APPENDIX C – Fluvial Geomorphology

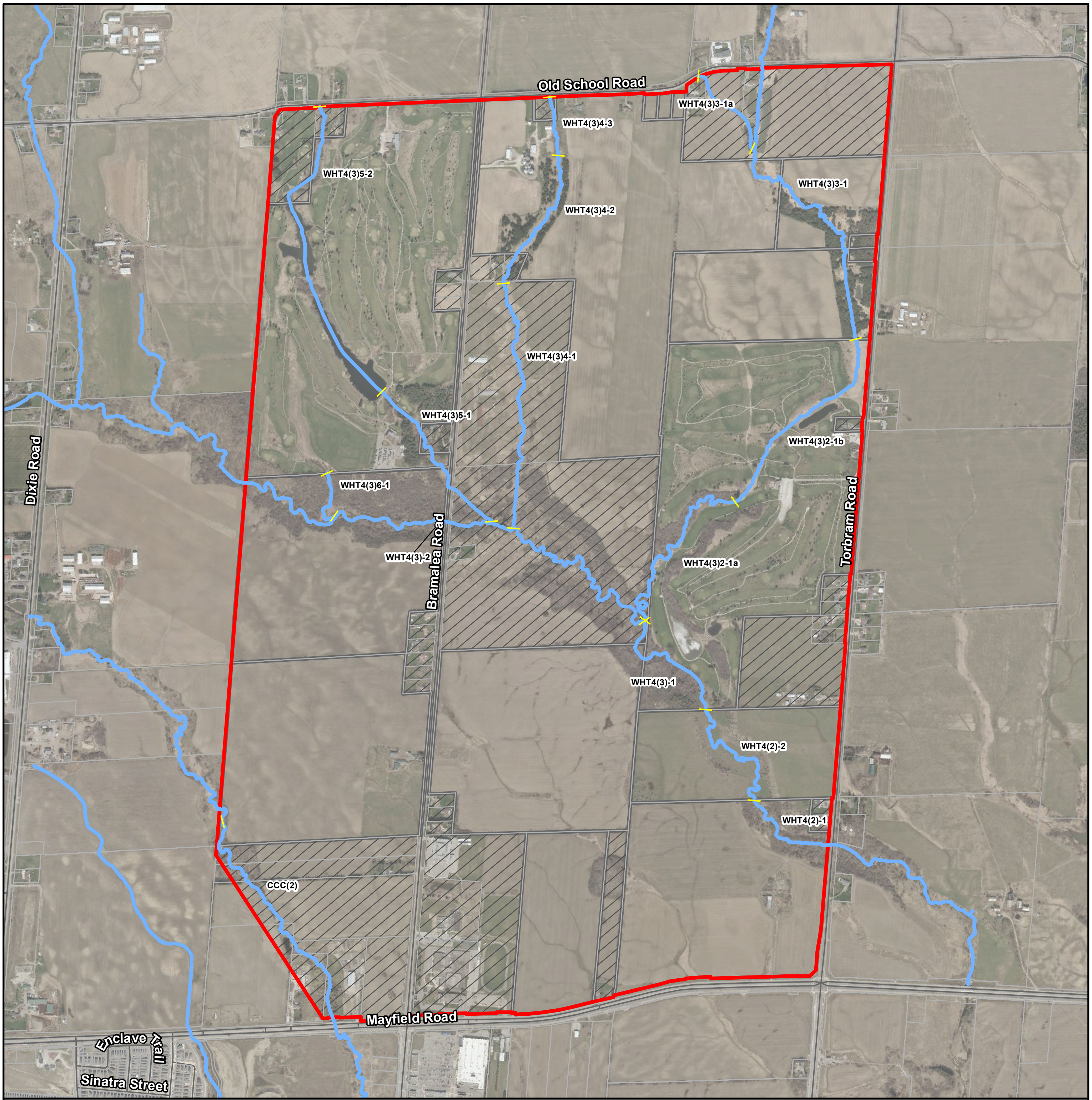
Appendix C1 – Figures

Appendix C2 – Historical Record

Appendix C3 – Photo Record

Appendix C4 – Tables

Appendix C1 – Figures



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Legend

🟥 Study Area
▨ Non-Participating Property
☐ Participating Property
— Watercourse (GEI, TRCA 2024)
/ Reach Breaks

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 1
Watercourse Reach Delineation

Reach naming convention, HDF adopted from SABE

0 390 m
1:18,000

N

GEI Consultants

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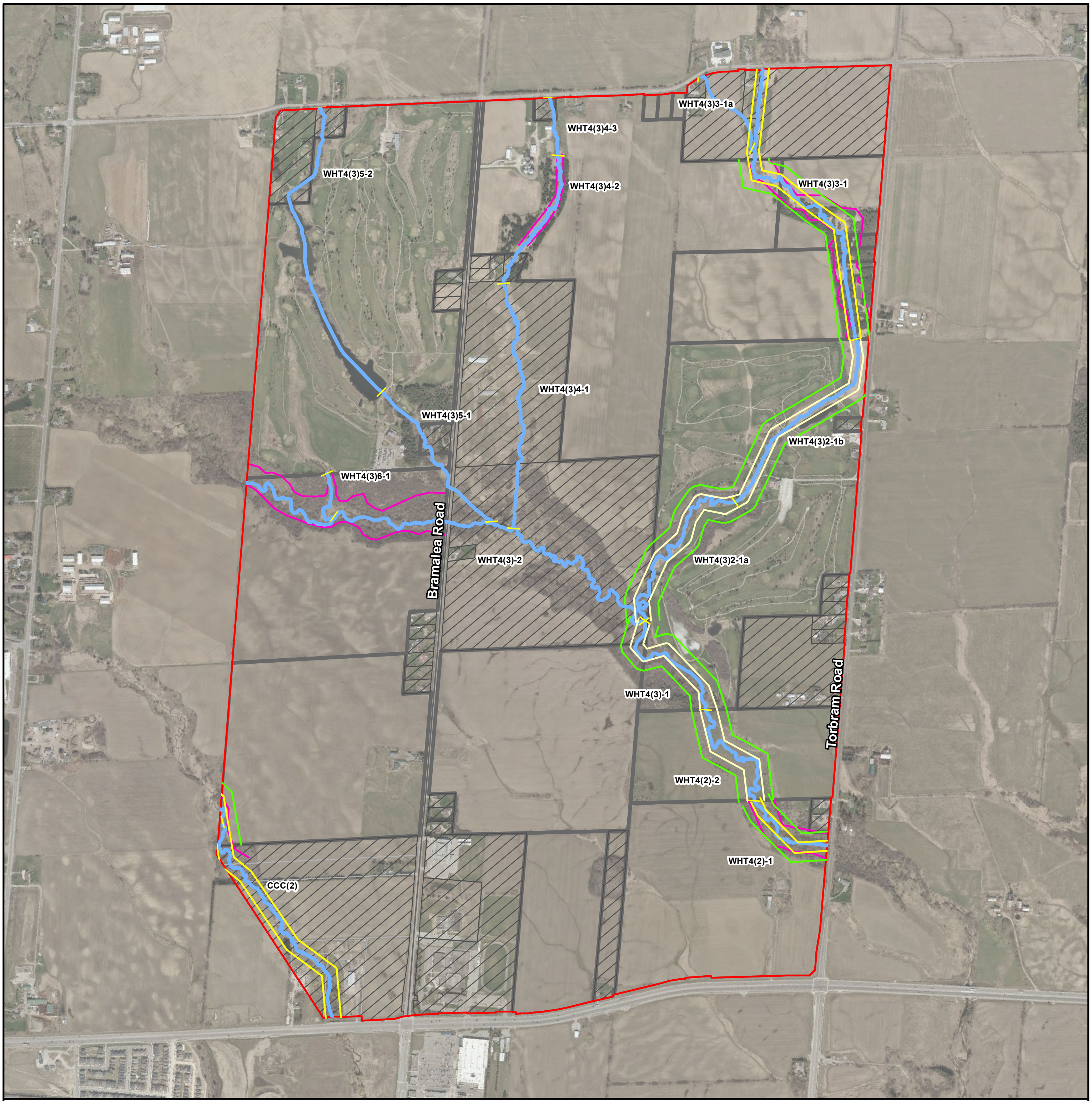

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Legend

- 🟥 Study Area
- ▨ Non-Participating Property
- ☐ Participating Property
- — Watercourse (GEI, TRCA 2024)
- — Toe of Erosion Allowance (GEI 2024)
- — Meander Belt (GEI 2024)
- — Meander Belt (Beacon 2024)
- — Redside Dace Habitat (Preliminary Belt + 30m)

Reach naming convention, HDF adopted from SABE

Project 2400278

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 2
Erosion Hazard Delineation

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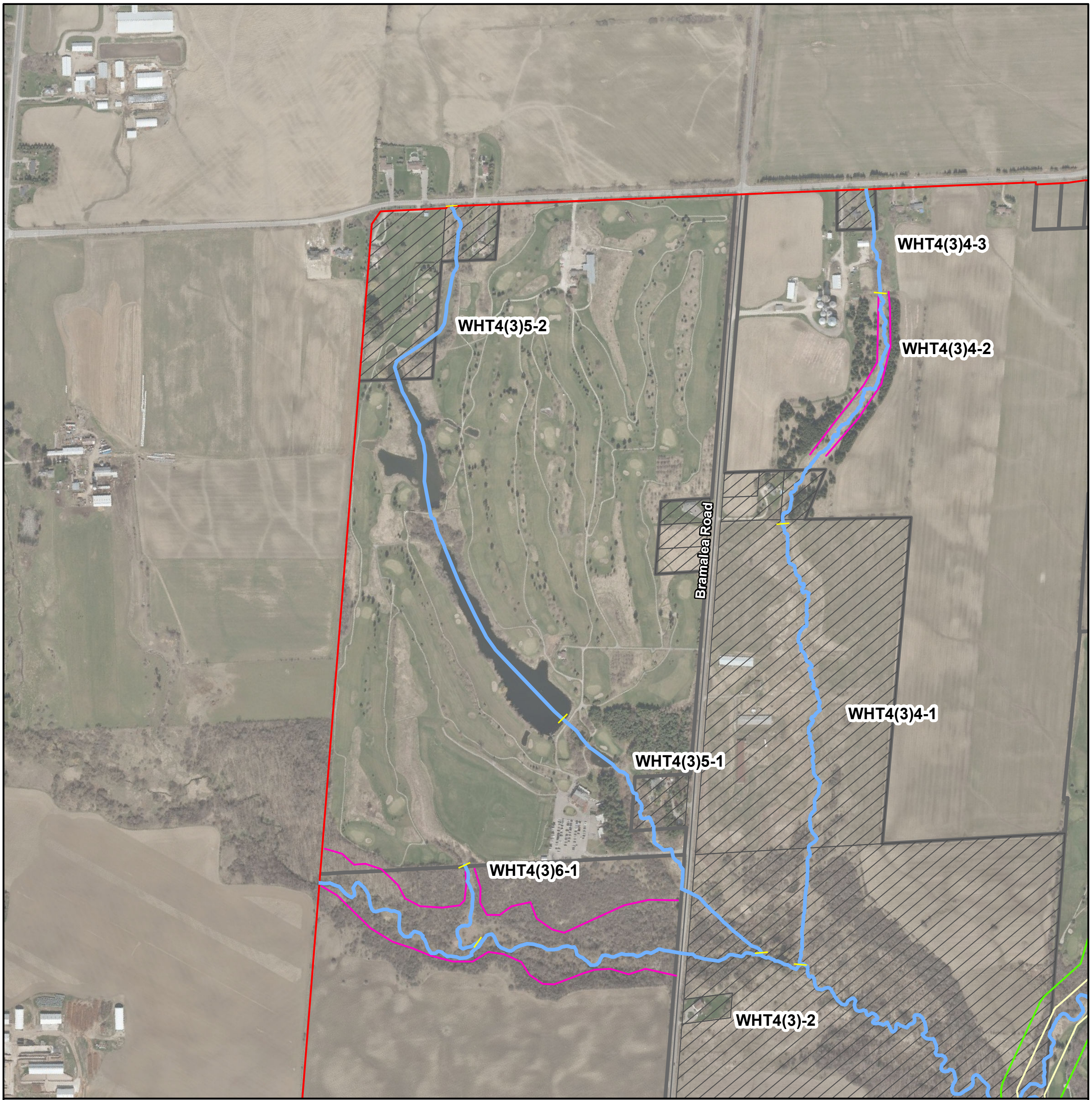

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Reach naming convention, HDF adopted from SABE

Project 2400278

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 2
Erosion Hazard Delineation

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GEI Consultants

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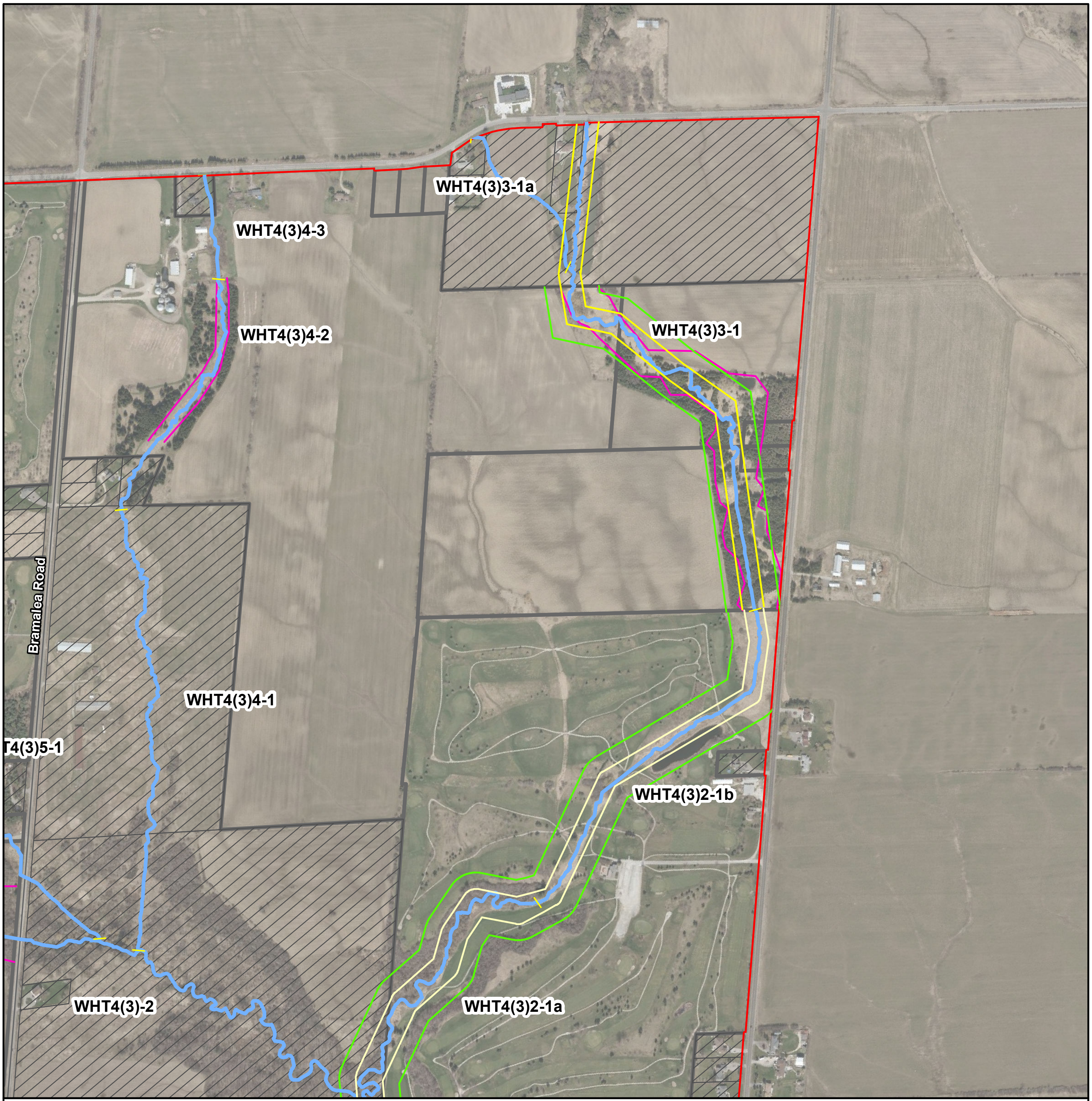

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Legend

- □ Study Area
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- □ Participating Property
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Reach naming convention, HDF adopted from SABE

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 2
Erosion Hazard Delineation

0 220 m
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GEI Consultants

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Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 2
Erosion Hazard Delineation

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Legend

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Reach naming convention, HDF adopted from SABE

0 220 m
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GEI Consultants

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Legend

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Reach naming convention, HDF adopted from SABE

Project 2400278

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 2
Erosion Hazard Delineation

0 220 m
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GEI Consultants

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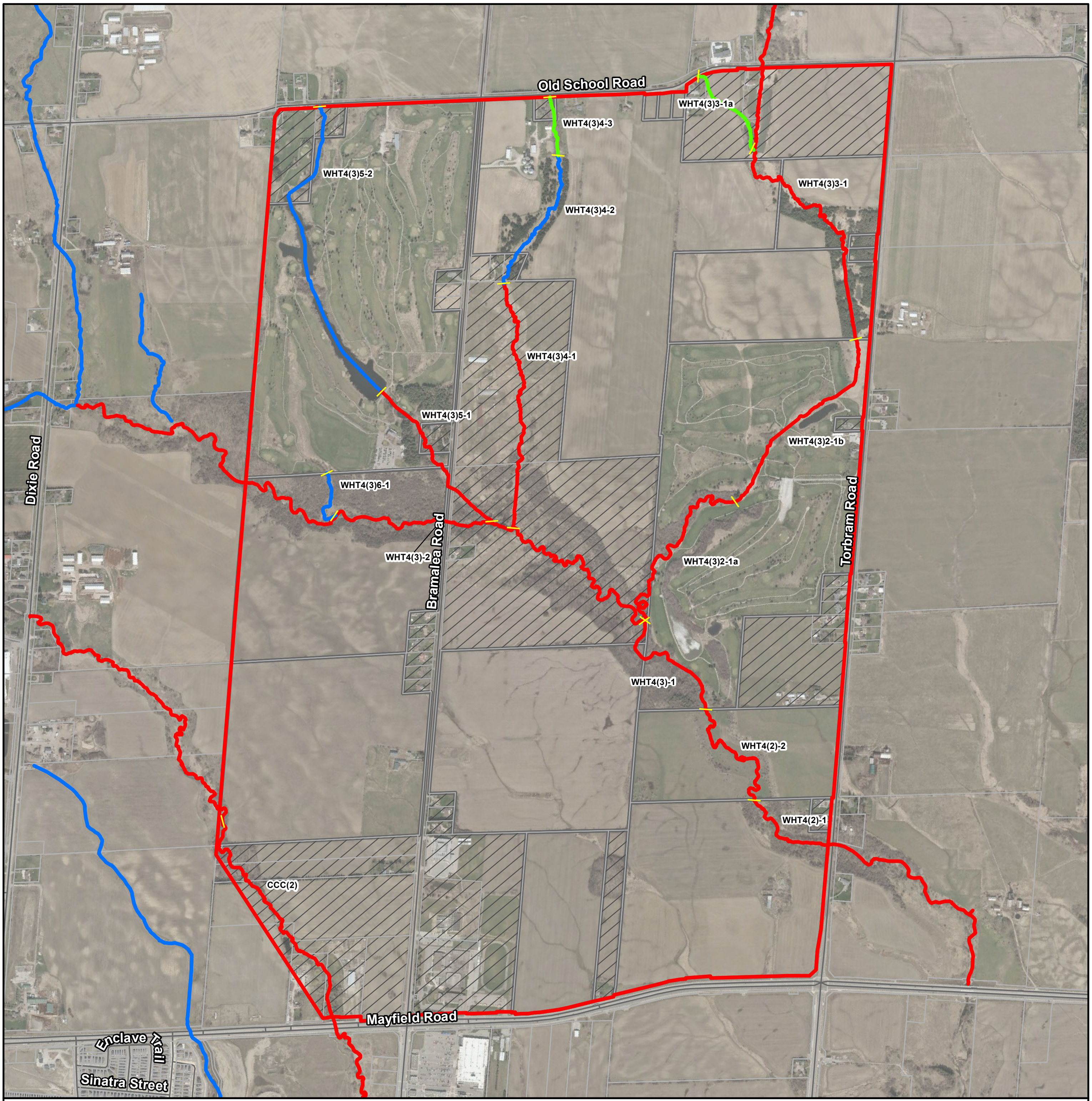

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Legend

🟥 Study Area

▨ Non-Participating Property

☐ Participating Property

Stream Constraints (GEI, TRCA 2024)

🟥 High

🟦 Medium

🟩 Low

/ Reach Breaks

Reach naming convention, HDF adopted from SABE

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

Figure 3
Watercourse Constraint Rankings

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GEI Consultants

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Appendix C2 – Historical Record

Project 2400278

NOTES:

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2. Airphoto Source: University of Toronto Historical Imagery.

Legend

🟥 Study Area

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

1954 AERIAL PHOTOGRAPH

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GEI Consultants

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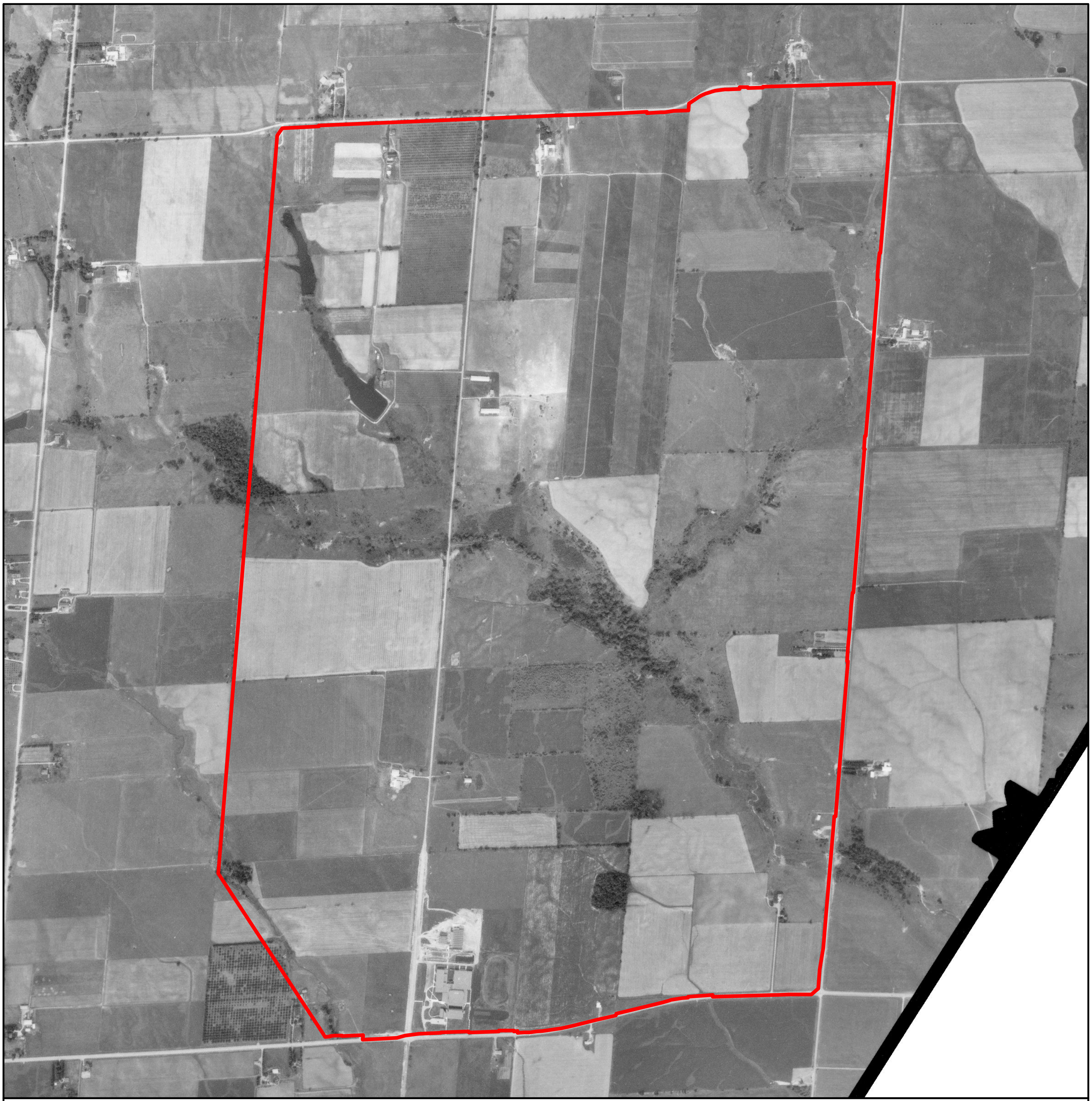

Project 2400278

NOTES:
1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: University of Toronto Historical Imagery.

Legend

🟥 Study Area

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

1970 AERIAL PHOTOGRAPH

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Legend

🟥 Study Area

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

1988 AERIAL PHOTOGRAPH

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1:18,000

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GEI Consultants

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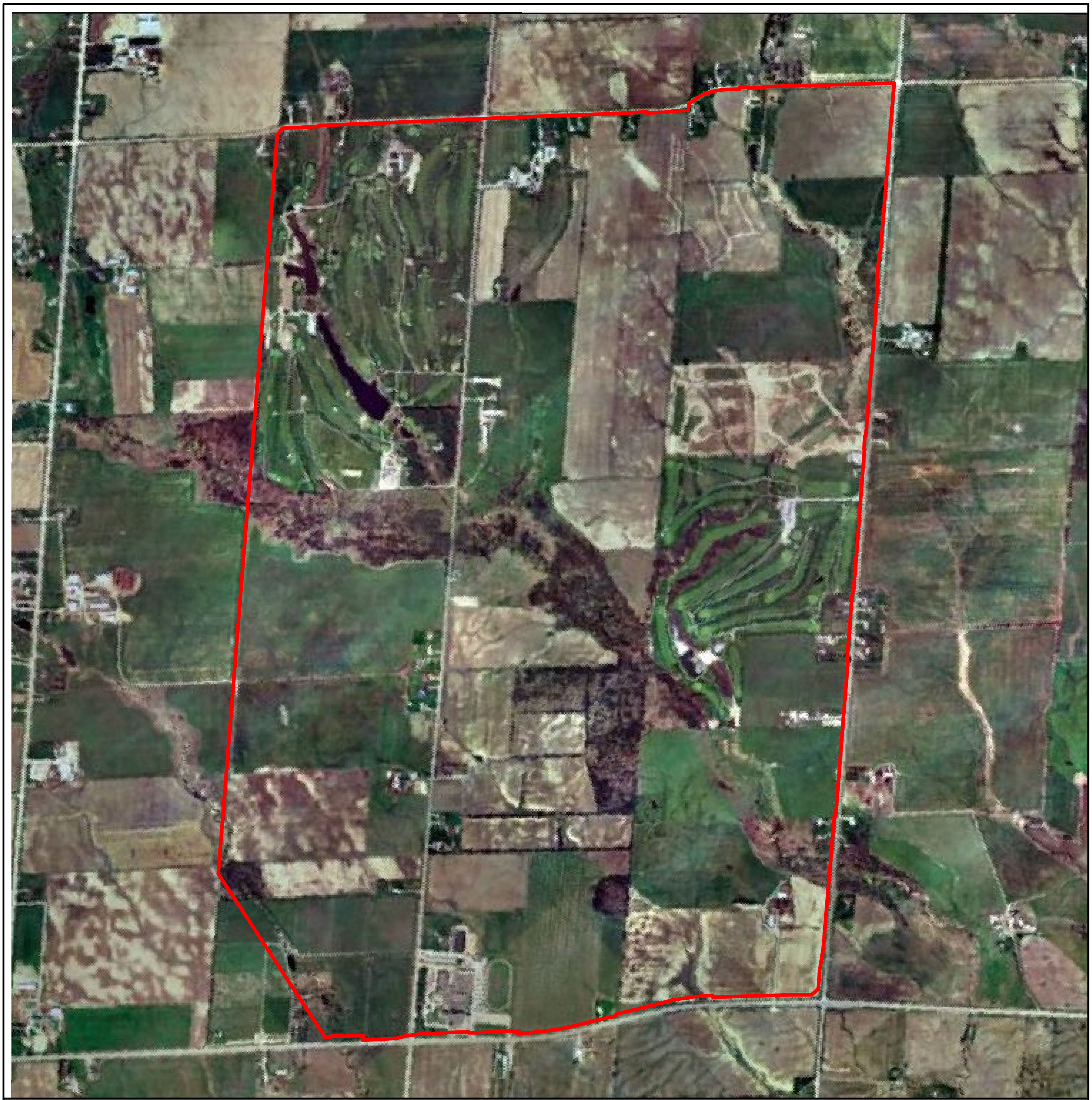

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2. Airphoto Source: First Base Solutions.

Legend

🟥 Study Area

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

2002 AERIAL PHOTOGRAPH

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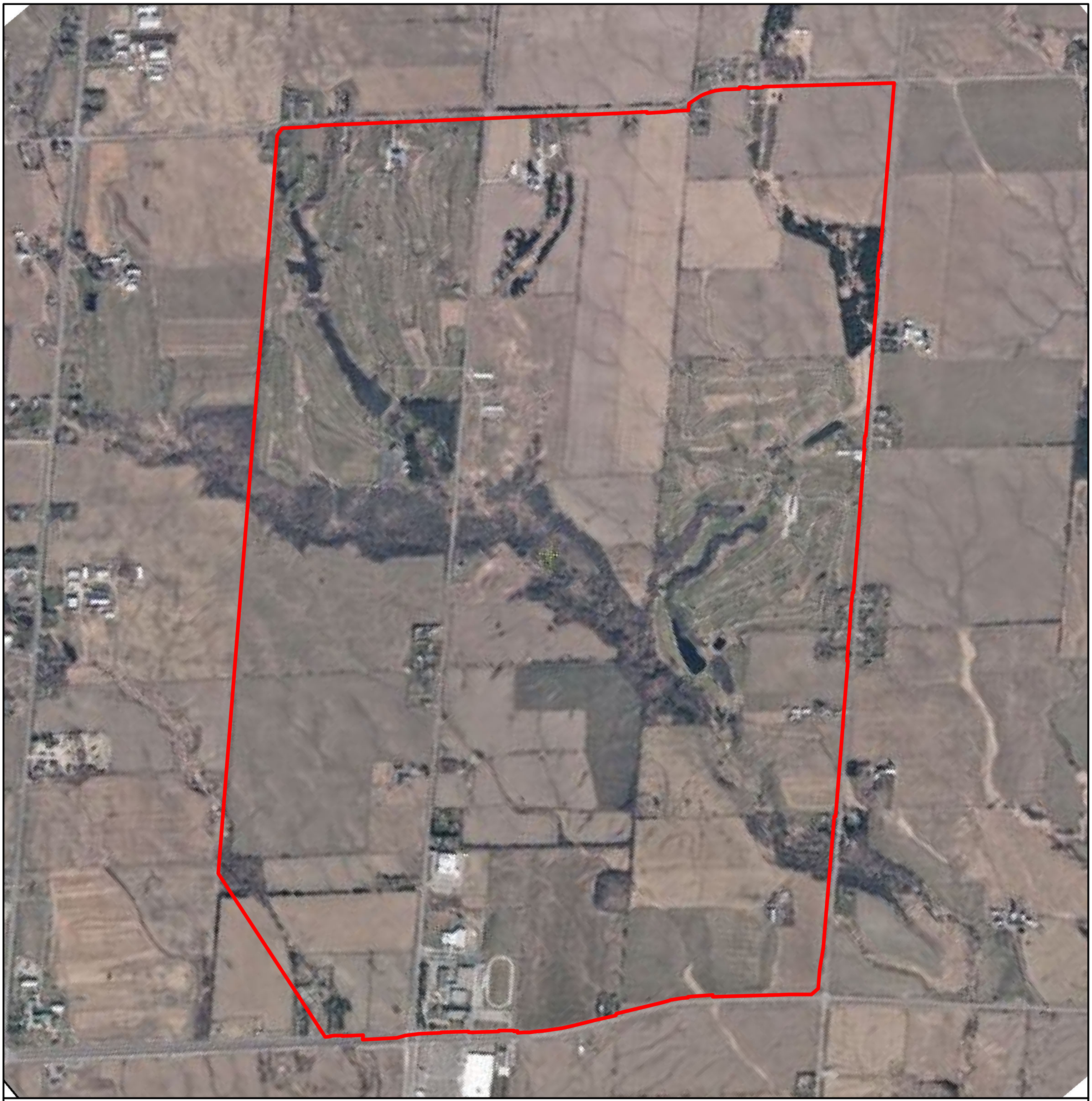

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Legend

🟥 Study Area

Project 2400278

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

2015 AERIAL PHOTOGRAPH

GEI Consultants

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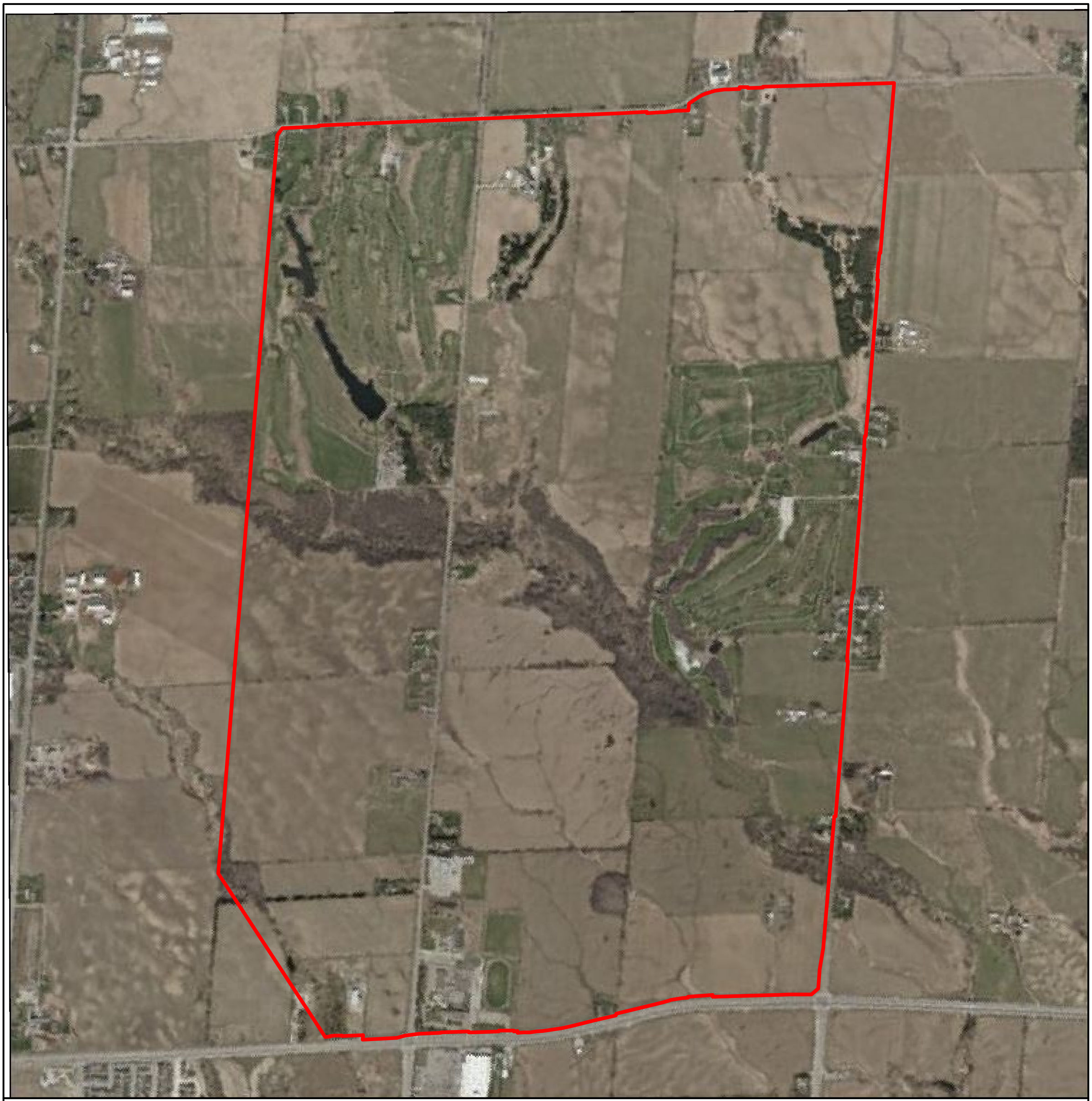

Project 2400278

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Legend

🟥 Study Area

Mayfield Tullamore Landowner Group
Phase 1 - Subwatershed Characterization and Integration Report
Fluvial Geomorphologic Assessment

2022 AERIAL PHOTOGRAPH

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Appendix C3 – Photo Record

Photographic Record

Photo 1 – View of Reach CCC(2) from the top of the valley slope, within the study area.

