Appendix ‘H’

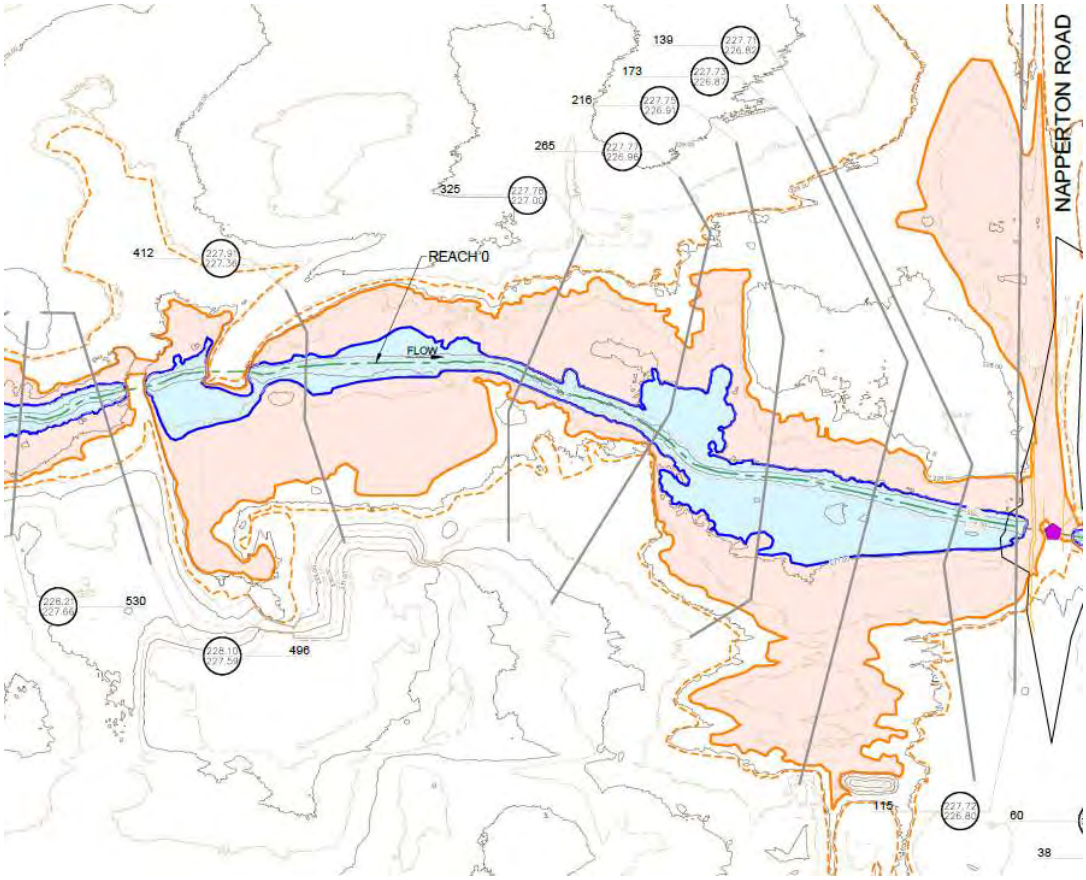
Flood Hazard Assessment

STRATHROY DEVELOPMENT LANDS

FLOOD HAZARD ASSESSMENT

JULY 29, 2021

PROJECT 21-769



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EXECUTIVE SUMMARY

This report has been prepared to determine the existing flood hazard extents on the subject property, located within Strathroy Ontario, referred to as Pt. Lot 19, Concession 4. The flood hazard extents will establish development limits on the subject property in accordance with municipal and provincial standards enforced by the Saint Clair Region Conservation Authority (SCRCA).

A hydrologic analysis was completed to determine peak flow rates of Cable Drain, a municipal drain, which runs north to south through the subject property. The analysis analyzed the entire contributing watershed and established flows generated from the 2-year through 100-year and the Regional storm events. The analysis assessed watershed characteristics such as land-use, slope, vegetative cover, and soil information to establish peak flow rates throughout the watercourse. A sensitivity analysis was completed to quantify levels of uncertainty in support of regulatory flood hazard setbacks.

Topographic survey information and hydrologic results were used to undertake a hydraulic analysis of the Cable Drain within the scope to the property. The topographic survey was completed to characterize the local culvert crossing at Napperton Drive. Further sensitivity analysis was completed for the hydraulic analyses and related modelling to not only quantify uncertainty but to determine freeboard levels and factors of safety for development.

The study and analyses resulted in a delineated flood hazard limit for the subject property. It is Greck's recommendation to ensure any future development is located outside of Regulatory floodplain with freeboard in accordance with provincial policy.

1.0 INTRODUCTION

Future development works is proposed in Pt. Lot 19, Concession 4 (subject property), Strathroy, which is located within the Township of Strathroy-Caradoc. The property is bounded by Napperton Drive to the south, County Lane to the west and Dominion Street to the east. The southwestern corner of the property is referred to as the Strathmere Lodge, functioning as a retirement home, while the remainder of the land is agricultural and open fields. A municipal drain, referred to as the Cable Drain, intersects the property where the drain conveys runoff from primarily agricultural lands in a southerly direction towards a watercourse crossing at Napperton Drive. Beyond Napperton Drive, the Cable Drain continues to drain in the southwest direction until its ultimate outlet location into St. Clair River. The Cable Drain and its watershed are located within the SCRCA jurisdiction, and therefore this authority will be the primary regulator for all works pertaining to flood and erosion hazards, and the conservation of land.

Greck and Associates Limited (Greck) have been engaged by SLD Group to prepare regulatory floodplain mapping for the subject property to support future development endeavors. This floodplain mapping will be approved by the St. Clair Region Conservation Authority (SCRCA) to serve as the official mapping for the area. To prepare this deliverable, a hydrologic study of the surrounding watershed was completed to determine peak regulatory flow rates, along with a detailed hydraulic analysis of the watercourses and applicable crossing structures. This report outlines the methodology and results of all analyses undertaken along with recommendations for future development.

1.1 BACKGROUND AND RELEVANT DOCUMENTS

The client conducted the pre-consultation process with the SCRCA. A property inquiry response letter from the SCRCA to the client dated March 3, 2021 informed that there are natural heritage features and natural hazards, including flooding and meander belt erosion hazards on site which govern the development limits. The meander belt hazard allowance has been established by the SCRCA to be 30m on each side of the Cable Drain, and the natural heritage features were determined from the Middlesex Natural Heritage System Study that was completed in 2014.

As part of the pre-consultation process, the official existing hydraulic and hydrology model for the Cable Drain was obtained from SCRCA. However, the scope of the existing hydraulic and hydrology model for the Cable Drain is in poor condition, as the official modelling is outdated and requires significant updates to account for more recent topographic information and flow rates. Therefore, a new flood hazard assessment of the watercourse is required using industry standard modelling techniques and analysis to determine development constraints on this subject property.

1.2 SCOPE OF WORK

The following report has been prepared by Greck and Associates Limited to present the following:

- A hydrologic model of the watershed associated with the Cable Drain watershed
- A hydraulic analysis and resulting floodplain mapping of the Cable Drain within the extents of the subject property
- Flood Hazard Assessment and required setbacks; and
- Summary of the methodology, calculations, assumptions, and analyses associated with hydrologic and hydraulic modelling.

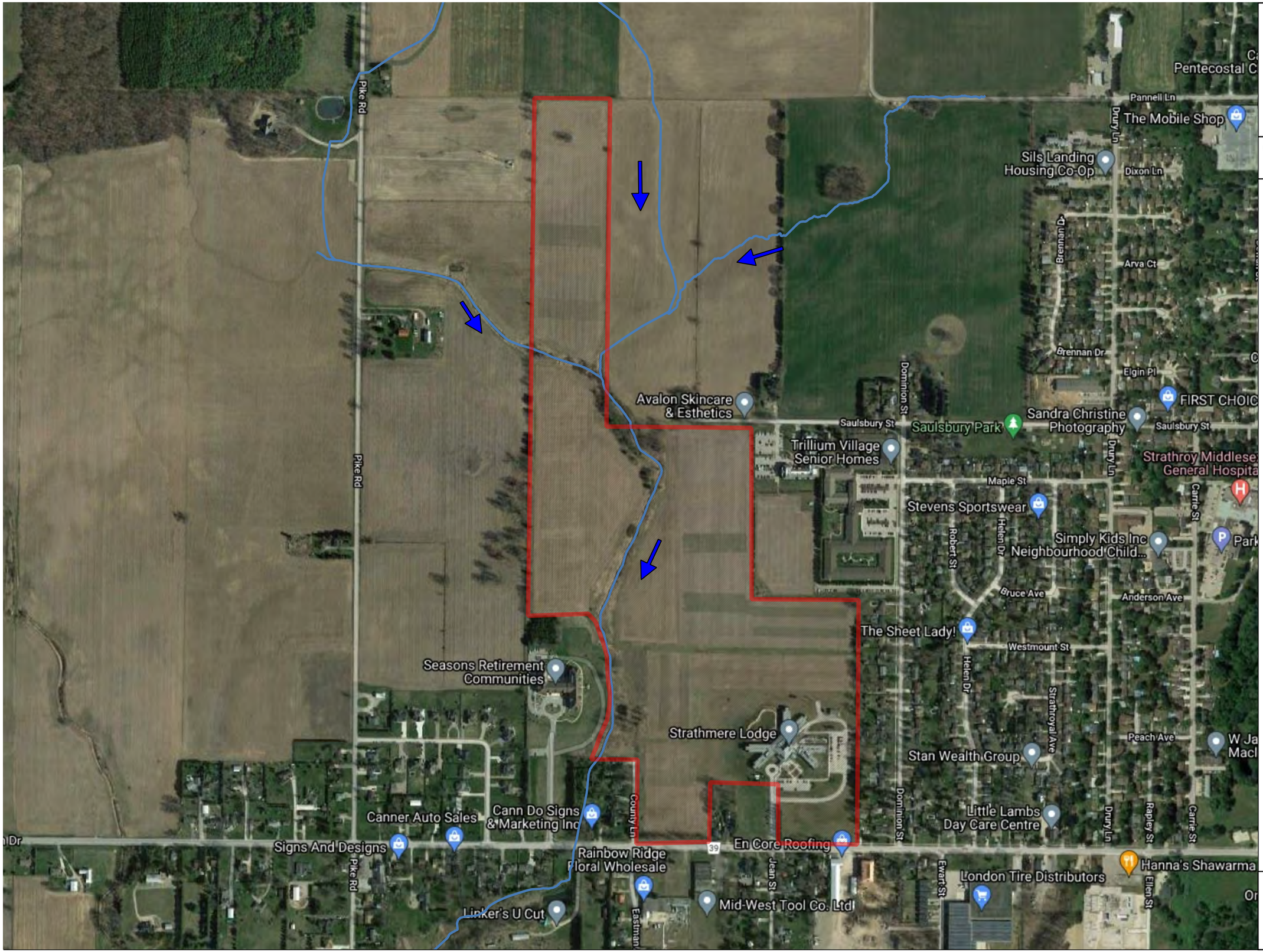

Figure 1.1:
Site Location Plan

Strathroy Development Lands

Project #: 21-769

0 150 300 m

Legend

- Property Line
- Cable Drain
- Drainage Arrow

Basemap Image: Google Maps 2021

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2.0 HYDROLOGY

This section outlines the methodology and results of the hydrologic analysis completed.

2.1 METHODOLOGY

PCSWMM software was used for the hydrologic modelling presented throughout this report. PCSWMM utilizes hydrologic computations using the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM) hydrologic software. PCSWMM is an approved software by the Ministry of Transportation (MTO) and provides Geographic Information System (GIS) capabilities. The EPA SWMM engine treats each sub-catchment as a non-linear reservoir. Inflows are calculated based on precipitation where outflows are based on a function of infiltration, depression storage and watershed slope.

Watersheds were delineated using PCSWMM software using a 0.5m grid generated digital terrain model (DTM), referred to as the “Lidar DTM Lake Erie 2016-18 Package H”, made available from Land Information Ontario. The DTM contains information licensed under the Open Government License – Ontario. A DTM is defined as a bare-earth Digital Elevation Model (DEM), where vegetation and buildings are filtered out.

Land-use information of the watershed was determined using the Southern Ontario Land Resource Information System (SOLARIS) in GIS format, dated June 2019. The land-use information was used to establish the overall percent impervious, depression storage, and manning’s roughness values for the overall catchment. Land-use information was either confirmed or updated via a review of available orthophotography from Google Earth. Subsurface soil information was used to determine the infiltration parameters using the Soils Survey Complex Documentation, obtained from the MNRF dated November 2015.The Soil Survey Complex illustrates the hydrologic soil groups of the underlying soils within southern Ontario.

The Green-Ampt Infiltration Method was used to calculate infiltration, as it is the most applicable methodology for agricultural and rural land-uses, such as the subject watershed. Parameters including hydraulic conductivity, initial deficit ratio and suction head were based on MTO standards. The Green-Ampt method is typically used within rural, agricultural watersheds due to its ability to account for the degree of saturated soils and their effects on ponded water within the ground surface.

Channel routing throughout the watershed was determined based on a combination of flow paths generated by PCSWMM and visually using orthophotography via Google Earth. The default dynamic routing method was applied for routing through channels as it accounts for channel storage, backwater, and attenuation of flows within the channel.

Several rainfall events were modelled as per the MNRF Technical Guide – River and Stream Systems: Flood Hazard Limit, 2002. The Regional Storm event noted as the 1954 Hurricane Hazel event is simulated in addition to the 2 through 100-year return period storm events.

2.1.1 CATCHMENT DELINEATION

The watershed boundary and catchments of the Cable Drain, within the scope of the proposed development, were delineated using elevation information obtained from the DTM model using the PCSWMM Watershed Delineation Tool (WDT). The WDT generates sub-catchments based on the target sub-catchment size and target outfall locations. A Stream Burn-In Layer was applied to modify the DTM to create a hydrologically corrected DTM to convey flows through a culvert or bridge.

The WDT automatically determines flow paths and slope for each sub-catchment based on the DTM. Once the sub-catchments were delineated, the sub-catchments were combined to simplify the model based on engineering judgement (i.e. multiple catchments that would outlet to a specific reach or drain would be grouped together). Once the sub-catchments were finalized, a QA/QC process was performed based on contour information to ensure the watershed is representative of the watercourse.

A total of 12 sub-catchments were generated to discretize the subject watersheds, for a total area of 354 ha, or 3.54 km^2. Discretization is required in order to accurately characterize spatial variability, or in this case, to incorporate flow routing throughout the watershed.

2.1.2 SURFICIAL SOILS/INFILTRATION PARAMETERS

A review of the underlying soils was completed to determine the overall infiltration characteristics of each sub-catchment. Soil information was obtained in a GIS format from the Soils Survey Complex Documentation from the MNRF. The overall surficial soils were determined to be generally of Perth Silty Clay Loam (Type C), Beverly Silty Clay Loam (Type C), and Walsingham Loamy Fine Sand (Type A). Soils groups labeled as “Built-up” were assumed to be Type D soils for conservative purposes.

A summary of the overall catchment area soil types are provided in **Table 2.1**, and in **Figure 2.1**.

TABLE 2.1: HYDROLOGIC SOILS GROUPS WITHIN OVERALL WATERSHED

Hydrologic Soils Group	% Cover	Area (ha)	Initial Deficit (mm/mm)	Suction Head (mm)	Hydraulic Conductivity (mm/hr)
Type A	15.4	54.4	0.34	100	25
Type C	81.4	288.5	0.26	250	5
Type D	3.2	11.3	0.21	180	3

From **Figure 2.1**, Type C Soil Groups represent the majority of the soils within the delineated watershed boundary. The sub-catchments located in the headwaters consist of Type C and D soils, however, as you move downstream towards Napperton Drive, there are higher levels of Type A soils. Type C soils consist of silty clay soils with limited infiltration in comparison to Type A soil groups. As a result, Type C soils undergo saturation faster than Type A soils. During a prolonged storm event, such as the Hurricane Hazel 12-hour duration storm event, catchments with Type C soils will saturate at a quicker rate, resulting in higher peak flows.

Soil infiltration rates were derived from MTO Design Chart 1.13. An overall infiltration rate for each sub-catchment was determined using an area weighted calculation.

Figure 2.1:
Surficial Soils Group

Strathroy Development Lands

Project #: 21-769

0 300 600 m

Legend

Soil Type
- Type A Hydrologic Soils
- Type C Hydrologic Soils
- Type D Hydrologic Soils
- Built Up Areas
- Subcatchment

S601
S1001
S901
S501
S1101
S701
S702
S401
S301
S201
S202
S101

Mullifarry

Tim Hortons
Ricco Food Distr
L H Gray & Son
MacEwen Strathroy
Dale Wurfel Chrysler Dodge Jeep Ltd
Moffatt & Powell RONA Strathroy
Ontario Provincial Police - Middlesex
Strathroy Home Hardware Building...
Burger King
Strathroy Middlesex General Hospital
Seasons Retiremer Communities
Strathmere Lodge
Alexandra Park
Poag James O Jewellers
Signs And Designs
Mid-West Tool Co. Ltd

Basemap Image: Google Maps 2021

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2.1.3 LAND-USE/PERCENT IMPERVIOUS

Land-use GIS information was extracted from the Southern Ontario Land Resource Information System (SOLARIS). The overall watershed consists of primarily agricultural land-use. A summary of the land-use within each overall watershed is provided in **Table 2.2**.

TABLE 2.2: PERCENT IMPERVIOUS & LAND-USE

Cover	% Cover	Percent Impervious	Area (ha)
Forest	0.08	0	0.29
Deciduous Forest	1.12	0	3.96
Treed Swamp	2.19	0	7.74
Plantations – Tree Cultivated	2.21	0	7.85
Hedge Rows	0.04	0	0.16
Tilled	79.16	0	280.46
Transportation	2.07	95	7.35
Built-Up Area - Impervious	1.66	50	5.89
Undifferentiated	11.46	10	40.61
Total	100.00%	4	354.31

Percent impervious values associated with each land-use was based on industry standards and engineering judgement.

Undifferentiated lands are classified as agricultural features as outlined in the SOLARIS documentation and confirmed through a review of aerial imagery via Google Maps. Percent impervious is a contributing factor to the overall runoff of each catchment, as 100% of rainfall within impervious surface results in runoff.

A plan view representation of the land-use within the overall watershed is provided in **Figure 2.2**. An area-weighted calculation was then applied for each sub-catchment to obtain an overall percent impervious associated with each of the 12 sub-catchments. Summary tables outlining all calculations for each of the 12 sub-catchments are provided in **Appendix A**.

Figure 2.2:
Overall Landcover

Strathroy Development Lands

Project #: 21-769

0 300 600 m

Legend

Landuse
- Forest
- Deciduous Forest
- Treed Swamp
- Plantations - Tree Cultivated
- Hedge Rows
- Tilled
- Transportation
- Built Up Impervious
- Undifferentiated

Subcatchment

S601
S1001
S901
S501
S1101
S701
S401
S702
S301
S201
S202
S101

Mullifarry

Tim Hortons
Ricco Food Distr
L H Gray & Son
MacEwen Strathroy
Dale Wurfel Chrysler Dodge Jeep Ltd
Moffatt & Powell RONA Strathroy
Ontario Provincial Police - Middlesex
Strathroy Home Hardware Building...
Burger King
Strathroy Middlesex General Hospital
Seasons Retiremer Communities
Strathmere Lodge
Alexandra Park
Poag James O Jewellers
Signs And Designs
Mid-West Tool Co. Ltd

Basemap Image: Google Maps 2021

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2.1.4 CHANNEL ROUTING

Channel routing accounts for the storage of flows between nodes. This storage causes a lag and attenuation in peak flows as flows are conveyed across the watershed. Channel routing was modelled by creating conduits to represent the watercourse and municipal drains. The cross-sectional profile of this flow network was determined by cutting a representative cross-section from the DTM. Slopes and lengths of the channel routing were also determined from the DTM.

Channel routing incorporates a Manning roughness to define the friction of the channel. A higher Manning roughness results in slower travel times and more significant attenuation of flows through the routed channel.

2.1.5 FLOW NODE LOCATIONS

Several flow nodes were inserted into the hydrologic model. Flow nodes were typically placed as per the following:

- points of confluence between watercourses/drainage ditches
- areas of land-use changes; and
- areas of significant grade change in the watercourse.

Flow nodes are important as it is essential to account for spatial variability properly and to incorporate flow routing throughout the watershed.

2.1.6 STORM DISTRIBUTIONS

In order to determine the appropriate storm distribution, the 4-hour Chicago Storm, and 6-hour, 12-hour, and 24-hour SCS Type II Storm Distributions were incorporated into the hydrologic model.

All storm distributions were generated in PCSWMM using Intensity-Duration-Frequency (IDF) parameters reported from the City of London Weather Station obtained from the Environment Canada IDF Station Locator Tool.

The 24-hour SCS Type II Distribution reports the greatest peak flows, therefore to be conservative, the 2-year to 100-year storm events is to be governed by the 24-hour SCS Type II Distribution.

The Hurricane Hazel historical storm event is the designated Regional Storm within the subject area. The Hurricane Hazel event was a historic storm event occurring in 1954 that resulted in significant property damage and loss of life throughout southern Ontario and is often used as a metric for determining regulatory flows. The 12-hour Hurricane Hazel

storm event was simulated, assuming no areal reduction factor due to the small size of the catchment.

To account for pre-saturated conditions during the Hurricane Hazel event, a separate hydrologic model was created where the initial soil moisture deficit was set to zero. This was applied only for the regional event, while the 2-year through 100-year events used standard, area weighted initial soil moisture deficits.

2.1.7 WATERSHED FLOW LENGTHS & SLOPE

The PCSWMM Watershed Declination Tool automatically generates flow paths with flow lengths and slopes for each sub-catchment. Flow lengths were determined as the longest travel path associated with each individual sub-catchment. Sub-catchment slopes were determined based on slope, derived from the DTM of the flow path. These watershed flow lengths were referenced along with aerial orthophotography to determine each sub-catchment's flow length.

However, the flow length generated from the PCSWMM Watershed Declination Tool typically exaggerates the actual flow length of the sub-catchment by producing a winding flow path, due to the intricacies of the DTM data. Therefore, the flow paths are reestablished by relatively straight lengths, representative of municipal drains, using the generated flow paths as a guide. The flow lengths and slopes are then reassigned based on the revised flow paths.

Watershed lengths and slopes are important parameters when determining the runoff generated using a non-linear reservoir model. Runoff from each timestep is derived using the manning's equation for open channel flow that incorporates the overall sub-catchment width and slope. All flow paths are reviewed comparing topographic mapping to confirm they are appropriate for each catchment.

