VALDOR ENGINEERING INC.
Municipal • Land Development • Water Resources
Site Development • Project Management • Contract Administration
Consulting Engineers – est. 1992

741 Rowntree Dairy Road, Ste.2
Woodbridge, Ontario L4L 5T9
TEL (905) 264-0054
FAX (905) 264-0069
info@valdor-engineering.com
www.valdor-engineering.com

Mimico Creek
Floodplain Mapping Update

Toronto and Region Conservation Authority
Cities of Toronto, Mississauga and Brampton

27 August 2020 (FINAL)

Prepared By:

Valdor Engineering Inc.

Prepared For:

The Toronto and Region Conservation Authority

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Floodplain Mapping Update

Toronto and Region Conservation Authority
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Valdor Engineering Inc. gratefully acknowledges the efforts and contributions of the following TRCA staff participating in the project management, technical analyses and detailed mapping for the Mimico Creek Floodplain Mapping Update project.

Qiao Ying, M.Sc., P.Eng.
Senior Engineer, Capital Projects

Christina Bright, MASc., P.Eng.
Project Engineer, Capital Projects

Michael Todd
GIS Technologist, Information Technology Management

Executive Summary

Valdor Engineering Inc. was retained by the TRCA to prepare an updated one-dimensional (1D) hydraulic model using the U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) based on the latest available LiDAR surface data and flow data and to prepare updated digitally signed and stamped Regulatory Floodplain Mapping. The study area consists of the entire 75 km^2 Mimico Creek Watershed which lies within three major municipalities including Toronto, Mississauga and Brampton.

The purpose of the study is to develop an up-to-date 1D hydraulic model to define existing flood conditions for the 2-yr to 100-yr design storms and the Regulatory storm, provide preliminary characterization of identified spill areas and to prepare updated floodplain mapping for the Regulatory storm within the Mimico Creek Watershed.

Using the high resolution digital elevation model (DEM) derived from recently obtained LiDAR data supplemented with available topographic survey and field measurements for channel sections and hydraulic structures and updated land use data, a new 1D hydraulic model was prepared using HEC-RAS software for the Mimico Creek Watershed. In addition, a number of reaches were included that had not been accounted for in the previous hydraulic model.

A sensitivity analysis was completed for the updated hydraulic model and confirmed that the selected parameter values are reasonable and that the model is not unreasonably sensitive to changes in Manning's roughness, peak flow and water levels in Lake Ontario.

Based on the results of the updated HEC-RAS hydraulic model, digital signed and stamped engineered floodplain mapping was prepared and finalized.

The approximate frequency at which watercourse crossings overtop was investigated and identified for the modeled structures within the Mimico Creek Watershed. It was noted that a number of structures overtop with a frequency of 1:25 years or greater and some overtop with a frequency of 1:2 years or greater. The structures that overtop with a frequency of 1:2 years or greater include: (1) MIM_102 – Railroad (Mississauga); and, (2) MIM_144 – Clark Blvd (Brampton). These crossings appear to be vulnerable to flooding due to undersized culverts and/or low deck elevations.

A total of 20 spill areas were identified based on the results of the updated HEC-RAS model and the preliminary and approximate spill area characteristics were identified including the approximate spill area extents and the potential number of buildings impacted. In addition, recommendations were provided regarding future additional 2D hydraulic modeling of these spill areas and the prioritization of such investigations.

It is recommended that the revised Mimico Creek Regulatory digital floodplain mapping prepared in this study should be used to fully replace the existing Mimico Creek Floodplain Map Sheets MIM-01 through MIM-19 based on the results from the updated HEC-RAS hydraulic model. The frequency at which various water crossings (*i.e.* bridges and culverts) overtop presented in this report should be considered for guidance in prioritizing future water crossing upgrades within the Mimico Creek Watershed.

It is also recommended that the TRCA should complete additional modeling for the identified spill areas using an appropriate 2D or 1D/2D coupled hydraulic program such as MIKE FLOOD to better define the flooding characteristics (*i.e.* flood extent, depth, velocity and flood risk) within these areas. The initial selection and/or staging of these additional hydraulic investigations may be based on the recommended prioritization of areas provided in this report as guidance.

In moving forward, it is recommended that any proposed development applications within the identified potential spill areas be reviewed using an appropriate 2D or 1D/2D coupled hydraulic model such as MIKE FLOOD to confirm and assess the flood risk for the application site and to assess and mitigate potential off-site flood impacts.

1.0 INTRODUCTION

Valdor Engineering Inc. was retained by the TRCA to prepare an updated one-dimensional (1D) hydraulic model using the U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) based on the latest available LiDAR surface data and flow data and to prepare updated digitally signed and stamped Regulatory Floodplain Mapping.

1.1 Study Area

The study area consists of the entire 75 km^2 Mimico Creek Watershed which lies in the general confines bounded by Lake Ontario to the south, Williams Parkway East to the north, Dixie Road to the west and Albion Road and Keele Street to the east. The Mimico Creek Watershed is nearly entirely developed with a blend of primarily commercial, industrial, residential and recreational land use. The Mimico Creek watercourse traverses three major municipalities including Toronto, Mississauga and Brampton and consists of a main branch and east and west tributaries that converge in the vicinity of Derry Road in Mississauga (see **Figure 1.1**).

1.2 Project Background

Since the last comprehensive floodplain mapping update (19 sheets) in 2013 prepared by Greck and Associates Limited, further development has occurred within the Mimico Creek Watershed which included channel and corridor realignments and the construction of a number of new watercourse crossings, all of which is not reflected in the current base mapping. There are numerous areas where spills were previously identified, and there are about 6 long buried pipes within the study area that require review and possibly special flow analysis. In addition, the TRCA obtained high resolution LiDAR data from 2015 which offers superior surface information for defining the watercourse geometry and floodplain. As such, the TRCA wishes to complete a comprehensive floodplain mapping update within the Mimico Creek Watershed using the latest version of HEC-RAS, the 2015 LiDAR data and the latest available flow information.

1.3 Purpose of Study

The purpose of the study is to develop an up-to-date 1D hydraulic model (HEC-RAS) (including reaches not previously modeled) to define existing flood conditions for the 2-yr to 100-yr design storms and the Regulatory storm, provide preliminary characterization of identified spill areas and to prepare updated digital signed and stamped floodplain mapping for the Regulatory storm within the Mimico Creek Watershed.

1.4 Study Scope and Approach

The general scope and the key steps of this report are as follows:

- Background review and identify data gaps
- Collect water crossings as-built information and identify data gaps
- Review LiDAR data
- Develop a flow table
- Determine the most appropriate boundary conditions
- Prepare stream crossing field inventory sheets and structure information to use in the HEC-RAS model
- Prepare an updated 1D hydraulic model using HEC-RAS, including reaches not previously modeled

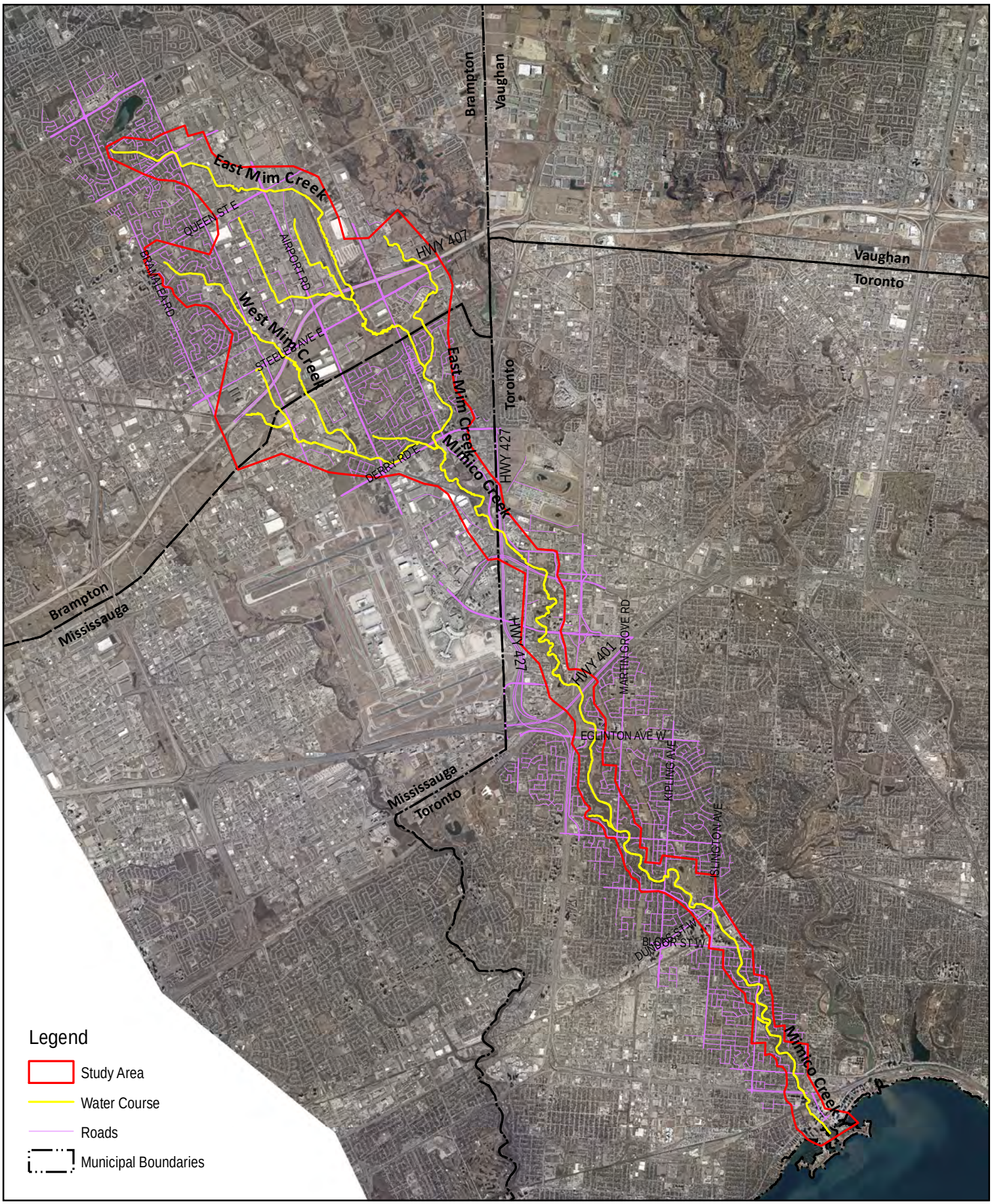

Figure 1.1

Study Area

2,000 1,000 0 2,000 Meters

August 2020

MIMICO CREEK FLOODPLAIN MAPPING UPDATE

Toronto and Region Conservation Authority

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- Hydraulic Model Development of Piped Flow Areas
- Complete a review of model errors and warnings
- Plot flood lines, assess spills and prepare signed and stamped digital map sheets
- Prepare a Technical Report
- Submit water surface elevation, depth and velocity rasters, etc. for flood risk characterization and screening

1.5 Previously Completed Available Studies and Information

A review of the following studies and drawings provided by the TRCA was completed in preparing the *Mimico Creek Floodplain Mapping Update* report:

- Greck and Associates Limited (prepared for TRCA), *Etobicoke Creek and Mimico Creek Watersheds Floodline Mapping Updates*, 2013. Floodplain Map Sheets MIM-01 through MIM-19.
- MNR, *Technical Guide River and Stream Systems: Flooding Hazard Limit*, 2002.
- Greck and Associates Limited (prepared for TRCA), HEC-RAS Model for Mimico Creek, 2013.
- Hydraulic structure as-built and design drawings from the MTO, TTC, CPR, CNR, Region of Peel, York Region, Metrolinx, City of Toronto, City of Mississauga, City of Brampton and 407 ETR.

2.0 BACKGROUND REVIEW AND SITE INVESTIGATIONS

2.1 Background Data Review

The following data sets were provided by the TRCA:

- Mimico Creek ArcMap containing links to all GIS data provided
- Study area GIS shapefiles including watershed and mapping coverage outlines
- Watercourse GIS shapefile
- Existing Mimico Creek HEC-RAS models
- DEM in 1 m ESRI grid format
- Orthophoto graphic imagery
- Building footprint GIS shapefile
- Contour GIS shapefile
- TRCA standard Manning's roughness values
- Existing mapping sheets index GIS shapefile
- Existing digital floodplain mapping sheets
- Existing TRCA floodlines shapefile
- Template for Hydraulic Structure Inventory Sheets
- Municipality boundary polygon
- Road and highway polyline for local and major roads and highways
- Land use shapefile
- Peak flows
- Boundary conditions
- Structure shapefile with identified watercourse crossings
- Contacts for crossing data collection
- MTO contract drawings
- TTC contract drawings
- Region of Peel contract drawings
- York Region contract drawings
- Metrolinx design drawings
- City of Toronto as-constructed drawings
- City of Mississauga as-constructed drawings
- City of Brampton as-constructed drawings
- 407 ETR contract drawings
- CPR drawings
- CNR drawings

2.2 Screening of Hydraulic Structures Re: Hydraulic Significance

The data set of hydraulic structures provided by the TRCA was overlaid on the orthophoto and road network. The orthophoto was scanned along all reaches within the Mimico Creek Watershed to include any other hydraulic structures that may not have been included in the original data set. Using the full data set of 197 identified hydraulic structures, preliminary field investigations were undertaken to confirm the hydraulic significance of these structures and whether inclusion in the HEC-RAS hydraulic model was warranted. A full listing of all hydraulic structures investigated along with the justification for exclusion from the hydraulic model is provided in **Table A.1** in **Appendix A**. Of the 197 hydraulic structures investigated, a total of 107 structures (*i.e.* culverts, bridges, weirs and drop structures) were ultimately included in the HEC-RAS hydraulic model as provided in **Table 2.1.**

Table 2.1 : Summary of Hydraulic Structures Included in HEC-RAS Model
Mimico Creek Floodplain Mapping Update

Structure ID	Location	River Name	Reach Name	Structure Type	Material	Included in TRCA's Previous HEC-RAS Model
MIM_001	Large Pedestrian bridge at the mouth	Mimico Creek	1	Ped Bridge	Steel/Wood	
MIM_002	LAKE SHORE BOULEVARD WEST	Mimico Creek	1	Bridge	Conc./Steel	Y
MIM_003	Railway	Mimico Creek	1	Bridge	Steel	Y
MIM_005	GARDINER E PARK LAWN RAMP	Mimico Creek	1	Bridge	Conc.	Y
MIM_006	F G GARDINER EXPY	Mimico Creek	1	Bridge	Conc.	Y
MIM_007	F G GARDINER EXPY RAMP	Mimico Creek	1	Bridge	Conc.	Y
MIM_008	THE QUEENSWAY	Mimico Creek	1	Bridge	Conc/Steel	Y
MIM_010	Trail	Mimico Creek	1	Ped Bridge	Conc/Steel	
MIM_011	Trail - pedestrian bridge	Mimico Creek	2	Ped Bridge	Conc.	
MIM_012	ROYAL YORK ROAD	Mimico Creek	2	Bridge	Conc.	Y
MIM_013	Trail - pedestrian bridge	Mimico Creek	2	Ped Bridge	Conc/Steel	
MIM_014	BLOOR STREET WEST	Mimico Creek	2	Bridge	Conc/Steel	Y
MIM_015	TTC Rail- Line 2 - Islington &Royal York	Mimico Creek	2	Bridge	Conc.	Y
MIM_016	Trail - pedestrian bridge	Mimico Creek	2	Ped Bridge	Conc.	
MIM_017	Railway	Mimico Creek	2	Bridge	Conc/Steel	Y
MIM_020	ISLINGTON AVENUE	Mimico Creek	2	Bridge	Conc.	Y
MIM_034	KIPLING AVENUE	Mimico Creek	2	Bridge	Conc.	Y
MIM_037	RATHBURN ROAD	Mimico Creek	2	Bridge	Conc.	Y
MIM_038	MARTIN GROVE ROAD	Mimico Creek	2	Bridge	Conc.	Y
MIM_043	EGLINTON AVENUE WEST	Mimico Creek	3	Bridge	Conc.	Y
MIM_044	EGLINTON AVENUE WEST	Mimico Creek	3	Bridge	Conc.	Y
MIM_045	HWY 401	Mimico Creek	3	Bridge	Conc.	Y
MIM_046	HWY 27	Mimico Creek	3	Bridge	Conc.	Y
MIM_047	Skyway Ave	Mimico Creek	3	Bridge	Conc.	Y
MIM_057	DIXON ROAD	Mimico Creek	3	Bridge	Conc.	Y
MIM_065	HWY 409	Mimico Creek	3	Bridge	Conc.	Y
MIM_066	CARLINGVIEW DRIVE	Mimico Creek	3	Bridge	Conc.	Y
MIM_067	HWY 427	Mimico Creek	3	Culvert	Conc.	Y
MIM_069	Zahavy Way	Mimico Creek	3	Bridge	Conc.	Y
MIM_070	Railway	Mimico Creek	3	Bridge	Conc/Steel	Y
MIM_075	DERRY ROAD EAST	West Mim Creek	West 1	Bridge	Conc/Steel	Y
MIM_076	Trail	West Mim Creek	West 2	Culvert	Conc.	
MIM_077	AIRPORT ROAD	West Mim Creek	West 2	Culvert	Conc.	Y
MIM_078	Scarboro Street	West Mim Creek	West 2	Bridge	Conc.	Y
MIM_079	Railway	West Mim Trib B	West B1	Culvert	Conc.	Y
MIM_081	NEW - TORBRAM ROAD	West Mim Trib B	West B1	Bridge	Conc.	Y
MIM_082	NEW - Torbram Road	West Mim Trib B	West B1	Culvert	CSP	
MIM_083	Railway, Long Pipe	West Mim Trib B	West B1	Culvert (LP)	Conc.	Y
MIM_084	Rena Road	West Mim Trib B	West B1	Culvert	Conc.	Y
MIM_085	Railway	West Mim Trib B	West B2	Culvert	CSP	
MIM_086	Railway	West Mim Trib B	West B2	Culvert	CSP	
MIM_089	Long Pipe	West Mim Trib C	West C1	Culvert (LP)	Conc.	
MIM_090	Railway	West Mim Trib C	West C1	Culvert	CSP	
MIM_091	Road culvert in hydrofield	West Mim Trib C	West C1	Culvert	CSP	
MIM_092	HWY 407	West Mim Trib C	West C1	Culvert	Conc.	
MIM_093	Long Pipe - buried culvert	West Mim Trib C	West C1	Culvert (LP)	Conc.	
MIM_095	Drew Road	West Mim Creek	West 3	Bridge	Conc.	Y

Structure ID	Location	River Name	Reach Name	Structure Type	Material	Included in TRCA's Previous HEC-RAS Model
MIM_099	South of Rena Road	West Mim Creek	West 3	Drop Structure		
MIM_100	Rena Road	West Mim Creek	West 3	Bridge	Conc.	Y
MIM_101	North of Rena Road	West Mim Creek	West 3	Drop Structure		
MIM_102	Railway	West Mim Creek	West 3	Culvert	CSP	Y
MIM_104	HWY 407	West Mim Creek	West 3	Culvert	Conc.	Y
MIM_105	STEELES AVENUE EAST	West Mim Creek	West 3	Culvert	Conc.	Y
MIM_106	Railway	West Mim Creek	West 3	Bridge	Conc.	Y
MIM_107	Walker Drive	West Mim Creek	West 3	Culvert	CSP	Y
MIM_108	TORBRAM ROAD	West Mim Creek	West 3	Culvert	Conc.	Y
MIM_114	Eastbourne Drive	West Mim Creek	West 3	Culvert	Conc.	Y
MIM_115	West of Eastbourne Drive	West Mim Creek	West 3	Drop Structure		
MIM_118	Clark Blvd	West Mim Creek	West 3	Culvert	Conc.	Y
MIM_120	Codlin Ave	West Mim Trib A	West A1	Culvert	Conc.	
MIM_121	LANCASTER AVENUE	West Mim Trib A	West A1	Culvert	Conc.	
MIM_122	Trail	West Mim Trib A	West A1	Culvert	Conc.	
MIM_123	Trail	West Mim Trib A	West A1	Culvert	Conc.	
MIM_124	DERRY ROAD EAST	East Mim Creek	East 1	Bridge	Conc.	Y
MIM_125	GOREWAY DRIVE	East Mim Creek	East 1	Bridge	Conc.	Y
MIM_126	Etude Drive	East Mim Creek	East 1	Culvert	Conc.	Y
MIM_128	Morning Star Drive	East Mim Creek	East 1	Culvert	Conc.	Y
MIM_129	BRANDON GATE DRIVE	East Mim Creek	East 2	Culvert	Conc.	Y
MIM_131	Railway	East Mim Creek	East 2	Culvert	CSP	Y
MIM_132	Crossing	East Mim Creek	East 2	Culvert	Conc.	
MIM_134	GOREWAY DRIVE	East Mim Creek	East 2	Culvert	Conc.	Y
MIM_135	STEELES AVENUE EAST	East Mim Creek	East 2	Culvert	Conc.	Y
MIM_136	Railway	East Mim Trib B	East B1	Culvert	CSP	
MIM_138	HWY 407	East Mim Trib B	East B2	Culvert	Conc.	
MIM_139	Weir	East Mim Trib B	East B2	Weir	Conc.	
MIM_140	AIRPORT ROAD	East Mim Trib B	East B2	Culvert	CSP	
MIM_141	WALKER DRIVE	East Mim Trib B	East B2	Culvert	Conc.	
MIM_142	Railway	East Mim Trib B	East B2	Culvert	Conc.	
MIM_144	Clark Blvd	East Mim Trib B	East B2	Culvert	CSP	
MIM_145	Railway	East Mim Trib B	East B2	Culvert	CSP	
MIM_146	Railway	East Mim Trib B	East B2	Culvert	CSP	
MIM_148	HWY 407	East Mim Trib C	East C1	Culvert	Conc.	
MIM_149	Intermodal Drive	East Mim Trib C	East C1	Culvert	Conc.	
MIM_151	North of Intermodal Drive	East Mim Trib C	East C1	Culvert (LP)	CSP	
MIM_152	Clark Blvd	East Mim Trib C	East C1	Culvert	CSP	
MIM_153	HWY 407	East Mim Creek	East 3	Bridge	Conc.	Y
MIM_154	Intermodal Drive	East Mim Creek	East 3	Culvert	Conc.	Y

Structure ID	Location	River Name	Reach Name	Structure Type	Material	Included in TRCA's Previous HEC-RAS Model
MIM_156	Railway	East Mim Creek	East 3	Culvert	Conc.	Y
MIM_157	East of Delta Park Boulevard	East Mim Creek	East 3	Drop Structure		
MIM_158	DELTA PARK BOULEVARD	East Mim Creek	East 3	Culvert	Conc.	Y
MIM_159	West of Delta Park Boulevard	East Mim Creek	East 3	Drop Structure		
MIM_160	QUEEN STREET EAST	East Mim Creek	East 3	Culvert	Conc.	Y
MIM_161	North of Queen Street East	East Mim Creek	East 3	Weir	Conc.	
MIM_162	Chrysler	East Mim Creek	East 3	Culvert	Conc.	Y
MIM_163	Corporation Drive	East Mim Creek	East 3	Culvert	Conc.	Y
MIM_165	Driveway	East Mim Creek	East 3	Bridge	Conc.	Y
MIM_166	WILLIAMS PARKWAY EAST	East Mim Creek	East 3	Culvert	CSP	Y
MIM_168	JAYFIELD ROAD	East Mim Creek	East 3	Culvert	CSP	Y
MIM_169	JORDAN BOULEVARD	East Mim Creek	East 3	Culvert	CSP	Y
MIM_179	MONICA DRIVE	East Mim Trib A	East A1	Culvert	Conc.	Y
MIM_180	BRANDON GATE DRIVE	East Mim Trib A	East A1	Culvert	Conc.	Y
MIM_181	Railway	East Mim Trib A	East A1	Culvert	CSP	Y
MIM_182	Culvert - fenceline	East Mim Trib A	East A1	Culvert	Conc.	
MIM_193	KENVIEW BOULEVARD	East Mim Trib A	East A1	Culvert	Conc.	Y
MIM_194	STEELES AVENUE EAST	East Mim Trib A	East A1	Culvert	Conc.	Y
MIM_195	HWY 407	East Mim Trib A	East A1	Culvert	Conc.	
MIM_196	Intermodal Drive	East Mim Trib A	East A1	Culvert	Conc.	