Photo 2 – Several small drainage features convey flow from surrounding agricultural fields into Reach CCC(2).

Photo 3 – Scour pool at downstream extent of pipe, in Reach WHT4(3)6-1.

Photo 4 – Downstream view of Reach WHT4(3)6-1 from scour pool, shown in Photo 3.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Photo 5 – Anastomosing portion of Reach WHT4(3)-2, upstream view.

Photo 6 – Valley toe impact in Reach WHT4(3)-2, downstream view.

Photo 7 – Series of ponds in Reach WHT4(3)5-2.

Photo 8 – Upstream view of diffuse wetland in Reach WHT4(3)5-1, downstream of Reach WHT4(3)5-2 pond outlet.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Photo 9 – Upstream extent of uncovered portion of Reach WHT4(3)4-2, downstream of piped portion.

Photo 10 – Downstream view of Reach WHT4(3)4-2. Intermittently defined watercourse heavily vegetated with grass.

Photo 11 – Upstream extent of Reach WHT4(3)3-1, existing as a very sinuous watercourse flowing through grassy meadows.

Photo 12 – Upstream portion of Reach WHT4(3)3-1 flows through a confined valley. Several hairpin meander bends were observed.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Photo 13 – Downstream portion of Reach WHT4(3)3-1, downstream of culvert. Watercourse displays severe degradation / widening.

Photo 14 – Downstream extent of Reach WHT4(3)3-1. Downstream half of reach flows through a cedar forest.

Photo 15 – Reach WHT4(3)2-1 traverses Mayfield Golf Course. Significant basal scour was observed throughout.

Photo 16 – Reach WHT4(3)2-1 flows under several crossings connecting golf cart pathways.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Photo 17 – Downstream portion of Reach WHT4(3)3-1, downstream of culvert. Watercourse displays severe degradation / widening.

Photo 18 – Downstream extent of Reach WHT4(3)3-1. Downstream half of reach flows through a cedar forest.

Photo 19 – Reach WHT4(3)2-1 traverses Mayfield Golf Course. Significant basal scour was observed throughout.

Photo 20 – Reach WHT4(3)2-1 flows under several crossings connecting golf cart pathways.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Photo 21 – Reach WHT4(3)2-1 flows through a woodlot downstream of Mayfield Golf Course. Valley toe impacts are common.

Photo 22 – Downstream extent of Reach WHT4(3)2-1 at its confluence with the tributary flowing from the west.

Photo 23 – Upstream extent of Reach WHT4(3)-1, downstream of confluence depicted in Photo 22.

Photo 24 – Downstream extent of Reach WHT4(3)-1 flowing from the woodlot into an open pasture.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Photo 25 – Downstream view of Reach WHT4(2)-2's upstream extent.

Photo 26 – Reach WHT4(2)-2's central portion, meandering through a confined, grassy pasture.

Photo 27 – Reach WHT4(2)-2 widens significantly shortly upstream of its downstream extent.

Photo 28 – Reach WHT4(2)-2's downstream extent as it flows into a woodlot.

Photo 29 – Reach WHT4(2)-1's upstream extent, flowing from an open pasture into a woodlot.

Photo 30 – Cutoff channels present in central portion of Reach WHT4(2)-1.

Photo 31 – Several treefalls were observed throughout Reach WHT4(2)-1.

Photo 32 – Downstream extent of Reach WHT4(2)-1.

APPENDIX C3

Fluvial Geomorphic Assessment

Phase 1 – Subwatershed Characterization and Integration Report

Mayfield Tullamore Landowner Group

March 26th – March 28th

PHOTOGRAPHIC RECORD

GEI Consultants

Appendix C4 – Tables

Table 1: Watercourse Constraint Evaluation

Reach Name	Constraint Ranking from SABE	Integrated Multi-Disciplinary SWS Assessment					
		Surface Water (Hydrology)	Geomorphology	Aquatic Resources (Fisheries)	Hydrogeology (Groundwater)	Terrestrial/Riparian	SWS Constraint Ranking
WHT4(2)-1*	High	High	High	High	High	High	High
WHT4(2)-2*	High	High	High	High	High	High	High
WHT4(3)-1	High	High	High	High	High	High	High
WHT4(3)-2	High	High	High	High	High	High	High
WHT4(3)2-1 a*	High	High	High	High	High	High	High
WHT4(3)2-1 b*	High	High	High	High	High	High	High
WHT4(3)3-1	Medium	High	High	High	High	High	High
WHT4(3)3-1a[1]	Low	Low	Low	Low	Low	Low	Low
WHT4(3)4-1[1]	High	Medium	High	High	High	High	High
WHT4(3)4-2*	Low	Medium	Medium	Medium	Medium	Medium	Medium
WHT4(3)4-3*	Low	Low	Low	Low	Low	Low	Low
WHT4(3)5-1	High	High	High	High	High	High	High
WHT4(3)5-2	Medium	Medium	Medium	Medium	Medium	High[2]	Medium
WHT4(3)6-1	Medium	Low	Medium	Medium	Medium	Medium	Medium
CCC(2)	High	High	High	High	High	High	High

Notes

1 These reaches were located in non-participating properties within the Study Area; multidisciplinary constraints assessments are based on desktop assessments only.

2 Met significant wildlife habitat within created golf course ponds that are highly disturbed and would benefit from ecological interventions. Technically this meets the high constraint criteria; however, it is recommended that this criteria does not drive the ultimate watercourse constraint ranking given the historical and ongoing alteration of the watercourse.

* Reaches have been subdivided or revised from the SABE Phase 2 Part B Appendix C for the SWS.

APPENDIX D – Hydrology and Hydraulics

Appendix D1 – Tables

Appendix D2 – Figures

Appendix D3 – Hydrology and Hydraulics Model

Appendix D4 – Relevant Excerpts

Appendix D1 – Tables

Table D1-1 - Undersized Structures within Secondary Plan Area

Undersized Structure	Intersecting Road	Structure Shape	Structure Size (m)
Campbell's Crk-512.088	Bramalea Road	Box	Span: 4.9 Rise: 1.8
		Box	Span: 1.4 Rise: 2.0
Campbell's Crk-507.641	Mayfield Road	Box	Span: 10.67 Rise: 2.44
Campbell's TribA-807.008	Torbram Road	Ellipse	Span: 8 Rise: 4.4
Campbell's TribA-806.128	Mayfield Road	Arch	Span: 8.42 Rise: 3.69

Table D1-2 - Hydrology and Hydraulics Peak Flow Summary

WHZ1 HEC-RAS Model Flow Updates

Watercourse	HEC-RAS River	HEC-RAS Reach	HEC-RAS River Station	VO ADDHYD/ NASHYD Number (Existing SCS Model)	VO Aerial Reduction Factor	HEC-RAS Regional Flow (m^3/s)	SCS VO Regional Flow (m^3/s)
West Humber Tributary 4(3)5-1	CamTribP South	Reach 1	1009.95	8	Hazel1000	8.375	6.427
West Humber Tributary 4(3)5-1	CamTribP North	Reach 1	668.98	9	Hazel1000	4.123	5.336
West Humber Tributary 4(3)5-1	Campbell TribP	Reach 1A/1B	1432.02/671.06	9	Hazel1000	11.008	13.473
West Humber Tributary 4(3)5-1	Campbell TribP	Reach 1C	512.07	14	Hazel1000	14.023	17.66
West Humber Tributary 4(3)4-2	Campbell TribO	Reach 1	1993.51	7	Hazel1000	5.97	8.427
West Humber Tributary 4(3)4-2	Campbell TribO	Reach 1	1148.69	15	Hazel1000	7.383	10.312
West Humber Tributary 4(3)4-2	Campbell TribO	Reach 1	301.74	18	Hazel1000	9.285	10.269
West Humber Tributary 4(3)2-1	Campbell TribJ	Reach 2	988.33	22	Hazel1000	54.935	53.367
West Humber Tributary 4(3)2-1	Campbell TribJ	Reach 1	867.84	24	Hazel1000	61.629	60.173

West HEC-RAS Model Flow Updates

Watercourse	HEC-RAS River	HEC-RAS Reach	HEC-RAS River Station	VO ADDHYD/ NASHYD Number (Existing SCS Model)	VO Aerial Reduction Factor	TRCA VO Regional Flow (m^3/s)	HEC-RAS Regional Flow (m^3/s)	SCS VO Regional Flow (m^3/s)
West Humber Tributary 4(2)-1	Campbell's TripA	Reach 3	812.543	794	Hazel1000	68.502	68.502	68.447
West Humber Tributary 4(2)-1	Campbell's TripA	Reach 3	810.603	1124	Hazel992	94.581	94.581	95.809
West Humber Tributary 4(2)-1	Campbell's TripA	Reach 3	809.18	732	Hazel992	95.498	95.498	96.884
West Humber Tributary 4(2)-1	Campbell's TripA	Reach 3	808.382	732	Hazel992	156.302	156.302	159.535
West Humber Tributary 4(2)-1	Campbell's TripA	Reach 3	808.212	1734	Hazel982	161.447	161.446	164.859
West Humber Tributary 4(2)-1	Campbell's TripA	Reach 3	806.107	1734	Hazel971	159.381	159.371	162.761

Appendix D2 – Figures

APPROXIMATE LOCATION OF
EXISTING 350mm DIAMETER
CSP CULVERT

EXISTING 17.7m LONG - 8.0m WIDE
BY 4.4m HIGH CONCRETE ELLIPTICAL
CULVERT @ 0.5%
W INV. = 232.08m
E INV. = 231.99m

MAYFIELD TULLAMORE
LANDOWNER GROUP

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

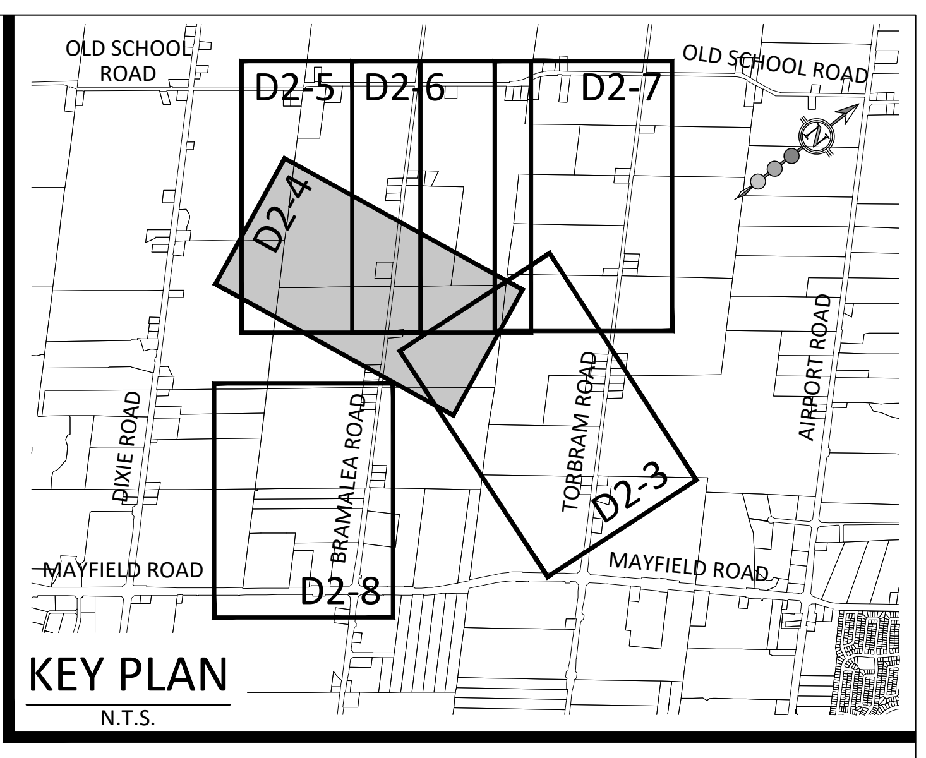
▬ ▬ ▬	LIMIT OF SECONDARY PLAN
● ● ● ●	EXISTING REGULATORY FLOODLINE (SCS)
- - - -	EXISTING REGULATORY FLOODLINE +10m BUFFER (SCS)
🟩	GREENBELT
→	WATERCOURSE
247.00	EXISTING CONTOUR
▬	HEC CROSS-SECTION
- - -	EXISTING CULVERT

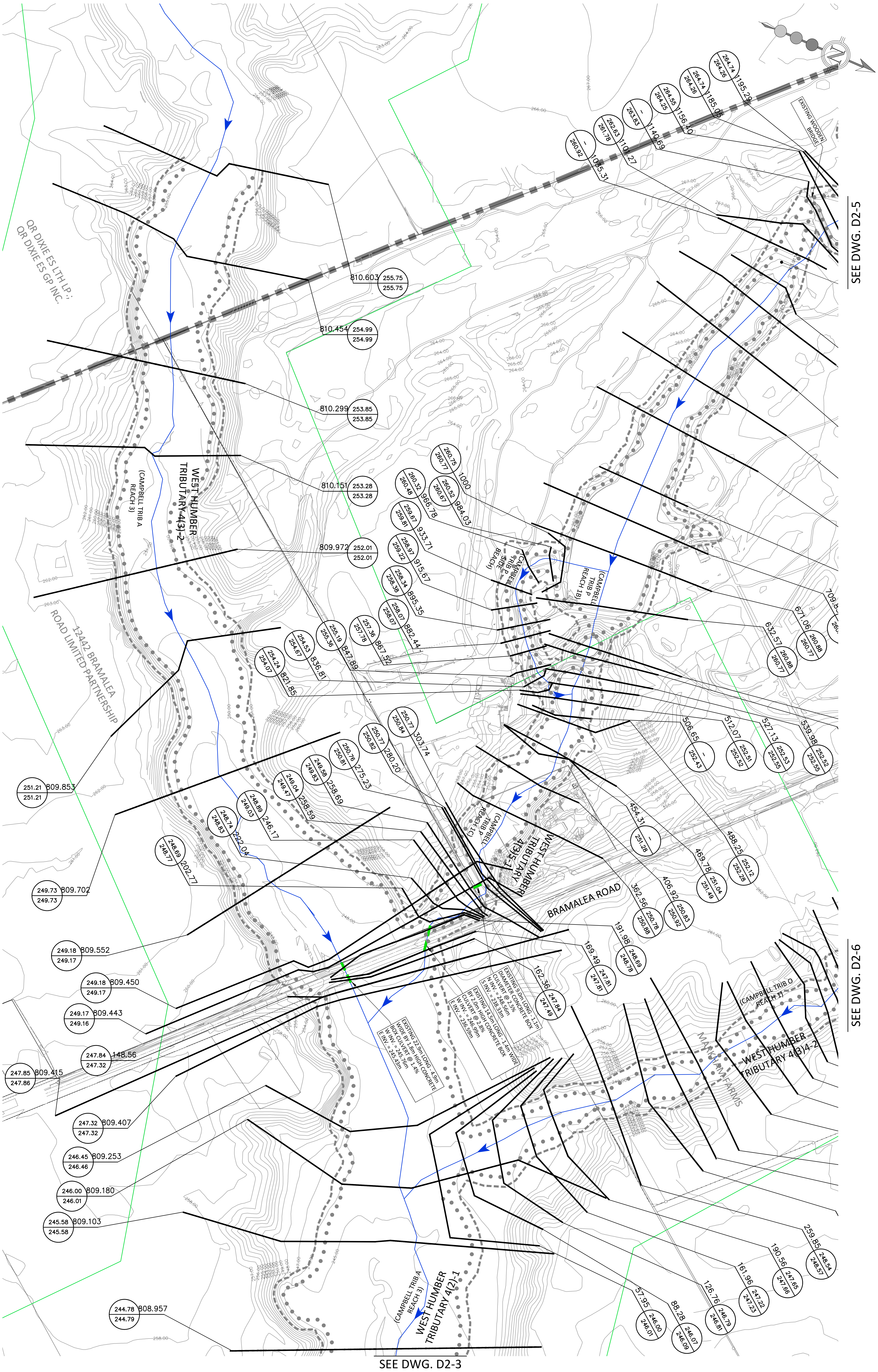
262.39 / 2745 / 262.39
- TRCA EXISTING REGULATORY FLOOD ELEVATION
- HYDRAULIC SECTION ID
- FLOODLINE ELEVATION LEADER
- SCS EXISTING REGULATORY FLOOD ELEVATION

LOCAL SUBWATERSHED
STUDY

EXISTING
FLOODPLAIN MAPPING

DESIGNED BY: C.M.D.
CHECKED BY: N.D.M.
SCALE: 1:2000
DATE: AUGUST 2024
PROJECT No: 2699
FIGURE No: D2-3





MAYFIELD TULLAMORE
LANDOWNER GROUP

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▬ ▬	LIMIT OF SECONDARY PLAN
● ● ● ●	EXISTING REGULATORY FLOODLINE (SCS)
- - - -	EXISTING REGULATORY FLOODLINE +10m BUFFER (SCS)
─	GREENBELT
→	WATERCOURSE
247.00	EXISTING CONTOUR
━	HEC CROSS-SECTION
- - -	EXISTING CULVERT
262.39	TRCA EXISTING REGULATORY FLOOD ELEVATION
2745	HYDRAULIC SECTION ID
	FLOODLINE ELEVATION LEADER
262.39	SCS EXISTING REGULATORY FLOOD ELEVATION

LOCAL SUBWATERSHED
STUDY

DESIGNED BY: C.M.D.
CHECKED BY: N.D.M.
SCALE: 1:2000
DATE: AUGUST 2024

EXISTING
FLOODPLAIN MAPPING

PROJECT No: 2699
FIGURE No: D2-4

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-FLOD-D2-3-8.dwg - Revised by <JNELLAS> : Wed, Aug 21 2024 - 5:09pm

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LANDOWNER GROUP

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
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TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▬ ▬	LIMIT OF SECONDARY PLAN
● ● ●	EXISTING REGULATORY FLOODLINE (SCS)
- - -	EXISTING REGULATORY FLOODLINE +10m BUFFER (SCS)
🟩	GREENBELT
➤	WATERCOURSE
247.00	EXISTING CONTOUR
▬	HEC CROSS-SECTION
- - -	EXISTING CULVERT
262.39	TRCA EXISTING REGULATORY FLOOD ELEVATION
2745	HYDRAULIC SECTION ID
	FLOODLINE ELEVATION LEADER
262.39	SCS EXISTING REGULATORY FLOOD ELEVATION

LOCAL SUBWATERSHED
STUDY

DESIGNED BY: C.M.D.
CHECKED BY: N.D.M.
SCALE: 1:2000
DATE: AUGUST 2024

EXISTING
FLOODPLAIN MAPPING

PROJECT No: 2699
FIGURE No: D2-5

EXISTING 21.2m LONG 600mmØ HDPE
CULVERT @ 3.0%
W INV. = 269.58m
E INV. = 268.94m

EXISTING 9.0m LONG - 1.1m
DIAMETER CONCRETE BOX
CULVERT @ 2.5%
N INV. = 248.56m
S INV. = 238.33m

EXISTING 14.5m LONG - 1.4m WIDE
BY 2.0m HIGH CONCRETE BOX
CULVERT @ 2.8%
W INV. = 246.99m
E INV. = 236.59m

EXISTING 22.9m LONG - 4.9m
WIDE BY 1.8m HIGH CONCRETE
BOX CULVERT @ 1.4%
W INV. = 245.76m
E INV. = 245.43m

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LANDOWNER GROUP

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30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▬ ▬	LIMIT OF SECONDARY PLAN
● ● ●	EXISTING REGULATORY FLOODLINE (SCS)
- - -	EXISTING REGULATORY FLOODLINE +10m BUFFER (SCS)
🟩	GREENBELT
→	WATERCOURSE
247.00	EXISTING CONTOUR
▬	HEC CROSS-SECTION
- - -	EXISTING CULVERT
262.39	TRCA EXISTING REGULATORY FLOOD ELEVATION
2745	HYDRAULIC SECTION ID
	FLOODLINE ELEVATION LEADER
262.39	SCS EXISTING REGULATORY FLOOD ELEVATION

LOCAL SUBWATERSHED
STUDY

DESIGNED BY: C.M.D.
CHECKED BY: N.D.M.
SCALE: 1:2000
DATE: AUGUST 2024

EXISTING
FLOODPLAIN MAPPING

PROJECT No: 2699
FIGURE No: D2-6

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-FLOD-D2-3-8.dwg - Revised by <JNELLAS> : Wed, Aug 21 2024 - 5:09pm

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MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▪ ▪ ▬	LIMIT OF SECONDARY PLAN
● ● ● ●	EXISTING REGULATORY FLOODLINE (SCS)
- - - -	EXISTING REGULATORY FLOODLINE +10m BUFFER (SCS)
🟩	GREENBELT
➤	WATERCOURSE
247.00	EXISTING CONTOUR
▬	HEC CROSS-SECTION
- - -	EXISTING CULVERT
262.39	TRCA EXISTING REGULATORY FLOOD ELEVATION
2745	HYDRAULIC SECTION ID
	FLOODLINE ELEVATION LEADER
262.39	SCS EXISTING REGULATORY FLOOD ELEVATION

LOCAL SUBWATERSHED STUDY

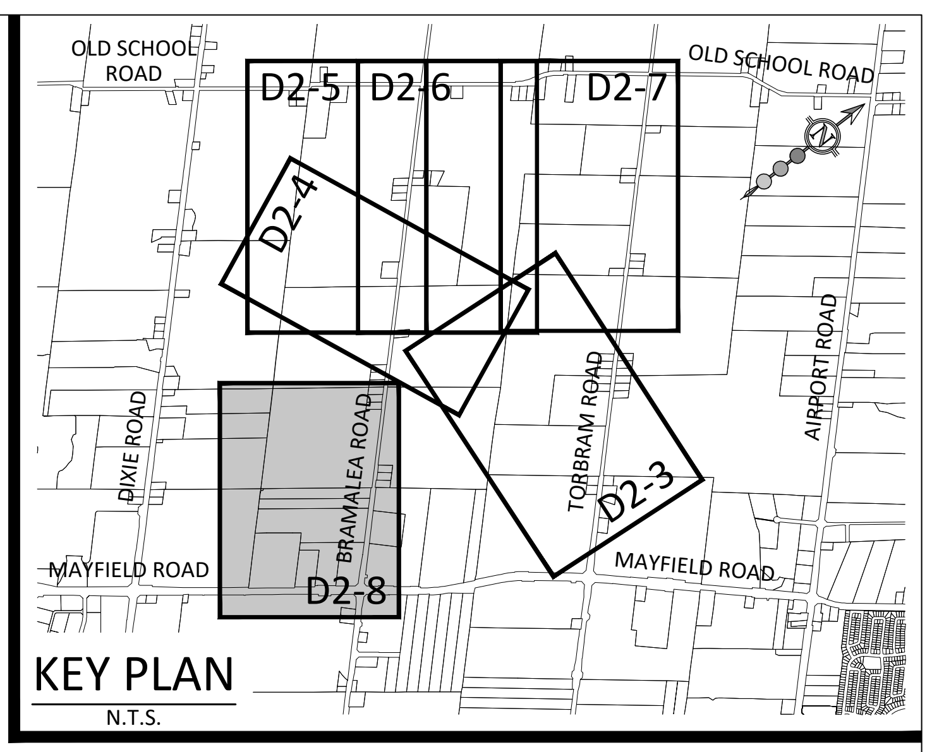
EXISTING FLOODPLAIN MAPPING

DESIGNED BY:	C.M.D.	CHECKED BY:	N.D.M.
SCALE:	1:2000	DATE:	AUGUST 2024

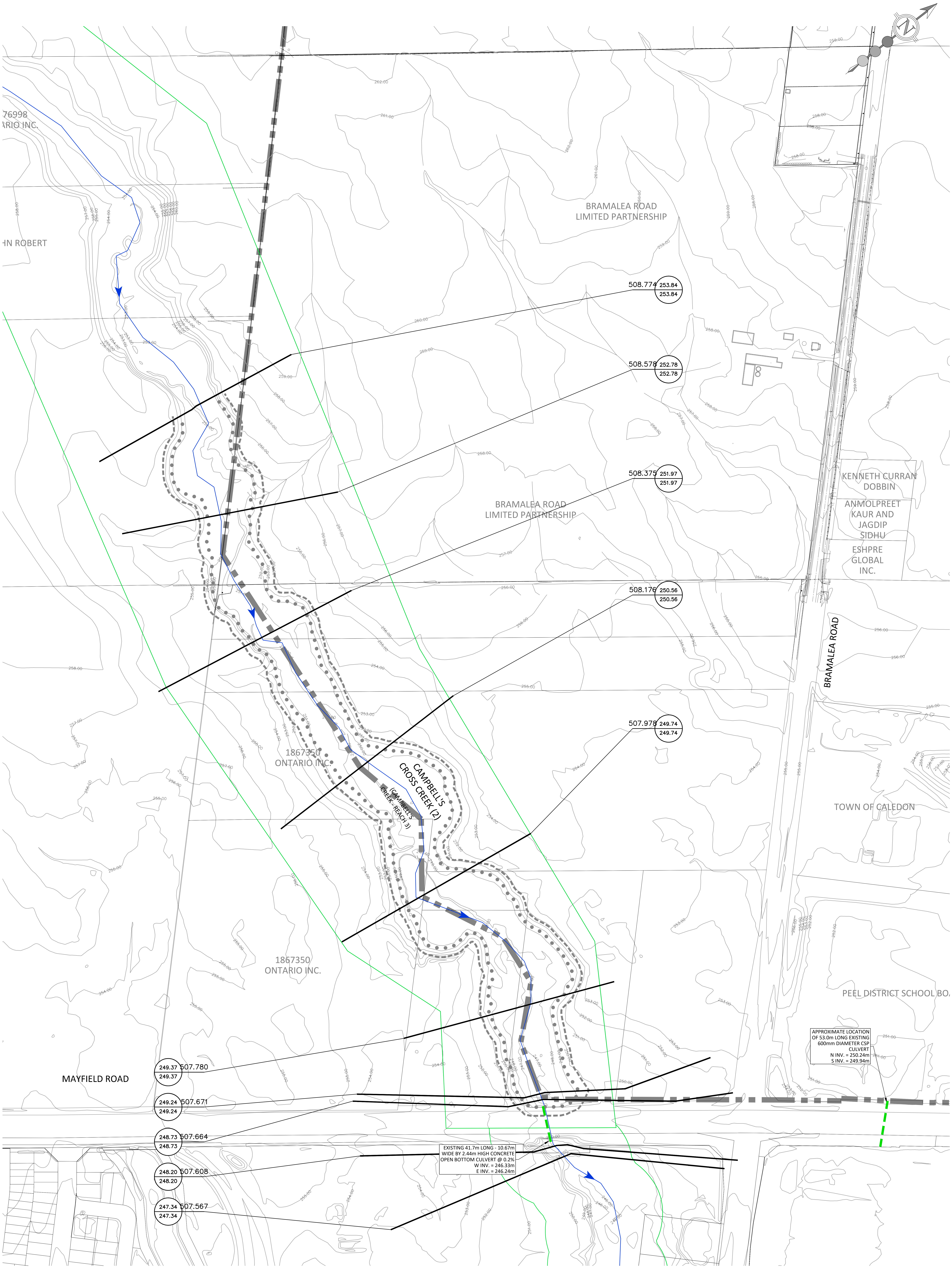
PROJECT No: 2699

FIGURE No: D2-7

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-FLOD-D2-3-8.dwg - Revised by <JNELLAS> : Wed, Aug 21 2024 - 5:09pm



KEY PLAN
N.T.S.



APPROXIMATE LOCATION
OF 53.0m LONG EXISTING
600mm DIAMETER CSP
CULVERT
N INV. = 250.24m
S INV. = 249.94m

EXISTING 41.7m LONG - 10.67m
WIDE BY 2.44m HIGH CONCRETE
OPEN BOTTOM CULVERT @ 0.2%
W INV. = 246.33m
E INV. = 246.24m

MAYFIELD TULLAMORE
LANDOWNER GROUP

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FAX: (905) 475-8335

LEGEND:

- LIMIT OF SECONDARY PLAN
- EXISTING REGULATORY FLOODLINE (SCS)
- EXISTING REGULATORY FLOODLINE +10m BUFFER (SCS)
- GREENBELT
- WATERCOURSE
- 247.00 EXISTING CONTOUR
- HEC CROSS-SECTION
- EXISTING CULVERT

262.39 / 262.39 2745
- TRCA EXISTING REGULATORY FLOOD ELEVATION
- HYDRAULIC SECTION ID
- FLOODLINE ELEVATION LEADER
- SCS EXISTING REGULATORY FLOOD ELEVATION

LOCAL SUBWATERSHED
STUDY

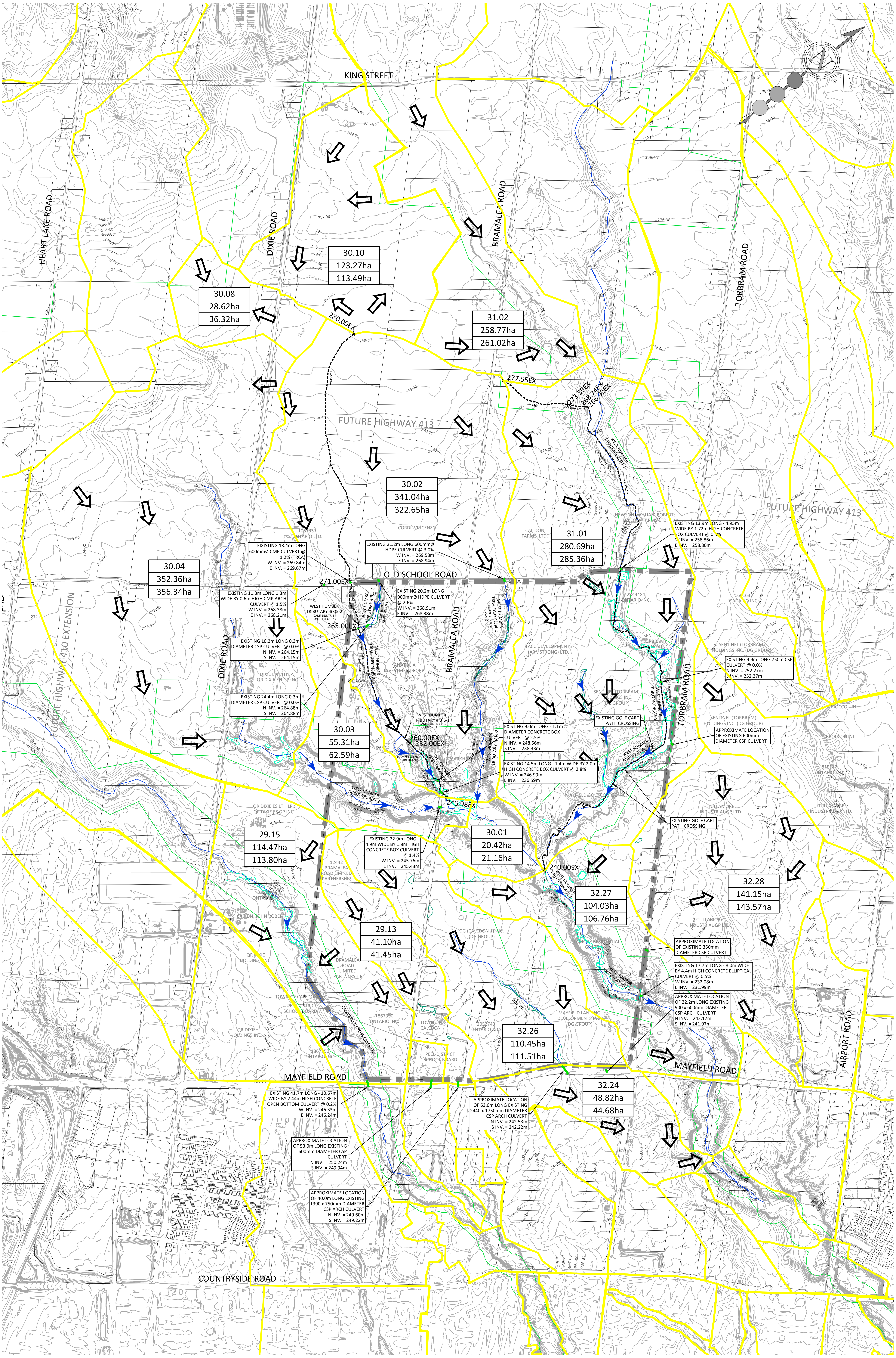
EXISTING
FLOODPLAIN MAPPING

DESIGNED BY:	C.M.D.	CHECKED BY:	N.D.M.
SCALE:	1:2000	DATE:	AUGUST 2024

PROJECT No: 2699

FIGURE No: D2-8

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-FLOD-D2-3-8.dwg - Revised by <JNELLAS> : Wed, Aug 21 2024 - 5:09pm



MAYFIELD TULLAMORE LANDOWNER GROUP

SCS consulting group ltd
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MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

- LIMIT OF SECONDARY PLAN
- WATERCOURSE
- 247.00 EXISTING CONTOUR
- ⇨ OVERLAND FLOW DIRECTION
- HUMBER RIVER HYDROLOGY MODEL BOUNDARY
- GREENBELT
- EXISTING CULVERT
- ×258.93EX EXISTING ELEVATION
- L=434m TIME OF PEAK FLOW PATH AND LENGTH

30.02 — TRCA CATCHMENT ID
100.00ha — TRCA DRAINAGE AREA (HECTARES)
90.00ha — SCS DRAINAGE AREA (MAY 2024) (HECTARES)

LOCAL SUBWATERSHED STUDY

DESIGNED BY: C.M.D.
CHECKED BY: N.D.M.
SCALE: 1:10000
DATE: AUGUST 2024

EXISTING WATERSHED DRAINAGE PLAN

PROJECT No: 2699
FIGURE No: D2-1

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-WATR-SHED-D2-1.dwg – Revised by <JNELLAS> : Thu, Aug 22 2024 – 2:36pm

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LANDOWNER GROUP

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▪ ▪ ▬	LIMIT OF SECONDARY PLAN
▬▬▬	STORM DRAINAGE BOUNDARY
▬▬▬	HUMBER RIVER HYDROLOGY MODEL BOUNDARY
──➤──	WATERCOURSE
247.00	EXISTING CONTOUR
L=771m - - - -	TIME TO PEAK
────	GREENBELT
- - - -	CULVERT
48.88ha	DRAINAGE AREA (HECTARES)
301	CATCHMENT ID
⇨	OVERLAND FLOW DIRECTION
30.02	TRCA CATCHMENT ID
100.00ha	TRCA DRAINAGE AREA (HECTARES)
90.00ha	SCS DRAINAGE AREA (MAY 2024) (HECTARES)

LOCAL SUBWATERSHED STUDY

LOCAL TRIBUTARY STORM DRAINAGE PLAN

DESIGNED BY: C.M.D.
CHECKED BY: N.D.M.
SCALE: 1:6000
DATE: AUGUST 2024
PROJECT No: 2699
FIGURE No: D2-2

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-WATR-SHED-D2-2.dwg – Revised by <JNELLAS> : Thu, Aug 22 2024 – 2:35pm

Appendix D3 – Hydrology and Hydraulics Model

DIGITAL MODELLING FILES

The following secure link is being provided by **SCS Consulting Group** to share Mayfield Tullamore Landowner Group related digital data:

https://filesafecloud.scsconsultinggroup.com/url/bjfbgix2duex2cak

Please click on the link and download all files from this location.

