FINAL

Fluvial Geomorphological Assessment Report

Highway 413 Preliminary Design and Assessment of Environmental Impacts

March 2026

Ontario

WSP

AECOM

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Acronyms

asl..... Above Sea Level
CH..... Conservation Halton
CVC..... Credit Valley Conservation
DFO……Fisheries and Oceans Canada
GIS..... Geographic Information System
GTA..... Greater Toronto Area
LID..... Low Impact Development
MBW ..... Meander Belt Width
MECP..... Ontario Ministry of the Environment, Conservation and Parks
MNR..... Ontario Ministry of Natural Resources
MTO ..... Ontario Ministry of Transportation
OGS ..... Ontario Geological Survey
PTE ..... Permission to Enter
RGA ..... Rapid Geomorphic Assessment
RSD..... Redside Dace
SAR..... Species at Risk
TRCA ..... Toronto and Region Conservation Authority

1. Introduction

1.1 Project Overview

The Ontario Ministry of Transportation has retained WSP Canada Inc. and AECOM Canada ULC in collaboration with various sub-consultant and technical firms to undertake the Highway 413 Preliminary Design and Assessment of Environmental Impacts, hereinafter referred to as “the Project”.

The Project is following the requirements of the *Highway 413 Act, 2024*.

The Project includes the 52-kilometre Highway 413 Corridor, a 4 kilometre extension to Highway 410, and a 3 kilometre extension to Highway 427 (both facilitating connections to the Highway 413 Corridor), for a total of 59 kilometres of new infrastructure (**Figure 1-1**). The highway will have 11 interchanges at municipal roads. Features such as stormwater management ponds, carpool lots, Commercial Vehicle Inspection Facilities, maintenance facilities and the potential for electric vehicle charging stations have been explored as part of Preliminary Design.

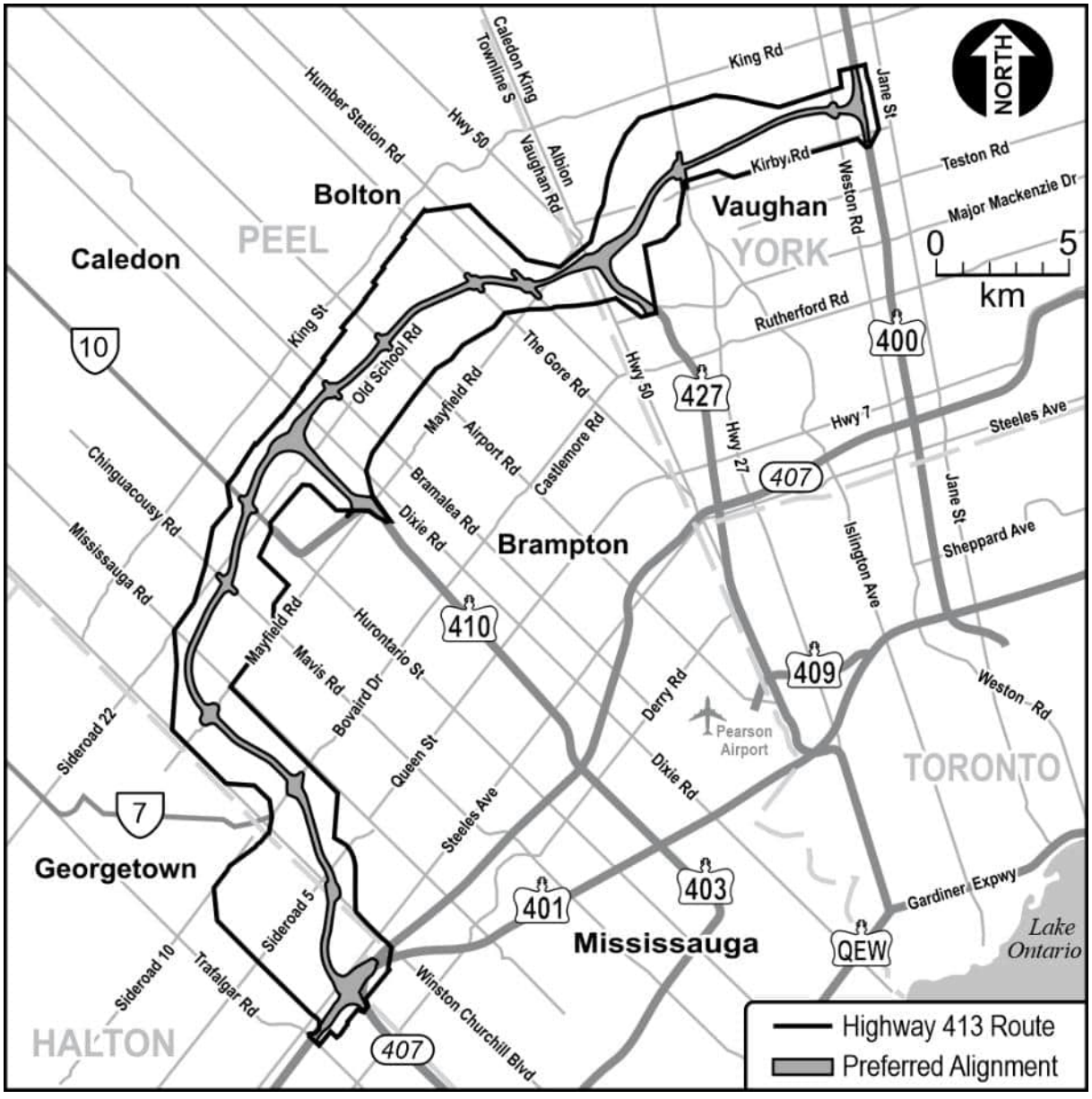
Highway 413 will connect Highway 401 and Highway 407 Express Toll Route in the Regional Municipality of Halton and the Regional Municipality of Peel with Highway 400 in the Regional Municipality of York.

The typical right-of-way will be 170 metres which includes 110 metres for the typical mainline highway and 60 metres for a proposed transitway. A multi-use trail parallel to Highway 413 may be accommodated within the proposed transitway right-of-way. The right-of-way is expanded at interchanges and high fills areas to accommodate ramps to and from the crossing roads, as well as in locations with ancillary highway facilities as mentioned above. The Preliminary Design consists of a typical six-lane cross section (three lanes in each direction) with a grassed median. The right-of-way has been designed to accommodate up to ten-lanes (five lanes in each direction) should future traffic conditions warrant additional capacity. These additional lanes would be provided by widening the highway towards the median.

The proposed transitway will be a separate corridor running alongside the highway, dedicated for public transit, including stations to facilitate passenger access at key locations. The proposed transitway and stations will be subject to a separate future assessment of environmental impacts.

Highway 413 is a 400-series highway, which is a network of controlled-access highways throughout the Province of Ontario. Their primary function is to accommodate through traffic and provide links between urban centres. 400-series highways feature full grade separations (such as bridges) at most intersecting roads and railway lines. Interchanges are provided along the 400-series highways to connect to other highways and municipal roads. These highways have design standards to accommodate high speeds and various collision avoidance and traffic management systems. Highway 413 is proposed to have a posted speed limit of 110 kilometres per hour.

Figure 1-1: Highway 413 Route



The future Highway 413 is expected to:

- Relieve traffic on local roads and parallel highways,
- Help accommodate travel demand,
- Reduce travel times for commuters and goods movement,
- Reduce the social, environmental, and economic costs of congestion,
- Provide greater connectivity between urban growth centres,
- Provide better connections to residential and employment lands, and
- Provide an alternate route in the event of an incident or road closure on local and regional roads.

1.2 Purpose of Report

This report documents the Fluvial Geomorphic Impact Assessment conducted in support of the Preliminary Design for the Highway 413. Readers are encouraged to view this report in its entirety.

When crossings are placed over a watercourse without due consideration for the geomorphological processes that are occurring within the watercourse and their upstream sub-catchment, risks to the crossing structure and/or channel form and function may occur. Such risks could lead to the need for continual or emergency maintenance of the crossing, impede fish passage through the structure, and adversely affect channel stability/aquatic habitat conditions both up and downstream of the crossing.

The Fluvial Geomorphological Analysis provides an opportunity to mitigate future erosion risk to watercourse crossing structures and/or enhance the natural channel processes by informing crossing design, while minimizing unnecessary construction of oversized crossing structures. It serves two main functions:

1. It provides a multi-criteria evaluation to determine the proper crossing size for watercourses affected by the highway work, and
2. It identifies the preferred alignment concepts for watercourses that presently
    a. Cross the proposed highway obliquely, and
    b. Identifies locations where installing a crossing is not feasible (e.g., complex highway interchanges like a cloverleaf exchange, etc.).

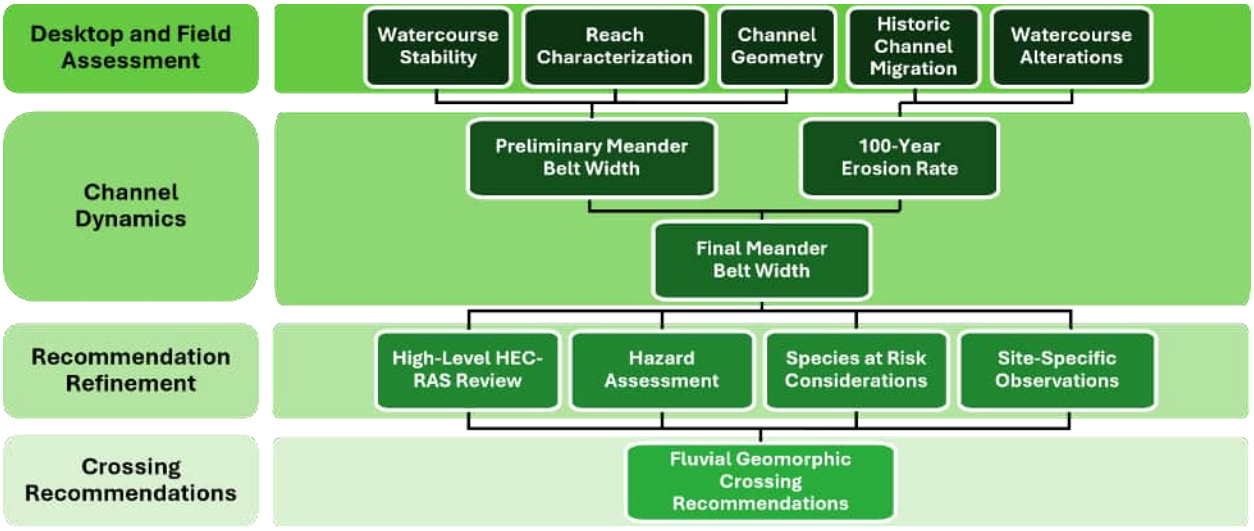
Numerous factors have been considered to provide appropriate crossing size and alignment recommendations. Specifically, the factors targeted in this report and its respective subsections are:

1. Reviewing Conservation Authority guidelines so that crossings are designed with due consideration of relevant policies and legislation (**Section 2**).Reviewing available background documentation (previous studies, surficial physiography, and surficial geology) to provide a general understanding of the natural, historical, and anthropogenic conditions that influence channel morphology and watercourse stability in a broad sense (**Section 3**).
2. Assessing the pre-construction existing conditions through a desktop assessment (**Section 4.1**) encompassing:
    a. A broad-scale review of watershed characteristics,
    b. A review of historical imagery from multiple decades to inform how each watercourse has responded to local changes in land use/cover, and
    c. Delineation of fluvial geomorphological reaches for all watercourses that cross the proposed alignment.
3. Assessing the pre-construction existing conditions through a field assessment of each watercourse reach as close to the proposed crossing location as possible (**Section 4.2**) by considering critical reach-specific information about hydraulic flow regime, channel definition, channel dimensions, watercourse stability (Rapid Geomorphic Assessment), and any additional site-specific constraints identified during field work for the proposed crossing locations.
4. Based on the existing conditions, channel dynamics will be assessed. This includes a meander belt width and erosion rate delineation for all defined watercourses that cross the preferred alignment based on channel form, function, future erosion risk, and site-specific features such as current erosion or sedimentation issues, identified through desktop and field assessments (**Section 6**). Meander belt and erosion rate assessments will be generated for all proposed defined watercourse crossings. Species at Risk (SAR) habitat considerations (particularly Redside Dace) as they pertain to watercourse crossings will be considered in co-ordination with the aquatic specialists at this stage.