2.3 Collection of As-Constructed Information – Hydraulic Structures

The TRCA and Valdor obtained all available as-constructed drawings for the watercourse crossings based on the location of the identified structures and by contacting the appropriate municipality or agency responsible for the structures. Where as-constructed drawings were not available, design drawings and contract drawings were obtained. The drawings obtained include the following:

- MTO contract drawings
- TTC contract drawings
- Region of Peel contract drawings
- York Region contract drawings
- Metrolinx design drawings
- City of Toronto as-constructed drawings
- City of Mississauga as-constructed drawings
- City of Brampton as-constructed drawings
- 407 ETR contract drawings
- CPR as-constructed drawings
- CNR as-constructed drawings

All available drawings were reviewed and the key elevations and dimensions for the watercourse crossings (*i.e.* culverts, bridges, weirs and drop structures) were tabulated. A list of the tabulated dimensions are provided in **Table A.1** in **Appendix A**.

2.4 Site Reconnaissance and Preparation of Hydraulic Structure Inventory Sheets

Following the initial screening of hydraulic structures, Valdor Engineering Inc. conducted site visits and field measurements in the summer/fall of 2019 along the watercourse and adjacent areas within the study area. The field measurements confirmed the dimensions and elevations of all openings, road decks, bridge railings, bridge alignments and skew angles, dam/weir alignments and dimensions. Photos were obtained for all the key structures. An inventory of all hydraulic structures including detailed measurements and sketches is provided in **Appendix B** and summarized in **Table A.1** in **Appendix A**.

2.5 Preparation of the Digital Elevation Model (DEM)

Three main sources of elevation data were integrated to create a base digital elevation model in GIS. These data sources were the LiDAR elevation surface (2015), the measured channel water depth data and the as-constructed channel modification drawings for works completed since the collection of the 2015 LiDAR. In addition, 2019 LiDAR data was used to include DEM adjustments corresponding to the channel re-alignment areas. The areas associated with the channel modifications that were updated included the following sites:

- Islington Golf Course channel realignment between Islington Ave and Kipling Ave (west of structure MIM_020)
- Torbram Road channel realignment (near structure MIM_081 and MIM_083)
- Intermodal Site creek realignment (near structure MIM_155)
- Channel stabilization work between Rena Road and Drew Road (near structure MIM_095)

The location of the above-noted sites is provided on **Maps 3(a)**, **3(b)** and **3(c)**. Available information extracted from surveys, field measurements and drawings were integrated into the LiDAR data to upgrade, update and eventually prepare an adjusted high resolution digital elevation surface, which was used to create approximately 1,200 1D-channel cross-sections. ArcGIS and HEC-GeoRAS were used to

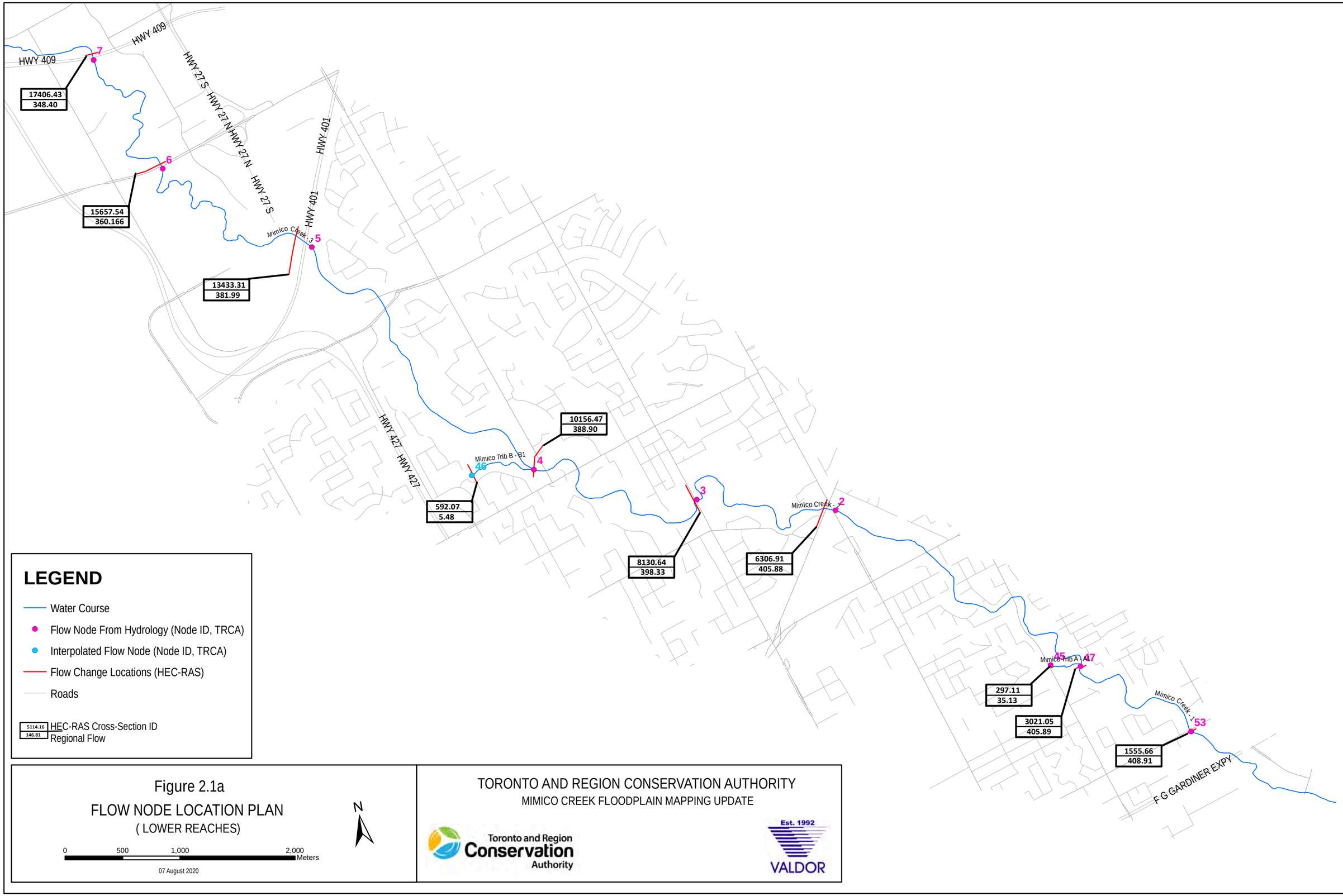
complete DEM adjustments and the generation of the cross sections. This step was necessary to accurately represent various localized elevation features such as drop structures including abrupt changes in the river bed slope, bridge road deck surfaces, channel cross-sections immediately upstream and downstream of culverts and bridges, low flow channel cross sections, etc.

Ground elevation data was provided by the TRCA in raster format with a 0.5 m resolution. The raster data was compiled from bare earth LiDAR data collected in 2015. Road deck surfaces at all bridge and culvert locations were removed to ensure appropriate water flow paths at those locations.

It is important to note that the elevation in the LiDAR DEM for the low flow channel area does not represent the bathymetry of the low flow channel, rather it corresponds to the elevation of the water surface at the time the LiDAR data was obtained. Based on water depths obtained during the field investigations, the channel bathymetry was modified from the mouth of Mimico Creek at Lake Ontario to the confluence of the east and west tributaries in the vicinity of Derry Road. Based on the generally shallow water depths observed upstream of the confluence of the east and west tributaries, it was determined that adjustment of the channel bathymetry was not required for these reaches.

2.6 Steady Flow Table Development for HEC-RAS

The original intent was to include the updated peak flow information from the 2019 *Mimico Watershed Hydrology Study Update* prepared by Civica. During the preparation of the hydrology update, however, it was determined that reliable peak flow information could not be achieved based on the limited available calibration data and TRCA decided to use peak flow information from the 2009 Mimico Creek Hydrology prepared by MMM Group. The steady peak flows for use in the HEC-RAS model update were provided by the TRCA and a flow node location plan is provided in **Figures 2.1(a)** and **2.1(b)** as well as in **Figures C.1(a)** and **C.1(b)** in **Appendix C**. A tabulation of the hydrology model peak flows and interpolated peak flows provided by the TRCA is provided in **Table C.1**. The peak flows were then incorporated into the HEC-RAS model. The peak flows used in the HEC-RAS model and the identified flow change locations are provided in **Table C.2**.



LEGEND

- Water Course
- Flow Node From Hydrology (Node ID, TRCA)
- Interpolated Flow Node (Node ID, TRCA)
- Flow Change Locations (HEC-RAS)
- Roads

5114.16 / 146.81 HEC-RAS Cross-Section ID / Regional Flow

Figure 2.1a

FLOW NODE LOCATION PLAN

(LOWER REACHES)

0 500 1,000 2,000 Meters

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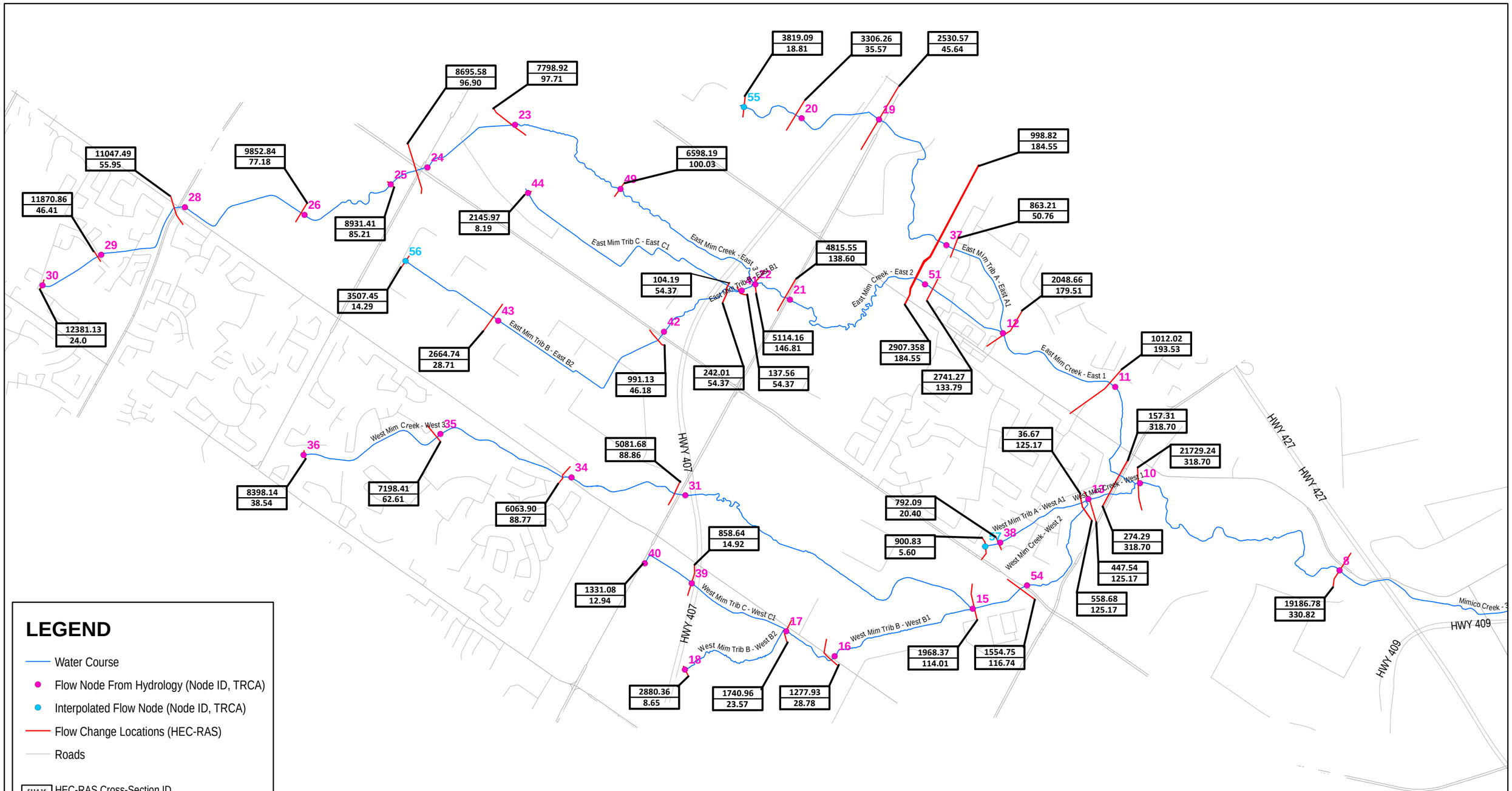

LEGEND

- Water Course
- Flow Node From Hydrology (Node ID, TRCA)
- Interpolated Flow Node (Node ID, TRCA)
- Flow Change Locations (HEC-RAS)
- Roads

5114.16 / 146.81 HEC-RAS Cross-Section ID / Regional Flow

Figure 2.1b
FLOW NODE LOCATION PLAN
(UPPER REACHES)

N

0 500 1,000 2,000 Meters

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3.0 HYDRAULIC MODEL DEVELOPMENT (HEC-RAS)

3.1 HEC-RAS Software

A new HEC-RAS (Version 5.0.7) model was prepared for the Mimico Creek study area using the methodology described below.

3.2 HEC-GeoRAS and Development of the HEC-RAS Model

The details regarding the preparation of the HEC-RAS hydraulic model are provided below for the various key model components.

3.2.1 Cross Sections

The location and number of cross-sections as shown in **Maps 3(a)**, **3(b)** and **3(c)** was determined to best define the hydraulic features (*i.e.* bridges, roads, pinch points, obstructions, etc.) of the study area and were placed as per the approach identified in the *HEC-RAS User's Manual, Version 4.1* (Hydraulic Engineering Center, USACE, January 2010) and the *HEC-RAS Hydraulic Reference Manual, Version 4.1* (Hydraulic Engineering Center, USACE, January 2010). The cross sections were oriented left to right looking downstream as per standard convention. In general, cross sections were drawn perpendicular to contour lines, except where it was not feasible to do so.

Using the adjusted high resolution LiDAR bare earth digital elevation surface, cross sections were cut using ArcGIS and HEC-GeoRAS in order to create geo-referenced cross-sections and river network for the HEC-RAS model. Approximately 1,200 cross sections were generated. The average spacing of the cross sections was in the range of 40 m to 50 m while the minimum and the maximum spacing ranges are 5 m to 10 m and 90 m to 115 m, respectively. In addition, the bank line layers, flow path layers, 2D roughness and building footprint layers were included in the GeoRAS processing to construct the corresponding data layers. The GeoRAS export file was imported by the HEC-RAS software to create the model. The HEC-RAS model was then manually adjusted and revised where necessary to properly define all hydraulic features (*i.e.* bridges, bank stations, channel/overbank lengths, roughness coefficients, ineffective flow areas, flow inputs, boundary conditions, junctions, etc.) as per the approaches identified in the *HEC-RAS User's Manual* and *HEC-RAS Hydraulic Reference Manual*.

Cross-sections were labelled based on channel length as calculated using HEC-GeoRAS moving from downstream to upstream.

3.2.2 Low Flow Channel Correction

When using LiDAR derived DEM, the low flow channel geometry is not accurately defined in many areas since the LiDAR only picks up the water surface and not the bathymetry. As such, corrections were required for many reaches, in particular those with deep baseflow conditions. In order to correct these areas, Valdor derived georeferenced water edges, centre line of the channel and the low flow channel details using high resolution contours, the LiDAR digital elevation surface and the digital orthophotos (where available). During field investigations, Valdor collected water depth measurements at each watercourse crossing. Valdor used the field measured water depth to adjust the low flow channel bathymetry. Where the low flow channel was significantly wider and deeper, Valdor considered the longitudinal river slope in conjunction with the measured water depth and width to create more accurate channel details using the most appropriate GIS approach for bathymetry adjustment. It was noted during field investigations that the channel water depths in the upper parts of the watershed were mostly negligible upstream of the confluence of the east and west tributaries. As such, it was decided that

correction of channel bathymetry would only be completed for the main branch of Mimico Creek downstream of the confluence of the east and west tributaries near Derry Road East.

3.2.3 Manning's Roughness

Manning's roughness coefficients "n" for each land use were chosen in accordance with the TRCA's *Standard Manning's Roughness Coefficients for TRCA Watershed Hydraulic Modelling* document (refer to **Table D.1** in **Appendix D**). Land use polygons were prepared using ArcGIS and the assigned roughness values for each land use were incorporated into the cut cross sections at appropriate stations using HEC-GeoRAS. The Manning's roughness values assigned for each land use category in ArcGIS was discussed and agreed to with the TRCA and these values are provided in **Table D.2** in **Appendix D**. The land use was also confirmed in many cases based on a review of the orthophoto image provided by the TRCA.

3.2.4 Hydraulic Structures

Culvert data, weir data, drop structure data and bridge opening and low chord data was entered into the HEC-RAS model based on a review of the previous HEC-RAS model, as-constructed drawings, field measurements and available survey information provided by the TRCA. The best available measurements from the various data sets was identified and used in the coding of hydraulic structures in the HEC-RAS model. A number of long pipes were identified within the Mimico Creek Watershed and these were further investigated to confirm the most appropriate modeling methodology. The information used to code the hydraulic structures is provided in **Table A.1** in **Appendix A** and also in the hydraulic structure inventory sheets provided in **Appendix B**. A total of 197 hydraulic structures were initially reviewed within the Mimico Creek Watershed. Based on an initial screening and follow-up investigations in the field, a number of these hydraulic structures were identified as not hydraulically significant and, therefore, inclusion in the hydraulic model was not warranted. In addition, some structures were eliminated from smaller reaches that were ultimately excluded from the hydraulic model and some structures were not included due to safety or inaccessibility constraints whereby information was not available. A total of 107 hydraulic structures were ultimately included in the HEC-RAS model for Mimico Creek. The location of all hydraulic structures investigated is included in **Maps 3(a)**, **3(b)** and **3(c)**.

3.2.5 Ineffective Flow Areas

Ineffective flow areas were identified for watercourse crossings and other areas, as appropriate, to better define zones within the cross section that will contain water that is not actively conveyed. Ineffective flow areas were used to describe portions of a cross section in which water will pond, but the velocity of that water, in the downstream direction, is close to zero. The methodology employed in locating the ineffective flow areas generally assumed a contraction of 1:1 on the upstream and downstream side of the watercourse crossings. The elevation of the ineffective flow on the upstream side of the crossing was typically set to the lowest deck elevation while the ineffective elevation on the downstream side of the crossing was typically set halfway between the soffit elevation of the structure and the deck elevation.

3.2.6 Contraction and Expansion Coefficients

Contraction and expansion coefficients were applied within the HEC-RAS hydraulic model to enable the computation of energy losses due to flow expansion and contraction between adjacent cross sections. The approach was taken whereby typical contraction and expansion values of 0.1 and 0.3, respectively, were applied to most cross sections. Respective contraction and expansion values of 0.3 and 0.5 were applied at locations where abrupt valley narrowing and widening occurred. The respective contraction and expansion values applied at watercourse crossings (*i.e.* culverts and bridges) were set as follows:

- Section 4 (u/s of structure) – 0.3/0.5
- Section 3 (immediately u/s of structure) – 0.3/0.5
- Section 2 (immediately d/s of structure) – 0.3/0.5
- Section 1 (d/s of structure) – 0.1/0.3

3.2.7 Weir Flow Coefficients

A typical weir coefficient value of 1.44 or 1.7 was applied to most watercourse crossings (*i.e.* bridges and culverts). In cases where different weir coefficients were applied to previously modelled structures, the previous weir coefficient value was retained for the updated model.

3.2.8 Blocked Obstructions

Obstructions were entered into the HEC-RAS model to represent buildings within the floodplain, as per the base mapping provided by the TRCA. Buildings immediately adjacent to, but not bounded by a cross section, were also taken into consideration and included as obstructions where appropriate and to better reflect the overall impact of the obstructions within the floodplain.

