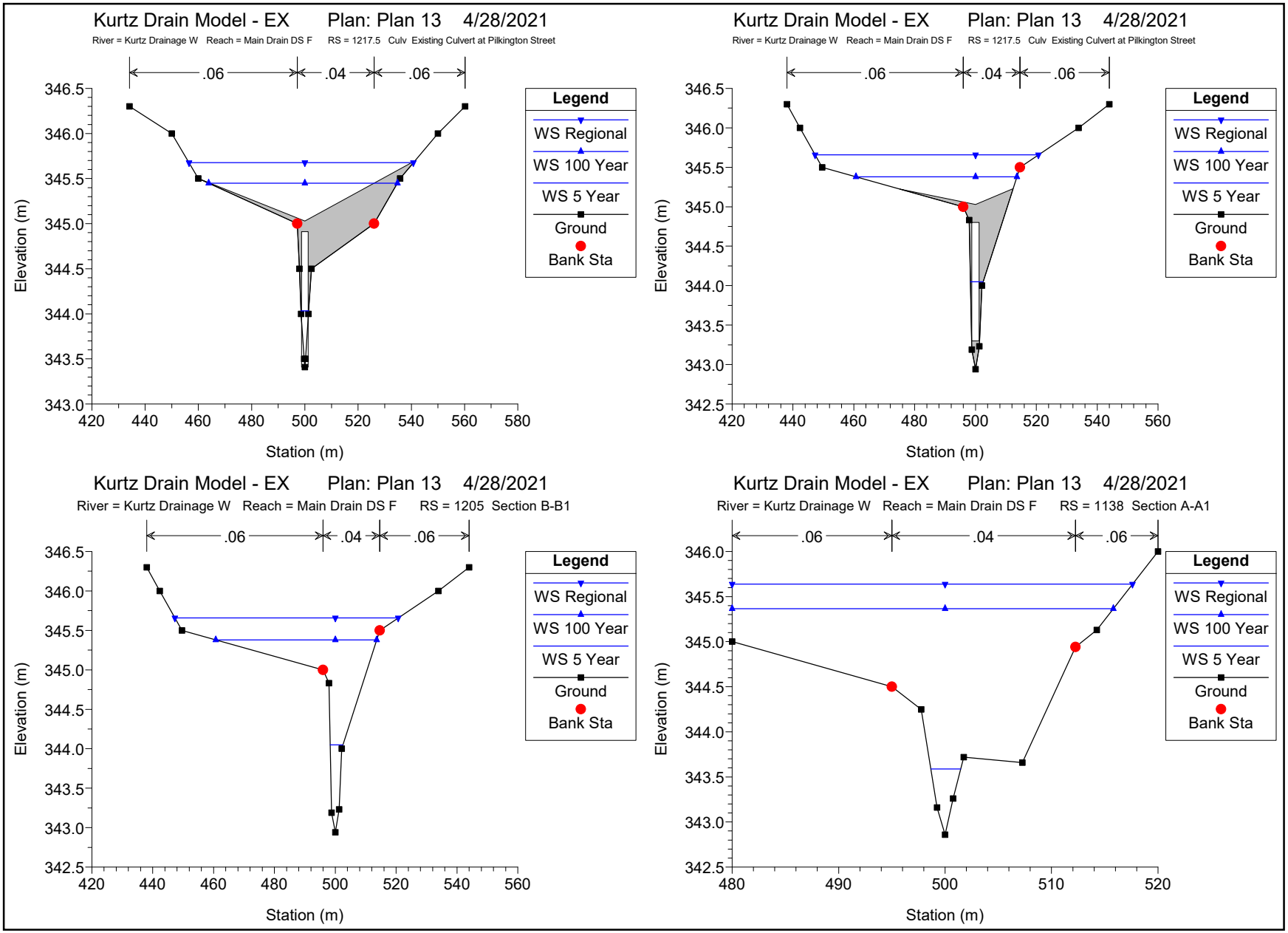

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch C RS = 2063
.06
.04
.06
Elevation (m)
346.5
346.0
345.5
345.0
344.5
344.0
-50
0
50
100
150
200
250
300
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Ineff
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch C RS = 2000
.06
.04
.06
Elevation (m)
346.5
346.0
345.5
345.0
344.5
344.0
-100
-50
0
50
100
150
200
250
300
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Ineff
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F ds C RS = 3001
.06
.04
.06
Elevation (m)
346.5
346.0
345.5
345.0
344.5
344.0
343.5
-80
-60
-40
-20
0
20
40
60
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Branch F ds C RS = 3000
.06
.04
.06
Elevation (m)
346.5
346.0
345.5
345.0
344.5
344.0
343.5
-80
-60
-40
-20
0
20
40
60
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta

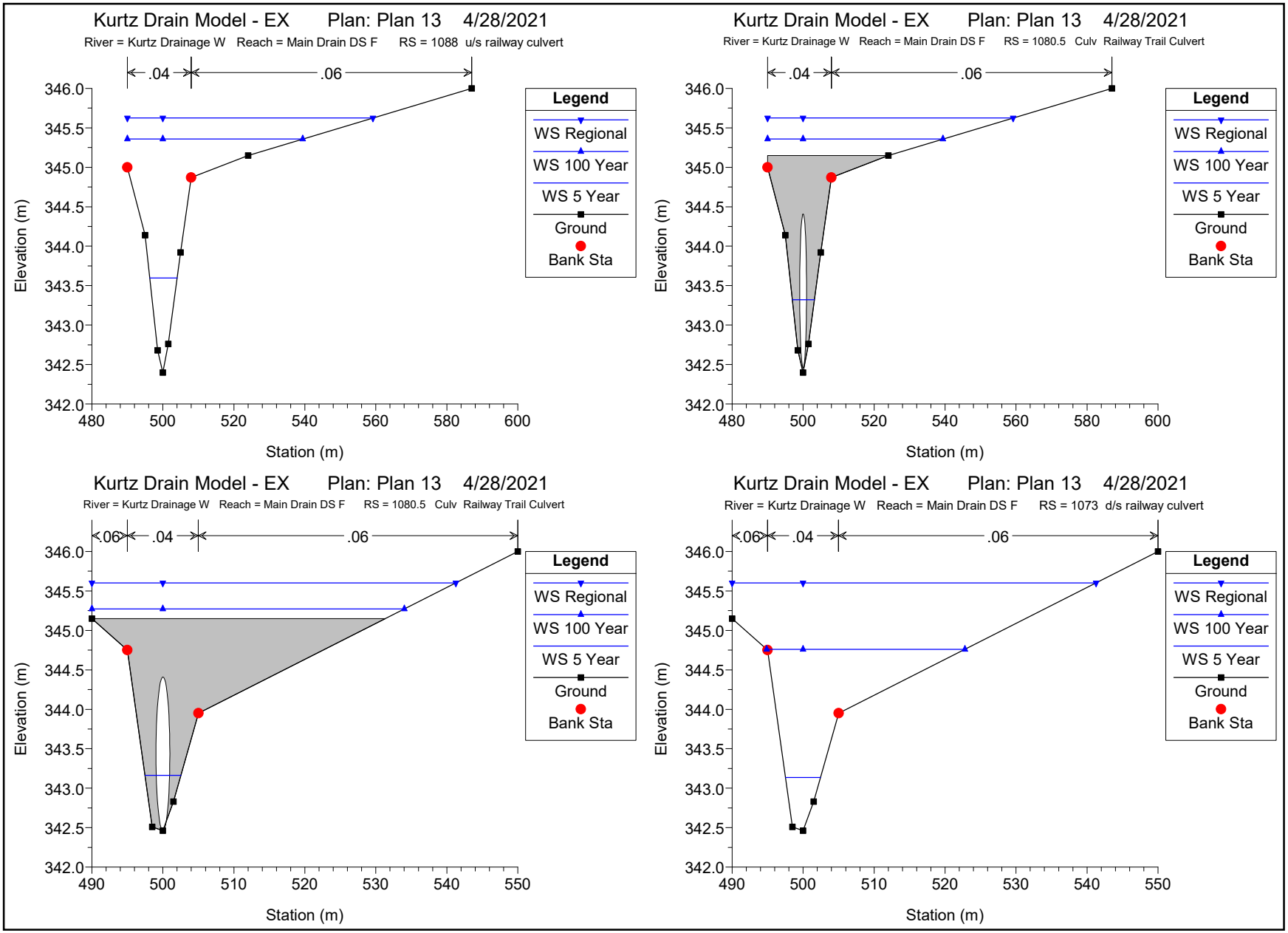

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1572
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1522
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1492
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1475
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