Hydrology Models - Visual Otthymo
Hydraulic Models - HEC RAS

Mayfield Tullamore Landowner Group
Project Number: 2699
Date: August 2024
Designer Initials: L.S

Existing Conditions
VO6 Parameter Summary

Proposed SCS Catchments
NASHYD

Number	**101**	**102**	**103**	**104**	**105**	**106**	**201**	**202**	**203**	**301, 302, & 305**	**303 & 304**	**30.02**	**31.01**
Description													
DT(min)	5	5	5	5	5	5	5	5	5	5	5	5	5
Area (ha)	37.17	34.08	58.05	26.02	28.51	14.93	98.13	22.56	3.20	102.15	183.20	322.65	285.36
CN_{II}*	95.0	95.0	95.0	88.0	84.0	70.0	98.0	72.0	10.6	92.0	90.0	90.0	88.0
CN_{III}*	98.0	98.0	98.0	95.0	93.0	85.0	99.0	86.0	23.0	97.0	96.0	96.0	95.0
IA(mm)	7.8	7.7	7.5	5.6	5.7	7.3	7.9	8.1	8.0	7.6	7.9	7.4	7.4
TP Method	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands
TP (hr)	1.33	1.46	1.33	0.21	0.83	0.21	1.57	0.31	0.08	1.25	1.84	1.97	2.19

NOTE: Area, CN_{III}*, IA, and TP values for Catchments 30.02 and 31.01 modified in TRCA Humber River Model

TRCA Model Catchment Modifications
Existing NASHYDs in TRCA Humber River Model

Number	**464**	**466**	**468**	**470**	**471**	**475**	**477**	**479**	**480**	**481**	**505**	**507**	**508**	**509**
Description	29.13	29.15	30.01	30.03	30.04	30.08	30.10	31.02	31.03	31.04	32.24	32.26	32.27	32.28
DT(min)	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TRCA Area (ha)	41.10	114.47	20.42	55.31	352.36	28.62	123.27	258.77	316.89	138.58	48.82	110.45	104.03	141.15
SCS Area (ha)	41.45	113.80	21.16	62.59	356.34	36.32	113.49	261.02	-	-	44.68	111.51	106.76	143.57
CN_{II}*	95	88	78	78	89	88	90	83	86	84	88	89	86	91
CN_{III}*	98	94	89	89	95	94	95	92	93	92	94	95	93	96
IA(mm)	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TP Method	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model	TRCA Model
TP (hr)	1.42	1.66	0.68	1.42	3.05	0.49	1.63	3.98	2.03	1.96	1.15	1.80	1.80	1.52

Existing Conditions
CN Calculations

Site Soils: per Agricultural Soils Map Dated January 2024

Soil Type	Hydrologic Soil Group
Clay Loam	C

TABLE OF CURVE NUMBERS (CN's)**										
Land Use		Hydrologic Soil Type							Manning's 'n'	Source
		A	AB	B	BC	C	CD	D		
Meadow	"Good"	30	44	58	64.5	71	74.5	78	0.40	MTO
Woodlot	"Fair"	36	48	60	66.5	73	76	79	0.40	MTO
Gravel		76	80.5	85	87	89	90	91	0.30	USDA
Lawns	"Good"	39	50	61	67.5	74	77	80	0.25	USDA
Pasture/Range		58	61.5	65	70.5	76	78.5	81	0.17	MTO
Crop		66	70	74	78	82	84	86	0.13	MTO
Fallow (Bare)		77	82	86	89	91	93	94	0.05	MTO
Low Density Residences		57	64.5	72	76.5	81	83.5	86	0.25	USDA
Streets, paved		98	98	98	98	98	98	98	0.01	USDA

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. USDA (1986), Urban Hydrology for Small Watersheds, Table 2.2-Runoff Curve Numbers for Urban Areas

HYDROLOGIC SOIL TYPE (%)								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
101					100			100
102					100.0			100
103					100.0			100
104					100.0			100
105					100.0			100
106	31.9				68.1			100
201					100.0			100
202	22.3				77.7			100
203	100.0							100
301, 302, & 305	0.5				99.5			100
303 & 304					100.0			100
30.02	1.5				98.5			100
31.01	0.2				99.8			100

LAND USE (%)										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
101	0.5		0.0	0.3		96.3			2.9	100.0
102	1.3			6.9		90.3			1.4	100.0
103	2.7	1.6	0.4	12.2		80.6			2.5	100.0
104	7.7	4.0	0.4	52.0		21.1			14.8	100.0
105	24.7	2.6	1.3	65.9					5.5	100.0
106	26.1	40.4	1.2	17.5					14.8	100.0
201	11.7	8.6	1.0			75.5			3.2	100.0
202	74.6	8.5				15.1			1.9	100.0
203	100.0									100.0
301, 302, & 305	2.9	3.0		14.5		78.6			1.0	100.0
303 & 304	12.2	18.6	0.5	8.1		56.8			3.9	100.0
30.02	14.4	5.9	0.6	13.8		60.9			4.4	100.0
31.01	15.1	21.5	0.5	22.6		35.4			4.9	100.0

Note: Where STANDHYD command used (shaded), impervious fraction is not considered in CN determination, since %Imp directly input in STANDHYD command

CURVE NUMBER (CN)										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Weighted CN
101	0.3	0.0	0.0	0.3	0.0	79.0	0.0	0.0	2.8	82
102	0.9	0.0	0.0	5.1	0.0	74.1	0.0	0.0	1.4	82
103	1.9	1.2	0.4	9.1	0.0	66.1	0.0	0.0	2.4	81
104	5.5	2.9	0.4	38.4	0.0	17.3	0.0	0.0	14.5	79
105	17.5	1.9	1.2	48.8	0.0	0.0	0.0	0.0	5.4	75
106	15.1	24.7	1.0	11.0	0.0	0.0	0.0	0.0	14.5	66
201	8.3	6.3	0.9	0.0	0.0	61.9	0.0	0.0	3.1	81
202	46.1	5.5	0.0	0.0	0.0	11.9	0.0	0.0	1.8	65
203	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30
301, 302, & 305	2.1	2.2	0.0	10.7	0.0	64.4	0.0	0.0	1.0	80
303 & 304	8.6	13.5	0.4	6.0	0.0	46.6	0.0	0.0	3.9	79
30.02	10.2	4.3	0.5	10.1	0.0	49.8	0.0	0.0	4.3	79
31.01	10.7	15.7	0.4	16.7	0.0	29.0	0.0	0.0	4.8	77

** AMC II assumed

P:\2699 Mayfield Tullamore Landowner Group\Design\SWM\MESP\Hydrology\VO6\SCS Modified VO Model (TRCA)\2699-VO Model Parameters Pre.xlsm

SCS consulting group ltd

Existing Conditions
CN Calculations

Mayfield Tullamore Landowner Group
Project Number: 2699
Date: August 2024
Designer Initials: L.S

Step	Input Values														
Step	Subcatchment:	101		102	103	104	105	106	201	202	203	301, 302, & 305	303 & 304	30.02	31.01
1	**CN (AMC II):**	**82**		**82**	**81**	**79**	**75**	**66**	**81**	**65**	**30**	**80**	**79**	**79**	**77**
	Calibration Factor:	1.1		1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	Calibrated CN (AMC II):	**90.2**		**90.2**	**89.1**	**86.9**	**82.5**	**72.6**	**89.1**	**71.5**	**33**	**88**	**86.9**	**86.9**	**84.7**
2	CN (AMC III) =	96		96	96	94	92	86	96	86	53.11406578	95	94	94	93
3	100 Year Precipitation, P =	88.54	mm	88.54	88.54	88.54	88.54	88.54	88.54	88.54	88.54	88.54	88.54	88.54	88.54

NOTE: CN (AMC II) calibrated per the Humber River Hydrology Report (June 2015) Table 2.12

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S} \qquad S = \frac{(P - Ia)^2}{Q} - (P - Ia)$$

Q = rainfall excess or runoff, mm
S = potential maximum retention or available storage, mm

$$CN = \frac{25400}{S + 254} \qquad S = \frac{25400}{CN} - 254$$

CN* = modified SCS curve # that better reflects Ia conditions in Ontario

	Output Values														
	Subcatchment:	101		102	103	104	105	106	201	202.00	203.00	301, 302, & 305	303 & 304	30	31
	S_{III} =	10.58	mm	10.58	10.58	16.21	22.09	41.35	10.58	41.35	224.22	13.37	16.21	16.21	19.12
	SCS Assumption of 0.2 S = Ia =	2.12	mm	2.12	2.12	3.24	4.42	8.27	2.12	8.27	44.84	2.67	3.24	3.24	3.82
4	Q_{III} =	76.99	mm	76.99	76.99	71.67	66.63	52.98	76.99	52.98	7.13	74.30	71.67	71.67	69.12
	Preferred Initial Abstraction, Ia =	7.8	mm	7.7	7.5	5.6	5.7	7.3	7.9	8.1	8.0	7.6	7.9	7.4	7.4
5	S^*_{III} =	3.91	mm	4.03	4.27	13.02	20.21	43.29	3.79	41.78	829.62	7.28	10.13	10.71	14.07
6	CN^*_{III} =	98.48	mm	98.44	98.35	95.12	92.63	85.44	98.53	85.87	23.44	97.22	96.16	95.95	94.75
	CN^*_{III}=	**98**	Rounded	**98**	**98**	**95**	**93**	**85**	**99**	**86**	**23**	**97**	**96**	**96**	**95**
7	**CN^*_{II}=**	**95**	convert	**95**	**95**	**88**	**84**	**70**	**98**	**72**	**11**	**92**	**90**	**90**	**88**

Explanation of Procedure

1 Determine CN based on typical AMC II conditions (attached)
2 Convert CN from AMC II to AMC III conditions (standard SCS tables)
3 Get precipitation depth P for 100 year storm
4 Using CN_{III} with Ia = 0.2S, compute Q_{III} for 100 year precipitation
5 For the same Q_{III}, compute S^*_{III} using Ia=1.5mm (or otherwise determined)
6 Compute CN^*_{III} using S^*_{III}
7 Calculate CN^*_{II} using SCS conversion table

Existing Conditions
IA Calculations

LAND USE (%)

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
101	0.5		0.0	0.3		96.3			2.9	100.0
102	1.3			6.9		90.3			1.4	100.0
103	2.7	1.6	0.4	12.2		80.6			2.5	100.0
104	7.7	4.0	0.4	52.0		21.1			14.8	100.0
105	24.7	2.6	1.3	65.9					5.5	100.0
106	26.1	40.4	1.2	17.5					14.8	100.0
201	11.7	8.6	1.0			75.5			3.2	100.0
202	74.6	8.5				15.1			1.9	100.0
203	100.0									100.0
301, 302, & 305	2.9	3.0		14.5		78.6			1.0	100.0
303 & 304	12.2	18.6	0.5	8.1		56.8			3.9	100.0
30.02	14.4	5.9	0.6	13.8		60.9			4.4	100.0
31.01	15.1	21.5	0.5	22.6		35.4			4.9	100.0

IA VALUES (mm)

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
IA (mm)	8	10	2	5	8	8	3	2	2	
101	0.0		0.0	0.0		7.7			0.1	7.8
102	0.1			0.3		7.2			0.0	7.7
103	0.2	0.2	0.0	0.6		6.5			0.0	7.5
104	0.6	0.4	0.0	2.6		1.7			0.3	5.6
105	2.0	0.3	0.0	3.3					0.1	5.7
106	2.1	4.0	0.0	0.9					0.3	7.3
201	0.9	0.9	0.0			6.0			0.1	7.9
202	6.0	0.8				1.2			0.0	8.1
203	8.0									8.0
301, 302, & 305	0.2	0.3		0.7		6.3			0.0	7.6
303 & 304	1.0	1.9	0.0	0.4		4.5			0.1	7.9
30.02	1.2	0.6	0.0	0.7		4.9			0.1	7.4
31.01	1.2	2.2	0.0	1.1		2.8			0.1	7.4

* IA values based on TRCA guidelines

SCS consulting group ltd

Existing Conditions
Time to Peak Calculations

Mayfield Tullamore Landowner Group
Project Number: 2699
Date: August 2024
Designer Initials: L.S

Uplands Method:

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Land Cover Type	Velocity (m/s)	Time of Concentration (s)	Time of Concentration (hr)	Time to Peak (hr)	Calibration Factor	Calibrated Time to Peak
101a	279.65	265.98	1888	0.72	Cultivated Straight Row	0.24	7928.5	2.20	1.48	0.9	1.33
101									**1.48**		**1.33**
102a	280.00	271.00	1642	0.55	Cultivated Straight Row	0.21	7921.5	2.20	1.47	0.9	1.33
102b	271.00	265.86	255	2.02	Pasture	0.31	821.6	0.23	0.15	0.9	0.14
102									**1.63**		**1.46**
103a	280.00	271.03	1563	0.57	Cultivated Straight Row	0.21	7371.3	2.05	1.37	0.9	1.23
103b	271.03	264.95	358	1.70	Waterway	0.61	588.1	0.16	0.11	0.9	0.10
103									**1.48**		**1.33**
104a	273.00	261.00	453	2.65	Pasture	0.36	1274.2	0.35	0.24	0.9	0.21
104									**0.24**		**0.21**
105a	275.00	257.00	1087	1.66	Pasture	0.28	3876.0	1.08	0.72	0.9	0.65
105b	257.00	254.83	174	1.25	Woodland	0.17	1026.5	0.29	0.19	0.9	0.17
105c	254.83	252.00	73	3.86	Waterway	0.91	81.0	0.02	0.02	0.9	0.01
105									**0.93**		**0.83**
106a	262.86	252.00	246	4.41	Pasture	0.46	534.7	0.15	0.10	0.9	0.09
106b	252.00	246.98	382	1.31	Waterway	0.54	710.2	0.20	0.13	0.9	0.12
106									**0.23**		**0.21**
201a	280.00	270.00	1767	0.57	Cultivated Straight Row	0.21	8390.8	2.33	1.56	0.9	1.41
201b	270.00	261.95	560	1.44	Waterway	0.56	997.0	0.28	0.19	0.9	0.17
201									**1.75**		**1.57**
202a	267.17	254.18	560	2.32	Cultivated Straight Row	0.42	1318.1	0.37	0.25	0.9	0.22
202b	254.18	248.97	325	1.60	Waterway	0.59	548.9	0.15	0.10	0.9	0.09
202									**0.35**		**0.31**
203a	260.26	247.29	191	6.79	Cultivated Straight Row	0.72	263.6	0.07	0.05	0.9	0.04
203b	247.29	246.28	101	1.00	Waterway	0.47	214.3	0.06	0.04	0.9	0.04
203									**0.09**		**0.08**
301, 302, & 305a	272.00	255.36	1418	1.17	Cultivated Straight Row	0.30	4683.8	1.30	0.87	0.9	0.78
301, 302, & 305b	255.36	246.00	454	2.06	Waterway	0.67	679.0	0.19	0.13	0.9	0.11
301, 302, & 305c	246.00	240.00	843	0.71	Waterway	0.40	2107.5	0.59	0.39	0.9	0.35
301, 302, & 305									**1.39**		**1.25**
303 & 304a	277.55	273.59	440	0.90	Woodland	0.14	3067.1	0.85	0.57	0.9	0.51
303 & 304b	273.59	268.74	236	2.06	Cultivated Straight Row	0.40	590.0	0.16	0.11	0.9	0.10
303 & 304c	268.74	266.92	19	9.58	Woodland	0.47	40.7	0.01	0.01	0.9	0.01
303 & 304d	266.92	246.00	2924	0.72	Waterway	0.40	7291.6	2.03	1.36	0.9	1.22
303 & 304									**2.05**		**1.84**
30.02a	280.00	271.00	1642	0.55	Cultivated Straight Row	0.21	7919.0	2.20	1.47	0.9	1.33
30.02b	271.00	265.00	272	2.21	Pasture	0.32	839.2	0.23	0.16	0.9	0.14
30.02c	265.00	260.00	807	0.62	Waterway	0.37	2157.3	0.60	0.40	0.9	0.36
30.02d	260.00	252.00	20	40.00	Waterway	2.80	7.1	0.00	0.00	0.9	0.00
30.02e	252.00	246.98	434	1.16	Waterway	0.51	858.2	0.24	0.16	0.9	0.14
30.02									**2.19**		**1.97**
31.01a	277.55	273.59	440	0.90	Woodland	0.14	3067.1	0.85	0.57	0.9	0.51
31.01b	273.59	268.74	236	2.06	Cultivated Straight Row	0.40	590.0	0.16	0.11	0.9	0.10
31.01c	268.74	266.92	19	9.58	Woodland	0.47	40.7	0.01	0.01	0.9	0.01
31.01d	266.92	240.00	3767	0.71	Waterway	0.40	9399.1	2.61	1.75	0.9	1.57
31.01									**2.44**		**2.19**

NOTE: Time to Peak calibrated per the Humber River Hydrology Report (June 2015) Table 2.12

HEC-RAS Plan: SCS Modified   River: Campbell's Crk   Reach: Reach3   Profile: Regional

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)	
Reach3	508.774 29.15-08	Regional	74.18	251.58	253.84		254.00	0.003664	2.64	62.62	46.53	0.60
Reach3	508.578 29.15-07	Regional	74.18	250.83	252.78		253.08	0.008099	3.76	52.02	54.24	0.89
Reach3	508.375 29.15-06	Regional	74.18	250.08	251.97		252.09	0.003806	2.43	74.44	69.50	0.60
Reach3	508.176 29.15-05	Regional	74.18	248.79	250.56	250.56	250.89	0.011519	3.81	50.58	69.46	1.02
Reach3	507.978 29.15-04	Regional	74.18	247.83	249.74	248.90	249.79	0.001758	1.67	101.33	75.48	0.41
Reach3	507.780 29.15-03	Regional	74.18	246.81	249.37		249.46	0.001657	1.99	98.07	82.98	0.42
Reach3	507.671 29.15-02	Regional	74.18	246.48	249.24		249.31	0.001091	1.79	106.03	69.13	0.35
Reach3	507.664 29.15-01	Regional	74.18	246.33	248.73	248.33	249.11	0.005064	3.32	36.84	62.72	0.73
Reach3	507.641 x-30 (29.10-15)	Regional	74.18									
Reach3	507.608 29.10-14	Regional	73.46	246.24	248.20	248.20	248.96	0.012749	4.50	24.18	123.03	1.11
Reach3	507.567 29.10-13	Regional	73.46	246.12	247.34		247.39	0.003874	1.82	91.59	103.60	0.57

HEC-RAS Plan: SCS Modified   River: Campbell's TribA   Reach: Reach3   Profile: Regional

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)	
Reach3	810.603 30.03-13	Regional	95.94	254.28	255.75		256.00	0.009447	3.26	66.76	79.20	0.92
Reach3	810.454 30.03-12	Regional	95.94	253.29	254.99		255.13	0.005527	2.80	87.34	91.63	0.72
Reach3	810.299 30.03-11	Regional	95.94	252.39	253.85		254.13	0.008871	3.26	62.54	66.94	0.90
Reach3	810.151 30.03-10	Regional	95.94	251.61	253.28		253.41	0.004080	2.44	89.27	83.12	0.62
Reach3	809.972 30.03-09	Regional	95.94	250.32	252.01	252.01	252.44	0.010735	4.01	54.71	59.88	1.01
Reach3	809.853 30.03-08	Regional	95.94	249.51	251.21		251.38	0.007220	3.30	76.55	75.83	0.83
Reach3	809.702 30.03-07	Regional	95.94	248.16	249.73	249.73	250.10	0.011719	3.97	59.58	72.28	1.05
Reach3	809.552 30.03-06	Regional	95.94	246.66	249.17		249.28	0.002040	2.08	110.30	97.82	0.45
Reach3	809.450 30.03-05	Regional	95.94	245.97	249.17	247.95	249.19	0.000323	1.03	232.10	138.93	0.19
Reach3	809.443 30.03-04	Regional	95.94	245.76	249.16	248.41	249.19	0.000351	1.13	235.99	194.84	0.20
Reach3	809.432 x-48 (30.03-03)	Regional	95.94									
Reach3	809.415 30.03-02	Regional	95.94	245.43	247.86	247.86	248.88	0.009505	4.55	22.74	133.11	0.99
Reach3	809.407 30.03-01	Regional	95.94	245.46	247.32		247.55	0.005877	3.04	83.05	107.07	0.75
Reach3	809.253 30.02-01	Regional	95.94	245.19	246.46		246.58	0.006824	2.62	96.53	146.82	0.77
Reach3	809.180 30.01-06	Regional	97.03	245.04	246.01		246.07	0.008742	1.13	92.29	158.82	0.37
Reach3	809.103 30.01-05	Regional	97.03	244.41	245.58		245.67	0.004763	2.14	120.38	180.78	0.64
Reach3	808.957 30.01-04	Regional	97.03	243.66	244.79		244.89	0.007795	2.61	99.67	158.91	0.81
Reach3	808.807 30.01-03	Regional	97.03	242.34	243.81	243.71	243.98	0.008812	3.25	92.38	144.39	0.89
Reach3	808.655 30.01-02	Regional	97.03	240.90	242.66	242.64	242.92	0.009028	3.63	80.31	116.62	0.92
Reach3	808.507 30.01-01	Regional	97.03	240.24	241.72		241.91	0.007544	2.85	78.47	108.97	0.81
Reach3	808.438 31.01-01	Regional	97.03	239.61	241.58		241.61	0.003166	1.00	130.47	154.34	0.24
Reach3	808.382 32.27-22	Regional	159.56	239.52	241.21	241.09	241.38	0.007623	3.20	140.24	170.78	0.84
Reach3	808.212 32.27-21	Regional	164.99	238.59	240.75	240.38	240.83	0.002865	2.38	193.39	166.55	0.54
Reach3	808.059 32.27-20	Regional	164.99	237.66	240.02		240.28	0.005161	3.28	125.41	115.79	0.72
Reach3	807.908 32.27-19	Regional	164.99	237.18	239.43		239.58	0.003873	2.90	138.86	92.74	0.64
Reach3	807.688 32.27-18	Regional	164.99	236.31	238.93		239.06	0.002649	2.65	152.89	90.34	0.54
Reach3	807.608 32.27-17	Regional	164.99	235.89	238.86		238.91	0.001079	1.87	212.06	97.43	0.35
Reach3	807.469 32.27-16	Regional	164.99	235.20	238.78		238.82	0.000536	1.52	247.59	96.93	0.26
Reach3	807.310 32.27-15	Regional	164.99	234.39	238.74		238.77	0.000340	1.34	285.94	94.17	0.21
Reach3	807.161 32.27-14	Regional	164.99	233.37	238.72		238.74	0.000133	0.96	390.89	109.88	0.14
Reach3	807.027 32.27-13	Regional	164.99	232.14	238.71		238.72	0.000071	0.82	532.12	122.60	0.10
Reach3	807.023 32.27-12	Regional	164.99	232.08	238.70	235.15	238.72	0.000095	0.91	418.31	112.53	0.12
Reach3	807.008 x-54 (32.27-11)	Regional	164.99									
Reach3	806.994 32.27-10	Regional	164.99	231.99	234.98	234.98	236.02	0.008528	4.95	47.06	79.53	0.97
Reach3	806.988 32.27-09	Regional	164.99	231.96	234.46		234.83	0.004731	3.22	94.62	74.39	0.70
Reach3	806.861 32.27-08	Regional	164.99	231.15	233.80	233.46	234.16	0.006743	4.44	95.06	57.87	0.88
Reach3	806.717 32.27-07	Regional	164.99	230.70	232.53	232.53	232.98	0.012361	4.48	89.40	86.33	1.10

HEC-RAS Plan: SCS_Modified   Profile: Regional

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)	
Reach3	856.27	Regional	49.04	259.60	261.60		261.62	0.002206	0.79	79.43	78.12	0.20
Reach3	840.79	Regional	49.04	258.97	261.60		261.60	0.000652	0.50	122.57	88.21	0.10
Reach3	838.1	Regional	49.04	258.86	261.59	260.64	261.60	0.000762	0.58	117.15	89.70	0.11
Reach3	829.53 hum_225	Regional	49.04									
Reach3	821.23	Regional	49.04	258.80	260.66	260.66	261.42	0.062293	3.90	12.87	65.16	0.94
Reach3	811.11	Regional	49.04	258.77	260.60		260.66	0.008790	1.41	47.64	59.54	0.34
Reach3	789.13	Regional	49.04	258.97	260.29		260.37	0.010984	1.78	43.72	60.03	0.58
Reach3	745.53	Regional	49.04	258.66	259.67	259.67	259.84	0.014851	2.06	29.21	75.96	0.76
Reach3	685.45	Regional	49.04	258.25	259.27		259.34	0.004224	0.79	42.36	74.01	0.29
Reach3	639.73	Regional	49.04	257.78	258.99		259.12	0.006260	1.20	33.56	61.95	0.45
Reach3	572.78	Regional	49.04	257.51	258.79		258.84	0.002929	0.96	46.77	70.38	0.33
Reach3	535.73	Regional	50.78	257.21	258.68		258.74	0.002967	0.80	46.92	62.45	0.25
Reach3	475.27	Regional	50.78	257.04	258.43		258.50	0.005875	1.66	56.84	78.19	0.50
Reach3	370.35	Regional	50.78	256.24	257.98		258.02	0.004500	1.23	62.69	72.09	0.33
Reach3	261.27	Regional	50.78	255.63	257.27		257.40	0.013037	2.29	37.81	48.46	0.62
Reach3	155.95	Regional	50.78	254.72	256.24		256.31	0.009042	1.65	50.87	75.59	0.48
Reach3	123.74	Regional	50.78	254.66	256.08		256.12	0.004382	1.17	66.54	82.75	0.34
Reach3	45.53	Regional	50.78	254.05	255.28	255.28	255.51	0.037940	3.04	29.94	63.24	1.00
Reach2	988.33	Regional	57.11	253.41	255.31		255.33	0.001987	0.72	104.16	112.07	0.19
Reach2	884.2	Regional	57.11	252.68	255.23		255.24	0.000647	0.52	128.91	77.83	0.11
Reach2	860.39	Regional	57.11	252.45	255.19	254.33	255.21	0.002153	1.04	86.12	73.11	0.21
Reach2	856 hum_755	Regional	57.11									
Reach2	851.25	Regional	57.11	252.30	254.41	254.18	254.52	0.015855	2.25	43.92	61.84	0.52
Reach2	808.64	Regional	57.11	252.14	253.79	253.51	253.90	0.015307	1.77	40.73	50.07	0.50
Reach2	772.24	Regional	57.11	251.96	253.54		253.58	0.005529	1.10	61.40	82.48	0.30
Reach2	669.97	Regional	57.11	251.00	252.51	252.51	252.78	0.011493	3.14	42.57	73.16	0.97
Reach2	566.49	Regional	57.11	249.97	251.61		251.76	0.006610	2.55	49.97	64.29	0.74
Reach2	463.38	Regional	57.11	249.05	251.20		251.27	0.003406	2.22	67.56	65.13	0.53
Reach2	399.55	Regional	57.11	248.75	251.08		251.12	0.001517	1.64	78.28	64.73	0.35
Reach2	382.88	Regional	57.11	248.36	250.94	250.65	251.06	0.002599	2.19	52.45	60.71	0.48
Reach2	380 hum_754	Regional	57.11		250.94		251.06					
Reach2	376.03	Regional	57.11	248.54	250.62	250.62	250.92	0.006843	3.21	39.21	56.37	0.78
Reach2	337.65	Regional	57.11	248.21	250.25		250.33	0.002466	1.93	51.54	54.03	0.45
Reach2	279.27	Regional	57.11	247.57	250.13		250.21	0.001960	1.92	58.70	67.64	0.42
Reach2	212.05	Regional	57.11	247.43	250.04		250.10	0.001451	1.82	64.33	56.05	0.37
Reach2	170.59	Regional	57.11	246.84	249.81		250.01	0.003081	2.55	40.23	41.57	0.52
Reach2	156.28	Regional	57.11	246.76	249.66	249.42	249.94	0.003975	2.78	34.77	40.46	0.59
Reach2	154 hum_753	Regional	57.11		249.66		249.94					
Reach2	150.47	Regional	57.11	246.72	249.16	249.16	249.62	0.008058	3.54	24.74	26.88	0.81
Reach2	121.06	Regional	57.11	246.49	248.75	248.75	249.06	0.006074	3.27	39.09	53.22	0.73
Reach2	52.39	Regional	57.11	245.99	247.91		248.00	0.003013	1.96	46.56	45.45	0.51
Reach2	34.43	Regional	57.11	245.70	247.77		247.94	0.004541	2.59	38.94	42.84	0.62
Reach2	29.6	Regional	57.11	245.57	247.75	247.50	247.91	0.004336	2.49	39.81	44.27	0.60
Reach2	25.76 hum_752	Regional	57.11		247.75		247.91					
Reach2	20.1	Regional	57.11	245.71	247.34	247.34	247.64	0.009612	3.29	30.78	46.86	0.89
Reach2	12.34	Regional	57.11	245.63	247.19	247.19	247.47	0.010810	3.38	31.19	50.37	0.95
Reach1	867.84	Regional	64.14	245.34	247.04		247.24	0.007679	2.91	38.72	63.91	0.80
Reach1	846.68	Regional	64.14	245.20	246.93		247.08	0.006384	2.42	45.08	65.63	0.71
Reach1	840.45	Regional	64.14	245.22	246.88		247.04	0.006838	2.61	44.19	64.37	0.74
Reach1	790.77	Regional	64.14	244.64	246.58	246.38	246.74	0.005266	2.63	54.80	66.84	0.69
Reach1	728.54	Regional	64.14	244.18	245.87	245.87	246.19	0.013947	4.04	40.70	55.89	1.08
Reach1	630.96	Regional	64.14	244.24	245.28		245.32	0.002048	1.26	78.98	87.75	0.41
Reach1	506.08	Regional	64.14	243.25	244.68	244.61	244.85	0.007557	2.67	48.36	76.98	0.80
Reach1	403.1	Regional	64.14	242.75	244.09		244.20	0.005602	2.32	50.55	66.10	0.68
Reach1	292.6	Regional	64.14	242.00	243.66		243.75	0.003726	1.88	66.40	76.75	0.56
Reach1	223.1	Regional	64.14	241.36	242.93		243.07	0.014029	1.89	40.48	63.91	0.56
Reach1	179.29	Regional	64.14	241.25	242.80		242.86	0.002162	1.61	65.27	68.47	0.44
Reach1	117.41	Regional	64.14	240.75	242.35	242.30	242.60	0.010288	3.41	38.13	54.41	0.93
Reach1	39.72	Regional	64.14	240.48	241.72	241.61	241.84	0.008400	2.76	60.69	107.78	0.84

HEC-RAS Plan: SCS_Modified   River: Campbell TribO   Reach: Reach1   Profile: Regional

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)	
Reach1	1993.51	Regional	8.43	270.72	271.50		271.51	0.002997	0.49	22.46	57.63	0.20
Reach1	1944.25	Regional	8.43	270.69	271.34		271.35	0.003686	0.55	21.10	57.84	0.22
Reach1	1890.76	Regional	8.43	270.28	271.15		271.16	0.003358	0.65	17.11	32.61	0.23
Reach1	1857.79	Regional	8.43	270.11	271.06		271.07	0.002316	0.57	20.05	36.42	0.19
Reach1	1819.44	Regional	8.43	269.55	271.03		271.04	0.000361	0.30	39.88	49.55	0.08
Reach1	1777.19	Regional	8.43	269.24	271.03		271.03	0.000079	0.16	70.72	67.39	0.04
Reach1	1765.97	Regional	8.43	269.18	271.03	270.37	271.03	0.000067	0.15	80.62	93.71	0.04
Reach1	1752.6 hum_238	Regional	8.43									
Reach1	1738.95	Regional	8.43	268.51	269.61	269.61	270.13	0.008907	3.18	2.65	35.78	1.01
Reach1	1711.76	Regional	8.43	268.28	268.93		269.00	0.003782	1.17	7.36	19.55	0.57
Reach1	1674.27	Regional	8.43	267.89	268.44	268.44	268.59	0.098826	1.70	4.96	17.30	1.01
Reach1	1652.33	Regional	8.43	267.32	268.31		268.34	0.000924	0.91	12.02	23.23	0.31
Reach1	1631.53	Regional	8.43	266.86	268.30		268.32	0.000704	0.63	18.29	24.84	0.18
Reach1	1597.7	Regional	8.43	267.12	268.29		268.30	0.000366	0.35	24.31	30.19	0.12
Reach1	1564.39	Regional	8.43	266.44	268.29		268.29	0.000072	0.25	41.32	35.45	0.06
Reach1	1550.3	Regional	8.43	267.24	268.28	267.62	268.29	0.001089	0.42	25.57	37.00	0.13
Reach1	1541.50		Inl Struct									
Reach1	1531.8	Regional	8.43	265.86	266.58		266.67	0.011543	1.50	6.55	16.46	0.63
Reach1	1511.74	Regional	8.43	265.87	266.34		266.44	0.018371	1.53	6.16	18.56	0.75
Reach1	1474.21	Regional	8.43	265.25	265.86		265.93	0.010295	1.26	7.55	20.11	0.57
Reach1	1407.88	Regional	8.43	264.58	265.05		265.12	0.015351	1.39	7.42	25.14	0.68
Reach1	1370.19	Regional	8.43	264.06	264.63		264.69	0.009298	1.29	8.80	23.39	0.56
Reach1	1284.5	Regional	8.43	263.17	263.82		263.90	0.012705	1.64	7.29	21.58	0.66
Reach1	1257.27	Regional	8.43	262.93	263.52		263.59	0.011010	1.44	7.59	20.70	0.61
Reach1	1205.23	Regional	8.43	262.40	262.76		262.85	0.025211	1.52	6.64	27.67	0.84
Reach1	1148.69	Regional	10.31	261.57	262.06		262.11	0.008761	1.14	10.89	32.83	0.53
Reach1	1089.95	Regional	10.31	260.44	261.39	261.30	261.51	0.012399	1.65	7.43	20.07	0.66
Reach1	1039.45	Regional	10.31	259.35	260.37	260.36	260.51	0.039987	2.08	7.15	18.81	0.74
Reach1	931.96	Regional	10.31	257.69	258.73		258.76	0.009251	1.09	12.95	25.86	0.37
Reach1	876.54	Regional	10.31	256.65	257.57	257.57	257.76	0.057432	2.49	6.50	21.10	0.90
Reach1	823.24	Regional	10.31	256.17	256.90	256.56	256.92	0.006861	0.79	15.20	28.70	0.31
Reach1	706.04	Regional	10.31	254.90	255.17	255.17	255.28	0.096338	1.36	7.22	33.02	0.95
Reach1	615.46	Regional	10.31	253.35	254.58		254.59	0.001278	0.49	27.51	36.14	0.14
Reach1	580.8	Regional	10.31	252.71	254.56	253.88	254.56	0.000504	0.36	40.13	47.02	0.09
Reach1	572.24 hum_818	Regional	10.31									
Reach1	565.04	Regional	10.31	252.43	253.29	253.28	253.55	0.056342	2.47	4.77	26.65	0.90
Reach1	550.22	Regional	10.31	252.20	252.95		253.00	0.019578	1.19	11.20	30.67	0.50
Reach1	524.11	Regional	10.31	251.67	252.51		252.56	0.020664	1.26	11.82	37.51	0.51
Reach1	479.68	Regional	10.31	251.48	252.07		252.10	0.009309	0.81	14.88	34.08	0.35
Reach1	445.48	Regional	10.31	251.19	251.64		251.69	0.021930	1.02	10.61	28.80	0.51
Reach1	405.73	Regional	10.31	250.51	250.93		250.97	0.016256	0.83	13.02	37.48	0.43
Reach1	370.17	Regional	10.31	249.85	250.44		250.47	0.014773	1.04	12.78	33.23	0.44
Reach1	334.56	Regional	10.31	249.55	249.99		250.02	0.016215	0.83	12.81	36.00	0.43
Reach1	301.74	Regional	10.27	248.67	249.35		249.41	0.020805	1.21	11.33	37.41	0.52
Reach1	259.85	Regional	10.27	247.96	248.57		248.62	0.018033	1.16	10.80	26.22	0.49
Reach1	190.56	Regional	10.27	246.90	247.66		247.69	0.011442	1.04	15.59	51.68	0.40
Reach1	161.96	Regional	10.27	246.75	247.23		247.27	0.019541	0.96	14.09	58.33	0.48
Reach1	126.76	Regional	10.27	246.38	246.81		246.82	0.008508	0.58	21.90	92.54	0.31
Reach1	88.28	Regional	10.27	245.58	246.09	246.09	246.15	0.056121	1.53	11.14	92.27	0.80
Reach1	57.95	Regional	10.27	245.17	246.01	245.43	246.01	0.000167	0.13	91.59	178.38	0.05