3.2.9 Starting Water Surface Elevations

The boundary condition used at the downstream limits of the HEC-RAS hydraulic model was the most updated 100-yr water level in Lake Ontario (75.97 m) provided by the TRCA.

3.3 Reaches Excluded from the HEC-RAS Hydraulic Model

Through discussions with the TRCA, it was determined that some smaller reaches within the Mimico Creek Watershed would not be included in the hydraulic model for a variety of reasons. The reaches excluded from the hydraulic model are listed as follows along with the supporting rationalization:

1. Small Reach Connected to East Mimico Creek (East 3) Located North of Intermodal Dr and East of CNR (see **Map 3[c]**) – It was agreed that this reach would not be modelled since it is very short and the structures are not accessible. It appears that floodlines for this reach are governed by backwater effects resulting from WSEL's in the main tributary.
2. Small Reach Connected to West Mimico Creek (West B2) Located West of Torbram Rd and South of HWY 407 (see **Map 3[c]**) – Since this is a minor tributary whereby flooding is governed more by Reach West Mimico Creek (West B2), it was agreed that it would not be modelled.
3. Small Reach Connected to Mimico Creek (2) Located in Golf Course West of Islington Ave and North of Dundas St. (see **Map 3[a]**) – Due to split flows conveyed to separate hydraulic structures connected to the local storm sewer network, the hydraulics are complex and would require more information and detailed hydraulic investigations to assess the hydraulic implications regarding flooding. It was agreed that this reach would not be included in the HEC-RAS model.
4. Small Reach Connected to East Mimico Trib B (East B1) Located on the East Side of Airport Rd North of HWY 407 (see **Map 3[c]**) – Due to the presence of a long buried pipe and a small upstream drainage area, it was agreed that this reach would not be modeled
5. Small Reach Connected to East Mimico Trib B (East B2) Located North of Clark Blvd Near Colony Ct (see **Map 3[c]**) - It was agreed that this reach would not be modeled since it is very short and the floodlines would be governed by backwater effects.

3.4 Flow Analysis for Long Pipes

There are a number of long pipes located throughout the Mimico Creek Watershed where reaches were filled in historically to enable development. A total of three (3) long pipes were identified within the HEC-RAS model extents and these pipes were investigated to determine the most appropriate modeling method. A description of the long pipes including the selected modeling methodology is provided below.

MIM_083 (Long Pipe)

The MIM_083 structure is approximately 102 m long and is located along Torbram Road and under the CN Railroad. A location plan for this long pipe is provided in **Figure 3.1** and the hydraulic structure inventory sheet is provided in **Appendix B**. Based on field investigations, this pipe consists of three different size culverts with a bend and internal modifications. As such, modeling directly using HEC-RAS was not the initial preferred approach without completing some external hydraulic analyses. In order to account for the varying culvert characteristics, it was initially proposed to prepare a culvert model using PCSWMM that reflects the *in situ* conditions. It was proposed to build a rating curve for WSEL vs flow (based on various return period storm flows) immediately upstream of the culvert using PCSWMM and to prepare an equivalent culvert (*e.g.* by adjusting culvert roughness, entrance and/or exit loss coefficients, and possibly culvert dimensions) in HEC-RAS using the culvert routine such that the WSEL results match as closely as possible the rating curve derived using the *in situ* culvert characteristics in PCSWMM. As these investigations were undertaken, however, it became apparent that the on-going and dynamic nature of the construction works underway for the CNR underpass along Torbram Road and the uncertainty in the ultimate configuration would make it difficult to complete a meaningful assessment. As such, it was agreed with the TRCA that the structure would be modelled using a conservative approach whereby the smallest opening size was utilized.

MIM_089 (Long Pipe)

The MIM_089 structure is approximately 153 m long and is located along Torbram Road under the storage area and parking lot associated with Weston Forest (7600 Torbram Rd). A location plan for this long pipe is provided in **Figure 3.2** and the hydraulic structure inventory sheet is provided in **Appendix B**. Based on field investigations, this pipe is straight with uniform size/shape and slope, although there is a drop located at the upstream end of the pipe. The pipe appears to be new and the alignment is different than that currently shown. The channel delineation was adjusted in the hydraulic model to reflect the new conditions. The downstream end of the pipe is open to the downstream channel. As such, it was determined this long pipe would be modeled using the culvert routine in HEC-RAS.

MIM_093 (Long Pipe)

The MIM_093 structure is approximately 248 m long and is located south of Steeles Avenue East under an access road and parking area. A location plan for this long pipe is provided in **Figure 3.3** and the hydraulic structure inventory sheet is provided in **Appendix B**. Based on field investigations, this pipe is straight with uniform size/shape and slope and is open to the downstream channel. As such, it was determined this long pipe would be modeled using the culvert routine in HEC-RAS.

3.5 Hydraulic Structure Field Measurement Tie-In Using LiDAR

There were some hydraulic structures where it was not possible to complete a field measurement tie-in to the deck surface due to accessibility, safety or other constraints. In these cases, the full feature LiDAR surface was provided by the TRCA and the deck elevations for measurement tie-in was obtained. The structures for which this was required is noted in **Table A.1** in **Appendix A**.

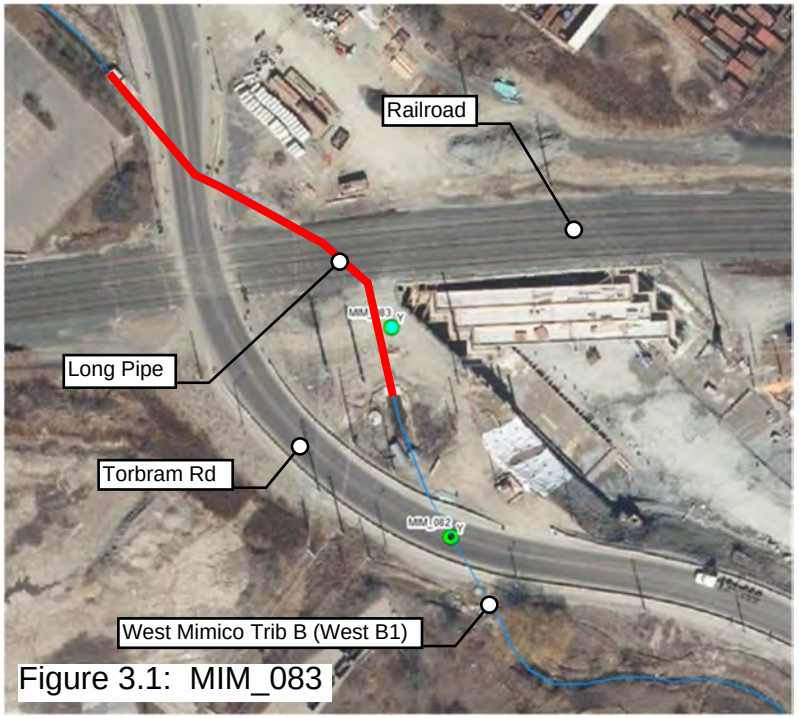


Figure 3.1: MIM_083

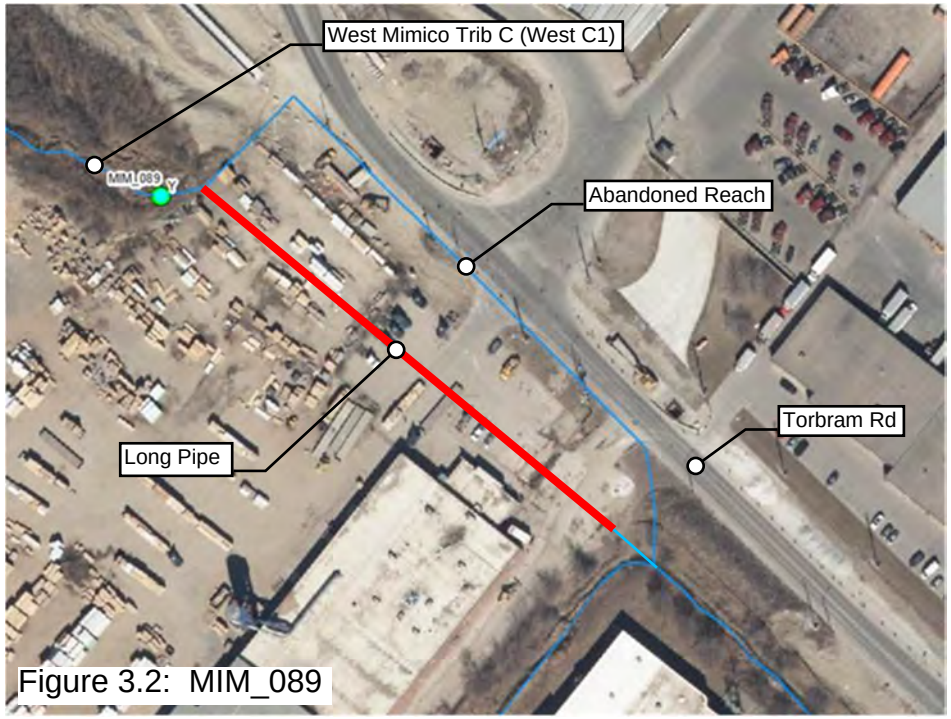


Figure 3.2: MIM_089

Figure 3.3: MIM_093

Figures 3.1 - 3.3: Mimico Creek Long Pipe Locations

3.6 Review of HEC-RAS Summary of Errors, Warnings and Notes

A review of the HEC-RAS errors, warnings and notes has been completed for each cross section to address any modelling issues and to ensure that the results of the model are accurate. It is noted that some cross-sections indicate an energy loss greater than 0.3 m, or a water surface elevation drop of more than 0.5 m between consecutive cross-sections. This is consistent, however, with the location of bridges and pinch points within the model where a drop in the energy grade and water surface elevation is to be expected. Furthermore, some warnings indicated that additional cross sections may be needed. Additional cross sections were added where feasible, but generally the addition of cross sections did not prevent these warnings. The HEC-RAS model was reviewed and revised where possible to minimize the number of occurrences where the hydraulic calculations defaulted to critical depth.

3.7 Model Sensitivity Analysis

A sensitivity analysis was completed for the updated HEC-RAS model to better understand the inherent potential for errors and/or uncertainty in the results and to provide reassurance regarding the selection of model input variables which could affect the resulting WSEL's. Due to the size of the watercourse network, the sensitivity analysis was applied to the main branch that extends from Lake Ontario to the confluence of the east and west tributaries near Derry Road in the City of Mississauga.

3.7.1 Manning's Roughness

A sensitivity analysis was completed for the HEC-RAS hydraulic model for Manning's roughness by varying the baseline model Manning's 'n' by +/- 15%. The sensitivity analysis was investigated regarding impacts to both computed water surface elevation and critical depth occurrence and the respective results are provided in **Tables 3.1** and **3.2**. Based on a review of the results, the respective average change in computed WSEL over the range of storms reported for an increase/decrease in Manning's roughness of 15% is between 0.076 m and 0.095 m and -0.025 m and -0.082 m which is generally considered not significant. Regarding the change in number of critical depth occurrences for an increase/decrease in Manning's roughness of 15%, the respective total number of changes over the range of storms reported is between –9 and -25 and 22 and 30.

Table 3.1 Sensitivity Analysis of Manning's Roughness Coefficient – Change in Computed Water Surface Elevations

Storm Event	Manning's 'n' (+15%)			Manning's 'n' (-15%)		
	Average Change in WSEL (m)	Maximum Increase in WSEL (m)	Maximum Decrease in WSEL (m)	Average Change in WSEL (m)	Maximum Increase in WSEL (m)	Maximum Decrease in WSEL (m)
2-yr	0.076	0.180	-0.010	-0.076	0.010	-0.180
5-yr	0.079	0.230	-0.010	-0.078	0.020	-0.200
10-yr	0.082	0.220	-0.010	-0.081	0.020	-0.250
25-yr	0.085	0.220	-0.010	-0.082	0.020	-0.230
50-yr	0.084	0.340	-0.010	-0.081	0.040	-0.230
100-yr	0.081	0.360	-0.130	-0.076	0.360	-0.420
Regional	0.095	0.550	-0.020	-0.025	0.770	-0.320

Table 3.2 Sensitivity Analysis of Manning's Roughness Coefficient – Change in Critical Depth Occurrences

Scenario	Critical Depth Occurrence by Storm Event						
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional
Base Model	50	56	62	64	67	68	54
Manning's 'n' (+15%)	35	40	43	45	42	45	45
Difference Relative to Base Model (+15%)	-15	-16	-19	-19	-25	-23	-9
Manning's 'n' (-15%)	79	82	84	94	90	96	76
Difference Relative to Base Model (-15%)	29	26	22	30	23	28	22

3.7.2 Peak Discharge

A sensitivity analysis was completed for the HEC-RAS hydraulic model for peak discharge by varying the baseline model peak flow by +/- 10%. The sensitivity analysis was investigated regarding impacts to both computed water surface elevation and critical depth occurrence and the results are provided in **Tables 3.3** and **3.4**, respectively. Based on a review of the results, the respective average change in computed WSEL over the range of storms reported for an increase/decrease in peak flow of 10% is between 0.075 m and 0.293 m and -0.080 m and -0.234 m which is generally considered not significant. Regarding the change in number of critical depth occurrences for an increase/decrease in peak flow of 10%, the respective total number of changes over the range of storms reported is between -1 and 4 and -2 and 2.

Table 3.3 Sensitivity Analysis of Steady Inflow – Change in Computed Water Surface Elevations

Storm Event	Steady Inflow (+10%)			Steady Inflow (-10%)		
	Average Change in WSEL (m)	Maximum Increase in WSEL (m)	Maximum Decrease in WSEL (m)	Average Change in WSEL (m)	Maximum Increase in WSEL (m)	Maximum Decrease in WSEL (m)
2-yr	0.075	0.130	0.000	-0.080	0.000	-0.130
5-yr	0.084	0.470	-0.130	-0.092	0.050	-0.320
10-yr	0.093	0.370	-0.030	-0.099	0.000	-0.220
25-yr	0.106	0.250	-0.010	-0.109	0.020	-0.240
50-yr	0.114	0.410	-0.040	-0.120	0.000	-0.260
100-yr	0.121	0.670	-0.170	-0.124	0.080	-0.430
Regional	0.293	1.260	-0.570	-0.234	0.120	-0.830

Table 3.4 Sensitivity Analysis of Steady Inflow – Change in Critical Depth Occurrences

Scenario	Critical Depth Occurrence by Storm Event						
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional
Base Model	50	56	62	64	67	68	54
Inflow (+10%)	49	60	64	66	69	69	54
Difference Relative to Base Model (+10%)	-1	4	2	2	2	1	0
Inflow (-10%)	48	54	61	64	67	67	56
Difference Relative to Base Model (-10%)	-2	-2	-1	0	0	-1	2

3.7.3 Starting Water Surface Elevation (WSEL)

A sensitivity analysis was completed for the HEC-RAS hydraulic model for starting WSEL by varying the baseline model WSEL at Lake Ontario by +/- 0.30 m and the results are provided in **Table 3.5**. The sensitivity analysis was investigated regarding impacts to computed water surface elevation. Based on a review of the results, the respective average change in WSEL at Lake Ontario over the range of storms reported for an increase/decrease in WSEL of 0.30 m is between 0.001 m and 0.009 m and -0.001 m and -0.008 m which is generally considered not significant.

Table 3.5 Sensitivity Analysis of Starting Water Level – Change in Computed Water Surface Elevations

Storm Event	Starting Water Level (+30 cm)				Starting Water Level (-30 cm)			
	Average Change in WSEL (m)	Maximum Increase in WSEL (m)	Maximum Decrease in WSEL (m)	Maximum Upstream Propagation Cross-section	Average Change in WSEL (m)	Maximum Increase in WSEL (m)	Maximum Decrease in WSEL (m)	Maximum Upstream Propagation Cross-section
2-yr	0.009	0.300	-0.010	715.62	-0.008	0.000	-0.300	605.46
5-yr	0.008	0.300	0.000	674.80	-0.006	0.000	-0.300	605.46
10-yr	0.007	0.300	0.000	674.80	-0.005	0.000	-0.300	605.46
25-yr	0.006	0.300	0.000	674.80	-0.004	0.000	-0.300	605.46
50-yr	0.005	0.300	0.000	605.46	-0.003	0.000	-0.300	477.15
100-yr	0.004	0.300	0.000	674.80	-0.003	0.000	-0.300	269.13
Regional	0.001	0.300	0.000	57.16	-0.001	0.000	-0.300	57.15

3.7.4 Summary of Hydraulic Model Sensitivity

The average change in computed water surface elevations corresponding to the sensitivity analysis over the range of storms is low, which is generally considered not significant. The number of critical depth occurrences corresponding to sensitivity runs is very close to the base model results. The sensitivity analysis confirmed that the selected parameter values are reasonable and that the model is not unreasonably sensitive to changes in Manning's roughness, peak flow and water levels in Lake Ontario.

3.8 Finalization of the HEC-RAS Model

A number of meetings were held with the TRCA during the model development process to discuss options regarding the hydraulic structures (including long pipes), peak flows, spacing and location of cross sections, low flow channel correction, general model parameter values, methodologies for applying Manning's roughness and blocked obstructions and the tributaries for inclusion in the hydraulic model. Throughout this process, the TRCA reviewed and provided comments regarding the HEC-RAS model with revisions subsequently completed by Valdor. Following this thorough review process, the HEC-RAS hydraulic model was developed, revised and finalized. The summary output for the finalized HEC-RAS model for the 2-yr to 100-yr design storms and the Regional storm is provided in **Tables E.1** to **E.7** in **Appendix E**.

Toronto

SPILL AREA - 1

SPILL AREA - 1

LEGEND

- River Network
- Railways
- Municipal Boundaries
- Location of DEM Adjustment
- HEC-RAS Cross-Section Cutlines
- HEC-RAS Flow Change Locations
- 45 Structure Included in HEC-RAS Model (with MIM# ID)
- 68 Structure Not Included in HEC-RAS Model (with MIM# ID)
- Regulatory Floodplain
- Spill Line (Approximate)
- Spill
- Identified Spill Area (Approximate)
- Spill May Continue Flowing Farther

MAP 3A

MIMICO CREEK - LOWER REACHES

400 200 0 400 Meters

August 2020

TORONTO AND REGION CONSERVATION AUTHORITY

MIMICO CREEK FLOODPLAIN MAPPING UPDATE

Toronto and Region Conservation Authority

Est. 1992 VALDOR

Toronto

Mississauga

SPILL AREA - 2

Mimico Creek - 3

Mimico Trib B - B1

Mimico Creek

LEGEND

- River Network
- Railways
- Municipal Boundaries
- Location of DEM Adjustment
- HEC-RAS Cross-Section Cutlines
- HEC-RAS Flow Change Locations
- Structure Included in HEC-RAS Model (with MIM# ID)
- Structure Not Included in HEC-RAS Model (with MIM# ID)
- Regulatory Floodplain
- Spill Line (Approximate)
- Spill
- Identified Spill Area (Approximate)
- Spill May Continue Flowing Further

MAP 3B

MIMICO CREEK - MIDDLE REACHES

400 200 0 400 Meters

August 2020

N

TORONTO AND REGION CONSERVATION AUTHORITY

MIMICO CREEK FLOODPLAIN MAPPING UPDATE

Toronto and Region Conservation Authority

Est. 1992 VALDOR


SPILL AREA - 14
SPILL AREA - 16
SPILL AREA - 17
SPILL AREA - 15
SPILL AREA - 19
SPILL AREA - 19
SPILL AREA - 20
SPILL AREA - 13
SPILL AREA - 12
SPILL AREA - 18
SPILL AREA - 10
SPILL AREA - 11
SPILL AREA - 9
SPILL AREA - 8
SPILL AREA - 7
SPILL AREA - 3
SPILL AREA - 6
SPILL AREA - 6
SPILL AREA - 6
SPILL AREA - 5
SPILL AREA - 4
Vaughan
Toronto
Brampton
Mississauga
LEGEND
River Network
Railways
Municipal Boundaries
Location of DEM Adjustment
HEC-RAS Cross-Section Cutlines
HEC-RAS Flow Change Locations
Structure Included in HEC-RAS Model (with MIM# ID)
Structure Not Included in HEC-RAS Model (with MIM# ID)
Regulatory Floodplain
Spill Line (Approximate)
Spill
Identified Spill Area (Approximate)
Spill May Continue Flowing Further
MAP 3C
MIMICO CREEK - UPPER REACHES
500 250 0 500 Meters
August 2020
N
TORONTO AND REGION CONSERVATION AUTHORITY
MIMICO CREEK FLOODPLAIN MAPPING UPDATE
Toronto and Region Conservation Authority
Est. 1992
VALDOR

4.0 FLOOD CHARACTERIZATION AND SCREENING

4.1 Preparation of Updated and New Floodplain Mapping

With assistance from the TRCA, digital updated floodplain mapping was prepared based on the flood water surface elevation results calculated with the finalized HEC-RAS model described in Section 3.0 for the greater of the 100-yr and Regional storms (*i.e.* the Regulatory storm). The updated digital floodplain mapping will replace the existing Mimico Creek Floodplain Map Sheets MIM-01 through MIM-19. Flood extent lines were generated based on the water surface elevation and the adjusted high resolution (50 cm grid) LiDAR ground elevation surface. The HEC-GeoRAS module of ArcGIS was used to generate the flood extent lines. The auto-generated floodlines were adjusted based on the 0.5 m elevation contours, high resolution digital orthophoto and the building footprint layers. The contours used to prepare the base map were created using the LiDAR digital elevation surface provided by the TRCA. Reduced copies of the updated digital Mimico Creek engineered floodplain maps for the Regulatory storm are provided in **Sheets 01**, **02** and **03** in **Appendix F**. The reduced copies provided are for reference only and the TRCA should be contacted for the most current official floodplain mapping.