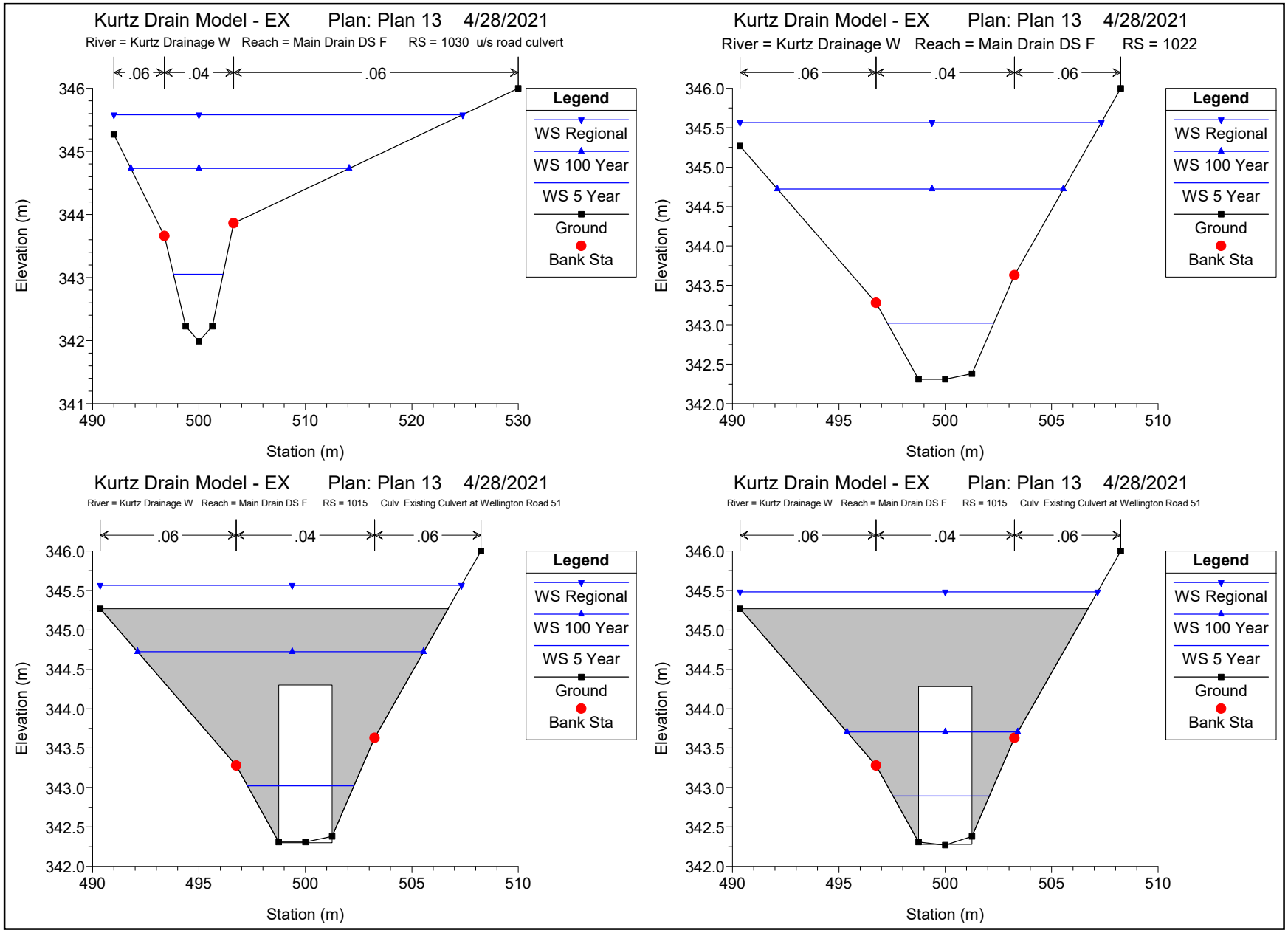

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1455
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1422
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1408
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1386
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

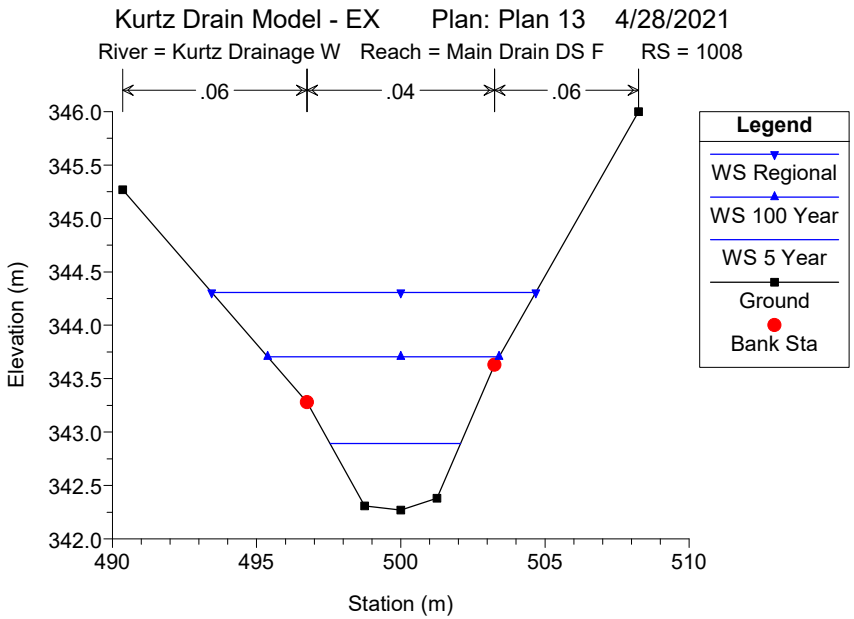

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1364 Culv Proposed Culvert at the extension of Ariss Glen Drive
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1364 Culv Proposed Culvert at the extension of Ariss Glen Drive
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1363
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1340
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta

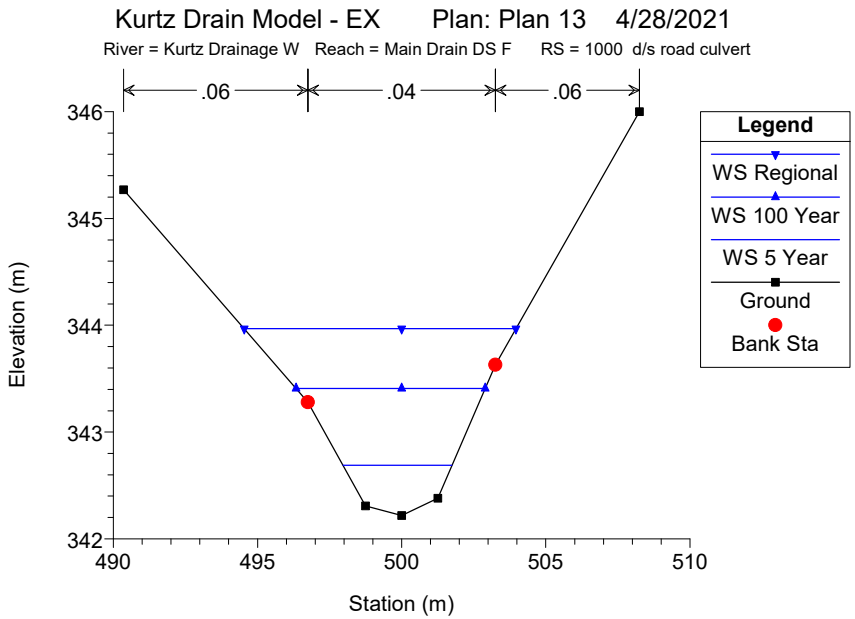

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1312
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1272
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1256
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1229
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