2.1.8 ADDITIONAL DESIGN PARAMETERS

The remaining sub-catchment parameters were determined using area weighting functions and default values. A summary of the area-weighted values regarding depression storage and Manning's n values are provided below in **Table 2.3**.

TABLE 2.3: DEPRESSION STORAGE AND MANNING'S N VALUES

Cover	% Cover	Manning's n		Depression Storage	
		Imperv.	Pervious	Imperv.	Pervious
Forest	0.08	0.015	0.40	2	8
Deciduous Forest	1.12	0.015	0.40	2	8
Treed Swamp	2.19	0.015	0.40	2	15
Plantations – Tree Cultivated	2.21	0.015	0.40	2	5
Hedge Rows	0.04	0.015	0.40	2	8
Tilled	79.16	0.015	0.15	2	5
Transportation	2.07	0.015	0.15	2	5
Built-Up Area - Impervious	1.66	0.015	0.15	2	5
Undifferentiated	11.46	0.015	0.15	2	5

The following default values were applied for all catchments within the PCSWMM hydrologic model:

- Percent of impervious area with no depression storage (25%)
- Percent of runoff routed between subareas (100%)

2.1.9 OVERALL WATERSHED MAP

The overall watershed map is provided in **Figure 2.3**. This figure outlines each individual sub-catchment, associated travel paths, flow nodes and channel routing.

Figure 2.3:
Watershed Schematic

Strathroy Development Lands

Project #: 21-769

0 300 600 m

Legend

Subwatershed
- S1001
- S101
- S1101
- S201
- S202
- S301
- S401
- S501
- S601
- S701
- S702
- S901

Flow Nodes

Channel Routing

Subcatchment Length

Basemap Image: Google Maps 2021

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2.2 HYDROLOGIC MODELLING RESULTS

Peak flows throughout the project reach are presented in **Table 2.4**. Details pertaining to flow nodes at other locations throughout the watershed can be found within the hydrologic model. Flow nodes were placed at specific areas, such as the upstream and downstream limit of the site and bridge crossing locations.

TABLE 2.4: PEAK FLOWS THROUGH PROJECT REACH

	Pike Road (Node N300)	East Ditch (Node N700)	Downstream of Napperton Drive (Node N100)
Contributing Drainage Area	167.99 ha	133.86 ha	354.31 ha
2-year flows	0.41 m^3/s	0.51 m^3/s	0.68 m^3/s
5-year flows	0.72 m^3/s	0.72 m^3/s	1.28 m^3/s
10-year flows	1.05 m^3/s	0.98 m^3/s	1.92 m^3/s
25-year flows	1.51 m^3/s	1.33 m^3/s	2.92 m^3/s
50-year flows	1.89 m^3/s	1.66 m^3/s	3.71 m^3/s
100-year flows	2.30 m^3/s	2.04 m^3/s	4.62 m^3/s
Regional flows	8.85 m^3/s	6.33 m^3/s	16.21 m^3/s

It can be established that flood hazards associated with the Regional Event (Hurricane Hazel) would result in the highest flow rate overall, and therefore will define the regulatory storm event through the subject property to be used for regulatory floodplain mapping delineation. This is typical for predominantly rural watersheds. Detailed hydrologic results for the Regional event only, are provided in **Appendix B**.

2.2.1 CATCHMENT RESULTS

Each flow node's hydrologic response is plotted for the 100-year and Regional event in **Figure 2.4** and **Figure 2.5**. The hydrologic response illustrates the effects of land-use and/or routing has on an overall watershed.

In **Figure 2.4**, during the Regional event, it is demonstrated that the peak flow at all three flow nodes is generally in sync with the hyetograph of Hurricane Hazel, with a minor delay in the overall peak flow in comparison to the peak hyetograph (approximately 2.5 hours). This delay is due to the routing and associated travel time throughout the entire watershed.

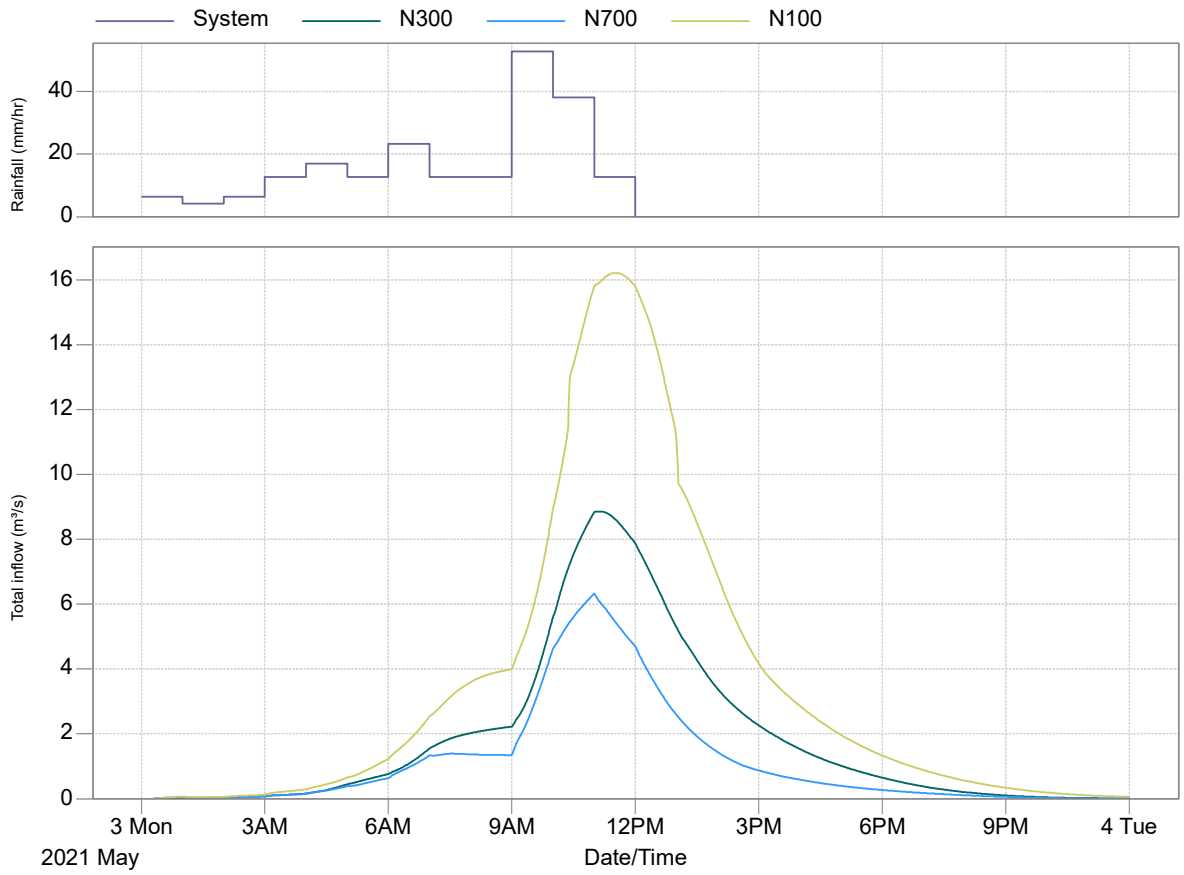


FIGURE 2.4: REGIONAL HYDROLOGIC RESPONSE THROUGH THE PROJECT REACH

As seen in **Figure 2.5**, at Nodes N700 and N100, during the 100-year event hydrologic response, a minor initial peak occurs during the 12th hour. This can be attributed to the runoff generated by catchments S701, S702, and S101 which are located downstream of the watershed. As a result, the time taken for runoff generated from catchments S701, S702, and S101 to reach Nodes N700 and N100 is shorter, causing the early peak of flows. The contribution of flows generated by the catchments further upstream is observed by the following larger peak flow.

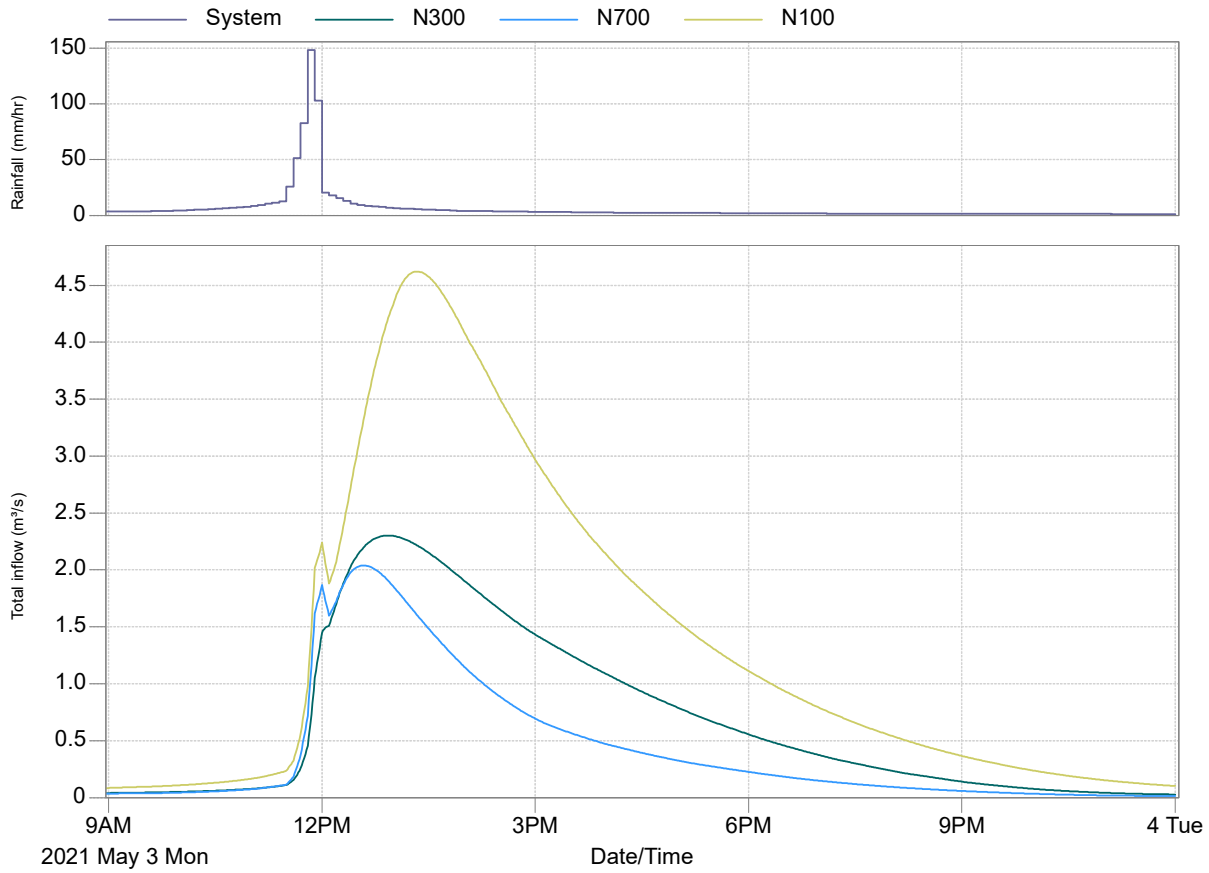


FIGURE 2.5: 100-YEAR HYDROLOGIC RESPONSE THROUGH THE PROJECT REACH

2.3 SENSITIVITY ANALYSIS

A sensitivity analysis was carried out to assess key input parameters and their effects on peak flows. A sensitivity analysis is important in determining factors of safety that may be applicable to peak flows. The analysis was carried out based on varying the following parameters by a certain percentage determined through engineering judgement and relative confidence in data and methodology, as outlined below:

- Catchment Area: +/- 10%
- Catchment Slope: +/- 20%
- Catchment Length: +/- 20%
- Percent Impervious: +/- 20%
- Impervious Manning roughness: +/- 20%
- Pervious Manning roughness: +/- 20%
- Impervious Depression Storage: +/- 20%
- Pervious Depression Storage: +/- 20%

Soil infiltration parameters were varied as outlined below:

- Suction Head: +/- 20%
- Conductivity: +/- 20%

Channel routing parameters were varied as outlined below:

- Channel routing Length: +/- 20%

The sensitivity analysis was completed for the Regional Storm event only (Hurricane Hazel), as the Regional Storm produces the highest peak flows and therefore flood hazard limits would only be affected by the Regional Storm. The sensitivity analysis only observed results at the Napperton Drive culvert crossing (Node N100), as it defines the flood hazard on the subject property.

The Sensitivity-Based Radio Tuning Calibration (SRTC) tool in PCSWMM was used to investigate the sensitivity associated with the model. The SRTC tool allows one to test the sensitivity of specific parameters by adjusting their values and to determine how they may influence specific values (i.e. peak flow). The SRTC tool can be applied to an observed time series to calibrate models; however, no suitable flow data is available for the Cable Drain within the extents of the subject property. Therefore, there was no calibration completed within the hydrologic model. The results of the sensitivity analysis are presented below in **Table 2.5**.

TABLE 2.5: SENSITIVITY ANALYSIS RESULTS

Storm Event	Sensitivity	Peak Flow (m3/s)		Change in Peak Flow	
		+	-	%	%
Base Condition	-	16.21		0%	0%
Sub-catchment Area	+/- 10%	17.38	15.49	7.2%	-4.4%
Sub-catchment Slope	+/- 20%	17.01	15.71	4.9%	-3.1%
Sub-catchment Length	+/- 20%	15.21	17.75	-6.2%	9.5%
Imperviousness	+/- 20%	16.34	16.12	0.8%	-0.6%
N Impervious	+/- 20%	16.21	16.21	0%	0%
N Pervious	+/- 20%	15.21	17.76	-6.2%	9.6%
Impervious Depression Storage	+/- 20%	16.21	16.21	0%	0%
Pervious Depression Storage	+/- 20%	16.13	16.28	-0.5%	0.4%
Suction Head	+/- 20%	16.21	16.21	0%	0%
Conductivity	+/- 20%	14.72	18.25	-9.2%	12.6%
Routing Length	+/- 20%	15.66	17.30	-3.4%	6.7%

A list of the most sensitive parameters with a brief description has been provided below:

Sub-catchment Area

Each sub-catchment area was varied by 10%. A larger sub-catchment area would result in more runoff generated, therefore a higher peak flow. Varying the sub-catchment area varied peak flows by a maximum of 7.2%. There is confidence in the catchment area, as recent LiDAR information was applied to delineate the areas, where the LiDAR provides a reasonable level of accuracy, with a vertical vegetated accuracy of +/- 18.3cm and non-vegetated vertical accuracy of +/-8.8cm.

Sub-catchment Length

Each sub-catchment length was varied by 20%. A smaller flow length would result in a lesser travel time to their respective flow-node, therefore a higher peak flow (typically). Flow lengths were established by relatively straight lengths, representative of municipal drains, in lieu of a winding watercourse flow path that is typically automatically calculated in PCSWMM based on the intricacies of DEM data. This results in a more conservative flow length and considers the factor of a surcharged floodplain that effectively reduces sub-catchment length, in comparison to a winding, meandering channel. Varying the sub-catchment flow length varied peak flows by a maximum of 9.5%.

Pervious Manning Roughness

The pervious Manning n represents the overland roughness of the catchment, specifically to pervious areas. A higher roughness coefficient causes surface runoff to be discharged at a slower rate and therefore reduces peak flows (typically).

Changes to pervious Manning n by 20% resulted in peak flows being varied by a maximum of 9.6%. This is because the majority area of the subject watersheds is rural pervious covered lands with high variability in vegetative cover.

Soil Conductivity

Soil hydraulic conductivity is the measure of the soil's ability to transport water through the soil when saturated. A higher soil conductivity results in lower levels of runoff due to an increased level of infiltration.

Changes to the soil conductivity by 20% resulted in peak flows being varied by a maximum of 12.6%. As such, soil conductivity was noted to be the most sensitive parameter. This is due to sub-catchments S101, S301, and S702, which partially consists of Class A soils (sands), which have characteristically high conductivity rates, while the other sub-catchments consist of Class C and D soils, have lower conductivity rates. Sub-

catchments S101, S301, and S702 represent 35% of the total watershed area and have a great influence over the watershed hydrology.

Routing Length

Each conduit length was varied by 20%. A shorter conduit length would result in a lesser travel time to their respective flow-node, therefore a higher peak flow (typically). Varying the sub-catchment flow length varied peak flows by a maximum of 6.9%.

2.3.1 HYDRAULIC CONSIDERATIONS

The lack of significant changes in peak flows due to varying hydrologic parameters gives confidence in the peak flow recommended in this report. The sensitivity analysis resulted in a maximum increase in peak flows by 12.6%. These peak flows for the Regional Event only will be incorporated within the hydraulic analysis to support hydraulic modelling sensitivity and ultimately freeboard setbacks associated with floodplain mapping. A summary of the maximum peak flows as a result of the sensitivity analysis is provided in **Table 2.6**.

TABLE 2.6: REGIONAL SENSITIVITY ANALYSIS PEAK FLOWS

Node	Base Scenario Peak Flow (m^3/s)	Sensitivity Analysis Peak Flow (m^3/s)
N300	8.85	9.97
N700	6.33	7.13
N100	16.21	18.25

3.0 HYDRAULIC ANALYSIS

GeoHEC-RAS software was used for the hydraulic modelling presented throughout this report. GeoHEC-RAS utilizes hydraulic computation using the US Army Corps HEC-RAS software, an industry standard when completing hydraulic analyses throughout Ontario. GeoHEC-RAS provides GIS capabilities that provide integration with GIS data such as land-use and DTM, that improves efficiencies and modelling techniques.

3.1 DIGITAL TERRAIN MODEL ADJUSTMENTS

As outlined in the previous sections, a 0.5m grid generated DTM, referred to as the “Lidar DTM Lake Erie 2016-18 Package H”, was used to perform all hydrologic analyses. The DTM was completed using the CGVD2013 Geoid (vertical datum). A topographic survey of the culvert crossing at Napperton Drive was undertaken in May 2021 by B.M. Ross and Associates Limited.

It is common for there to be a discrepancy between vertical elevations when considering multiple vertical datums. Therefore, a site-specific vertical accuracy assessment was completed to assess variation between the survey and the DTM so an adjustment to the generated DTM can be applied. As such, topographic survey points taken from the centerline of the road at Napperton Drive were compared to the DTM elevations. The survey points at the centerline of the road was chosen for the assessment as it is typical to have more satellite interference and less accuracy within vegetated cover areas in comparison to open areas such as a roadway.

A total of 12 points were compared, and confirmed that the DTM surface was on average, 0.4m below the surveyed points. A summary of the Vertical Accuracy Assessment is provided in **Table 3.1**.

TABLE 3.1: VERTICAL ACCURACY ASSESSMENT VARIANCE

Survey Point #	Survey Elevation (m)	LiDAR Elevation (m)	Delta (m)
136	228.000	227.609	0.391
137	227.960	227.559	0.401
138	227.905	227.506	0.399
139	227.866	227.469	0.397
140	227.816	227.414	0.402
142	227.789	227.389	0.400
143	227.765	227.389	0.376
144	227.749	227.356	0.393
145	227.712	227.310	0.402
146	227.684	227.278	0.406
147	227.676	227.280	0.396
148	227.667	227.265	0.402
Average			**0.397**

Therefore, for consistency with the provided topographic survey, an adjustment to the DTM was applied by raising the DTM by 0.4m. In all instances, the topographic survey will be the primary source for elevation data, with the DTM to supplement where necessary.

3.2 TOPOGRAPHIC SURVEY – HYDRAULIC STRUCTURES

As part of the hydraulic modelling, the culvert crossing at Napperton Drive, was surveyed to confirm the geometry and hydraulic characteristics. A summary of the Napperton Drive culvert characteristics are provided in **Table 3.2**.

TABLE 3.2: HYDRAULIC STRUCTURE SUMMARY

Parameter	Napperton Drive Culvert
Watercourse	Cable Drain
Opening Type	Open Bottom Concrete Box Culvert
Span (m)	2.4
Rise (m)	1.5
Length (m)	18.6
Upstream Invert Elevation (m)	225.531
Downstream Invert Elevation (m)	225.379

3.3 HYDRAULIC MODELLING METHODOLOGY

Three reaches were created to represent the Cable Drain within the scope of the subject property:

- Reach 1 starts east of Pike Road approximately 1 km north of the Pike Road and Napperton Drive intersection, and converges with Reach 2 approximately 474m southeast downstream.
- Reach 2 starts 540m northwest of the Saulsbury Street and Dominion Street intersection, and converges with Reach 1 approximately 322m southwest downstream.
- Reach 1 and 2 converge to a single tributary titled Reach 0 which flows south 935m towards Napperton Drive and terminates 62m south downstream of Napperton Drive. Modelling was extended farther downstream of Napperton Drive to account for any potential backwater effects.

Several cross-sections were cut to define the watercourse geometry for the three reaches based on a combination of the DTM, and topographic survey. A summary of the cross sections is provided in **Table 3.3**.

TABLE 3.3: CROSS SECTION SUMMARY

Parameter	Reach 0	Reach 1	Reach 2
Modelled Reach Length (m)	1011	474	322
Number of Cross Sections	20	9	7
Average Cross Section Spacing (m)	49	49	47
Channel Roughness	0.035	0.035	0.035
Floodplain Roughness (agricultural)	0.05	0.05	0.05
Floodplain Roughness (forest)	0.08	NA	NA

The Cable Drain meanders slightly and features a grassed channel, therefore a Manning's roughness factor of 0.035 was applied for the channel. For channel overbanks a Manning's roughness of 0.05 was applied for agricultural lands, and 0.08 in more heavily vegetated and treed areas. Standard ineffective flows were applied at bridge crossings, with additional ineffective flow areas inserted at cross sections where a low-lying isolated pocket exists that would not contribute to conveyance. For the downstream boundary condition, it was assumed that the watercourse undergoes normal flow depth conditions and would receive no backwater effect from any downstream impacts. The peak flows reported at the downstream flow nodes of each reach in the hydrologic modelling were applied to the entire reach in the hydraulic modelling. The peak flows generated from the 2-year through 100-year and the Regional storm events, and the respective downstream flow node, are summarized in **Table 3.4**.