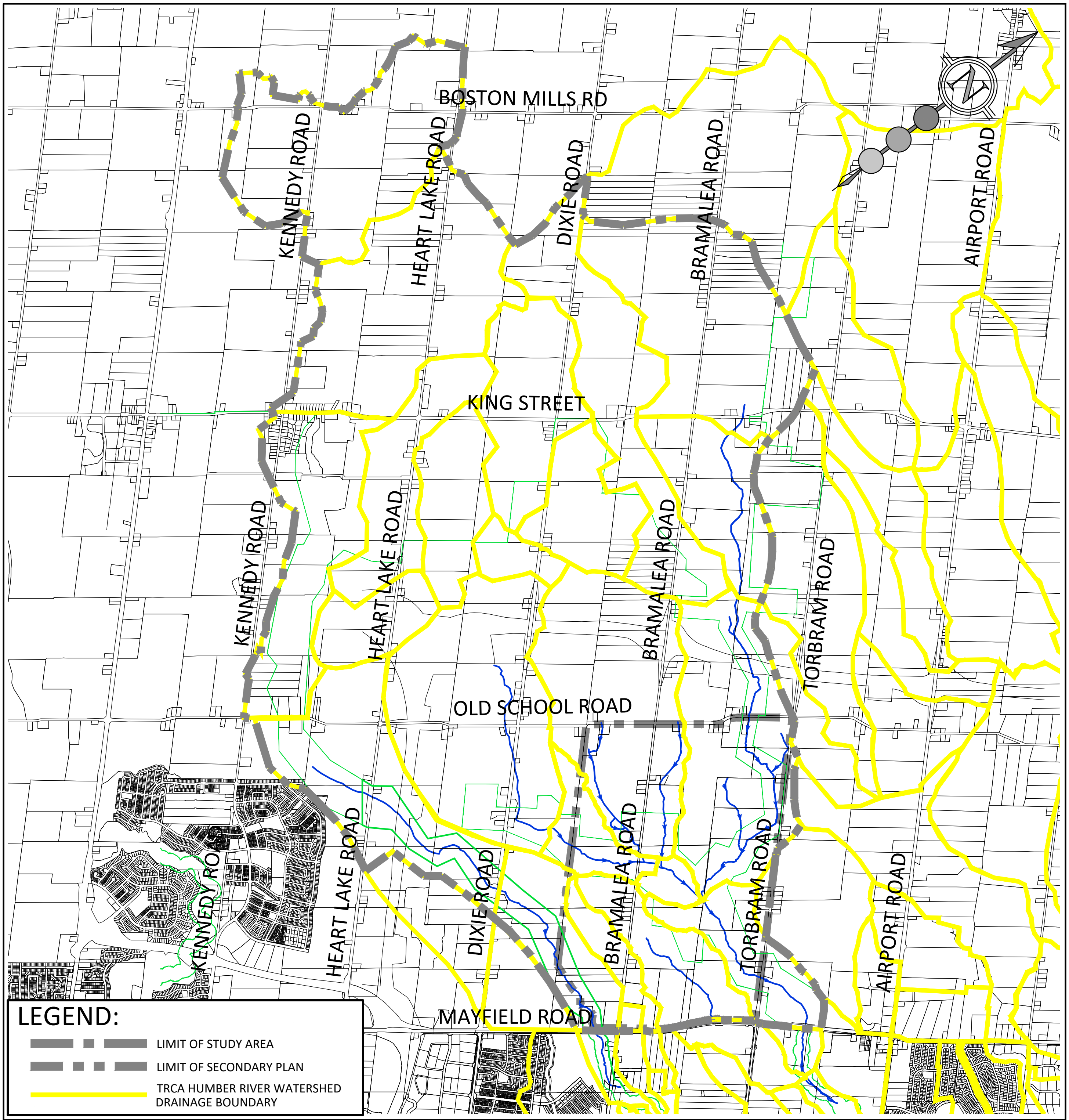
HEC-RAS Plan: SCS_Modified   Profile: Regional

River	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)	
CamTribP South	Reach1	1009.95	Regional	6.43	264.14	265.64		265.64	0.000028	0.20	35.95	34.89	0.05
CamTribP South	Reach1	1000	Regional	6.43	264.13	265.64	265.07	265.64	0.000017	0.15	45.50	43.20	0.04
CamTribP South	Reach1	994.96 hum_746a	Regional	6.43									
CamTribP South	Reach1	988.16	Regional	6.43	263.36	264.32	264.32	264.78	0.012192	3.01	2.14	32.83	1.00
CamTribP North	Reach1	724.17	Regional	7.87	272.09	272.90		272.92	0.006859	0.80	14.53	43.36	0.31
CamTribP North	Reach1	668.98	Regional	7.87	271.74	272.54		272.56	0.006580	0.75	15.00	47.28	0.30
CamTribP North	Reach1	626.09	Regional	7.87	271.56	272.29		272.30	0.005477	0.69	17.59	58.59	0.27
CamTribP North	Reach1	568.12	Regional	7.87	271.40	272.10		272.10	0.002326	0.45	24.97	68.00	0.18
CamTribP North	Reach1	531.38	Regional	7.87	271.27	271.92		271.95	0.010665	0.92	12.32	41.93	0.38
CamTribP North	Reach1	493.73	Regional	7.87	271.16	271.78		271.78	0.002265	0.40	25.42	70.81	0.17
CamTribP North	Reach1	464.14	Regional	7.87	270.51	271.75		271.75	0.000448	0.29	37.35	54.60	0.09
CamTribP North	Reach1	439.42	Regional	7.87	270.30	271.74		271.74	0.000529	0.33	31.24	41.52	0.09
CamTribP North	Reach1	405.32	Regional	7.87	269.85	271.72		271.72	0.000475	0.38	30.05	40.22	0.09
CamTribP North	Reach1	379.03	Regional	7.87	269.75	271.71		271.72	0.000137	0.23	48.71	43.39	0.05
CamTribP North	Reach1	375.84	Regional	7.87	269.05	271.71	270.10	271.72	0.000061	0.18	63.50	59.40	0.04
CamTribP North	Reach1	365.14 hum_232	Regional	7.87									
CamTribP North	Reach1	352.6	Regional	7.87	266.89	268.24	268.11	268.59	0.044617	2.65	3.02	6.93	0.81
CamTribP North	Reach1	339.89	Regional	7.87	266.33	267.48	267.48	267.81	0.085573	2.56	3.07	4.59	1.00
CamTribP North	Reach1	276.88	Regional	7.87	264.26	266.12		266.13	0.000236	0.38	20.70	14.65	0.10
CamTribP North	Reach1	250	Regional	7.87	263.92	266.12		266.12	0.000106	0.30	29.02	18.68	0.07
CamTribP North	Reach1	225.7	Regional	7.87	264.60	266.11	265.06	266.12	0.000438	0.48	18.06	15.64	0.13
CamTribP North	Reach1	220	Regional	7.87		266.11		266.12					
CamTribP North	Reach1	211.03	Regional	7.87	264.20	266.11		266.11	0.000072	0.21	37.68	24.58	0.05
CamTribP North	Reach1	196.65	Regional	7.87	264.15	266.11		266.11	0.000020	0.16	50.10	30.14	0.04
CamTribP North	Reach1	141.08	Regional	7.87	264.20	266.11		266.11	0.000029	0.15	53.01	33.22	0.04
CamTribP North	Reach1	130	Regional	7.87	264.18	266.10		266.11	0.000007	0.11	78.40	47.26	0.03
CamTribP North	Reach1	62.87	Regional	7.87	264.19	266.10	265.25	266.11	0.000016	0.17	51.83	31.58	0.04
CamTribP North	Reach1	48 hum_746	Regional	7.87									
CamTribP North	Reach1	36.6	Regional	7.87	264.88	265.56	265.56	265.78	0.064375	2.12	4.02	9.79	0.91

HEC-RAS Plan: SCS_Modified   Profile: Regional

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)	
Reach1A	1432.03	Regional	14.03	263.34	264.34		264.35	0.000368	0.49	30.43	34.82	0.16
Reach1A	1394.49	Regional	14.03	263.31	264.32		264.33	0.000405	0.53	27.06	29.61	0.17
Reach1A	1350	Regional	14.03	263.26	264.30		264.31	0.000287	0.44	33.00	34.48	0.14
Reach1A	1293.17	Regional	14.03	263.33	264.29		264.30	0.000233	0.40	36.74	42.29	0.13
Reach1A	1195.29	Regional	14.03	263.34	264.26	263.57	264.27	0.000597	0.34	40.80	48.15	0.11
Reach1A	1185.05	Regional	14.03	263.31	264.26	263.57	264.26	0.000209	0.36	40.46	49.26	0.12
Reach1A	1156.4	Regional	14.03	263.31	264.25	263.57	264.26	0.000142	0.31	46.06	54.85	0.11
Reach1A	1140.69	Regional	14.03	262.49	263.83	263.83	264.21	0.014584	2.76	5.09	6.51	1.00
Reach1A	1101.27	Regional	14.03	260.80	261.78	261.35	261.81	0.007952	0.82	17.03	26.14	0.33
Reach1A	1035.31	Regional	14.03	260.18	260.92	260.92	261.11	0.061158	2.15	8.09	23.31	0.90
Reach1A	1000	Regional	14.03	259.69	260.80		260.81	0.000474	0.46	31.34	35.84	0.15
Reach1A	973.68	Regional	14.03	259.52	260.80		260.81	0.000110	0.33	44.02	38.96	0.09
Reach1A	928.18	Regional	14.03	259.55	260.79		260.80	0.000131	0.38	38.14	34.62	0.11
Reach1A	873.26	Regional	14.03	259.54	260.79		260.79	0.000119	0.33	45.37	40.69	0.09
Reach1A	817.77	Regional	14.03	259.51	260.78		260.78	0.000138	0.30	49.32	45.72	0.09
Reach1A	771.77	Regional	14.03	259.52	260.77		260.78	0.000090	0.23	61.72	55.39	0.07
Reach1A	709.85	Regional	14.03	259.49	260.77		260.78	0.000013	0.12	124.55	104.67	0.03
Reach1A	671.06	Regional	14.03	259.54	260.77		260.77	0.000022	0.14	101.36	90.06	0.04
Side Reach	1000	Regional	13.89	260.35	260.77	260.77	260.91	0.086438	1.97	8.64	31.40	1.00
Side Reach	984.03	Regional	13.89	259.71	260.67		260.75	0.002118	1.45	12.17	24.90	0.48
Side Reach	966.78	Regional	13.89	259.94	260.48	260.48	260.65	0.010107	1.88	7.94	24.63	0.93
Side Reach	933.71	Regional	13.89	258.93	259.81	259.81	260.08	0.009116	2.37	7.01	14.97	0.93
Side Reach	915.67	Regional	13.89	258.27	259.22	259.22	259.48	0.009347	2.72	7.37	15.23	0.98
Side Reach	895.35	Regional	13.89	257.54	258.38	258.38	258.61	0.008684	2.38	7.16	15.97	0.92
Side Reach	882.44	Regional	13.89	257.39	258.07	258.00	258.25	0.006915	1.88	7.85	16.72	0.80
Side Reach	867.52	Regional	13.89	257.03	257.78	257.78	258.01	0.062802	2.20	6.95	15.91	0.91
Side Reach	847.89	Regional	13.89	254.25	255.36	255.36	255.67	0.079795	2.45	5.66	9.46	1.01
Side Reach	836.81	Regional	13.89	253.25	254.67		254.73	0.006617	1.19	13.41	14.79	0.34
Side Reach	821.85	Regional	13.89	253.34	254.24	254.24	254.49	0.055581	2.47	6.78	12.95	0.90
Reach1B	632.57	Regional	0.14	259.53	260.77	259.57	260.77	0.000000	0.00	73.57	73.79	0.00
Reach1B	600		Inl Struct									
Reach1B	570.54	Regional	0.14	251.58	252.55		252.55	0.000000	0.01	18.86	23.48	0.00
Reach1B	559.83	Regional	0.14	251.57	252.55		252.55	0.000000	0.01	18.99	24.60	0.00
Reach1B	539.98	Regional	0.14	251.59	252.55		252.55	0.000000	0.01	13.48	25.71	0.00
Reach1B	527.13	Regional	0.14	251.62	252.55		252.55	0.000000	0.01	25.04	35.43	0.00
Reach1C	512.07	Regional	18.23	251.63	252.52		252.54	0.001433	0.70	26.13	34.56	0.26
Reach1C	506.65	Regional	18.23	251.71	252.43		252.50	0.003501	1.21	15.95	31.42	0.49
Reach1C	488.25	Regional	18.23	251.69	252.28	252.28	252.45	0.018327	1.80	10.15	32.17	1.02
Reach1C	469.78	Regional	18.23	250.68	251.49		251.54	0.003228	1.02	17.84	34.24	0.45
Reach1C	454.31	Regional	18.23	250.56	251.28	251.28	251.47	0.014408	1.94	9.50	25.49	0.99
Reach1C	406.92	Regional	18.23	249.90	250.92		250.94	0.000884	0.68	28.39	41.14	0.22
Reach1C	362.56	Regional	18.23	249.87	250.88		250.90	0.001049	0.62	30.06	42.29	0.23
Reach1C	303.74	Regional	18.23	249.27	250.84	249.86	250.85	0.000660	0.39	53.34	52.31	0.11
Reach1C	280.2	Regional	18.23	249.61	250.82	250.17	250.83	0.001709	0.48	39.61	51.30	0.16
Reach1C	275.23	Regional	18.23	249.39	250.81	250.19	250.82	0.001677	0.45	40.35	48.46	0.16
Reach1C	275	Regional	18.23									
Reach1C	258.69	Regional	18.23	248.74	249.83	249.83	249.85	0.003831	0.64	31.48	53.41	0.24
Reach1C	258.59	Regional	18.23	248.81	249.47	249.37	249.53	0.022764	1.22	18.29	53.98	0.54
Reach1C	246.17	Regional	18.23	248.58	249.03		249.13	0.055731	1.29	13.15	41.02	0.77
Reach1C	222.04	Regional	18.23	247.82	248.83		248.87	0.009409	1.05	22.36	41.89	0.37
Reach1C	202.77	Regional	18.23	247.53	248.77		248.79	0.002685	0.69	35.18	51.12	0.21
Reach1C	191.98	Regional	18.23	246.69	248.78	247.67	248.78	0.000116	0.18	130.49	123.61	0.04
Reach1C	181.05	Regional	18.23									
Reach1C	169.49	Regional	18.23	246.59	247.81	247.74	247.87	0.020950	1.59	21.71	83.74	0.51
Reach1C	162.36	Regional	18.23	246.50	247.49	247.49	247.61	0.077747	2.05	13.18	61.09	0.91
Reach1C	148.56	Regional	18.23	246.40	247.32	246.62	247.33	0.001226	0.28	56.94	104.70	0.12

Appendix D4 – Relevant Excerpts



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MAYFIELD TULLAMORE LOCAL SUBWATER STUDY

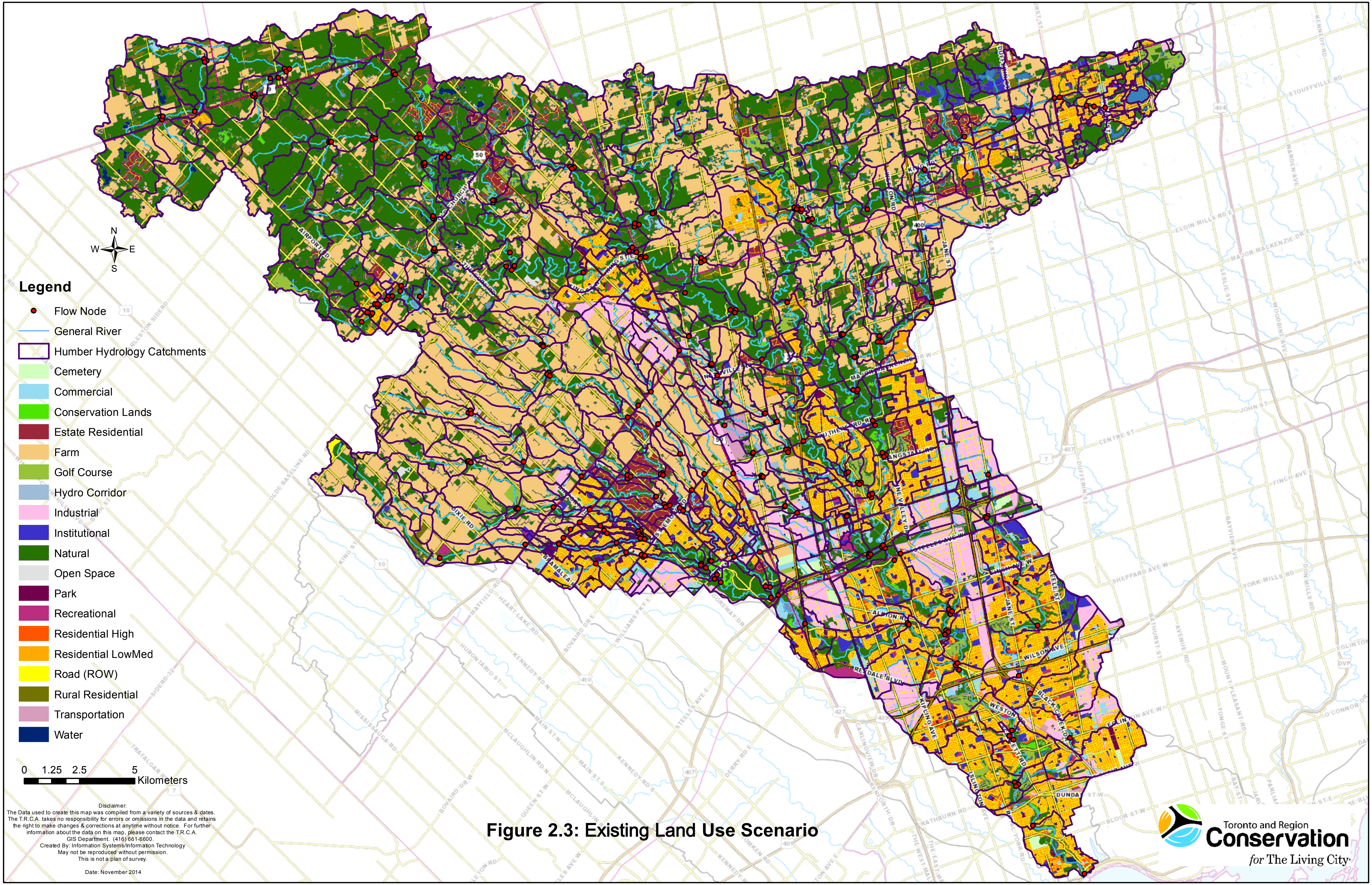
HYDRAULIC AND HYDROLOGIC STUDY AREA

DESIGNED BY:	C.M.D.	CHECKED BY:	N.D.M.
SCALE:	1:50000	DATE:	AUGUST 2024

PROJECT No: 2699

FIGURE No: 2

File: P:\2699 Mayfield Tullamore Landowner Group\Drawings\MESP\Fig\Report Figures\2699P-LOCT-X.2.dwg - Revised by <DDILAY> : Wed, Aug 28 2024 - 12:04pm



Date: November 2014

Figure 2.3: Existing Land Use Scenario

Toronto and Region
Conservation
for The Living City

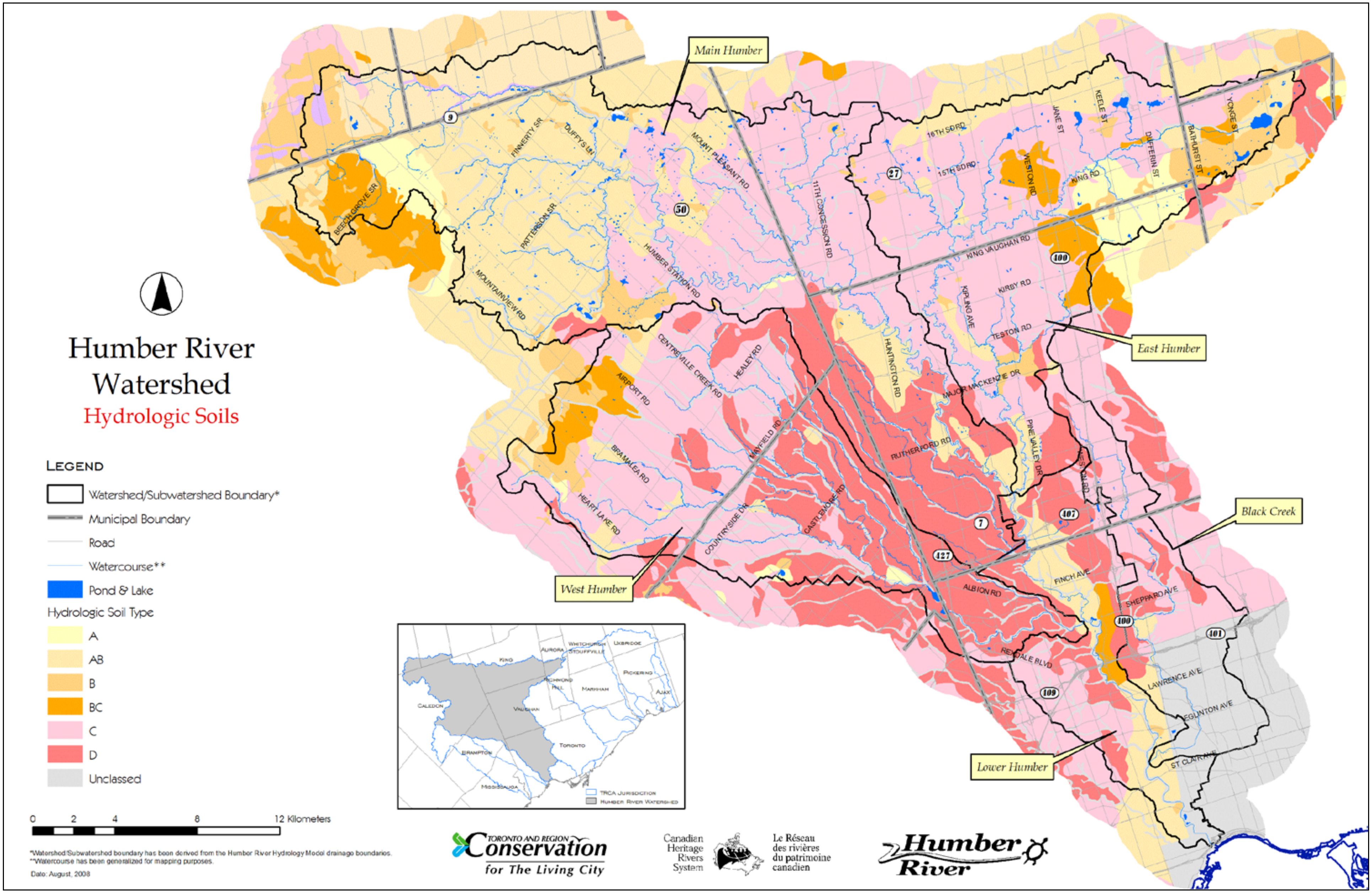


Figure 2.5: Hydrologic Soil Groups

Hydrologic Model Review

As part of the baseline characterization of the hydrologic conditions within the FSA, a desktop review of the previously completed hydrologic models for the Etobicoke Creek, Humber River and Credit River Watersheds has been completed to summarize the current level of modelling and the applicability to the FSA, and to thereby identify any gaps and potential needs for future modelling refinements or updates.

Etobicoke Creek

The most recent hydrology study for the Etobicoke Creek Watershed was completed by MMM Group Limited in April 2013, which utilized Visual OTTHYMO Version 2.4 (VO 2.4) as the primary modelling platform (ref. Etobicoke Creek Hydrology Update, MMM Group, April 2013). This work included updating the previous VO hydrologic models, originally developed in 1996 and subsequently updated in 2003 and 2007, and development of stormwater management quantity control criteria to inform management and planning for existing and future developments.

The study area for the April 2013 hydrologic update encompassed the entire Etobicoke Creek Watershed, which spans over 200 km^2 in area. This modelling area was divided into eight (8) subwatersheds, represented by twelve (12) sub-basins. The subcatchment discretization resulted in a total of 280 subcatchments, ranging in area from 2 ha (i.e. small development site) to 500 ha (undeveloped rural areas of the headwaters), with an average drainage area of approximately 80 ha. Consistent with the legacy models for the Etobicoke Creek watershed, the SCS Curve Number method was used to model the rainfall-runoff relationship. The subcatchment boundaries corresponding to the April 2013 Etobicoke Creek model update are presented on Drawing WR4a.

The model included a total of 143 routing elements, representing the open watercourse reaches within the watershed. The Etobicoke Creek Watershed has three (3) unique hydrological features which required specific methodology (additional routing, rating curves and storages), for inclusion in the modelling; these features included the Brampton Esker system, the Downtown Brampton by-pass channel and the City of Toronto storm sewer system (major/minor split).

Additionally, a number of online storage and stormwater management (SWM) facilities were included in the modelling based upon design records; a total of 57 storage elements were incorporated in the model, including 33 SWM facilities designed for storm events up to the 100-year event, and 24 SWM facilities only providing quality control and erosion control storages. These SWM facilities were removed from the modeling as part of the Regional Storm simulation, in accordance with MNRF protocols. The SWM facilities within the watershed are presented on Drawing WR9, based upon registered waterbody mapping data.

As a result of the modelling software chosen for the study [i.e. Visual OTTHYMO (VO)], the hydrologic analyses completed for the April 2013 study applied a synthetic design storm methodology. The synthetic design storm simulation included the 2-year through to the 100-year event, as well as the 350 year and Regional Storm. Various storm distributions of different durations were evaluated to determine the most conservative design storm simulation for the watershed, including Chicago (3, 4, and 12 hours), AES (1, 6, 12 and 24 hours) and SCS Type II (6, 12 and 24 hours). The 12-hour AES rainfall distribution, was ultimately applied for the April 2013 study, which is consistent with TRCA protocols for other urban watersheds (i.e. Humber and Rouge River watersheds), as this was found to generate the most conservative peak flows for the study area.

Table **2.3.2.13** summarizes the existing conditions design storm peak flows for the primary nodes along the Etobicoke Creek from the headwaters (FSA) downstream to Downtown Brampton. The primary flow nodes from the previous hydrologic study are shown on Figure WR-4a.

Table 2.3.2.13. Etobicoke Creek - Existing Conditions Peak Flows (Synthetic Design Storms)

Key Flow Node	Node ID	Drainage Area (ha)	12-hour AES – Peak Flow Rates (m^3/s)					
			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	1.265	1471	1.45	2.53	3.39	4.54	5.45	6.4
B	1.285	2096	2.05	3.61	4.82	6.45	7.75	9.03
C	1.615	2307	2.32	4.06	5.42	7.31	8.84	10.45
D	1.62	4716	4.7	8.27	10.99	14.71	17.65	20.76
E	2.03	5241	5.16	9.08	12.06	16.03	19.21	22.57
F	2.09	6479	30.27	40.59	47.99	57.38	64.66	72.02
Brampton	2.14	6912	26.81	38.54	47.29	58.16	66.76	75.69

For the simulation of the Regional Storm event, the saturated antecedent moisture condition (AMC III) was applied in the April 2013 hydrology study to account for the increase in soil moisture caused by the first 36 hours of the storm. In accordance with the MNR Technical Guide, 2002, all SWM facilities were removed for the Regional Storm simulation and areal adjustment factors were applied based on the equivalent circular area method. The existing conditions peak flow results and areal reduction factors for each of the primary headwater flow nodes are summarized in Table 2.3.2.14.

Table 2.3.2.14. Etobicoke Creek - Existing Conditions Peak Flows (Regional Storm)

Key Flow Node	Node ID	Drainage Area (ha)	Aerial Reduction Factor (%)	Hurricane Hazel Peak Flow (m^3/s) – Without Ponds
A	1.265	1471	100	30.9
B	1.285	2096	100	44.1
C	1.615	2307	100	51.4
D	1.62	4716	99.2	100.8
E	2.03	5241	97.1	106.2
F	2.09	6479	94.8	149.5
Brampton	2.14	6912	93.5	171

Flow nodes A, B and C represent the headwater tributaries, which combine further downstream at the confluence node D, located at Hurontario Street, north of Highway 410. Flow node A appears to be the primary contributor to the downstream node B, by representing over 60% of the contributing drainage area and the resulting peak flow. The peak flows at the confluence further downstream (node D) demonstrate an approx. equivalent influence from both the B and C drainage areas, indicating a similar time to peak for both contributing systems.

Further downstream, large increases in peak flow can be seen from node E to F and Downtown Brampton under both the design storms, and Regional event simulations. The drainage area increase from node E to F is not as significant as those in the headwaters, therefore demonstrating that the increase in peak flow is largely attributed to the urbanization occurring within the local area and upper/central watershed. This suggests that the increased peak flows and associated flood risks may be more heavily influenced by the local urban drainage area, rather than the flows generated in the headwaters. Nonetheless, appropriate SWM design and implementation will be required to ensure control to existing conditions and minimize any timing/peak flow impacts further downstream.

Humber River

The most current hydrology study for the Humber River Watershed was completed by Civica Infrastructure Ltd. (ref. Humber River Hydrology Update, Civica Infrastructure, April 2018). This work included updating the future conditions modelling, building upon the previous existing conditions study completed by Civica in June 2015 (ref. Humber River Hydrology Update, Civica Infrastructure Ltd, June 2015). The focus for the 2018 study was to resolve inconsistencies in the future conditions land use scenario, and to update stormwater management quantity control criteria to inform management and planning for future developments.

The existing conditions model, developed as part of the 2015 study, represents the 2014 land use conditions for the Humber River Watershed, which spans across over 900 km^2 of land, reaching from the headwaters at the Niagara Escarpment and Oak Ridges moraine, down through flat plains to the marshes and river mouth at Lake Ontario. The hydrologic model for the watershed was built using Visual OTTHYMO Version 4 (VO4) with subsequent future conditions updates using Version 5 (VO5). The existing conditions model developed in 2015 was discretized into 714 subcatchments, of which 410 were modeled as rural areas (less than 20% impervious). The rainfall-runoff relationship was calculated using the SCS Curve Number method, based upon land use. The subcatchments delineated for the Humber River hydrology update are presented on Drawing WR4a.

The VO model contains a total of 768 routing elements (river segments) which convey runoff from the subcatchments throughout the river system. This model also contains 81 storage elements, which model stormwater management ponds, reservoirs, and lakes throughout the watershed. The SWM facilities within the Humber River watershed are presented on Drawing WR9, based upon registered waterbody mapping data.

The calibrated existing conditions model developed in 2015 was run using the 6, 12 and 24-hour AES synthetic design storms in order to evaluate the current (2015) requirements for quantity control in the Humber River. The results concluded that the 6 and 12-hour AES storms were the critical durations in terms of flooding throughout the watershed. Additional storms such as the 350-year and 500-year events were also simulated, although not recognized as regulatory events. The peak flows for nodes at the southern boundary of the FSA and select locations downstream under the design storm events are summarized in Table 2.3.2.15. The primary flow nodes from the previous hydrologic study are shown on Figure WR-4a.

Table 2.3.2.15: Humber River Watershed - Existing Conditions Peak Flows (Synthetic design storms)

Key Flow Node	Description	12-hour AES – Peak Flow Rates (m^3/s)					
		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
43.20	West Humber – Mayfield between Coleraine and Humber Station	6.2	9.81	19.87	25.3	29.73	34.13
41.30	West Humber – Mayfield southwest of Humber Station	2.5	4.28	9.24	11.66	13.52	15.43
38.30	West Humber – Mayfield northeast of The Gore	2.1	3.72	29.64	38.38	45.25	52.32
35.70	West Humber – Mayfield southwest of Innis Lake	2.03	2.92	17.84	23.36	27.69	31.95
32.42	West Humber – Mayfield northeast of Torbram	1.88	3.41	28.46	37.25	43.99	51.07
29.50	Main Humber – Mayfield southwest of Bramalea	0.83	1.5	10.99	14.77	17.56	20.44

Key Flow Node	Description	12-hour AES – Peak Flow Rates (m^3/s)					
		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
10.10	West Humber – Mayfield between Coleraine and Humber Station	3.08	4.88	25.02	34.35	42.27	51.15
40.30	Downstream Point of West Humber River	16.82	23.83	115.17	151.43	178.18	206.67
27.60	Downstream Point of Upper Main Humber River	53.68	77.44	113.47	147.95	176.02	208.31
49.70	Confluence Point - West and Main Humber River	74.09	109.51	238.34	303.01	361.1	419.79

For the simulation of the Regional Storm event, the saturated antecedent moisture condition (AMC III) was applied to account for the increase in soil moisture caused by the first 36 hours of the storm. In accordance with the MNR Technical Guide, 2002, all SWM facilities were removed for the Regional Storm simulation and areal adjustment factors were applied based on the equivalent circular area method. The existing conditions peak flow results and areal reduction factors for each of the primary headwater flow nodes and select nodes downstream are summarized in Table 2.3.2.16.

Table 2.3.2.16. Humber River - Existing Conditions Peak Flows (Regional Event)

Key Flow Node	Description	Areal Reduction Factor (%)	Hurricane Hazel Peak Flow (m^3/s) – Without Ponds
43.20	West Humber – Mayfield between Coleraine and Humber Station	100	71.33
41.30	West Humber – Mayfield southwest of Humber Station	100	40.85
38.30	West Humber – Mayfield northeast of The Gore	97	163.6
35.70	West Humber – Mayfield southwest of Innis Lake	97	100.62
32.42	West Humber – Mayfield northeast of Torbram	98	161.45
29.50	Main Humber – Mayfield southwest of Bramalea	97	73.94
40.30	Downstream Point of West Humber River	89	636.63
27.60	Downstream Point of Upper Main Humber River	77	817.99
49.70	Confluence Point - West and Main Humber River	73	1197.26

In addition to peak flows, the simulated hydrographs for all design storm events and the Regional Storm event have also been reviewed in order to determine the influence of timing throughout the subwatershed, which may impact the appropriate selection and design of SWM in the headwaters. This review has focused upon three (3) primary nodes, which represent the downstream extent of the West Humber River, Upper Main Humber and the confluence point further downstream. The area surrounding the confluence point is known to be a flood damage center, or flood vulnerable area (FVA), which is highly susceptible to flooding and associated damages. Further discussion regarding the FVAs relative to the FSA can be found in subsequent sections.