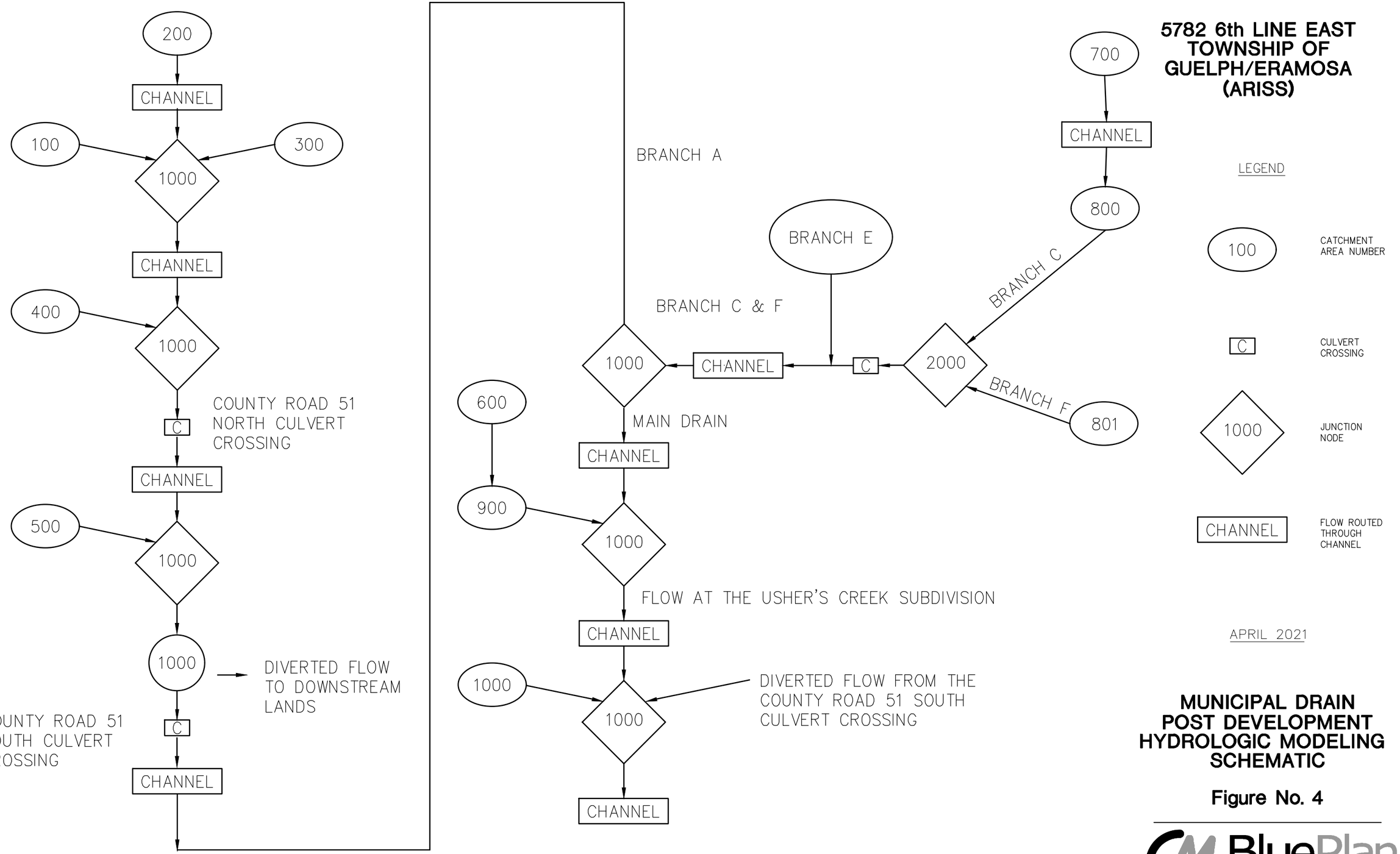

Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1217.5 Culv Existing Culvert at Pilkington Street
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1217.5 Culv Existing Culvert at Pilkington Street
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1205 Section B-B1
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1138 Section A-A1
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)


Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1088 u/s railway culvert
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1080.5 Culv Railway Trail Culvert
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1080.5 Culv Railway Trail Culvert
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1073 d/s railway culvert
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta


Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1030 u/s road culvert
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1022
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1015 Culv Existing Culvert at Wellington Road 51
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1015 Culv Existing Culvert at Wellington Road 51
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta


Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1008
.06
.04
.06
346.0
345.5
345.0
344.5
344.0
343.5
343.0
342.5
342.0
Elevation (m)
490
495
500
505
510
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta


Kurtz Drain Model - EX Plan: Plan 13 4/28/2021
River = Kurtz Drainage W Reach = Main Drain DS F RS = 1000 d/s road culvert
.06
.04
.06
346
345
344
343
342
Elevation (m)
490
495
500
505
510
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta



5782 6th LINE EAST TOWNSHIP OF GUELPH/ERAMOSA (ARISS)