5. Refine and provide finalized crossing recommendations from a fluvial geomorphic perspective including input regarding the location, size, and orientation of the final crossing design (**Section 7**). Finalized crossing recommendations will be refined using:
    a. A high-level review of HEC-RAS modelling results for pre-existing and proposed conditions to identify any significant future changes in the channel and floodplain hydraulics that would increase the local erosion potential (**Section 7.1.1**).
    b. A hazard assessment (**Section 7.1.2**) that considers pre-existing channel conditions including feature definition and anthropogenic alteration, evidence of instability (Rapid Geomorphic Assessment), evidence of pre-existing erosion, drainage area, valley confinement, and planform of watercourse at the proposed watercourse crossing location.
    c. A review of species at risk (SAR) and crossing design recommendations (**Section 2**).
    d. Any site-specific considerations noted during field work (e.g., evidence of channel alteration like the presence of tile drains).
6. Preliminary channel designs (**Section 8.1**) will also be provided where the orientation of the existing watercourse crossings are either severely misaligned with respect to the preferred highway alignment, or where it is not feasible to construct crossing structures, such as at complex highway interchanges.

A flow chart has been provided (**Figure 1-2**) identifying how the various components of the desktop and field components in the above scope of work are integrated in order to provide fluvial geomorphic crossing recommendations.

Figure 1-2: Workflow for Crossing Recommendations



1.3 Study Area

The Highway 413 Corridor is set within a mix of land uses including rural, agricultural, commercial, residential, institutional and protected areas, and traverses through the regions of Halton (eastern corner of Halton Region at the Highway 401/407 interchange, runs south-north in the Town of Halton Hills); Peel (the corridor runs south-north in the City of Brampton and east-west in the Town of Caledon); and York (corridor traverses the northwest portion of the City of Vaughan), entering at Highway 50 and Nashville Road, and extending easterly along the south side of King Vaughan Road to Highway 400, with a small portion of the corridor encroaching into the Township of King).

The proposed highway alignment spans the jurisdiction of three Conservation Authorities: Toronto and Region Conservation Authority (TRCA), Credit Valley Conservation (CVC) and Conservation Halton (CH) and four watersheds; Humber River, Etobicoke Creek, Credit River, and Sixteen Mile Creek (**Figure 1-3**). The jurisdictional boundaries of these Conservation Authorities and the watersheds that fall under their respective regulations are listed below.

- **CH Section** – From west of Tenth Line to Steeles Avenue as well as the Highway 413, Highway 401 and Highway 407 400 series Highway interchange and their associated ramps bounded by Trafalgar Road (at Highway 401) to the west, Tenth Line West (at Highway 407) to the east, Steeles Avenue (at Highway 413) to the north and 0.5 km north of Derry Road

(at Highway 407) to the south. This area contains part of the Sixteen Mile Creek Watershed.

- **CVC Section** – From west of Tenth Line to north of Mayfield Road. This area contains part of the Credit River Watershed.
- **TRCA Section** – From north of Mayfield Road to Highway 400. This area contains parts of the Humber River and Etobicoke Creek Watersheds.

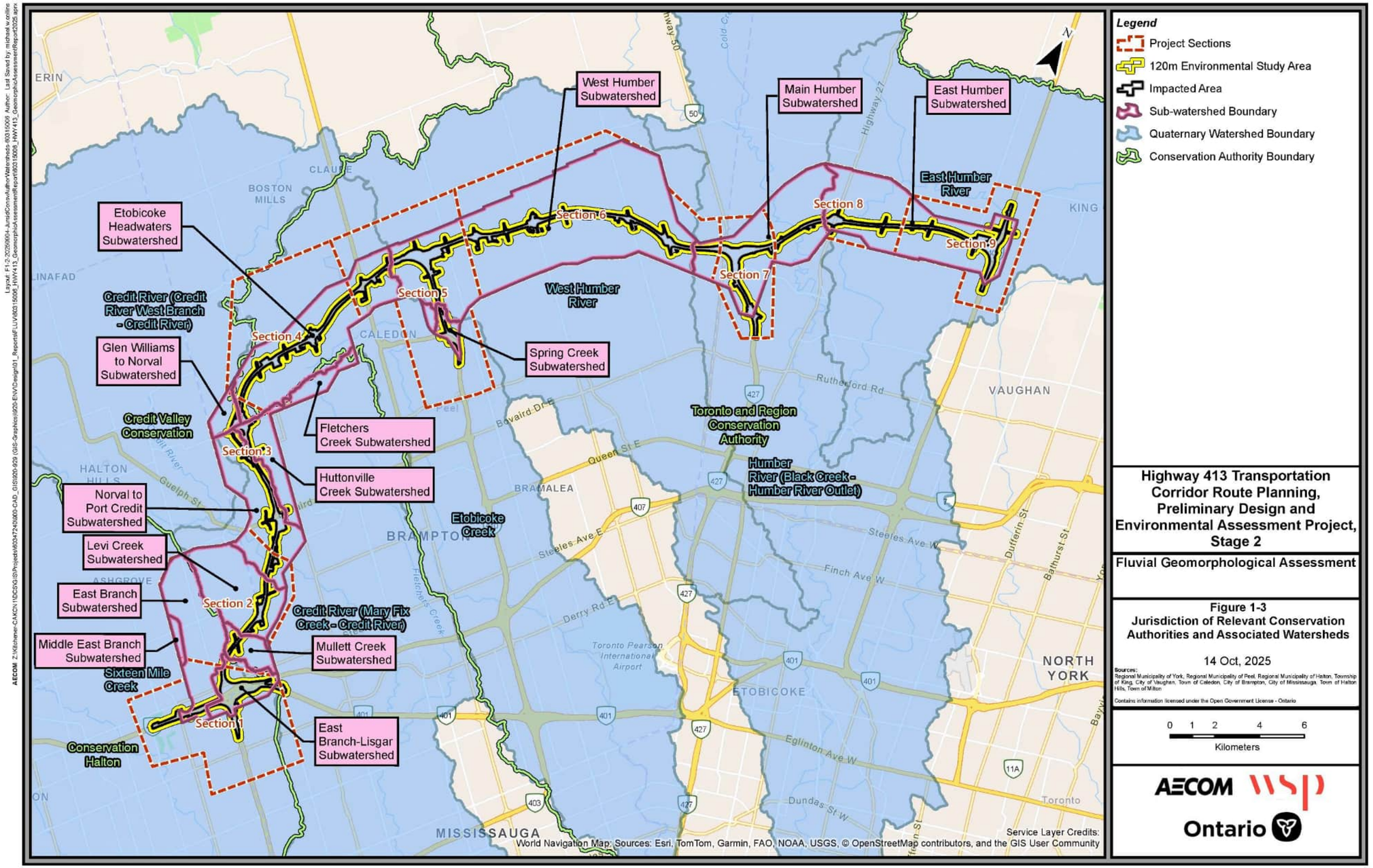
1.3.1 Study Area Subdivision

At the outset of the study, the Study Area, referring to the Transportation Development Strategy Route (MTO 2012), was divided into nine sections. **Figure 1-3** shows the section locations and the watersheds contained within, which include:

- **Section 1** extends along the existing Highway 401 route at the Highway 407 ETR interchange, then moves northwards, running east of and parallel to Ninth Line in Halton Hills. The section overlaps the Sixteen Mile Creek Watershed.
- **Section 2** extends northeastwards from Section 1, crossing Tenth Line to a proposed interchange at Winston Churchill Boulevard, then moving northwards towards Heritage Road. The section overlaps the Sixteen Mile Creek and Credit River Watersheds.
- **Section 3** extends north from Section 2, crossing Heritage Road, Bovaird Road, Wanless Drive, and heading northeast just past the proposed Mayfield Road interchange, which also overlaps the Credit River Watershed.
- **Section 4** extends northeast from Section 3, crossing Mississauga Road, Creditview Road, Chinguacousy Road, McLaughlin Road and terminating north of Old School Road and southwest of Hurontario Street. The section overlaps the Credit River and Etobicoke Creek Watersheds.
- **Section 5** extends northeast from Section 4, crossing Hurontario Road, Kennedy Road, Heart Lake Road, Dixie Road and terminating west of Bramalea Road north of Old School Road and southwest of Hurontario Street. A connection to the Highway 410 runs south from the primary route between Heart Lake Road and Dixie Road connecting to the Highway 410 just south of Mayfield Road. The section overlaps the Etobicoke Creek Watershed and the West Humber River Subwatershed.

- **Section 6** begins just west of Bramalea Road and heads in an easterly direction ending approximately 250 m west of Highway 50, overlapping the West Humber River and Main Humber River Subwatersheds.
- **Section 7** extends eastwards from Section 6, beginning just west of Highway 50 and continuing towards Huntington Road. In the middle of the section the route branches southwards to meet Major Mackenzie Drive and Huntington Road in Vaughan. The section overlaps the Main Humber River Subwatershed.
- **Section 8** begins at Huntington Road in Vaughan and moves northeastwards to a proposed interchange at Highway 27, then further eastwards, crossing Kipling Avenue and ending west of Pine Valley Drive. The section overlaps the Main Humber River and East Humber River Subwatersheds.
- **Section 9** extends eastwards from Section 8, crossing Pine Valley Drive to a proposed partial interchange at Weston Road and ending at the existing Highway 400. Approximately 3 km of the existing Highway 400 route are included in the proposed Highway 413 Corridor for any improvements that may be needed as part of the connection. This section overlaps the East Humber River Subwatershed.

Figure 1-3: Jurisdiction of Relevant Conservation Authorities and Associated Watersheds



2. Relevant Crossing Guidelines and Protocol

The Study Area falls within the jurisdiction of three Conservation Authorities including the Toronto and Region Conservation Authority (TRCA), the Credit Valley Conservation (CVC), and Conservation Halton (CH). Relevant guidelines and policy documents set by the Conservation Authorities regarding meander belt delineation, 100-year erosion rate, and crossing span recommendations are outlined below. All regulated watercourses that cross the route were assessed for this project. Note that while the guidelines provided by the MNR and Conservation Authorities were generally consistent, where recommendations were not specific, the most stringent regulation from another Conservation Authority was applied, as appropriate, based on an understanding of the fluvial geomorphic processes occurring in the Study Area.

There are also watercourses within the Study Area that are identified as Redside Dace habitat, which is regulated by the provincial and federal governments. Relevant policies and legislation relating to Redside Dace and this scope of work are found in **Section 2.6.**

2.1 Ontario Ministry of Natural Resources

The Ontario Ministry of Natural Resources created a technical guide on the Erosion Hazard Limit of River and Stream Systems (MNR 2002). The guidance document outlines the provincially set minimum standards required so that the risks and costs in regard to flood risk are reduced.

2.1.1 Meander Belt Delineation and Methods

The MNR (2002) document states that the meander belt can be calculated by multiplying the bankfull channel width by 20 centred on the meander belt axis. It further states that “where municipalities and planning boards determine that 20 times the bankfull width of the reach is excessive or not sufficient enough in determining the meander belt allowance, mechanisms should be incorporated into the planning process providing the flexibility to undertake a study using accepted scientific, and engineering principles to determine the meander belt allowance” (MNR 2002).

2.1.2 Toe Erosion Allowance and Methods

The technical guide (MNR 2002) outlines that the toe erosion rate (100-year erosion rate) can be determined from mapping using a minimum of 25 years of data to calculate the annual recession rate. These data can then be extended over a 100-year planning period to define the 100-year erosion rate (see **Section 6.4** for further details on erosion rate methods).

Where this is not possible, the toe erosion allowance can be determined based on soil types and hydraulic processes as shown in **Table 2-1** from MNR (2002). Toe scour represents the most erosion-susceptible part of the watercourse. It typically progresses faster and more unpredictably than long-term migration rates represented by 100-year erosion rates (Sholtes, Yochum, Scott & Bledsoe 2018). Because Ontario's MNR erosion-hazard methodology explicitly includes a Toe Erosion Allowance, toe scour provides a more conservative and appropriate basis for hazard delineation and setback determination in unconfined systems.

2.2 Toronto and Region Conservation Authority

The TRCA prepared a crossing guidelines document which "outlines TRCA's study requirements and recommendations for the planning and design of valley and stream corridor crossings" in their jurisdiction. The publication outlines the natural hazard and natural heritage objectives for crossing structures as well as the study requirements for the planning and design of new structures and replacement crossing structures.

The TRCA outlines submission requirements for crossing structures including when fluvial geomorphic studies are required, based on three planning stages as outlined in **Table 2-2** (reproduced from TRCA 2015). Note that field and desktop assessments were conducted for all regulated watercourses that cross the route in the Study Area where PTE was available, including watercourses that were considered small, rural, vegetation-dominated watercourses with a drainage area under 100 Ha, as discussed further in **Section 4.2**.