4.1.1 Hydraulic Structure Overtopping

Based on the results of the updated HEC-RAS model, modeled water crossings within the Mimico Creek Watershed were investigated to determine the frequency of overtopping during the range of storm events simulated (*i.e.* 2-yr to 100-yr and Regional). The WSEL's for the range of storms simulated at various watercourse crossings is provided in **Table 4.1**. The frequency at which the water crossings overtop during the simulated storms and the depth of inundation during overtopping is provided in **Table 4.2**. Cells shaded in green in **Table 4.2** indicate the crossing is not overtopped with available freeboard and the cells shaded in red indicate the crossing is inundated. It is noted that spill across a watercourse crossing did not always occur at the structure (*i.e.* bridge or culvert) itself and, due to the site specific topography, the low point across which flood waters spill may be located away from the structure. As such, the location of the lowest road elevation was identified in **Table 4.2** as being: (1) approximately over the structure; (2) to the left of the structure; and, (3) to the right of the structure. The surrounding topography was also verified to confirm hydraulic connectivity between the watercourse and the low point on the road/railroad/trail deck crossing.

It is noted that a number of road and railroad water crossing structures are overtopped with a frequency of 1:25 years or greater, including the following:

Road Crossings Inundated with a Frequency of 1:25 Years or Greater

- MIM_081 – Torbram Rd (Mississauga)
- MIM_082 – Torbram Rd (Mississauga)
- MIM_108 – Torbram Rd (Brampton)
- MIM_134 – Goreway Dr (Brampton)
- MIM_144 – Clark Blvd (Brampton)
- MIM_162 – Chrysler Dr (Brampton)
- MIM_169 – Jordan Blvd (Brampton)
- MIM_193 – Kenview Blvd (Brampton)
- MIM_194 – Steeles Ave East (Brampton)

Railroad Crossings Inundated with a Frequency of 1:25 Years or Greater

- MIM_102 – Railroad (Mississauga)

Table 4.1 : WSELs at Modelled Water Crossings - 2-yr to 100-yr and Regional Storms
Mimico Creek Floodplain Mapping Update

Structure ID	Location	Structure Type	HEC-RAS River	HEC-RAS Reach	HEC-RAS Xsection U/S of Structure	Water Surface Elevation (m)							Regulatory
						2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional	
MIM_001	Large Pedestrian bridge at the mouth	Ped Bridge	Mimico Creek	1	137.27	76.00	76.02	76.05	76.11	76.17	76.26	77.73	Regional
MIM_002	LAKE SHORE BOULEVARD WEST	Bridge	Mimico Creek	1	306.71	76.13	76.28	76.41	76.60	76.76	76.91	78.89	Regional
MIM_003	Railway	Bridge	Mimico Creek	1	779.83	78.17	78.48	78.70	78.97	79.14	79.33	81.95	Regional
MIM_005	GARDINER E PARK LAWN RAMP	Bridge	Mimico Creek	1	1039.69	78.68	78.97	79.18	79.46	79.66	79.84	82.91	Regional
MIM_006	F G GARDINER EXPY	Bridge	Mimico Creek	1	1125.29	80.02	80.29	80.48	80.72	80.90	81.09	83.27	Regional
MIM_007	F G GARDINER EXPY RAMP	Bridge	Mimico Creek	1	1170.47	81.21	81.55	81.79	82.08	82.30	82.50	86.69	Regional
MIM_008	THE QUEENSWAY	Bridge	Mimico Creek	1	1588.83	84.24	84.53	84.73	84.98	85.14	85.28	87.55	Regional
MIM_010	Trail	Ped Bridge	Mimico Creek	1	2918.35	94.79	95.08	95.27	95.52	95.71	95.89	98.44	Regional
MIM_011	Trail - pedestrian bridge	Ped Bridge	Mimico Creek	2	3759.24	101.55	101.92	102.16	102.42	102.63	102.80	104.83	Regional
MIM_012	ROYAL YORK ROAD	Bridge	Mimico Creek	2	4214.84	104.87	105.19	105.40	105.65	105.83	105.97	109.46	Regional
MIM_013	Trail - pedestrian bridge	Ped Bridge	Mimico Creek	2	4895.38	110.18	110.49	110.69	110.95	111.14	111.32	114.86	Regional
MIM_014	BLOOR STREET WEST	Bridge	Mimico Creek	2	5307.71	112.08	112.44	112.68	112.96	113.17	113.35	115.59	Regional
MIM_015	TTC Rail- Line 2 - Islington &Royal York	Bridge	Mimico Creek	2	5417.43	112.55	112.93	113.19	113.49	113.70	113.88	116.47	Regional
MIM_016	Trail - pedestrian bridge	Ped Bridge	Mimico Creek	2	5715.57	114.34	114.65	114.86	115.08	115.23	115.17	116.81	Regional
MIM_017	Railway	Bridge	Mimico Creek	2	5824.5	114.79	115.15	115.38	115.64	115.86	115.93	119.39	Regional
MIM_020	ISLINGTON AVENUE	Bridge	Mimico Creek	2	6306.91	117.10	117.38	117.57	117.80	117.97	118.13	121.13	Regional
MIM_034	KIPLING AVENUE	Bridge	Mimico Creek	2	8130.64	126.47	126.76	126.89	127.09	127.24	127.38	130.48	Regional
MIM_037	RATHBURN ROAD	Bridge	Mimico Creek	2	9719.91	131.23	131.55	131.68	131.82	131.93	132.02	134.16	Regional
MIM_038	MARTIN GROVE ROAD	Bridge	Mimico Creek	2	10062.85	131.87	132.20	132.38	132.60	132.77	132.91	136.08	Regional
MIM_043	EGLINTON AVENUE WEST	Bridge	Mimico Creek	3	12305.9	138.48	138.86	139.08	139.34	139.54	139.71	142.40	Regional
MIM_044	EGLINTON AVENUE WEST	Bridge	Mimico Creek	3	12444.33	139.11	139.59	139.88	140.22	140.48	140.69	144.31	Regional
MIM_045	HWY 401	Bridge	Mimico Creek	3	13433.31	141.11	141.52	141.77	142.06	142.28	142.49	145.26	Regional
MIM_046	HWY 27	Bridge	Mimico Creek	3	13600.64	141.62	142.05	142.31	142.60	142.83	143.02	146.82	Regional
MIM_047	Skyway Ave	Bridge	Mimico Creek	3	13764.33	143.41	143.74	143.93	144.13	144.32	144.48	147.86	Regional
MIM_057	DIXON ROAD	Bridge	Mimico Creek	3	15657.54	148.77	148.94	149.04	149.17	149.33	149.47	151.42	Regional
MIM_065	HWY 409	Bridge	Mimico Creek	3	17406.43	151.94	152.29	152.42	152.60	152.75	152.87	155.35	Regional
MIM_066	CARLINGVIEW DRIVE	Bridge	Mimico Creek	3	17899.62	152.82	153.19	153.39	153.64	153.85	154.01	156.97	Regional
MIM_067	HWY 427	Culvert	Mimico Creek	3	18917.39	154.69	155.17	155.46	155.78	156.07	156.27	160.20	Regional
MIM_069	Zahavy Way	Bridge	Mimico Creek	3	19186.78	155.38	155.81	156.07	156.39	156.66	156.88	161.52	Regional
MIM_070	Railway	Bridge	Mimico Creek	3	19862.54	157.28	157.60	157.76	157.89	158.04	158.16	161.97	Regional
MIM_075	DERRY ROAD EAST	Bridge	West Mim Creek	West 1	274.29	161.29	161.69	161.91	162.16	162.38	162.52	164.57	Regional
MIM_076	Trail	Culvert	West Mim Creek	West 2	1184.88	164.36	164.55	164.69	164.84	164.98	165.07	165.94	Regional
MIM_077	AIRPORT ROAD	Culvert	West Mim Creek	West 2	1554.75	165.33	165.70	165.90	166.12	166.36	166.98	167.20	Regional
MIM_078	Scarboro Street	Bridge	West Mim Creek	West 2	1814.52	166.14	166.49	166.69	166.94	167.61	167.74	168.18	Regional
MIM_079	Railway	Culvert	West Mim Trib B	West B1	281.81	166.84	167.24	167.50	167.81	168.21	168.36	169.17	Regional
MIM_081	NEW - TORBRAM ROAD	Bridge	West Mim Trib B	West B1	1277.93	172.19	172.45	172.62	172.81	172.87	172.95	173.14	Regional
MIM_082	NEW - Torbram Road	Culvert	West Mim Trib B	West B1	1463.183	172.80	173.07	173.28	173.50	173.66	173.83	174.24	Regional
MIM_083	Railway, Long Pipe	Culvert (LP)	West Mim Trib B	West B1	1572.8	173.58	173.93	174.15	174.43	174.88	175.03	175.03	Regional
MIM_084	Rena Road	Culvert	West Mim Trib B	West B1	1645.56	174.43	174.62	174.76	174.92	175.40	175.57	175.80	Regional
MIM_085	Railway	Culvert	West Mim Trib B	West B2	1992.27	175.87	176.13	176.34	176.61	176.83	177.00	177.15	Regional
MIM_086	Railway	Culvert	West Mim Trib B	West B2	2505.07	178.78	179.12	179.42	179.87	180.26	180.69	181.58	Regional
MIM_089	Long Pipe	Culvert (LP)	West Mim Trib C	West C1	179.16	176.15	176.27	176.32	176.39	176.44	176.47	176.64	Regional
MIM_090	Railway	Culvert	West Mim Trib C	West C1	367.66	177.83	178.31	178.71	179.30	179.81	180.05	180.05	Regional
MIM_091	Road culvert in hydrofield	Culvert	West Mim Trib C	West C1	639.99	178.57	178.81	179.14	179.40	179.83	180.06	180.07	Regional
MIM_092	HWY 407	Culvert	West Mim Trib C	West C1	858.64	178.78	178.99	179.26	179.52	179.95	180.20	180.37	Regional
MIM_093	Long Pipe - buried culvert	Culvert (LP)	West Mim Trib C	West C1	1241.55	181.44	181.72	181.90	182.12	182.28	182.43	183.12	Regional
MIM_095	Drew Road	Bridge	West Mim Creek	West 3	2427.43	167.87	168.20	168.31	168.55	168.70	168.90	169.62	Regional
MIM_099	South of Rena Road	Drop Structure	West Mim Creek	West 3	3107.63	169.70	170.02	170.11	170.34	170.45	170.63	171.21	Regional
MIM_100	Rena Road	Bridge	West Mim Creek	West 3	3362.12	170.65	171.07	171.18	171.44	171.90	171.98	172.74	Regional
MIM_101	North of Rena Road	Drop Structure	West Mim Creek	West 3	3383.92	170.58	170.97	171.09	171.36	171.89	171.97	172.74	Regional
MIM_102	Railway	Culvert	West Mim Creek	West 3	3848.39	177.94	178.00	178.02	178.06	178.07	178.10	178.20	Regional
MIM_104	HWY 407	Culvert	West Mim Creek	West 3	4977.06	178.05	178.25	178.32	178.51	178.62	178.81	179.71	Regional
MIM_105	STEELES AVENUE EAST	Culvert	West Mim Creek	West 3	5081.68	178.11	178.39	178.50	178.76	178.92	179.18	180.72	Regional
MIM_106	Railway	Bridge	West Mim Creek	West 3	5306.21	180.01	180.19	180.71	181.02	181.25	181.93	183.24	Regional
MIM_107	Walker Drive	Culvert	West Mim Creek	West 3	5571.47	181.74	182.22	182.55	182.93	183.20	183.52	184.65	Regional
MIM_108	TORBRAM ROAD	Culvert	West Mim Creek	West 3	6063.9	185.49	186.01	186.33	186.55	186.66	186.78	186.94	Regional
MIM_114	Eastbourne Drive	Culvert	West Mim Creek	West 3	7198.41	197.40	197.77	198.09	198.52	198.88	199.27	200.19	Regional
MIM_115	West of Eastbourne Drive	Drop Structure	West Mim Creek	West 3	7213.36	198.84	198.96	199.04	199.13	199.20	199.26	200.17	Regional
MIM_118	Clark Blvd	Culvert	West Mim Creek	West 3	8094.92	206.40	206.66	206.83	207.04	207.20	207.42	208.57	Regional
MIM_120	Codlin Ave	Culvert	West Mim Trib A	West A1	306.29	165.10	165.32	165.47	165.67	165.85	166.06	166.09	Regional
MIM_121	LANCASTER AVENUE	Culvert	West Mim Trib A	West A1	471.92	166.30	166.57	166.76	166.96	167.11	167.24	167.53	Regional
MIM_122	Trail	Culvert	West Mim Trib A	West A1	639.62	167.40	167.57	167.69	167.81	167.88	167.92	168.09	Regional
MIM_123	Trail	Culvert	West Mim Trib A	West A1	792.09	167.81	168.01	168.14	168.29	168.42	168.50	168.69	Regional
MIM_124	DERRY ROAD EAST	Bridge	East Mim Creek	East 1	157.31	161.04	161.45	161.69	161.96	162.18	162.36	164.61	Regional
MIM_125	GOREWAY DRIVE	Bridge	East Mim Creek	East 1	490.61	161.73	162.12	162.36	162.66	162.88	163.08	164.95	Regional
MIM_126	Etude Drive	Culvert	East Mim Creek	East 1	1012.02	162.58	163.09	163.39	163.74	164.13	164.55	165.33	Regional
MIM_128	Morning Star Drive	Culvert	East Mim Creek	East 1	1833.9	163.54	163.97	164.25	164.57	164.83	165.16	167.26	Regional
MIM_129	BRANDON GATE DRIVE	Culvert	East Mim Creek	East 2	2569.04	164.93	165.37	165.66	166.00	166.23	166.45	168.49	Regional
MIM_131	Railway	Culvert	East Mim Creek	East 2	2857.35	167.89	168.35	168.66	169.05	169.32	169.65	172.34	Regional
MIM_132	Crossing	Culvert	East Mim Creek	East 2	2900.3	169.02	170.09	170.45	170.49	170.54	170.58	172.39	Regional
MIM_134	GOREWAY DRIVE	Culvert	East Mim Creek	East 2	3197.8	169.27	170.35	170.51	170.55	170.58	170.62	172.40	Regional
MIM_135	STEELES AVENUE EAST	Culvert	East Mim Creek	East 2	4815.55	170.90	171.10	171.23	171.39	171.51	171.64	173.48	Regional
MIM_136	Railway	Culvert	East Mim Trib B	East B1	137.56	174.41	174.73	174.91	175.16	175.34	175.51	175.78	Regional
MIM_138	HWY 407	Culvert	East Mim Trib B	East B2	489.19	174.58	174.91	175.13	175.40	175.60	175.82	176.49	Regional
MIM_139	Weir	Weir	East Mim Trib B	East B2	767.92	180.26	180.53	180.68	180.82	180.83	180.82	180.94	Regional
MIM_140	AIRPORT ROAD	Culvert	East Mim Trib B	East B2	991.13	180.56	180.98	181.28	181.69	181.95	182.23	182.54	Regional
MIM_141	WALKER DRIVE	Culvert	East Mim Trib B	East B2	1366.27	181.44	181.72	181.90	182.18	182.46	182.87	183.14	Regional
MIM_142	Railway	Culvert	East Mim Trib B	East B2	1882.59	186.17	186.41	186.57	186.76	186.90	187.05	187.61	Regional
MIM_144	Clark Blvd	Culvert	East Mim Trib B	East B2	2664.74	194.40	194.86	195.17	195.17	195.14	195.11	194.75	100-yr
MIM_145	Railway	Culvert	East Mim Trib B	East B2	2741.28	194.78	195.37	195.44	195.44	195.46	195.49	195.59	Regional
MIM_146	Railway	Culvert	East Mim Trib B	East B2	3101.99	196.40	196.46	196.46	196.52	196.55	196.60	196.85	Regional
MIM_148	HWY 407	Culvert	East Mim Trib C	East C1	211.65	174.47	174.81	175.01	175.28	175.48	175.66	176.05	Regional

Structure ID	Location	Structure Type	HEC-RAS River	HEC-RAS Reach	HEC-RAS Xsection U/S of Structure	Water Surface Elevation (m)							Regulatory
						2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional	
MIM_149	Intermodal Drive	Culvert	East Mim Trib C	East C1	614.77	175.40	175.48	175.52	175.57	175.64	175.76	176.11	Regional
MIM_151	North of Intermodal Drive	Culvert (LP)	East Mim Trib C	East C1	1236.58	179.3473	179.5193	179.6341	179.7839	179.9023	180.0474	181.7467	Regional
MIM_152	Clark Blvd	Culvert	East Mim Trib C	East C1	1791.84	181.8083	181.941	182.0262	182.1297	182.2052	182.28	182.6151	Regional
MIM_153	HWY 407	Bridge	East Mim Creek	East 3	5424.36	172.12	172.34	172.48	172.65	172.78	172.90	174.27	Regional
MIM_154	Intermodal Drive	Culvert	East Mim Creek	East 3	5879.61	174.12	174.31	174.42	174.56	174.66	174.76	176.23	Regional
MIM_156	Railway	Culvert	East Mim Creek	East 3	8008.2	182.08	182.38	182.60	182.92	183.10	183.29	184.24	Regional
MIM_157	East of Delta Park Boulevard	Drop Structure	East Mim Creek	East 3	8054.33	183.04	183.22	183.34	183.53	183.63	183.73	184.54	Regional
MIM_158	DELTA PARK BOULEVARD	Culvert	East Mim Creek	East 3	8257.77	184.56	184.76	184.93	185.17	185.48	185.74	188.27	Regional
MIM_159	West of Delta Park Boulevard	Drop Structure	East Mim Creek	East 3	8372.031	188.05	188.23	188.36	188.54	188.68	188.77	189.58	Regional
MIM_160	QUEEN STREET EAST	Culvert	East Mim Creek	East 3	8695.58	190.35	190.67	190.99	191.46	191.74	192.02	194.19	Regional
MIM_161	North of Queen Street East	Weir	East Mim Creek	East 3	9042.41	195.76	196.15	196.40	196.71	196.94	197.16	198.17	Regional
MIM_162	Chrysler	Culvert	East Mim Creek	East 3	9585.94	199.20	199.65	199.95	200.57	200.76	200.86	201.22	Regional
MIM_163	Corporation Drive	Culvert	East Mim Creek	East 3	9852.84	201.13	201.58	201.86	202.21	202.48	202.82	203.68	Regional
MIM_165	Driveway	Bridge	East Mim Creek	East 3	10910.33	209.38	209.67	209.86	210.08	210.37	210.46	211.28	Regional
MIM_166	WILLIAMS PARKWAY EAST	Culvert	East Mim Creek	East 3	11047.49	210.41	210.93	211.34	212.04	212.03	212.07	212.36	Regional
MIM_168	JAYFIELD ROAD	Culvert	East Mim Creek	East 3	11582.38	215.70	216.15	216.46	216.84	217.11	217.26	217.52	Regional
MIM_169	JORDAN BOULEVARD	Culvert	East Mim Creek	East 3	11870.86	218.47	219.05	219.45	219.74	219.86	219.95	220.17	Regional
MIM_179	MONICA DRIVE	Culvert	East Mim Trib A	East A1	297.49	164.63	165.01	165.25	165.54	165.76	166.07	168.44	Regional
MIM_180	BRANDON GATE DRIVE	Culvert	East Mim Trib A	East A1	744.39	166.32	166.45	166.69	166.97	167.45	167.62	168.80	Regional
MIM_181	Railway	Culvert	East Mim Trib A	East A1	973.51	168.14	168.52	168.76	169.09	169.40	169.72	172.14	Regional
MIM_182	Culvert - fenceline	Culvert	East Mim Trib A	East A1	998.82	168.72	168.82	168.90	169.13	169.44	169.76	172.23	Regional
MIM_193	KENVIEW BOULEVARD	Culvert	East Mim Trib A	East A1	2094.83	170.55	171.07	171.43	171.57	171.62	171.66	172.23	Regional
MIM_194	STEELES AVENUE EAST	Culvert	East Mim Trib A	East A1	2512.52	171.27	171.64	172.00	172.48	172.56	172.63	172.84	Regional
MIM_195	HWY 407	Culvert	East Mim Trib A	East A1	2776.83	171.99	172.27	172.48	172.80	172.93	173.05	174.05	Regional
MIM_196	Intermodal Drive	Culvert	East Mim Trib A	East A1	3306.26	173.22	173.51	173.74	174.06	174.32	174.62	175.49	Regional

Table 4.2 : Overtopping of Water Course Crossings - 2-yr to 100-yr and Regional Storms
Mimico Creek Floodplain Mapping Update