The time to peak for the three (3) primary nodes within the Humber River Watershed are summarized in Table 2.3.2.17 below.

Table 2.3.2.17. Time to Peak at Primary Nodes throughout the Humber River Watershed

Key Flow Node	Location Description	Time to Peak (hrs)						
		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional
40.30	D/S Extent of West Humber	9.083	8.5	12.083	11.833	11.583	11.333	11.583
27.60	D/S Extent of Upper Main Humber	7.333	7.25	6.333	17.083	15.583	17.167	18.667
49.70	Confluence Point – FVA	11.083	9.75	17.083	16.583	16.083	15.75	11.917

The time to peak results summarized in Table 2.3.2.17 indicate that under the synthetic design storm events, the peak flow at the downstream extent of the West Humber River occurs earlier than that of the confluence point further downstream. This suggests that traditional SWM applied in the headwaters, which provide a controlled and lagged release of stormwater (i.e. SWM facilities), may have the potential to increase the peak flows at the confluence should the timing of release coincide with the time to peak further downstream. As for the Regional Storm event, the peak flow at the downstream extent of the West Humber River and the confluence point of the West Humber and Main Humber River occur at approximately the same time.

Discussion

The previously completed hydrologic studies for the Etobicoke Creek and Humber River watersheds were both completed on behalf of TRCA, using the modelling software Visual OTTHYMO (VO). This suggests similar methodology in subcatchment parameterization, routing and storage elements included in the respective modelling. Both studies applied the synthetic design storm methodology, and generated peak flow rates for events ranging from the 2 through to 100-year return period as well as for the 350-year, 500-year return period and the Regional Storm event. These studies did not include a continuous simulation assessment, as the versions of VO used in those assessments were specifically intended for event-based modelling only. Therefore, neither study characterized existing conditions land use or assessed the impact of future land development on regional water balance or erosion of downstream receivers; the impact assessment and analysis of the recommended management plan for future development within the FSA should be conducted as part of future studies. In addition, future studies should apply continuous simulation for the hydrologic analyses, to allow for assessment of flood risk (i.e. frequency analysis), erosion assessment (i.e. duration analysis) and water budget assessment using long-term continuous meteorological datasets, and thereby allow for a fulsome impact assessment and evaluation of the recommended stormwater management plan including application of low impact development best management practices (LID BMPs).

Through the mapping of the existing subcatchments for the current study, it was found that there are a number of discrepancies between the boundaries of the Credit River, Etobicoke Creek, and Humber River watersheds. As presented on Drawing WR4b, there are a number of areas which are either overlapping or unaccounted for as part of the separate studies; this suggests further investigation and refinement of the subcatchment boundaries will be required in order to accurately identify the lands within the FSA contributing to each independent watershed.

Credit River Watershed – Huttonville Creek & Fletcher's Creek

The limits of the FSA extend within the headwaters of the Credit River Watershed, with small portions (i.e. less than 5%) contributing to the headwaters of the Huttonville Creek and Fletcher's Creek Subwatersheds, along the eastern limit of the Credit River Watershed. The Huttonville and Fletcher's Creek systems were assessed as part of the North West Brampton Subwatershed Study, completed by AMEC in June of 2011. This study included three (3) separate phases, focusing on Subwatershed Characterization, Subwatershed Impact Analysis, and Management Strategies and Implementation.

The hydrologic analytic characterization employed in the 2011 study was facilitated by the use of the Hydrologic Simulation Program-Fortran (HSP-F) hydrologic model to provide an indication of subwatershed response to rainfall and snowmelt. HSP-F is both an event based and continuous hydrologic model, although it is more commonly used for continuous modelling. HSP-F incorporates meteorological data, such as precipitation data, air temperature, evapotranspiration, solar radiation, wind, and dew-point temperature. The HSP-F hydrologic model provides a continuous flow time series for use in characterization of surface runoff, baseflows and surface and groundwater interaction.

The HSP-F model utilized for the 2011 study was based upon previously completed modeling exercises / studies for the Huttonville Creek (2003 Subwatershed Study), Fletcher's Creek (1997 Subwatershed Study) and the 2007 Credit River Flow Management Study which encompassed those contributing systems. The resulting hydrologic analysis adopted focused upon continuous simulation, generating frequency flows for the study area.

The subcatchment boundaries and subsequently the model schematics have been developed based upon review of background reports, the 1994 topographic mapping, 2005 aerial photography and field verification. The base parameters of land use, soil types and slopes were sourced from the CVC's Water Quality HSP-F model, which was developed for the evaluation of BMP's within the Credit River Watershed, as opposed to conventional hydrologic analysis of flood and erosion assessments.

Routing elements within Huttonville Creek and Fletcher's Creek exist in the form of surface drainage features such as creeks, ditches roads, and on-line stormwater management facilities. These elements are incorporated into the HSP-F hydrologic model in the form of rating curves, which define the storage-discharge relationship of the specific element.

The routing elements for the watercourses were determined using the associated up to date HEC-RAS hydraulic models which were developed for the hydraulic analyses within the Fletcher's Creek and Huttonville Creek Subwatersheds. For the purpose of hydrologic calibration, the hydraulic structures within the watercourses were included in the rating curve generation. As part of the subsequent continuous simulation, the rating curves were then updated to remove any influence and artificial storage generated from the hydraulic structures.

A component of the Subwatershed Characterization completed in 2011, a review of existing/proposed stormwater management facilities was completed, for inclusion in updated hydrologic modelling. Four (4) stormwater management facilities were proposed within the North West Sandalwood Parkway Secondary Planning Area in the Fletcher's Creek Subwatershed, in order to provide stormwater quantity control for that development. A total of seventeen stormwater management facilities for stormwater quantity control have been constructed/approved within the Fletcher's Meadows Secondary Planning Area, plus the Fletcher's Village facility located between Highway 7 and the CN Railway, west of the Fletcher's Creek.

The calibrated continuous hydrologic models were used to determine frequency flows for the 1.05 to the 100 year storm event, based upon a 39 year continuous simulation (1960 – 1998). The frequency analysis was conducted using the Consolidated Frequency Analysis (CFA) program. Two distributions were assessed: Three Parameter Lognormal Distribution and Log Pearson Type III Distribution. As per the Ministry of

Natural Resources guidelines for conducting frequency analysis, the Coefficient of Skew was checked to determine which distribution is the most appropriate. Frequency analysis testing of both distributions was conducted at various locations within the subwatersheds. In the Huttonville subwatershed the Log Pearson Type III Distribution was selected based on best fit of data within the scatter graphs, although the Coefficient of Skew is positive. In the Fletchers Creek subwatershed the Log Pearson Type III Distribution was selected based on best fit and positive Coefficient of Skew.

The results of the baseline land use assessment for both the Huttonville and Fletchers Creeks headwaters are summarized in Table **2.3.2.18**.

Table 2.3.2.18: Huttonville Creek and Fletchers Creek Frequency Flows (m^3/s) for Baseline Land Use

Subwatershed	Node	Frequency (years)								
		1.05	1.25	2	5	10	20	50	100	Regional
Huttonville Creek	7.350	0.06	0.1	0.18	0.38	0.57	0.82	1.2	1.73	2.71
	7.340	0.15	0.25	0.47	0.95	1.41	1.99	2.99	3.97	6.22
	7.320	0.18	0.29	0.52	1.03	1.54	2.19	3.36	4.54	8.04
	7.310	0.35	0.55	0.98	1.92	2.86	4.09	6.28	8.51	14.3
	7.290	0.53	0.76	1.12	1.66	2.05	2.44	2.98	3.41	12.4
	7.260	0.74	1.06	1.62	2.66	3.55	4.58	6.19	7.65	21.7
	7.231	0.92	1.34	2.14	3.72	5.16	6.89	9.75	12.5	28.4
	7.230	0.93	1.35	2.09	3.45	4.61	5.94	8.04	9.94	28.7
Fletchers Creek	5.420	0.11	0.15	0.24	0.39	0.51	0.66	0.88	1.08	1.83
	5.410	0.13	0.2	0.34	0.62	0.87	1.18	1.67	2.14	3.73
	5.390	0.18	0.29	0.51	0.95	1.35	1.83	2.63	3.37	6.26
	5.380	0.19	0.27	0.43	0.75	1.05	1.43	2.07	2.71	6.02
	5.470	0.044	0.069	0.12	0.24	0.35	0.5	0.78	1.05	2.12
	5.460	0.07	0.11	0.19	0.35	0.49	0.67	0.97	1.25	2.93
	5.450	0.12	0.19	0.34	0.66	0.96	1.35	2.01	2.66	4.58
	5.430	0.36	0.55	0.87	1.44	1.91	2.44	3.24	3.95	14.78
	5.490	0.087	0.14	0.26	0.53	0.8	1.15	1.8	2.46	4.26
	5.480	0.14	0.23	0.43	0.83	1.22	1.7	2.5	3.27	5.65
	5.570	0.045	0.077	0.14	0.3	0.45	0.65	1.01	1.37	2.19
	5.500	0.088	0.14	0.25	0.5	0.74	1.05	1.61	2.17	3.91
	5.550	0.18	0.3	0.57	1.17	1.78	2.57	3.99	5.43	8.65
	5.540	0.2	0.31	0.51	0.93	1.3	1.75	2.5	3.2	8.23
	5.520	0.3	0.43	0.66	1.1	1.48	1.92	2.62	3.26	12.26
	5.580	0.04	0.067	0.12	0.25	0.38	0.56	0.86	1.18	1.94
	5.820	0.061	0.1	0.19	0.38	0.56	0.8	1.22	1.63	2.62

Subwatershed	Node	Frequency (years)								
		1.05	1.25	2	5	10	20	50	100	Regional
	5.590	0.029	0.046	0.082	0.16	0.23	0.33	0.49	0.66	1.42
	5.560	0.37	0.56	0.9	1.57	2.17	2.87	4.02	5.08	15.63
	5.610	0.17	0.27	0.49	1	1.52	2.2	3.42	4.67	8.22
	5.600	0.22	0.34	0.6	1.11	1.6	2.19	3.18	4.13	8.96
	5.370	0.78	1.16	1.77	2.8	3.59	4.44	5.68	6.72	32.75

The results of the 2011 hydrologic analysis and the associated flow monitoring found that Huttonville Creek is typically dry, with intermittent flows resulting only from precipitation events. The headwater areas of Fletchers Creek are also dry, with flow resulting only from precipitation events. The location of the FSA being in the headwaters of both systems indicates minimal limitations for future SWM design and implementation with regards to timing influences or upstream influences. The findings and modelling files from this study can be utilized in subsequent studies related to the FSA and headwater development.

Hydrologic Modelling Summary

In summary, the hydrologic modeling completed to date for the Etobicoke Creek, Humber River and Credit River Watersheds range in both modeling software, type of assessment and vintage. These sources can be utilized and built upon as part of subsequent studies related to the FSA but will require integration and refinement to ensure consistent discretization of the study area within the respective Watersheds, and should apply a consistent modelling platform and methodology for establishing stormwater management criteria for the FSA and proposed development as part of future studies.

The details of each source are summarized in Table 2.3.2.19.

Table 2.3.2.19. Hydrologic Modeling Summary

Watershed	Hydrologic Model	Type of Assessment	Year Completed	Source
Humber River	Visual OTTHYMO Version 4	Synthetic design storms	2015	Humber Hydrology Update Report, Civica
Etobicoke Creek	Visual OTTHYMO Version 2.4	Synthetic design storms	2013	Etobicoke Creek Hydrology Update, MMM
Credit River (Huttonville Creek / Fletcher's Creek)	HSP-F	Continuous Simulation	2011	North West Brampton Subwatershed Study, AMEC

Hydraulic Conditions

Hydraulic Modelling & Floodline Generation

Hydraulic analyses of open watercourses are predominately completed using the HEC-RAS hydraulic model. The HEC-RAS tool has been developed based on the U.S. Army Corp of Engineers HEC-2 hydraulic model and uses energy and momentum equations to determine water surface elevations for given channel geometric cross-sections, crossings and boundary conditions.

The primary watercourses which run throughout the FSA are headwater tributaries contributing to the Upper Etobicoke Creek and the Upper West Humber River; these systems continue to flow south outside of the FSA and outlet at Lake Ontario. These watercourse systems are constraints to potential development due to their physical traits (steep banks, watercourse width, ecological value etc.) but also the limits of the regulated floodplains which are prone to inundation during a variety of storm events, and represent formal hazards.

Previously completed hydraulic analyses and approved floodlines have been provided for the watercourses throughout the FSA and surrounding areas downstream, as approved by the respective regulatory authority (TRCA and CVC). The regulated floodlines have been generated based upon the results from the approved HEC-RAS models simulating the Regulatory event (greater of Regional Storm or 100-year event). The floodlines respective to the FSA and downstream areas are depicted on Drawing WR5.

The floodline mapping provided indicates two (2) main categories of floodlines: *engineered* and *estimated*. Engineered floodlines are understood to have been developed from engineered hydraulic models, which were built using detailed data collection for channel / floodplain geometry and includes hydraulic structures (i.e. culverts, bridges, weirs, etc.) based upon best available sources (field survey, as-built drawings, etc.). Estimated floodlines are understood to have been developed from simplified hydraulic models, generally based upon basic channel topography (i.e. from an available DEM source only) and do not include hydraulic structures. These are noted to be primarily generated for smaller headwater tributaries / drainage features which feed into the larger systems downstream; this methodology has been applied for majority of the floodplain delineation within the FSA, as part of the Upper West Humber River Subwatershed.

Flood Vulnerable Areas

In 1980 Toronto and Region Conservation Authority (TRCA) developed a Flood Control Program which integrated flood protection works, property acquisition and TRCA's regulations to reduce and manage flood risk. This program was restricted by various conditions and technologies of the day, hence only 210 total flood sites, along with 31 damage centers, were identified in the program. These damage centers located throughout TRCA's jurisdiction are also known as Flood Vulnerable Areas (FVAs), which contain flood vulnerable sites such as buildings, as well as flood vulnerable roads (FVRs).

As part of the current study, TRCA has provided a GIS mapping shapefile indicating the limits of existing FVAs, as defined through hydraulic modeling and floodline mapping (ref. Drawing WR5). Notably, for the current study there are four (4) FVAs which are located downstream of the FSA; these areas are located along the Upper Etobicoke Creek in Downtown Brampton, Main Humber in Bolton and further downstream in Vaughn, as well as the confluence of the West Humber and Lower Main Humber branches in northern Etobicoke. These FVAs are reviewed further in subsequent study components, as part of the Part B: Impact Assessment for potential development of the FSA.

Upper Etobicoke Creek FVA – Downtown Brampton SPA

The Etobicoke Creek flows throughout Downtown Brampton and has historically caused significant flooding throughout the downtown core. In response to the frequent flooding, a concrete-lined by-pass channel was constructed between Church Street and Wellington Street in 1952, which subsequently facilitated development and protected Downtown Brampton from riverine flooding since its construction. The by-pass channel extends from Church Street to just downstream of the CN railway crossing of Etobicoke Creek. The channel is of trapezoidal shape with an approximate top width of 21 meters, including a 5 m wide by 1 m deep low flow channel, and is constructed of reinforced concrete.

However, the downtown core remains within the Regulatory (Regional Storm) floodplain due to a simulated spill condition. This would be caused when flood waters leave Etobicoke Creek at the upstream limit of the by-pass channel and flow through the 'remnant' valley associated with the original watercourse plan form (i.e. prior to construction of the by-pass channel), eventually rejoining the original unaltered Etobicoke Creek, just downstream of the by-pass channel.

To recognize the need for flexibility with regard to development in key socio-economic areas impacted by flood hazards, Provincial flood management policies allow for the designation of a Special Policy Area (SPA). Downtown Brampton was recognized as such an area and designated a Special Policy Area (SPA 3, Secondary Planning Area 7) in 1986, as part of the Brampton Central Secondary Plan. The SPA3 policies were then incorporated into the Downtown Brampton Secondary Plan (1998).

Amec Foster Wheeler conducted a Flood Protection Feasibility Study for Downtown Brampton on behalf of TRCA with support from the City of Brampton (ref. Downtown Brampton Flood Protection Feasibility Study, Amec Foster Wheeler, July 2016). This study reviewed and evaluated numerous flood mitigation options for Downtown Brampton to align the mandate of TRCA to reduce risk to life and property (from flooding) with the goals of the City of Brampton to support development potential in SPA3.

The preferred short/long term flood mitigation options resulting from the 2016 study include the following:

- **Rosalea Park Flood Berm**
- Combined Flood Protection Landform
- Lower By-pass Channel
- Downstream Channel Improvements
- Tailwater Flood Protection Landform
- **Clarence Street Bridge Improvements**
- Greenfield Stormwater Management
- Floodproofing
- Combination Approaches

Any subsequent studies completed for the Downtown Brampton SPA should be reviewed further to determine if any updates or refinements to the proposed mitigation alternatives have been made since the 2016 study. These recommendations will help to provide further context and design guidance for any development upstream (i.e. FSA) to ensure mitigation of downstream impacts. This FVA has been reviewed in further detail as part of the off-site hydraulic impact assessment, discussed further in a subsequent section.

Main Humber River FVAs – Bolton and Vaughn

The FVAs located along the upper portions of the Main Humber River include one in the community of Bolton, at the confluence with Cold Creek, and another additional FVA further downstream at the confluence of the Main Humber River and the East Humber River, in the City of Vaughan.

The FSA lands represent a small portion of the Main Humber Watershed drainage area, of only approximately 1%. Therefore, it is expected that should development occur within the headwaters, the appropriate SWM designs should be capable of mitigating potential negative impacts on the downstream FVAs. Nonetheless, detailed studies for these FVAs (if available) should be reviewed further to determine if any special circumstances would need to be incorporated into the SWM design and criteria for the subject FSA lands draining to these FVAs. Detailed reports for these FVAs have not been provided for the current study and should therefore be reviewed further in subsequent study components.

Main Humber River FVA – Confluence with West Humber River

The FVA with the greatest area located downstream of the FSA is the Albion Road community, located along the confluence of the West Humber River and Main Humber River, in the City of Toronto. This FVA could be significantly impacted by the FSA development, given that the FSA lands occupy approximately 26% of the drainage area within the West Humber River Subwatershed. Based on review of the time to peak results from the Humber River Hydrologic Model, the timing influences may be unfavorable for traditional SWM in the headwaters, which may lead to increases in peak flows further downstream, due to lagged release of outflows. Detailed studies for this FVA (if available) have not been provided for the current study, however if such studies have been completed for this area, the outcomes and findings should be reviewed. This FVA has been reviewed in further detail as part of the off-site hydraulic impact assessment, discussed in the following section.

Off-Site Hydraulic Impact Assessment – Baseline Conditions

As part of the subsequent impact assessment for the FSA lands, an off-site hydraulic impact assessment is to be completed for the Etobicoke Creek and Humber River FVAs located downstream of the FSA, in order to evaluate anticipated flood risk impacts resulting from future urbanization within the designated whitebelt areas of the Etobicoke Creek and Humber River Watersheds.

This is to be completed using the as-approved HEC-RAS models for both FVAs, as follows:

- Etobicoke Creek – Brampton SPA, Wood, March 2014
- Humber River – Humber in Toronto, Wood, 2017

The primary input for the off-site hydraulic assessment is the results of the hydrologic impact assessment completed by TRCA (ref. Hydrologic Assessment Memo, TRCA, November 2019), which identified the changes in peak flow rates associated with a "50% Whitebelt build-out" and "100% Whitebelt build-out" scenarios for the Humber River Watershed. The hydrologic assessment completed by TRCA did not include updated modelling for the Etobicoke Creek Watershed, therefore the "Ultimate" future land use condition from the 2013 Etobicoke Creek Subwatershed Study is to be utilized in the future land use hydraulic impact assessment (ref. Etobicoke Creek Hydrology Update, MMM Group, April 2013). Further details regarding the whitebelt land use changes and impact assessment is to be provided in subsequent study phases (i.e. Part B Report).

The change in flood risk within the FVAs is to be summarized in two different ways: the first being the change in hydraulic performance related to both water surface elevation and wetted width/floodline limits, and the second being the potential increase in flood damage costs within the affected FVAs. The flood damage costs are to be estimated using Flood Damage Curves as provided in the National Flood Damage Guidelines (ref. Canadian Guidelines and Database of Flood Vulnerability Functions, March 2017). The damage curves provided in these guidelines vary based upon the building type, structure/contents, number of stories, etc. The damage curves provide a flood damage cost per building footprint ($\$/m^2$) which can be used to estimate the associated damages with respect to a certain flood depth at the affected building.

The details regarding the flood vulnerable sites located within the affected FVAs have been sourced from a previous study completed by AMEC in 2014 on behalf of TRCA (ref. TRCA Flood Protection and Remedial Capital Works Program, AMEC, 2014). This study included the development of a Query Processing Tool (QPT) which determined the flood damage costs and associated risk to life for all FVAs within TRCA's jurisdiction. The QPT is built upon a large database including details of all flood vulnerable sites (buildings and roads), hydraulic model results, and flood damage curves. It should be noted that the flood vulnerable sites for both the Etobicoke Creek and Humber River FVAs consist of both buildings and roadways; however, flood vulnerable roads (FVRs) have not been included in the current flood damage cost estimations.

Given the scope of the current assessment, a simplified spreadsheet approach has been applied for the flood damage cost estimation, in order to utilize the most recent (2017) publication of the flood damage curves, and hydraulic modelling from both the 2014 and 2017 studies. The data related to the flood vulnerable sites has been sourced directly from the QPT databases and GIS shapefiles generated as part of the previous study on behalf of TRCA (ref. TRCA Flood Protection and Remedial Capital Works Program, AMEC, 2014).

A GIS point shapefile of the flood vulnerable buildings within the FVAs has been sourced from the 2014 AMEC study, which has been used in conjunction with the results from the as-approved HEC-RAS models for both the Etobicoke Creek and Humber River FVAs. Both models have been executed for all storm events (2- through 100-year, and Regional) with the as-approved steady flows in order to represent the baseline condition for comparison with the future whitebelt development condition. However, only the 100-year and Regional events are included in any updated mapping.

The mapping function in HEC-RAS (RAS-Mapper) has been used to generate water surface elevation (WSE) maps in a raster format using the DEM/Terrain file associated with the respective hydraulic model. The resulting maps provide estimated flood inundation limits and have been used to extract the resulting maximum WSE surrounding the flood vulnerable buildings; seeing as the GIS shapefile for the building locations is a point file, the maximum WSE result has been extracted using a buffer area of 5 m surrounding the building point location. The 100-year and Regional event WSE maps and the susceptible buildings within the Etobicoke Creek and Humber River FVA systems are presented on Drawing WR10a and Drawing WR10b, respectively.

The extracted WSE is then used against the “lowest elevation” associated with the building, which was previously determined through the 2014 AMEC study with TRCA, in order to establish a water depth result at each affected building. This resulting water depth can then be used to determine the estimated damages resulting from the floodplain inundation, based upon the associated flood damage curve and the building footprint area.

It should be noted that if a building footprint is unavailable in the existing databases, a placeholder area has been applied in order to utilize the flood damage curve; given the nature of the current comparative assessment, this gap filling approach will not change the outcome and/or conclusions of the baseline and future whitebelt development conditions comparisons.

For the purpose of the current assessment, the flood damage curves have been simplified into three (3) general building types/categories listed below. The damage curves utilized in the current assessment can be found in Appendix D.

- Commercial (assuming Non-Residential Retail – Class C6, surface level damages only)
- Miscellaneous (assuming Non-Residential Institution – Class N1, surface level damages only)
- Residential (assuming Residential Class B – Single Unit Dwellings, average between single- and two-story units, allows for calculation of basement flood damages)

The distribution of flood vulnerable buildings within the downstream FVAs are summarized in Table **2.3.2.20**.

Table 2.3.2.20. Number of Buildings within Flood Vulnerable Areas downstream of FSA

Building Type	Etobicoke Creek FVA	Humber River FVA
Commercial (Retail)	110	0
Miscellaneous (Institutional)	13	3
Residential	68	63
Total	**191**	**66**

The Etobicoke Creek FVA is located within Downtown Brampton and has a significant number of flood vulnerable buildings, with over half being designated commercial uses. The Humber River FVA is within a less dense urban community, with primarily residential properties located within the floodplain.

The resulting flood damage curves for the baseline (as-approved model) conditions for each FVA has been summarized in Table 2.3.2.21.

Table 2.3.2.21. Direct Flood Damage Estimations for Downstream FVAs - Baseline Conditions

FVA	2-yr to 50-yr	100-yr	Regional	Average Annual
Etobicoke Creek	-	$ 9,044	$ 125,938,520	$ 576,481
Humber River	-	-	$ 18,359,764	$ 84,026

The resulting flood damage estimates under baseline conditions result in average annual damages of $576K and $84K for the Etobicoke Creek and Humber River FVAs, respectively. No damages are seen to occur as a result of riverine flooding under the 2- through 50-year events, with the primary source of damages occurring under the Regional storm for both systems. These damage estimates will be used as the baseline condition for comparison to the future whitebelt land use conditions, in order to estimate the change in flood risk and associated potential damages.

Hydraulic Structures / Constraints

Hydraulic structures and their embankments have the potential to impose constraints upon proposed development, by undersized crossings (bridges/culverts) creating a backwater effect and/or overtopping during high flow events such as the Regional Storm. These structures also have the potential to exacerbate flood conditions within the floodplain with increased development runoff in the headwaters. Identifying the susceptible structures can allow for potential solutions to be determined to improve conveyance and reduce the likelihood of increased flooding should development occur.

Various hydraulic models (HEC-RAS) consisting of both the Etobicoke Creek and Humber River tributaries have been reviewed in order to identify potential capacity constraints associated with the hydraulic structures, which may result in a backwater condition and/or overtopping of the structure during the Regional Storm event. The hydraulic models reviewed in detail focused upon the FSA and the FVAs located downstream of the proposed development; these included the following:

- Upper and West Humber, Cole Engineering, June 2017
- Etobicoke Creek – Brampton SPA, Wood, March 2014
- Humber in Toronto, Wood, 2017

The structures experiencing backwater and/or overtopping during the Regional Storm event within the FSA and the existing FVAs located directly downstream have been identified as potential constraints; these hydraulic structures are summarized in the following Table **2.3.2.22** and Drawing WR6.

Table 2.3.2.22. Hydraulic Structure Constraints - FSA and FVAs

Hydraulic Structure ID	HEC-RAS Coding	Structure Type	Span (m)	Rise (m)	Length (m)	U/S Inv (m)	D/S Inv (m)	Spill Elevation (m)
Etobicoke Creek-26.795	Bridge	Open Bridge	21.10	2.70	18.00	213.00	213.20	217.24
Etobicoke Creek-26.735	Multiple Opening	Open Bridge	21.70	4.90	8.70	209.30	209.29	213.34
Campbell's TribA-812.124	Culvert	Concrete Box	3.70	1.60	24.53	263.79	263.43	267.42
Campbell's TribA-811.699	Culvert	Concrete Box	5.10	3.00	44.04	260.46	260.43	264.93

Hydraulic Structure ID	HEC-RAS Coding	Structure Type	Span (m)	Rise (m)	Length (m)	U/S Inv (m)	D/S Inv (m)	Spill Elevation (m)
Campbell's TribA-809.432	Culvert	Concrete Box	4.90	1.80	22.90	245.76	245.43	248.41
Campbell's TribA-807.008	Culvert	CSP Ellipse	8.00	4.40	17.69	232.08	231.99	238.26
Campbell's TribA-806.128	Culvert	CSP Arch	8.42	3.69	28.50	224.80	224.60	231.54
Gore Road Trib-1414.268	Culvert	Concrete Box	6.05	1.49	20.90	220.35	220.35	222.33
Campbell's Crk-513.682	Culvert	Concrete Box	3.70	2.40	21.36	264.57	264.54	268.49
Campbell's Crk-512.088	Culvert	CSP Arch	3.73	2.30	33.05	262.44	262.44	265.93
Campbell's Crk-509.895	Culvert	Concrete Box	5.10	3.00	33.98	256.59	256.47	260.28
Campbell's Crk-507.641	Culvert	Concrete Box	10.67	2.44	41.73	246.33	246.24	250.20
Salt Creek-1012.466	Culvert	Concrete Box	5.50	2.00	15.28	249.87	249.87	252.17
Salt Creek-1009.981	Bridge	Open Bridge	10.90	2.30	13.58	237.69	237.09	240.45
Salt Creek-1007.277	Bridge	Open Bridge	9.15	2.39	11.84	223.92	223.80	226.51
West Humber-1380.675	Culvert	CSP Arch	3.80	2.60	23.03	241.32	240.45	245.12
West Humber-1355.061	Culvert	CSP Arch	7.20	4.60	35.37	227.16	226.98	237.30
West Humber-1353.874	Culvert	CSP Arch	8.90	3.92	28.87	222.69	222.60	229.08
West Humber-1304.84	Culvert	CSP Arch	8.80	4.23	25.25	211.30	211.18	218.16
West Humber Crk-679.4845	Bridge	Open Bridge w/ Pier	42.35	2.16	28.00	125.41	125.07	129.40
Lower Humber-148.4585	Bridge	Open Bridge w/ Pier	53.60	5.80	16.00	120.80	120.80	127.30
Lower Humber-75.84924	Bridge	Open Bridge w/ Pier	50.40	6.74	20.00	120.73	120.60	128.02
Lower Humber-4264.165	Bridge	Open Span Bridge w/ Pier	~130	~9.5	9.00	120.50	120.46	130.09
Lower Humber-4201.13	Bridge	Open Span Bridge w/ Pier	~100	~5.8	87.00	120.54	120.30	127.85
Lower Humber-4098.95	Bridge	Open Span Bridge w/ Pier	~92	~6.1	10.00	120.30	120.30	128.34

The identified structures range in opening type and size, with primarily culverts and smaller span bridges being located within the FSA boundary, whereas the existing bridges within the FVAs and directly downstream include highway crossings with spans ranging upwards of 100 m. These areas and structures are to be reviewed further as the FSA is refined and assessed in subsequent study phases.

Hydraulic Modelling Summary

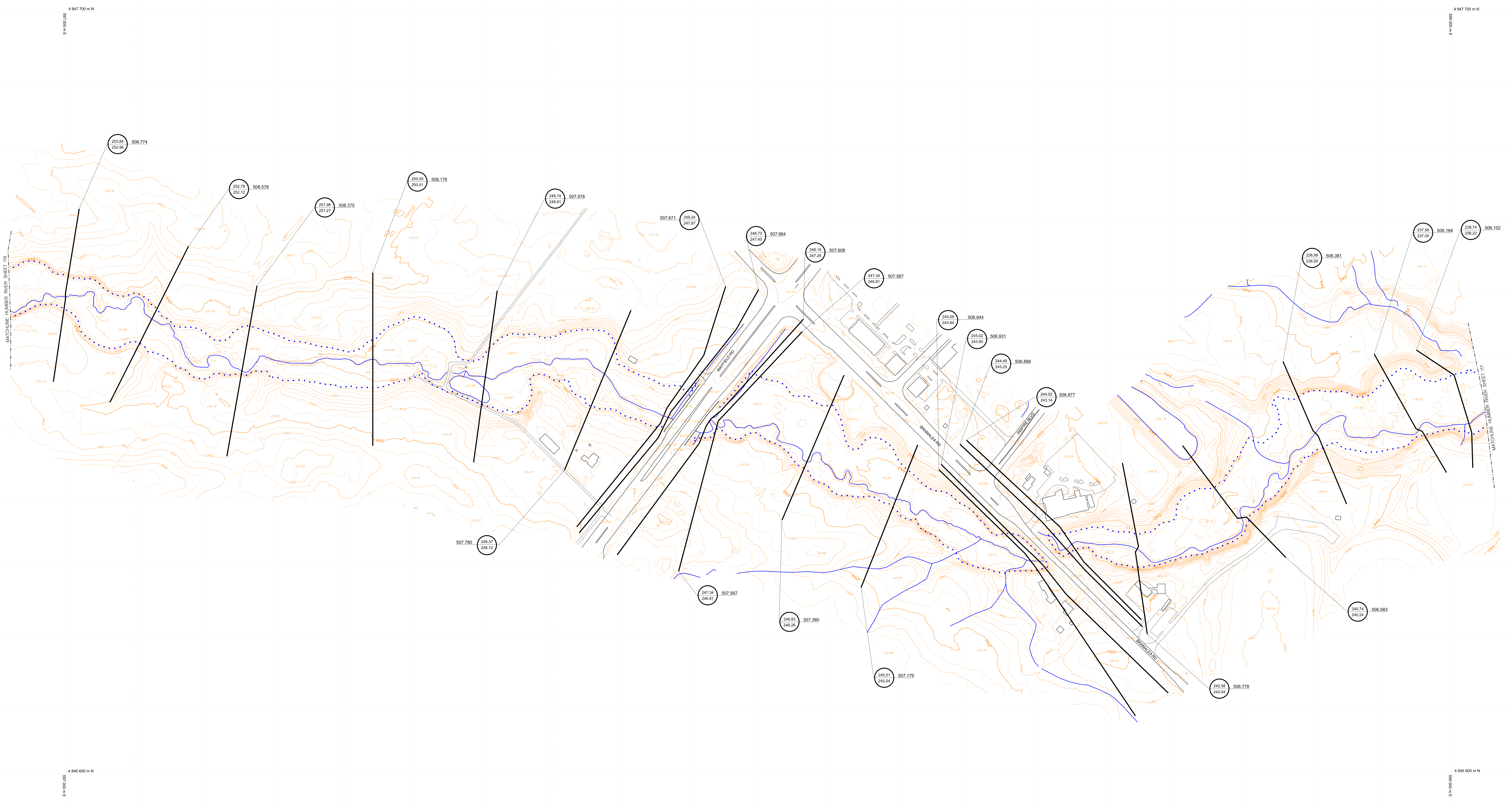
In summary, the hydraulic modelling completed to date for the Etobicoke Creek, Humber River and Credit River Watersheds are consistent in the modelling software, but range in age/vintage. Those with older vintage will require review and updating should bridges/culverts be replaced or changes in the floodplain/terrain have occurred. Nonetheless, these models will serve as a strong basis for characterizing hydraulic conditions relative to the FSA and downstream areas as part of subsequent studies. The various sources are summarized in Table 2.3.2.23.

Table 2.3.2.23. Hydraulic Modelling Summary

Watershed	Subwatershed / Study Limits	Hydraulic Model	Year Completed	Source
Humber River	West Humber	HEC-RAS	2017	Cole Engineering Ltd
	Bolton SPA	HEC-RAS	N/A	N/A
	Upper Main Humber	HEC-RAS	2018	N/A
	Lower Main Humber	HEC-RAS	2017	Wood
Etobicoke Creek	Etobicoke Creek	HEC-RAS	2016	Aquafor Beech Limited
	Downtown Brampton SPA	HEC-RAS	2014	Amec Foster Wheeler
Credit River[1]	Huttonville Creek	HEC-RAS	2011	AMEC
	Fletcher's Creek	HEC-RAS	2011	AMEC

Note: [1] Hydraulic models have not been provided for the Credit River Watershed – HEC-RAS models from the North West Brampton Subwatershed Study, completed by AMEC in 2011, are available for scoped use in the current study, if required.