Table 2-1: Toe Erosion Allowance, reproduced from MNR 2002

Type of Material Native Soil Structure	Evidence of Active Erosion** or Bankfull Flow Velocity > Competent Flow Velocity*** Range of Suggested Toe Erosional Allowances	No Evidence of Active Erosion** or Bankfull Flow velocity < Competent Flow Velocity – Bankfull Width		
		< 5 m	5-30 m	> 30 m
Hard Rock (granite)*	0 – 2 m	0 m	0 m	1 m
Soft Rock (shale, limestone), Cobbles, Boulders*	2 – 5 m	0 m	1 m	2 m
Stiff/Hard Cohesive Soil (clays, clay silt), Coarse Granular (gravels), Tills*	5 – 8 m	1 m	2 m	4 m
Soft/Firm Cohesive Soil, loose granular, (sand, silt) Fill*	8 – 15 m	1 to 2 m	5 m	7 m

Note: * Where a combination of different native soil structures occurs, the greater or largest range of applicable toe erosion allowances for the materials found at the site should be applied.

** Active Erosion is defined as: bank material is exposed directly to stream flow under normal or flood flow conditions where undercutting, oversteepening, slumping of a bank or down stream sediment loading is occurring. An area may have erosion but there may not be evidence of “active erosion” either as a result of well rooted vegetation or as a result of a condition of net sediment deposition. The area may still suffer erosion at some point in the future as a result of shifting of the channel. The toe erosion allowance presented in the right half of [the] Table are suggested for sites with this condition.

*** Competent Flow Velocity is the flow velocity that the bed material in the stream can support without resulting in erosion or scour.

Table 2-2: TRCA Planning Stages, reproduced from TRCA (2015)

Planning Stage	Geomorphic Assessment – Conditions where studies are required	Geomorphic Assessment – Conditions where studies are not required
Early: Environmental assessment and planning process related to establishing the need for crossing infrastructure, road and/or rail routing, and alignments	■ Historic channel movement and preliminary meander belt width studies are required where crossing locations are being selected when alternative crossing locations are being evaluated. ■ Preliminary calculation of 100-year erosion limit is required when preliminary crossing opening dimensions are being examined.	■ Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km^2 (100 ha) or smaller. ■ Studies are not required for existing crossings if minor changes** are proposed.
Intermediate: Begins once the need for the infrastructure has been established and the preferred alignment has been determined	■ Accurate meander belt width delineation and 100-year erosion limit calculations are required when preliminary crossing opening dimensions are being determined. ■ Erosion protection locations and specifications are required if a preliminary crossing design is being developed. ■ Preliminary or Detail channel (as appropriate) realignment design required when realignment is proposed.	■ Studies are not required for small, rural, vegetation-dominated watercourses as described above. ■ Studies are not required for existing crossings if minor changes** are proposed.
Late: Further refinement of the conceptual designs	■ Accurate meander belt width delineation, 100-year erosion limit calculation, and erosion protection locations and specification are required in support of Detail crossing design. ■ Detail channel realignment design is required where realignment is proposed	■ Studies are not required for small, rural, vegetation-dominated watercourses as described above. ■ New studies are not required when detailed analysis has been conducted at intermediate planning stages and conditions have not changed or the crossing design has not been modified. ■ Studies are not required for existing crossings if minor changes** are proposed.

Note: **To be confirmed in consultation with TRCA staff

2.2.1 Meander Belt Delineation and Methods

The meander belt of a watercourse includes the area currently occupied by or expected to be occupied by the watercourse in the future. A report commissioned to Parish Geomorphic by the TRCA (Belt Width Delineation Procedures - 2004), outlines appropriate meander belt width delineation steps. Mapping approaches, provided within the meander belt report, can be applied to delineate the preliminary meander belt widths for unconfined, partially confined, and confined reaches based on historical channel planform, aerial photography, and topographic mapping.

An unconfined system has unrestricted access to its floodplain with no limits on the spatial occupation of its planform. A partially confined system is a watercourse that contacts the valley wall on one side of the channel, restricting meander migration, with no contact present on the opposite side. A confined system is constrained by valley wall contacts on both sides, restricting lateral development.

Generally, a river's meander belt width increases towards the lower reaches as the drainage area of the system increases and with it, the flow input (Parish Geomorphic 2004).

The preferred approach for meander belt delineation involves drawing tangential lines along the outside of channel bends, running parallel to the meander belt axis (i.e., valley axis), on both sides of the watercourse. In unconfined systems, the greatest perpendicular distance between these two lines represents the meander belt width; the same procedure is used in partially and fully confined systems, although the meander belt axis must be adjusted to account for valley wall contacts. Additionally, final belt width determination requires interpreting present and historical imagery to determine natural rates of bend migration; these values are added to the initial meander belt width estimation to minimize the long-term threat to surrounding infrastructure (Parish Geomorphic 2004).

The report also details how to quantify the meander belt using empirical approaches. These approaches are best suited for defining meander belts of altered channels when a surrogate reach that can serve as a proxy for meander behaviour is unavailable (TRCA 2004). Examples of such scenarios include instances where watercourses have been artificially altered through recent human activity and thus their dynamics are not captured through historical mapping (Parish Geomorphic 2004).

2.2.2 100-year Erosion Rate Definition and Methods

Guidance on determining the 100-year erosion rate is provided by the TRCA. As a rule, the preferred method involves directly measuring erosion rates using a series of historical maps, air photos, or survey information, spanning a minimum of 25 years (Parish Geomorphic 2004; TRCA 2015). Erosion rates should be measured at, and immediately downstream, of the apex of meander bends. Surrogate reaches may be used to determine the 100-year erosion rate if the scale, vegetation cover, or past modifications to the channel interfere with the measurements (Parish Geomorphic 2004). This technique is best suited for natural, unaltered reaches (TRCA 2015).

A different approach is used for reaches that have been either artificially altered, lack high-quality aerial imagery, or where the watercourse's width is less than 3 m (refers to a width of 5 m as per TRCA 2015 guidelines). In these cases, the TRCA recommends using the criteria outlined in Table 4, Appendix 2A of their Crossings Guideline for Valley and Stream Corridors (2015) report which is based on the channel erosion activity and the surficial geology of the site. A similar and more descriptive table (Table 3: Determination of Toe Erosion Allowance) is found in the Ministry of Natural Resources (MNR) Technical Guide – River and Stream Systems: Erosion Hazard Limit (2002).

Table 2-3: Reproduction of Table 4: Approximate 100-year Toe Erosion Rates for Watercourses <5 metres in width from TRCA (2015)

Type of Material OR Native Soil OR Structure	Evidence of Active Erosion* OR where the Bankfull Flow Competence Exceeds the Erosion Threshold (m)	No Evidence of Active Erosion (m)
Hard Rock (e.g., granite)	0-2	0
Soft Rock (e.g., shale, limestone), cobbles, boulders	2-5	0
Clays, clay-silt, gravels	5-8	1
Sand, silt	8-15	1-2

Note: * Active Erosion is defined as channel banks exposed directly to stream flow under normal or flood flow conditions and/or where undercutting, oversteepening, slumping of a bank or downstream sediment loading is occurring. It is expected that the majority of watercourses with defined bed and banks will displace evidence of active erosion or will have bankfull flow competence in excess of the erosion threshold. Only very small watercourses with heavily vegetated bed and banks are expected to exhibit no evidence of active erosion.

2.2.3 Recommendations for Crossing Size

In general, TRCA (2015) guidelines state that:

> "Crossings should be located away from geomorphically active and unsteady areas and be designed to span the zone of potential future channel migration, as defined by the meander belt or the 100-year erosion limit, to reduce risks from channel migration over time" (TRCA 2015).

The TRCA (2015) further clarifies when crossings should span the entire meander belt or span the 100-year erosion rate, and provides a table (reproduced below as **Table 2-4**) to clearly outline their recommendations for existing and new crossing structures:

> "The results of geomorphic analyses should be used by the proponent in the selection of locations for crossings and in the design of both new and replacement crossings in order to address channel migration risks. The determination of acceptable risk is the responsibility of the proponent and the municipal infrastructure owner and should be made in consultation with qualified consultants and in discussion with public agencies. However, TRCA strongly recommends that proponents consider the additional risk associated with large, rapidly eroding or unstable watercourses and apply a more precautionary approach to crossing siting and design. In particular, it is recommended that crossing structure openings in these circumstances span the watercourse meander belt, where possible, and at a minimum, span the 100-year erosion limit of the watercourse in order to minimize the risk of channel contacts with abutments, footings, and fill slopes.
>
> For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing.
>
> In all cases, scour and erosion protection should be provided for structural components […]. Scour and erosion protection is particularly important where structural components are located within the meander belt of the watercourse" (TRCA 2015).

Table 2-4: Reproduction of Table 3 from TRCA 2015. Summary of Geomorphic Recommendations for Existing and New crossings

Watercourse Classification	Geomorphic Preference	Existing Crossings	New Crossings
Large, rapidly eroding or unstable watercourses*	Most Preferred	Meander belt	Meander Belt
	Preferred	100-year erosion limit	100-year erosion limit
	Less Preferred	Geomorphic Design**	---
	Not Recommended	Realignment**	Geomorphic design** or Realignment**
Small, stable watercourses*	Most Preferred	Meander belt	Meander Belt
	Preferred	100-year erosion limit	100-year erosion limit
	Less Preferred	Geomorphic design** or Realignment**	Geomorphic design** or Realignment**
	Not Recommended	---	---

Notes: * "Large" watercourses are those with drainage areas greater than 25 km^2 [2500 hectares], "small" watercourses are those with drainage areas between 1 km^2 to 25 km^2.
"Rapidly eroding" watercourses are those with annual rates of lateral erosion greater than 5% of their channel width
"Unstable" watercourses are those with a catchment area greater than 5 km^2 with more than 25% urban land uses, either current or as proposed in municipal plans.

** These options are less preferred as they increase the risk that the channel will come into contact with the infrastructure, increase the likelihood of maintenance, decrease the long-term structural stability of the crossing, and can lead to aquatic habitat degradation. In all cases, erosion protection should be provided for abutments, footings, and piers.

Note - as discussed further in **Section 7.2** and **Appendix F**, the following reaches were classified as part of this study as large, rapidly eroding, or unstable according to TRCA protocol:

- HU_WH_WHR_0_2.
- HU_WH_WHR_0_3.
- HU_MH_ROB_7_1.
- HU_MH_MHR_0_1.
- MH_EH_EHR_0_2.

The remainder of the reaches were classified as small, stable watercourses.

2.3 Credit Valley Conservation

The CVC released a document on the Technical Guidelines for Watercourse Crossings (CVC 2015), which outlines the requirements for crossing structures. They have also released numerous documents that outline how to calculate the meander belt width and erosion rate of a watercourse in their jurisdiction.

2.3.1 Meander Belt Delineation and Methods

The CVC released Fluvial Geomorphic Guidelines (2015) with a detailed description of calculating the meander belt for confined and unconfined systems. In general, their guidelines are as follows:

- **Unconfined systems**: The final meander belt width should span the preliminary meander belt with and associated erosion allowance.
- **Confined systems**: Fully confined systems where the watercourse is within 15 m of the valley wall do not require a meander belt width determination. Instead, they require a toe erosion allowance to account for the 100-year erosion limit. This limit should address the potential long-term meander of the watercourse.
- **Partially confined systems**: The meander belt width should span the preliminary meander belt and the associated erosion allowance for unconfined portions of the watercourse, and the toe-erosion allowance plus additional setback from the confining slope (to be considered geotechnically safe if slumping or slope failure occurs) for the confined portions of the reach.

Note that an additional safety factor may be required for systems if hazards are present.

Aligning with TRCA guidelines, the CVC states that meander belt widths should be calculated from channel measurements through mapping, and empirical approaches should be reserved for “heavily impacted channels or where substantial changes to hydrology are anticipated”.

2.3.2 100-Year Erosion Rate

The CVC defined the 100-year erosion rate as the “site-specific 100-year erosion rate [as] determined by a qualified geomorphologist” (CVC 2019). The CVC frequently uses the mapping method outlined by the TRCA to define the 100-year erosion rates within their jurisdiction. For watercourses that are within confined systems, the Slope Stability

Definition & Determination Guidelines (CVC 2014) includes suggested toe erosion allowance limits based on the degree of channel erosion and valley composition. The result is applied as an additional buffer to the meander belt width when the distance between the stream bank and valley toe is less than 15 m (CVC 2014).