					HEC-RAS	Top of	Lowest Rd		Difference Between Top of Road Elv'n and Water Surface (m)					
Structure	Location	Structure	HEC-RAS	HEC-RAS	Xsec U/S	Road Elv'n	Elevation at							
ID		Type	River	Reach	of Structure	(m)	L/O/R	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional
MIM_001	Large Pedestrian bridge at the mouth	Ped Bridge	Mimico Creek	1	137.27	76.03	R	0.03	0.01	-0.02	-0.08	-0.14	-0.23	-1.70
MIM_002	LAKE SHORE BOULEVARD WEST	Bridge	Mimico Creek	1	306.71	79.1	O	2.97	2.82	2.69	2.50	2.34	2.19	0.21
MIM_003	Railway	Bridge	Mimico Creek	1	779.83	89.61	O	11.44	11.13	10.91	10.64	10.47	10.28	7.66
MIM_005	GARDINER E PARK LAWN RAMP	Bridge	Mimico Creek	1	1039.69	85	L	6.32	6.03	5.82	5.54	5.34	5.16	2.09
MIM_006	F G GARDINER EXPY	Bridge	Mimico Creek	1	1125.29	90.24	L	10.22	9.95	9.76	9.52	9.34	9.15	6.97
MIM_007	F G GARDINER EXPY RAMP	Bridge	Mimico Creek	1	1170.47	89.6	R	8.39	8.05	7.81	7.52	7.30	7.10	2.91
MIM_008	THE QUEENSWAY	Bridge	Mimico Creek	1	1588.83	91.5	L	7.26	6.97	6.77	6.52	6.36	6.22	3.95
MIM_010	Trail	Ped Bridge	Mimico Creek	1	2918.35	96.5	L	1.71	1.42	1.23	0.98	0.79	0.61	-1.94
MIM_011	Trail - pedestrian bridge	Ped Bridge	Mimico Creek	2	3759.24	103.3	L	1.76	1.38	1.14	0.88	0.67	0.50	-1.53
MIM_012	ROYAL YORK ROAD	Bridge	Mimico Creek	2	4214.84	107.5	R	2.63	2.31	2.10	1.85	1.67	1.53	-1.96
MIM_013	Trail - pedestrian bridge	Ped Bridge	Mimico Creek	2	4895.38	114.13	O	3.95	3.64	3.44	3.18	2.99	2.81	-0.73
MIM_014	BLOOR STREET WEST	Bridge	Mimico Creek	2	5307.71	115.76	R	3.68	3.32	3.08	2.80	2.59	2.41	0.17
MIM_015	TTC Rail- Line 2 - Islington &Royal York	Bridge	Mimico Creek	2	5417.43	115	L	2.45	2.07	1.81	1.51	1.30	1.12	-1.47
MIM_016	Trail - pedestrian bridge	Ped Bridge	Mimico Creek	2	5715.57	114.95	R	0.61	0.30	0.09	-0.13	-0.28	-0.22	-1.86
MIM_017	Railway	Bridge	Mimico Creek	2	5824.5	123.05	O	8.26	7.90	7.67	7.41	7.19	7.12	3.66
MIM_020	ISLINGTON AVENUE	Bridge	Mimico Creek	2	6306.91	121.28	L, R	4.18	3.90	3.71	3.48	3.31	3.15	0.15
MIM_034	KIPLING AVENUE	Bridge	Mimico Creek	2	8130.64	130.81	L, R	4.34	4.05	3.92	3.72	3.57	3.43	0.33
MIM_037	RATHBURN ROAD	Bridge	Mimico Creek	2	9719.91	136	R	4.77	4.45	4.32	4.18	4.07	3.98	1.84
MIM_038	MARTIN GROVE ROAD	Bridge	Mimico Creek	2	10062.85	134	L	2.13	1.80	1.62	1.40	1.23	1.09	-2.08
MIM_043	EGLINTON AVENUE WEST	Bridge	Mimico Creek	3	12305.9	143.68	L	5.20	4.82	4.60	4.34	4.14	3.97	1.28
MIM_044	EGLINTON AVENUE WEST	Bridge	Mimico Creek	3	12444.33	143.08	R	3.97	3.49	3.20	2.86	2.60	2.39	-1.23
MIM_045	HWY 401	Bridge	Mimico Creek	3	13433.31	152	R	10.89	10.48	10.23	9.94	9.72	9.51	6.74
MIM_046	HWY 27	Bridge	Mimico Creek	3	13600.64	145.9	R	4.28	3.85	3.59	3.30	3.07	2.88	-0.92
MIM_047	Skyway Ave	Bridge	Mimico Creek	3	13764.33	148.47	R	5.06	4.73	4.54	4.34	4.15	3.99	0.61
MIM_057	DIXON ROAD	Bridge	Mimico Creek	3	15657.54	152.8	R	4.03	3.86	3.76	3.63	3.47	3.33	1.38
MIM_065	HWY 409	Bridge	Mimico Creek	3	17406.43	164.93	L	12.99	12.64	12.51	12.33	12.18	12.06	9.58
MIM_066	CARLINGVIEW DRIVE	Bridge	Mimico Creek	3	17899.62	158.54	L	5.72	5.35	5.15	4.90	4.69	4.53	1.57
MIM_067	HWY 427	Culvert	Mimico Creek	3	18917.39	161.6	L	6.91	6.43	6.14	5.82	5.53	5.33	1.40
MIM_069	Zahavy Way	Bridge	Mimico Creek	3	19186.78	161.93	L	6.55	6.12	5.86	5.54	5.27	5.06	0.41
MIM_070	Railway	Bridge	Mimico Creek	3	19862.54	164.93	L	7.65	7.33	7.17	7.04	6.89	6.77	2.96
MIM_075	DERRY ROAD EAST	Bridge	West Mim Creek	West 1	274.29	163.24	L	1.95	1.55	1.33	1.08	0.86	0.72	-1.33
MIM_076	Trail	Culvert	West Mim Creek	West 2	1184.88	165.26	R	0.90	0.71	0.57	0.42	0.28	0.19	-0.68
MIM_077	AIRPORT ROAD	Culvert	West Mim Creek	West 2	1554.75	166.65	R	1.32	0.95	0.75	0.53	0.29	-0.33	-0.55
MIM_078	Scarboro Street	Bridge	West Mim Creek	West 2	1814.52	167.13	R	0.99	0.64	0.44	0.19	-0.48	-0.61	-1.05
MIM_079	Railway	Culvert	West Mim Trib B	West B1	281.81	169.6	R	2.76	2.36	2.10	1.79	1.39	1.24	0.43
MIM_081	NEW - TORBRAM ROAD	Bridge	West Mim Trib B	West B1	1277.93	172.3	L	0.11	-0.15	-0.32	-0.51	-0.57	-0.65	-0.84
MIM_082	NEW - Torbram Road	Culvert	West Mim Trib B	West B1	1463.183	173.2	O	0.40	0.13	-0.08	-0.30	-0.46	-0.63	-1.04
MIM_083	Railway, Long Pipe	Culvert (LP)	West Mim Trib B	West B1	1572.8	175.02	L	1.44	1.09	0.87	0.59	0.14	0.00	0.00
MIM_084	Rena Road	Culvert	West Mim Trib B	West B1	1645.56	175.32	L	0.89	0.70	0.56	0.40	-0.08	-0.25	-0.48
MIM_085	Railway	Culvert	West Mim Trib B	West B2	1992.27	176.75	R	0.88	0.62	0.41	0.14	-0.08	-0.25	-0.40
MIM_086	Railway	Culvert	West Mim Trib B	West B2	2505.07	181.4	L	2.62	2.28	1.98	1.53	1.14	0.71	-0.18
MIM_089	Long Pipe	Culvert (LP)	West Mim Trib C	West C1	179.16	175.86	O	-0.29	-0.41	-0.46	-0.53	-0.58	-0.61	-0.78
MIM_090	Railway	Culvert	West Mim Trib C	West C1	367.66	180.05	L	2.22	1.74	1.34	0.75	0.24	0.00	0.00
MIM_091	Road culvert in hydrofield	Culvert	West Mim Trib C	West C1	639.99	179.21	R	0.64	0.40	0.07	-0.19	-0.62	-0.85	-0.86
MIM_092	HWY 407	Culvert	West Mim Trib C	West C1	858.64	181.27	L	2.49	2.28	2.01	1.75	1.32	1.07	0.90
MIM_093	Long Pipe - buried culvert	Culvert (LP)	West Mim Trib C	West C1	1241.55	182.78	L	1.34	1.06	0.88	0.66	0.50	0.35	-0.34
MIM_095	Drew Road	Bridge	West Mim Creek	West 3	2427.43	170.5	L	2.63	2.30	2.19	1.95	1.80	1.60	0.88
MIM_100	Rena Road	Bridge	West Mim Creek	West 3	3362.12	172.5	R	1.85	1.43	1.32	1.06	0.60	0.52	-0.24
MIM_102	Railway	Culvert	West Mim Creek	West 3	3848.39	177.8	L	-0.14	-0.20	-0.22	-0.26	-0.27	-0.30	-0.40
MIM_104	HWY 407	Culvert	West Mim Creek	West 3	4977.06	182.11	R	4.06	3.86	3.79	3.60	3.49	3.30	2.40
MIM_105	STEELES AVENUE EAST	Culvert	West Mim Creek	West 3	5081.68	183.2	R	5.09	4.81	4.70	4.44	4.28	4.02	2.48
MIM_106	Railway	Bridge	West Mim Creek	West 3	5306.21	183.18	O	3.17	2.99	2.47	2.16	1.93	1.25	-0.06
MIM_107	Walker Drive	Culvert	West Mim Creek	West 3	5571.47	183.6	L	1.86	1.38	1.05	0.67	0.40	0.08	-1.05
MIM_108	TORBRAM ROAD	Culvert	West Mim Creek	West 3	6063.9	185.85	L	0.36	-0.16	-0.48	-0.70	-0.81	-0.93	-1.09
MIM_114	Eastbourne Drive	Culvert	West Mim Creek	West 3	7198.41	199.73	O	2.33	1.96	1.64	1.21	0.85	0.46	-0.46

Structure ID	Location	Structure Type	HEC-RAS River	HEC-RAS Reach	HEC-RAS Xsec U/S of Structure	Top of Road Elv'n (m)	Lowest Rd Elevation at L/O/R	Difference Between Top of Road Elv'n and Water Surface (m)						
								2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Regional
MIM_118	Clark Blvd	Culvert	West Mim Creek	West 3	8094.92	208.66	O	2.26	2.00	1.83	1.62	1.46	1.24	0.09
MIM_120	Codlin Ave	Culvert	West Mim Trib A	West A1	306.29	166.2	L	1.10	0.88	0.73	0.53	0.35	0.14	0.11
MIM_121	LANCASTER AVENUE	Culvert	West Mim Trib A	West A1	471.92	167.5	R	1.20	0.93	0.75	0.54	0.39	0.26	-0.03
MIM_122	Trail	Culvert	West Mim Trib A	West A1	639.62	167.69	O	0.29	0.12	0.00	-0.12	-0.19	-0.23	-0.40
MIM_123	Trail	Culvert	West Mim Trib A	West A1	792.09	168.39	O	0.58	0.38	0.25	0.10	-0.03	-0.11	-0.30
MIM_124	DERRY ROAD EAST	Bridge	East Mim Creek	East 1	157.31	163.25	R	2.21	1.80	1.56	1.29	1.07	0.89	-1.36
MIM_125	GOREWAY DRIVE	Bridge	East Mim Creek	East 1	490.61	163.24	R	1.51	1.12	0.88	0.58	0.36	0.16	-1.71
MIM_126	Etude Drive	Culvert	East Mim Creek	East 1	1012.02	164.5	R	1.92	1.41	1.11	0.76	0.37	-0.05	-0.83
MIM_128	Morning Star Drive	Culvert	East Mim Creek	East 1	1833.9	166.55	L	3.01	2.58	2.30	1.98	1.72	1.39	-0.71
MIM_129	BRANDON GATE DRIVE	Culvert	East Mim Creek	East 2	2569.04	167.63	O	2.70	2.26	1.97	1.63	1.40	1.18	-0.86
MIM_131	Railway	Culvert	East Mim Creek	East 2	2857.35	171.55	L	3.66	3.20	2.89	2.50	2.23	1.90	-0.79
MIM_132	Crossing	Culvert	East Mim Creek	East 2	2900.3	168.32	L	-0.70	-1.77	-2.13	-2.17	-2.22	-2.26	-4.07
MIM_134	GOREWAY DRIVE	Culvert	East Mim Creek	East 2	3197.8	170.03	O	0.76	-0.32	-0.48	-0.52	-0.55	-0.59	-2.37
MIM_135	STEELES AVENUE EAST	Culvert	East Mim Creek	East 2	4815.55	173.41	R	2.51	2.31	2.18	2.02	1.90	1.77	-0.07
MIM_136	Railway	Culvert	East Mim Trib B	East B1	137.56	182.86	R	8.45	8.13	7.95	7.70	7.52	7.35	7.08
MIM_138	HWY 407	Culvert	East Mim Trib B	East B2	489.19	177.78	O	3.20	2.87	2.65	2.38	2.18	1.96	1.29
MIM_140	AIRPORT ROAD	Culvert	East Mim Trib B	East B2	991.13	182.2	L	1.64	1.22	0.92	0.51	0.25	-0.03	-0.34
MIM_141	WALKER DRIVE	Culvert	East Mim Trib B	East B2	1366.27	182.93	O	1.49	1.21	1.03	0.75	0.47	0.06	-0.21
MIM_142	Railway	Culvert	East Mim Trib B	East B2	1882.59	187.36	O	1.19	0.95	0.79	0.60	0.46	0.31	-0.25
MIM_144	Clark Blvd	Culvert	East Mim Trib B	East B2	2664.74	193.33	L	-1.07	-1.53	-1.84	-1.84	-1.81	-1.78	-1.42
MIM_145	Railway	Culvert	East Mim Trib B	East B2	2741.28	194.95	L	0.17	-0.42	-0.49	-0.49	-0.51	-0.54	-0.64
MIM_146	Railway	Culvert	East Mim Trib B	East B2	3101.99	197.23	L	0.83	0.77	0.77	0.71	0.68	0.63	0.38
MIM_148	HWY 407	Culvert	East Mim Trib C	East C1	211.65	177.39	O	2.92	2.58	2.38	2.11	1.91	1.73	1.34
MIM_149	Intermodal Drive	Culvert	East Mim Trib C	East C1	614.77	177.05	L	1.65	1.57	1.53	1.48	1.41	1.29	0.94
MIM_151	North of Intermodal Drive	Culvert (LP)	East Mim Trib C	East C1	1236.58	180.62	L	1.27	1.10	0.99	0.84	0.72	0.57	-1.13
MIM_152	Clark Blvd	Culvert	East Mim Trib C	East C1	1791.84	183.96	L	2.15	2.02	1.93	1.83	1.75	1.68	1.34
MIM_153	HWY 407	Bridge	East Mim Creek	East 3	5424.36	177.1	O	4.98	4.76	4.62	4.45	4.32	4.20	2.83
MIM_154	Intermodal Drive	Culvert	East Mim Creek	East 3	5879.61	176	L	1.88	1.69	1.58	1.44	1.34	1.24	-0.23
MIM_156	Railway	Culvert	East Mim Creek	East 3	8008.2	184	R	1.92	1.62	1.40	1.08	0.90	0.71	-0.24
MIM_158	DELTA PARK BOULEVARD	Culvert	East Mim Creek	East 3	8257.77	188.25	O	3.69	3.49	3.32	3.08	2.77	2.51	-0.02
MIM_160	QUEEN STREET EAST	Culvert	East Mim Creek	East 3	8695.58	194.2	L	3.85	3.53	3.21	2.74	2.46	2.18	0.01
MIM_162	Chrysler	Culvert	East Mim Creek	East 3	9585.94	200.56	R	1.36	0.91	0.61	-0.01	-0.20	-0.30	-0.66
MIM_163	Corporation Drive	Culvert	East Mim Creek	East 3	9852.84	203.18	O	2.05	1.60	1.32	0.97	0.70	0.36	-0.50
MIM_165	Driveway	Bridge	East Mim Creek	East 3	10910.33	211.4	L, R	2.02	1.73	1.54	1.32	1.03	0.94	0.12
MIM_166	WILLIAMS PARKWAY EAST	Culvert	East Mim Creek	East 3	11047.49	212.4	R	1.99	1.47	1.06	0.36	0.37	0.33	0.04
MIM_168	JAYFIELD ROAD	Culvert	East Mim Creek	East 3	11582.38	217.1	L	1.40	0.95	0.64	0.26	-0.01	-0.16	-0.42
MIM_169	JORDAN BOULEVARD	Culvert	East Mim Creek	East 3	11870.86	219.58	L	1.11	0.53	0.13	-0.16	-0.28	-0.37	-0.59
MIM_179	MONICA DRIVE	Culvert	East Mim Trib A	East A1	297.49	167.95	R	3.32	2.94	2.70	2.41	2.19	1.88	-0.49
MIM_180	BRANDON GATE DRIVE	Culvert	East Mim Trib A	East A1	744.39	168.44	O	2.12	1.99	1.75	1.47	0.99	0.82	-0.36
MIM_181	Railway	Culvert	East Mim Trib A	East A1	973.51	171.55	R	3.41	3.03	2.79	2.46	2.15	1.83	-0.59
MIM_182	Culvert - fenceline	Culvert	East Mim Trib A	East A1	998.82	168.32	L	-0.40	-0.50	-0.58	-0.81	-1.12	-1.44	-3.91
MIM_193	KENVIEW BOULEVARD	Culvert	East Mim Trib A	East A1	2094.83	171.4	O	0.85	0.33	-0.03	-0.17	-0.22	-0.26	-0.83
MIM_194	STEELES AVENUE EAST	Culvert	East Mim Trib A	East A1	2512.52	172.38	O	1.11	0.74	0.38	-0.10	-0.18	-0.25	-0.46
MIM_195	HWY 407	Culvert	East Mim Trib A	East A1	2776.83	174.25	R	2.26	1.98	1.77	1.45	1.32	1.20	0.20
MIM_196	Intermodal Drive	Culvert	East Mim Trib A	East A1	3306.26	174.6	R	1.38	1.09	0.86	0.54	0.28	-0.02	-0.89

Note:

L/O/R: L is used to indicate lowest road elevation occurs at the left side of the structure (looking d/s)

O is used to indicate lowest road elevation occurs approximately over the structure (looking d/s)

R is used to indicate lowest road elevation occurs at the right side of the structure (looking d/s)

Spill point is not located on the road deck. Spill elevation was identified using LiDAR elevation surface

- MIM_145 – Railroad (Brampton)

Of the watercourse crossings noted above, the following crossings are inundated with a frequency of 1:2 years or greater:

- MIM_102 – Railroad (Mississauga)
- MIM_144 – Clark Blvd (Brampton)

Watercourse crossings MIM_102 and MIM_144 appear to be vulnerable to flooding due to undersized culverts and/or low deck elevations.

4.2 Identification of Spills and Spill Paths

The MNRF's *Technical Guide River & Stream Systems: Flooding Hazard Limit* (2002) (see Section 4.13 of the guidelines) defines a spill as occurring when flood levels overtop the banks of a watercourse and spill overland away from the watercourse channel. Frequently, this spill will move into another watershed or join the originating watercourse at a distance downstream. Further, the guidelines describe that:

> *"The effect of spills moving into another watershed should be assessed to determine the potential flood risks. Alternative measures should be investigated to prevent the spill moving into the adjacent watershed. If the amount of spill is relatively small, less than 10% of the peak flow, the flood plain mapping for the watercourse should be based on the original flow, without any deduction for the spill. For larger spills, allowance for the reduced flow should only be made where the review of alternatives proves that the spill cannot be prevented, either because there are no feasible alternatives or the costs, when compared to the potential benefits, are too high. Where the spill re-joins the watercourse further downstream, the route of the spill should be examined to determine the potential harmful effects of overland flow. No reduction should be made for the spill in the downstream flood plain computations."*

While delineating the Regulatory floodplain and based on the results of the HEC-RAS hydraulic model, a number of spill areas were identified where the Regional flow is not contained within well defined limits associated with the hydraulic model. These identified spill areas were investigated and their general flooding characteristics were estimated using preliminary and simplified approximation methods. The flood characteristics estimated for the identified spill areas included approximate spill width, spill depth, spill quantity (flow) and size of the spill area. In addition, the total peak flow in the watercourse closest to the spill area was identified along with the land use characteristics and number of buildings potentially impacted within the spill area. The purpose of approximating these preliminary flooding characteristics was to enable a general evaluation of the potential significance of the spill areas and to enable recommendations regarding the requirement and prioritization for further hydraulic investigations in the future to better define the extent and risks associated with these spill areas.

A total of 20 spill areas were identified within the modeled Mimico Creek Watershed and these areas are listed in **Table 4.3**. In addition, the location and approximate extent of each identified spill area is provided in **Figures 4.1** to **4.18**. The dashed red line and red arrows in these figures identify the spill point and spill direction and the blue arrows, where applicable, identify areas where the spill may continue beyond the identified limits most often due to the nature of the topography (*i.e.* there is uncertainty due to very flat topography or continuous slope). An overview of the location of identified spill areas and the potential hydraulic connectivity of some spill areas is illustrated on **Maps 3(a)**, **3(b)** and **3(c)**.

4.3 Recommendations for Additional 2D Hydraulic Modeling

Based on a review of the preliminary and approximated flood characteristics within the identified spill areas, recommendations were prepared regarding further hydraulic investigations using more

sophisticated 2D hydraulic modeling tools such as MIKE FLOOD. MIKE FLOOD is a coupled 1D/2D hydraulic model that can take full advantage of the LiDAR-based ground surface and provides accurate and detailed flood characterization of spills including full spill extents, flood depths and velocities. In addition, this 2D modeling tool allows for detailed and accurate assessments of possible flood mitigation opportunities.

Based on the evaluation of identified spill areas, each spill area was classified based on the following four (4) categories:

1. Additional 2D Modeling Recommended (High Priority)
2. Additional 2D modeling Recommended (Moderate Priority)
3. Additional 2D Modeling Recommended for Consideration (Low Priority)
4. No Additional 2D Modeling is Warranted

4.3.1 Spill Areas Recommended for Additional 2D Modeling (High/Moderate Priority)

The following identified spill areas are recommended for additional modeling using a more sophisticated 2D hydraulic model such as MIKE FLOOD and these spill areas are considered to be high priority within the Mimico Creek Watershed:

- Spill Area #1 – Legion Rd and Humber Bay Park Rd W (see **Figure 4.1**)
- Spill Area #4 – Railroad Near Cattrick St (see **Figure 4.4**)
- Spill Area #8 – Railroad Near Airport Rd (see **Figure 4.7**)
- Spill Area #17 – Jayfield Rd Near Jeremy Pl (see **Figure 4.15**)

These spill areas were considered high priority based on the following characteristics:

- A large number of residential buildings are potentially impacted by the spill
- The estimated quantity of spill is potentially significant
- The extent of the spill is potentially large

The following identified spill areas are recommended for additional 2D modeling and these spill areas are considered to be moderate priority within the Mimico Creek Watershed:

- Spill Area #3 – Justine Dr (see **Figure 4.3**)
- Spill Area #5 – Rena Rd (see **Figure 4.5**)
- Spill Area #6 – Torbram Rd / Railroad South of HWY 407 (see **Figure 4.6**)
- Spill Area #11 – HWY 407 Near Airport Rd (see **Figure 4.10**)
- Spill Area #12 – Walker Dr Area (see **Figure 4.11**)
- Spill Area #13 – CN Railroad Intermodal Facility (see **Figure 4.12**)
- Spill Area #14 – Queen St at Airport Rd (see **Figure 4.13**)
- Spill Area #16 – Williams Pkwy Near Torbram Rd (see **Figure 4.15**)
- Spill Area #18 – Finch Ave and Railroad (see **Figure 4.16**)

These spill areas were considered moderate priority based on the following characteristics:

- A small number of residential buildings are potentially impacted by the spill, however, the estimated spill quantity and estimated spill extent is relatively small
- A large number of industrial and/or commercial buildings are potentially impacted by the spill
- The estimated quantity of spill is potentially significant
- Spill areas are potentially hydraulically connected to other moderate priority spill areas

- The estimated extent of spill is potentially significant
- Significant roads are potentially impacted by the spill

A summary of the preliminary estimated spill area characteristics and additional modeling recommendations, including the above-noted sites, is provided in **Table 4.3**.