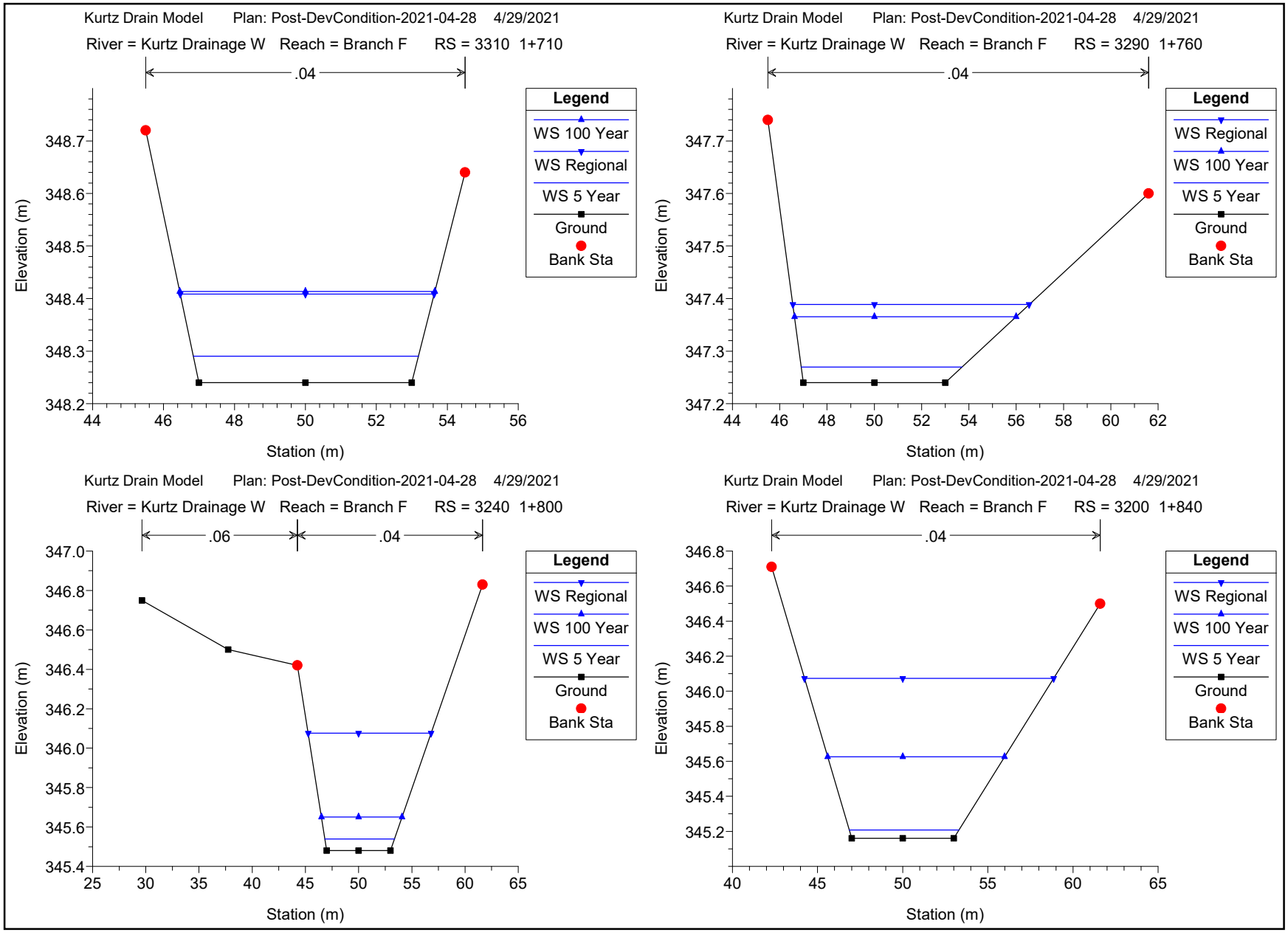
APRIL 2021

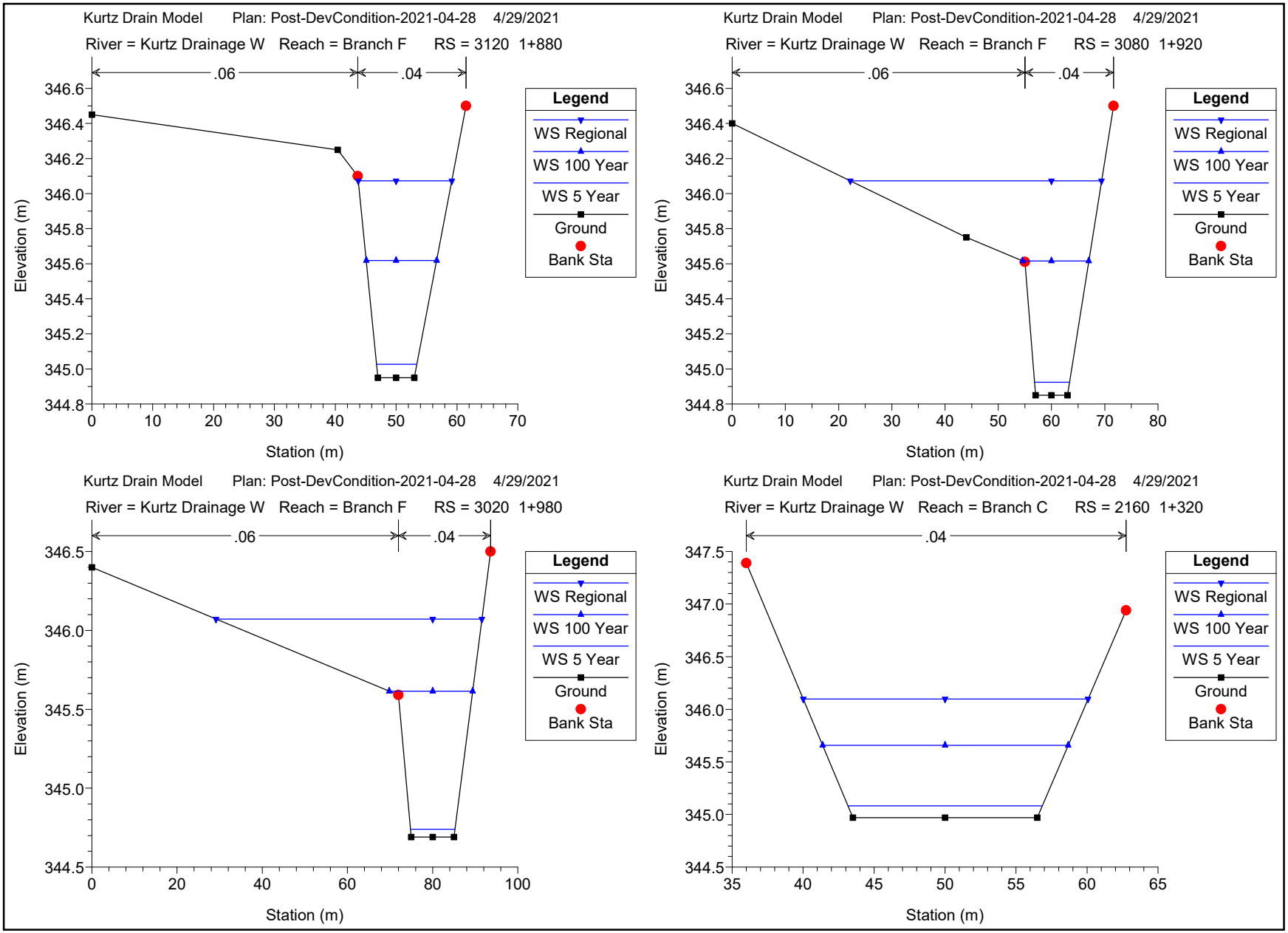
MUNICIPAL DRAIN POST DEVELOPMENT HYDROLOGIC MODELING SCHEMATIC

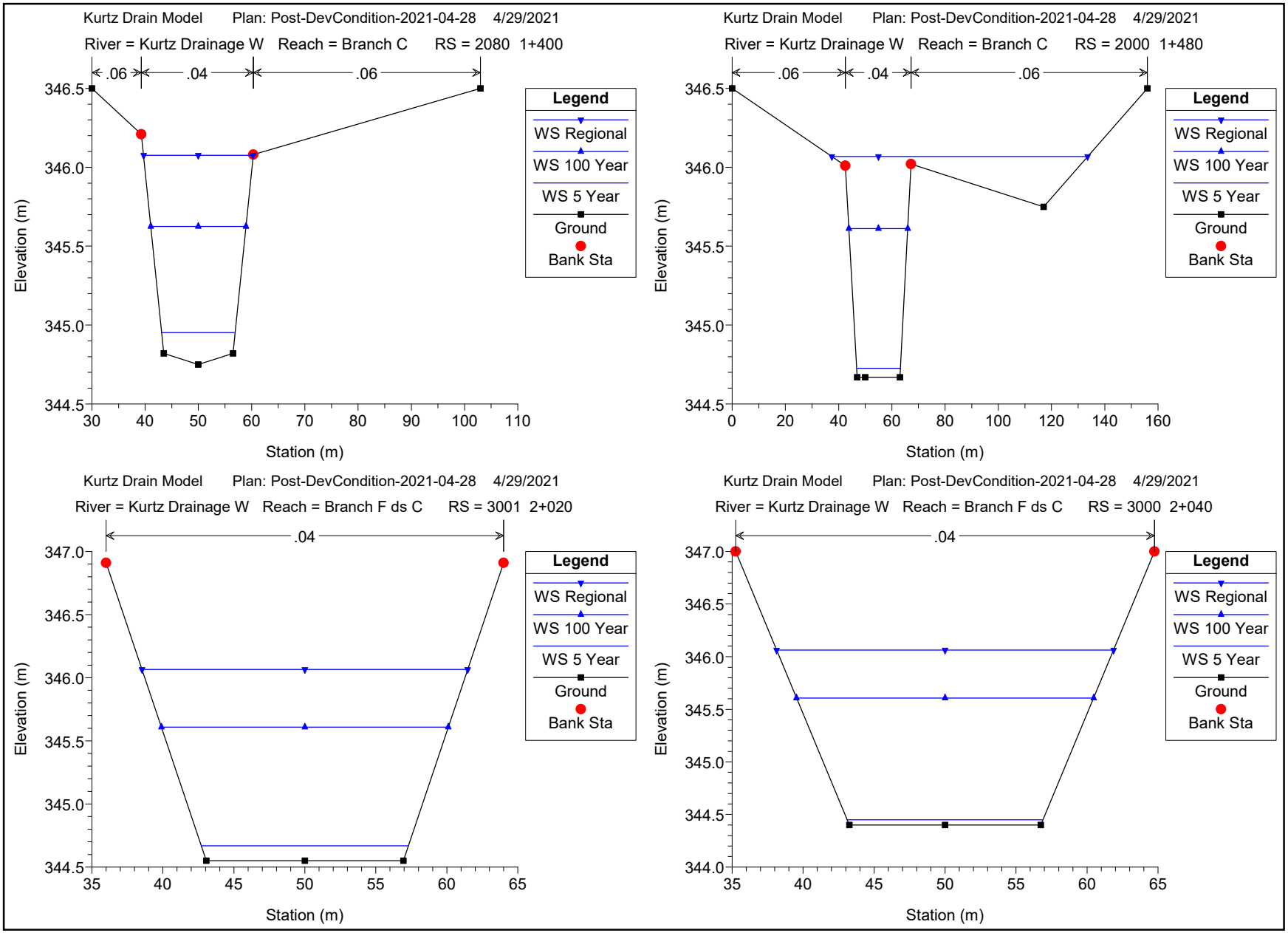
Figure No. 4

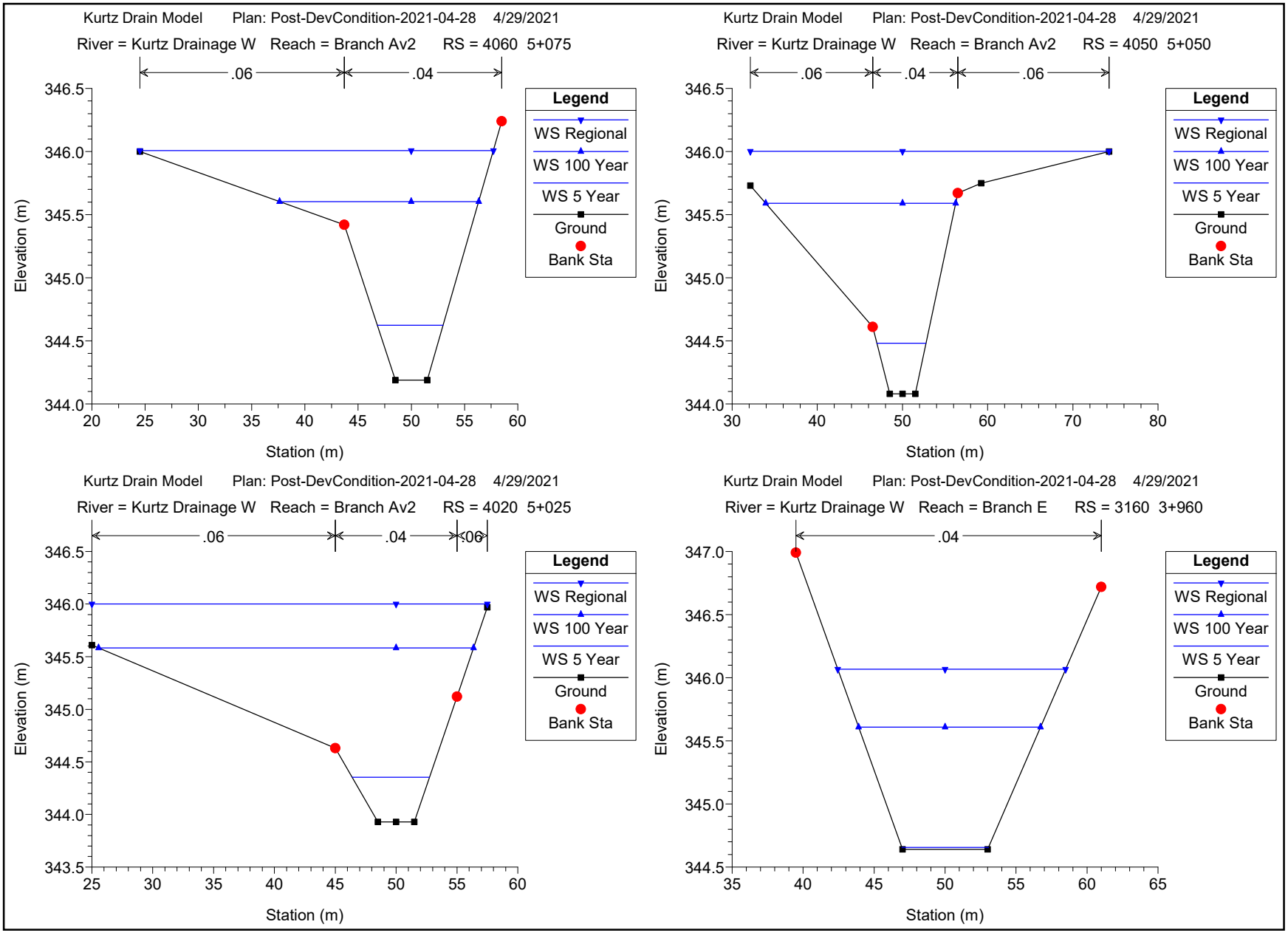
BluePlan ENGINEERING

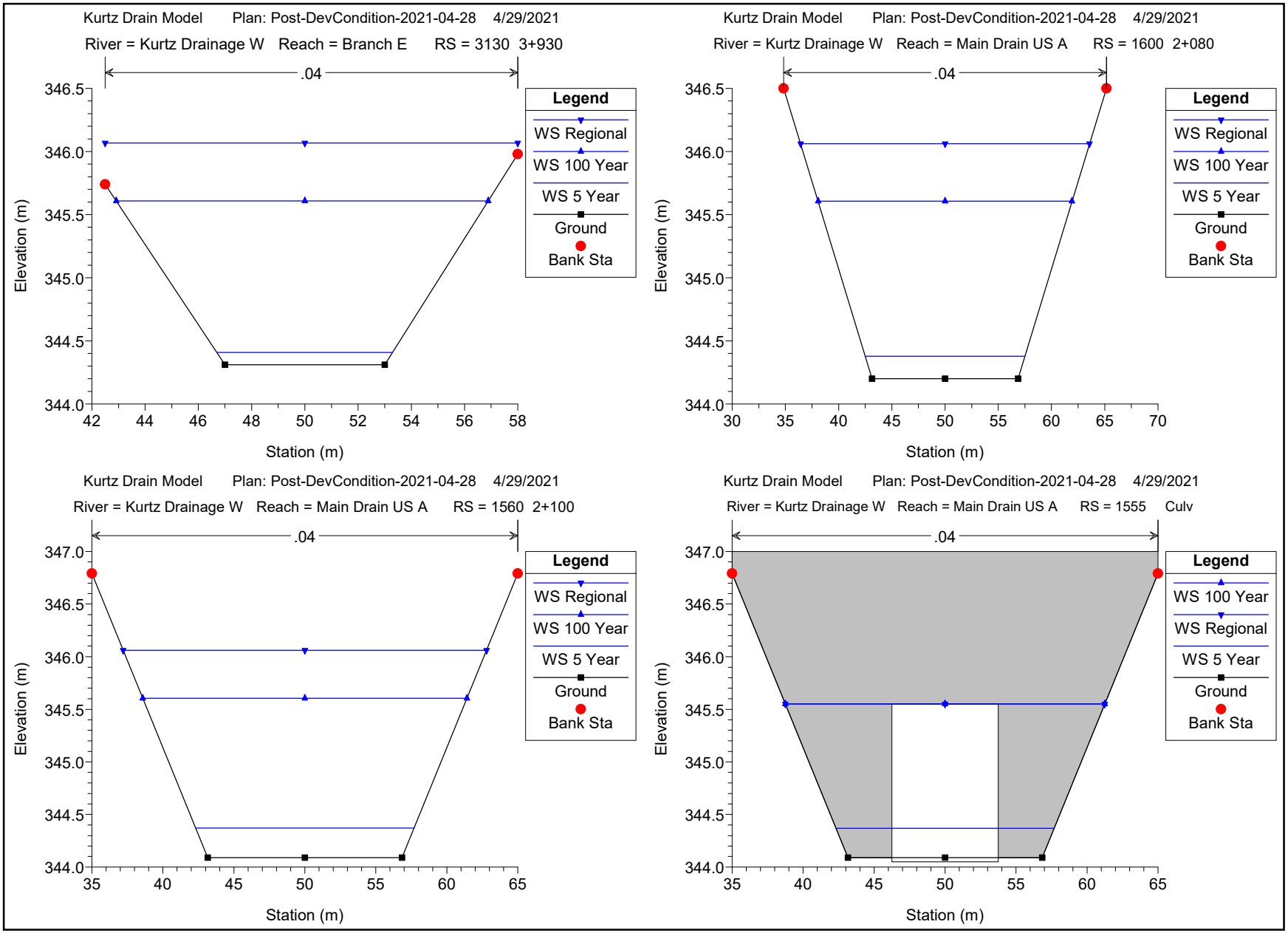
Plotted On: July 22, 2021 111070-Model Schematic.dwg