Table 2-5: Reproduced Table (Figure 4a) from CVC 2014. Suggested Design Toe Erosion Allowance

Material at Channel Bank or Full Bankfull / Bank Condition	Active Erosion of Bank (m)	Erosion Currently Not Evident (m)	Existing Erosion Protection in Place and Maintained Along Bank
Limestone, Dolostone	2	1	0
Shale	5	2	0
Cohesive Soils; Silty Clays, Clayey Silts	8	4	0
Cohesionless Soils; Silts, Sands	15	7	0

2.3.3 Recommendations for Crossing Size

The CVC Technical Guidelines (2019) document includes the following recommendations for crossings:

a) “The crossing design should respect the fluvial geomorphic process in the watercourse in order to minimize negative impacts on the aquatic and terrestrial environment.

b) The span of crossings should be selected based on detailed fluvial geomorphic analyses. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Determination of the local erosion hazard is separate from the procedure of determining meander belt and scour potential at a specific site. The 100-year local erosion hazard will determine the extent at which the crossing infrastructure should be placed in order to avoid future channel realignment or unnecessary hardening of the channel or banks. This assessment must be completed by a professional fluvial geomorphologist or equivalent. Any existing reports for the watercourse can also be considered for this purpose.

c) Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.

d) Where the existing bridge abutments interfere with the erosion hazard, a fluvial geomorphic assessment must be completed in order to identify the abutment needs removal or relocation.

e) It is recognized that larger crossings, may require piers in the watercourse. This must be specified early in the process. In some cases, as early as during the assessment of environmental impacts.

f) For new crossings, the footing depths are based on the scour depth […] as identified by a fluvial geomorphologist. Provide the method used, results of the analyses and the input parameters used to determine the type and depth of footings.

g) The replacement or new construction of a crossing must be an open footing culvert or bridge, unless there is a compelling reason why a closed bottom culvert would provide greater social, economic and environmental benefits. Closed bottom culverts must be embedded (sunk into the stream) by at least 10 per cent of the height of the culvert, if there is no substrate (engineered material) incorporated into the design. Otherwise, if a design substrate is proposed, consider embedment of the culvert equivalent to two times the depth of the substrate above the base of the closed bottom culvert. The general principle is that if the crossing cannot be embedded, then closed bottom culverts should not be used. Over time the closed bottom culvert can result in a perched crossing, which requires extensive repairs or watercourse modifications. Properly designed crossings not only reduce long-term maintenance cost but also enhance the natural environment in the vicinity of the crossings.

h) For guidance and information regarding the sizing and design of substrate through a proposed crossing, refer to CVC's Fluvial Geomorphic Guidelines."

2.4 Conservation Halton

Conservation Halton (CH) does not provide guidelines for determining the meander belt widths or erosion rates of watercourses. Consequently, these parameters are typically calculated using the methods outlined by the TRCA.

2.4.1 Meander Belt Delineation and Methods

Meander belt assessments in the jurisdiction of CH are typically determined using the TRCA's Belt Width Delineation Procedures (Parish Geomorphic 2004) and the Ministry of Natural Resources' (MNR) River and Stream Systems: Erosion Hazard Limit Technical Guide (2002). Where channels have been previously straightened, belt widths are determined using surrogate reaches (if available), or a suite of empirical approaches based on channel dimensions, hydraulics, substrate characteristics and upstream drainage area (e.g., (Williams 1986; Parish Geomorphic 2004) that are subsequently synthesized to arrive at an appropriate belt width value.

2.4.2 100-Year Erosion Rate

Like the initial meander belt width calculations, CH defers to the TRCA's methodology for determining the 100-year erosion rate described in **Section 6.4.**

2.4.3 Recommendations for Crossing Size

CH does provide a specific checklist for the size of watercourse-crossing structures outlined in their Culverts and Bridges report (CH 2020) that must be met when applying for approvals pursuant to Ontario Regulation 162/02 – "Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses". One requirement for watercourse crossings is that a Fluvial Geomorphic Assessment is conducted that meets the criteria outlined by the Conservation Authority. The requirements listed by CH (2020) are as follows:

> "A fluvial geomorphological assessment by a qualified licensed professional (e.g., P. Geo) with demonstrated expertise in natural channel design to verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure. The study is to include, but not be limited to:
>
> - Details on how the proposed design provides a natural channel morphology consistent with anticipated drainage, gradient, and sediment transport regimes;
> - Channel migration, widening, potential downcutting/scour based on historical observations or acceptable modelling;

- Potential changes in channel alignment and bank erosion in upstream and downstream reaches;
- Appropriate bankfull flows, water depth and water velocities, and tractive forces. These parameters should be the same through the crossing as in upstream and downstream natural areas;
- Natural bottom substrate matching upstream and downstream substrates (with due consideration given to the impacts of lack of vegetative control within the crossing); and
- Bedload conveyance, ice jams and woody debris accumulation."

2.5 DFO Guidelines Pertaining to Watercourse Alteration

A series of Federal Guidelines published by the DFO exist to protect watercourse and fish habitat integrity. These have been described in detail in the Highway 413 Preliminary Design and Assessment of Environmental Impacts: Fish and Fish Habitat Impact Assessment Report (AECOM 2026).

The DFO does not publish standalone guidelines dedicated exclusively to fluvial geomorphology. However, many of its policies and guidance documents incorporate geomorphic principles, particularly related to flow regime, sediment transport, channel stability, and the physical processes that shape fish habitat. The following DFO policies were reviewed for their relevance to fluvial geomorphology as part of this scope of work:

1. **The Fish and Fish Habitat Protection Policy Statement (DFO 2019a) and Applicant's Guide Supporting the Authorizations Concerning Fish and Fish Habitat Protection Regulations (DFO 2025b):** These documents implement the 2019 amendments to the *Fisheries Act* and require proponents to describe, in detail, any project-related effects on fish habitat. Habitat threats explicitly include changes in flow, water levels, and modifications to the watercourse, all of which directly alter fluvial geomorphic processes such as sediment transport, erosion, deposition, and channel form. Projects must evaluate how proposed works may affect the physical structure and function of the channel, recognizing that geomorphic processes are fundamental to habitat creation and maintenance.

2. **Measures to protect Fish and Fish Habitat (DFO 2024a):** This guidance document outlines required measures to prevent harm to fish and habitat, sever of which are rooted in geomorphic principles. These include:
    - Maintaining riparian vegetation to support bank stability and limit erosion.
    - Conducting works in a manner that minimizes disturbance to the channel bed and banks.
    - Planning for proper sediment control to prevent unnatural sedimentation or channel infilling.
    - Preventing deleterious substances from entering the watercourse, which can alter substrate composition and geomorphic function.

    Each measure helps maintain the natural geomorphic processes that shape channel morphology and fish habitat.

3. **Fish and Fish Habitat Protection Program: Pathways of Effects (DFO 2024b):** The Pathways of Effects (PoE) framework describes how modifications to water level, flow, riparian zones, and the channel itself can influence fish habitat and geomorphic processes. Unmanaged changes can result in:
    - Altered channel and shoreline morphology.
    - Increased or decreased sedimentation.
    - Changes to habitat structure and cover.
    - Altered wetted area, affecting habitat availability.

    This framework outlines how disruptions to geomorphic processes can degrade fish habitat.

4. **DFO Code of Practice: Culvert Maintenance (DFO 2025a):** This code recognizes that culverts can influence both the flow regime and the integrity of a watercourse. Maintenance activities may disturb the bed and banks affecting sediment transport and channel stability. The document identifies risks such as:
    - Localized erosion or scour.
    - Changes in flow velocity and distribution.
    - Disruptions to bed material continuity.

    These impacts inherently affect geomorphic processes within a watercourse and must be minimized through proper maintenance practices.

5. **DFO Code of Practice: Clear Span Bridges – Construction, Maintenance, and Decommissioning (DFO 2025c):** This code outlines that clear span bridges should be designed to avoid interference with the channel bed and banks. However, the construction phase may still disturb channel morphology. The code identifies potential effects and mitigation measures to manage risks such as:

   - Bank disturbance.
   - Channel encroachment.
   - Sediment mobilization.

   By avoiding in-channel structures and emphasizing careful construction practices, this code aligns strongly with geomorphic best practices that prioritize maintaining natural channel processes.

6. **Culvert Installation Information Requirements – DRAFT (DFO 2025d):** As part of the standard DFO requirements for fish-bearing streams, DFO prefers open bottom culverts or structures to enable fish passage. If closed bottom culverts are used, they should be embedded to simulate the natural conditions of an open-bottom or pipe-arch culvert. Culverts up to 2000 mm in diameter should be countersunk by 300 mm. For larger culverts, the countersink depth should be between 15%-30% of the culvert diameter (DFO 2025d).

AECOMs Fluvial Geomorphology team is working closely with and will continue to work as part of the multi-disciplinary team including AECOM and WSP fisheries teams so that that all proposed crossings and conceptual channel designs incorporate fisheries considerations.

2.6 Redside Dace

A note about provincial species at risk protections discussed in the following sections:

The *Species Conservation Act, 2025* was enacted as part of Bill 5 (*Protect Ontario by Unleashing our Economy Act 2025*), and should it come into force, would replace the *Endangered Species Act, 2007*. At the time of writing this report, the *Endangered Species Act, 2007* is still in force. It is recommended that regulatory requirements be confirmed as the Project approaches implementation to verify if adjustments are required for the Project (e.g., confirmation of applicable legislation at the time permits are sought). **All references to the *Endangered Species Act, 2007* throughout this**

document have been marked with an asterisk to illustrate this point. Additionally, "habitat", as described within this document, refers to that habitat as determined pursuant to the *Endangered Species Act, 2007* and, where applicable, Ontario Regulation 832/21, prior to June 5, 2025, when the *Protect Ontario by Unleashing our Economy Act, 2025* received Royal Assent.

Redside Dace are a species of fish that is designated as Endangered both federally and provincially. Redside Dace have been federally regulated under the *Species at Risk Act* (SARA) since 2017 and both the species and its habitat have been regulated under the provincial *Endangered Species Act, 2007** (ESA) since 2009. Critical Habitat is defined in the *Species at Risk Act* as "…the habitat necessary for the survival or recovery of a listed wildlife species and that is identified as the species' Critical Habitat in the recovery strategy or in an action plan for the species". In July 2024, the *Recovery Strategy and Action Plan for the Redside Dace (Clinostomus elongatus) in Canada,* (DFO 2024c) was finalized, and "…identifies features of Redside Dace Critical Habitat as run, riffle, or pool areas in stream reaches with slow to moderate flow for juveniles and slow to fast flow for adults, within the entire bankfull channel width." Critical Habitat under the *Species at Risk Act* includes the meander belt width, the riparian vegetation within it, and associated 30 metres of vegetated area extending from the meander belt width (with an exception to the meander belt requirement for certain municipal drains). These Critical Habitat protections came into force in January 2025. In addition, at the provincial level, the *Endangered Species Act, 2007** defines what constitutes Redside Dace habitat under Ontario Regulation (O. Reg.) 832/21 Section 29, which prescribes regulated areas – commonly referred to as Occupied Habitat, Recovery Habitat, and Contributing Habitat – in subsections 1 and 2.

> "**1**. Within the cities of Hamilton and Toronto, the counties of Bruce, Grey, Huron, Simcoe and Wellington, the regional municipalities of Durham, Halton, Peel and York, the Townships of St. Joseph, Jocelyn and Hilton, and the Village of Hilton Beach,
>
> **i.** any part of a stream or other watercourse that is being used by a Redside Dace,
>
> **ii**. any part of a stream or other watercourse that was used by a Redside Dace at any time during the previous 20 years and that provides suitable conditions for a Redside Dace to carry out its life processes,
>
> **iii.** the area encompassing the meander belt width of an area described in subparagraph i or ii,
>
> **iv.** the vegetated area or agricultural lands that are within 30 metres of an area described in subparagraph iii, and

v. a stream, permanent or intermittent headwater drainage feature, groundwater discharge area or wetland that augments or maintains the baseflow, coarse sediment supply or surface water quality of a part of a stream or other watercourse described in subparagraph i or ii, provided the part of the stream or watercourse has an average bankfull width of 7.5 metres or less.