4.3.2 Spill Areas Recommended for Additional 2D Modeling Consideration (Low Priority)

The following identified spill areas are recommended for additional modeling consideration using a more sophisticated 2D hydraulic model such as MIKE FLOOD and these spill areas are considered to be low priority within the Mimico Creek Watershed:

- Spill Area #9 – Walker Dr (see **Figure 4.8**)
- Spill Area #10 – Steeles Ave South of HWY 407 (see **Figure 4.9**)
- Spill Area #19 – Gorewood Dr and HWY 407 Ditch (see **Figure 4.17**)

These spill areas were considered low priority based on the following characteristics:

- No residential buildings are potentially impacted by the spill and the estimated spill quantity and estimated spill extent is relatively small
- Only a small number of industrial and/or commercial buildings are potentially impacted by the spill
- The estimated extent of the spill is not very large.

A summary of the preliminary estimated spill area characteristics and additional modeling recommendations, including the above-noted sites, is provided in **Table 4.3**.

4.3.3 Spill Areas Where Additional 2D Modeling is Not Warranted

The following identified spill areas do not warrant additional modeling using a more sophisticated 2D hydraulic model:

- Spill Area #2 – HWY 27 Near HWY 401 (see **Figure 4.2**)
- Spill Area #7 – HWY 407 Near Torbram Rd (see **Figure 4.6**)
- Spill Area #15 – SMW Facility Between Chrysler Dr and Airport Rd (see **Figure 4.14**)
- Spill Area #20 – Intermodal Dr (see **Figure 4.18**)

These spill areas do not warrant further investigations based on the following characteristics:

- No residential buildings are potentially impacted by the spill and the estimated spill quantity and estimated spill extent is relatively small
- The extent of the spill is relatively easy to estimate with confidence
- The impacted areas consist primarily of open space
- Regarding Spill Area #15, the spill is associated with a possible low point along the berm of the SWM facility and potential flooding may be better addressed through a verification of berm elevations and the SWM facility design drawings and operational characteristics
- Only a small number of industrial and/or commercial buildings are potentially impacted by the spill and the spill area sits between two defined floodplains
- The estimated extent of the spill is not very large.

A summary of the preliminary estimated spill area characteristics and additional modeling recommendations, including the above-noted sites, is provided in **Table 4.3**.

4.4 Development of Graphical Representations of Model Data

The following graphical representations for the updated HEC-RAS model and model results were prepared in ESRI Grid for rasters and ESRI Geodatabase Feature Class for polygons and submitted to the TRCA as per the study requirements:

- Water surface elevation
- Water depth
- Velocity rasters
- Polygon features of the flood extents for the 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr and Regional storms.
- Cross sections associated with the WSEL's for each storm

It is noted that the output above provided for the 2-yr through 100-yr design storms was not subjected to the detailed and rigorous review afforded the Regional storm as per the study terms of reference. As such, this information is meant solely for flood risk screening and characterization and is not intended to produce floodlines.

Figure 4.1: SPILL AREA - 1
Legion Rd and Humber Bay Park Rd W

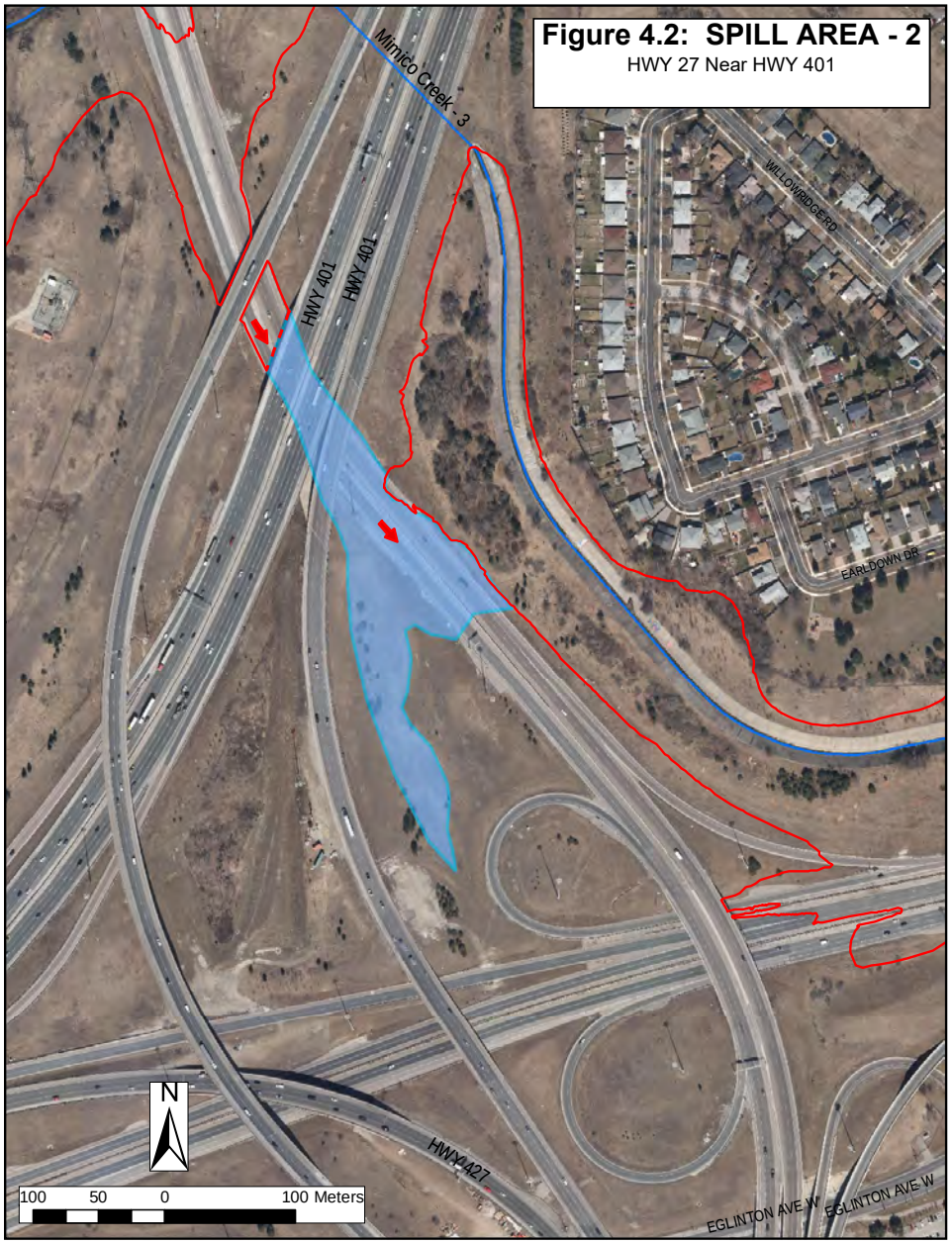


Figure 4.2: SPILL AREA - 2
HWY 27 Near HWY 401

Figure 4.3: SPILL AREA - 3
Justine Dr

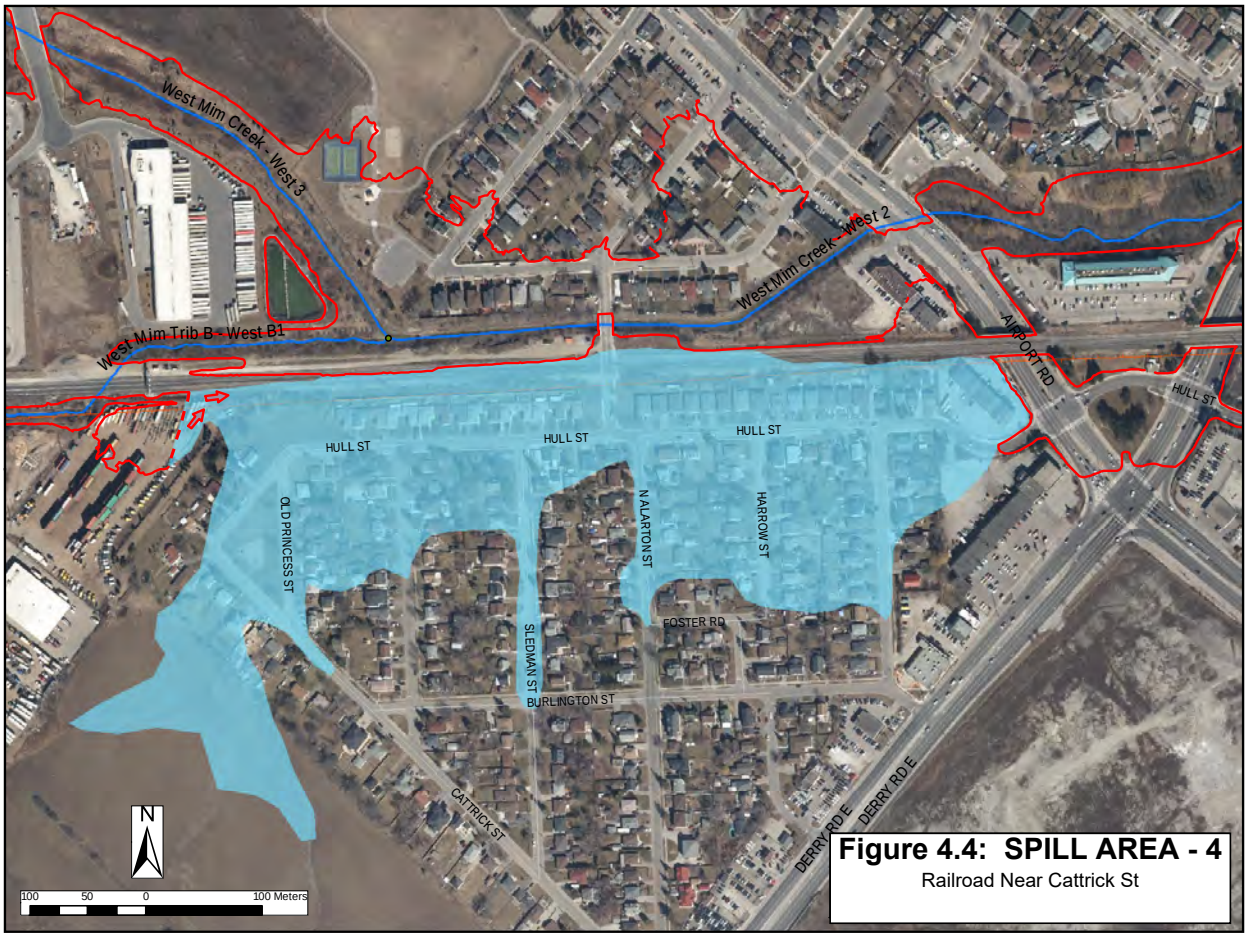


Figure 4.4: SPILL AREA - 4
Railroad Near Cattrick St

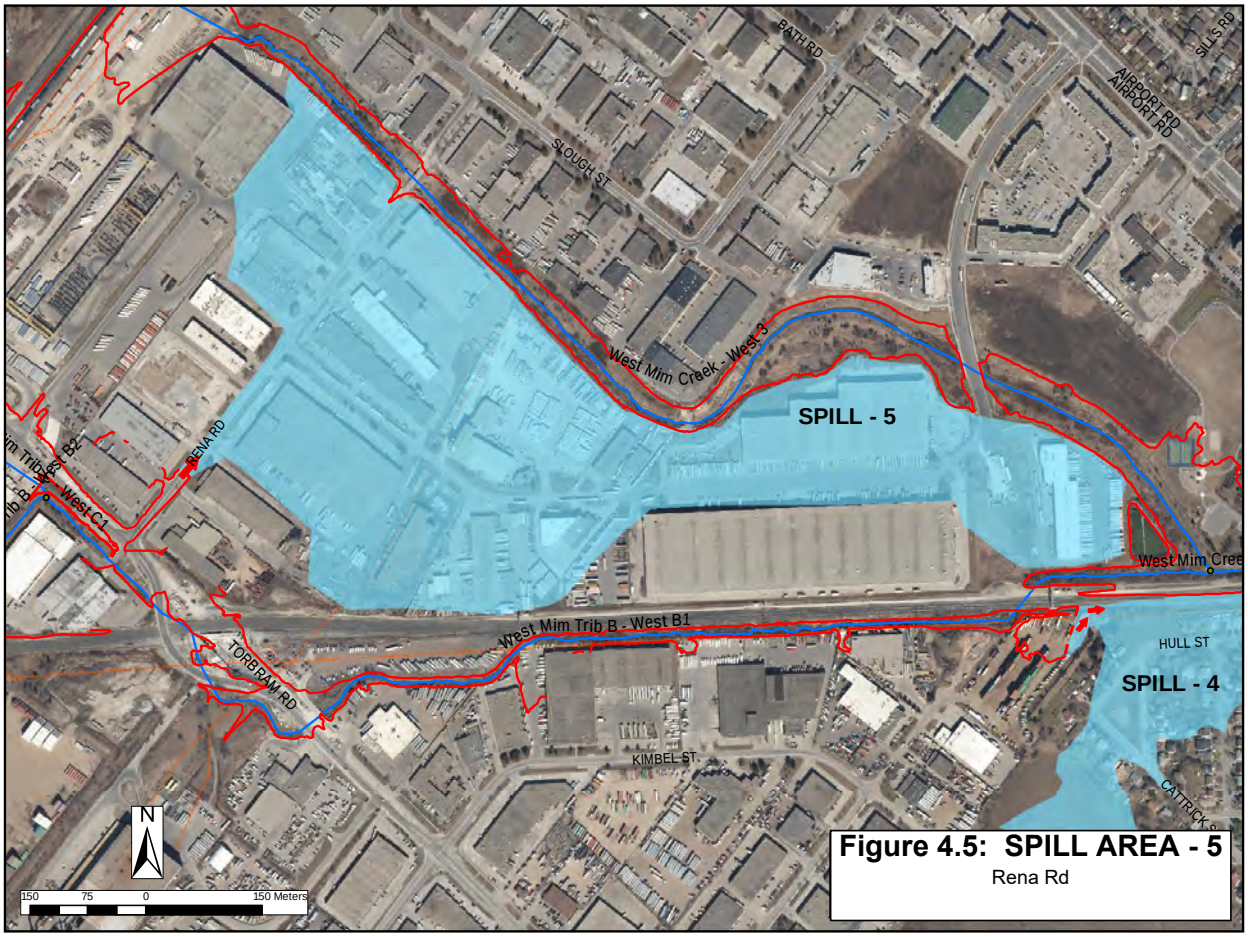


Figure 4.5: SPILL AREA - 5
Rena Rd

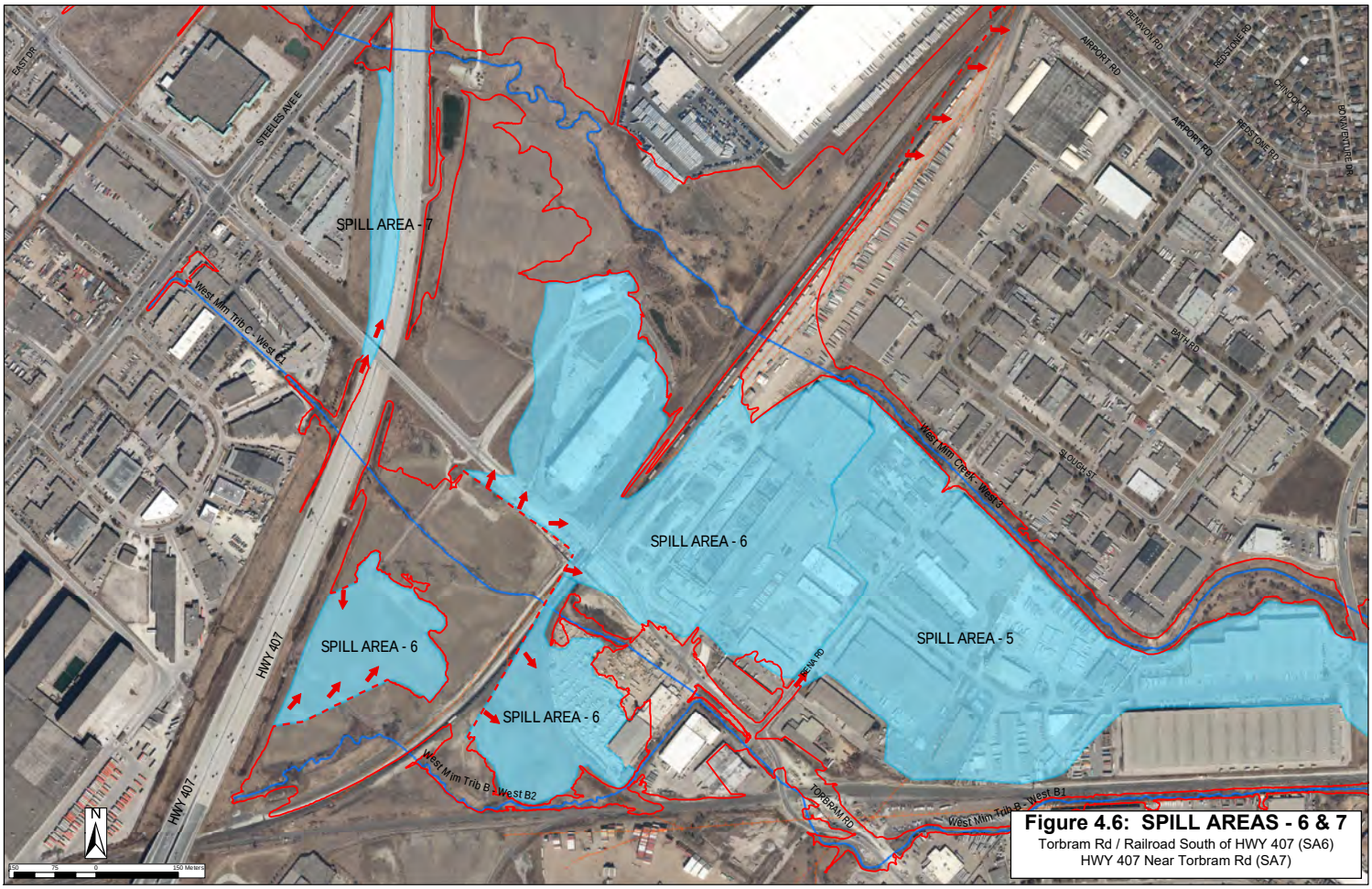


Figure 4.6: SPILL AREAS - 6 & 7
Torbram Rd / Railroad South of HWY 407 (SA6)
HWY 407 Near Torbram Rd (SA7)