TABLE 3.4: HEC-RAS FLOW INPUTS

	Reach 0	Reach 1	Reach 2
Hydrology Model Flow Node	N100	N300	N700
2-year	0.676	0.405	0.506
5-year	1.275	0.722	0.722
10-year	1.915	1.050	0.975
25-year	2.917	1.511	1.331
50-year	3.708	1.889	1.659
100-year	4.622	2.302	2.039
Regional	16.210	8.854	6.327

3.4 HYDRAULIC MODELLING RESULTS

The results of the 2-year through 100-year, and Regional flood elevations through Reach 2, 1 and 0 of the Cable Drain are provided below in **Table 3.5**, **Table 3.6**, and **Table 3.7** respectively. Full output tables of the HEC-RAS sections are provided in **Appendix C**. Cross-section numbers are arranged from upstream to downstream and provide flood elevations for each of the storm events (2-year through 100-year, Regional).

TABLE 3.5: CABLE DRAIN REACH 2 FLOOD ELEVATIONS

Section	Flood Elevation (m)						
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	Regional
322	230.19	230.21	230.23	230.25	230.27	230.28	230.43
278	230.07	230.08	230.10	230.12	230.14	230.17	230.33
218	229.90	229.92	229.95	229.98	230.00	230.02	230.21
176	229.81	229.83	229.86	229.89	229.91	229.94	230.13
101	229.63	229.66	229.68	229.70	229.73	229.75	229.92
83	229.50	229.51	229.52	229.55	229.55	229.58	229.68
39	228.15	228.26	228.36	228.49	228.58	228.68	229.39

TABLE 3.6: CABLE DRAIN REACH 1 FLOOD ELEVATIONS

Section	Flood Elevation (m)						
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	Regional
474	229.81	229.94	230.05	230.17	230.26	230.33	231.02
436	229.68	229.81	229.91	230.02	230.10	230.18	230.87
392	229.57	229.68	229.78	229.88	229.96	230.03	230.71
353	229.46	229.57	229.66	229.77	229.84	229.91	230.54
302	229.26	229.38	229.48	229.58	229.65	229.72	230.31
251	229.13	229.26	229.35	229.45	229.51	229.58	230.15
191	228.89	228.92	228.96	229.03	229.08	229.13	229.74
134	228.21	228.36	228.48	228.62	228.72	228.81	229.59
81	228.12	228.28	228.40	228.54	228.64	228.74	229.51

TABLE 3.7: CABLE DRAIN REACH 0 FLOOD ELEVATIONS

Section	Flood Elevation (m)						
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	Regional
1011	227.92	228.08	228.20	228.35	228.44	228.54	229.16
942	227.80	227.98	228.11	228.27	228.37	228.47	229.10
896	227.72	227.91	228.03	228.20	228.30	228.40	229.03
834	227.59	227.77	227.89	228.05	228.16	228.25	228.77
707	227.40	227.56	227.68	227.82	227.92	228.00	228.51
642	227.30	227.46	227.58	227.72	227.81	227.90	228.37
574	227.18	227.35	227.47	227.60	227.69	227.76	228.29
530	227.07	227.24	227.36	227.49	227.58	227.66	228.21
496	227.01	227.18	227.30	227.42	227.51	227.59	228.10
412	226.87	227.04	227.14	227.23	227.29	227.36	227.91
325	226.35	226.47	226.58	226.78	226.90	227.00	227.78
265	226.24	226.42	226.55	226.73	226.84	226.96	227.77
216	226.20	226.37	226.50	226.67	226.79	226.91	227.75
173	226.16	226.33	226.46	226.63	226.75	226.87	227.73
139	226.12	226.29	226.41	226.58	226.70	226.82	227.71
115	226.08	226.26	226.39	226.55	226.67	226.80	227.72
100	**Napperton Drive**						
87	226.04	226.20	226.29	226.41	226.48	226.55	227.06
75	225.99	226.15	226.23	226.34	226.41	226.48	226.99
60	225.93	226.07	226.16	226.27	226.33	226.40	226.85
38	225.87	226.00	226.09	226.21	226.28	226.35	226.84

3.5 HYDRAULIC ANALYSIS – SENSITIVITY ANALYSIS

A sensitivity analysis was carried out to assess the uncertainty of key input parameters and their effects on the flood levels. A sensitivity analysis is important to determine factors of safety and freeboard allowance. The sensitivity analysis was carried out based on the Regional Storm event only. The following scenarios were assessed:

- Peak Flow (as per hydrologic analysis)
- Downstream Boundary Condition (+500mm)
- Manning roughness (+50%)

Peak Flow Variation

Peak flow rates were modified based on the variation in results from the hydrologic sensitivity analysis in **Section 2.3**. Peak flows were increased as per **Table 2.6** for the Regional storm event only to account for any uncertainties or assumptions undergone through the hydrologic analysis.

Downstream Boundary Condition

As outlined in **Section 3.3**, it was assumed that downstream of the hydraulic analysis, the watercourse undergoes normal flow depth conditions and would receive no backwater effect from any downstream impacts.

The downstream starting flood elevation was increased by 500mm to determine if there are any adverse effects through the subject property due to the downstream obstructions.

Manning's Roughness

Manning's roughness factors were increased by 50% to account for assumptions of the channel characteristics (i.e. clean, straight channel versus winding, weedy channel, etc.).

3.5.1 SENSITIVITY ANALYSIS RESULTS

The resulting flood elevations reported from the sensitivity analysis through Reach 2, 1 and 0 of the Cable Drain are provided below in **Table 3.8**, **Table 3.9**, and **Table 3.10** respectively. Full output tables of the HEC-RAS sections from the sensitivity analysis are provided in **Appendix C**.

TABLE 3.8: SENSITIVITY ANALYSIS - CABLE DRAIN REACH 2 FLOOD ELEVATIONS

Section	Flood Elevation (m)				
	Base	Downstream Boundary Condition	Manning Roughness	Peak Flow Uncertainty	Max Uncertainty
322	230.43	230.43	230.51	230.45	0.08
278	230.33	230.33	230.41	230.35	0.08
218	230.21	230.21	230.30	230.23	0.09
176	230.13	230.13	230.22	230.16	0.09
101	229.92	229.92	229.98	229.94	0.06
83	229.68	229.68	229.68	229.71	0.03
39	229.39	229.39	229.54	229.47	0.15

Cross Section within Subject Property Limits

TABLE 3.9: SENSITIVITY ANALYSIS - CABLE DRAIN REACH 1 FLOOD ELEVATIONS

Section	Flood Elevation (m)				
	Base	Downstream Boundary Condition	Manning Roughness	Peak Flow Uncertainty	Max Uncertainty
474	231.02	231.02	231.19	231.09	0.17
436	230.87	230.87	231.08	230.95	0.21
392	230.71	230.71	230.91	230.77	0.20
353	230.54	230.54	230.71	230.59	0.17
302	230.31	230.31	230.46	230.35	0.15
251	230.15	230.15	230.29	230.20	0.14
191	229.74	229.74	229.97	229.80	0.23
134	229.59	229.59	229.74	229.66	0.15
81	229.51	229.51	229.65	229.59	0.14

Cross Section within Subject Property Limits

TABLE 3.10: SENSITIVITY ANALYSIS - CABLE DRAIN REACH 0 FLOOD ELEVATIONS

Section	Flood Elevation (m)				
	Base	Downstream Boundary Condition	Manning Roughness	Peak Flow Uncertainty	Max Uncertainty
1011	229.16	229.16	229.36	229.22	0.20
942	229.10	229.10	229.24	229.17	0.14
896	229.03	229.03	229.15	229.10	0.12
834	228.77	228.77	228.96	228.81	0.19
707	228.51	228.51	228.68	228.56	0.17
642	228.37	228.37	228.55	228.42	0.18
574	228.29	228.29	228.45	228.34	0.16
530	228.21	228.21	228.38	228.26	0.17
496	228.10	228.10	228.27	228.14	0.17
412	227.91	227.92	228.06	227.95	0.15
325	227.78	227.81	227.89	227.83	0.10
265	227.77	227.80	227.85	227.81	0.08
216	227.75	227.78	227.82	227.79	0.06
173	227.73	227.76	227.78	227.76	0.05
139	227.71	227.73	227.73	227.73	0.02
115	227.72	227.74	227.73	227.74	0.02
100	**Napperton Drive**				
87	227.06	227.42	227.34	227.11	0.36
75	226.99	227.33	227.18	227.03	0.34
60	226.85	227.33	227.08	226.90	0.48
38	226.84	227.34	227.03	226.90	0.50

Cross Section within Subject Property Limits

From the sensitivity analysis, adjusting the downstream boundary condition had minimal effects, while adjusting the manning roughness and peak flow values resulted in a more noticeable increase in Regional flood elevations within the limits of the subject site. The maximum increase through the limits of the subject site was 0.23m as reported from the manning's roughness sensitivity analysis.

3.5.2 DEVELOPMENT RECOMMENDATIONS – FREEBOARD AND MEANDER BELT EROSION ALLOWANCE

Typically, a 300mm freeboard is applied to account for sensitivity within hydraulic models, DTMs, topographic survey, etc. The resulting above sensitivity analysis concluded that a 300mm freeboard is adequate to define the freeboard associated with the development.

Over time, the form and orientation of a watercourse changes and shifts due to dynamic balances of energy. The extent in which the watercourses shifts is referred to the meander belt. Anything within the meander belt is subject to erosion hazards, therefore, to account for this, the proposed development must not encroach onto the meander belt erosion allowance of 30m, which is provided from the centerline on either side of the watercourse. The 30m meander belt allowance was provided by SCRCA as per 2.2.1 of SCRCA Policy. It should be noted that a geomorphic assessment can be completed to more accurately define the meander belt width, however, was not completed as part of this study.

As such, Greck recommends to the client that all development area maintain a 300mm freeboard from the Regulatory flood elevation and provide a meander belt erosion allowance of 30m from the centerline on either side of the Cable Drain.

3.5.3 INGRESS/EGRESS

During the Regional event, flows overtop Napperton Drive. The low point of Napperton Drive, measured at the centerline, was 227.52m, and the Regional WSEL is at elevation 227.72m, resulting in a flood depth of 0.20m over Napperton Drive, which is below the maximum flood depth of 0.4m as recommended by MNRF guidelines. Therefore, safe ingress and egress can be provided if the access road comes from Napperton Drive, however, safe ingress and egress to the proposed development will be revisited and determined once a draft plan is prepared showing the proposed access road.

3.6 FLOODPLAIN MAPPING

The Regulatory floodline and freeboard setback are plotted on **Drawing FPM1, FPM2,** and **FPM3** provided in **Appendix D**.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Greck and Associates Limited is confident that this report and the analyses completed are consistent with the latest municipal and provincial standards and guidelines with respect to scientific analysis and engineering principles. It is recommended that the analysis and results presented be used to characterize the flood hazard conditions on the subject property and study area in support of protecting future development.

APPENDIX A

Sub-catchment Summary

PCSWMM Subcatchment Summary

Strathroy Flood Study

#21-769

Subcatchment	Area	Flow Length	Impervious	Slope	Manning's n		Depression Storage		Suction Head	Conductivity	Initial Deficit
	(ha)	(m)	(%)	(%)	Pervious	Impervious	Pervious	Impervious	(mm)	(mm/hr)	(ratio)
S1001	6.55	478.93	4.21	1.330	0.150	0.015	5.000	2	250.000	5.000	0.260
S101	35.70	1297.86	10.36	1.659	0.152	0.015	5.021	2	174.920	13.316	0.287
S1101	4.45	338.90	10.46	2.576	0.150	0.015	5.000	2	250.000	5.000	0.260
S201	14.92	674.14	1.39	1.403	0.150	0.015	5.000	2	249.986	5.002	0.260
S202	1.84	271.94	0.53	1.911	0.150	0.015	5.000	2	250.000	5.000	0.260
S301	28.57	808.16	3.65	1.644	0.233	0.015	5.703	2	186.306	13.493	0.294
S401	14.26	651.79	6.03	0.813	0.153	0.015	5.032	2	250.000	5.000	0.260
S501	89.35	2001.03	1.95	0.573	0.160	0.015	5.046	2	250.000	5.000	0.260
S601	35.81	1160.00	5.64	0.472	0.150	0.015	5.000	2	250.000	5.000	0.260
S701	46.73	2086.24	3.87	0.531	0.184	0.015	6.368	2	243.171	4.805	0.255
S702	59.11	1739.18	1.57	0.638	0.151	0.015	5.023	2	179.976	14.060	0.295
S901	17.02	825.41	5.51	1.141	0.150	0.015	5.000	2	250.000	5.000	0.260

APPENDIX B

Hydrologic Analysis Results – Regional Event

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 03: negative offset ignored for Link RC900

****
Element Count
****
Number of rain gages 16
Number of subcatchments ... 12
Number of nodes 11
Number of links 10
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100year	Chicago_4h_100year	INTENSITY	5 min.
Chicago_4h_10year	Chicago_4h_10year	INTENSITY	60 min.
Chicago_4h_25year	Chicago_4h_25year	INTENSITY	60 min.
Chicago_4h_2year	Chicago_4h_2year	INTENSITY	60 min.
Chicago_4h_50year	Chicago_4h_50year	INTENSITY	60 min.
Chicago_4h_5year	Chicago_4h_5year	INTENSITY	60 min.
Hurricane_Hazel_(0-25)	Hurricane_Hazel_(0-25)	INTENSITY	60 min.
Raingage1	Hurricane_Hazel_(0-25)	INTENSITY	5 min.
SCS_Type_II_12h_100year	SCS_Type_II_12h_100year	INTENSITY	6 min.
SCS_Type_II_24h_100year	SCS_Type_II_24h_100year	INTENSITY	6 min.
SCS_Type_II_24h_10year	SCS_Type_II_24h_10year	INTENSITY	6 min.
SCS_Type_II_24h_25year	SCS_Type_II_24h_25year	INTENSITY	6 min.
SCS_Type_II_24h_2year	SCS_Type_II_24h_2year	INTENSITY	6 min.
SCS_Type_II_24h_50year	SCS_Type_II_24h_50year	INTENSITY	6 min.
SCS_Type_II_24h_5year	SCS_Type_II_24h_5year	INTENSITY	6 min.
SCS_Type_II_6h_100year	SCS_Type_II_6h_100year	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1001	6.55	136.70	4.21	1.3300	Hurricane_Hazel_(0-25)	N1000
S101	35.70	275.05	10.36	1.6590	Hurricane_Hazel_(0-25)	N100
S1101	4.45	131.20	10.46	2.5760	Hurricane_Hazel_(0-25)	N1100
S201	14.92	221.28	1.39	1.4030	Hurricane_Hazel_(0-25)	N200
S202	1.84	67.69	0.53	1.9110	Hurricane_Hazel_(0-25)	N200
S301	28.57	353.57	3.65	1.6440	Hurricane_Hazel_(0-25)	N300
S401	14.26	218.72	6.03	0.8130	Hurricane_Hazel_(0-25)	N400
S501	89.35	446.52	1.95	0.5730	Hurricane_Hazel_(0-25)	N500
S601	35.81	308.70	5.64	0.4720	Hurricane_Hazel_(0-25)	N600
S701	46.73	224.02	3.87	0.5310	Hurricane_Hazel_(0-25)	N700
S702	59.11	339.87	1.57	0.6380	Hurricane_Hazel_(0-25)	N700
S901	17.02	206.25	5.51	1.1410	Hurricane_Hazel_(0-25)	N900

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
N1000	JUNCTION	240.87	0.85	0.0	
N1100	JUNCTION	235.20	1.95	0.0	
N200	JUNCTION	227.07	2.31	0.0	
N300	JUNCTION	229.95	2.02	0.0	
N400	JUNCTION	232.70	1.28	0.0	
N500	JUNCTION	234.44	1.28	0.0	
N600	JUNCTION	246.15	1.26	0.0	
N700	JUNCTION	229.37	1.86	0.0	
N800	JUNCTION	235.09	2.00	0.0	
N900	JUNCTION	237.42	2.00	0.0	
N100	OUTFALL	225.32	2.31	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
RC100	N200	N100	CONDUIT	924.3	0.1893	0.0350
RC200	N300	N200	CONDUIT	511.8	0.5628	0.0350
RC201	N700	N200	CONDUIT	185.1	1.2428	0.0350
RC300	N400	N300	CONDUIT	427.6	0.6431	0.0350
RC400	N500	N400	CONDUIT	479.4	0.3629	0.0350
RC500	N600	N500	CONDUIT	1447.3	0.8091	0.0350
RC700	N800	N700	CONDUIT	1383.2	0.4136	0.0350
RC800	N900	N800	CONDUIT	391.1	0.5958	0.0350
RC801	N1100	N800	CONDUIT	24.0	0.4591	0.0350
RC900	N1000	N900	CONDUIT	559.9	0.6162	0.0350

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
RC100	T-C14	2.31	51.75	0.60	58.00	1	45.96
RC200	T-C22	2.02	34.61	0.46	61.27	1	44.47
RC201	T-C26	1.86	71.50	0.52	62.90	1	147.52
RC300	T-C27	1.23	41.17	0.35	55.00	1	46.78
RC400	T-C33	1.28	42.39	0.40	53.45	1	39.79
RC500	T-C51	1.26	45.63	0.43	62.00	1	66.99
RC700	T-C54	1.53	52.19	0.50	56.00	1	60.04
RC800	T-C65	2.00	81.87	0.52	79.19	1	117.36
RC801	T-C95	1.95	88.74	0.66	94.00	1	130.14
RC900	T-C88	0.85	15.67	0.21	42.03	1	12.41

****
Transect Summary
****

Transect T-C101
Area:
0.0004 0.0016 0.0033 0.0055 0.0081
0.0111 0.0148 0.0193 0.0259 0.0336
0.0424 0.0530 0.0663 0.0831 0.1005
0.1189 0.1388 0.1592 0.1802 0.2016
0.2233 0.2453 0.2676 0.2903 0.3133
0.3365 0.3600 0.3838 0.4079 0.4323
0.4568 0.4816 0.5067 0.5321 0.5580
0.5842 0.6107 0.6376 0.6649 0.6929
0.7213 0.7501 0.7794 0.8095 0.8401
0.8710 0.9025 0.9344 0.9669 1.0000
Hrad:
0.0173 0.0377 0.0597 0.0798 0.0991
0.1152 0.1248 0.1318 0.1223 0.1432
0.1622 0.1640 0.1398 0.1679 0.1950
0.2170 0.2363 0.2651 0.2932 0.3220
0.3507 0.3791 0.4074 0.4355 0.4632
0.4910 0.5187 0.5460 0.5732 0.6007
0.6279 0.6549 0.6810 0.7028 0.7244
0.7481 0.7720 0.7957 0.8101 0.8275
0.8496 0.8716 0.8799 0.8975 0.9178
0.9371 0.9558 0.9736 0.9908 1.0000
Width:
0.0249 0.0445 0.0576 0.0707 0.0837
0.0991 0.1220 0.1508 0.2177 0.2414
0.2917 0.3328 0.4889 0.5100 0.5313
0.5646 0.6049 0.6178 0.6313 0.6420
0.6519 0.6619 0.6711 0.6801 0.6892
0.6976 0.7058 0.7140 0.7220 0.7292
0.7364 0.7436 0.7516 0.7641 0.7766
0.7867 0.7963 0.8060 0.8251 0.8413
0.8524 0.8634 0.8886 0.9043 0.9172
0.9309 0.9452 0.9603 0.9760 1.0000

Transect T-C14
Area:
0.0011 0.0032 0.0056 0.0082 0.0111
0.0143 0.0178 0.0215 0.0255 0.0298

0.0344 0.0392 0.0444 0.0499 0.0557
0.0618 0.0682 0.0749 0.0820 0.0895
0.0976 0.1063 0.1157 0.1261 0.1374
0.1497 0.1631 0.1789 0.1998 0.2233
0.2498 0.2786 0.3084 0.3392 0.3710
0.4040 0.4379 0.4727 0.5087 0.5460
0.5847 0.6258 0.6685 0.7126 0.7579
0.8041 0.8515 0.8998 0.9492 1.0000

Hrad:

0.0436 0.1088 0.1674 0.2215 0.2724
0.3208 0.3689 0.4145 0.4562 0.4973
0.5379 0.5779 0.6176 0.6551 0.6921
0.7291 0.7660 0.8030 0.8495 0.9167
0.9774 1.0314 1.0765 1.1118 1.1393
1.1605 1.1753 1.1701 1.1303 1.0922
1.0531 1.0208 1.0003 0.9863 0.9757
0.9692 0.9666 0.9660 0.9655 0.9661
0.9625 0.9608 0.9607 0.9642 0.9683
0.9747 0.9809 0.9891 0.9965 1.0000

Width:

0.0378 0.0431 0.0484 0.0537 0.0591
0.0644 0.0694 0.0745 0.0802 0.0859
0.0916 0.0972 0.1029 0.1090 0.1151
0.1212 0.1273 0.1334 0.1407 0.1512
0.1617 0.1739 0.1917 0.2104 0.2294
0.2474 0.2699 0.3720 0.4281 0.4850
0.5379 0.5707 0.5863 0.6042 0.6274
0.6481 0.6647 0.6842 0.7085 0.7333
0.7748 0.8099 0.8413 0.8635 0.8866
0.9052 0.9269 0.9446 0.9662 1.0000

Transect T-C15

Area:

0.0003 0.0013 0.0030 0.0053 0.0080
0.0111 0.0146 0.0185 0.0228 0.0273
0.0322 0.0375 0.0431 0.0492 0.0556
0.0624 0.0697 0.0774 0.0854 0.0938
0.1026 0.1116 0.1210 0.1307 0.1407
0.1511 0.1617 0.1728 0.1841 0.1959
0.2080 0.2206 0.2335 0.2469 0.2606
0.2751 0.2904 0.3124 0.3415 0.3755
0.4154 0.4605 0.5121 0.5686 0.6313
0.7003 0.7730 0.8472 0.9228 1.0000

Hrad:

0.0388 0.0776 0.1163 0.1613 0.2103
0.2564 0.3008 0.3474 0.3923 0.4361
0.4788 0.5207 0.5582 0.5940 0.6300
0.6661 0.7026 0.7392 0.7783 0.8215
0.8642 0.9065 0.9483 0.9898 1.0309
1.0715 1.1110 1.1503 1.1859 1.2199
1.2540 1.2883 1.3228 1.3575 1.3808
1.3854 1.3918 1.3578 1.2954 1.2034
1.1051 0.7606 0.8083 0.8661 0.9156
0.9592 0.8222 0.8832 0.9421 1.0000

Width:

0.0085 0.0170 0.0255 0.0324 0.0375
0.0426 0.0477 0.0521 0.0565 0.0609
0.0653 0.0697 0.0747 0.0799 0.0852
0.0905 0.0957 0.1009 0.1058 0.1099
0.1141 0.1182 0.1224 0.1265 0.1307
0.1348 0.1391 0.1434 0.1483 0.1534
0.1585 0.1636 0.1686 0.1737 0.1805
0.1903 0.2130 0.3250 0.4107 0.4683
0.5577 0.6049 0.6990 0.7494 0.8528
0.9188 0.9418 0.9602 0.9800 1.0000

Transect T-C17

Area:

0.0012 0.0047 0.0105 0.0171 0.0242
0.0315 0.0392 0.0472 0.0556 0.0643
0.0734 0.0828 0.0925 0.1026 0.1130
0.1238 0.1350 0.1466 0.1587 0.1712
0.1843 0.1978 0.2118 0.2263 0.2413
0.2569 0.2731 0.2899 0.3074 0.3256
0.3444 0.3638 0.3839 0.4047 0.4260
0.4480 0.4709 0.4945 0.5189 0.5441
0.5702 0.5974 0.6258 0.6560 0.6880
0.7252 0.7803 0.8459 0.9185 1.0000

Hrad:

0.0306 0.0612 0.0987 0.1523 0.2031
0.2516 0.2980 0.3427 0.3858 0.4276
0.4683 0.5078 0.5465 0.5844 0.6215
0.6579 0.6882 0.7178 0.7473 0.7767
0.8061 0.8333 0.8600 0.8869 0.9139
0.9397 0.9600 0.9810 1.0027 1.0249
1.0476 1.0708 1.0955 1.1217 1.1475
1.1656 1.1844 1.2040 1.2243 1.2451
1.2551 1.2663 1.2578 1.2447 1.2477
1.2708 1.2587 1.2385 1.2191 1.0000

Width:

0.0265 0.0530 0.0733 0.0772 0.0810
0.0849 0.0888 0.0927 0.0965 0.1004
0.1043 0.1081 0.1120 0.1159 0.1198
0.1236 0.1287 0.1340 0.1392 0.1444
0.1496 0.1554 0.1612 0.1671 0.1729
0.1791 0.1865 0.1939 0.2013 0.2087
0.2161 0.2235 0.2306 0.2375 0.2445
0.2534 0.2623 0.2713 0.2802 0.2891
0.3010 0.3130 0.3309 0.3513 0.3683
0.5274 0.6921 0.7803 0.8628 1.0000

Transect T-C21

Area:

0.0007 0.0028 0.0062 0.0106 0.0159
0.0220 0.0288 0.0363 0.0445 0.0534
0.0629 0.0732 0.0841 0.0966 0.1104
0.1252 0.1416 0.1583 0.1752 0.1924
0.2100 0.2277 0.2459 0.2645 0.2835
0.3032 0.3237 0.3450 0.3669 0.3893
0.4121 0.4362 0.4611 0.4865 0.5125
0.5395 0.5675 0.5963 0.6258 0.6558
0.6862 0.7183 0.7514 0.7851 0.8196
0.8545 0.8899 0.9257 0.9625 1.0000

Hrad:

0.0189 0.0379 0.0591 0.0824 0.1055
0.1292 0.1526 0.1751 0.1978 0.2198
0.2415 0.2627 0.2740 0.2777 0.2918
0.3013 0.3244 0.3569 0.3886 0.4199
0.4507 0.4807 0.5075 0.5339 0.5557
0.5744 0.5826 0.6047 0.6272 0.6527
0.6780 0.6714 0.6938 0.7169 0.7401
0.7393 0.7592 0.7735 0.7967 0.8235
0.8421 0.8284 0.8530 0.8741 0.8926
0.9205 0.9481 0.9680 0.9816 1.0000

Width:

0.0368 0.0736 0.1043 0.1288 0.1508
0.1704 0.1889 0.2074 0.2252 0.2429
0.2607 0.2784 0.3071 0.3477 0.3782
0.4157 0.4365 0.4435 0.4509 0.4583
0.4658 0.4738 0.4846 0.4954 0.5101
0.5278 0.5556 0.5705 0.5850 0.5964
0.6078 0.6496 0.6645 0.6786 0.6925
0.7298 0.7475 0.7708 0.7855 0.7963
0.8148 0.8671 0.8810 0.8981 0.9181
0.9284 0.9386 0.9563 0.9806 1.0000

Transect T-C22

Area:

0.0010 0.0034 0.0060 0.0089 0.0119
0.0151 0.0185 0.0221 0.0259 0.0298
0.0340 0.0383 0.0428 0.0475 0.0525
0.0577 0.0631 0.0688 0.0748 0.0810
0.0875 0.0943 0.1013 0.1086 0.1163
0.1243 0.1327 0.1414 0.1504 0.1599
0.1700 0.1808 0.1923 0.2046 0.2181
0.2378 0.2726 0.3173 0.3653 0.4151
0.4664 0.5191 0.5733 0.6289 0.6863
0.7456 0.8063 0.8685 0.9326 1.0000

Hrad:

0.0430 0.1124 0.1861 0.2550 0.3201
0.3819 0.4411 0.4981 0.5531 0.6066
0.6587 0.7096 0.7595 0.8030 0.8417
0.8806 0.9196 0.9588 0.9981 1.0375
1.0770 1.1166 1.1499 1.1788 1.2088
1.2397 1.2715 1.3040 1.3372 1.4004
1.4724 1.5368 1.5942 1.6439 1.6817
1.6519 1.5148 1.3684 1.2616 1.1866
1.1339 1.0963 1.0698 1.0508 1.0360

1.0268 1.0227 1.0188 1.0186 1.0000

Width:

0.0270 0.0360 0.0386 0.0412 0.0438
0.0463 0.0489 0.0515 0.0541 0.0566
0.0592 0.0618 0.0644 0.0675 0.0711
0.0747 0.0783 0.0819 0.0855 0.0890
0.0926 0.0962 0.1005 0.1052 0.1100
0.1147 0.1195 0.1242 0.1290 0.1372
0.1467 0.1562 0.1661 0.1801 0.2011
0.3780 0.5877 0.6565 0.6864 0.7085
0.7286 0.7488 0.7688 0.7906 0.8186
0.8413 0.8596 0.8876 0.9098 1.0000

Transect T-C23

Area:

0.0005 0.0016 0.0033 0.0056 0.0083
0.0112 0.0145 0.0188 0.0233 0.0282
0.0335 0.0392 0.0459 0.0554 0.0669
0.0805 0.0960 0.1129 0.1309 0.1505
0.1718 0.1944 0.2177 0.2415 0.2662
0.2917 0.3177 0.3441 0.3708 0.3978
0.4252 0.4528 0.4807 0.5089 0.5374
0.5662 0.5952 0.6246 0.6543 0.6842
0.7144 0.7449 0.7756 0.8066 0.8379
0.8696 0.9017 0.9341 0.9668 1.0000

Hrad:

0.0177 0.0417 0.0498 0.0763 0.1008
0.1240 0.1213 0.1442 0.1661 0.1872
0.2074 0.2182 0.2265 0.2237 0.2198
0.2099 0.2270 0.2449 0.2583 0.2669
0.2778 0.2863 0.3130 0.3372 0.3574
0.3827 0.4089 0.4388 0.4664 0.4926
0.5216 0.5503 0.5781 0.6044 0.6312
0.6587 0.6861 0.7118 0.7368 0.7639
0.7911 0.8182 0.8434 0.8685 0.8914
0.9136 0.9373 0.9607 0.9823 1.0000

Width:

0.0281 0.0393 0.0665 0.0747 0.0829
0.0910 0.1209 0.1312 0.1416 0.1521
0.1629 0.1814 0.2331 0.3203 0.3705
0.4440 0.4853 0.5201 0.5594 0.6108
0.6615 0.6857 0.7024 0.7232 0.7523
0.7698 0.7847 0.7915 0.8019 0.8143
0.8216 0.8289 0.8372 0.8473 0.8564
0.8641 0.8719 0.8815 0.8915 0.8990
0.9060 0.9130 0.9218 0.9306 0.9415
0.9531 0.9629 0.9728 0.9845 1.0000

Transect T-C26

Area:

0.0016 0.0042 0.0079 0.0125 0.0176
0.0235 0.0309 0.0392 0.0483 0.0582
0.0693 0.0812 0.0943 0.1084 0.1232
0.1387 0.1550 0.1720 0.1902 0.2092
0.2286 0.2491 0.2707 0.2931 0.3163
0.3408 0.3662 0.3917 0.4173 0.4430
0.4689 0.4948 0.5209 0.5471 0.5734
0.5999 0.6266 0.6535 0.6806 0.7079
0.7354 0.7631 0.7910 0.8191 0.8475
0.8762 0.9055 0.9360 0.9676 1.0000

Hrad:

0.0520 0.1000 0.1458 0.1974 0.2426
0.2767 0.2980 0.3189 0.3394 0.3560
0.3715 0.3851 0.3969 0.4097 0.4247
0.4396 0.4535 0.4670 0.4741 0.4926
0.5101 0.5235 0.5367 0.5515 0.5632
0.5721 0.5800 0.5998 0.6202 0.6410
0.6621 0.6833 0.7045 0.7259 0.7474
0.7682 0.7890 0.8097 0.8304 0.8510
0.8714 0.8915 0.9115 0.9313 0.9508
0.9680 0.9783 0.9751 0.9861 1.0000

Width:

0.0684 0.0920 0.1325 0.1484 0.1670
0.2097 0.2433 0.2668 0.2889 0.3228
0.3513 0.3829 0.4156 0.4446 0.4646
0.4857 0.5097 0.5345 0.5793 0.5861
0.6078 0.6479 0.6746 0.6969 0.7292
0.7707 0.7802 0.7833 0.7865 0.7896
0.7928 0.7967 0.8009 0.8050 0.8092
0.8150 0.8208 0.8267 0.8327 0.8388
0.8453 0.8520 0.8589 0.8661 0.8736
0.8849 0.9086 0.9591 0.9826 1.0000

Transect T-C27

Area:

0.0008 0.0028 0.0054 0.0086 0.0123
0.0168 0.0224 0.0294 0.0375 0.0466
0.0567 0.0675 0.0788 0.0906 0.1028
0.1156 0.1293 0.1449 0.1641 0.1836
0.2035 0.2240 0.2451 0.2672 0.2900
0.3132 0.3368 0.3608 0.3851 0.4098
0.4350 0.4607 0.4870 0.5138 0.5414
0.5694 0.5978 0.6267 0.6560 0.6856
0.7154 0.7455 0.7759 0.8069 0.8384
0.8703 0.9024 0.9348 0.9673 1.0000

Hrad:

0.0350 0.0834 0.1290 0.1742 0.2149
0.2662 0.3092 0.3354 0.3568 0.3739
0.3914 0.4105 0.4305 0.4512 0.4722
0.4913 0.5080 0.5137 0.4977 0.5108
0.5243 0.5373 0.5515 0.5603 0.5760
0.5924 0.6088 0.6270 0.6455 0.6600
0.6769 0.6931 0.7080 0.7219 0.7356
0.7524 0.7706 0.7844 0.8029 0.8221
0.8407 0.8586 0.8751 0.8891 0.9036
0.9221 0.9408 0.9605 0.9803 1.0000

Width:

0.0479 0.0704 0.0893 0.1050 0.1221
0.1535 0.1930 0.2370 0.2592 0.2945
0.3181 0.3372 0.3520 0.3661 0.3803
0.3992 0.4473 0.5423 0.5898 0.5997
0.6149 0.6349 0.6524 0.6878 0.7010
0.7131 0.7263 0.7354 0.7441 0.7635
0.7767 0.7915 0.8091 0.8290 0.8487
0.8610 0.8703 0.8893 0.8976 0.9048
0.9130 0.9227 0.9349 0.9518 0.9676
0.9756 0.9830 0.9887 0.9943 1.0000

Transect T-C3

Area:

0.0010 0.0040 0.0088 0.0142 0.0202
0.0268 0.0339 0.0417 0.0503 0.0596
0.0699 0.0811 0.0933 0.1063 0.1201
0.1348 0.1504 0.1670 0.1846 0.2033
0.2233 0.2444 0.2663 0.2888 0.3116
0.3348 0.3585 0.3825 0.4069 0.4316
0.4567 0.4821 0.5078 0.5338 0.5602
0.5869 0.6140 0.6415 0.6693 0.6975
0.7260 0.7549 0.7842 0.8138 0.8438
0.8742 0.9050 0.9363 0.9679 1.0000

Hrad:

0.0161 0.0323 0.0554 0.0804 0.1037
0.1258 0.1470 0.1647 0.1819 0.1963
0.2101 0.2244 0.2393 0.2552 0.2718
0.2882 0.3024 0.3152 0.3278 0.3399
0.3516 0.3637 0.3872 0.4122 0.4368
0.4612 0.4853 0.5096 0.5349 0.5599
0.5847 0.6093 0.6337 0.6579 0.6810
0.7040 0.7268 0.7495 0.7720 0.7942
0.8161 0.8378 0.8595 0.8810 0.9023
0.9222 0.9418 0.9613 0.9807 1.0000

Width:

0.0625 0.1251 0.1586 0.1767 0.1947
0.2127 0.2308 0.2535 0.2764 0.3039
0.3329 0.3615 0.3898 0.4164 0.4421
0.4678 0.4973 0.5298 0.5632 0.5983
0.6351 0.6718 0.6880 0.7007 0.7133
0.7260 0.7386 0.7507 0.7608 0.7709
0.7811 0.7912 0.8013 0.8114 0.8226
0.8337 0.8448 0.8559 0.8670 0.8782
0.8896 0.9010 0.9124 0.9238 0.9352
0.9479 0.9609 0.9740 0.9870 1.0000

Transect T-C33

Area:

0.0011 0.0033 0.0062 0.0101 0.0154
0.0217 0.0291 0.0374 0.0468 0.0574
0.0691 0.0818 0.0956 0.1104 0.1262

0.1429 0.1604 0.1787 0.1977 0.2175
0.2380 0.2595 0.2816 0.3041 0.3268
0.3499 0.3733 0.3970 0.4210 0.4453
0.4700 0.4949 0.5201 0.5456 0.5714
0.5976 0.6240 0.6507 0.6777 0.7050
0.7328 0.7608 0.7892 0.8180 0.8470
0.8765 0.9065 0.9370 0.9681 1.0000

Hrad:

0.0399 0.0813 0.1150 0.1449 0.1856
0.2280 0.2616 0.2895 0.3129 0.3307
0.3478 0.3643 0.3778 0.3920 0.4060
0.4200 0.4339 0.4481 0.4634 0.4777
0.4905 0.5033 0.5197 0.5384 0.5570
0.5759 0.5952 0.6144 0.6329 0.6520
0.6715 0.6909 0.7102 0.7293 0.7478
0.7668 0.7862 0.8054 0.8232 0.8410
0.8587 0.8767 0.8945 0.9123 0.9297
0.9455 0.9606 0.9749 0.9863 1.0000

Width:

0.0544 0.0786 0.1062 0.1372 0.1824
0.2121 0.2448 0.2743 0.3078 0.3498
0.3798 0.4094 0.4472 0.4762 0.5042
0.5312 0.5573 0.5812 0.6016 0.6248
0.6528 0.6796 0.6939 0.7024 0.7126
0.7223 0.7309 0.7402 0.7521 0.7619
0.7703 0.7789 0.7879 0.7974 0.8080
0.8171 0.8249 0.8333 0.8450 0.8563
0.8674 0.8777 0.8879 0.8980 0.9089
0.9234 0.9392 0.9568 0.9816 1.0000

Transect T-C36

Area:

0.0011 0.0035 0.0065 0.0098 0.0135
0.0176 0.0219 0.0277 0.0363 0.0475
0.0595 0.0722 0.0878 0.1044 0.1216
0.1392 0.1575 0.1767 0.1968 0.2175
0.2388 0.2610 0.2839 0.3071 0.3305
0.3542 0.3782 0.4024 0.4268 0.4515
0.4765 0.5017 0.5271 0.5528 0.5789
0.6052 0.6320 0.6590 0.6862 0.7137
0.7415 0.7696 0.7978 0.8263 0.8549
0.8836 0.9126 0.9416 0.9707 1.0000

Hrad:

0.0147 0.0382 0.0598 0.0816 0.1027
0.1228 0.1421 0.1346 0.1312 0.1201
0.1412 0.1625 0.1560 0.1816 0.2049
0.2276 0.2462 0.2638 0.2823 0.3040
0.3250 0.3362 0.3613 0.3863 0.4110
0.4355 0.4602 0.4848 0.5092 0.5334
0.5574 0.5813 0.6048 0.6261 0.6471
0.6680 0.6898 0.7122 0.7344 0.7564
0.7783 0.8016 0.8256 0.8494 0.8732
0.8975 0.9233 0.9489 0.9745 1.0000

Width:

0.0722 0.0924 0.1082 0.1205 0.1318
0.1430 0.1543 0.2463 0.3579 0.3954
0.4214 0.4719 0.5626 0.5751 0.5935
0.6118 0.6400 0.6700 0.6972 0.7155
0.7348 0.7765 0.7857 0.7950 0.8042
0.8135 0.8218 0.8301 0.8384 0.8467
0.8549 0.8631 0.8715 0.8830 0.8946
0.9061 0.9162 0.9254 0.9345 0.9436
0.9528 0.9602 0.9664 0.9727 0.9790
0.9845 0.9884 0.9923 0.9961 1.0000

Transect T-C42

Area:

0.0004 0.0015 0.0033 0.0058 0.0088
0.0122 0.0160 0.0204 0.0257 0.0318
0.0388 0.0469 0.0562 0.0669 0.0786
0.0910 0.1045 0.1189 0.1342 0.1505
0.1685 0.1873 0.2070 0.2281 0.2500
0.2725 0.2958 0.3197 0.3443 0.3697
0.3958 0.4226 0.4501 0.4782 0.5070
0.5364 0.5663 0.5969 0.6283 0.6603
0.6929 0.7260 0.7594 0.7931 0.8270
0.8611 0.8954 0.9300 0.9649 1.0000

Hrad:

0.0177 0.0354 0.0531 0.0750 0.0981
0.1185 0.1382 0.1505 0.1600 0.1711
0.1835 0.1897 0.2007 0.2103 0.2301
0.2503 0.2648 0.2834 0.3019 0.3117
0.3236 0.3449 0.3594 0.3748 0.3981
0.4214 0.4439 0.4662 0.4881 0.5091
0.5299 0.5511 0.5725 0.5947 0.6175
0.6403 0.6623 0.6823 0.7023 0.7240
0.7455 0.7716 0.8008 0.8302 0.8595
0.8885 0.9173 0.9451 0.9726 1.0000

Width:

0.0208 0.0416 0.0624 0.0778 0.0896
0.1029 0.1163 0.1361 0.1608 0.1864
0.2122 0.2483 0.2814 0.3192 0.3428
0.3652 0.3962 0.4214 0.4463 0.4850
0.5229 0.5454 0.5785 0.6113 0.6306
0.6496 0.6692 0.6888 0.7086 0.7294
0.7503 0.7702 0.7896 0.8077 0.8246
0.8414 0.8589 0.8788 0.8985 0.9160
0.9334 0.9447 0.9516 0.9581 0.9646
0.9710 0.9775 0.9850 0.9925 1.0000

Transect T-C45

Area:

0.0031 0.0088 0.0163 0.0254 0.0362
0.0482 0.0613 0.0755 0.0907 0.1067
0.1235 0.1410 0.1591 0.1774 0.1961
0.2151 0.2345 0.2541 0.2742 0.2945
0.3150 0.3358 0.3567 0.3778 0.3992
0.4207 0.4425 0.4645 0.4866 0.5090
0.5316 0.5543 0.5772 0.6003 0.6236
0.6472 0.6710 0.6950 0.7193 0.7438
0.7686 0.7936 0.8187 0.8440 0.8696
0.8952 0.9211 0.9471 0.9734 1.0000

Hrad:

0.0196 0.0359 0.0525 0.0683 0.0864
0.1035 0.1225 0.1386 0.1578 0.1762
0.1946 0.2145 0.2372 0.2597 0.2817
0.3037 0.3253 0.3458 0.3667 0.3897
0.4125 0.4351 0.4575 0.4797 0.5018
0.5234 0.5448 0.5661 0.5879 0.6096
0.6312 0.6525 0.6734 0.6941 0.7146
0.7336 0.7525 0.7712 0.7899 0.8084
0.8281 0.8481 0.8680 0.8881 0.9087
0.9291 0.9494 0.9675 0.9836 1.0000

Width:

0.1628 0.2490 0.3144 0.3781 0.4256
0.4727 0.5083 0.5531 0.5836 0.6148
0.6447 0.6677 0.6810 0.6932 0.7060
0.7181 0.7301 0.7442 0.7568 0.7645
0.7721 0.7798 0.7875 0.7951 0.8028
0.8108 0.8189 0.8269 0.8339 0.8407
0.8476 0.8546 0.8620 0.8695 0.8770
0.8862 0.8954 0.9047 0.9139 0.9231
0.9308 0.9380 0.9452 0.9521 0.9584
0.9647 0.9710 0.9794 0.9899 1.0000

Transect T-C48

Area:

0.0010 0.0045 0.0146 0.0291 0.0454
0.0639 0.0842 0.1047 0.1253 0.1459
0.1665 0.1872 0.2079 0.2287 0.2495
0.2703 0.2912 0.3121 0.3331 0.3541
0.3752 0.3962 0.4174 0.4385 0.4597
0.4809 0.5022 0.5234 0.5447 0.5661
0.5874 0.6088 0.6302 0.6517 0.6732
0.6947 0.7162 0.7378 0.7593 0.7810
0.8026 0.8243 0.8460 0.8677 0.8895
0.9113 0.9333 0.9554 0.9776 1.0000

Hrad:

0.0115 0.0215 0.0281 0.0441 0.0624
0.0789 0.0941 0.1167 0.1393 0.1618
0.1843 0.2066 0.2290 0.2512 0.2734
0.2955 0.3176 0.3396 0.3615 0.3834
0.4052 0.4270 0.4489 0.4708 0.4926
0.5144 0.5361 0.5578 0.5795 0.6010
0.6226 0.6441 0.6655 0.6869 0.7083
0.7296 0.7508 0.7721 0.7932 0.8143
0.8354 0.8565 0.8774 0.8984 0.9193
0.9377 0.9534 0.9690 0.9845 1.0000

Width:

0.0859	0.3031	0.5520	0.6866	0.7706
0.8819	0.9120	0.9138	0.9156	0.9174
0.9193	0.9211	0.9229	0.9247	0.9265
0.9283	0.9301	0.9319	0.9338	0.9356
0.9374	0.9392	0.9405	0.9418	0.9431
0.9444	0.9457	0.9470	0.9483	0.9496
0.9509	0.9522	0.9535	0.9548	0.9561
0.9574	0.9587	0.9600	0.9613	0.9626
0.9638	0.9651	0.9664	0.9677	0.9690
0.9730	0.9797	0.9865	0.9932	1.0000