2. Within the City of Hamilton, counties of Bruce, Grey, Huron, Simcoe and Wellington and the regional municipalities of Durham, Halton, Peel and York,

i. any part of a stream or other watercourse used by a Redside Dace at any time in the past that is located in the same or adjacent subwatershed as the area identified in subparagraph 1 i or ii that provides suitable conditions for successful stream corridor rehabilitation and for natural recolonization of Redside Dace,

ii. the area encompassing the meander belt width of an area described in subparagraph i,

iii. the vegetated area or agricultural lands that are within 30 metres of an area described in subparagraph ii, and

iv. a stream, permanent or intermittent headwater drainage feature, groundwater discharge area or wetland that augments or maintains the baseflow, coarse sediment supply or surface water quality of a part of a stream or other watercourse described in subparagraph i, provided the part of the stream or watercourse has an average bankfull width of 7.5 metres or less."

Given the complexity of the applicable Ontario regulation, a simplified explanation of the habitat types and habitat protection requirements is described below:

- **Occupied Habitat** – any part of a watercourse being used by Redside Dace or that has been used by Redside Dace within the past 20 years and still provides suitable habitat in addition to the meander belt width of the Occupied watercourse plus the vegetated area or agricultural lands within 30 m of the meander belt width.
- **Recovery Habitat** – any part of a watercourse used by Redside Dace anytime in the past, located in the same or an adjacent subwatershed as an Occupied watercourse, that provides suitable conditions for stream rehabilitation and natural recolonization by Redside Dace in addition to the meander belt width of the Recovery watercourse plus the vegetated area or agricultural lands within 30 m of the meander belt width.

- **Contributing Habitat** – any aquatic feature (e.g., stream, permanent or intermittent drainage feature, groundwater discharge area, or wetland) that supports either an Occupied or Recovery Habitat watercourse by augmenting or maintaining flow, coarse sediment supply, or surface water quality to that habitat, provided the part of the watercourse has an average bankfull width of 7.5 m or less.

The Ministry of the Environment, Conservation and Parks (MECP) regulates Redside Dace habitat in Ontario, including the meander belt of the watercourse plus 30 m of "riparian habitat" on both sides of Occupied and Recovery Habitat watercourses. Redside Dace feed on terrestrial insects and thus this vegetated buffer is regulated to protect and maintain their food source. For this reason, Redside Dace Occupied and Recovery Habitat watercourses will include the final meander belt plus a 30 m riparian buffer on each side. The industry standard MNR guidance document Guidance for Development Activities in Redside Dace Protected Habitat (2016) further recommends that all crossings should be designed to avoid/mitigate impacts to Redside Dace habitat by adhering to the following:

- "For all Redside Dace habitat, crossings should be designed to avoid/mitigate impacts by adhering to the following:
  - "The proposed road networks for new crossings should be designed to minimize the number of stream crossings (e.g., stream crossings should generally be limited to one per km of stream).
  - In-water works must adhere to Redside Dace timing windows.
  - The location of new stream crossings should be chosen to:
    - Avoid reaches known to be occupied by Redside Dace;
    - Minimize the width of the crossings;
    - Cross over straight sections of the stream where there is less likelihood for bank erosion; and
    - Cross at areas that have already been disturbed and avoid initiating disturbances in new areas of the stream.
- Construction methods used should attempt to minimize the amount of activity in protected habitat (i.e., including the stream meander belt and riparian habitat) and incorporate the following to maintain the natural flow and functions of streams:
  - For new/replacement crossings in confined valleys (i.e., defined valleys), stream crossings should be bridges that span the valley with

any piers required placed outside of the meander belt of the stream, where opportunities exist (Figure 4, see Appendix D [of the Guidance for Development Activities in Redside Dace Protected Habitat (2016)] for example of how meander belt is calculated). Bridges should be high enough to maintain light penetration to the stream.

- For new/replacement crossings in unconfined valleys (i.e., undefined valleys), stream crossings should be open bottom culverts designed to span the meander belt of the stream. The length of the culvert should be minimized by using retaining walls versus wider embankments, where opportunities exist, to minimize disruption to riparian habitat and channel bed.
- For extension of existing structures, the footprint of the structure should be minimized by using retaining walls where technically feasible to minimize disruption to riparian habitat. Replacement of the existing structure should be considered as an alternative through the planning process.
- Where appropriate, subsurface investigations should be undertaken to confirm the need and extent of dewatering to construct footings, to ensure groundwater resources are not impacted.

- Developing a plan for managing the stormwater runoff from road crossings and where possible preventing it from entering the stream. For example, by retaining rural road cross-sections adjacent to the crossings, which do not have curbs or drains, stormwater will not be discharged directly into the stream.
  - In addition to the Best Management Practices (BMPs) listed above, any construction activity that must occur in the stream should also incorporate the BMPs outlined for indirect habitats (i.e., upstream areas) below. This includes restoring any temporary disturbances within the riparian habitat (i.e., 30 m on each side of the meander belt) by planting native, non-invasive species.
- For proposed road crossings in all indirect Redside Dace habitat (i.e., upstream of occupied reaches), there is more flexibility in the location and design of the crossings, as the impact on the habitat is lessened. If the form and/or function of these supporting features are maintained, a permit may be avoided. This can be achieved through the following:
  - In-water work should only be conducted during the recommended construction timing window of July 1 to Sept 15. This will allow Redside Dace and their habitats downstream to be protected during the

sensitive spawning period, as well as allowing for the stream to be stabilized and the riparian habitat to be established before the winter months. Once construction is completed, the riparian habitat must be restored using native materials.

- Construction should be undertaken during periods when the channel is dry or with minimal flow. Although flows may be absent, contingency plans should be established to address potential flows resulting from unanticipated storm events.
- The length of time required for in-water work should be kept to a minimum.
- Watercourses should not be blocked or flows impeded sufficiently to limit fish movement (i.e., pumping or diversion of flows around the work site can be used to avoid blocking flow during construction).
- Appropriate sediment controls should be in place and measures taken to prevent sediment from exceeding 25 mg/L above background level during construction (see Section 4.3 BMPs: Construction Site Preparation).
- Exposed soil should be graded to a stable angle and revegetated in a manner that prevents erosion.
- Closed-bottom culverts should be installed so that the invert is embedded a minimum of 20 percent (of the culvert diameter) below the stream bed. This will facilitate fish passage because the culvert will not be perched during periods of low flow and help prevent flows from undercutting the culvert.
- Slopes of culverts should mimic the natural stream bed.
- Materials moved during construction activities should not be stockpiled where they can adversely affect drainage patterns and be a minimum of 30 m from the watercourse." (MNR 2016).

The following reaches depicted in **Table 2-6** have been identified by the AECOM/WSP Aquatics team as Regulated and/or Critical Redside Dace habitat based on publicly available background data, agency consultation, and field investigations.

Table 2-6: Reaches identified as Redside Dace Habitat

Section	Fluvial Geomorphology Reach ID	Environmental Reach ID	Structural ID	Culvert/ Drainage ID
Section 2	CR_LC_LEV_0_1	CR_LC_LEV_0_E1	W-W56 A&B	CR_LC_LEV_0_WC2
	CR_LC_LEV_0_2			
Section 5	HU_WH_CAC_0_2a	HU_WH_CAC_0_E1-E2	W-W142 A&B	HU_WH_CAC_0_WC2
Section 6	HU_WH_WHR_0_2	HU_WH_WHR_0_E2	E-W7B	HU_WH_WHR_0_2
	HU_WH_WHR_0_3	HU_WH_WHR_0_E2	E-W7B	HU_WH_WHR_0_3
	HU_WH_SAL_0_1	HU_WH_SAL_0_E6-E8	Realignment has negated need for crossing	Realignment has negated need for crossing
	HU_WH_SAL_0_2	HU_WH_SAL_0_E3, HU_WH_SAL_0_E4, HU_WH_SAL_0_E5	E-W2A E-W2B	HU_WH_SAL_0_2
	HU_WH_SAL_0_3	HU_WH_SAL_0_E1-E2	Realignment has negated need for crossing	Realignment has negated need for crossing
	HU_WH_TWH_2_1	HU_WH_TWH_2_E1	W-W160 A&B	HU_WH_TWH_2_WC1
Section 8	HU_MH_EHR_0_2	HU_EH_EHR_0_E1	E-W31B E-W31A	HU_EH_EHR_0_1, HU_EH_EHR_0_2
Section 9	HU_EH_EHR_18_8	HU_EH_EHR_18_E1 HU_EH_EHR_18_E9	No proposed crossing	No proposed crossing
	HU_EH_EHR_18_8b		No proposed crossing	No proposed crossing
	HU_EH_EHR_18_8c		No proposed crossing	No proposed crossing
	HU_EH_EHR_19_1	HU_EH_EHR_0_E3	No Drainage ID. Culverts will be widened based on existing opening	No Drainage ID

3. Background Review

3.1 Data Sources

A background review of various fluvial geomorphic reports relevant to watercourses within the Study Area was completed. Sources guiding this review include all previous inspections and assessments, online documentation, topographic maps, aerial imagery, and other sources of natural heritage information falling within the Project footprint. The most pertinent references guiding the fluvial geomorphic, meander belt width assessments, and final crossing recommendations are listed below, and an overview of the fluvial geomorphic Study Area's geology and land use changes are provided in **Sections 4.1**; summaries of previous fluvial geomorphic assessments in the fluvial geomorphic Study Area are outlined in **Section 3.2**.

Previous Fluvial Geomorphology Studies

- 401 Corridor Integrated Planning Project – Town of Halton Hills (Dillon Consulting 2000).
- Airport Road Class EA – Geomorphic Assessment (Parish Geomorphic Ltd. 2014)
- Credit Valley Subwatershed Study – Huttonville Creek (7), Springbrook Creek (8a), Churchville Tributary (8b) Draft Appendices (CVC 2004).
- GTA West Corridor Planning and Environmental Assessment Study – Stage 1 – Revised Draft Overview of Environmental Conditions and Constraints Working Paper (McCormick Rankin Corporation 2010).
- Etobicoke and Mimico Creeks Watersheds Technical Update Report – Chapter 7 Fluvial Geomorphology (TRCA 2010).
- Geomorphic Characterization for Redside Dace Habitat – East Humber River and Tributary C, Purpleview Creek and Tributaries A-C. Highway 400 Study Area, Teston Road to King Road. Township of King, City of Vaughan (Aqualogic 2012).
- Rainbow Creek Master Plan Update Study (Cole Engineering 2014).
- Natural Heritage Report – Impact Assessment, (LGL Ltd. 2015)

- GTA West Transportation Corridor Planning and Environmental Assessment Study Draft Overview of Environmental Conditions and Constraints Working Paper Update (AECOM Canada Ltd. and MMM Group 2015).
- Humber River Watershed Characterization Report (TRCA 2023a).
- Watershed Management – Humber River (TRCA 2023b).
- Airport Road from North of Mayfield Road to King Street – Fluvial Geomorphic Assessment and Channel Design Report (AECOM 2024).

Guidelines

- Technical Guide – River and Stream Systems: Erosion Hazard Limit (MNR 2002).
- Belt Width Delineation Procedures (Parish Geomorphic 2004).
- Humber River Fisheries Management Plan (Clayton et al. 2004).
- Humber River Fisheries Management Plan (MNR and TRCA 2005).
- The Aquatic Ecosystem (TRCA 2006).
- Strategic Plan (CVC 2007).
- Slope Stability Definition & Determination Guideline (CVC 2014).
- Fluvial Geomorphic Guidelines (CVC 2015).
- Crossings Guidelines for Valley and Stream Corridors (TRCA 2015).
- Technical Guidelines for Watercourse Crossings (CVC 2019).
- Complete Applications Checklist – Culverts & Bridges (CH 2020).
- The Fish and Fish Habitat Protection Policy Statement (DFO 2019a).
- Measures to protect Fish and Fish Habitat (DFO 2024a).
- Fish and Fish Habitat Protection Program: Pathways of Effects (DFO 2024b).
- Recovery Strategy and Action Plan for the Redside Dace (Clinostomus elongatus) in Canada, (DFO 2024c).
- DFO Code of Practice: Culvert Maintenance (DFO 2025a).
- Applicant's Guide Supporting the Authorizations Concerning Fish and Fish Habitat Protection Regulations (DFO 2025b).
- DFO Code of Practice: Clear Span Bridges – Construction, Maintenance, and Decommissioning (DFO 2025c).
- Culvert Installation Information Requirements – DRAFT (DFO 2025d).

Data Sources

- Physiography of Southern Ontario (Chapman and Putnam 1984).
- Watercourses TRCA Dataset (Tam and Watercourses TRCA Dataset 2021a).
- Watersheds TRCA Dataset (Tam and Watersheds TRCA Dataset 2021b).