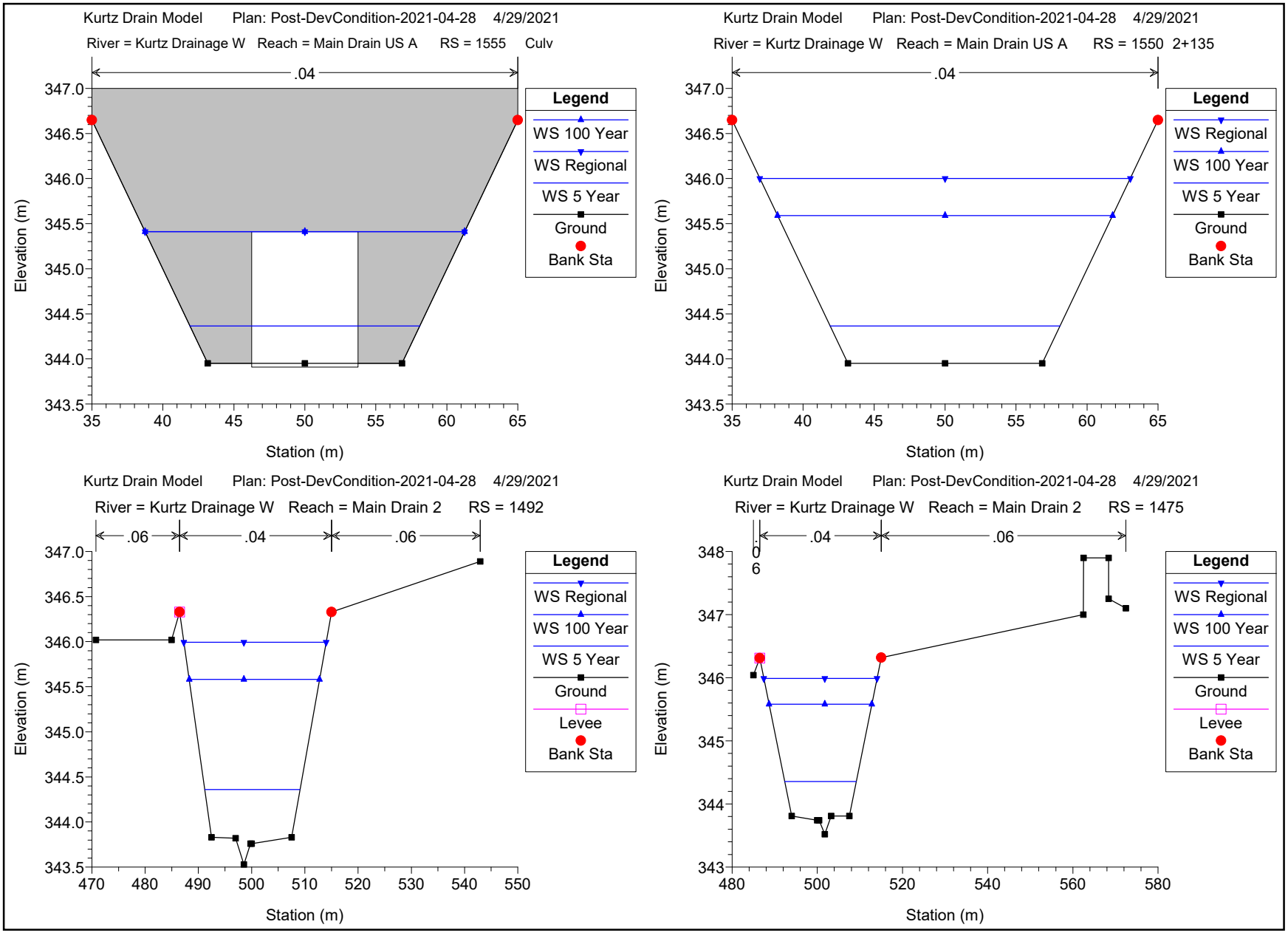

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3310 1+710
.04
Legend
WS 100 Year
WS Regional
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3290 1+760
.04
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3240 1+800
.06
.04
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3200 1+840
.04
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)