As noted in the above, the Regulatory Floodline Mapping has been estimated along some reaches, hence has not been developed based upon field verified hydraulic structures and topographic mapping. Furthermore, the extent of floodline mapping will need to be extended along various reaches through the FSA to establish that floodline mapping for all regulated watercourses within the area (i.e. generally watercourses with contributing drainage areas greater than 50 ha). As such, future studies for the FSA will be required to populate the hydraulic structure inventory to include as-built or field-surveyed information, and to extend the hydraulic modelling to encompass all regulated watercourses. In addition, the geometry data within current models should be verified against topographic mapping for the area, to confirm that the geodetic datum for topographic mapping is consistent with that used for the current modelling, and the modelling and/or mapping revised as appropriate to apply a consistent datum for the hydraulic analyses.



R E V I S I O N S

NO.	DESCRIPTION	BY	DATE

LEGEND
Cross–Section Label
Cross–Section Leader Line
Regional Flood Elevation (m)
Cross–Section Number 14.060
100 Year Flood Elevation (m)
172.00
172.00
Cross–Section Length

REGULATORY FLOOD ELEVATION IS THE HIGHER OF THE TWO ELEVATIONS DISPLAYED

LEGEND

Contour Index
Contour 1 metre
Contour 0.5 metre
Contour Label 100
Spot Elevation 100.10
Road
Parking Lot / Large Driveway
Rail Line
Bridge / Large Culvert
Water Feature
Ditch
Marsh
Building
Regulatory Flood Line • • • • •

The elevation data on this map was produced by TRCA from a DEM with 1.0 m grid resolution. The DEM was created using mass points with a vertical accuracy tolerance of +/- 0.10m RMSE on hard flat surfaces. The mass points were collected using LiDAR flown in 2014 by Airborne Imaging.

Downstream of Mayfield Rd.:
The planimetric data on this map was acquired from the City of Brampton Open Data Catalogue in 2017. The vintage of the data may not match with the elevation dataset and is for reference only.

Upstream of Mayfield Rd.:
The planimetric data on this map was compiled from a variety of sources of different vintage and may not match with the elevation dataset. This data is for reference only.

Building footprints were acquired from Peel Region in 2017.

The vertical datum is mean sea level as established by the Geodetic Survey of Canada. CGVD 1928–1978 Ontario Adjusted Version

The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W

Grid Interval 100 metres.

PLEASE NOTE:
FLOODLINE ELEVATIONS ARE SUBJECT TO CHANGE DUE TO REVISED INFORMATION.

Elevation Data provided by:

AIRBORNE IMAGING
A Clean Harbors Company

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

PLEASE NOTE:
THE PROFESSIONAL ENGINEER'S STAMP VERIFIES THE FLOOD LINE AND ASSOCIATED DATA NOT THE MAP DATA UNLESS OTHERWISE NOTED

O.F. SANDERS

FLOOD PLAIN MAPPING PROGRAM

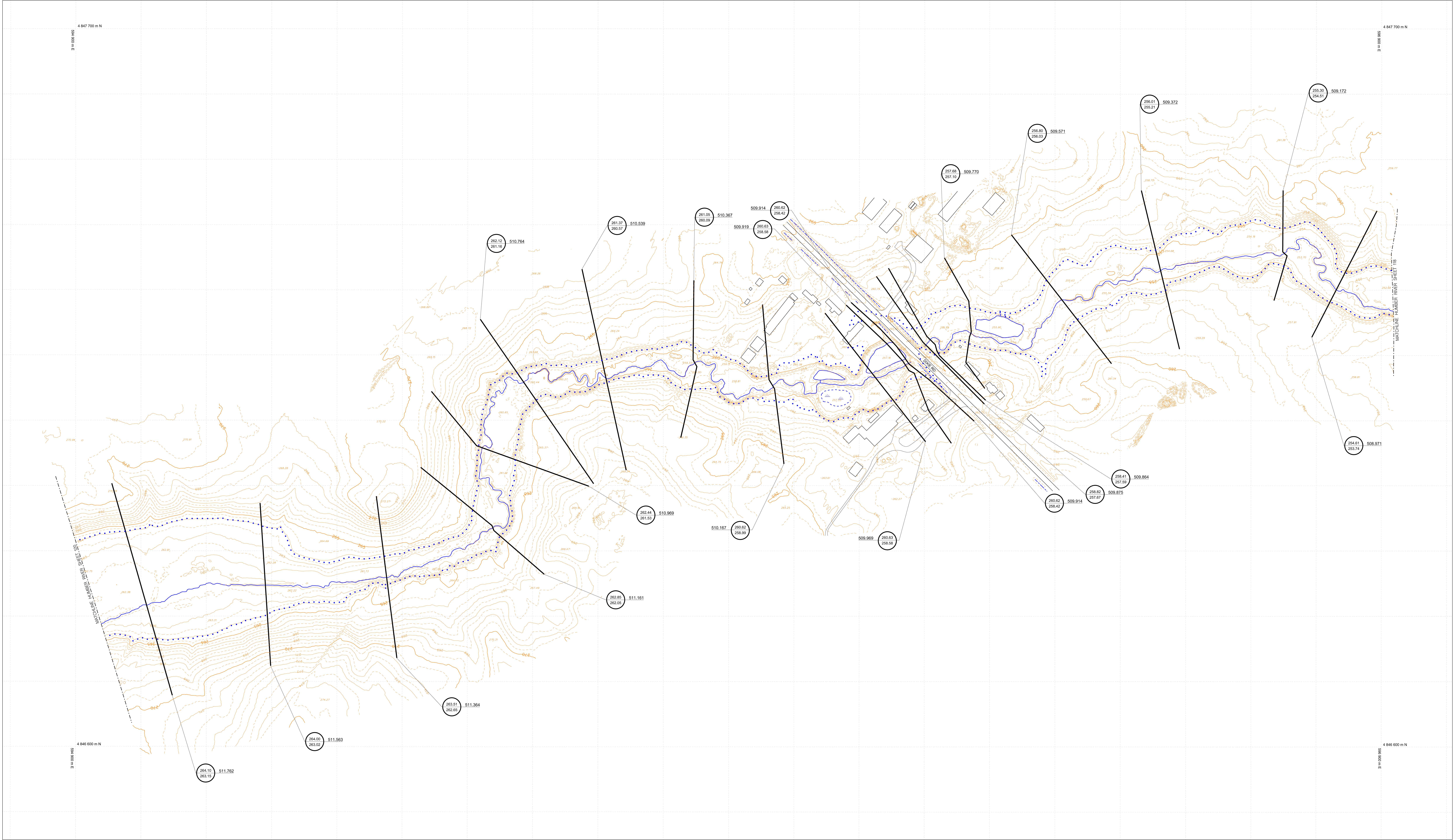
FLOODLINE APPROVED DATE: 2018-05-18

Toronto and Region Conservation
for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661–6600

Scale 1:2000
100 Metres 0 100 200 Metres
200 Feet 0 200 400 600 800 1000 Feet

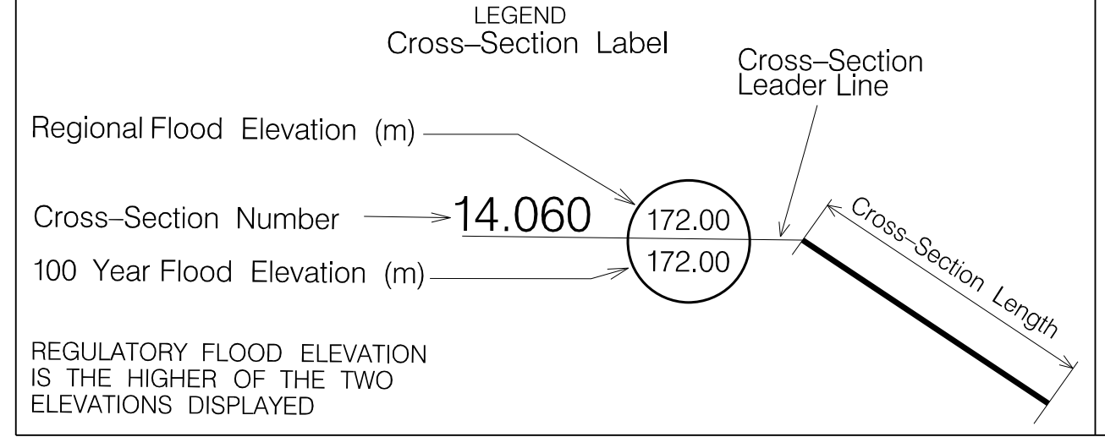
HUMBER RIVER

SHEET No. 118



REVISIONS			
NO.	DESCRIPTION	BY	DATE

LEGEND



REGULATORY FLOOD ELEVATION IS THE HIGHER OF THE TWO ELEVATIONS DISPLAYED

LEGEND

Contour Index	
Contour 1 metre	
Contour 0.5 metre	
Contour Label	100
Spot Elevation	. 100.10
Road	
Parking Lot / Large Driveway	
Rail Line	
Bridge / Large Culvert	
Water Feature	
Ditch	
Marsh	
Building	
Regulatory Flood Line	• • • • •

The elevation data on this map was produced by TRCA from a DEM with 1.0 m grid resolution. The DEM was created using mass points with a vertical accuracy tolerance of +/- 0.10m RMSE on hard flat surfaces. The mass points were collected using LiDAR flown in 2014 by Airborne Imaging.

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The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W

Grid Interval 100 metres.

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O.F. SANDERS

FLOOD PLAIN MAPPING PROGRAM

FLOODLINE APPROVED DATE: 2018-05-18

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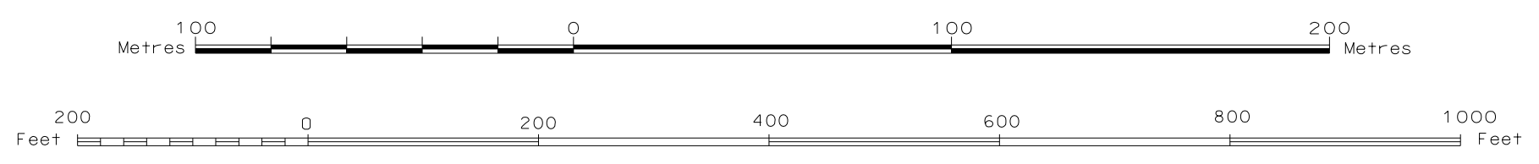
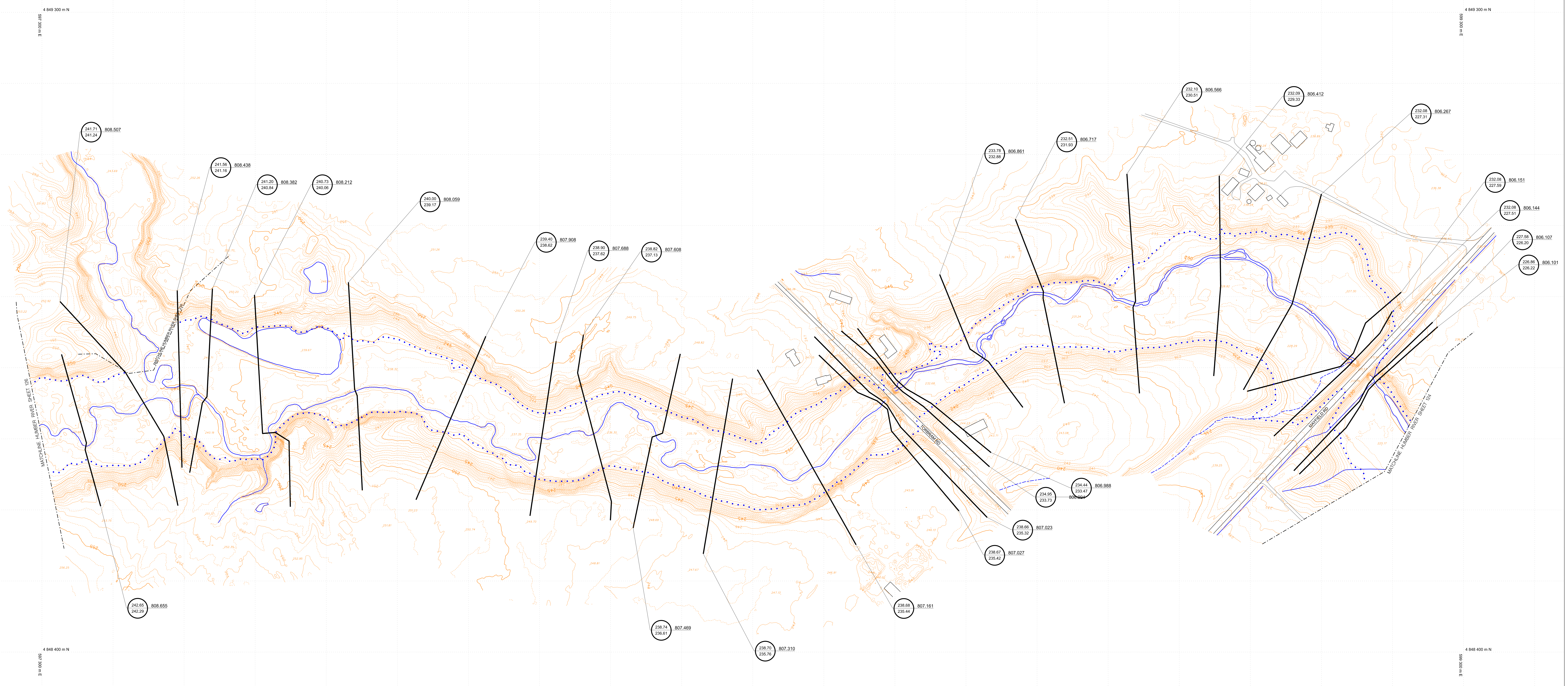
Scale 1:2000



HUMBER RIVER

SHEET No. 119



REVISIONS

NO.	DESCRIPTION	BY	DATE
1	Floodline removed at matchline for Humber River sheet 236. This data has been superseded and can be found on Humber River sheet 236.	MDT	2023-10-20

LEGEND
Cross–Section Label

Regional Flood Elevation (m)
Cross–Section Number 14.060
100 Year Flood Elevation (m)
172.00
172.00
Cross–Section Leader Line
Cross–Section Length

REGULATORY FLOOD ELEVATION IS THE HIGHER OF THE TWO ELEVATIONS DISPLAYED

LEGEND

Contour Index	—	Bridge / Large Culvert	—
Contour 1 metre	—	Water Feature	—
Contour 0.5 metre	- - -	Ditch	— - — -
Contour Label	100	Marsh	
Spot Elevation	. 100.10	Building	
Road	═	Regulatory Flood Line	• • • • •
Parking Lot / Large Driveway	—		
Rail Line	—+——⊢		

The elevation data on this map was produced by TRCA from a DEM with 1.0 m grid resolution. The DEM was created using mass points with a vertical accuracy tolerance of +/- 0.10m RMSE on hard flat surfaces. The mass points were collected using LiDAR flown in 2014 by Airborne Imaging.

Downstream of Mayfield Rd.:
The planimetric data on this map was acquired from the City of Brampton Open Data Catalogue in 2017. The vintage of the data may not match with the elevation dataset and is for reference only.

Upstream of Mayfield Rd.:
The planimetric data on this map was compiled from a variety of sources of different vintage and may not match with the elevation dataset. This data is for reference only.

Building footprints were acquired from Peel Region in 2017.

The vertical datum is mean sea level as established by the Geodetic Survey of Canada.
CGVD 1928–1978 Ontario Adjusted Version

The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W

Grid Interval 100 metres.

PLEASE NOTE:
FLOODLINE ELEVATIONS ARE SUBJECT TO CHANGE DUE TO REVISED INFORMATION.

Elevation Data provided by:

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O.F. SANDERS

FLOOD PLAIN MAPPING PROGRAM

FLOODLINE APPROVED DATE: 2018-05-18

Toronto and Region Conservation
for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661–6600

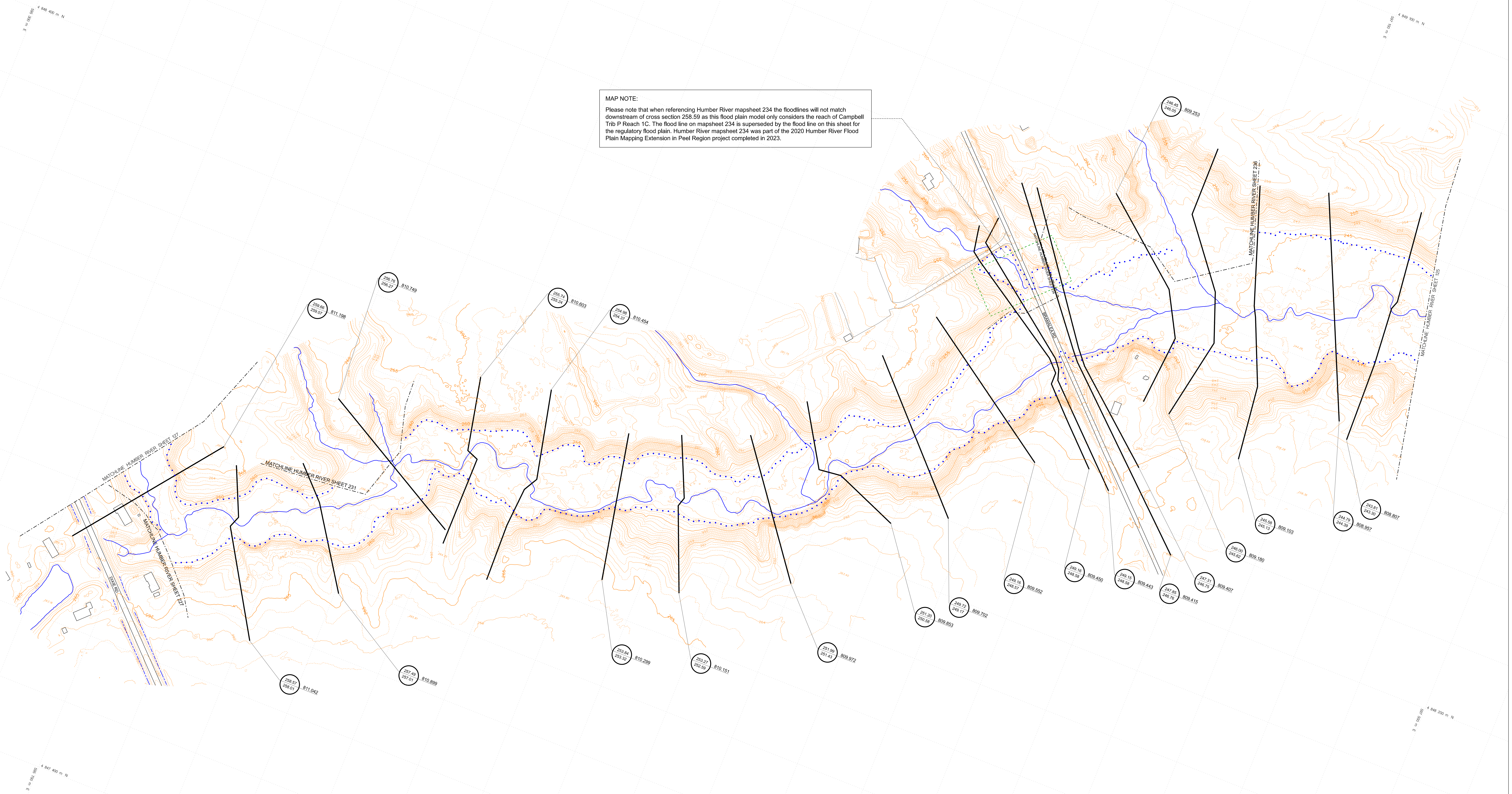
Scale 1:2000
100 Metres 0 100 200 Metres
200 Feet 0 200 400 600 800 1000 Feet

HUMBER RIVER

SHEET No. 125

MAP NOTE:

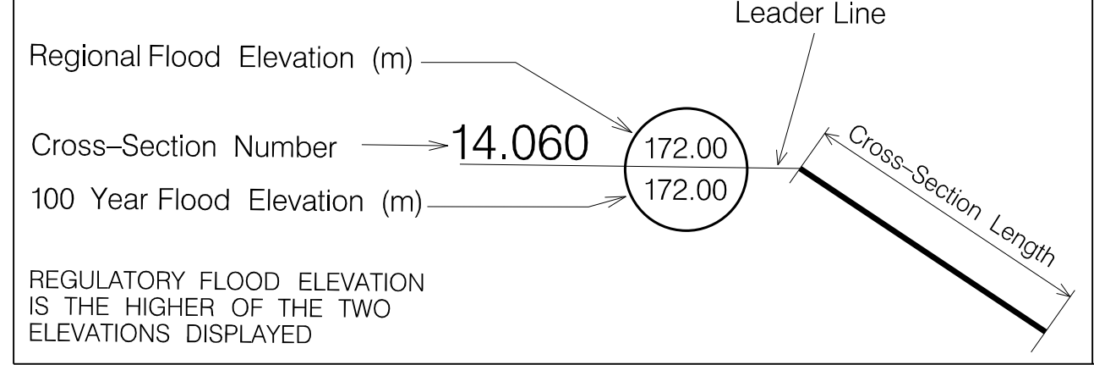
Please note that when referencing Humber River mapsheet 234 the floodlines will not match downstream of cross section 258.59 as this flood plain model only considers the reach of Campbell Trib P Reach 1C. The flood line on mapsheet 234 is superseded by the flood line on this sheet for the regulatory flood plain. Humber River mapsheet 234 was part of the 2020 Humber River Flood Plain Mapping Extension in Peel Region project completed in 2023.



R E V I S I O N S

NO.	DESCRIPTION	BY	DATE
1	Added matchline for Humber River mapsheet 234. Removed floodline at matchline for Humber River mapsheet 227, 231, 236. Data has been superseded and can be found on Humber River mapsheet 227, 231 and 236 respectively.	MDT	2023-10-20

LEGEND
Cross–Section Label



REGULATORY FLOOD ELEVATION
IS THE HIGHER OF THE TWO
ELEVATIONS DISPLAYED

LEGEND

Contour Index	—	Bridge / Large Culvert	—
Contour 1 metre	—	Water Feature	—
Contour 0.5 metre	- - - -	Ditch	— - — - —
Contour Label	100	Marsh	
Spot Elevation	. 100.10	Building	▭
Road	═	Regulatory Flood Line	• • • • •
Parking Lot / Large Driveway	—		
Rail Line	—+——+		

The elevation data on this map was produced by TRCA from a DEM with 1.0 m grid resolution. The DEM was created using mass points with a vertical accuracy tolerance of +/- 0.10m RMSE on hard flat surfaces. The mass points were collected using LiDAR flown in 2014 by Airborne Imaging.

The planimetric data on this map was compiled from a variety of sources of different vintage and may not match with the elevation dataset. This data is for reference only.

Building footprints were acquired from Peel Region in 2017.

The vertical datum is mean sea level as established by the Geodetic Survey of Canada.
CGVD 1928–1978 Ontario Adjusted Version

The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W

Grid Interval 100 metres.

PLEASE NOTE:
FLOODLINE ELEVATIONS ARE SUBJECT TO CHANGE DUE TO REVISED INFORMATION.

Elevation Data provided by:

AIRBORNE IMAGING
A Clean Harbors Company

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

PLEASE NOTE:
THE PROFESSIONAL ENGINEER'S STAMP VERIFIES THE FLOOD LINE AND ASSOCIATED DATA NOT THE MAP DATA UNLESS OTHERWISE NOTED

LICENSED PROFESSIONAL ENGINEER
O.F. SANDERS
PROVINCE OF ONTARIO

FLOOD PLAIN MAPPING PROGRAM

FLOODLINE APPROVED DATE: 2018-05-18

Toronto and Region Conservation
for The Living City

5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661–6600

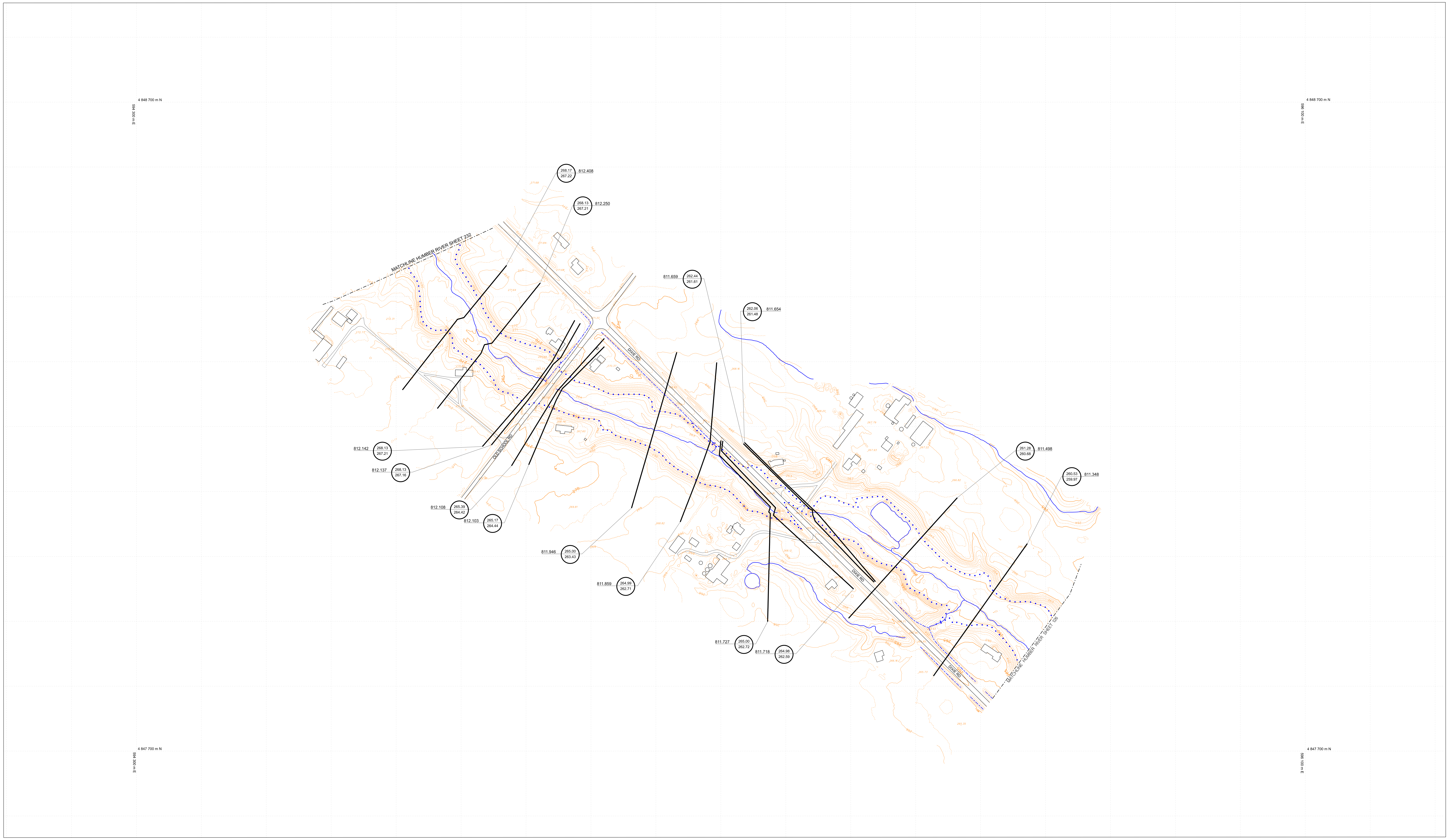
Scale 1:2000

100 Metres 0 100 200 Metres

200 Feet 0 200 400 600 800 1000 Feet

HUMBER RIVER

SHEET No. 126



REVISIONS

NO.	DESCRIPTION	BY	DATE
1	Cross section 812.543 removed at upstream end of mapsheet and matchline added for Humber River mapsheet 232.	MDT	2023-10-20

LEGEND
Cross–Section Label

Regional Flood Elevation (m)
Cross–Section Number 14.060
100 Year Flood Elevation (m)
172.00
172.00
Cross–Section Leader Line
Cross–Section Length

REGULATORY FLOOD ELEVATION IS THE HIGHER OF THE TWO ELEVATIONS DISPLAYED

LEGEND

Contour Index
Contour 1 metre
Contour 0.5 metre
Contour Label 100
Spot Elevation 100.10
Road
Parking Lot / Large Driveway
Rail Line
Bridge / Large Culvert
Water Feature
Ditch
Marsh
Building
Regulatory Flood Line • • • • •

The elevation data on this map was produced by TRCA from a DEM with 1.0 m grid resolution. The DEM was created using mass points with a vertical accuracy tolerance of +/- 0.10m RMSE on hard flat surfaces. The mass points were collected using LiDAR flown in 2014 by Airborne Imaging.

The planimetric data on this map was compiled from a variety of sources of different vintage and may not match with the elevation dataset. This data is for reference only.

Building footprints were acquired from Peel Region in 2017.

The vertical datum is mean sea level as established by the Geodetic Survey of Canada.
CGVD 1928–1978 Ontario Adjusted Version

The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W

Grid Interval 100 metres.

PLEASE NOTE:
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Elevation Data provided by:

AIRBORNE IMAGING
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70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

PLEASE NOTE:
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O.F. SANDERS

FLOOD PLAIN MAPPING PROGRAM

FLOODLINE APPROVED DATE: 2018-05-18

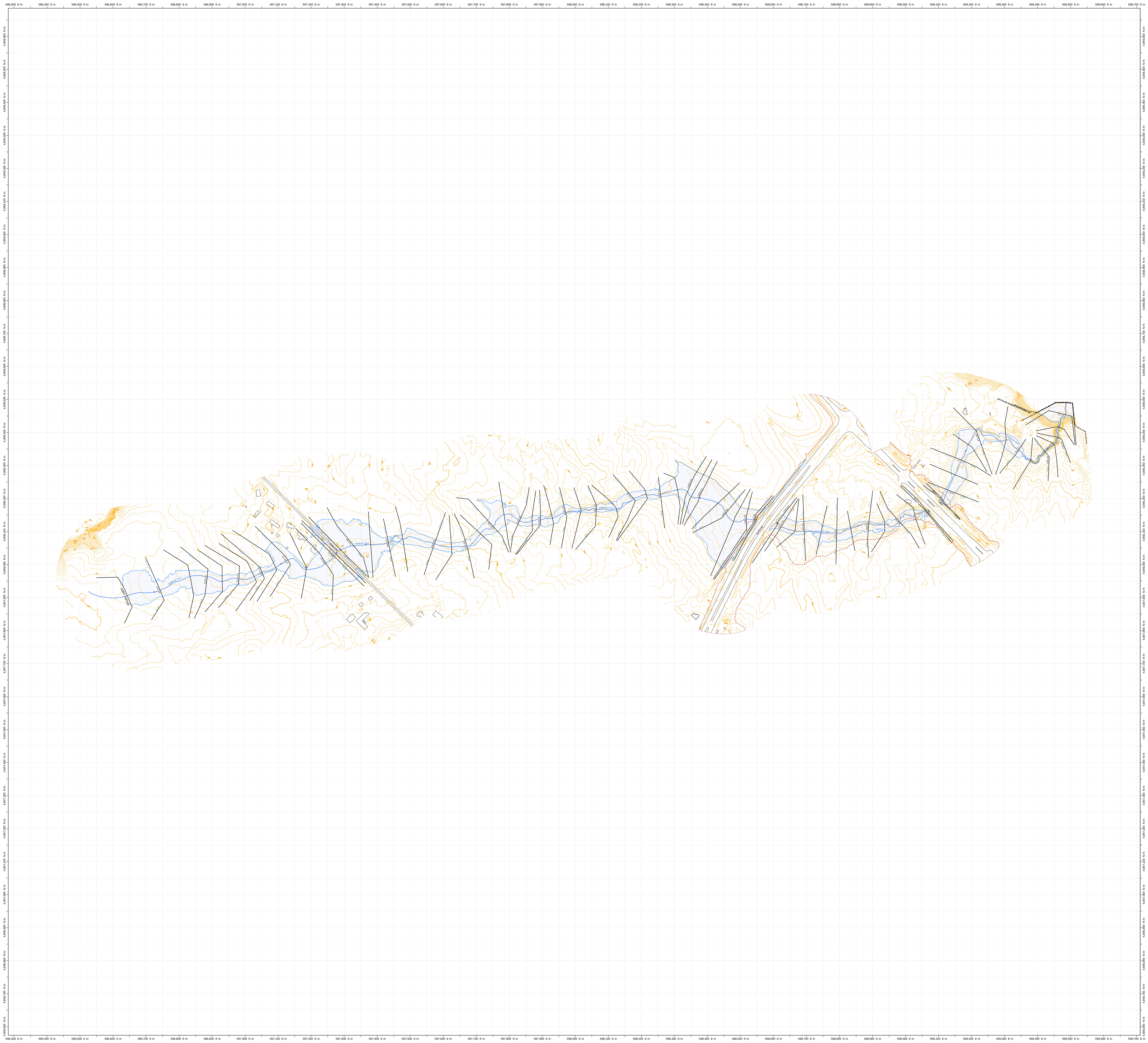
Toronto and Region
Conservation
for The Living City

5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661–6600

Scale 1:2000
100 Metres 0 100 200 Metres
200 Feet 0 200 400 600 800 1000 Feet

HUMBER RIVER

SHEET No. 127



TRCA Flood Plain Mapping Program

Hydraulic Engineering Service Provided By:

This map is a copy of the original map sheet sealed by Y. Qiao on October 20, 2023. If the sealed map is required please contact TRCA. The professional engineer's seal and signature verifies the location of the flood line and the associated water surface elevations only.

Map Note:

The flood line on this map was produced from hydraulic modelling software using a digital elevation model (DEM) with 1m grid resolution. The DEM was created using bare earth mass points with a vertical accuracy tolerance of +/- 0.10 m on hard flat surfaces. The mass points were collected using LiDAR flown in 2014/2015 by Airborne Imaging. In select areas elevation data from 2019 was used. This data was collected using LiDAR flown in 2019 by Airborne Imaging, and uses the same specification as the 2014/2015 dataset.

The spot elevations shown on this map were produced by TRCA using the DEM mentioned above. The contour lines were produced by TRCA by smoothing the full resolution DEM to create smooth lines for cartographic display and should therefore be used as reference only. The river banks were produced by TRCA and are approximate, contours within close proximity are a result of interpolation from the DEM surface and should not be considered a true representation of the water surface or bathymetry.

Contour labels and spot elevations are represented as metres above sea level (masl).

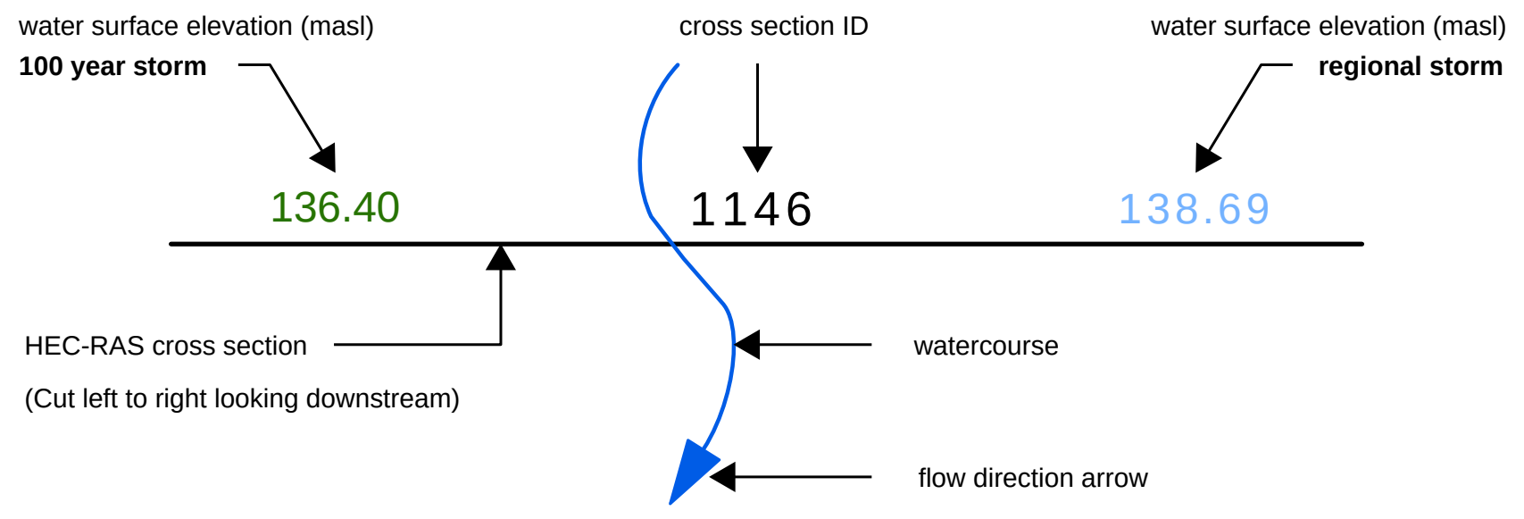
The planimetric data on this map were acquired from various sources with different collection dates and are provided for reference only. The building footprints were acquired from the Region of Peel Open Data in 2020.