Additional Reference Materials

- Humber River Subwatershed Study Final Report and Technical Appendices (Aquafor Beech Limited 1997).
- Gateway West Subwatershed Study (Gartner Lee Limited 1999).
- Oak Ridges Moraine Conservation Plan (Ontario Regulation 140/02 2001).
- A Groundwater Monitoring Network and Partnership for Ontario: Suggested Groundwater Monitoring Networks for Ten Basins in Southern Ontario (MECP 2001).
- Silver Creek Subwatershed Study: Phase I Characterization Report (CVC 2002).
- Hydrogeology of Southern Ontario, Second Edition. Environmental Monitoring and Reporting Branch (Singer et al. 2003).
- Growth Plan for the Greater Golden Horseshoe (OMMA 2020).
- Humber River Watershed Plan – Pathways to a Healthy Humber (TRCA 2008b).
- Making it work – Credit River Water Management Strategy Update (CVC 2008).
- New North Oakville Transportation Corridor and Crossing of Sixteen Mile Creek Class EA Study (AECOM 2010).
- Northwest Brampton Subwatershed Study – Huttonville and Fletcher's Creek: Phase 1: Subwatershed Characterization and Integration (AMEC 2010).
- Fletcher's Creek Restoration Study – Appendix 1 Characterization Report (CVC 2011).
- Provincial Policy Statement (Government of Ontario 2020)
- Provincial Planning Statement (OMMA 2024).
- CH – Watersheds Webpage (CH 2022).

3.2 Previous Studies

The following provides a brief description of previous fluvial geomorphology studies completed for watercourses that cross the preferred alignment.

3.2.1 401 Corridor Integrated Planning Project – Town of Halton Hills. Dillon Consulting 2000

The Scoped Subwatershed Plan outlines specific portions of the Sixteen Mile Creek subwatershed that are located within the Highway 401 Corridor boundaries (Dillon Consulting 2000). The report also describes the Mullet Creek Subwatershed and outlines its basic geomorphological characteristics. Refer to **Figure 4-4** to **Figure 4-12** for maps showing the location of each reach identified in the table below labelled using the Reach ID used for the purposes of this report. A historical analysis was undertaken for the Project, as reproduced in **Table 3-1**.

Table 3-1: Reproduction of Table 2.5 from Dillon Consulting, 2000. Qualitative Observations of Land Use and Channel Characteristics and Changes Noted on 1954, 1979, and 1996 Aerial Photography

Fluvial Reach ID used in this Report	Area	Land Use Characteristics and Changes	Channel Characteristics and Changes
SM_EB_SIM_2_1	Trafalgar Road to 8th Line	■ '54 agriculture ■ '79 and '96 no change	■ See reach D below.
SM_EB_SIM_0_2	Reach D: 8th Line	■ '54 dense forest surrounds channel, agriculture beyond trees ■ '79 no change in land use, Trafalgar Rd has been extended ■ '96 no change	■ '54 meandering ■ '79 obscured by vegetation ■ '96 obscured by vegetation
SM_EB_SIM_5_1 **SM_EB_SIM_0_3** **SM_EB_SIM_5_2** **SM_EB_SIM_5_3** **SM_EB_SIM_5_4** **SM_EL_SIM_1_1**	8th Line to 9th Line	■ '54 agriculture ■ '79 and '96 slight increase in residential housing, especially upstream	■ '54 low sinuosity streams ■ '79 and '96 no change observed
SM_EL_SIM_1_2 **SM_EL_SIM_1_3** **SM_EL_SIM_1_4** **SM_EL_SIM_1_5** **SM_EL_SIM_1_6** **SM_EL_SIM_1_7** **SM_EL_SIM_1_8** **SM_EL_SIM_1_9**	9th Line to 10th Line	■ '54 agriculture ■ '79 and '96 slight increase in residential housing, especially upstream	■ '54 low sinuosity stream ■ '79 and '96 no change observed

Reach D (SM_EB_SIM_0_2) is the only permanent watercourse identified in this background document that is present within the current Highway 413 Study Area (the remainder are classified as ephemeral). The following key details were noted for the permanent watercourse SM_EB_SIM_0_2:

- Drainage area: 19.7 km^2,
- Channel bankfull width: 7.69,
- Channel bankfull depth: 0.44 m,
- Channel width: depth ratio: 17.5,
- Average bankfull velocity: 1.47 m/s,
- Median substrate size (D50): 0.10 cm (coarse sand),
- Bankfull gradient: 0.0044 m/m (low gradient), and
- Meander belt width of 75 m.

The results have been compared to the results of the field assessments completed for the purposes of this report.

3.2.2 Credit Valley Subwatershed Study – Huttonville Creek (7), Springbrook Creek (8a), Churchville Tributary (8b) Draft Appendices. CVC 2004

A Subwatershed study was published by the City of Brampton for the Credit Valley Conservation (CVC 2004) as a management strategy. The study identifies seven reaches as part of Huttonville Creek. Reach 1 extends from Mayfield Road to a confluence point and has a length of 2715 m, a gradient of 0.46% and a sinuosity of 1.1. It also has a meander belt width of 10.0 m. Reach 1 was divided into multiple reaches in this assessment (refer to **Figure 4-4** to **Figure 4-12**), including CR_HC_HUT_6_3, CR_HC_HUT_6_2, CR_HC_HUT_6_1, CR_HC_HUT_0_1, CR_HC_HUT_0_2, and part of CR_HC_HUT_0_3. For the purposes of this assessment, only reach CR_HC_HUT_6_2 crosses the preferred alignment and therefore only this reach was assessed in detail beyond the initial reach delineation process.

The report also identifies that in 1944 and 1974 the features were not defined on air photos and were surrounded by agricultural fields and forest. In 1996 the channel is visible and is straight with no deposition. The surrounding land use is largely agricultural with patches of forest.

Reach 2 contains a portion of CR_HC_HUT_0_3 before leaving the fluvial geomorphic Study Area. In the 2004 assessment, Reach 2 was defined as occurring from the confluence to Mississauga Road. It has a length of 2205 m, a gradient of 0.52%, and a sinuosity of 1.2. It also has a meander belt width of 30 m. The historical assessment identifies that this reach has experienced a gradual change in the meander pattern at the lower end of the reach. In 1974 it was experiencing increased amounts of deposition as identified by the presence of medial bars. At this time, it was surrounded by agricultural land with small, forested sections in the upper part of the reach. By 1976 the reach had lost its riparian zone although the forested section became more mature.

3.2.3 Humber River Watershed Characterization Report. TRCA 2023a

This report summarizes existing conditions within the Humber River watershed and evaluates trends relative to the previous watershed plan released in 2008. Since 2001, TRCA has conducted monitoring at 35 stations throughout the watershed, collecting fluvial geomorphology data including channel form and dimensions, bank characteristics, substrate composition, and critical discharge values. Channel stability was assessed for each subwatershed using metrics such as entrenchment ratio, bank angle, inter-pool slope ratio, width-to-depth ratio, and substrate sorting. Erosion sensitivity was evaluated using parameters including Specific Stream Power Ratio, erosion control structure density, cross-sectional changes, Rapid Geomorphic Assessment (RGA) scores, and shear stress ratios.

The Humber River Watershed Report indicates that one fluvial geomorphology monitoring station is located within the Highway 413 Study Area. Monitoring station GHU-21 is located east of Huntington Road and south of Kirby Road, within a tributary of the Main Humber River identified as HU_MH_MHR_0_2 (refer to **Figure 4-4** to **Figure 4-12**) in the current fluvial assessment report. Results of the monitoring assessments indicate that channel stability at this site has remained moderate between 2001 and 2021. Erosion sensitivity, which was only assessed in 2021, is classified as high.

At the subwatershed scale, the Main Humber has experienced an approximately 75% reduction in floodplain connectivity between 2001 and 2021. Bank angles were generally less steep in 2021. There has been a slight increase in the divergence between inter-pool and bankfull slopes between 2001 and 2021. Substrate sorting has improved and width-to-depth ratios have remained consistent. Specific Stream Power

Ratios are moderate, most reaches lack erosion control structures, and only moderate cross-sectional changes have been observed over time. RGA results indicate predominantly stressed to transitional channel conditions.

3.2.4 Etobicoke and Mimico Creeks Watersheds Technical Update Report – Fluvial Geomorphology. TRCA 2010

Reaches from the Etobicoke and Mimico Creek Watersheds were the focus of a Technical Update Report published by the Conservation Authority (TRCA 2010). The subwatershed that pertains to the focus of this report is the Etobicoke Creek Headwaters Subwatershed (refer to **Figure 1-3** for a map showing the location of the Etobicoke Creek Subwatershed). The reaches from this Subwatershed were monitored at six pre-defined sites that are further southeast than the reaches of interest for this study. Therefore, the presented Study Area in the Etobicoke and Mimico Creeks Watersheds Technical Update Report – Fluvial Geomorphology (TRCA 2010) does not directly overlap with the fluvial geomorphic Study Area of this assessment. However, at the monitoring sites, the reaches were identified to have an erosion sensitivity rating ranging from moderate to highly sensitive, which has been taken into account when assessing watercourse reaches in in the field for the purposes of this assessment that are part of the Etobicoke Creek Watershed.

3.2.5 Geomorphic characterization for Redside Dace Habitat East Humber River and Tributary C, Purpleview Creek and Tributaries A-C Highway 400 Study Area, Teston Road to King Road, Aqualogic 2012 and Tributaries A-C Highway 400 Study Area, Teston Road to King Road, Aqualogic 2012

A memo was completed by Aqualogic in 2012 that provided a geomorphic characterization for Redside Dace (*Clinostomus elongatus*) habitat for the East Humber River and Tributary C, Purpleville Creek (incorrectly labelled as Purpleview Creek in title of original report) and Tributaries A-C along Highway 400. The watercourse crossings were constructed as part of the Highway 400 Widening from Major Mackenzie Drive to King Road Project in 2013 by SNC Lavalin, and they were monitored by AECOM in 2017/2018. Pertinent results have been provided below in **Table 3-2**.

Purpleville Creek Tributary B corresponds to reach HU_EH_EHR_18_11 of this report. Purplevile Creek Tributary A corresponds to reach HU_EH_EHR_18_6 of this report and East Humber River corresponds to reach HU_EH_EHR_19_1 of this report. Refer to **Figure 4-4** to **Figure 4-12** for maps showing the location of reaches delineated for the purposes of this assessment.

Table 3-2: Results of Geomorphic Assessment, reproduced from Aqualogic 2012

Reach ID	Drainage Area (ha)	Bankfull / Active Channel Width (m)	Meander Belt Width (m)	Low Flow Regime
Purpleville Creek Tributary B Highway 400 Culvert 15	244.2	3.3	23.2	Intermittent
Purpleville Creek Tributary A Highway 400 Culvert C18	51.1	2.1	14	Ephemeral to Intermittent
East Humber River Highway 400 Culvert	6489.6	9.2	93.2	Permanent

3.2.6 Airport Road Class EA – Geomorphic Assessment, Parish Geomorphic Ltd. 2014

In 2014 IBI Group retained Parish Geomorphic Ltd. to complete a fluvial geomorphological assessment. They assessed the conditions at channel crossings including the conditions at the Salt Creek (equivalent to reach HU_WH_SAL_0_1) and Dean's culvert (equivalent to reach HU_WH_SAL_0_2) crossings. Refer to **Figure 4-4** to **Figure 4-12** for maps identifying the location of each reach delineated for the purposes of this assessment.

A review of historical aerial imagery identified that between 1954 and 1978 portions of Salt Creek were straightened and a series of online ponds were added along Salt Creek. There have been minimal changes since 1978.

Reach dimensions, meander belts, erosion rates and reach summaries were provided in the report, as reported in **Table 3-3**.