Transect T-C51

Area:

0.0008	0.0024	0.0044	0.0069	0.0102
0.0141	0.0191	0.0252	0.0327	0.0413
0.0506	0.0609	0.0723	0.0844	0.0976
0.1117	0.1267	0.1426	0.1594	0.1770
0.1955	0.2148	0.2349	0.2558	0.2774
0.2996	0.3225	0.3460	0.3700	0.3947
0.4200	0.4459	0.4724	0.4995	0.5271
0.5553	0.5841	0.6135	0.6434	0.6738
0.7047	0.7362	0.7682	0.8004	0.8330
0.8658	0.8989	0.9323	0.9660	1.0000

Hrad:

0.0362	0.0788	0.1149	0.1390	0.1652
0.1830	0.2012	0.2151	0.2571	0.3015
0.3407	0.3739	0.4026	0.4283	0.4511
0.4717	0.4908	0.5089	0.5257	0.5418
0.5580	0.5731	0.5876	0.6024	0.6174
0.6323	0.6480	0.6635	0.6780	0.6927
0.7076	0.7223	0.7367	0.7512	0.7659
0.7802	0.7941	0.8081	0.8224	0.8367
0.8509	0.8642	0.8806	0.8974	0.9145
0.9318	0.9484	0.9650	0.9825	1.0000

Width:

0.0398	0.0520	0.0649	0.0847	0.1044
0.1309	0.1610	0.1990	0.2392	0.2627
0.2854	0.3178	0.3441	0.3703	0.3993
0.4272	0.4536	0.4790	0.5052	0.5304
0.5525	0.5771	0.6019	0.6232	0.6434
0.6626	0.6790	0.6959	0.7153	0.7335
0.7506	0.7677	0.7855	0.8024	0.8183
0.8348	0.8523	0.8690	0.8845	0.8995
0.9149	0.9321	0.9414	0.9500	0.9581
0.9660	0.9755	0.9850	0.9925	1.0000

Transect T-C53

Area:

0.0003	0.0012	0.0027	0.0047	0.0073
0.0107	0.0156	0.0214	0.0275	0.0342
0.0414	0.0494	0.0582	0.0694	0.0815
0.0940	0.1070	0.1203	0.1340	0.1485
0.1640	0.1802	0.1969	0.2140	0.2323
0.2529	0.2751	0.2984	0.3243	0.3529
0.3837	0.4154	0.4472	0.4790	0.5109
0.5429	0.5749	0.6069	0.6391	0.6712
0.7035	0.7357	0.7681	0.8006	0.8332
0.8661	0.8991	0.9323	0.9657	1.0000

Hrad:

0.0177	0.0355	0.0540	0.0733	0.0921
0.0950	0.1005	0.1271	0.1525	0.1768
0.1935	0.2096	0.2110	0.2083	0.2354
0.2618	0.2877	0.3159	0.3437	0.3478
0.3667	0.3892	0.4157	0.4415	0.4417
0.4235	0.4499	0.4744	0.4942	0.5000
0.5073	0.4640	0.4986	0.5332	0.5678
0.6023	0.6367	0.6711	0.7054	0.7396
0.7738	0.8080	0.8414	0.8722	0.9028
0.9334	0.9638	0.9940	1.0159	1.0000

Width:

0.0169	0.0339	0.0500	0.0645	0.0791
0.1124	0.1554	0.1681	0.1807	0.1934
0.2141	0.2357	0.2760	0.3333	0.3462
0.3591	0.3719	0.3809	0.3899	0.4271
0.4475	0.4632	0.4736	0.4970	0.5458
0.6100	0.6378	0.6953	0.7657	0.8449
0.8847	0.8954	0.8969	0.8984	0.8999
0.9015	0.9030	0.9045	0.9060	0.9075
0.9091	0.9106	0.9129	0.9179	0.9229
0.9279	0.9328	0.9378	0.9505	1.0000

Transect T-C54

Area:

0.0014	0.0039	0.0076	0.0127	0.0191
0.0264	0.0346	0.0435	0.0530	0.0635
0.0748	0.0871	0.1003	0.1142	0.1287
0.1440	0.1600	0.1769	0.1947	0.2134
0.2329	0.2533	0.2744	0.2958	0.3177
0.3399	0.3626	0.3856	0.4091	0.4331
0.4574	0.4822	0.5073	0.5328	0.5588
0.5851	0.6119	0.6391	0.6668	0.6949
0.7234	0.7523	0.7816	0.8114	0.8417
0.8725	0.9037	0.9354	0.9675	1.0000

Hrad:

0.0444	0.0781	0.1066	0.1433	0.1904
0.2290	0.2632	0.2946	0.3227	0.3475
0.3692	0.3890	0.4082	0.4268	0.4453
0.4629	0.4790	0.4926	0.5066	0.5200
0.5334	0.5464	0.5610	0.5788	0.5963
0.6136	0.6306	0.6480	0.6651	0.6822
0.6994	0.7169	0.7342	0.7507	0.7681
0.7850	0.8009	0.8175	0.8332	0.8491
0.8655	0.8818	0.8976	0.9125	0.9268
0.9410	0.9564	0.9718	0.9871	1.0000

Width:

0.0601	0.0933	0.1336	0.1759	0.2100
0.2372	0.2601	0.2805	0.3045	0.3314
0.3602	0.3880	0.4118	0.4342	0.4542
0.4757	0.5000	0.5299	0.5557	0.5819
0.6066	0.6313	0.6499	0.6593	0.6708
0.6832	0.6965	0.7089	0.7221	0.7354
0.7478	0.7594	0.7713	0.7850	0.7961
0.8082	0.8227	0.8351	0.8494	0.8629
0.8747	0.8864	0.8993	0.9140	0.9299
0.9457	0.9580	0.9702	0.9824	1.0000

Transect T-C65

Area:

0.0005	0.0018	0.0039	0.0069	0.0105
0.0147	0.0200	0.0260	0.0330	0.0409
0.0499	0.0604	0.0723	0.0852	0.0988
0.1129	0.1275	0.1427	0.1584	0.1746
0.1913	0.2085	0.2262	0.2444	0.2631
0.2822	0.3020	0.3224	0.3436	0.3656
0.3886	0.4124	0.4368	0.4619	0.4881
0.5167	0.5479	0.5800	0.6124	0.6452
0.6785	0.7123	0.7466	0.7813	0.8165
0.8521	0.8882	0.9247	0.9617	1.0000

Hrad:

0.0380	0.0834	0.1162	0.1570	0.2038
0.2522	0.3107	0.3567	0.3936	0.4221
0.4428	0.4547	0.4656	0.4793	0.4960
0.5141	0.5333	0.5529	0.5727	0.5926
0.6126	0.6328	0.6528	0.6729	0.6927
0.7110	0.7275	0.7430	0.7567	0.7651
0.7772	0.7917	0.8053	0.8176	0.8287
0.8217	0.7995	0.8152	0.8308	0.8463
0.8624	0.8771	0.8932	0.9107	0.9270
0.9451	0.9615	0.9787	0.9948	1.0000

Width:

0.0250	0.0435	0.0659	0.0858	0.1006
0.1222	0.1463	0.1674	0.1908	0.2173
0.2500	0.2935	0.3225	0.3418	0.3566
0.3707	0.3843	0.3980	0.4116	0.4248
0.4378	0.4503	0.4629	0.4747	0.4866
0.5014	0.5180	0.5359	0.5561	0.5828
0.6038	0.6208	0.6388	0.6584	0.7013
0.7741	0.8223	0.8311	0.8414	0.8529
0.8640	0.8786	0.8910	0.9009	0.9136
0.9230	0.9361	0.9477	0.9749	1.0000

Transect T-C72

Area:

0.0030	0.0075	0.0125	0.0181	0.0240
0.0304	0.0372	0.0444	0.0521	0.0603
0.0690	0.0784	0.0884	0.0989	0.1099
0.1214	0.1335	0.1461	0.1592	0.1726

0.1865 0.2011 0.2171 0.2348 0.2540
0.2739 0.2947 0.3167 0.3394 0.3626
0.3865 0.4110 0.4362 0.4629 0.4902
0.5181 0.5465 0.5756 0.6053 0.6360
0.6680 0.7014 0.7354 0.7704 0.8062
0.8425 0.8802 0.9188 0.9591 1.0000

Hrad:

0.0293 0.0645 0.0979 0.1290 0.1607
0.1910 0.2202 0.2484 0.2720 0.2953
0.3155 0.3338 0.3553 0.3807 0.4058
0.4256 0.4451 0.4700 0.4965 0.5226
0.5483 0.5363 0.5463 0.5151 0.5387
0.5615 0.5672 0.5846 0.6112 0.6365
0.6618 0.6836 0.7026 0.7084 0.7349
0.7613 0.7864 0.8114 0.8296 0.8405
0.8434 0.8605 0.8837 0.8985 0.9227
0.9503 0.9514 0.9601 0.9734 1.0000

Width:

0.1014 0.1162 0.1283 0.1404 0.1502
0.1599 0.1696 0.1794 0.1920 0.2047
0.2193 0.2354 0.2495 0.2605 0.2715
0.2859 0.3007 0.3117 0.3215 0.3312
0.3410 0.3760 0.3984 0.4572 0.4728
0.4891 0.5211 0.5433 0.5569 0.5714
0.5857 0.6030 0.6227 0.6553 0.6690
0.6825 0.6970 0.7114 0.7317 0.7589
0.7944 0.8174 0.8341 0.8590 0.8751
0.8876 0.9261 0.9576 0.9856 1.0000

Transect T-C73

Area:

0.0013 0.0044 0.0105 0.0179 0.0260
0.0357 0.0467 0.0599 0.0739 0.0891
0.1056 0.1225 0.1397 0.1573 0.1752
0.1943 0.2146 0.2354 0.2567 0.2785
0.3005 0.3227 0.3449 0.3673 0.3899
0.4125 0.4353 0.4582 0.4813 0.5044
0.5277 0.5510 0.5745 0.5981 0.6219
0.6457 0.6697 0.6938 0.7181 0.7425
0.7671 0.7918 0.8169 0.8423 0.8679
0.8939 0.9200 0.9465 0.9731 1.0000

Hrad:

0.0193 0.0267 0.0428 0.0627 0.0845
0.0946 0.1083 0.1189 0.1418 0.1626
0.1726 0.1964 0.2198 0.2432 0.2611
0.2748 0.2848 0.3072 0.3228 0.3477
0.3725 0.3972 0.4218 0.4462 0.4705
0.4950 0.5194 0.5437 0.5678 0.5918
0.6157 0.6395 0.6631 0.6866 0.7098
0.7328 0.7556 0.7783 0.8003 0.8212
0.8421 0.8614 0.8769 0.8932 0.9099
0.9276 0.9459 0.9640 0.9821 1.0000

Width:

0.0688 0.1804 0.2478 0.2899 0.3124
0.3821 0.4502 0.5108 0.5284 0.5914
0.6200 0.6321 0.6442 0.6555 0.6802
0.7295 0.7636 0.7766 0.8059 0.8114
0.8167 0.8219 0.8271 0.8322 0.8373
0.8416 0.8459 0.8503 0.8546 0.8589
0.8633 0.8676 0.8719 0.8763 0.8809
0.8856 0.8904 0.8951 0.9006 0.9071
0.9136 0.9215 0.9336 0.9448 0.9554
0.9648 0.9736 0.9824 0.9912 1.0000

Transect T-C78

Area:

0.0003 0.0010 0.0023 0.0040 0.0060
0.0083 0.0114 0.0160 0.0220 0.0301
0.0410 0.0561 0.0737 0.0930 0.1132
0.1336 0.1541 0.1750 0.1965 0.2186
0.2410 0.2637 0.2870 0.3106 0.3345
0.3586 0.3828 0.4073 0.4319 0.4567
0.4816 0.5067 0.5321 0.5580 0.5842
0.6104 0.6368 0.6634 0.6902 0.7172
0.7444 0.7718 0.7994 0.8272 0.8553
0.8836 0.9121 0.9410 0.9702 1.0000

Hrad:

0.0153 0.0307 0.0460 0.0652 0.0841
0.1021 0.1045 0.0938 0.1044 0.1199
0.1244 0.1297 0.1339 0.1432 0.1711
0.2004 0.2287 0.2558 0.2734 0.3010
0.3283 0.3511 0.3754 0.4006 0.4270
0.4540 0.4808 0.5076 0.5351 0.5625
0.5897 0.6167 0.6286 0.6553 0.6818
0.7082 0.7345 0.7595 0.7842 0.8087
0.8328 0.8566 0.8802 0.9035 0.9263
0.9490 0.9696 0.9884 1.0056 1.0000

Width:

0.0165 0.0329 0.0494 0.0610 0.0715
0.0820 0.1324 0.1712 0.2123 0.3099
0.4484 0.5403 0.6028 0.6538 0.6660
0.6710 0.6780 0.6880 0.7227 0.7303
0.7379 0.7550 0.7681 0.7787 0.7866
0.7929 0.7993 0.8053 0.8099 0.8145
0.8192 0.8238 0.8486 0.8536 0.8586
0.8636 0.8686 0.8749 0.8815 0.8880
0.8948 0.9018 0.9089 0.9161 0.9237
0.9313 0.9409 0.9521 0.9647 1.0000

Transect T-C8

Area:

0.0014 0.0053 0.0101 0.0152 0.0208
0.0267 0.0331 0.0399 0.0471 0.0547
0.0627 0.0710 0.0797 0.0888 0.0982
0.1081 0.1183 0.1289 0.1398 0.1512
0.1629 0.1751 0.1877 0.2010 0.2149
0.2294 0.2445 0.2602 0.2765 0.2934
0.3111 0.3295 0.3487 0.3688 0.3901
0.4133 0.4396 0.4683 0.4986 0.5343
0.5735 0.6139 0.6554 0.6981 0.7424
0.7887 0.8366 0.8877 0.9427 1.0000

Hrad:

0.0297 0.0701 0.1207 0.1678 0.2122
0.2544 0.2950 0.3341 0.3720 0.4090
0.4483 0.4867 0.5224 0.5575 0.5921
0.6262 0.6599 0.6932 0.7262 0.7588
0.7913 0.8203 0.8386 0.8579 0.8780
0.8989 0.9204 0.9429 0.9661 0.9885
1.0023 1.0174 1.0337 1.0437 1.0256
0.9813 0.9250 0.9308 0.9136 0.8121
0.8474 0.8823 0.9169 0.9461 0.9661
0.9850 1.0117 0.9747 0.9926 1.0000

Width:

0.0473 0.0766 0.0835 0.0905 0.0975
0.1045 0.1114 0.1184 0.1254 0.1323
0.1382 0.1440 0.1504 0.1569 0.1633
0.1698 0.1762 0.1827 0.1891 0.1956
0.2020 0.2093 0.2196 0.2300 0.2404
0.2507 0.2611 0.2713 0.2815 0.2920
0.3055 0.3190 0.3325 0.3485 0.3755
0.4167 0.4711 0.4993 0.5422 0.6552
0.6743 0.6934 0.7125 0.7358 0.7666
0.7990 0.8256 0.9100 0.9493 1.0000

Transect T-C82

Area:

0.0007 0.0028 0.0056 0.0089 0.0128
0.0172 0.0222 0.0277 0.0339 0.0408
0.0485 0.0570 0.0664 0.0766 0.0876
0.0993 0.1116 0.1244 0.1379 0.1524
0.1678 0.1838 0.2007 0.2188 0.2379
0.2580 0.2791 0.3010 0.3240 0.3484
0.3738 0.4002 0.4274 0.4555 0.4846
0.5146 0.5454 0.5770 0.6094 0.6423
0.6760 0.7103 0.7454 0.7808 0.8165
0.8525 0.8888 0.9256 0.9626 1.0000

Hrad:

0.0188 0.0429 0.0689 0.0927 0.1154
0.1374 0.1588 0.1775 0.1951 0.2115
0.2255 0.2395 0.2550 0.2729 0.2915
0.3110 0.3337 0.3559 0.3738 0.3826
0.4023 0.4220 0.4321 0.4429 0.4564
0.4721 0.4895 0.5055 0.5143 0.5260
0.5440 0.5613 0.5823 0.6004 0.6182
0.6360 0.6577 0.6792 0.7028 0.7263
0.7487 0.7699 0.7962 0.8272 0.8573
0.8862 0.9148 0.9435 0.9721 1.0000

Width:

```
          0.0389    0.0655    0.0807    0.0958    0.1107
          0.1253    0.1399    0.1565    0.1742    0.1934
          0.2155    0.2386    0.2610    0.2814    0.3010
          0.3197    0.3350    0.3503    0.3696    0.3991
          0.4178    0.4364    0.4654    0.4950    0.5223
          0.5476    0.5712    0.5966    0.6311    0.6637
          0.6886    0.7144    0.7355    0.7602    0.7854
          0.8107    0.8310    0.8513    0.8687    0.8861
          0.9046    0.9245    0.9379    0.9454    0.9536
          0.9630    0.9723    0.9814    0.9905    1.0000

Transect T-C88
Area:
          0.0005    0.0022    0.0046    0.0071    0.0097
          0.0125    0.0155    0.0185    0.0217    0.0251
          0.0286    0.0322    0.0360    0.0399    0.0439
          0.0482    0.0527    0.0573    0.0622    0.0673
          0.0727    0.0785    0.0872    0.0982    0.1118
          0.1290    0.1485    0.1696    0.1945    0.2223
          0.2528    0.2873    0.3230    0.3591    0.3956
          0.4325    0.4699    0.5076    0.5458    0.5843
          0.6233    0.6628    0.7028    0.7433    0.7843
          0.8260    0.8683    0.9113    0.9551    1.0000
Hrad:
          0.0402    0.0803    0.1495    0.2192    0.2857
          0.3494    0.4108    0.4702    0.5278    0.5839
          0.6385    0.6920    0.7444    0.7959    0.8357
          0.8737    0.9119    0.9502    0.9885    1.0172
          1.0314    1.0557    1.0519    1.0248    0.9850
          0.9557    0.9258    0.9018    0.8675    0.8398
          0.8158    0.7849    0.7735    0.7704    0.7733
          0.7803    0.7904    0.8030    0.8174    0.8331
          0.8495    0.8664    0.8838    0.9017    0.9195
          0.9370    0.9546    0.9721    0.9869    1.0000
Width:
          0.0241    0.0482    0.0538    0.0569    0.0599
          0.0629    0.0660    0.0690    0.0721    0.0751
          0.0781    0.0812    0.0842    0.0873    0.0916
          0.0961    0.1006    0.1051    0.1096    0.1153
          0.1229    0.1430    0.2189    0.2672    0.3427
          0.4072    0.4462    0.4894    0.5874    0.6377
          0.7285    0.7793    0.7891    0.7983    0.8075
          0.8167    0.8256    0.8344    0.8431    0.8521
          0.8624    0.8735    0.8849    0.8963    0.9089
          0.9233    0.9377    0.9531    0.9750    1.0000

Transect T-C95
Area:
          0.0009    0.0041    0.0103    0.0179    0.0263
          0.0353    0.0449    0.0551    0.0659    0.0771
          0.0888    0.1009    0.1135    0.1266    0.1405
          0.1557    0.1716    0.1878    0.2044    0.2215
          0.2391    0.2571    0.2757    0.2947    0.3141
          0.3341    0.3546    0.3756    0.3969    0.4188
          0.4411    0.4638    0.4870    0.5108    0.5351
          0.5599    0.5853    0.6114    0.6384    0.6662
          0.6947    0.7240    0.7542    0.7853    0.8173
          0.8502    0.8844    0.9206    0.9590    1.0000
Hrad:
          0.0263    0.0653    0.0878    0.1391    0.1865
          0.2308    0.2713    0.3090    0.3452    0.3799
          0.4132    0.4455    0.4755    0.5030    0.5250
          0.5440    0.5668    0.5904    0.6128    0.6346
          0.6560    0.6767    0.6966    0.7176    0.7372
          0.7548    0.7728    0.7927    0.8113    0.8286
          0.8463    0.8638    0.8803    0.8958    0.9102
          0.9253    0.9397    0.9470    0.9578    0.9688
          0.9792    0.9882    0.9960    1.0039    1.0119
          1.0182    1.0145    1.0134    0.9959    1.0000
Width:
          0.0508    0.0989    0.1675    0.1956    0.2101
          0.2229    0.2413    0.2547    0.2660    0.2772
          0.2877    0.2975    0.3099    0.3249    0.3495
          0.3764    0.3879    0.3966    0.4076    0.4191
          0.4306    0.4424    0.4551    0.4641    0.4755
          0.4903    0.5030    0.5111    0.5216    0.5340
          0.5451    0.5555    0.5674    0.5806    0.5947
          0.6069    0.6202    0.6457    0.6634    0.6805
          0.6984    0.7190    0.7411    0.7627    0.7837
          0.8079    0.8528    0.8925    0.9745    1.0000

Transect T-C98
Area:
          0.0070    0.0169    0.0284    0.0412    0.0554
          0.0729    0.0907    0.1087    0.1267    0.1449
          0.1632    0.1816    0.2002    0.2189    0.2377
          0.2567    0.2757    0.2948    0.3141    0.3335
          0.3529    0.3725    0.3922    0.4120    0.4319
          0.4519    0.4720    0.4923    0.5128    0.5334
          0.5542    0.5751    0.5962    0.6176    0.6393
          0.6613    0.6837    0.7064    0.7293    0.7526
          0.7761    0.7998    0.8237    0.8478    0.8721
          0.8968    0.9219    0.9475    0.9735    1.0000
Hrad:
          0.0200    0.0429    0.0618    0.0829    0.0964
          0.1102    0.1360    0.1617    0.1872    0.2125
          0.2377    0.2627    0.2875    0.3122    0.3368
          0.3615    0.3861    0.4106    0.4350    0.4592
          0.4833    0.5073    0.5311    0.5549    0.5785
          0.6010    0.6231    0.6450    0.6668    0.6885
          0.7100    0.7315    0.7505    0.7652    0.7799
          0.7946    0.8108    0.8269    0.8430    0.8596
          0.8784    0.8971    0.9157    0.9343    0.9527
          0.9621    0.9707    0.9800    0.9900    1.0000
Width:
          0.3487    0.3946    0.4603    0.4981    0.6452
          0.6640    0.6688    0.6736    0.6784    0.6833
          0.6881    0.6929    0.6978    0.7026    0.7071
          0.7111    0.7151    0.7191    0.7230    0.7270
          0.7310    0.7350    0.7389    0.7429    0.7469
          0.7521    0.7578    0.7635    0.7692    0.7749
          0.7806    0.7863    0.7944    0.8070    0.8197
          0.8323    0.8432    0.8542    0.8652    0.8755
          0.8835    0.8914    0.8994    0.9073    0.9153
          0.9320    0.9496    0.9667    0.9834    1.0000


**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 05/03/2021 00:00:00
Ending Date ..... 05/04/2021 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:06:00
Dry Time Step ..... 00:06:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation .....         74.759       211.000
Evaporation Loss .....             0.000         0.000
Infiltration Loss .....           44.557       125.759
Surface Runoff .....              30.026        84.745
```