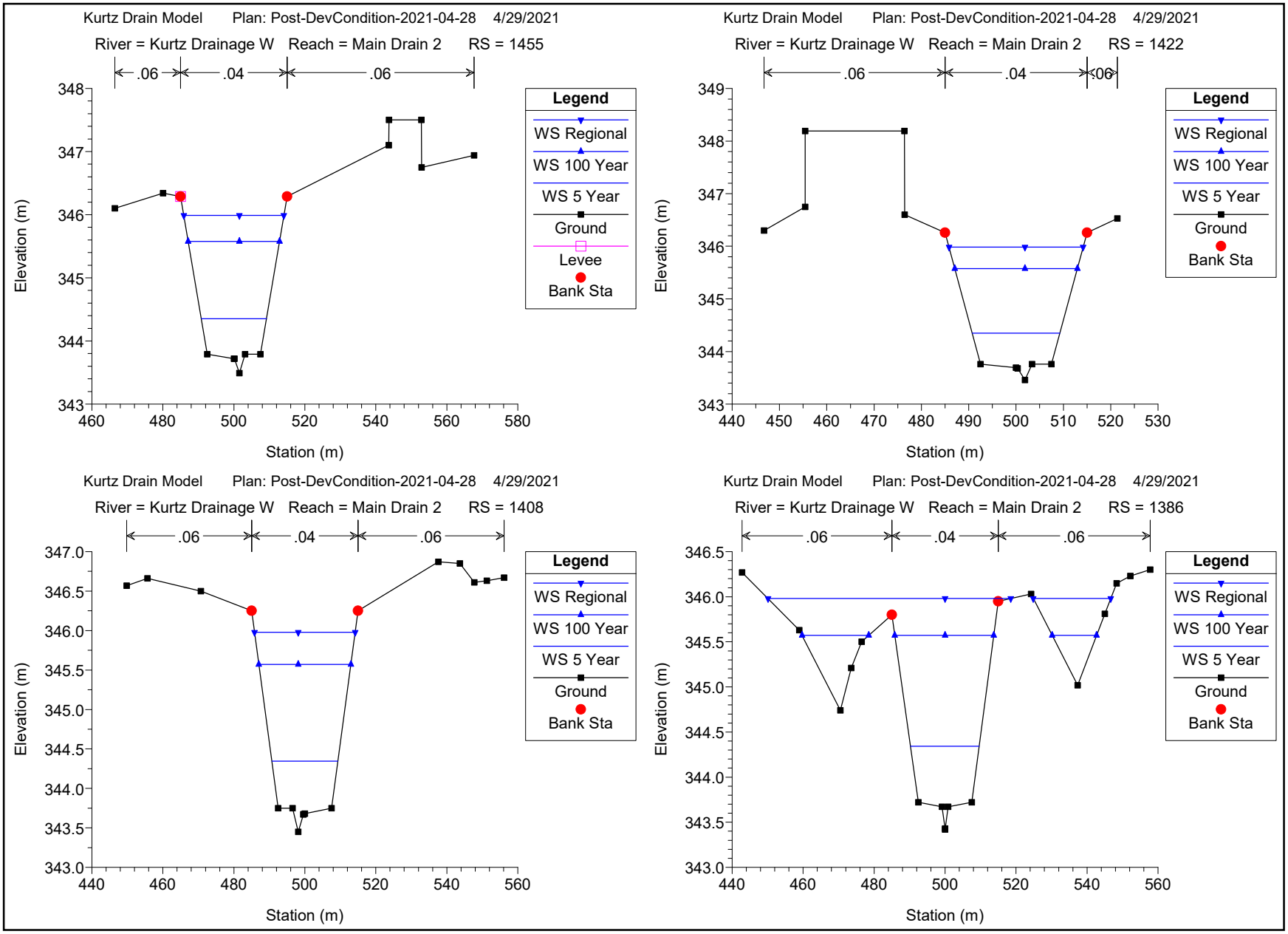

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3120 1+880
.06
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3080 1+920
.06
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F RS = 3020 1+980
.06
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch C RS = 2160 1+320
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

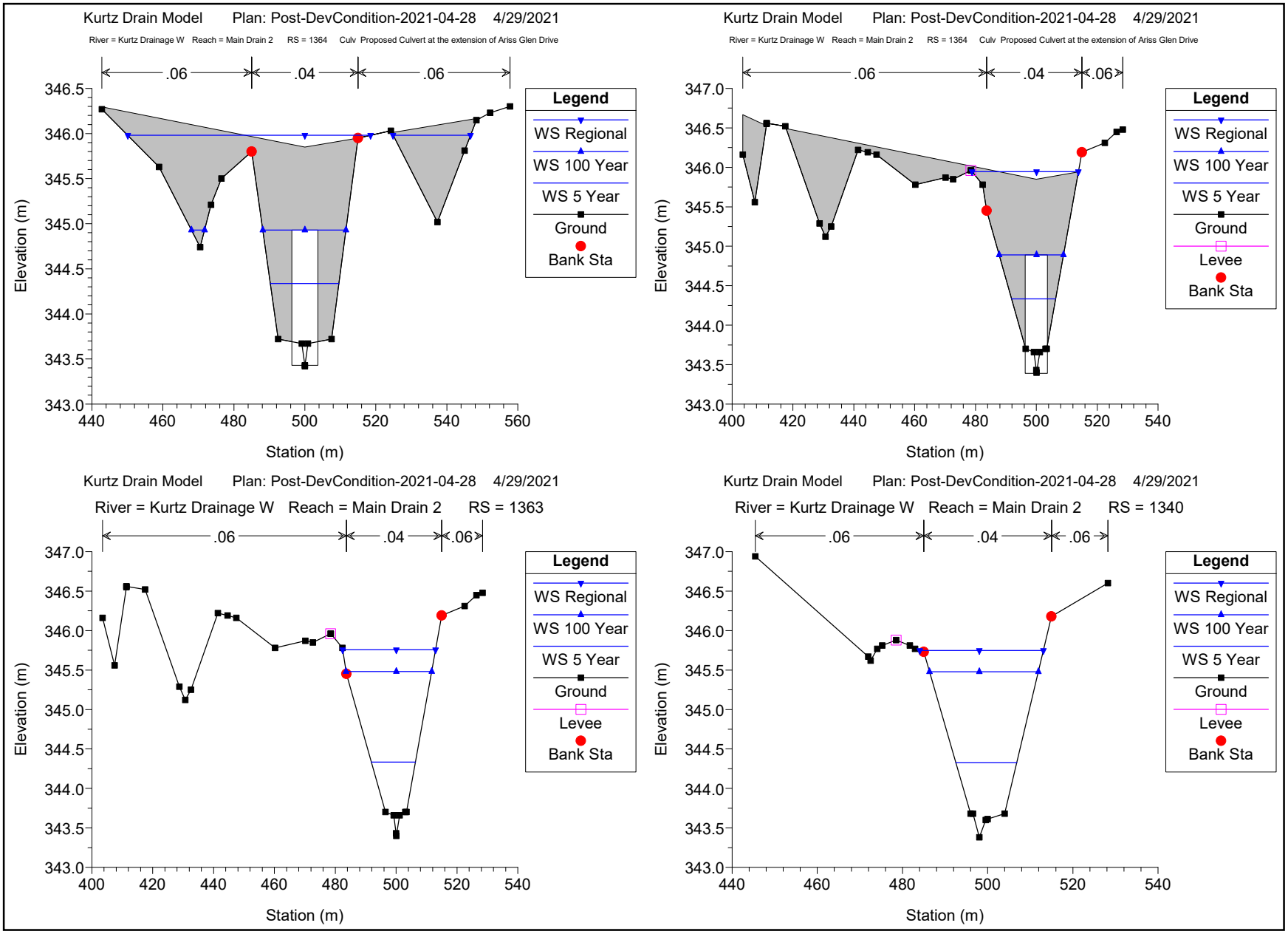

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch C RS = 2080 1+400
.06
.04
.06
346.5
346.0
345.5
345.0
344.5
30
40
50
60
70
80
90
100
110
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch C RS = 2000 1+480
.06
.04
.06
346.5
346.0
345.5
345.0
344.5
0
20
40
60
80
100
120
140
160
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F ds C RS = 3001 2+020
.04
347.0
346.5
346.0
345.5
345.0
344.5
35
40
45
50
55
60
65
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch F ds C RS = 3000 2+040
.04
347.0
346.5
346.0
345.5
345.0
344.5
344.0
35
40
45
50
55
60
65
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