The vertical datum is the Canadian Geodetic Vertical Datum of 1928:1978 Ontario Adjusted Version.
The horizontal datum is North American Datum of 1983, UTM 6° projection Zone 17,
Central Meridian 81° W.

Legend

Surface Contour
5m
1m
0.5m
Spot Elevaton Point
Roads
Building
Bridge / Culvert
Waterbody
Regulatory Flood Line
Elevation Data from 2019

Hydraulic Model Legend:



NOTE: The regulatory flood elevation is the greater of the regional storm or 100 year storm.

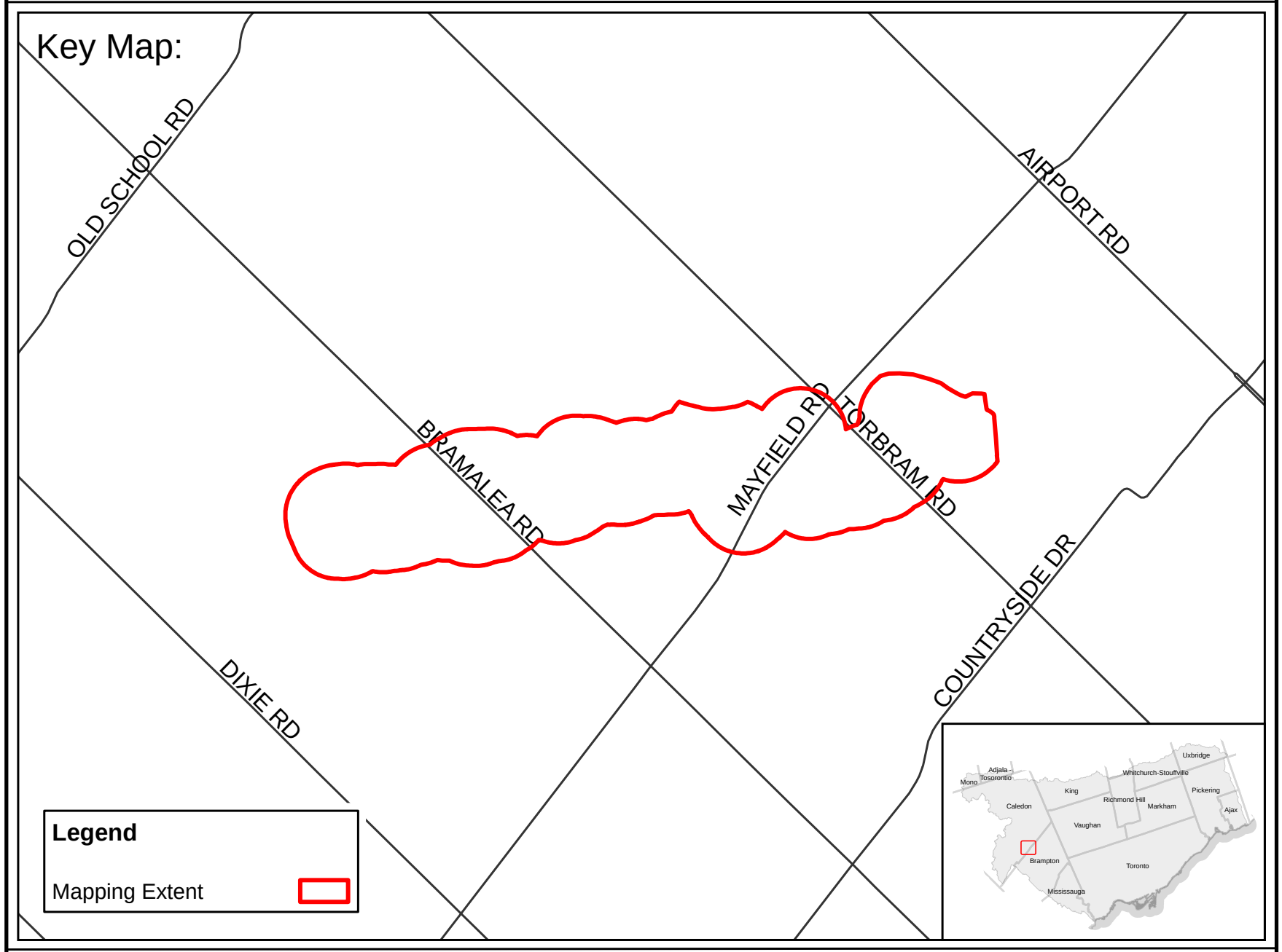
When the 100 year storm is greater, it is symbolized as follows: ***136.40***

SPILL 01 Indicates Spill, Spill ID and Approximate Flow Direction

Scale: 1:3,500

N

Key Map:

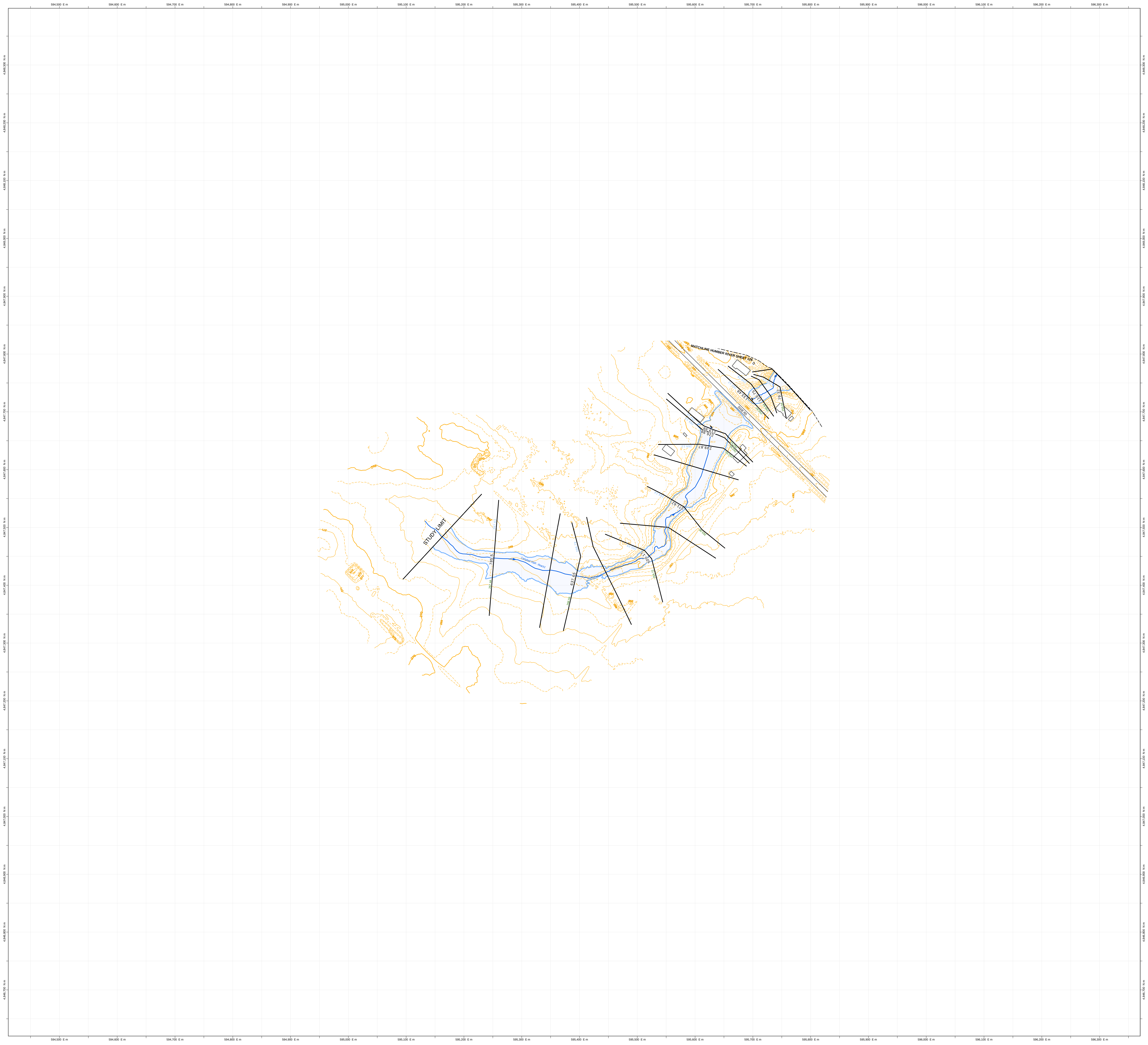


HUMBER RIVER

Sheet No.

226

5 Shoreham Dr., Downsview, ON M3N 1S4 (416) 661 6600 info@trca.ca



TRCA Flood Plain Mapping Program

Hydraulic Engineering Service Provided By:

Toronto and Region Conservation Authority

This map is a copy of the original map sheet sealed by Y. Qiao on October 20, 2023. If the sealed map is required please contact TRCA. The professional engineer's seal and signature verifies the location of the flood line and the associated water surface elevations only.

Map Note:

AIRBORNE IMAGING

The flood line on this map was produced from hydraulic modelling software using a digital elevation model (DEM) with 1m grid resolution. The DEM was created using bare earth mass points with a vertical accuracy tolerance of +/- 0.10 m on hard flat surfaces. The mass points were collected using LiDAR flown in 2014/2015 by Airborne Imaging.

The spot elevations shown on this map were produced by TRCA using the DEM mentioned above. The contour lines were produced by TRCA by smoothing the full resolution DEM to create smooth lines for cartographic display and should therefore be used as reference only. The river banks were produced by TRCA and are approximate, contours within close proximity are a result of interpolation from the DEM surface and should not be considered a true representation of the water surface or bathymetry.

Contour labels and spot elevations are represented as metres above sea level (masl).

The planimetric data on this map were acquired from various sources with different collection dates and are provided for reference only. The building footprints were acquired from the Region of Peel Open Data in 2020.

The vertical datum is the Canadian Geodetic Vertical Datum of 1928:1978 Ontario Adjusted Version.
The horizontal datum is North American Datum of 1983, UTM 6° projection Zone 17,
Central Meridian 81° W.

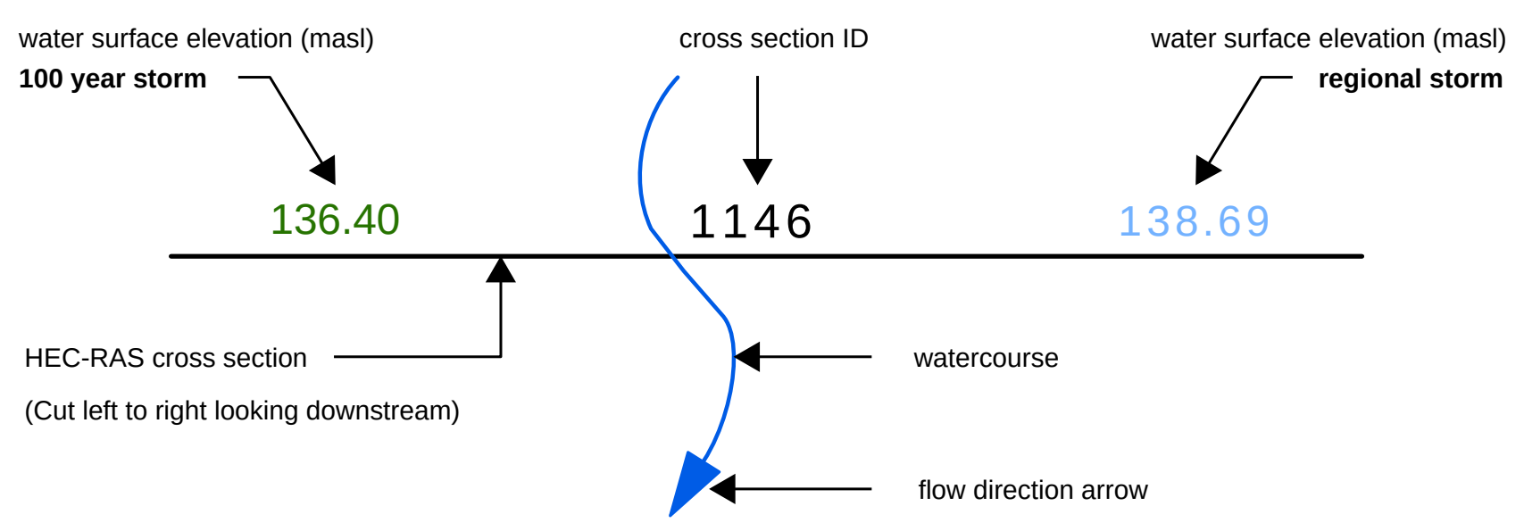
Legend

Surface Contour
5m ―
1m ―
0.5m - - -
Spot Elevaton Point +

Roads ―
Building ▭
Bridge / Culvert ―
Waterbody ○

Regulatory Flood Line ―

Hydraulic Model Legend:



NOTE: The regulatory flood elevation is the greater of the regional storm or 100 year storm.

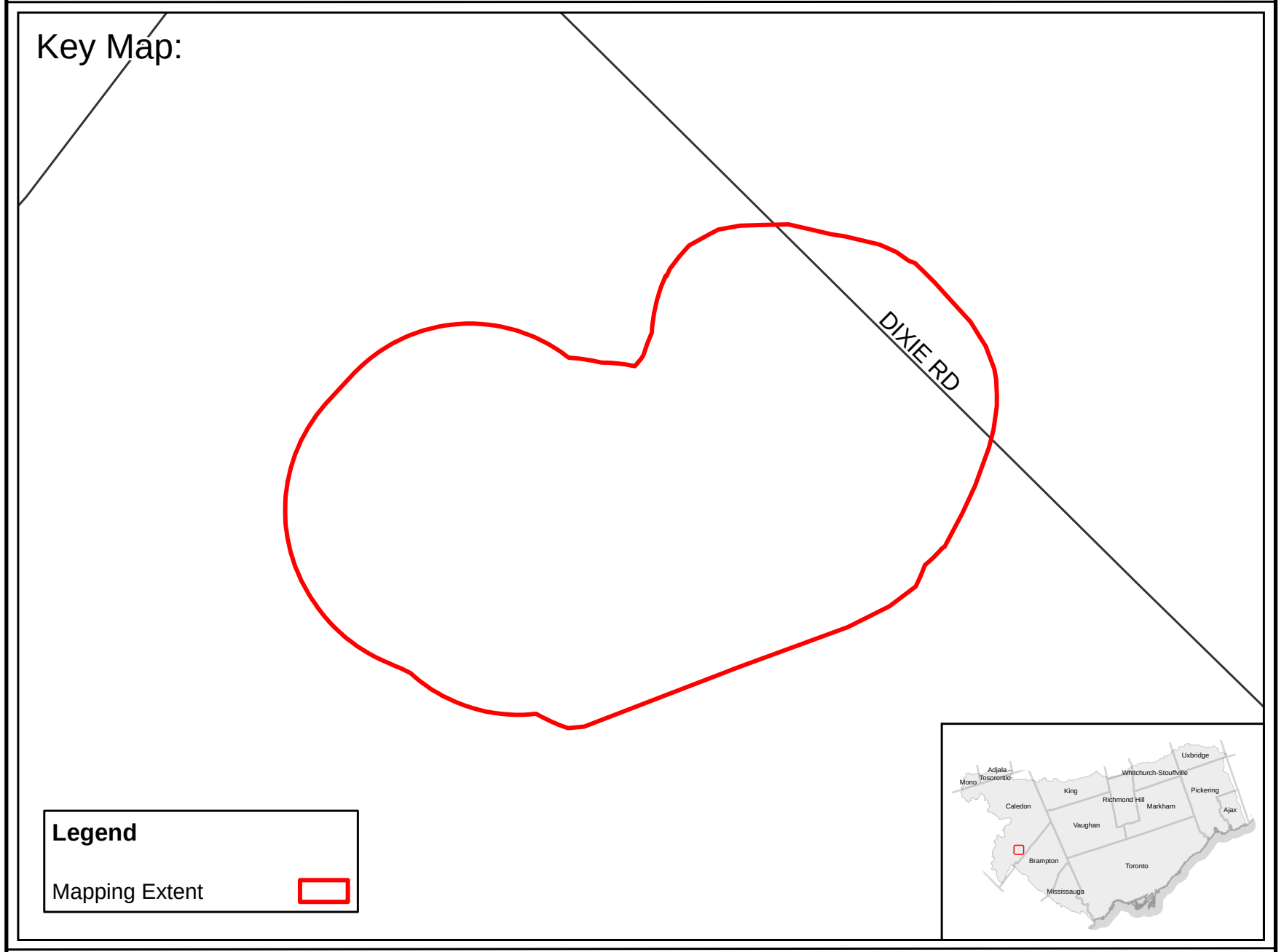
When the 100 year storm is greater, it is symbolized as follows: ***136.40***

SPILL 01 Indicates Spill, Spill ID and Approximate Flow Direction

N

Scale: 1:2,000

Key Map:



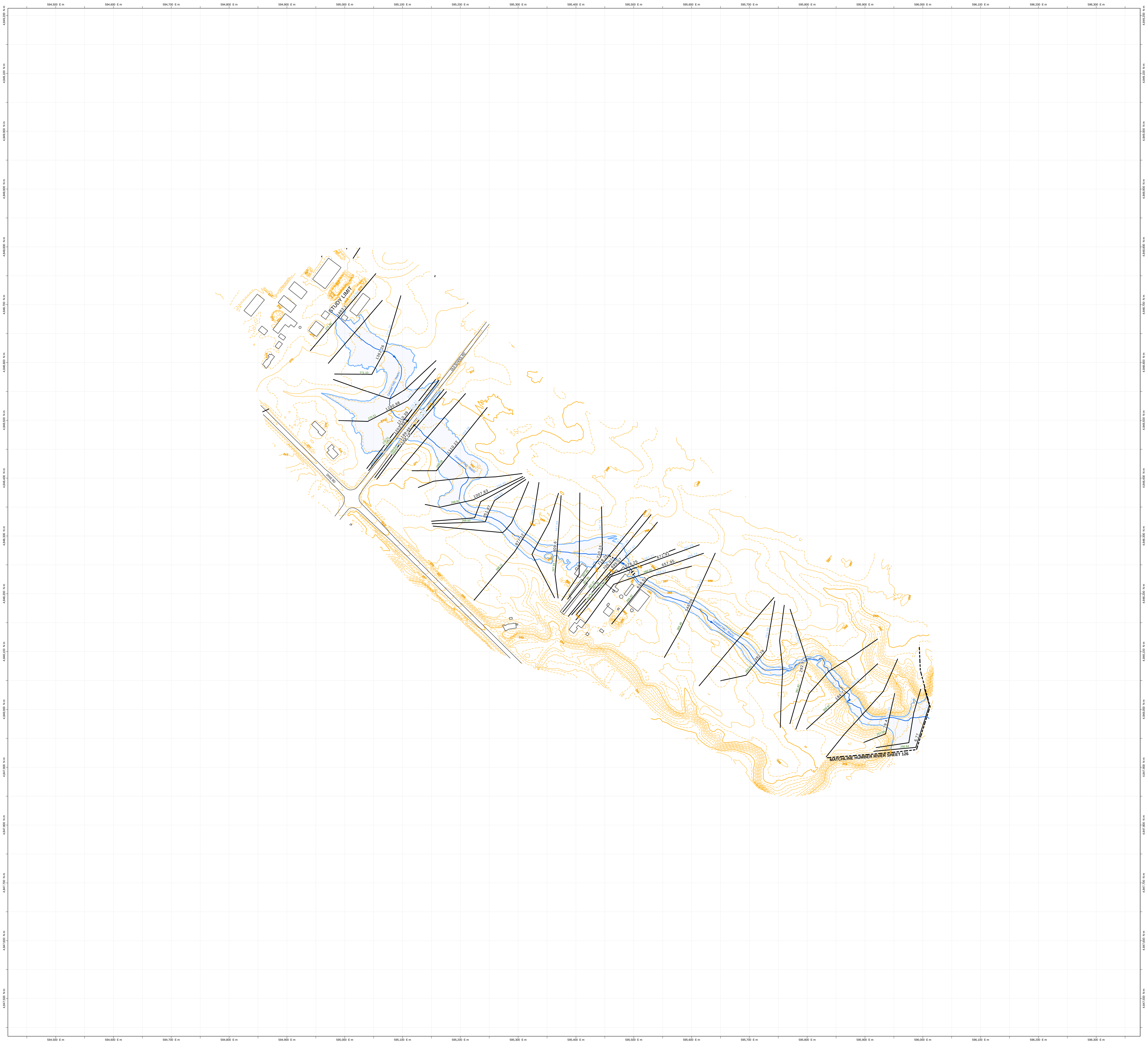
HUMBER RIVER

Sheet No.

227

Toronto and Region Conservation Authority

5 Shoreham Dr., Downsview, ON M3N 1S4 (416) 661 6600 info@trca.ca



TRCA Flood Plain Mapping Program

Hydraulic Engineering Service Provided By:

This map is a copy of the original map sheet sealed by Y. Qiao on October 20, 2023. If the sealed map is required please contact TRCA. The professional engineer's seal and signature verifies the location of the flood line and the associated water surface elevations only.

Map Note:

The flood line on this map was produced from hydraulic modelling software using a digital elevation model (DEM) with 1m grid resolution. The DEM was created using bare earth mass points with a vertical accuracy tolerance of +/- 0.10 m on hard flat surfaces. The mass points were collected using LiDAR flown in 2014/2015 by Airborne Imaging.

The spot elevations shown on this map were produced by TRCA using the DEM mentioned above. The contour lines were produced by TRCA by smoothing the full resolution DEM to create smooth lines for cartographic display and should therefore be used as reference only. The river banks were produced by TRCA and are approximate, contours within close proximity are a result of interpolation from the DEM surface and should not be considered a true representation of the water surface or bathymetry.

Contour labels and spot elevations are represented as metres above sea level (masl).

The planimetric data on this map were acquired from various sources with different collection dates and are provided for reference only. The building footprints were acquired from the Region of Peel Open Data in 2020.

The vertical datum is the Canadian Geodetic Vertical Datum of 1928:1978 Ontario Adjusted Version.
The horizontal datum is North American Datum of 1983, UTM 6° projection Zone 17,
Central Meridian 81° W.

Legend

Surface Contour
- 5m —
- 1m —
- 0.5m - - - -

Spot Elevaton Point +

Roads —

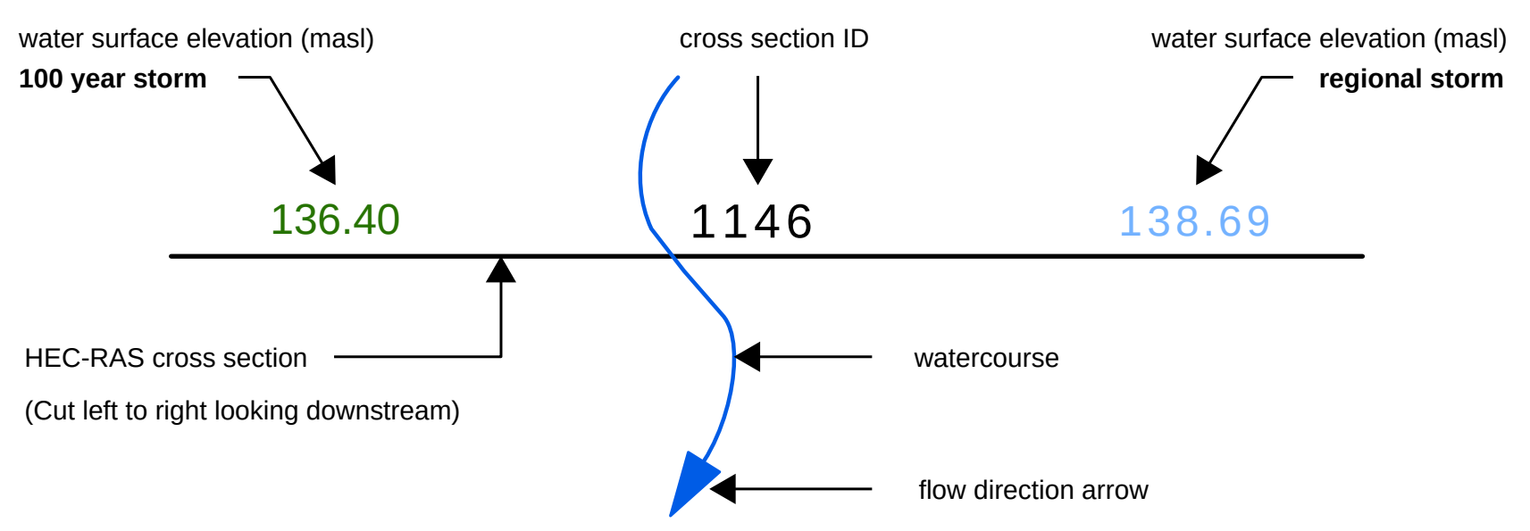
Building ▭

Bridge / Culvert —

Waterbody

Regulatory Flood Line —

Hydraulic Model Legend:



NOTE: The regulatory flood elevation is the greater of the regional storm or 100 year storm.

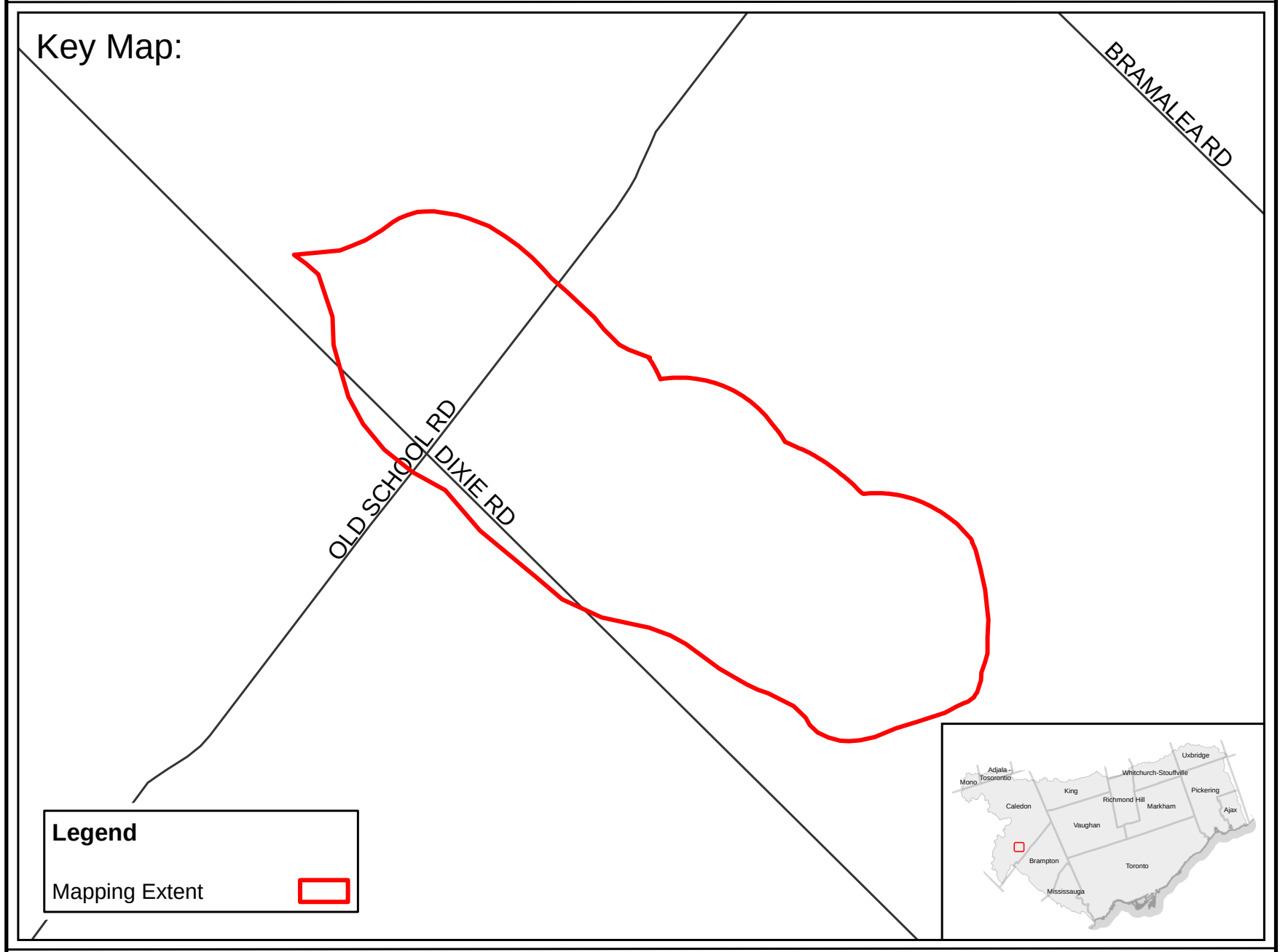
When the 100 year storm is greater, it is symbolized as follows: ***136.40***

SPILL 01 Indicates Spill, Spill ID and Approximate Flow Direction

Scale: 1:2,000

N

Key Map:

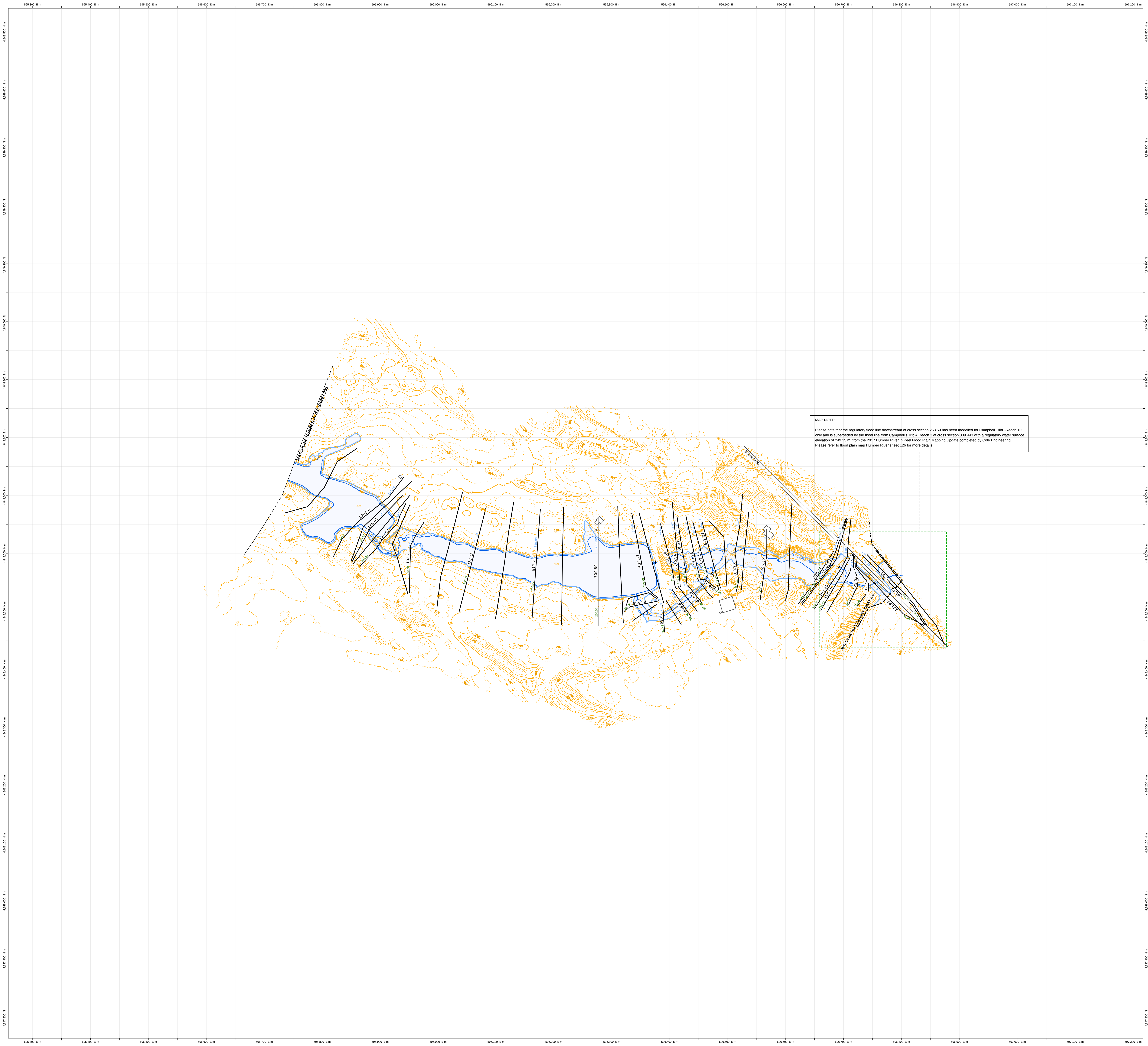


HUMBER RIVER

Sheet No.

231

5 Shoreham Dr., Downsview, ON M3N 1S4 (416) 661 6600 info@trca.ca



MAP NOTE:

Please note that the regulatory flood line downstream of cross section 258.59 has been modelled for Campbell TribP-Reach 1C only and is superseded by the flood line from Campbell's Trib A Reach 3 at cross section 809.443 with a regulatory water surface elevation of 249.15 m, from the 2017 Humber River in Peel Flood Plain Mapping Update completed by Cole Engineering. Please refer to flood plain map Humber River sheet 126 for more details

TRCA Flood Plain Mapping Program

Hydraulic Engineering Service Provided By:

Toronto and Region Conservation Authority

This map is a copy of the original map sheet sealed by Y. Qiao on October 20, 2023. If the sealed map is required please contact TRCA. The professional engineer's seal and signature verifies the location of the flood line and the associated water surface elevations only.

Map Note:

AIRBORNE IMAGING

The flood line on this map was produced from hydraulic modelling software using a digital elevation model (DEM) with 1m grid resolution. The DEM was created using bare earth mass points with a vertical accuracy tolerance of +/- 0.10 m on hard flat surfaces. The mass points were collected using LiDAR flown in 2014/2015 by Airborne Imaging.

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Contour labels and spot elevations are represented as metres above sea level (masl).