Final Storage	0.183	0.518
Continuity Error (%)	-0.010	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	30.026	300.261
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	29.964	299.647
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.057	0.573
Continuity Error (%)	0.014	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	1.15 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	99.96 %
3.155 - 1.991 sec	:	0.02 %
1.991 - 1.256 sec	:	0.02 %
1.256 - 0.792 sec	:	0.01 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1001	211.00	0.00	0.00	77.41	8.81	124.74	133.55	8.74	0.64	0.633
S101	211.00	0.00	0.00	151.87	21.67	37.29	58.96	21.05	1.93	0.279
S1101	211.00	0.00	0.00	66.71	21.90	122.25	144.15	6.41	0.52	0.683
S201	211.00	0.00	0.00	83.67	2.90	124.43	127.33	18.99	1.33	0.603
S202	211.00	0.00	0.00	74.35	1.11	135.59	136.69	2.52	0.21	0.648
S301	211.00	0.00	0.00	165.46	7.63	37.86	45.49	13.00	1.38	0.216
S401	211.00	0.00	0.00	82.43	12.61	115.88	128.49	18.32	1.25	0.609
S501	211.00	0.00	0.00	112.95	4.07	93.95	98.03	87.59	4.73	0.465
S601	211.00	0.00	0.00	96.58	11.79	102.53	114.33	40.94	2.50	0.542
S701	211.00	0.00	0.00	110.86	8.09	88.66	96.75	45.22	2.28	0.459
S702	211.00	0.00	0.00	184.24	3.28	23.47	26.74	15.81	1.57	0.127
S901	211.00	0.00	0.00	83.57	11.53	115.82	127.36	21.68	1.47	0.604

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
N1000	JUNCTION	0.08	0.29	241.16	0 10:07	0.29
N1100	JUNCTION	0.06	0.24	235.44	0 11:00	0.24
N200	JUNCTION	0.81	1.84	228.91	0 11:41	1.84
N300	JUNCTION	0.44	1.20	231.15	0 11:26	1.20
N400	JUNCTION	0.23	0.56	233.26	0 11:18	0.56
N500	JUNCTION	0.23	0.57	235.01	0 11:16	0.57
N600	JUNCTION	0.13	0.32	246.47	0 11:03	0.32
N700	JUNCTION	0.15	0.44	229.81	0 11:05	0.44
N800	JUNCTION	0.11	0.35	235.44	0 11:02	0.35
N900	JUNCTION	0.13	0.38	237.80	0 10:05	0.38
N100	OUTFALL	0.39	1.11	226.43	0 11:40	1.11

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
N1000	JUNCTION	0.637	0.637	0 10:00	8.74	8.74	-0.009
N1100	JUNCTION	0.524	0.524	0 10:00	6.41	6.41	-0.051
N200	JUNCTION	1.509	15.916	0 11:10	21.5	279	0.200
N300	JUNCTION	1.380	8.854	0 11:03	13	160	0.032
N400	JUNCTION	1.246	7.762	0 11:04	18.3	147	-0.031
N500	JUNCTION	4.734	7.135	0 11:00	87.6	129	0.284
N600	JUNCTION	2.503	2.503	0 11:00	40.9	40.9	-0.689
N700	JUNCTION	3.857	6.328	0 11:00	61	98.1	0.175
N800	JUNCTION	0.000	2.505	0 11:00	0	36.9	-0.435
N900	JUNCTION	1.472	2.083	0 11:00	21.7	30.4	-0.116
N100	OUTFALL	1.926	16.210	0 11:31	21	300	0.000

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr

N100	98.74	3.512	16.210	299.646
System	98.74	3.512	16.210	299.646

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
RC100	CHANNEL	14.987	0	11:40	1.21	0.33	0.64
RC200	CHANNEL	8.693	0	11:26	0.97	0.20	0.75
RC201	CHANNEL	6.122	0	11:05	0.29	0.04	0.61
RC300	CHANNEL	7.704	0	11:18	0.34	0.16	0.72
RC400	CHANNEL	6.716	0	11:17	0.60	0.17	0.44
RC500	CHANNEL	2.412	0	11:03	0.41	0.04	0.35
RC700	CHANNEL	2.473	0	11:02	0.51	0.04	0.26
RC800	CHANNEL	2.080	0	11:00	0.79	0.02	0.18
RC801	CHANNEL	0.517	0	10:00	2.32	0.00	0.15
RC900	CHANNEL	0.623	0	10:07	0.61	0.05	0.40

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
RC100	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
RC200	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.92	0.00
RC201	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.94	0.00
RC300	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.99	0.00
RC400	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.52	0.00
RC500	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.95	0.00
RC700	1.00	0.01	0.01	0.00	0.98	0.00	0.00	0.00	0.86	0.00
RC800	1.00	0.01	0.00	0.00	0.96	0.02	0.00	0.00	0.39	0.00
RC801	1.00	0.01	0.00	0.00	0.95	0.03	0.00	0.00	0.56	0.00
RC900	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.98	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue May 25 12:27:14 2021
Analysis ended on: Tue May 25 12:27:15 2021
Total elapsed time: 00:00:01

APPENDIX C

Hydraulic Analysis Results

HEC-RAS Plan: EC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	474	2 year	0.41	229.39	229.81	229.65	229.83	0.003636	0.69	0.59	2.12	0.41
1	474	5 year	0.72	229.39	229.94	229.75	229.97	0.003612	0.79	0.91	2.56	0.43
1	474	10 year	1.05	229.39	230.05	229.83	230.09	0.003588	0.87	1.20	2.92	0.43
1	474	25 year	1.51	229.39	230.17	229.91	230.22	0.003599	0.95	1.59	3.40	0.44
1	474	50 year	1.89	229.39	230.26	229.97	230.31	0.003619	1.00	1.89	3.79	0.45
1	474	100 year	2.30	229.39	230.33	230.03	230.39	0.003601	1.05	2.20	4.09	0.46
1	474	Regional	8.85	229.39	231.02	230.61	231.13	0.003966	1.46	6.08	33.99	0.52
1	436	2 year	0.41	229.21	229.68	229.51	229.71	0.002953	0.65	0.63	2.08	0.38
1	436	5 year	0.72	229.21	229.81	229.60	229.84	0.003362	0.79	0.92	2.47	0.41
1	436	10 year	1.05	229.21	229.91	229.68	229.95	0.003620	0.89	1.18	2.78	0.44
1	436	25 year	1.51	229.21	230.02	229.76	230.07	0.003956	1.00	1.52	3.22	0.46
1	436	50 year	1.89	229.21	230.10	229.83	230.16	0.004071	1.06	1.78	3.53	0.48
1	436	100 year	2.30	229.21	230.18	229.90	230.24	0.004161	1.12	2.05	3.81	0.49
1	436	Regional	8.85	229.21	230.87	230.51	230.98	0.003865	1.45	6.15	30.53	0.51
1	392	2 year	0.41	229.14	229.57	229.39	229.59	0.002444	0.57	0.72	2.65	0.35
1	392	5 year	0.72	229.14	229.68	229.47	229.71	0.002764	0.69	1.05	3.14	0.38
1	392	10 year	1.05	229.14	229.78	229.55	229.81	0.002845	0.78	1.35	3.41	0.39
1	392	25 year	1.51	229.14	229.88	229.63	229.92	0.002950	0.87	1.73	3.72	0.41
1	392	50 year	1.89	229.14	229.96	229.68	230.00	0.003058	0.94	2.02	3.99	0.42
1	392	100 year	2.30	229.14	230.03	229.73	230.08	0.003144	1.00	2.31	4.24	0.43
1	392	Regional	8.85	229.14	230.71	230.27	230.81	0.003831	1.46	6.05	9.96	0.51
1	353	2 year	0.41	229.10	229.46		229.47	0.003474	0.61	0.67	2.94	0.41
1	353	5 year	0.72	229.10	229.57		229.59	0.003165	0.70	1.02	3.31	0.40
1	353	10 year	1.05	229.10	229.66		229.69	0.003050	0.78	1.35	3.65	0.41
1	353	25 year	1.51	229.10	229.77		229.81	0.002991	0.86	1.76	3.96	0.41
1	353	50 year	1.89	229.10	229.84		229.88	0.003016	0.92	2.05	4.16	0.42
1	353	100 year	2.30	229.10	229.91		229.96	0.003090	0.98	2.34	4.36	0.43
1	353	Regional	8.85	229.10	230.54		230.65	0.004744	1.47	6.01	8.61	0.56
1	302	2 year	0.41	228.92	229.26		229.29	0.003878	0.67	0.61	2.49	0.43
1	302	5 year	0.72	228.92	229.38		229.41	0.003741	0.78	0.92	2.87	0.44
1	302	10 year	1.05	228.92	229.48		229.51	0.003872	0.87	1.21	3.28	0.46
1	302	25 year	1.51	228.92	229.58		229.63	0.004165	0.95	1.59	3.98	0.48
1	302	50 year	1.89	228.92	229.65		229.70	0.004223	1.00	1.88	4.41	0.49
1	302	100 year	2.30	228.92	229.72		229.77	0.004233	1.05	2.18	4.76	0.50
1	302	Regional	8.85	228.92	230.31		230.41	0.004497	1.37	6.50	12.42	0.55
1	251	2 year	0.41	228.74	229.13	228.95	229.14	0.002025	0.50	0.81	3.22	0.32
1	251	5 year	0.72	228.74	229.26	229.03	229.27	0.001925	0.57	1.27	3.99	0.32
1	251	10 year	1.05	228.74	229.35	229.09	229.37	0.001997	0.63	1.66	4.55	0.33
1	251	25 year	1.51	228.74	229.45	229.16	229.47	0.002111	0.71	2.14	5.18	0.35
1	251	50 year	1.89	228.74	229.51	229.22	229.54	0.002196	0.76	2.50	5.65	0.36
1	251	100 year	2.30	228.74	229.58	229.27	229.61	0.002187	0.79	2.90	6.05	0.37
1	251	Regional	8.85	228.74	230.15	229.72	230.21	0.002953	1.15	8.33	69.99	0.45
1	191	2 year	0.41	228.58	228.89		228.92	0.009504	0.85	0.48	2.70	0.65
1	191	5 year	0.72	228.58	228.92	228.91	229.00	0.018836	1.29	0.56	2.81	0.93
1	191	10 year	1.05	228.58	228.96	228.96	229.08	0.020702	1.51	0.70	2.97	1.00
1	191	25 year	1.51	228.58	229.03	229.03	229.17	0.020337	1.68	0.90	3.20	1.01
1	191	50 year	1.89	228.58	229.08	229.08	229.24	0.019151	1.74	1.08	3.49	1.00
1	191	100 year	2.30	228.58	229.13	229.13	229.30	0.019142	1.83	1.26	3.78	1.01
1	191	Regional	8.85	228.58	229.74		229.92	0.008774	1.85	4.80	7.93	0.76
1	134	2 year	0.41	227.93	228.21	228.18	228.26	0.014266	1.05	0.39	2.18	0.79
1	134	5 year	0.72	227.93	228.36	228.26	228.41	0.006474	0.95	0.76	2.69	0.57
1	134	10 year	1.05	227.93	228.48	228.32	228.53	0.004843	0.94	1.11	3.16	0.51
1	134	25 year	1.51	227.93	228.62	228.40	228.67	0.003748	0.95	1.59	3.66	0.46
1	134	50 year	1.89	227.93	228.72	228.46	228.76	0.003319	0.96	1.96	4.02	0.44
1	134	100 year	2.30	227.93	228.81	228.51	228.86	0.002987	0.97	2.38	4.46	0.42
1	134	Regional	8.85	227.93	229.59	229.05	229.66	0.002227	1.14	8.21	19.15	0.40
1	81	2 year	0.41	227.58	228.12	227.82	228.13	0.000795	0.38	1.05	2.92	0.20
1	81	5 year	0.72	227.58	228.28	227.90	228.29	0.000877	0.47	1.55	3.42	0.22
1	81	10 year	1.05	227.58	228.40	227.96	228.41	0.000937	0.53	1.99	3.77	0.23
1	81	25 year	1.51	227.58	228.54	228.05	228.56	0.000982	0.59	2.56	4.27	0.24
1	81	50 year	1.89	227.58	228.64	228.11	228.66	0.001015	0.63	3.00	4.62	0.25
1	81	100 year	2.30	227.58	228.74	228.16	228.76	0.001017	0.66	3.48	5.00	0.25
1	81	Regional	8.85	227.58	229.51	228.72	229.56	0.001347	0.96	10.98	40.36	0.31
2	322	2 year	0.51	230.08	230.19		230.19	0.003017	0.20	2.47	30.80	0.23
2	322	5 year	0.72	230.08	230.21		230.21	0.003149	0.24	3.05	31.49	0.24

HEC-RAS Plan: EC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
2	322	10 year	0.98	230.08	230.23		230.23	0.003420	0.27	3.61	32.43	0.26
2	322	25 year	1.33	230.08	230.25		230.26	0.003578	0.30	4.37	33.95	0.27
2	322	50 year	1.66	230.08	230.27		230.28	0.003620	0.33	5.04	37.70	0.28
2	322	100 year	2.04	230.08	230.28		230.29	0.004158	0.37	5.54	38.66	0.30
2	322	Regional	6.33	230.08	230.43		230.45	0.003840	0.55	12.18	52.35	0.32
2	278	2 year	0.51	229.97	230.07		230.07	0.002611	0.17	2.96	43.40	0.21
2	278	5 year	0.72	229.97	230.08		230.09	0.002744	0.20	3.61	43.90	0.22
2	278	10 year	0.98	229.97	230.10		230.11	0.002474	0.22	4.48	44.52	0.22
2	278	25 year	1.33	229.97	230.12		230.13	0.002655	0.25	5.30	45.09	0.23
2	278	50 year	1.66	229.97	230.14		230.15	0.002502	0.27	6.20	48.47	0.23
2	278	100 year	2.04	229.97	230.17		230.17	0.002139	0.28	7.50	53.20	0.22
2	278	Regional	6.33	229.97	230.33		230.34	0.001687	0.39	18.18	78.27	0.22
2	218	2 year	0.51	229.80	229.90		229.90	0.003023	0.22	2.36	29.66	0.23
2	218	5 year	0.72	229.80	229.92		229.93	0.002791	0.24	3.07	32.81	0.23
2	218	10 year	0.98	229.80	229.95		229.95	0.002374	0.26	3.95	34.32	0.22
2	218	25 year	1.33	229.80	229.98		229.98	0.002382	0.29	4.86	36.14	0.23
2	218	50 year	1.66	229.80	230.00		230.00	0.002353	0.31	5.65	37.63	0.23
2	218	100 year	2.04	229.80	230.02		230.03	0.002304	0.33	6.54	39.20	0.24
2	218	Regional	6.33	229.80	230.21		230.22	0.002109	0.49	14.76	53.50	0.25
2	176	2 year	0.51	229.66	229.81		229.81	0.001932	0.20	2.67	27.93	0.19
2	176	5 year	0.72	229.66	229.83		229.83	0.002047	0.24	3.34	30.46	0.21
2	176	10 year	0.98	229.66	229.86		229.86	0.001939	0.26	4.16	32.83	0.21
2	176	25 year	1.33	229.66	229.89		229.89	0.001858	0.29	5.20	34.75	0.21
2	176	50 year	1.66	229.66	229.91		229.92	0.001836	0.31	6.07	36.15	0.21
2	176	100 year	2.04	229.66	229.94		229.94	0.001762	0.33	7.04	36.95	0.21
2	176	Regional	6.33	229.66	230.13		230.14	0.001906	0.50	15.05	48.45	0.24
2	101	2 year	0.51	229.45	229.63		229.63	0.002340	0.23	2.32	23.97	0.21
2	101	5 year	0.72	229.45	229.66		229.66	0.002282	0.26	2.98	27.26	0.22
2	101	10 year	0.98	229.45	229.68		229.68	0.002406	0.29	3.61	29.18	0.23
2	101	25 year	1.33	229.45	229.70		229.71	0.002632	0.33	4.35	30.70	0.25
2	101	50 year	1.66	229.45	229.73	229.62	229.73	0.002644	0.36	5.07	32.49	0.25
2	101	100 year	2.04	229.45	229.75	229.62	229.75	0.002778	0.40	5.78	34.57	0.26
2	101	Regional	6.33	229.45	229.92	229.73	229.93	0.002868	0.58	12.70	44.54	0.29
2	83	2 year	0.51	229.40	229.49	229.49	229.52	0.090830	0.76	0.66	14.67	1.15
2	83	5 year	0.72	229.40	229.51	229.51	229.54	0.062389	0.77	0.94	15.50	1.00
2	83	10 year	0.98	229.40	229.52	229.52	229.56	0.076397	0.92	1.06	15.90	1.13
2	83	25 year	1.33	229.40	229.55	229.55	229.58	0.036588	0.83	1.63	17.99	0.83
2	83	50 year	1.66	229.40	229.55	229.55	229.60	0.048551	0.98	1.72	18.33	0.97
2	83	100 year	2.04	229.40	229.58	229.58	229.63	0.035055	0.96	2.19	19.40	0.85
2	83	Regional	6.33	229.40	229.68	229.68	229.79	0.040175	1.53	4.49	23.96	1.01
2	39	2 year	0.51	227.70	228.15		228.17	0.003758	0.63	0.80	3.54	0.43
2	39	5 year	0.72	227.70	228.26		228.28	0.002396	0.58	1.23	4.40	0.35
2	39	10 year	0.98	227.70	228.36		228.37	0.001777	0.58	1.69	4.91	0.31
2	39	25 year	1.33	227.70	228.49		228.50	0.001245	0.56	2.37	5.42	0.27
2	39	50 year	1.66	227.70	228.58		228.60	0.001090	0.58	2.88	5.73	0.26
2	39	100 year	2.04	227.70	228.68		228.69	0.000972	0.59	3.46	6.04	0.25
2	39	Regional	6.33	227.70	229.39		229.42	0.000719	0.74	8.54	8.16	0.23
0	1011	2 year	0.68	227.46	227.92	227.76	227.94	0.003132	0.63	1.07	4.14	0.40
0	1011	5 year	1.28	227.46	228.08	227.86	228.11	0.002581	0.69	1.85	5.46	0.38
0	1011	10 year	1.92	227.46	228.20	227.95	228.23	0.002457	0.75	2.55	6.38	0.38
0	1011	25 year	2.92	227.46	228.35	228.04	228.38	0.002204	0.83	3.52	6.96	0.37
0	1011	50 year	3.71	227.46	228.44	228.12	228.48	0.002098	0.88	4.22	7.29	0.37
0	1011	100 year	4.62	227.46	228.54	228.17	228.59	0.002016	0.93	4.96	7.60	0.37
0	1011	Regional	16.21	227.46	229.16	228.68	229.29	0.003352	1.55	10.45	34.36	0.50
0	942	2 year	0.68	227.21	227.80	227.54	227.80	0.001210	0.43	1.56	5.24	0.25
0	942	5 year	1.28	227.21	227.98	227.64	227.99	0.001065	0.46	2.74	7.58	0.25
0	942	10 year	1.92	227.21	228.11	227.73	228.12	0.001011	0.51	3.77	8.77	0.25
0	942	25 year	2.92	227.21	228.27	227.82	228.28	0.000872	0.56	5.23	9.40	0.24
0	942	50 year	3.71	227.21	228.37	227.88	228.39	0.000839	0.60	6.21	9.77	0.24
0	942	100 year	4.62	227.21	228.47	227.95	228.49	0.000821	0.64	7.25	10.11	0.24
0	942	Regional	16.21	227.21	229.10	228.39	229.14	0.000978	0.97	22.05	34.61	0.28
0	896	2 year	0.68	227.15	227.72	227.48	227.73	0.002046	0.59	1.15	3.51	0.33
0	896	5 year	1.28	227.15	227.91	227.61	227.93	0.001947	0.64	1.99	5.20	0.33
0	896	10 year	1.92	227.15	228.03	227.70	228.06	0.001899	0.72	2.67	5.77	0.34
0	896	25 year	2.92	227.15	228.20	227.83	228.23	0.001802	0.79	3.67	6.49	0.34