VALDOR

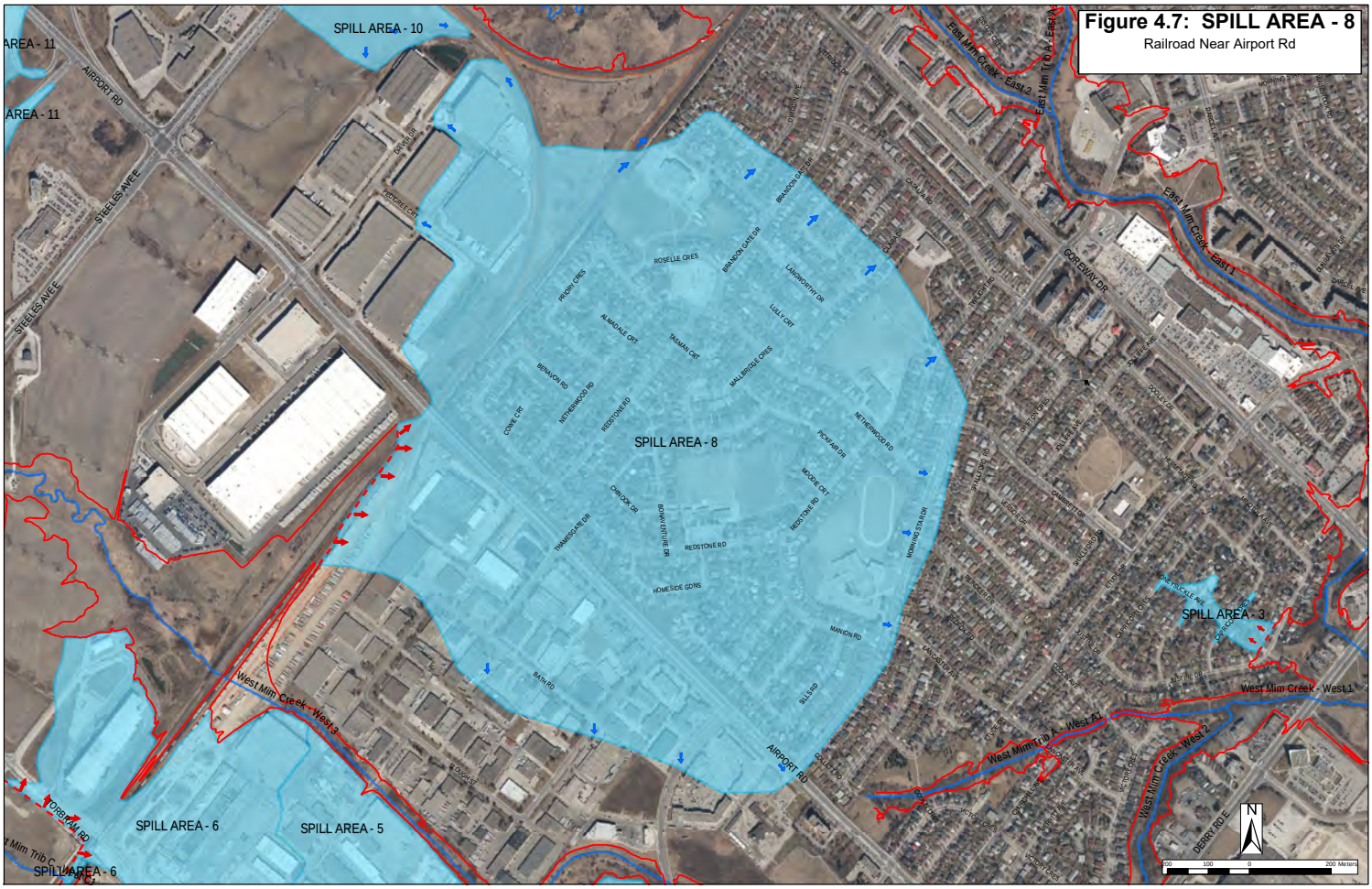


Figure 4.7: SPILL AREA - 8
Railroad Near Airport Rd

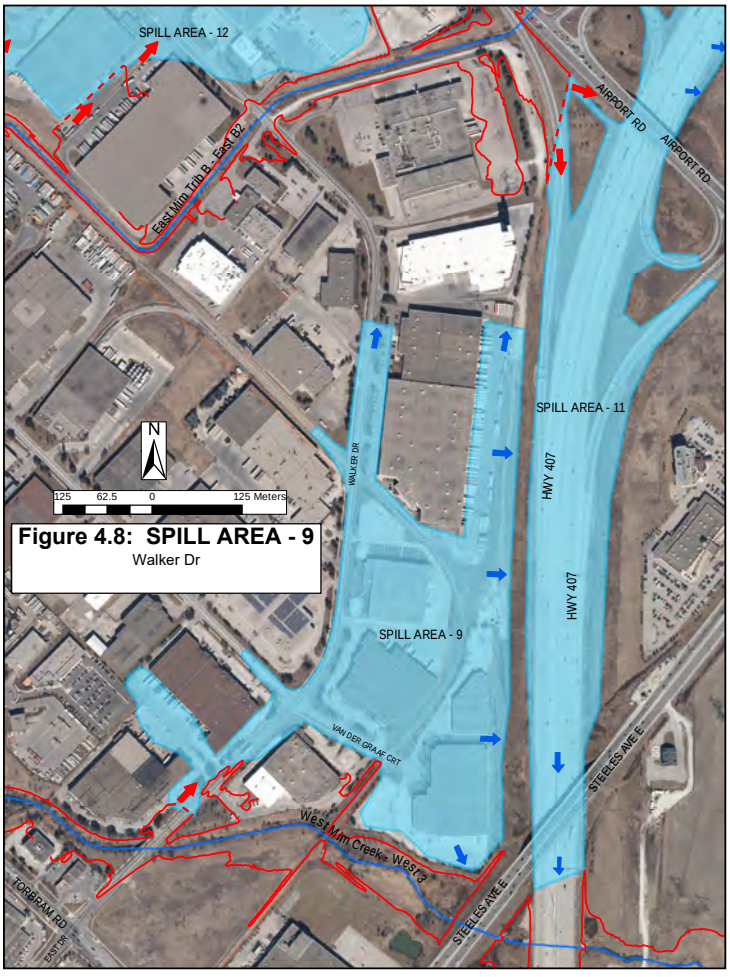


Figure 4.8: SPILL AREA - 9
Walker Dr

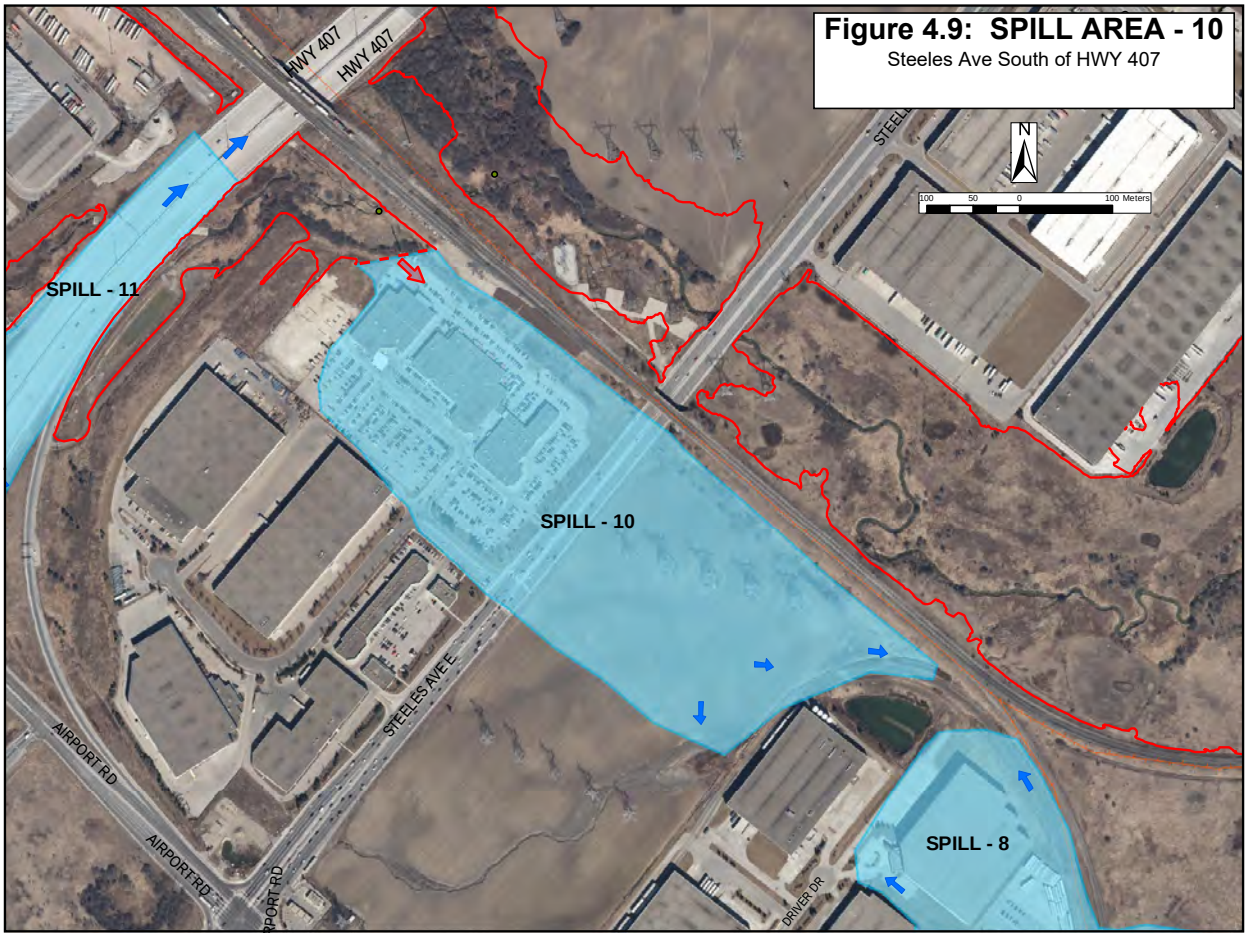


Figure 4.9: SPILL AREA - 10
Steeles Ave South of HWY 407

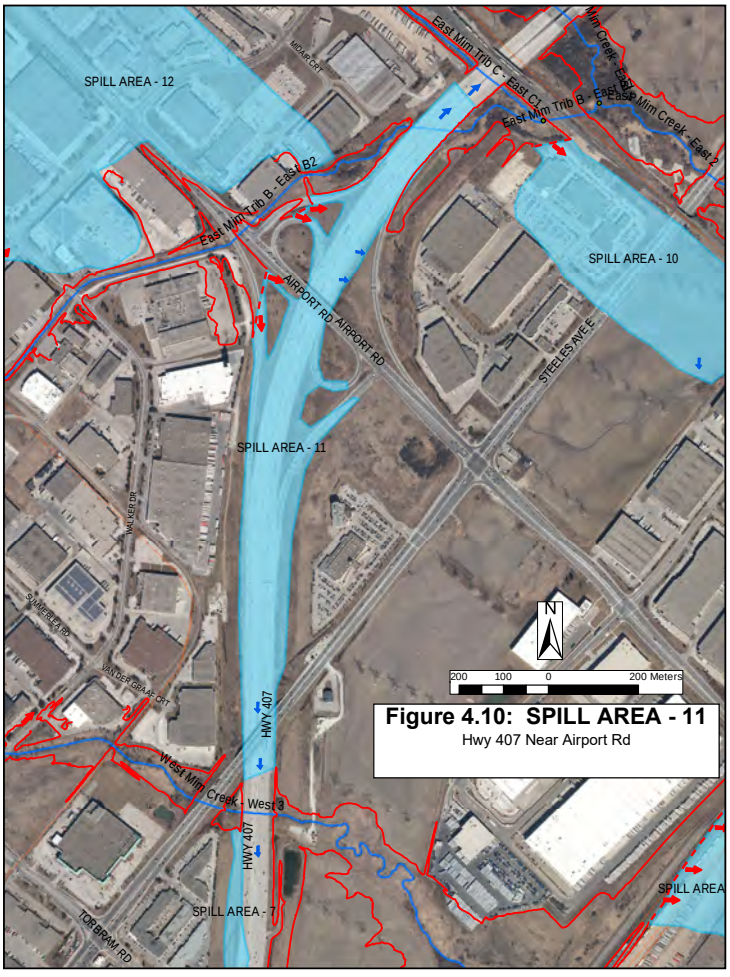


Figure 4.10: SPILL AREA - 11
Hwy 407 Near Airport Rd

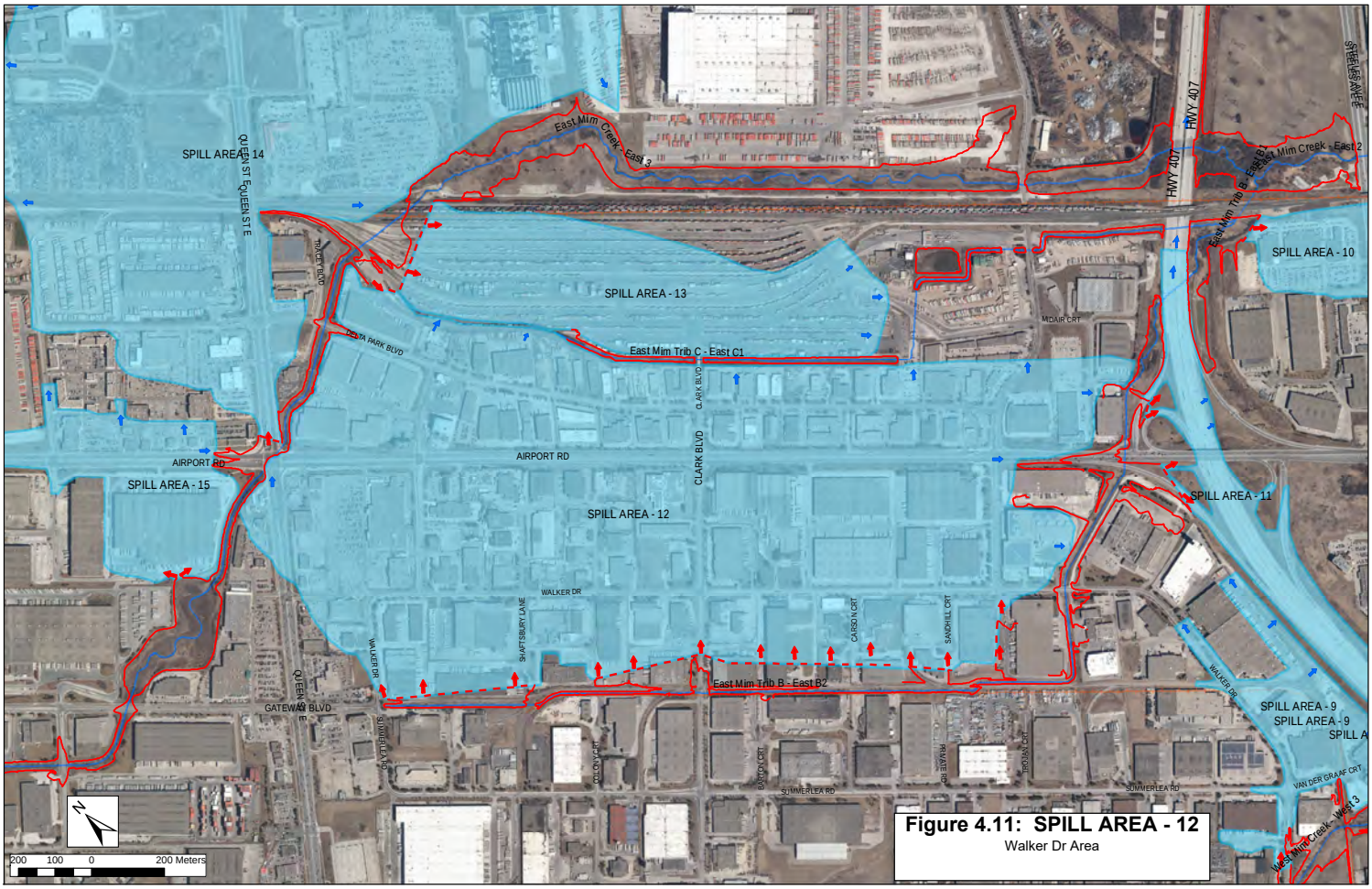


Figure 4.11: SPILL AREA - 12
Walker Dr Area

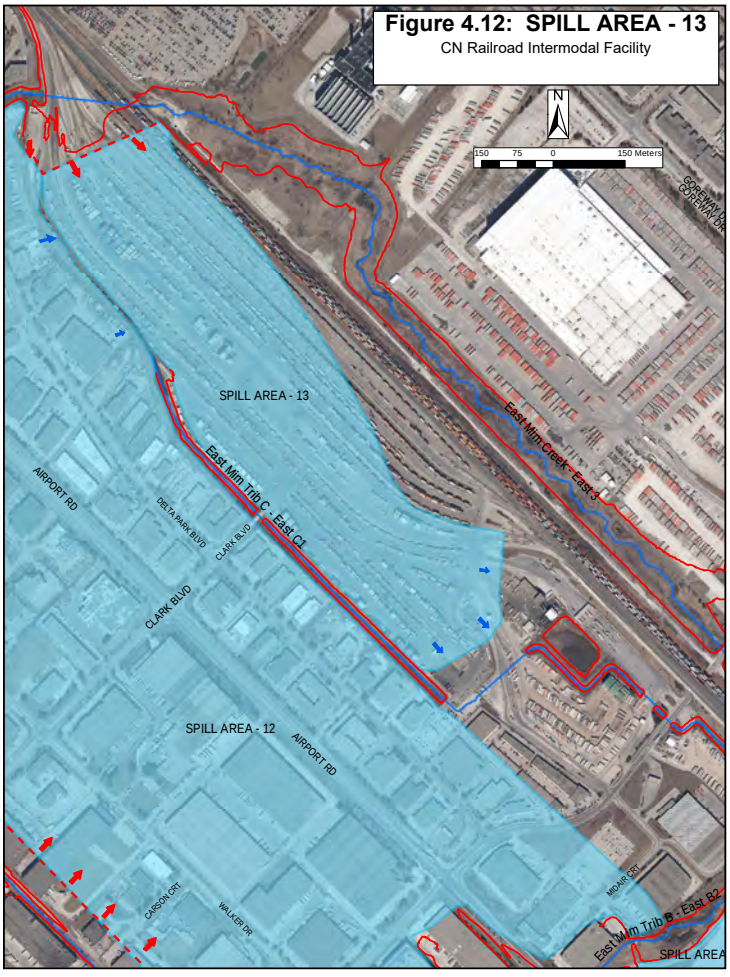


Figure 4.12: SPILL AREA - 13
CN Railroad Intermodal Facility

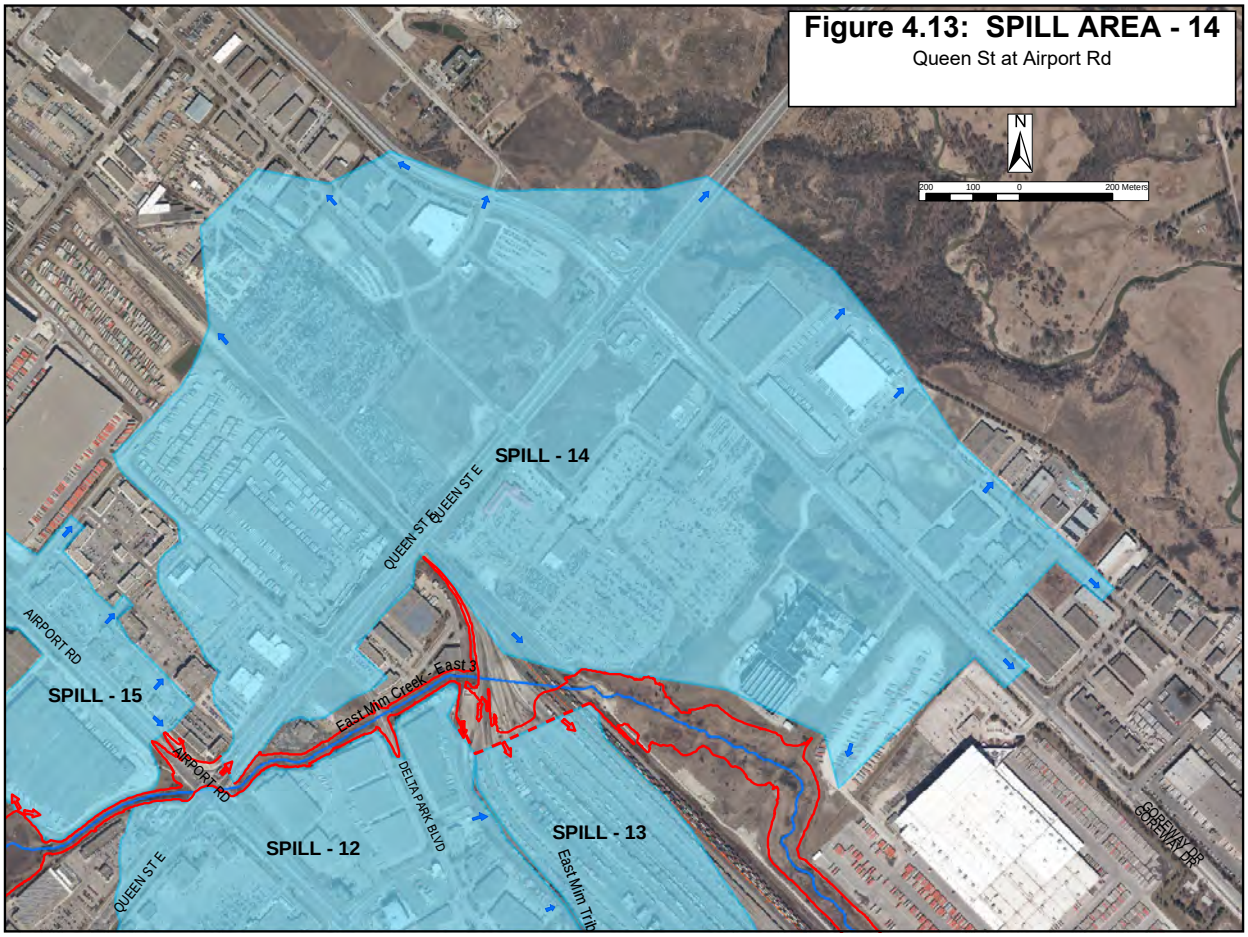


Figure 4.13: SPILL AREA - 14
Queen St at Airport Rd
N
200 100 0 200 Meters
SPILL - 14
SPILL - 15
SPILL - 12
SPILL - 13
QUEEN ST E
AIRPORT RD
East Mim Creek - East 3
DELTA PARK BLVD
East Mim Trib
GOREWAY DR

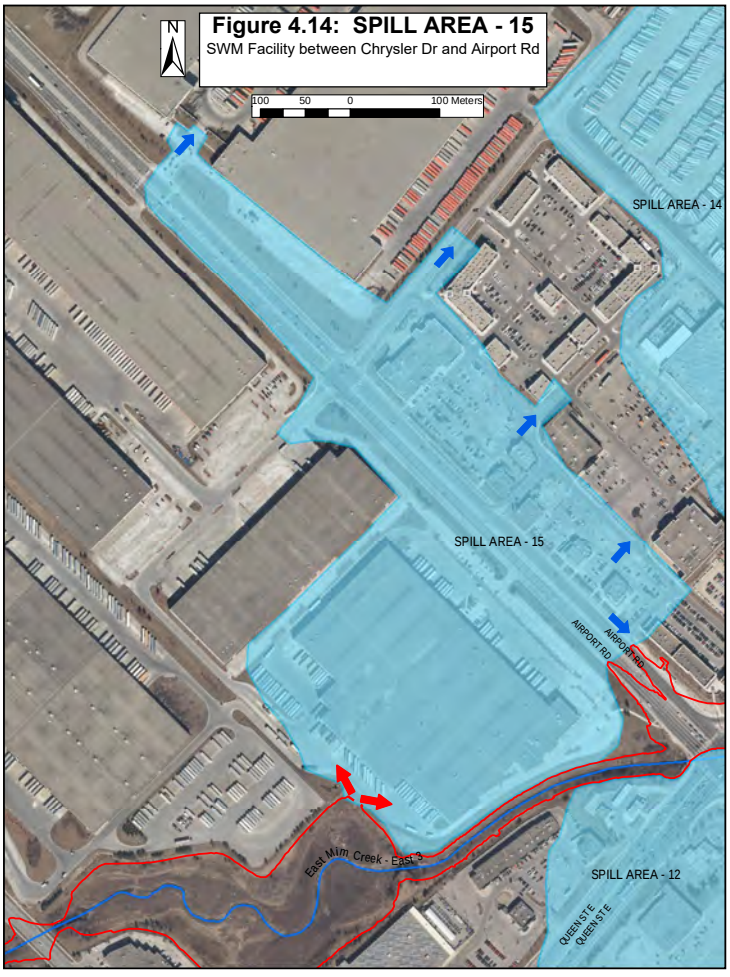


Figure 4.14: SPILL AREA - 15
SWM Facility between Chrysler Dr and Airport Rd
N
100 50 0 100 Meters
SPILL AREA - 14
SPILL AREA - 15
SPILL AREA - 12
AIRPORT RD
East Mim Creek - East 3
QUEEN ST E