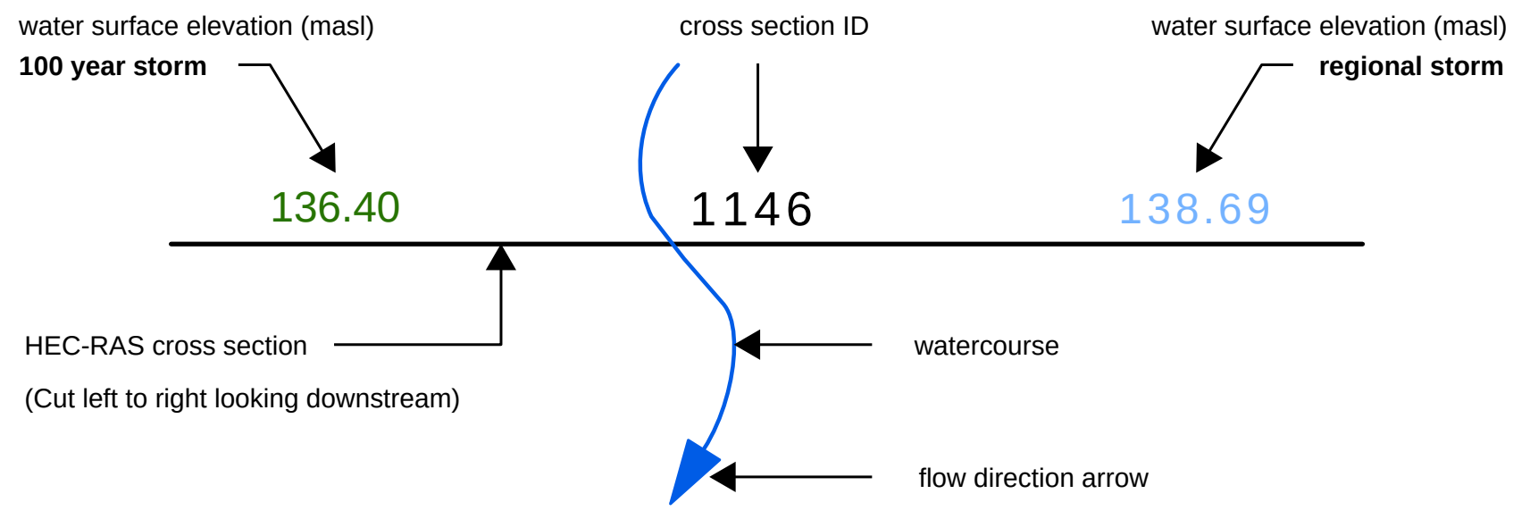
The planimetric data on this map were acquired from various sources with different collection dates and are provided for reference only. The building footprints were acquired from the Region of Peel Open Data in 2020.

The vertical datum is the Canadian Geodetic Vertical Datum of 1928:1978 Ontario Adjusted Version.
The horizontal datum is North American Datum of 1983, UTM 6° projection Zone 17,
Central Meridian 81° W.

Legend

Surface Contour		Roads	—	Regulatory Flood Line	—
5m	—	Building	▭		
1m	—				
0.5m	- - -	Bridge / Culvert	—		
Spot Elevaton Point	+	Waterbody	⬭		

Hydraulic Model Legend:



NOTE: The regulatory flood elevation is the greater of the regional storm or 100 year storm.

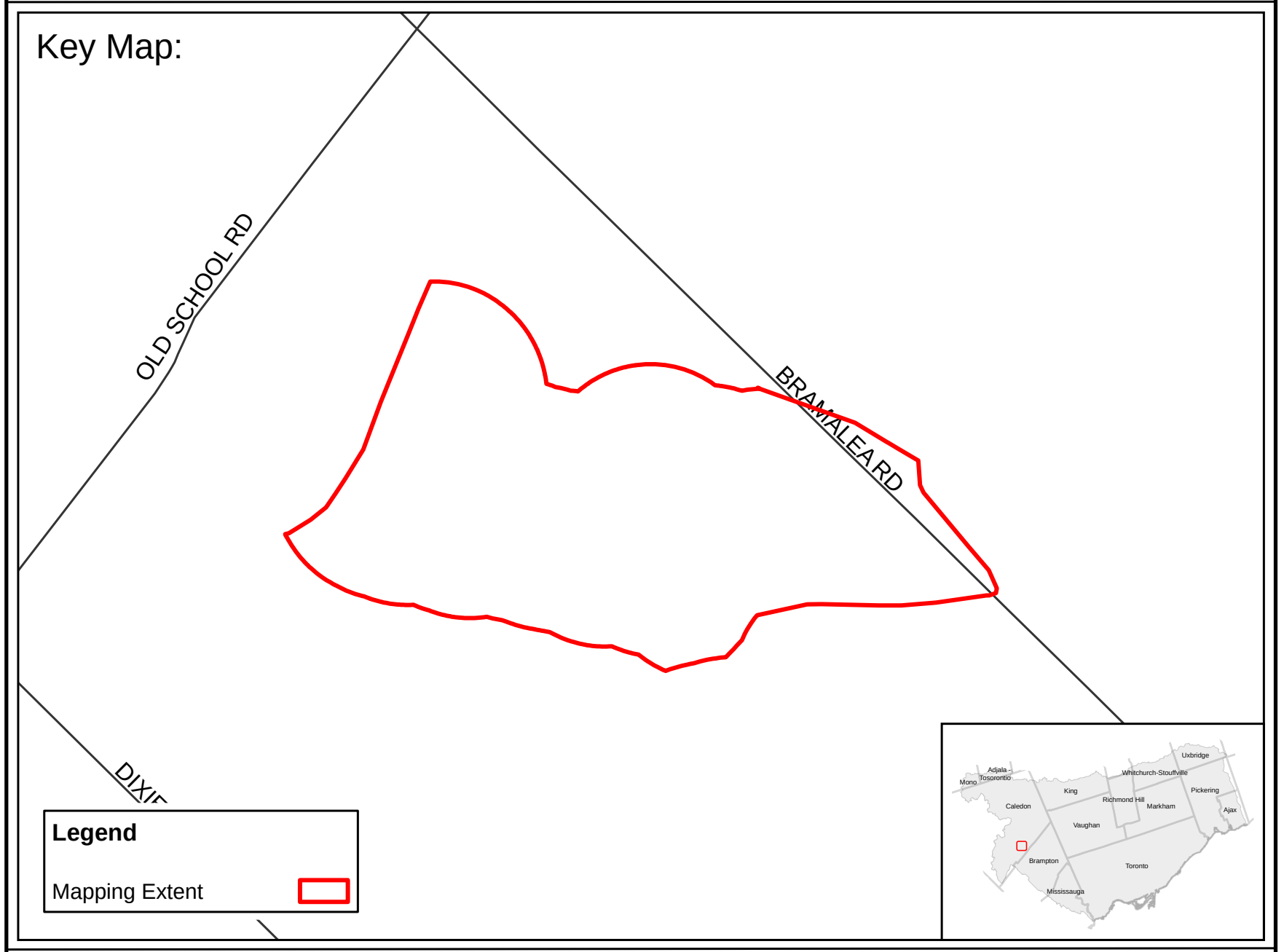
When the 100 year storm is greater, it is symbolized as follows: ***136.40***

SPILL 01 Indicates Spill, Spill ID and Approximate Flow Direction

Scale: 1:2,000

N

Key Map:



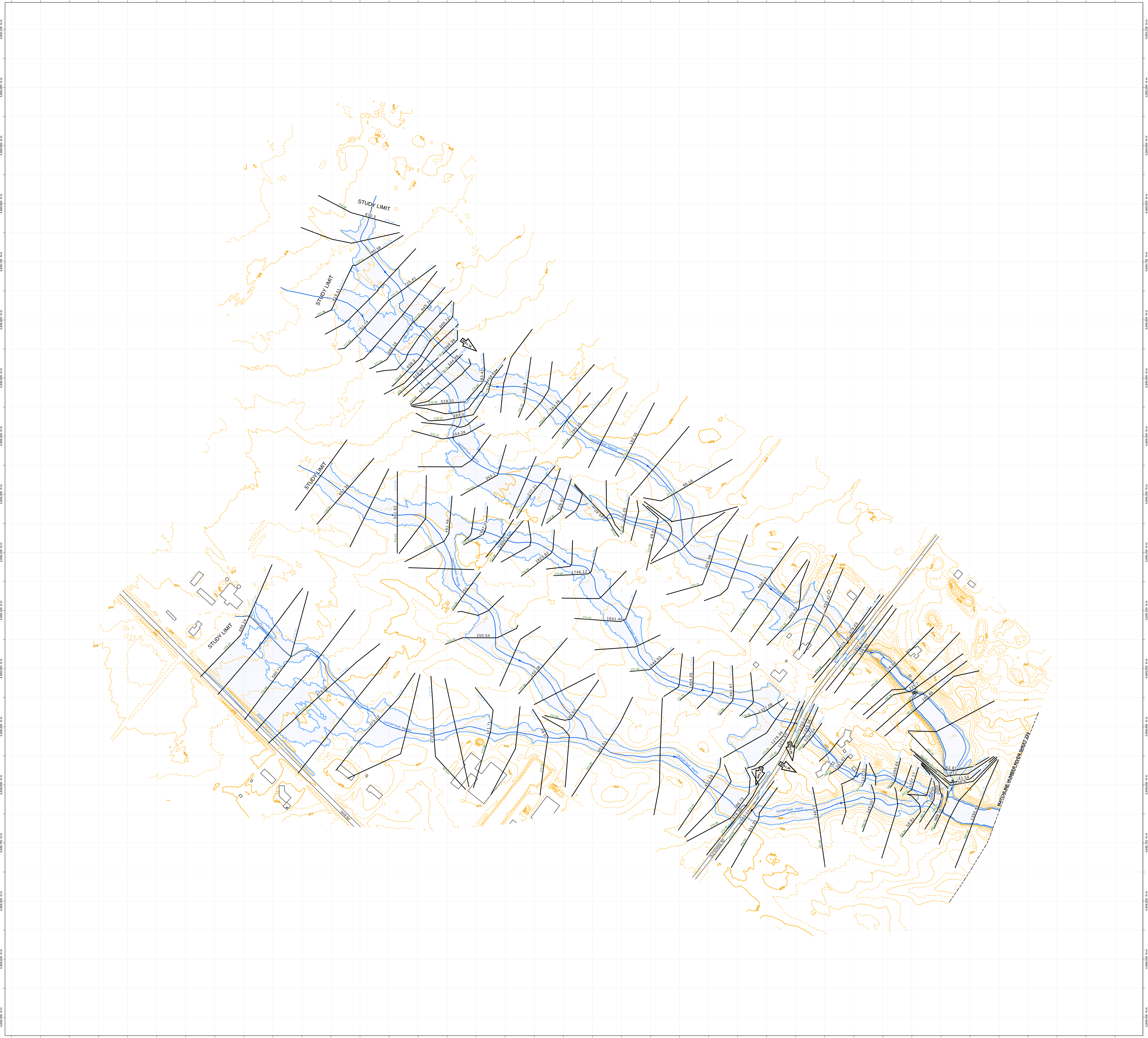
HUMBER RIVER

Sheet No.

234

Toronto and Region Conservation Authority

5 Shoreham Dr., Downsview, ON M3N 1S4 (416) 661 6600 info@trca.ca



TRCA Flood Plain Mapping Program

Hydraulic Engineering Service Provided By:

Toronto and Region Conservation Authority

This map is a copy of the original map sheet sealed by Y. Qiao on October 20, 2023. If the sealed map is required please contact TRCA. The professional engineer's seal and signature verifies the location of the flood line and the associated water surface elevations only.

Map Note:

AIRBORNE IMAGING

The flood line on this map was produced from hydraulic modelling software using a digital elevation model (DEM) with 1m grid resolution. The DEM was created using bare earth mass points with a vertical accuracy tolerance of +/- 0.10 m on hard flat surfaces. The mass points were collected using LiDAR flown in 2014/2015 by Airborne Imaging.

The spot elevations shown on this map were produced by TRCA using the DEM mentioned above. The contour lines were produced by TRCA by smoothing the full resolution DEM to create smooth lines for cartographic display and should therefore be used as reference only. The river banks were produced by TRCA and are approximate, contours within close proximity are a result of interpolation from the DEM surface and should not be considered a true representation of the water surface or bathymetry.

Contour labels and spot elevations are represented as metres above sea level (masl).

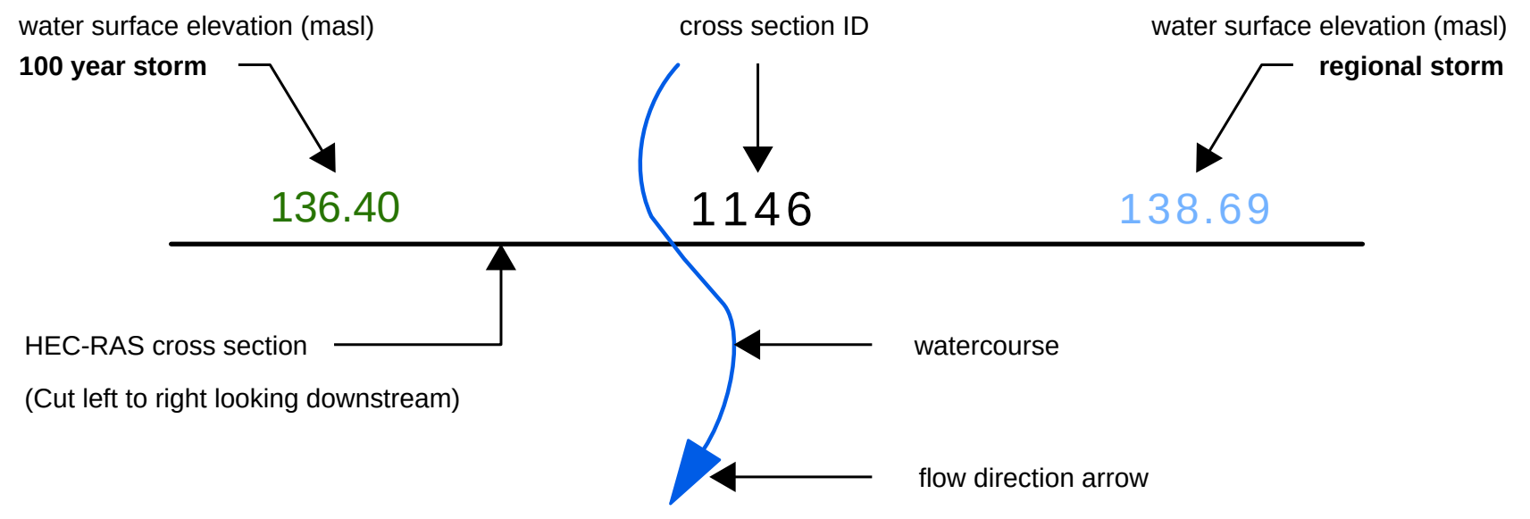
The planimetric data on this map were acquired from various sources with different collection dates and are provided for reference only. The building footprints were acquired from the Region of Peel Open Data in 2020.

The vertical datum is the Canadian Geodetic Vertical Datum of 1928:1978 Ontario Adjusted Version.
The horizontal datum is North American Datum of 1983, UTM 6° projection Zone 17,
Central Meridian 81° W.

Legend

Surface Contour		Roads	—	Regulatory Flood Line	—
5m	—	Building	▭		
1m	—	Bridge / Culvert	—		
0.5m	- - -	Waterbody	⬭		
Spot Elevaton Point	+				

Hydraulic Model Legend:



NOTE: The regulatory flood elevation is the greater of the regional storm or 100 year storm.

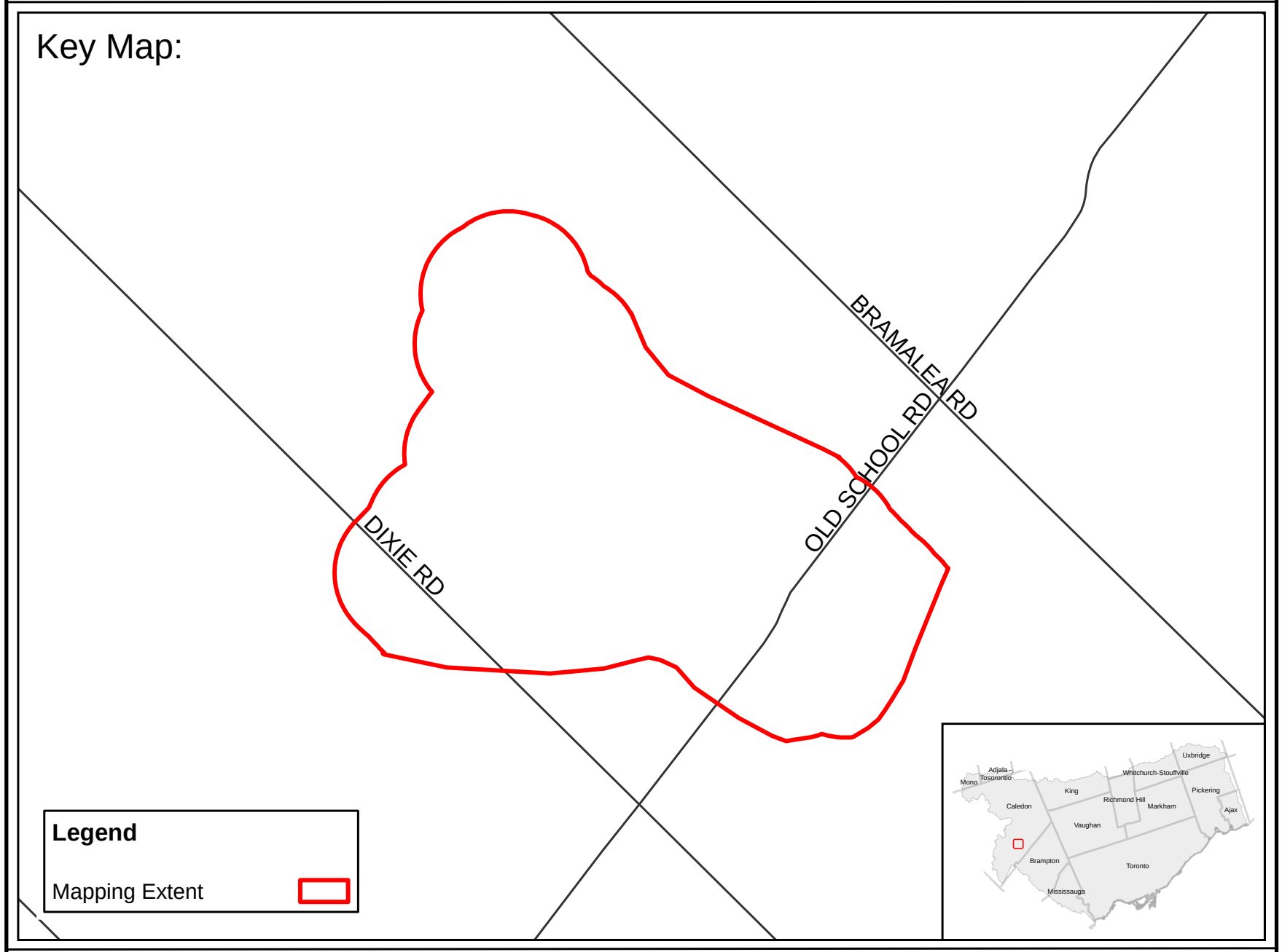
When the 100 year storm is greater, it is symbolized as follows: ***136.40***

SPILL 01 Indicates Spill, Spill ID and Approximate Flow Direction

Scale: 1:2,000

N

Key Map:



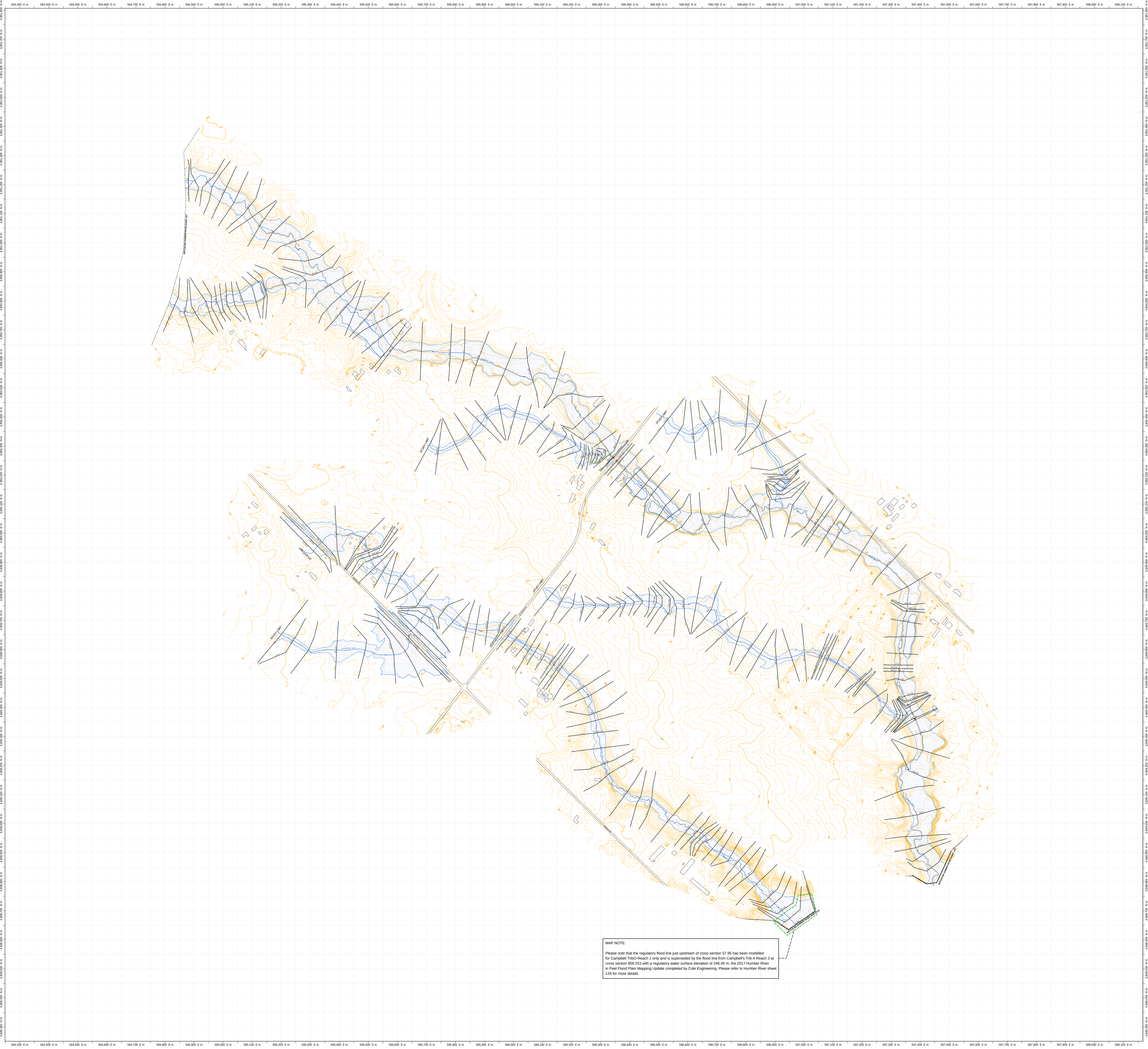
HUMBER RIVER

Sheet No.

235

Toronto and Region Conservation Authority

5 Shoreham Dr., Downsview, ON M3N 1S4 (416) 661 6600 info@trca.ca



MAP NOTE:

Please note that the regulatory flood line just upstream of cross section 57.95 has been modelled for Campbell TribO-Reach 1 only and is superseded by the flood line from Campbell's Trib A Reach 3 at cross section 809.253 with a regulatory water surface elevation of 246.45 m, the 2017 Humber River in Peel Flood Plain Mapping Update completed by Cole Engineering. Please refer to Humber River sheet 126 for more details.

TRCA Flood Plain Mapping Program

Hydraulic Engineering Service Provided By:

Toronto and Region Conservation Authority

This map is a copy of the original map sheet sealed by Y. Qiao on October 20, 2023. If the sealed map is required please contact TRCA. The professional engineer's seal and signature verifies the location of the flood line and the associated water surface elevations only.

Map Note:

AIRBORNE IMAGING

The flood line on this map was produced from hydraulic modelling software using a digital elevation model (DEM) with 1m grid resolution. The DEM was created using bare earth mass points with a vertical accuracy tolerance of +/- 0.10 m on hard flat surfaces. The mass points were collected using LiDAR flown in 2014/2015 by Airborne Imaging.

The spot elevations shown on this map were produced by TRCA using the DEM mentioned above. The contour lines were produced by TRCA by smoothing the full resolution DEM to create smooth lines for cartographic display and should therefore be used as reference only. The river banks were produced by TRCA and are approximate, contours within close proximity are a result of interpolation from the DEM surface and should not be considered a true representation of the water surface or bathymetry.

Contour labels and spot elevations are represented as metres above sea level (masl).

The planimetric data on this map were acquired from various sources with different collection dates and are provided for reference only. The building footprints were acquired from the Region of Peel Open Data in 2020.

The vertical datum is the Canadian Geodetic Vertical Datum of 1928:1978 Ontario Adjusted Version.
The horizontal datum is North American Datum of 1983, UTM 6° projection Zone 17,
Central Meridian 81° W.

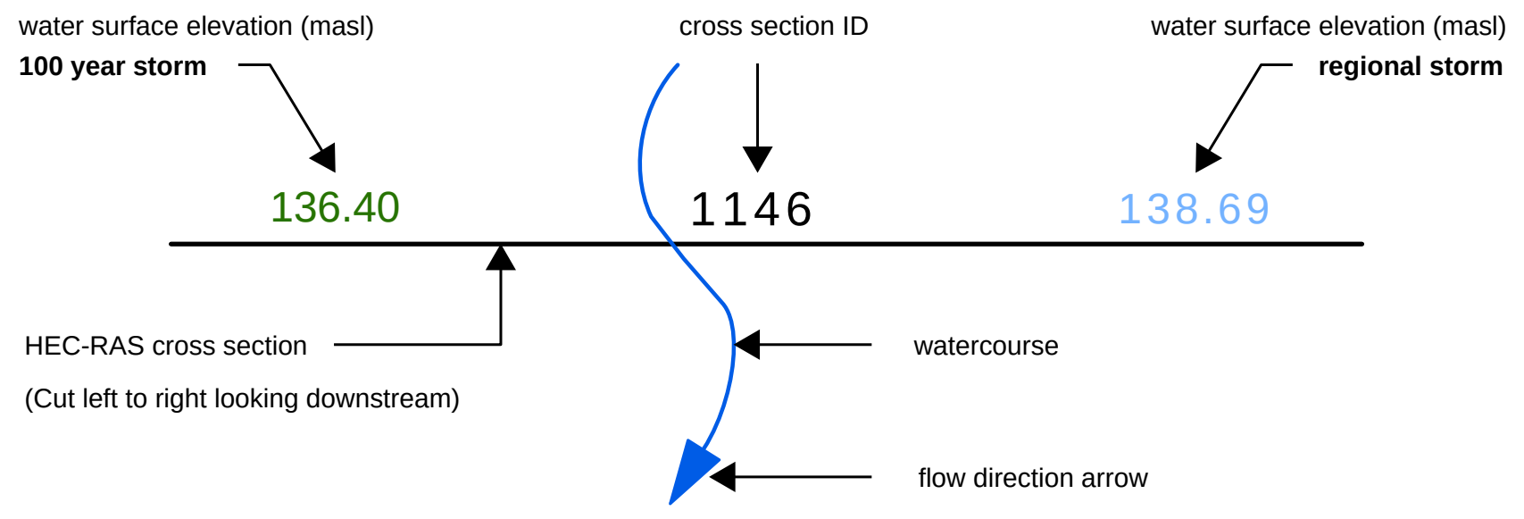
Legend

Surface Contour
5m ―
1m ―
0.5m ----
Spot Elevaton Point ·

Roads ―
Building ▭
Bridge / Culvert ―
Waterbody ○

Regulatory Flood Line ―

Hydraulic Model Legend:



NOTE: The regulatory flood elevation is the greater of the regional storm or 100 year storm.

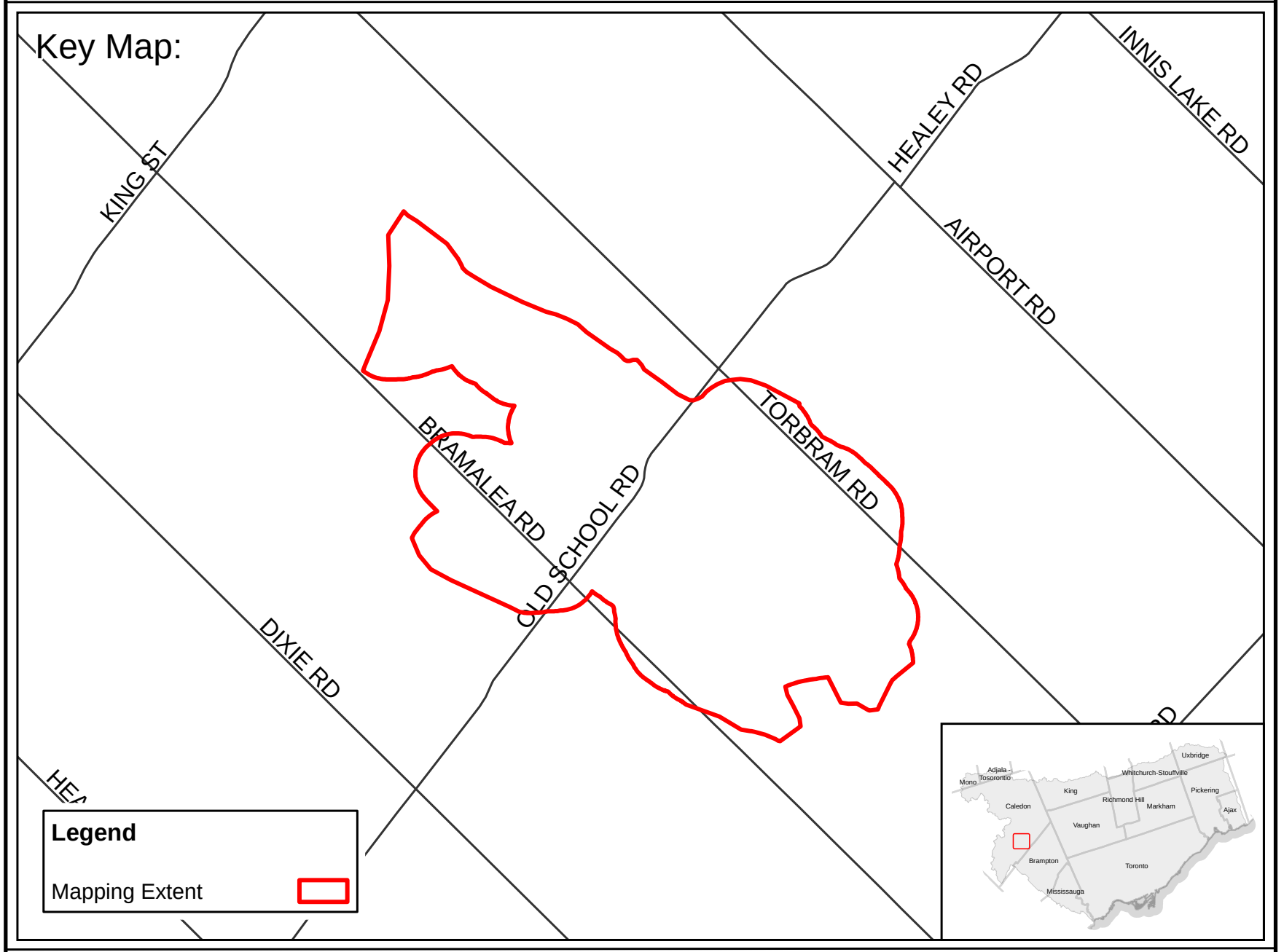
When the 100 year storm is greater, it is symbolized as follows: ***136.40***

SPILL 01 ⇨ Indicates Spill, Spill ID and Approximate Flow Direction

Scale: 1:4,000

N

Key Map:



HUMBER RIVER

Sheet No.

236

Toronto and Region Conservation Authority

5 Shoreham Dr., Downsview, ON M3N 1S4 (416) 661 6600 info@trca.ca

Cross Road culvert inspections on Mayfield Rd between Dixie and Torbram
All Culverts were inspected in 2024

Scale: 1-Good, 3-Fair, 5-Maintenance Required, 9-N/A
For Marker Post: 1-Good, 3-Missing, 5-Bent

From Asset	Main ID	To Asset	To Main ID	Street	Loc. Ref.	Diam. (mm)	Material	Pipe Shape	Insp Len	Observation	Scale	
STND	RR014-0426	STND	RR014-0427	MAYFIELD RD BRAMPTON	20M EAST OF DIXIE RD	600	CSP	R	47	BLOCKED WITH DEBRIS	BWD-1	
										COUPLER SEPARATED/FAILED	CPSF-1	
										DITCHING	DICH-3	Asset affected by overgrown invasive phragmities, minor ditching required
										END BENT	EB-1	
										MARKER POSTS	MP-3	
										STRUCTURAL INTEGRITY	SI-3	Fair condition, minor rust noted on the lower third of the pipe
										WASHOUT OF CULVERT END	WSH-1	
STND	RR014-0424	STND	RR014-0425	MAYFIELD RD BRAMPTON	80M EAST OF DIXIE RD	600	CSP	R	41	BLOCKED WITH DEBRIS	BWD-1	
										COUPLER SEPARATED/FAILED	CPSF-1	
										DITCHING	DICH-3	Asset affected by overgrown invasive phragmities, minor ditching required
										END BENT	EB-1	
										MARKER POSTS	MP-3	
										STRUCTURAL INTEGRITY	SI-3	Fair condition, minor rust noted on the lower third of the pipe
										WASHOUT OF CULVERT END	WSH-1	
STND	RR014-0422	STMH	RR014-0282	MAYFIELD RD BRAMPTON	200M EAST OF DIXIE RD	800	CSP	R	44.7	BLOCKED WITH DEBRIS	BWD-1	
										COUPLER SEPARATED/FAILED	CPSF-1	
										DITCHING	DICH-3	Asset affected by overgrown invasive phragmities, minor ditching required
										END BENT	EB-1	
										MARKER POSTS	MP-3	
										STRUCTURAL INTEGRITY	SI-1	
										WASHOUT OF CULVERT END	WSH-1	
STND	RR014-0420	STND	RR014-0421	MAYFIELD RD BRAMPTON		2100	CSP	O	48	BLOCKED WITH DEBRIS	BWD-1	
										COUPLER SEPARATED/FAILED	CPSF-1	
										DITCHING	DICH-1	
										END BENT	EB-1	

									MARKER POSTS	MP-3	
									STRUCTURAL INTEGRITY	SI-1	
									WASHOUT OF CULVERT END	WSH-1	
STND	RR014-0655	STMH	RR014-0142	MAYFIELD RD CALEDON		600 CSP	R	53	BLOCKED WITH DEBRIS	BWD-1	
									COUPLER SEPARATED/FAILED	CPSF-1	
									DITCHING	DICH-1	
									END BENT	EB-1	
									MARKER POSTS	MP-3	
									STRUCTURAL INTEGRITY	SI-1	
									WASHOUT OF CULVERT END	WSH-1	
STND	RR014-0410	STND	RR014-0411	MAYFIELD RD CALEDON	5M EAST OF MAYFIELD SCHOOL EAST ENTRANCE	1400 CSP	O	40	BLOCKED WITH DEBRIS	BWD-1	
									COUPLER SEPARATED/FAILED	CPSF-1	
									DITCHING	DICH-1	
									END BENT	EB-1	
									MARKER POSTS	MP-3	
									STRUCTURAL INTEGRITY	SI-1	
									WASHOUT OF CULVERT END	WSH-1	
STND	RR014-0793	STND	RR014-0794	MAYFIELD RD CALEDON		2440 CSP	O	63	BLOCKED WITH DEBRIS	BWD-1	
									COUPLER SEPARATED/FAILED	CPSF-1	
									DITCHING	DICH-3	Asset affected by overgrown invasive phragmities, minor ditching required
									END BENT	EB-1	
									MARKER POSTS	MP-3	
									STRUCTURAL INTEGRITY	SI-1	
									WASHOUT OF CULVERT END	WSH-1	