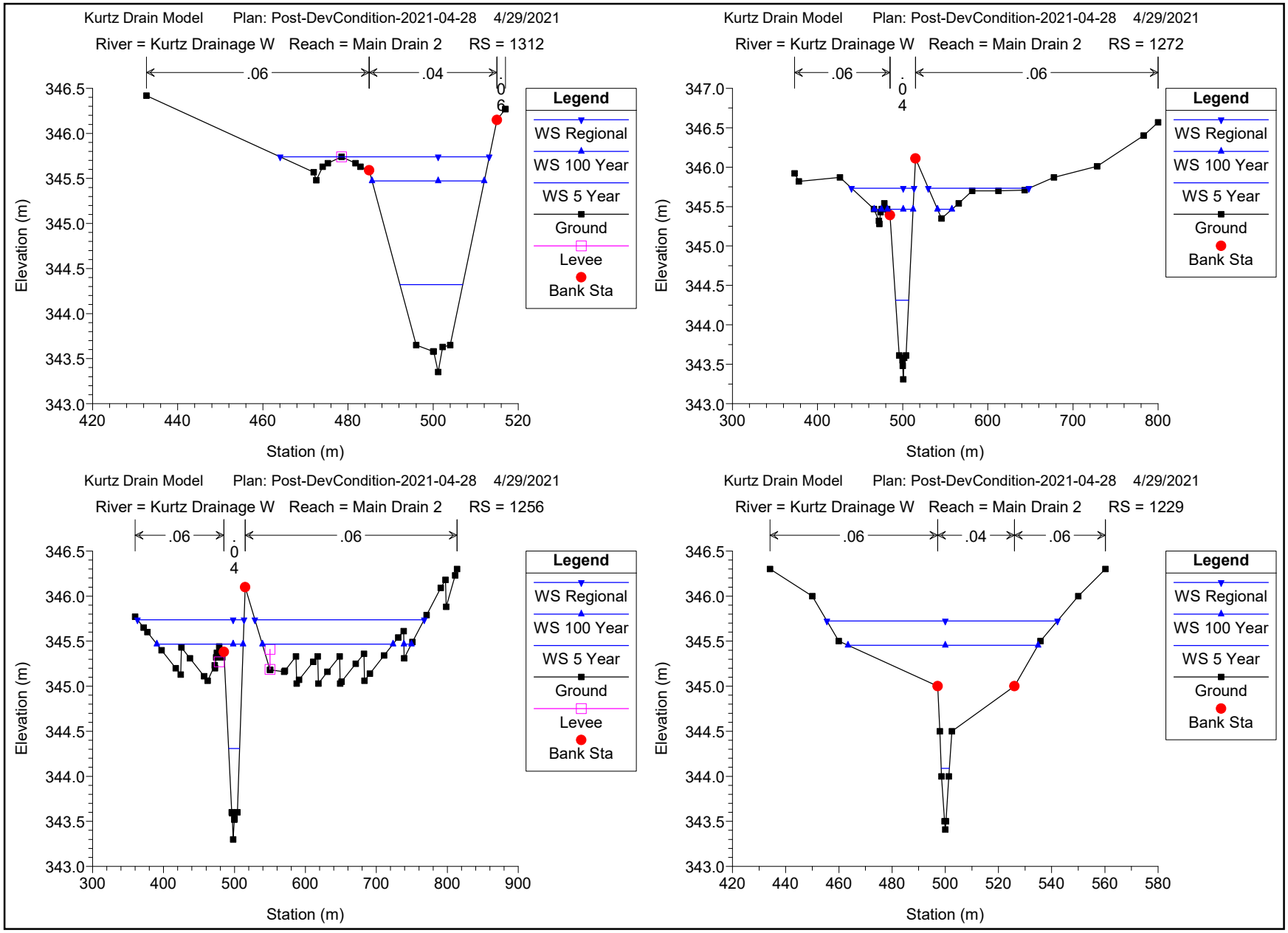

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch Av2 RS = 4060 5+075
.06
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch Av2 RS = 4050 5+050
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch Av2 RS = 4020 5+025
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch E RS = 3160 3+960
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

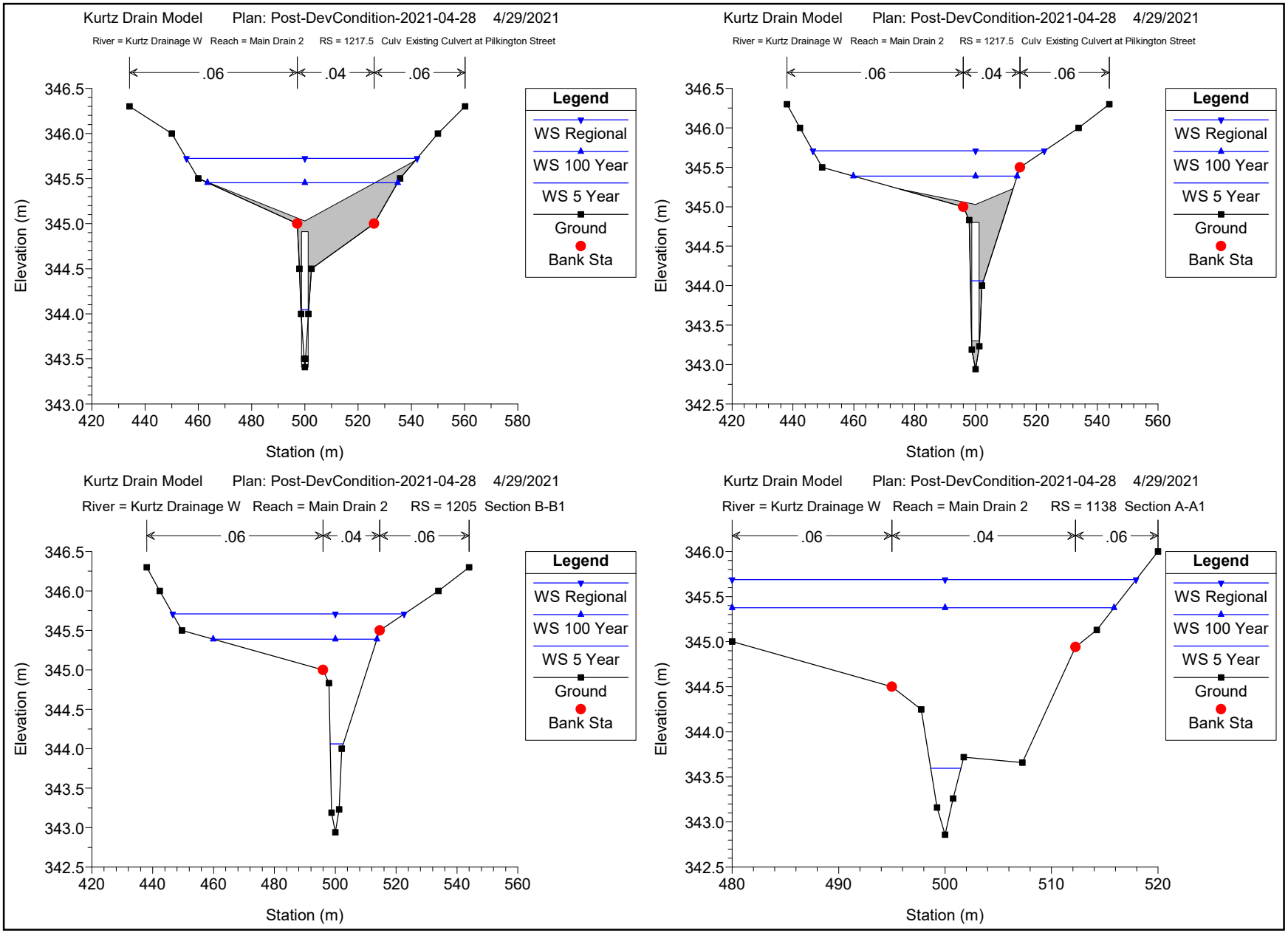

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Branch E RS = 3130 3+930
.04
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain US A RS = 1600 2+080
.04
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain US A RS = 1560 2+100
.04
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain US A RS = 1555 Culv
.04
Legend
WS 100 Year
WS Regional
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)

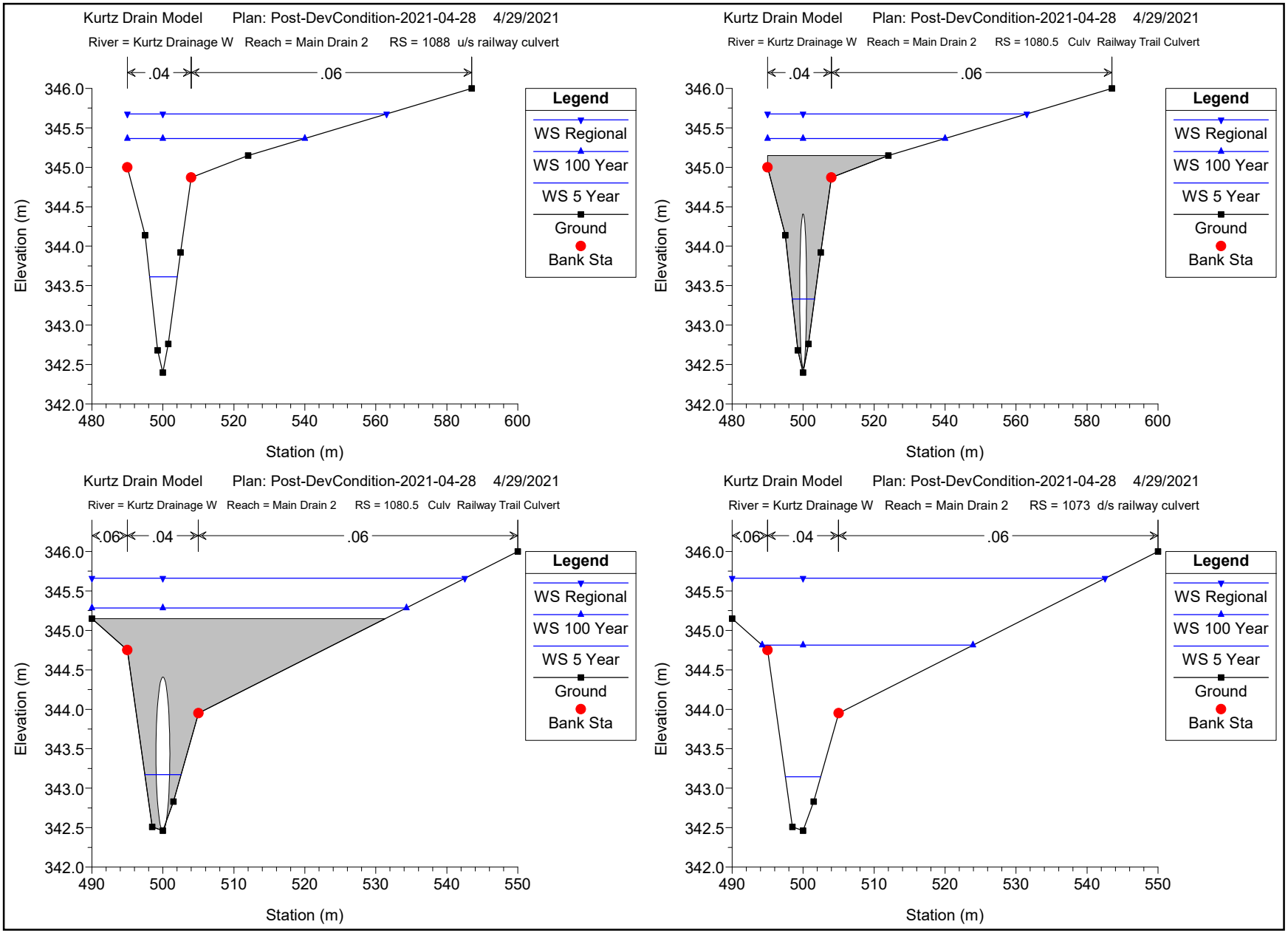

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain US A RS = 1555 Culv
.04
Elevation (m)
Station (m)
Legend
WS 100 Year
WS Regional
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain US A RS = 1550 2+135
.04
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1492
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1475
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta

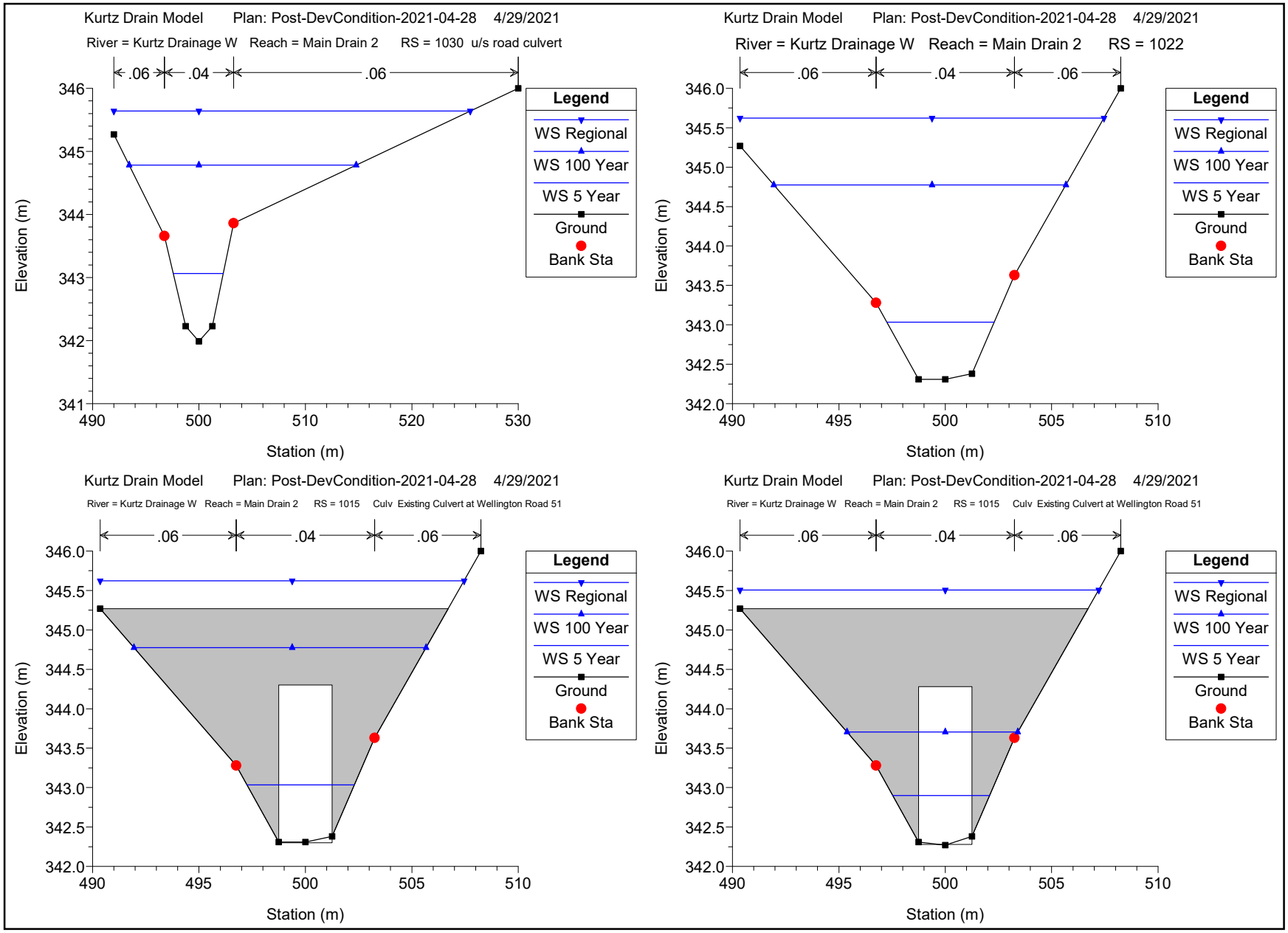

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1455
.06 .04 .06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1422
.06 .04 .06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1408
.06 .04 .06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1386
.06 .04 .06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta

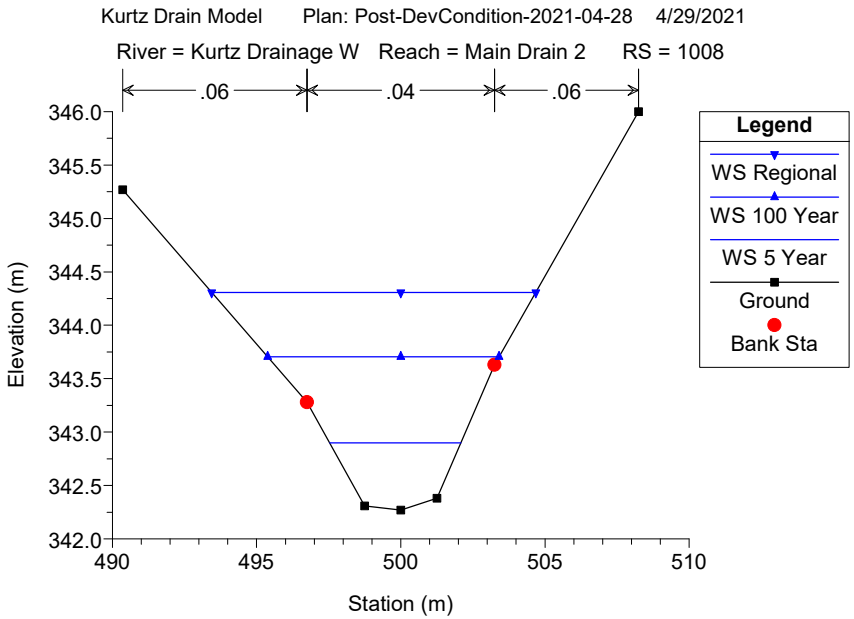

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1364 Culv Proposed Culvert at the extension of Ariss Glen Drive
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1364 Culv Proposed Culvert at the extension of Ariss Glen Drive
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1363
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1340
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta

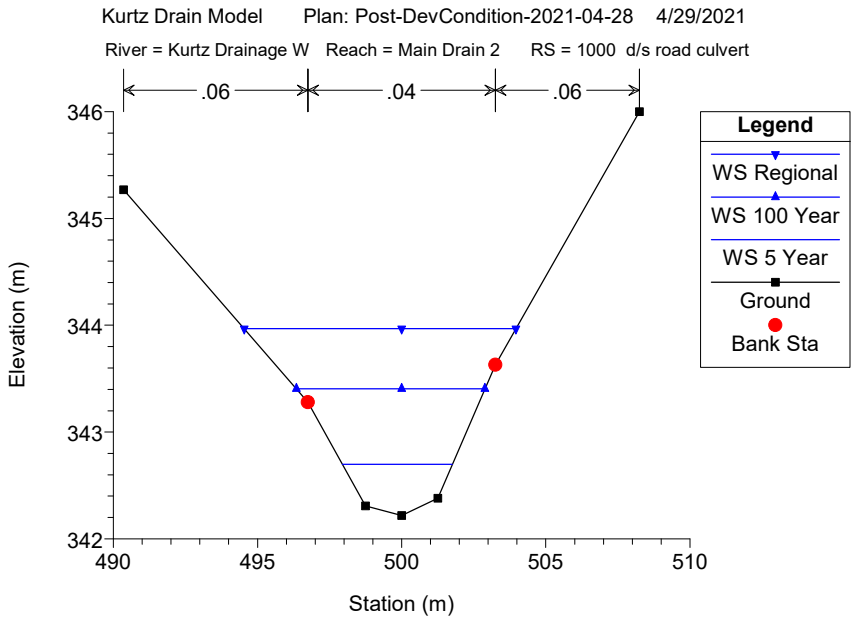

Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1312
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1272
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1256
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1229
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)


Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1217.5 Culv Existing Culvert at Pilkington Street
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1217.5 Culv Existing Culvert at Pilkington Street
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1205 Section B-B1
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1138 Section A-A1
.06
.04
.06
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Elevation (m)
Station (m)


Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1088 u/s railway culvert
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1080.5 Culv Railway Trail Culvert
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1080.5 Culv Railway Trail Culvert
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1073 d/s railway culvert
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta


Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1030 u/s road culvert
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1022
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1015 Culv Existing Culvert at Wellington Road 51
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta
Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1015 Culv Existing Culvert at Wellington Road 51
.06
.04
.06
Elevation (m)
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta


Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1008
.06
.04
.06
346.0
345.5
345.0
344.5
344.0
343.5
343.0
342.5
342.0
Elevation (m)
490
495
500
505
510
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta


Kurtz Drain Model Plan: Post-DevCondition-2021-04-28 4/29/2021
River = Kurtz Drainage W Reach = Main Drain 2 RS = 1000 d/s road culvert
.06
.04
.06
346
345
344
343
342
Elevation (m)
490
495
500
505
510
Station (m)
Legend
WS Regional
WS 100 Year
WS 5 Year
Ground
Bank Sta