Table 3-3: Summary of Observed Conditions as reported in Parish Geomorphic (2014)

Location	Bankfull Width (m)	Bankfull Depth (m)	Gradient	Preliminary Meander Belt Width (m)	Erosion Setback (m)	Final Meander Belt Width (m)	RGA Stability Index	Reach Description
Salt Creek Culvert (SC-2) ***Equivalent to reach HU_WH_SAL_0_1 of this Report***	1.0 – 2.0	0.4	Moderate	32.0	3.2	38.4	0.22 (Transitional)	■ Limited Sinuosity ■ Channelized ■ Steep channel banks ■ Channel dimensions variable due to dense channel vegetation ■ Undefined pool-riffle sequence ■ Bed material consisted of silt, clay, and sands ■ Within the vicinity of the crossing and through the channel bed was lined with 5 to 30 cm wide riverstone/rip rap ■ The dominant geomorphic processes included widening and planimetric adjustment ■ Extensive basal scour
Dean's Culvert (SC-1) ***Equivalent to reach HU_WH_SAL_0_2 of this Report***	1.5 – 2.0	0.6 – 0.8	Moderate	32.0	3.2	38.4	0.27 (Transitional)	■ Fairly confined ■ Steep channel banks ■ Heavily vegetated ■ Exposed clay till observed ■ Moderate channel gradient ■ Limited defined pool-riffle sequencing ■ Bed material ranged from clay till in pools to gravel and sands with 5 – 10 cm wide cobbles in riffles ■ Channel is wider and deeper upstream of Airport Road crossing ■ The dominant geomorphic process is widening ■ Extensive basal scour

3.2.7 Rainbow Creek Master Plan Update Study. Cole Engineering 2014

A comprehensive study on the Rainbow Creek Subwatershed was published by the City of Vaughan (Cole Engineering 2014). The Subwatershed was split up into nodes, which represent where different flows enter the creek to highlight potential flood-vulnerable areas. A series of reaches in the southeast portion south of Rutherford Road were further assessed.

Node RC18 was defined as being south of Countryside Drive and corresponds with the downward extent of reach HU_MH_RAI_1_3 delineated for the purposes of this assessment (refer to **Figure 4-4** to **Figure 4-12**). This node occurs roughly 1 km from the southern limit of HU_MH_RAI_1_3. Additionally, reach HU_MH_ROB_0_5 occurs between node RC_01 and RC_04 while reach HU_MH_ROB_7_1 occurs between node RC_02 and RC_03. No potential flood-vulnerable areas were defined near these watercourses. No additional details about the watercourses were provided in the study.

3.2.8 Natural Heritage Report – Impact Assessment, LGL Ltd. 2015

The Natural Heritage Report completed by LGL Ltd. in 2015 detailed the results of field investigations completed in 2012 – 2013 at nine watercourse crossings, including the Salt Creek Culvert and Deans Culvert (corresponding to reach HU_WH_SAL_0_1 and HU_WH_SAL_0_2 of this report, respectively). Refer to **Figure 4-4** to **Figure 4-12** for maps identifying the location of each reach delineated for the purposes of this assessment.

Field investigations determined that both crossings were Redside Dace recovery habitat and recommended restoration/ enhancement works be completed if possible. Crossing 5 corresponded to the “Salt Creek Culvert” (which crosses reach HU_WH_SAL_0_1 as identified in this report) which crossing 4 corresponded to “Deans Culvert” (which crosses reach HU_WH_SAL_0_2).

The following key features were identified at each of the crossing locations:

- **Crossing 5 – Salt Creek Culvert**
  - Upstream of the crossing the channel travels through a narrow floodplain.
  - In the vicinity of the culvert the channel is poorly defined and is approximately 30 to 4- cm wide and 10 to 20 cm deep.

- The channel morphology includes riffles and runs.
- The channel substrate includes cobbles, gravel, small boulders, and detritus.
- The water was flowing slowly in September 2012 and but was not flowing in August 2014.
- Downstream of the culvert the bankfull width is estimated to be 6 to 7 m wide with a bankfull depth of 1 m.

- **Crossing 4 – Deans Culvert**
  - Upstream of the crossing the channel is surrounded by a grassy floodplain.
  - The water is slow and ponded.
  - The bed substrate consists of silt, detritus, and boulders.
  - In the vicinity of the crossing the channel is approximately 5 m wide and 0.75 to 1 m deep.
  - The bed morphology is limited to flats and pools.
  - Channel banks are steep with overhanging vegetation upstream of the crossing.
  - Immediately downstream of the crossing there is a short run that is 0.75 m wide and 10 cm deep. There is a pool downstream of the run that is 8 m wide and 75 cm deep.
  - Downstream of the crossing the bankfull width is approximately 5.5 to 6.5 m wide and the bankfull depth is 2 m deep.

3.2.9 GTA West Transportation Corridor Planning and Environmental Assessment Study Draft Overview of Environmental Conditions and Constraints Working Paper Update, Chapters 3 and 4. AECOM Canada Ltd. and MMM Group 2015

As part of the Highway 413 assessment of environmental impacts, the GTA West Transportation Corridor Planning and Environmental Assessment Study Draft Overview of Environmental Conditions and Constraints Working Paper Update (2015) provided an update for the existing conditions and constraints in the Highway 413 Route collected during Completion of the Transportation Development Strategy (MTO 2012) of the assessment of environmental impacts and built upon the initial work done during Development of the Preliminary Design of the assessment of environmental impacts.

The information in the Working Paper is provided in the context of Policy, Natural Environment, Land Use / Socio-Economic Environment, and Cultural Environment. Relevant background information to the current fluvial assessment was found in Chapters 3 (Natural Environment) and 4 (Land Use / Socio-Economic Environment) and was used to better describe the different watershed characteristics.

3.2.10 Airport Road North of Mayfield Road to King Street– Fluvial Geomorphic Assessment and Channel Design Report. AECOM 2024

As part of the assessment of environmental impacts to widen Airport Road, the Region of Peel retained AECOM to undertake the engineering design. A fluvial geomorphic assessment was completed in 2018 (finalized in 2024) at three crossings along Airport Road from 1 km north of Mayfield Road to King Street in the Town of Caledon. The crossings included the main branch of Salt Creek and a tributary of the West Humber River. Only the Salt Creek crossings (two culverts) are within the Highway 413 Study Area.

The reaches identified in the 2019 AECOM report as SC-1 and SC-2, correspond to HU_WH_SAL_0_2 and HU_WH_SAL_0_1, respectively, in the current report. Refer to **Figure 4-4** to **Figure 4-12** for maps identifying the location of each reach delineated for the purposes of this assessment. The results of the RGA completed within reaches SC-1 and SC-2 are reproduced in **Table 3-4**.

Table 3-4: Reproduction of Table 4-2 from AECOM 2024 (based on field work completed in 2019). Geomorphic Assessment Results within the Airport Road Study Area

Reach	Bankfull Characteristics (m)	RGA Results	Reach Description	Key Findings	Natural Channel Design Objectives
SC-1 Equivalent to reach HU_WH_SAL_0_1 of this report	Bankfull Width: 4.61 Bankfull Depth: 0.32	Aggradation: 0.22 Degradation: 0.00 Widening: 0.5 Planimetric Form Adjustment: 0.43 Final: 0.29 (Transitional)	■ There is a backwater effect causing ponding upstream and slow flow conditions ■ There is a rise in bed elevation directly downstream of the crossing ■ Minor bank erosion and slumping was observed upstream of the crossing ■ At the crossing the planform is slightly sinuous ■ Channel has access to the floodplain ■ Downstream of the crossing a large pool was observed ■ Bed substrate ranged from silt, clay, fine sand, and coarse sand up to cobbles	■ The channel is not defined through the crossing ■ Only minor erosion and slumping were identified within the reach ■ A significant backwater effect is present due to rise in bed elevation located directly downstream of the existing culvert, creating a large pool upstream of the crossing that will be more distinct during times of larger flow	■ Design channel to contain bankfull flows at riffles/ runs (there is a low gradient) with additional capacity in pools ■ Include a defined low flow channel to increase channel definition through the crossing and provide a defined thalweg, this will help reduce choking by in-channel vegetation (cattails and grasses) by creating faster, deeper flow through the crossing ■ Provide overall benefit for Redside Dace in terms of habitat (deep pools, overhanging vegetation) ■ Improve geomorphological form and processes by removing backwater effect
SC-2 Equivalent to reach HU_WH_SAL_0_2 of this report	Bankfull Width: 3.4 Bankfull Depth: 0.5	Aggradation: 0.11 Degradation: 0.14 Widening: 0.38 Planimetric Form Adjustment: 0.29 Final: 0.23 (Transitional)	■ There is a backwater effect causing ponding upstream and slow flow conditions ■ There is a rise in bed elevation directly downstream of the crossing ■ Minor bank erosion and slumping was observed upstream of the crossing ■ At the crossing the planform is slightly sinuous ■ Channel has access to the floodplain ■ Downstream of the crossing a large pool was observed ■ Bed substrate ranged from silt, clay, fine sand, and coarse sand up to cobbles	■ The channel is not defined through the crossing ■ Only minor erosion and slumping were identified within the reach ■ A significant backwater effect is present due to rise in bed elevation located directly downstream of the existing culvert, creating a large pool upstream of the crossing that will be more distinct during times of larger flow	■ Design channel to contain bankfull flows at riffles/ runs (there is a low gradient) with additional capacity in pools ■ Include a defined low flow channel to increase channel definition through the crossing and provide a defined thalweg, this will help reduce choking by in-channel vegetation (cattails and grasses) by creating faster, deeper flow through the crossing ■ Provide overall benefit for Redside Dace in terms of habitat (deep pools, overhanging vegetation) ■ Improve geomorphological form and processes by removing backwater effect

4. Desktop and Field Assessment

4.1 Desktop Assessment

Watershed characteristics such as, physiography, surficial geology, topography, and land use/cover are important factors in determining the final classification of future hazard potential for the investigated reaches. The primary source for each category has been provided in **Table 4-1**, with supplemental resources included as referenced in sub-sections below.

Table 4-1: Documents Reviewed

Document Reviewed	Description
Physiography and Landscape Refer to Figure 4-1	**Southern Ontario Physiographic Unit Map** A physiographic unit is a region composed of a distinct type of landscape, landforms, rock type, and evolutionary history. Physiographic landforms in Ontario were defined in Miscellaneous Release Data (MRD) 228 by Chapman and Putnam (1984).
Surficial Geology Refer to Figure 4-2	**Surficial (Quaternary) Geology of Southern Ontario Map** Surficial geology refers to the unconsolidated materials that are present at the Earth's surface and include things like soils, sand and gravel, silt and clay, glacial till, alluvium, and organic deposits. The surficial geology was taken from MRD 128, Ontario Geological Survey (OGS) (2010)
Bedrock Geology Refer to Figure 4-3	**1:250 000 Scale Bedrock Geology of Ontario** Bedrock includes the consolidated rock that lies beneath soil, sediment, and loose surface materials. The bedrock data was taken from MRD 126, OGS (2011)
Topography	**Various data sources were used**
Land Use	**Various data sources were used**

The physiography and surficial geology shape a channel's cross-section, planform and longitudinal profile, which control the energy available to entrain and transport substrate as it is eroded from the valley and channel. In general, areas where the slope of the channel is steep can experience more transport and possibly erosion. Conversely, the same channel, but with a lower gradient, will transport less sediment and be more prone to sediment deposition.