HEC-RAS Plan: EC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
0	896	50 year	3.71	227.15	228.30	227.89	228.33	0.001806	0.85	4.34	6.88	0.34
0	896	100 year	4.62	227.15	228.40	227.96	228.44	0.001878	0.91	5.07	7.49	0.35
0	896	Regional	16.21	227.15	229.03	228.53	229.09	0.001620	1.17	20.48	43.34	0.36
0	834	2 year	0.68	227.04	227.59	227.35	227.61	0.001943	0.60	1.12	3.12	0.32
0	834	5 year	1.28	227.04	227.77	227.46	227.79	0.002449	0.72	1.76	4.48	0.37
0	834	10 year	1.92	227.04	227.89	227.56	227.92	0.002452	0.82	2.35	4.96	0.38
0	834	25 year	2.92	227.04	228.05	227.69	228.09	0.002566	0.90	3.24	6.14	0.40
0	834	50 year	3.71	227.04	228.16	227.78	228.20	0.002514	0.95	3.90	6.69	0.40
0	834	100 year	4.62	227.04	228.25	227.86	228.31	0.002499	1.01	4.58	7.15	0.40
0	834	Regional	16.21	227.04	228.77	228.45	228.92	0.004313	1.76	10.03	43.70	0.57
0	707	2 year	0.68	226.82	227.40	227.14	227.41	0.001264	0.45	1.51	4.95	0.26
0	707	5 year	1.28	226.82	227.56	227.26	227.58	0.001222	0.54	2.37	5.73	0.27
0	707	10 year	1.92	226.82	227.68	227.33	227.70	0.001294	0.62	3.08	6.24	0.28
0	707	25 year	2.92	226.82	227.82	227.43	227.85	0.001445	0.72	4.03	7.07	0.31
0	707	50 year	3.71	226.82	227.92	227.49	227.95	0.001544	0.78	4.74	7.78	0.32
0	707	100 year	4.62	226.82	228.00	227.55	228.04	0.001705	0.85	5.43	13.56	0.34
0	707	Regional	16.21	226.82	228.51	228.15	228.56	0.001732	1.09	22.32	57.17	0.36
0	642	2 year	0.68	226.78	227.30		227.31	0.001895	0.52	1.30	4.61	0.31
0	642	5 year	1.28	226.78	227.46		227.48	0.001711	0.57	2.23	6.37	0.31
0	642	10 year	1.92	226.78	227.58		227.60	0.001646	0.63	3.06	7.42	0.31
0	642	25 year	2.92	226.78	227.72		227.75	0.001662	0.70	4.16	8.56	0.32
0	642	50 year	3.71	226.78	227.81		227.84	0.001716	0.74	4.99	9.70	0.33
0	642	100 year	4.62	226.78	227.90		227.93	0.001715	0.80	5.87	12.05	0.34
0	642	Regional	16.21	226.78	228.37		228.44	0.001910	1.22	18.93	45.41	0.39
0	574	2 year	0.68	226.52	227.18	226.91	227.19	0.001588	0.51	1.32	4.12	0.29
0	574	5 year	1.28	226.52	227.35	227.04	227.37	0.001681	0.59	2.18	5.87	0.31
0	574	10 year	1.92	226.52	227.47	227.13	227.49	0.001784	0.66	2.92	6.95	0.32
0	574	25 year	2.92	226.52	227.60	227.24	227.63	0.001962	0.74	3.92	8.32	0.35
0	574	50 year	3.71	226.52	227.69	227.32	227.72	0.002032	0.79	4.68	12.49	0.36
0	574	100 year	4.62	226.52	227.76	227.38	227.80	0.002119	0.85	5.50	18.43	0.37
0	574	Regional	16.21	226.52	228.29	227.89	228.33	0.001199	1.01	25.65	49.82	0.31
0	530	2 year	0.68	226.52	227.07		227.09	0.003267	0.67	1.01	3.59	0.40
0	530	5 year	1.28	226.52	227.24		227.27	0.003279	0.73	1.74	5.55	0.42
0	530	10 year	1.92	226.52	227.36		227.39	0.003116	0.77	2.50	7.18	0.42
0	530	25 year	2.92	226.52	227.49		227.52	0.002926	0.83	3.53	8.73	0.41
0	530	50 year	3.71	226.52	227.58		227.61	0.002761	0.85	4.38	9.97	0.41
0	530	100 year	4.62	226.52	227.66		227.70	0.002541	0.89	5.24	11.25	0.40
0	530	Regional	16.21	226.52	228.21		228.26	0.001617	1.12	20.55	41.69	0.36
0	496	2 year	0.68	226.50	227.01	226.77	227.02	0.001348	0.47	1.45	4.71	0.27
0	496	5 year	1.28	226.50	227.18	226.86	227.19	0.001312	0.54	2.37	6.11	0.28
0	496	10 year	1.92	226.50	227.30	226.95	227.32	0.001379	0.61	3.12	6.84	0.29
0	496	25 year	2.92	226.50	227.42	227.05	227.45	0.001607	0.72	4.03	7.72	0.32
0	496	50 year	3.71	226.50	227.51	227.11	227.54	0.001777	0.78	4.74	8.73	0.34
0	496	100 year	4.62	226.50	227.59	227.18	227.62	0.001903	0.85	5.45	9.39	0.36
0	496	Regional	16.21	226.50	228.10	227.69	228.18	0.002992	1.34	13.59	31.17	0.47
0	412	2 year	0.68	226.23	226.87	226.62	226.89	0.001977	0.55	1.22	4.01	0.32
0	412	5 year	1.28	226.23	227.04	226.74	227.06	0.002063	0.64	2.00	5.54	0.34
0	412	10 year	1.92	226.23	227.14	226.85	227.17	0.002159	0.72	2.68	7.52	0.36
0	412	25 year	2.92	226.23	227.23	226.96	227.27	0.002667	0.90	3.46	9.90	0.41
0	412	50 year	3.71	226.23	227.29	227.04	227.34	0.002953	0.99	4.10	11.02	0.43
0	412	100 year	4.62	226.23	227.36	227.11	227.42	0.003015	1.06	4.94	12.81	0.44
0	412	Regional	16.21	226.23	227.91	227.60	227.96	0.001628	1.21	25.06	61.55	0.36
0	325	2 year	0.68	226.01	226.35	226.35	226.45	0.020875	1.43	0.47	2.19	0.98
0	325	5 year	1.28	226.01	226.47	226.47	226.60	0.020591	1.59	0.80	3.14	1.01
0	325	10 year	1.92	226.01	226.58	226.56	226.72	0.016732	1.65	1.16	3.67	0.94
0	325	25 year	2.92	226.01	226.78	226.69	226.87	0.008540	1.30	2.24	6.16	0.69
0	325	50 year	3.71	226.01	226.90	226.74	226.97	0.006028	1.23	3.01	6.93	0.60
0	325	100 year	4.62	226.01	227.00	226.80	227.08	0.004997	1.24	3.73	7.40	0.56
0	325	Regional	16.21	226.01	227.79	227.29	227.83	0.001143	1.07	24.52	46.25	0.31
0	265	2 year	0.68	225.74	226.24	225.94	226.25	0.000576	0.34	1.98	5.46	0.18
0	265	5 year	1.28	225.74	226.42	226.02	226.43	0.000633	0.42	3.05	6.63	0.20
0	265	10 year	1.92	225.74	226.55	226.09	226.56	0.000675	0.48	4.01	7.46	0.21
0	265	25 year	2.92	225.74	226.73	226.18	226.74	0.000717	0.54	5.43	8.87	0.22
0	265	50 year	3.71	225.74	226.84	226.24	226.86	0.000738	0.57	6.53	11.04	0.23
0	265	100 year	4.62	225.74	226.96	226.31	226.98	0.000629	0.58	9.05	24.29	0.21

HEC-RAS Plan: EC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
0	265	Regional	16.21	225.74	227.77	226.84	227.79	0.000323	0.68	35.66	54.33	0.17
0	216	2 year	0.68	225.71	226.20		226.21	0.001063	0.45	1.51	4.36	0.24
0	216	5 year	1.28	225.71	226.37		226.38	0.001177	0.55	2.34	5.39	0.26
0	216	10 year	1.92	225.71	226.50		226.52	0.001241	0.62	3.09	6.13	0.28
0	216	25 year	2.92	225.71	226.67		226.69	0.001256	0.69	4.22	7.14	0.29
0	216	50 year	3.71	225.71	226.79		226.81	0.001176	0.73	5.16	9.64	0.28
0	216	100 year	4.62	225.71	226.91		226.94	0.001036	0.76	6.97	26.65	0.27
0	216	Regional	16.21	225.71	227.76		227.77	0.000341	0.71	52.31	81.56	0.18
0	173	2 year	0.68	225.59	226.16	225.89	226.17	0.000706	0.36	1.85	5.42	0.20
0	173	5 year	1.28	225.59	226.33	225.97	226.34	0.000734	0.45	2.83	6.14	0.21
0	173	10 year	1.92	225.59	226.46	226.04	226.48	0.000794	0.52	3.66	6.68	0.23
0	173	25 year	2.92	225.59	226.63	226.13	226.65	0.000854	0.60	4.85	7.55	0.24
0	173	50 year	3.71	225.59	226.75	226.19	226.77	0.000891	0.64	5.79	9.34	0.25
0	173	100 year	4.62	225.59	226.87	226.25	226.89	0.000839	0.67	7.23	16.55	0.25
0	173	Regional	16.21	225.59	227.73	226.80	227.75	0.000403	0.76	40.57	139.20	0.19
0	139	2 year	0.68	225.60	226.12	225.92	226.13	0.001998	0.54	1.26	4.51	0.32
0	139	5 year	1.28	225.60	226.29	226.02	226.31	0.001664	0.61	2.10	5.36	0.31
0	139	10 year	1.92	225.60	226.41	226.10	226.44	0.001659	0.68	2.82	6.06	0.32
0	139	25 year	2.92	225.60	226.58	226.19	226.61	0.001586	0.75	3.91	7.05	0.32
0	139	50 year	3.71	225.60	226.70	226.26	226.73	0.001496	0.78	4.88	10.44	0.32
0	139	100 year	4.62	225.60	226.82	226.33	226.85	0.001451	0.78	6.52	15.20	0.31
0	139	Regional	16.21	225.60	227.71	226.92	227.73	0.000586	0.81	29.17	61.40	0.23
0	115	2 year	0.68	225.56	226.08	225.85	226.09	0.001354	0.46	1.48	4.99	0.27
0	115	5 year	1.28	225.56	226.26	225.94	226.27	0.001131	0.51	2.48	6.11	0.26
0	115	10 year	1.92	225.56	226.39	226.01	226.40	0.001129	0.58	3.29	6.71	0.27
0	115	25 year	2.92	225.56	226.55	226.12	226.58	0.001088	0.65	4.49	7.49	0.27
0	115	50 year	3.71	225.56	226.67	226.18	226.70	0.001042	0.69	5.41	8.05	0.27
0	115	100 year	4.62	225.56	226.80	226.24	226.83	0.000971	0.71	6.47	15.74	0.26
0	115	Regional	16.21	225.56	227.72	226.76	227.72	0.000151	0.45	82.42	159.76	0.11
0	100		Bridge									
0	87	2 year	0.68	225.38	226.04	225.79	226.06	0.001538	0.52	1.31	3.94	0.29
0	87	5 year	1.28	225.38	226.20	225.89	226.22	0.001783	0.64	1.99	4.86	0.32
0	87	10 year	1.92	225.38	226.29	225.99	226.32	0.002259	0.78	2.47	5.41	0.37
0	87	25 year	2.92	225.38	226.41	226.11	226.45	0.002812	0.93	3.12	6.11	0.42
0	87	50 year	3.71	225.38	226.48	226.18	226.53	0.003199	1.03	3.58	6.64	0.45
0	87	100 year	4.62	225.38	226.55	226.25	226.62	0.003529	1.13	4.09	7.14	0.48
0	87	Regional	16.21	225.38	227.06	226.81	227.26	0.005187	1.93	8.38	47.31	0.63
0	75	2 year	0.68	225.41	225.99		226.02	0.004280	0.74	0.91	3.37	0.46
0	75	5 year	1.28	225.41	226.15		226.18	0.004273	0.81	1.58	5.24	0.47
0	75	10 year	1.92	225.41	226.23		226.28	0.004692	0.93	2.05	5.90	0.51
0	75	25 year	2.92	225.41	226.34		226.40	0.004895	1.07	2.72	6.60	0.53
0	75	50 year	3.71	225.41	226.41		226.48	0.005087	1.16	3.19	7.00	0.55
0	75	100 year	4.62	225.41	226.48		226.56	0.005312	1.25	3.68	7.47	0.57
0	75	Regional	16.21	225.41	226.99		227.18	0.007001	1.92	8.44	11.93	0.71
0	60	2 year	0.68	225.40	225.93		225.96	0.004138	0.79	0.86	2.81	0.45
0	60	5 year	1.28	225.40	226.07		226.11	0.005593	0.85	1.51	5.77	0.53
0	60	10 year	1.92	225.40	226.16		226.20	0.005249	0.95	2.02	6.22	0.53
0	60	25 year	2.92	225.40	226.27		226.32	0.005060	1.07	2.73	6.80	0.54
0	60	50 year	3.71	225.40	226.33		226.40	0.005158	1.16	3.19	7.05	0.55
0	60	100 year	4.62	225.40	226.40		226.48	0.005473	1.27	3.65	7.44	0.58
0	60	Regional	16.21	225.40	226.85	226.73	227.06	0.008546	2.01	8.19	16.07	0.77
0	38	2 year	0.68	225.35	225.87	225.65	225.88	0.002698	0.56	1.20	4.85	0.36
0	38	5 year	1.28	225.35	226.00	225.76	226.02	0.002699	0.62	2.06	7.28	0.37
0	38	10 year	1.92	225.35	226.09	225.86	226.12	0.002699	0.69	2.76	8.31	0.38
0	38	25 year	2.92	225.35	226.21	225.97	226.24	0.002696	0.76	3.83	10.00	0.39
0	38	50 year	3.71	225.35	226.28	226.02	226.31	0.002699	0.81	4.55	10.80	0.40
0	38	100 year	4.62	225.35	226.35	226.07	226.38	0.002698	0.87	5.30	11.35	0.41
0	38	Regional	16.21	225.35	226.84	226.49	226.93	0.002700	1.33	14.01	29.89	0.45

HEC-RAS Profile: Regional

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	474	Regional	EC	8.85	229.39	231.02	230.61	231.13	0.003966	1.46	6.08	33.99	0.52
1	474	Regional	Sens: DS BC	8.85	229.39	231.02	230.61	231.13	0.003966	1.46	6.08	33.99	0.52
1	474	Regional	Sens: Roughness	8.85	229.39	231.19	230.61	231.26	0.005057	1.17	8.45	62.62	0.40
1	474	Regional	Sens: Flows	9.97	229.39	231.09	230.67	231.21	0.004055	1.51	6.69	45.78	0.53
1	436	Regional	EC	8.85	229.21	230.87	230.51	230.98	0.003865	1.45	6.15	30.53	0.51
1	436	Regional	Sens: DS BC	8.85	229.21	230.87	230.51	230.98	0.003865	1.45	6.15	30.53	0.51
1	436	Regional	Sens: Roughness	8.85	229.21	231.08	230.51	231.11	0.002438	0.89	15.95	43.57	0.28
1	436	Regional	Sens: Flows	9.97	229.21	230.95	230.57	231.06	0.003665	1.49	6.82	36.98	0.51
1	392	Regional	EC	8.85	229.14	230.71	230.27	230.81	0.003831	1.46	6.05	9.96	0.51
1	392	Regional	Sens: DS BC	8.85	229.14	230.71	230.27	230.81	0.003831	1.46	6.05	9.96	0.51
1	392	Regional	Sens: Roughness	8.85	229.14	230.91	230.27	230.97	0.004646	1.10	9.03	18.18	0.38
1	392	Regional	Sens: Flows	9.97	229.14	230.77	230.34	230.89	0.004126	1.52	6.58	12.96	0.53
1	353	Regional	EC	8.85	229.10	230.54		230.65	0.004744	1.47	6.01	8.61	0.56
1	353	Regional	Sens: DS BC	8.85	229.10	230.54		230.65	0.004744	1.47	6.01	8.61	0.56
1	353	Regional	Sens: Roughness	8.85	229.10	230.71		230.78	0.005007	1.14	8.83	26.27	0.40
1	353	Regional	Sens: Flows	9.97	229.10	230.59		230.71	0.004990	1.53	6.61	12.72	0.58
1	302	Regional	EC	8.85	228.92	230.31		230.41	0.004497	1.37	6.50	12.42	0.55
1	302	Regional	Sens: DS BC	8.85	228.92	230.31		230.41	0.004497	1.37	6.50	12.42	0.55
1	302	Regional	Sens: Roughness	8.85	228.92	230.46		230.52	0.005042	1.07	9.48	33.09	0.40
1	302	Regional	Sens: Flows	9.97	228.92	230.35		230.46	0.004716	1.44	7.05	13.51	0.57
1	251	Regional	EC	8.85	228.74	230.15	229.72	230.21	0.002953	1.15	8.33	69.99	0.45
1	251	Regional	Sens: DS BC	8.85	228.74	230.15	229.72	230.21	0.002953	1.15	8.33	69.99	0.45
1	251	Regional	Sens: Roughness	8.85	228.74	230.29	229.72	230.32	0.002855	0.85	14.47	102.26	0.31
1	251	Regional	Sens: Flows	9.97	228.74	230.20	229.78	230.27	0.002758	1.16	10.36	80.22	0.44
1	191	Regional	EC	8.85	228.58	229.74		229.92	0.008774	1.85	4.80	7.93	0.76
1	191	Regional	Sens: DS BC	8.85	228.58	229.74		229.92	0.008774	1.85	4.80	7.93	0.76
1	191	Regional	Sens: Roughness	8.85	228.58	229.97		230.05	0.008449	1.27	7.54	21.32	0.50
1	191	Regional	Sens: Flows	9.97	228.58	229.80		229.98	0.008848	1.90	5.25	8.41	0.77
1	134	Regional	EC	8.85	227.93	229.59	229.05	229.66	0.002227	1.14	8.21	19.15	0.40
1	134	Regional	Sens: DS BC	8.85	227.93	229.59	229.05	229.66	0.002227	1.14	8.21	19.15	0.40
1	134	Regional	Sens: Roughness	8.85	227.93	229.74	229.05	229.79	0.002738	0.94	10.48	31.10	0.30
1	134	Regional	Sens: Flows	9.97	227.93	229.66	229.11	229.73	0.002160	1.18	9.15	24.30	0.40
1	81	Regional	EC	8.85	227.58	229.51	228.72	229.56	0.001347	0.96	10.98	40.36	0.31
1	81	Regional	Sens: DS BC	8.85	227.58	229.51	228.72	229.56	0.001347	0.96	10.98	40.36	0.31
1	81	Regional	Sens: Roughness	8.85	227.58	229.65	228.72	229.67	0.001513	0.74	18.01	48.59	0.23
1	81	Regional	Sens: Flows	9.97	227.58	229.59	228.80	229.63	0.001115	0.92	15.48	46.36	0.29
2	322	Regional	EC	6.33	230.08	230.43		230.45	0.003840	0.55	12.18	52.35	0.32
2	322	Regional	Sens: DS BC	6.33	230.08	230.43		230.45	0.003840	0.55	12.18	52.35	0.32
2	322	Regional	Sens: Roughness	6.33	230.08	230.51		230.52	0.003695	0.42	16.65	64.23	0.22
2	322	Regional	Sens: Flows	7.13	230.08	230.45		230.47	0.003840	0.58	13.26	54.68	0.33
2	278	Regional	EC	6.33	229.97	230.33		230.34	0.001687	0.39	18.18	78.27	0.22
2	278	Regional	Sens: DS BC	6.33	229.97	230.33		230.34	0.001687	0.39	18.18	78.27	0.22
2	278	Regional	Sens: Roughness	6.33	229.97	230.41		230.41	0.001588	0.29	24.81	86.04	0.15
2	278	Regional	Sens: Flows	7.13	229.97	230.35		230.36	0.001651	0.41	19.94	80.12	0.22
2	218	Regional	EC	6.33	229.80	230.21		230.22	0.002109	0.49	14.76	53.50	0.25
2	218	Regional	Sens: DS BC	6.33	229.80	230.21		230.22	0.002109	0.49	14.76	53.50	0.25
2	218	Regional	Sens: Roughness	6.33	229.80	230.30		230.30	0.002035	0.37	20.01	59.72	0.17
2	218	Regional	Sens: Flows	7.13	229.80	230.23		230.24	0.002093	0.51	16.13	55.21	0.25
2	176	Regional	EC	6.33	229.66	230.13		230.14	0.001906	0.50	15.05	48.45	0.24
2	176	Regional	Sens: DS BC	6.33	229.66	230.13		230.14	0.001906	0.50	15.05	48.45	0.24
2	176	Regional	Sens: Roughness	6.33	229.66	230.22		230.23	0.001966	0.38	19.68	52.70	0.17
2	176	Regional	Sens: Flows	7.13	229.66	230.16		230.17	0.001908	0.52	16.30	49.24	0.24
2	101	Regional	EC	6.33	229.45	229.92	229.73	229.93	0.002868	0.58	12.70	44.54	0.29
2	101	Regional	Sens: DS BC	6.33	229.45	229.92	229.73	229.93	0.002868	0.58	12.70	44.54	0.29
2	101	Regional	Sens: Roughness	6.33	229.45	229.98		229.99	0.003676	0.48	15.39	46.73	0.23
2	101	Regional	Sens: Flows	7.13	229.45	229.94	229.75	229.96	0.002942	0.61	13.65	45.20	0.30
2	83	Regional	EC	6.33	229.40	229.68	229.68	229.79	0.040175	1.53	4.49	23.96	1.01
2	83	Regional	Sens: DS BC	6.33	229.40	229.68	229.68	229.79	0.040175	1.53	4.49	23.96	1.01
2	83	Regional	Sens: Roughness	6.33	229.40	229.68	229.68	229.79	0.090394	1.53	4.49	23.96	1.01
2	83	Regional	Sens: Flows	7.13	229.40	229.71	229.71	229.82	0.036137	1.54	5.08	25.88	0.97
2	39	Regional	EC	6.33	227.70	229.39		229.42	0.000719	0.74	8.54	8.16	0.23
2	39	Regional	Sens: DS BC	6.33	227.70	229.39		229.42	0.000719	0.74	8.54	8.16	0.23
2	39	Regional	Sens: Roughness	6.33	227.70	229.54		229.56	0.001108	0.64	10.57	22.36	0.19
2	39	Regional	Sens: Flows	7.13	227.70	229.47		229.50	0.000740	0.77	9.39	15.75	0.24
0	1011	Regional	EC	16.21	227.46	229.16	228.68	229.29	0.003352	1.55	10.45	34.36	0.50
0	1011	Regional	Sens: DS BC	16.21	227.46	229.16	228.68	229.29	0.003352	1.55	10.45	34.36	0.50
0	1011	Regional	Sens: Roughness	16.21	227.46	229.36	228.68	229.41	0.003042	1.08	22.35	58.06	0.33
0	1011	Regional	Sens: Flows	18.25	227.46	229.22	228.75	229.36	0.003674	1.65	11.09	47.30	0.53
0	942	Regional	EC	16.21	227.21	229.10	228.39	229.14	0.000978	0.97	22.05	34.61	0.28
0	942	Regional	Sens: DS BC	16.21	227.21	229.10	228.39	229.14	0.000978	0.97	22.05	34.61	0.28

HEC-RAS Profile: Regional (Continued)