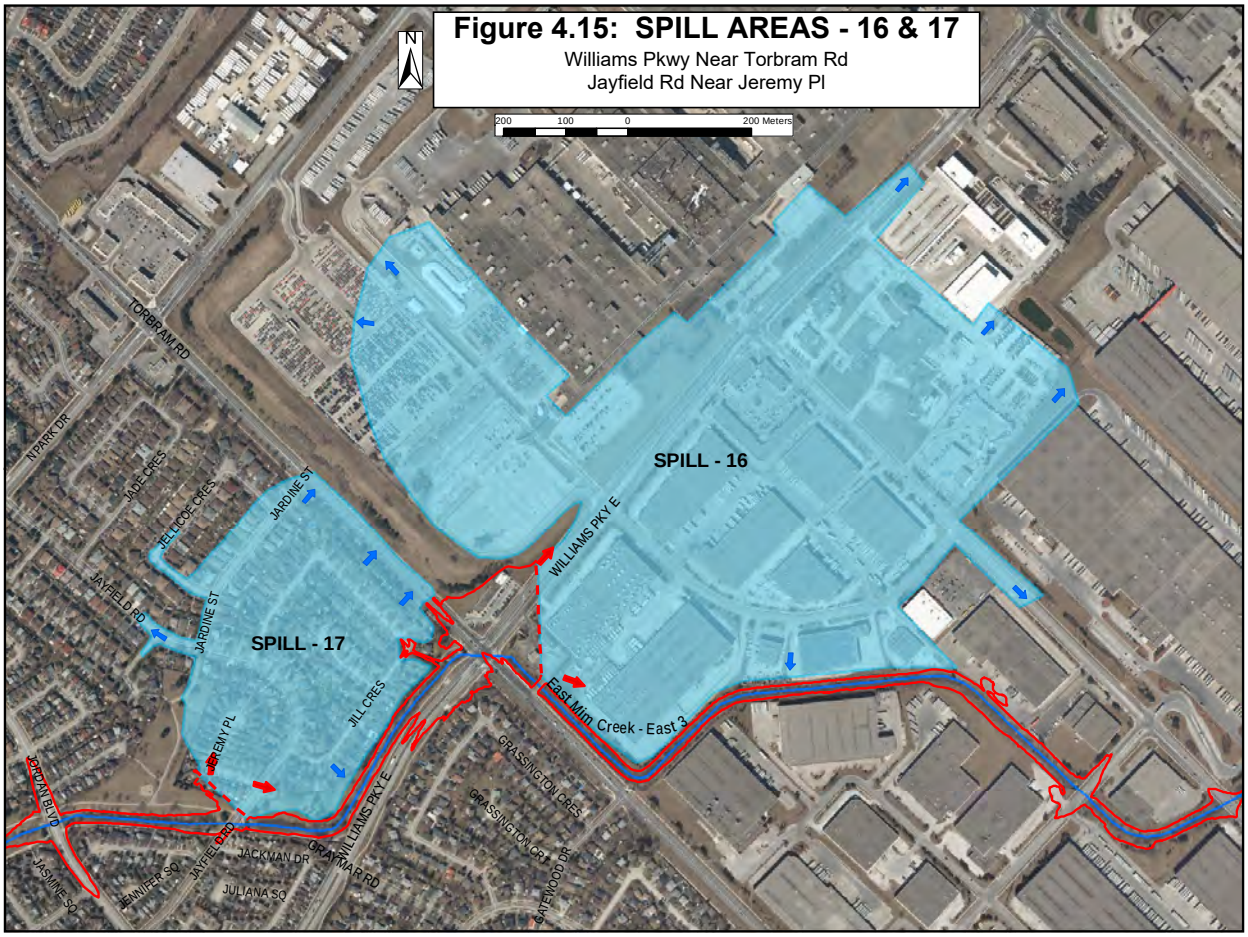


Figure 4.15: SPILL AREAS - 16 & 17
Williams Pkwy Near Torbram Rd
Jayfield Rd Near Jeremy Pl
N
200 100 0 200 Meters
SPILL - 16
SPILL - 17
TORBRAM RD
N PARK DR
JADE CRES
JELLICOE CRES
JARDINE ST
JAYFIELD RD
JARDINE ST
JEREMY PL
JILL CRES
WILLIAMS PKY E
East Mim Creek - East 3
GRASSINGTON CRES
GRASSINGTON CRT
GATEWOOD DR
JORDAN BLVD
JASMINE SQ
JENNIFER SQ
JAYFIELD RD
JACKMAN DR
JULIANA SQ
GRAYMAR RD
WILLIAMS PKY E

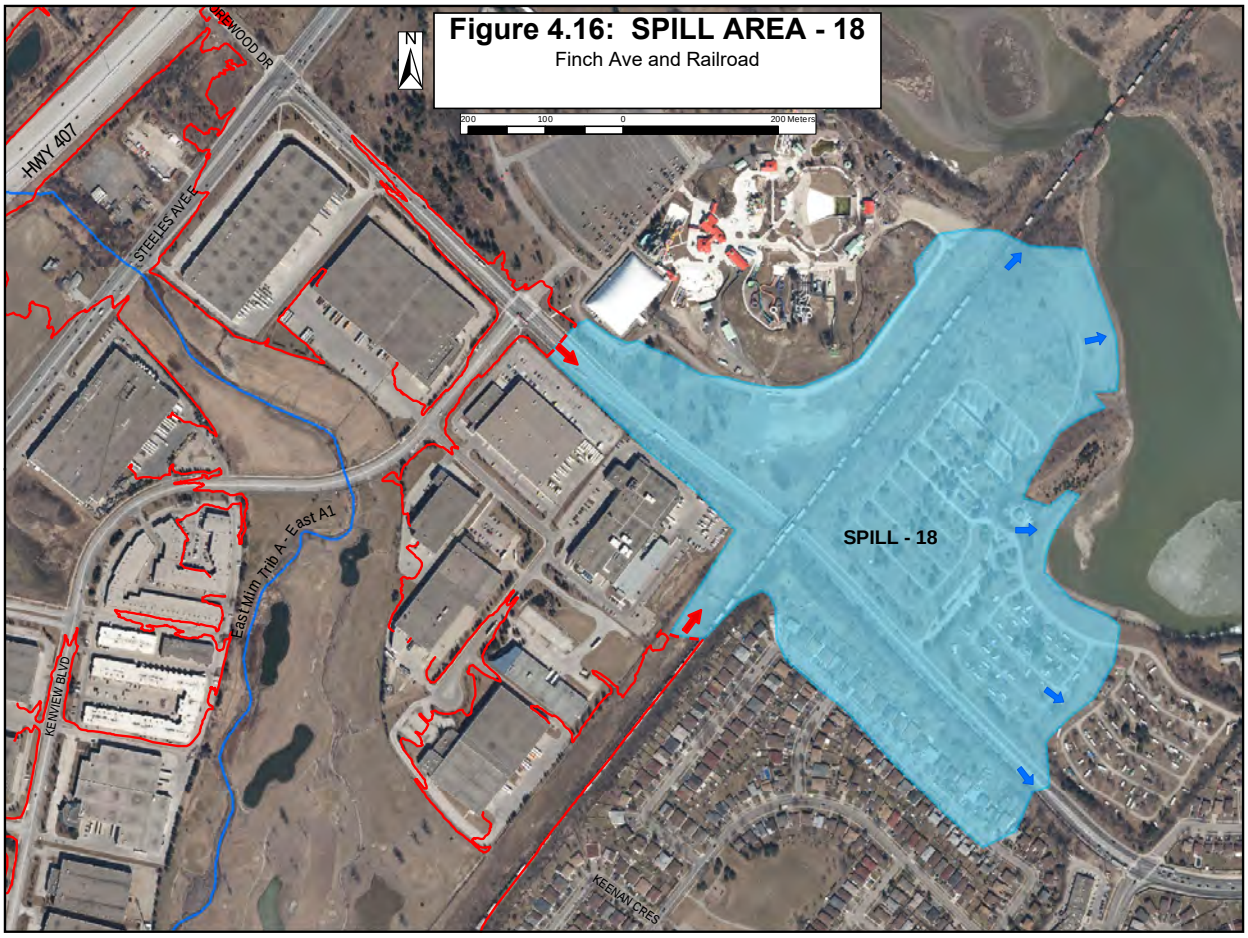


Figure 4.16: SPILL AREA - 18
Finch Ave and Railroad
N
200 100 0 200 Meters
SPILL - 18
GATEWOOD DR
HWY 407
STEELES AVE E
East Mim Trib A - East A1
KENVIEW BLVD
KEENAN CRES

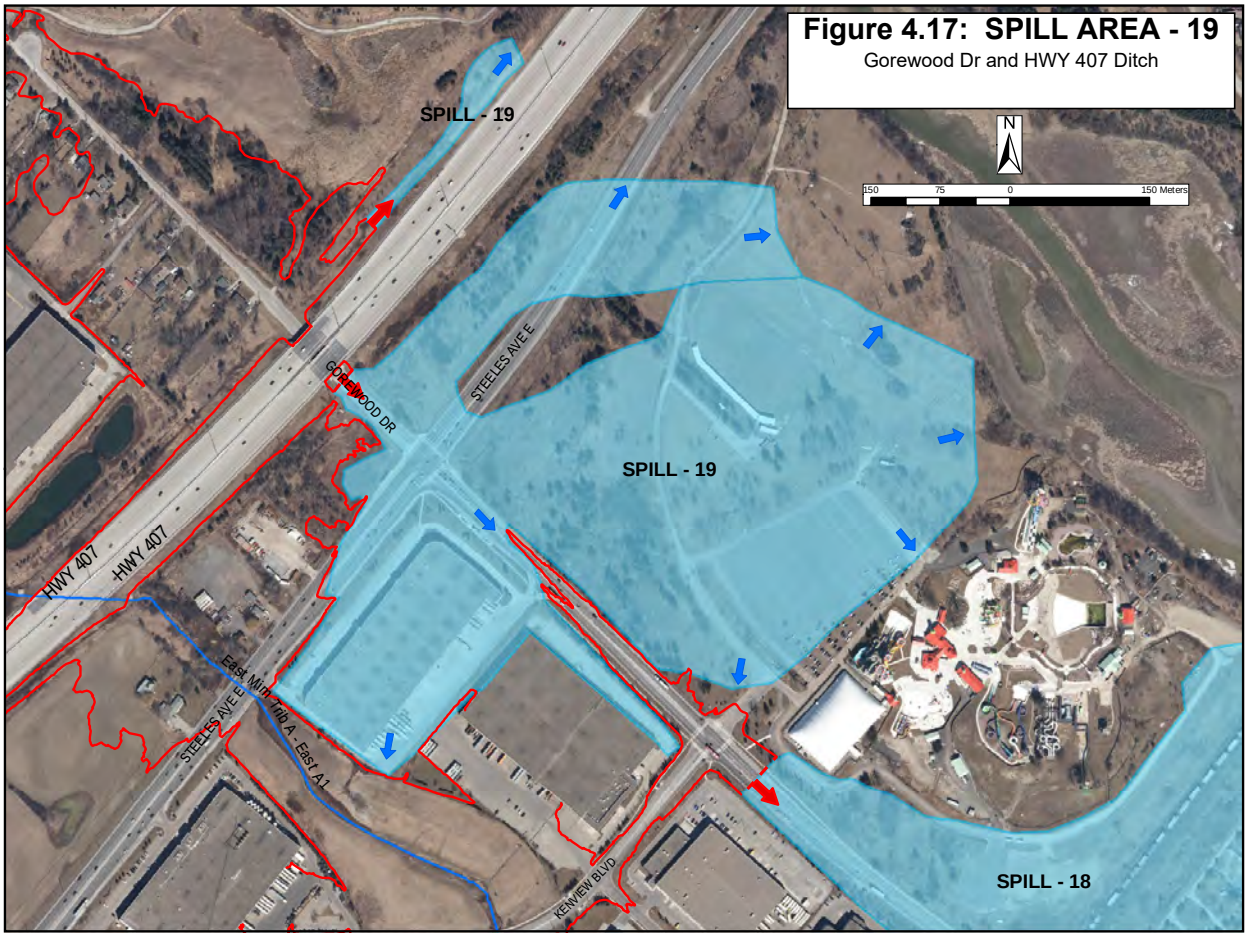


Figure 4.17: SPILL AREA - 19
Gorewood Dr and HWY 407 Ditch

Figure 4.18: SPILL AREA - 20
Intermodal Dr

Table 4.3: Spill Area Characteristics and Recommended Additional Modelling (2D) and Prioritization

Spill Area	General Spill Location	Approx. Spill Width (m)	Approx. Spill Depth (m)	Approx. Spill Flow (cms)	Approx. Total Flow Near Spill Area (cms)	Primary Land Use	Approx. Potential Size of Spill Area (ha)	Approx. Number of Buildings Potentially Impacted	Further Modelling using 2D Recommended	Remarks
1	Legion Rd and Humber Bay Park Rd W	51 (u/s) 50 (d/s)	0.68 (u/s) 0.62 (d/s)	48.3 (u/s) 41.1 (d/s)	408.9	Res./Marina	10.2 +	20 + (incl. Highrise)	Yes (H.P.)	Significant road (Lakeshore Blvd) and residential buildings lie within potential spill area
2	HWY 27 Near HWY 401	38	1.13	77.6	360.2	Road / O.S.	2.0	0	No	Spill extent appears to be well defined with little additional flood risk
3	Justine Dr	31	0.5	18.6	193.5	Res.	1.7	14	Yes (M.P.)	
4	Railroad Near Cattrick St	26	0.4	11.3	28.8	Res. with O.S.	13.7	112	Yes (H.P.)	A large number of residential buildings lie within the potential spill area
5	Rena Rd	17	0.45	8.7	23.6	Ind. / Com.	32.2	20	Yes (M.P.)	Potential hydraulic connection with Spill Area #6 that is moderate priority
6	Torbram Rd / Railroad South of HWY 407	875	0.16 - 0.88	-	23.6	Ind. / Com. with O.S.	39.4	9	Yes (M.P.)	Spill conditions too complex to quantify with a reasonable level of accuracy
7	HWY 407 Near Torbram Rd	22	0.27	5.3	12.9	Road / O.S.	1.9	0	No	Spill extent appears to be well defined and the estimated spill quantity is small
8	Railroad Near Airport Rd	389	1.59	-	88.9	Res. with Ind. / Com.	179 +	1,053 +	Yes (H.P.)	A large number of residential buildings lie within the potential spill area. Spill conditions too complex to quantify with a reasonable level of accuracy
9	Walker Dr	43	0.39	17.6	84.8	Ind.	15.5 +	5 +	Maybe (L.P.)	
10	Steeles Ave South of HWY 407	45	0.57	32.6	54.4	Ind. / O.S.	15.3 +	3 +	Maybe (L.P.)	
11	HWY 407 Near Airport Rd	109	0.22 - 0.78	-	46.2	Road with O.S.	17.4 +	0 +	Yes (M.P.)	Spill conditions too complex to quantify with a reasonable level of accuracy
12	Walker Dr Area	996	0.70 - 1.47	-	28.7	Ind. / Com.	186 +	116 +	Yes (M.P.)	Spill conditions too complex to quantify with a reasonable level of accuracy
13	CN Railroad Intermodal Facility	62	0.33	19.8	96.9	Intermodal Facility	37.5 +	0 +	Yes (M.P.)	Potential hydraulic connection with Spill Area #12 that is moderate priority
14	Queen St at Airport Rd	60	0.48	33.9	96.9	Ind. / Com. with O.S.	177 +	35 +	Yes (M.P.)	
15	SWM Facility between Chrysler Dr and Airport Rd	21	0.41	9.2	77.2	Ind. / Com.	20.2 +	11 +	No	SWMP Berm Elevations should be confirmed to contain Regional Storm
16	Williams Pkwy Near Torbram Rd	110	0.22	19.3	56.0	Ind. / Com. with O.S.	59.8 +	23 +	Yes (M.P.)	
17	Jayfield Rd Near Jeremy Pl	55	0.34	18.5	46.4	Res.	16.1 +	165 +	Yes (H.P.)	A large number of residential buildings lie within the potential spill area
18	Finch Ave and Railroad	53 (u/s) 40 (d/s)	0.32 (u/s) 0.62 (d/s)	16.3 (u/s) 33.2 (d/s)	45.6 (u/s) 184.6 (d/s)	Campground with Res. / O.S.	28.9 +	24 +	Yes (M.P.)	
19	Gorewood Dr and HWY 407 Ditch	14 (u/s) 20 (d/s)	0.44 (u/s) 0.54 (d/s)	7.0 (u/s) 13.5 (d/s)	35.6	Ind. / Rec. / O.S.	28.3 +	4 +	Maybe (L.P.)	
20	Intermodal Dr	161	0.1	8.7	18.8	Ind.	12.4	3	No	Spill extent is small in between two identified floodplains with only a few industrial buildings potentially impacted

Notes:

Res.: Residential, Ind.: Industrial, Com.: Commercial, Rec.: Recreational. O.S.: Open Space

u/s: Upstream, d/s: Downstream, L.P.: Low Priority, M.P.: Moderate Priority, H.P.: High Priority, +: Spill area and number of buildings impacted could be greater due to spill uncertainty

5.0 SUMMARY AND CONCLUSIONS

Under the direction of the Toronto and Region Conservation Authority, Valdor Engineering has completed the *Mimico Creek Floodplain Mapping Update* report. The key findings and results of the study are summarized as follows:

1. Using the updated digital elevation model (DEM) derived from recently obtained LiDAR data supplemented with available topographic survey and field measurements for channel sections and hydraulic structures and updated land use data, an updated 1D hydraulic model was prepared using HEC-RAS for the Mimico Creek Watershed. In addition, a number of reaches were included that had not been accounted for in the previous hydraulic model.

2. A sensitivity analysis was completed for the updated HEC-RAS model to better understand the inherent potential for errors and/or uncertainty in the results. The sensitivity analysis confirmed that the selected parameter values are reasonable and that the model is not unreasonably sensitive to changes in Manning's roughness, peak flow and water levels in Lake Ontario regarding computed WSEL's and number of critical depth occurrences.

3. Based on the results of the updated HEC-RAS hydraulic model, digital signed and stamped engineered floodplain mapping was prepared and finalized.

4. The approximate frequency at which watercourse crossings overtop was investigated and identified for the modeled structures within the Mimico Creek Watershed. It was noted that a number of structures overtop with a frequency of 1:25 years or greater and some overtop with a frequency of 1:2 years or greater. The structures that overtop with a frequency of 1:2 years or greater include: (1) MIM_102 – Railroad (Mississauga); and, (2) MIM_144 – Clark Blvd (Brampton). These crossings appear to be vulnerable to flooding due to undersized culverts and/or low deck elevations.

5. A total of 20 spill areas were identified based on the results of the updated HEC-RAS model and the preliminary and approximate spill area characteristics were identified including the approximate spill area extents and the potential number of buildings impacted. In addition, recommendations were provided regarding future additional 2D hydraulic modeling of these spill areas and the prioritization of such investigations.

6.0 RECOMMENDATIONS

The following summarizes the report recommendations:

1. The revised Mimico Creek Regulatory digital floodplain mapping prepared in this study should be used to fully replace the existing Mimico Creek Floodplain Map Sheets MIM-01 through MIM-19 based on the results from the updated HEC-RAS hydraulic model.
2. The frequency at which various water crossings (*i.e.* bridges and culverts) overtop presented in this report should be considered for guidance in prioritizing future water crossing upgrades within the Mimico Creek Watershed.
3. The TRCA should complete additional modeling for the identified spill areas using an appropriate 2D or 1D/2D coupled hydraulic program such as MIKE FLOOD to better define the flooding characteristics (*i.e.* flood extent, depth, velocity and flood risk) within these areas. The initial selection and/or staging of these additional hydraulic investigations may be based on the recommended prioritization of areas provided in this report as guidance.
4. Once the spill areas and the mechanisms contributing to the flooding of these spill areas are better characterized and identified using a more sophisticated 2D or 1D/2D coupled hydraulic model, the TRCA may want to consider investigating possible flood mitigation solutions to reduce or eliminate the identified spills.
5. In moving forward, and prior to the completion of any additional 2D hydraulic modeling for the identified spill areas, it is recommended that any proposed development applications within the identified potential spill areas be reviewed using an appropriate 2D or 1D/2D coupled hydraulic model such as MIKE FLOOD to confirm and assess the flood risk for the application site and to assess and mitigate potential off-site flood impacts.

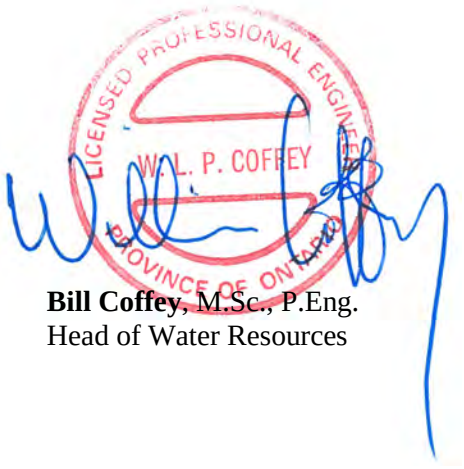
7.0 REFERENCES

- Greck and Associates Limited (prepared for TRCA), *Etobicoke Creek and Mimico Creek Watersheds Floodline Mapping Updates*, 2013. Floodplain Map Sheets MIM-01 through MIM-19.
- Greck and Associates Limited (prepared for TRCA), HEC-RAS Model for Mimico Creek, 2013.
- Hydraulic Engineering Center, USACE, *HEC-RAS User's Manual, Version 4.1*, January 2010.
- Hydraulic Engineering Center, USACE, *HEC-RAS Hydraulic Reference Manual, Version 4.1*, January 2010.
- Hydraulic structure as-built and design drawings from the MTO, TTC, CPR, CNR, Region of Peel, York Region, Metrolinx, City of Toronto, City of Mississauga, City of Brampton and 407 ETR.
- MNR, *Technical Guide River and Stream Systems: Flooding Hazard Limit*, 2002.

Respectfully Submitted,

VALDOR ENGINEERING INC.

Abdul Baten, M.Sc.
Water Resources Analyst



Bill Coffey, M.Sc., P.Eng.
Head of Water Resources