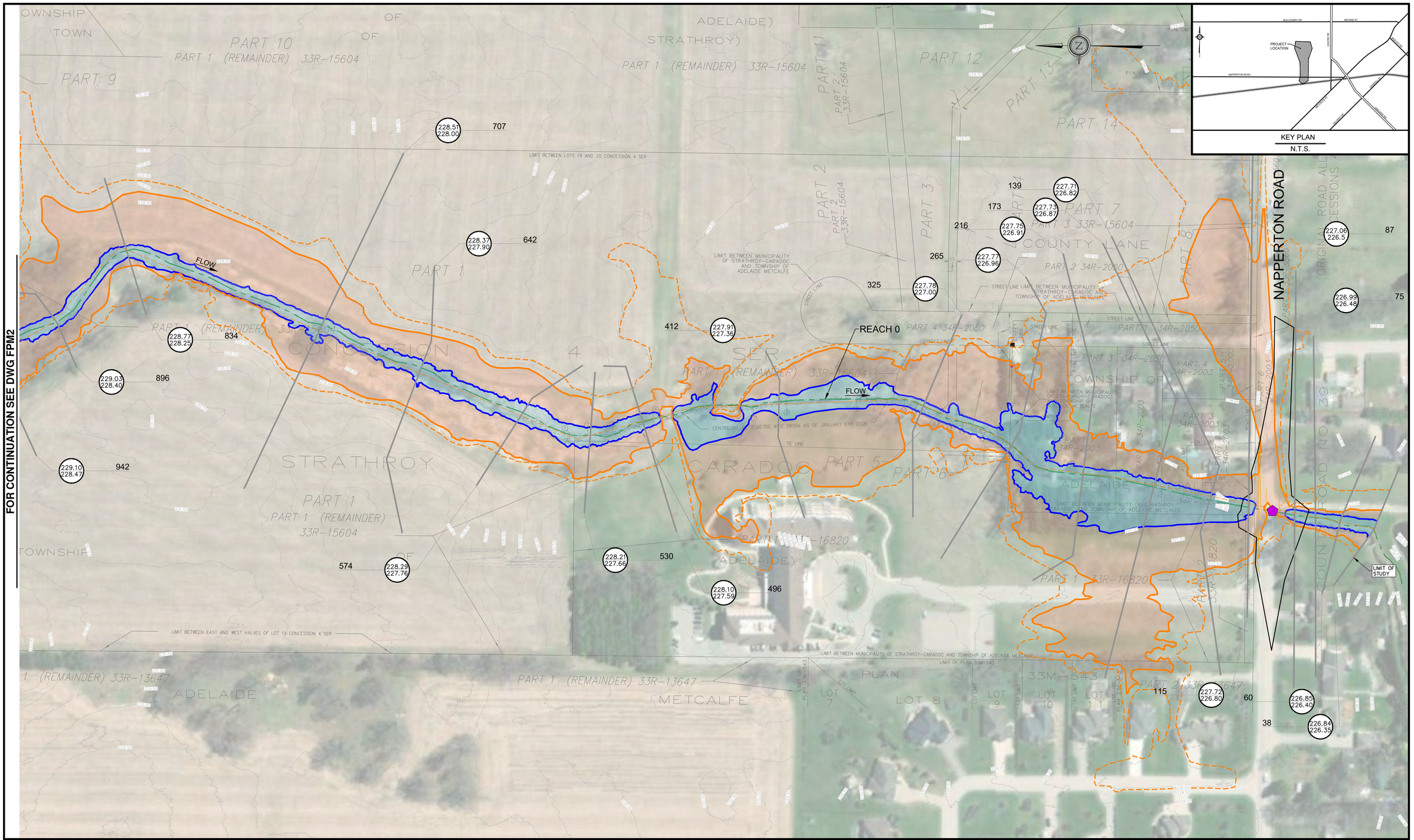
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
0	942	Regional	Sens: Roughness	16.21	227.21	229.24	228.39	229.27	0.001392	0.82	26.74	35.27	0.23
0	942	Regional	Sens: Flows	18.25	227.21	229.17	228.45	229.21	0.000997	1.01	24.21	34.93	0.29
0	896	Regional	EC	16.21	227.15	229.03	228.53	229.09	0.001620	1.17	20.48	43.34	0.36
0	896	Regional	Sens: DS BC	16.21	227.15	229.03	228.53	229.09	0.001620	1.17	20.48	43.34	0.36
0	896	Regional	Sens: Roughness	16.21	227.15	229.15	228.53	229.19	0.002208	0.97	25.89	48.70	0.28
0	896	Regional	Sens: Flows	18.25	227.15	229.10	228.60	229.15	0.001521	1.18	23.42	44.78	0.35
0	834	Regional	EC	16.21	227.04	228.77	228.45	228.92	0.004313	1.76	10.03	43.70	0.57
0	834	Regional	Sens: DS BC	16.21	227.04	228.77	228.45	228.92	0.004314	1.76	10.03	43.69	0.57
0	834	Regional	Sens: Roughness	16.21	227.04	228.96	228.45	229.01	0.003137	1.12	22.04	55.94	0.33
0	834	Regional	Sens: Flows	18.25	227.04	228.81	228.55	228.98	0.004709	1.89	10.60	46.85	0.60
0	707	Regional	EC	16.21	226.82	228.51	228.15	228.56	0.001732	1.09	22.32	57.17	0.36
0	707	Regional	Sens: DS BC	16.21	226.82	228.51	228.15	228.56	0.001730	1.09	22.33	57.18	0.36
0	707	Regional	Sens: Roughness	16.21	226.82	228.68	228.15	228.70	0.001666	0.80	32.68	64.03	0.25
0	707	Regional	Sens: Flows	18.25	226.82	228.56	228.26	228.61	0.001685	1.12	25.28	59.48	0.36
0	642	Regional	EC	16.21	226.78	228.37		228.44	0.001910	1.22	18.93	45.41	0.39
0	642	Regional	Sens: DS BC	16.21	226.78	228.37		228.44	0.001905	1.22	18.96	45.43	0.39
0	642	Regional	Sens: Roughness	16.21	226.78	228.55		228.58	0.001879	0.91	27.66	50.25	0.27
0	642	Regional	Sens: Flows	18.25	226.78	228.42		228.49	0.001885	1.26	21.34	46.85	0.39
0	574	Regional	EC	16.21	226.52	228.29	227.89	228.33	0.001199	1.01	25.65	49.82	0.31
0	574	Regional	Sens: DS BC	16.21	226.52	228.29	227.89	228.33	0.001193	1.00	25.70	49.85	0.31
0	574	Regional	Sens: Roughness	16.21	226.52	228.45	227.89	228.47	0.001345	0.78	34.30	56.42	0.23
0	574	Regional	Sens: Flows	18.25	226.52	228.34	227.92	228.38	0.001189	1.04	28.34	51.21	0.31
0	530	Regional	EC	16.21	226.52	228.21		228.26	0.001617	1.12	20.55	41.69	0.36
0	530	Regional	Sens: DS BC	16.21	226.52	228.21		228.26	0.001606	1.12	20.62	41.74	0.36
0	530	Regional	Sens: Roughness	16.21	226.52	228.38		228.41	0.001760	0.86	28.32	49.30	0.26
0	530	Regional	Sens: Flows	18.25	226.52	228.26		228.32	0.001632	1.16	22.77	45.80	0.36
0	496	Regional	EC	16.21	226.50	228.10	227.69	228.18	0.002992	1.34	13.59	31.17	0.47
0	496	Regional	Sens: DS BC	16.21	226.50	228.10	227.69	228.19	0.002957	1.34	13.66	31.52	0.47
0	496	Regional	Sens: Roughness	16.21	226.50	228.27	227.69	228.32	0.003102	1.04	20.47	44.83	0.33
0	496	Regional	Sens: Flows	18.25	226.50	228.14	227.77	228.24	0.003064	1.41	15.37	35.18	0.48
0	412	Regional	EC	16.21	226.23	227.91	227.60	227.96	0.001628	1.21	25.06	61.55	0.36
0	412	Regional	Sens: DS BC	16.21	226.23	227.92	227.60	227.97	0.001520	1.18	25.79	62.34	0.35
0	412	Regional	Sens: Roughness	16.21	226.23	228.06	227.60	228.08	0.001802	0.92	35.59	77.42	0.26
0	412	Regional	Sens: Flows	18.25	226.23	227.95	227.70	228.00	0.001610	1.24	27.74	69.58	0.37
0	325	Regional	EC	16.21	226.01	227.79	227.29	227.83	0.001143	1.07	24.52	46.25	0.31
0	325	Regional	Sens: DS BC	16.21	226.01	227.81	227.29	227.85	0.001038	1.03	25.57	46.85	0.29
0	325	Regional	Sens: Roughness	16.21	226.01	227.89	227.29	227.92	0.001663	0.91	29.58	54.61	0.25
0	325	Regional	Sens: Flows	18.25	226.01	227.83	227.40	227.87	0.001224	1.13	26.37	47.45	0.32
0	265	Regional	EC	16.21	225.74	227.77	226.84	227.79	0.000323	0.68	35.66	54.33	0.17
0	265	Regional	Sens: DS BC	16.21	225.74	227.80	226.84	227.81	0.000301	0.66	36.60	57.16	0.17
0	265	Regional	Sens: Roughness	16.21	225.74	227.85	226.84	227.86	0.000579	0.62	38.79	59.92	0.16
0	265	Regional	Sens: Flows	18.25	225.74	227.81	226.97	227.83	0.000367	0.73	37.15	58.29	0.18
0	216	Regional	EC	16.21	225.71	227.76		227.77	0.000341	0.71	52.31	81.56	0.18
0	216	Regional	Sens: DS BC	16.21	225.71	227.78		227.79	0.000313	0.69	54.33	82.50	0.17
0	216	Regional	Sens: Roughness	16.21	225.71	227.82		227.83	0.000622	0.66	57.41	87.33	0.16
0	216	Regional	Sens: Flows	18.25	225.71	227.79		227.81	0.000383	0.76	55.15	85.14	0.19
0	173	Regional	EC	16.21	225.59	227.73	226.80	227.75	0.000403	0.76	40.57	139.20	0.19
0	173	Regional	Sens: DS BC	16.21	225.59	227.76	226.80	227.78	0.000374	0.74	41.90	142.94	0.19
0	173	Regional	Sens: Roughness	16.21	225.59	227.78	226.80	227.80	0.000797	0.73	42.92	146.29	0.18
0	173	Regional	Sens: Flows	18.25	225.59	227.76	226.86	227.79	0.000469	0.83	42.11	143.58	0.21
0	139	Regional	EC	16.21	225.60	227.71	226.92	227.73	0.000586	0.81	29.17	61.40	0.23
0	139	Regional	Sens: DS BC	16.21	225.60	227.73	226.92	227.76	0.000542	0.79	30.14	66.27	0.22
0	139	Regional	Sens: Roughness	16.21	225.60	227.73	226.92	227.76	0.001226	0.80	30.06	66.01	0.22
0	139	Regional	Sens: Flows	18.25	225.60	227.73	226.99	227.77	0.000692	0.90	30.03	65.91	0.25
0	115	Regional	EC	16.21	225.56	227.72	226.76	227.72	0.000151	0.45	82.42	159.76	0.11
0	115	Regional	Sens: DS BC	16.21	225.56	227.74	226.76	227.75	0.000135	0.43	86.86	164.20	0.11
0	115	Regional	Sens: Roughness	16.21	225.56	227.73	226.76	227.74	0.000314	0.44	85.29	162.20	0.11
0	115	Regional	Sens: Flows	18.25	225.56	227.74	226.82	227.75	0.000171	0.49	86.84	164.14	0.12
0	100			Bridge									
0	87	Regional	EC	16.21	225.38	227.06	226.81	227.26	0.005187	1.93	8.38	47.31	0.63
0	87	Regional	Sens: DS BC	16.21	225.38	227.42	226.81	227.44	0.000721	0.80	36.88	89.29	0.24
0	87	Regional	Sens: Roughness	16.21	225.38	227.34	226.81	227.37	0.002526	0.95	30.04	82.74	0.30
0	87	Regional	Sens: Flows	18.25	225.38	227.11	226.87	227.33	0.005615	2.08	8.79	51.63	0.66
0	75	Regional	EC	16.21	225.41	226.99		227.18	0.007001	1.92	8.44	11.93	0.71
0	75	Regional	Sens: DS BC	16.21	225.41	227.33		227.41	0.001752	1.24	16.59	44.26	0.38
0	75	Regional	Sens: Roughness	16.21	225.41	227.18		227.29	0.007308	1.52	11.32	20.57	0.50
0	75	Regional	Sens: Flows	18.25	225.41	227.03		227.25	0.007295	2.04	9.01	12.98	0.73
0	60	Regional	EC	16.21	225.40	226.85	226.73	227.06	0.008546	2.01	8.19	16.07	0.77
0	60	Regional	Sens: DS BC	16.21	225.40	227.33		227.38	0.001100	1.02	21.62	40.49	0.30

HEC-RAS Profile: Regional (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
0	60	Regional	Sens: Roughness	16.21	225.40	227.08		227.18	0.006698	1.43	13.21	27.91	0.48
0	60	Regional	Sens: Flows	18.25	225.40	226.90	226.77	227.13	0.008687	2.11	8.97	18.66	0.78
0	38	Regional	EC	16.21	225.35	226.84	226.49	226.93	0.002700	1.33	14.01	29.89	0.45
0	38	Regional	Sens: DS BC	16.21	225.35	227.34	226.49	227.36	0.000363	0.66	36.61	52.74	0.18
0	38	Regional	Sens: Roughness	16.21	225.35	227.03	226.48	227.08	0.002696	1.01	21.41	46.53	0.31
0	38	Regional	Sens: Flows	18.25	225.35	226.90	226.54	226.99	0.002697	1.38	15.80	34.86	0.46

APPENDIX D

Floodplain Mapsheets



LEGEND

- ROADWAY
- MAJOR CONTOURS
- MINOR CONTOURS
- LIMIT OF SURVEY*
- CENTERLINE OF CREEK
- 100YR FLOODLINE
- REGIONAL FLOODLINE
- REGIONAL FLOODLINE +0.3m FREEBOARD
- EXISTING CULVERT

227.91 / 227.36 — 412 — HEC–RAS ID
REGIONAL FLOODLINE ELEVATION
100yr FLOODLINE ELEVATION
SECTION LINE

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. CONTOUR INTERVAL IS 0.50m.

0m 25m 50m 100m
SCALE 1:1000

BENCHMARK

BENCHMARK ELEV: 227.637m (NAL 1)
DESCRIPTION:
NAIL IN EDGE OF ASPHALT IN–LINE WITH HYDRO POLE 27.3M EAST OF NAPPERTON DRIVE CULVERT CENTERLINE.

BENCHMARK ELEV: 227.514m (NAL 4)
DESCRIPTION:
NAIL IN SIDEWALK EXPANSION JOINT NORTH OF NAPPERTON DRIVE.

DESCRIPTION:
ELEVATIONS SHOWN ARE GEODETIC AND ARE DERIVED FROM THE TRIMBLE VRS REFERENCE NETWORK AND ARE BASED ON THE NAD83 CSRS UTM ZONE 17N CANADA COUNTRY AND GRID.

*SURVEY SOURCE: S.M. ROSS AND ASSOCIATES LTD.
COMPLETED: MAY 2021

DEM SOURCE:
LIDAR DTM LAKE ERIE 2016–18 PACKAGE H,
OBTAINED FROM LAND INFORMATION ONTARIO
DEM ELEVATIONS ADJUSTED BY +0.40m TO MATCH TOPOGRAPHIC SURVEY ELEVATIONS

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LICENSED PROFESSIONAL ENGINEER
07/29/2021
S.M. SEXTON
100216608
PROVINCE OF ONTARIO

NO.	REVISION	DATE	BY	APPROVED
01	1ST SUBMISSION	2021/06/11	J.N.	
02	2ND SUBMISSION	2021/07/29	J.N.	

CLIENT NAME:
SLD GROUP

PROJECT NAME:
STRATHROY FLOOD STUDY

FLOODPLAIN MAPPING EXISTING CONDITIONS

DESIGNED BY:	E.P.	SCALES:	
CHECKED BY:	S.S.	HORIZONTAL:	1:1000
DRAWN BY:	J.N.	VERTICAL:	
DATE:	JUN 11, 2021		

PROJECT No. 21-769
DRAWING No. FPM1
SHEET No. 01

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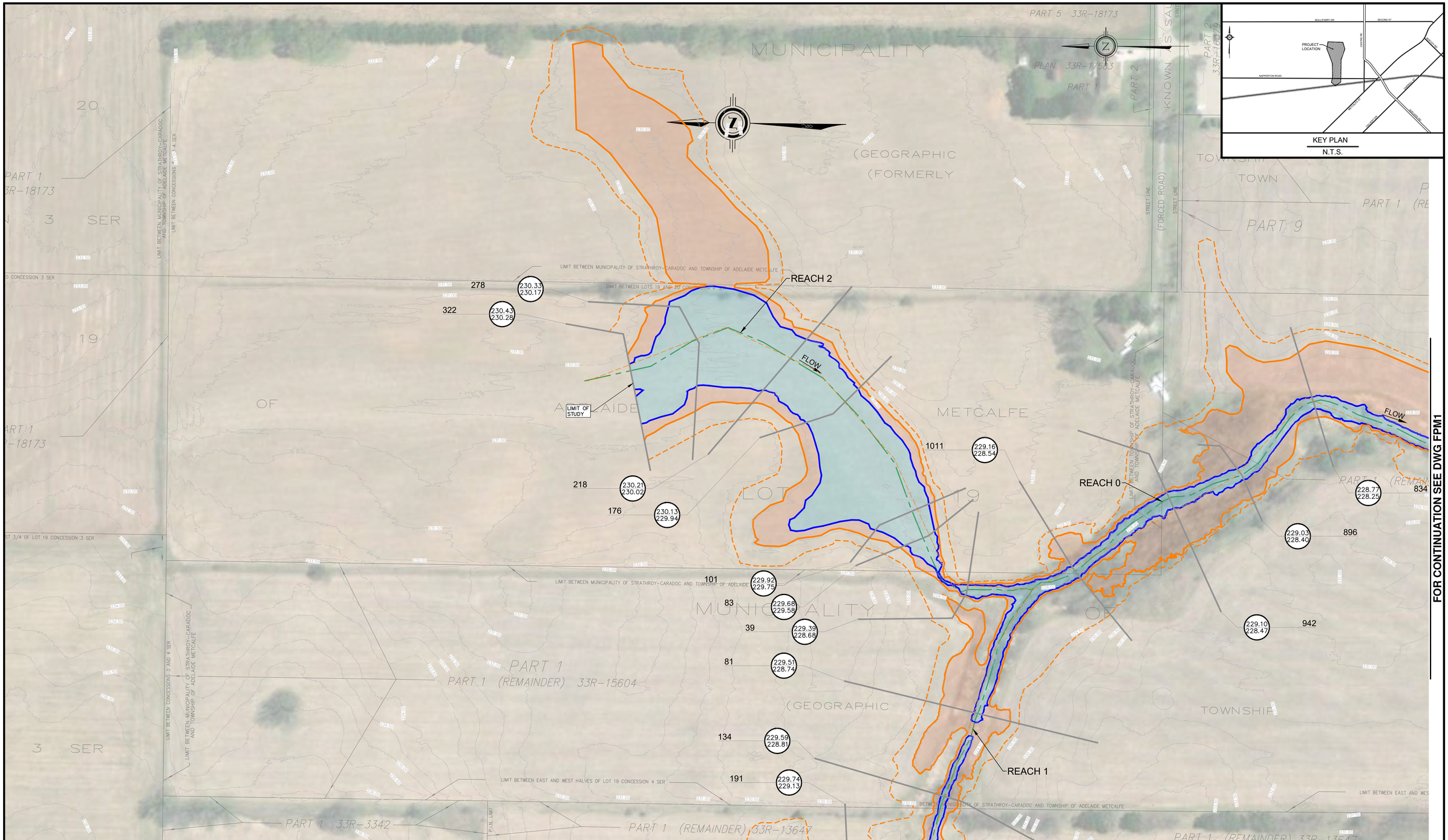
Date Plotted: Jul 28, 2021 – 1:50 PM



LEGEND

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- MINOR CONTOURS
- LIMIT OF SURVEY*#
- CENTERLINE OF CREEK
- 100YR FLOODLINE
- REGIONAL FLOODLINE
- REGIONAL FLOODLINE +0.3m FREEBOARD
- EXISTING CULVERT

227.91 / 227.36 — REGIONAL FLOODLINE ELEVATION / 100yr FLOODLINE ELEVATION
412 — HEC-RAS ID
SECTION LINE

NOTES

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0m 25m 50m 100m
SCALE 1:1000

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*SURVEY SOURCE: B.M. ROSS AND ASSOCIATES LTD.
COMPLETED: MAY 2021

DEM SOURCE:
LIDAR DTM LAKE ERIE 2016-18 PACKAGE H
OBTAINED FROM LAND INFORMATION ONTARIO
DEM ELEVATIONS ADJUSTED BY +0.40m TO MATCH TOPOGRAPHIC SURVEY ELEVATIONS

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NO.	REVISION	DATE	BY	APPROVED
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02	2ND SUBMISSION	2021/07/29	J.N.	

CLIENT NAME: SLD GROUP

PROJECT NAME: STRATHROY FLOOD STUDY

FLOODPLAIN MAPPING EXISTING CONDITIONS

DESIGNED BY:	E.P.	SCALES:	
CHECKED BY:	S.S.	HORIZONTAL:	1:1000
DRAWN BY:	J.N.	VERTICAL:	
DATE:	JUN 11, 2021		

PROJECT No. 21-769
DRAWING No. FPM2
SHEET No. 02

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FOR CONTINUATION SEE DWG FPM2

LEGEND

- ROADWAY
- MAJOR CONTOURS
- MINOR CONTOURS
- LIMIT OF SURVEY*
- CENTERLINE OF CREEK
- 100YR FLOODLINE
- REGIONAL FLOODLINE
- REGIONAL FLOODLINE +0.3m FREEBOARD
- EXISTING CULVERT

227.91 / 227.36 — REGIONAL FLOODLINE ELEVATION / 100yr FLOODLINE ELEVATION — 412 HEC-RAS ID — SECTION LINE

0m 25m 50m 100m
SCALE 1:1000

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
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*SURVEY SOURCE: B.M. ROSS AND ASSOCIATES LTD.
COMPLETED: MAY 2021

DEM SOURCE:
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OBTAINED FROM LAND INFORMATION ONTARIO
DEM ELEVATIONS ADJUSTED BY +0.40m TO MATCH TOPOGRAPHIC SURVEY ELEVATIONS

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CLIENT NAME: SLD GROUP

PROJECT NAME: STRATHROY FLOOD STUDY

FLOODPLAIN MAPPING EXISTING CONDITIONS

DESIGNED BY:	E.P.	SCALES:	
CHECKED BY:	S.S.	HORIZONTAL:	1:1000
DRAWN BY:	J.N.	VERTICAL:	
DATE:	JUN 11, 2021		

PROJECT No. 21-769
DRAWING No. FPM3
SHEET No. 03

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