Figure 4-1: Physiography of the Highway 413 Corridor

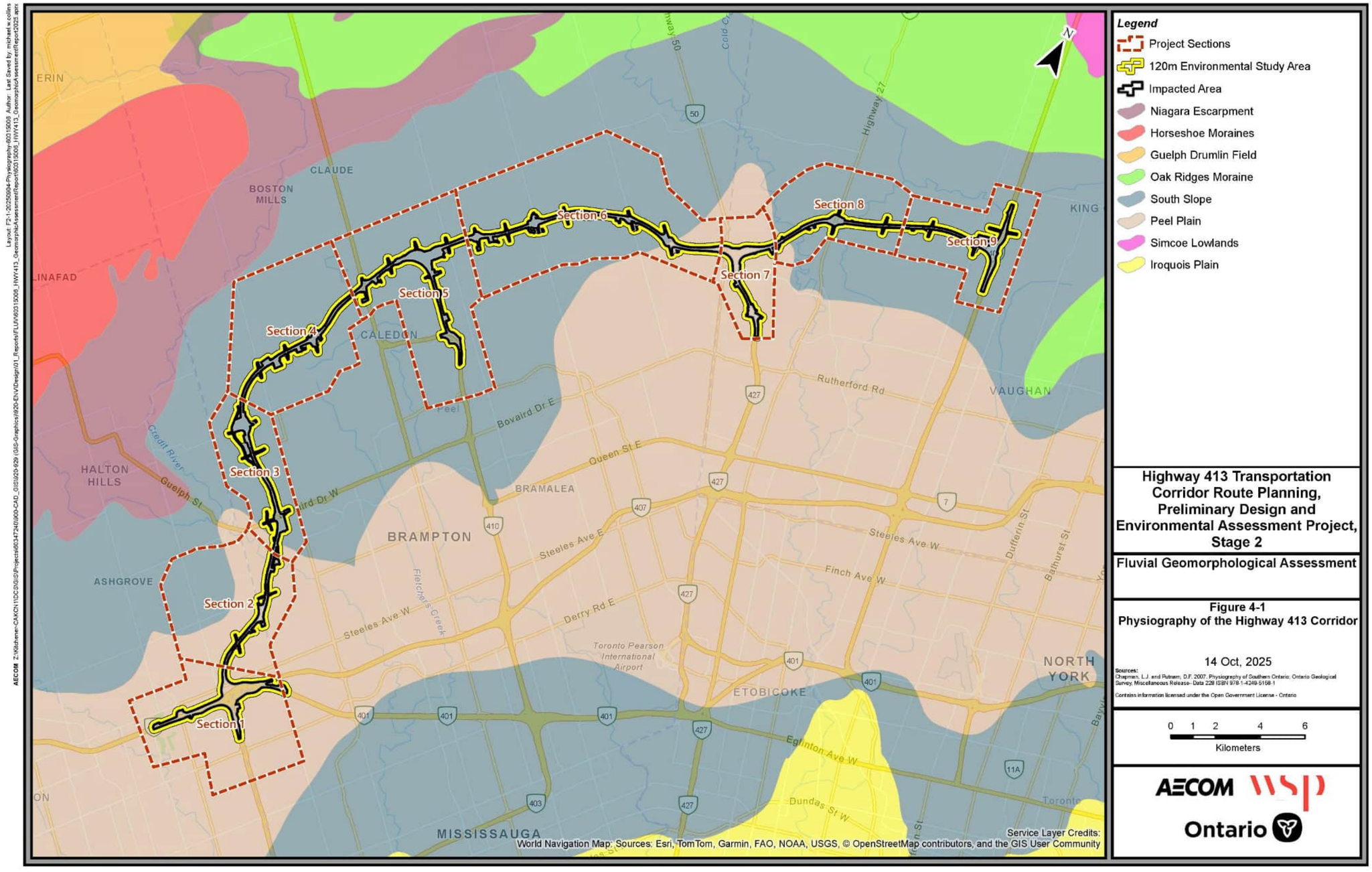


Figure 4-2: Quaternary Geology of the Highway 413 Corridor

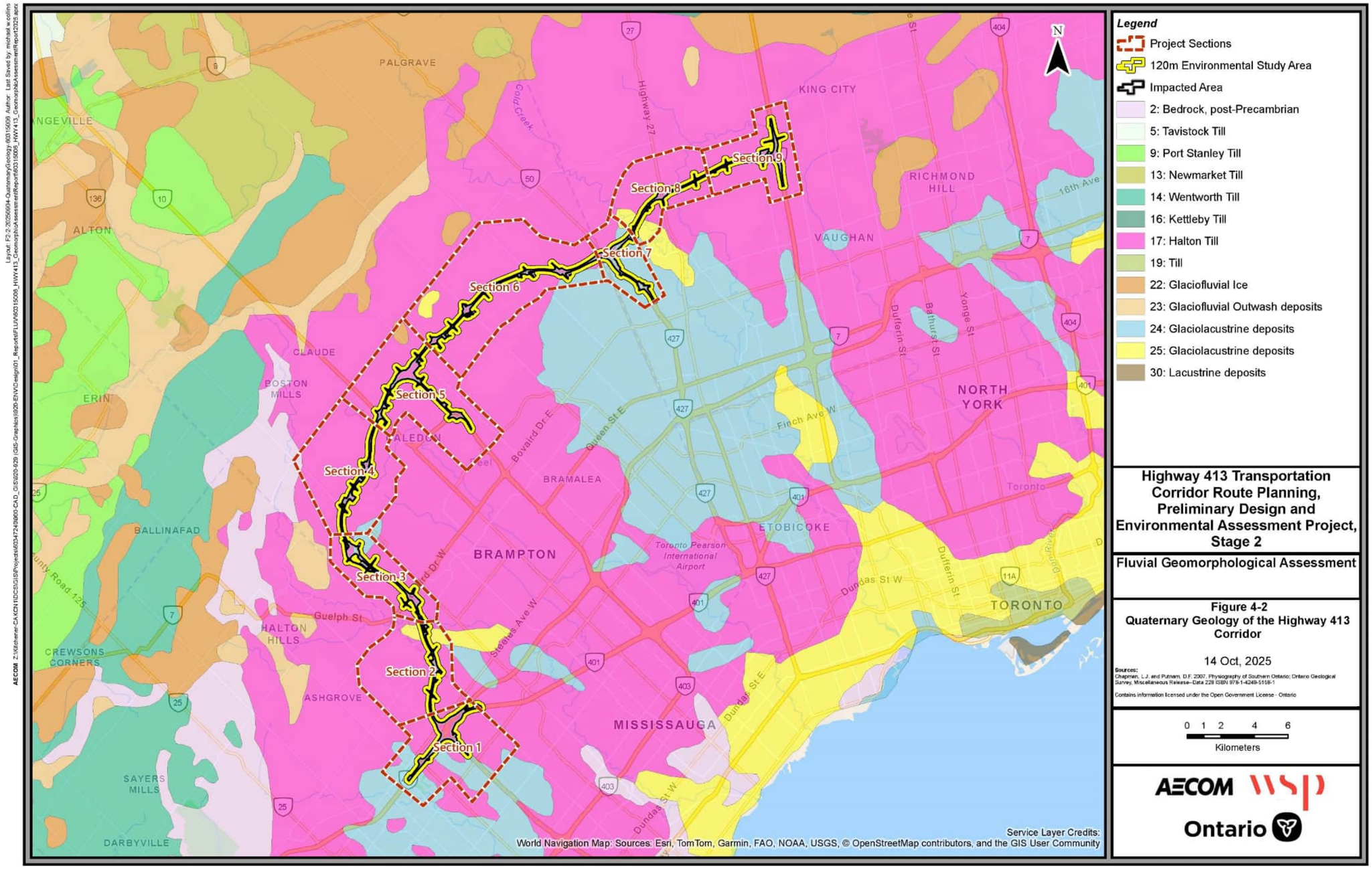
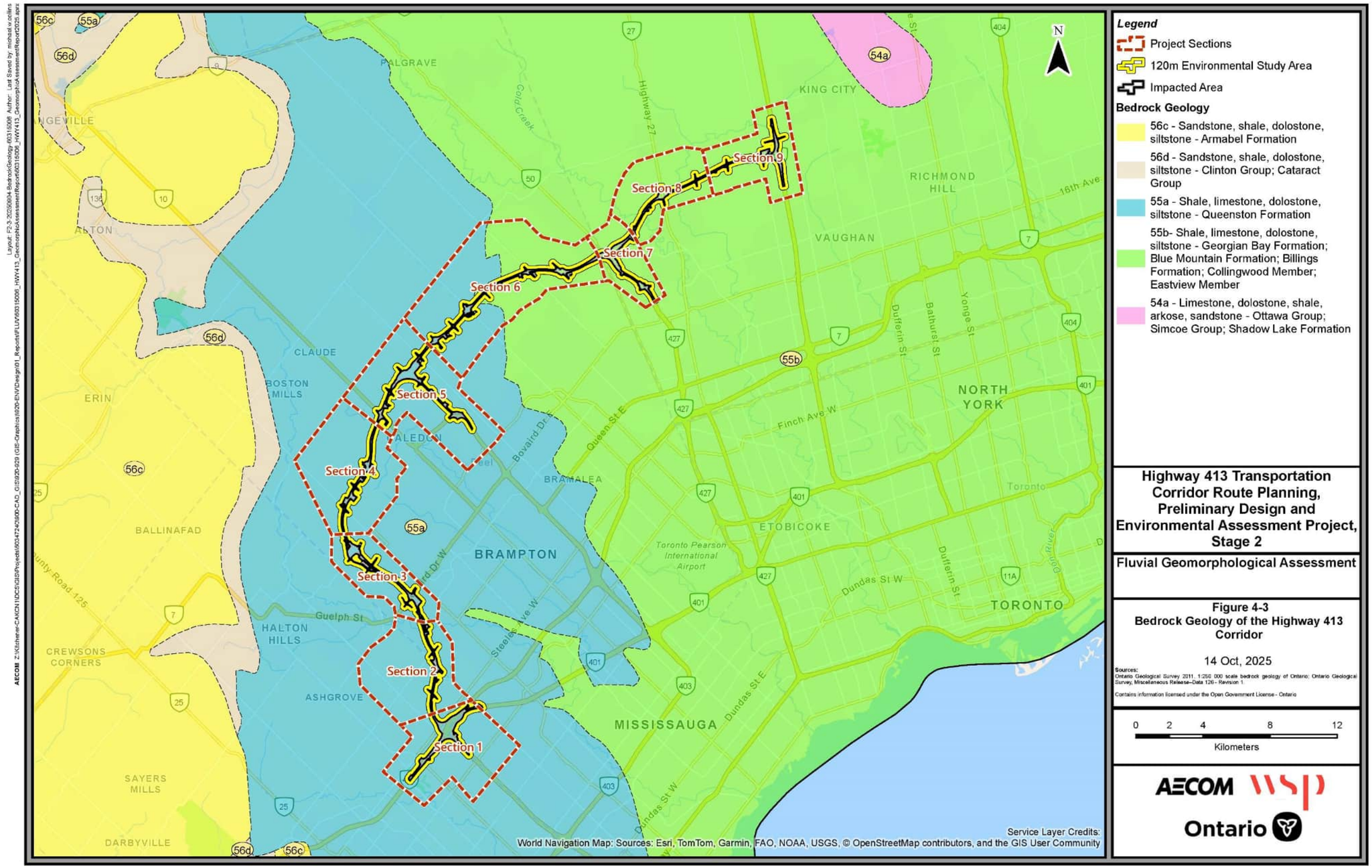


Figure 4-3: Bedrock Geology of the Highway 413 Corridor



The type of substrate being transported by the channel will also play a role in shaping the channel. Substrate along a watercourse is generally sourced from the channel banks and bed. In general, fine sandy substrate tends to be transported through watercourses more easily than clays due to clays cohesive nature (i.e., the electro-chemical bond between clay minerals and water molecules). Clay rich soils will also tend to have low infiltration rates due to this particle cohesion, which results in high surface runoff and limited groundwater recharge. Sand tends to also be transported more easily than cobble to boulder sized material because the energy required to move the substrate is greater. Channel and bed substrate, channel dimensions, sediment supply, streambed roughness and steepness, as well as vegetation all play a role in fluvial sediment transport and entrainment processes.

Changes in watershed cover and land use also impact runoff rates, floods, and sediment supply to watercourses (Pan et al. 2021; Talib and Randhir 2023). Much of the natural land in southern Ontario was cleared by 1840 for agricultural and urban purposes. Forest cover, which stores water and slowly releases it to watercourses, had been drastically reduced and many wetlands were drained and filled, impacting natural watercourses. More recently, over the past 40 years, many streams and rivers were hardened to create storm drains, straightened, enclosed, or re-directed due to urbanization (Heaton et al. 2002). The importance of natural watercourse systems is now better understood, and the focus has shifted to the protection, restoration, rehabilitation, and reclamation of natural channels.

The fluvial geomorphic Study Area lies within one of the fastest-growing areas in North America. Thirty years ago, the lands within the fluvial geomorphic Study Area were part of the rural residential outskirts surrounding the GTA. The area also consists of many rural and recreational land uses that are within a commutable distance of the GTA. Uses such as riding stables, campgrounds and golf courses were developed in this area given its high-quality natural features and proximity to the urbanized areas to the south. Now, the regions of York, Peel, and Halton are home to over 2.3 million people, and the area is characterized by a mix of urban and rural communities, and numerous rural residential clusters and settlements. Portions of the fluvial geomorphic Study Area also lie within the Greenbelt planning area, particularly in the City of Vaughan, Region of York. While these lands have historically been used for agricultural purposes, there is continued pressure to urbanize these areas and expand the range of uses that provide services to the abutting urban areas (Ontario Nature 2011).

Changing land use has a major role in a watercourse hydrology and morphology (Pan et al. 2021) (Talib and Randhir 2023). Highly urbanized areas have lower permeability due

to increased development, which leads to higher peak flows. This in turn can increase channel erosion and the risk of flooding. Downstream portions of watercourses will also have to adjust to the new runoff conditions, leading to changes in aggradation, degradation, channel widening, or planimetric form adjustment. Proper land use planning including adequately sizing crossing structures, limiting development within the hazard lands, and using Low Impact Development (LID) techniques, is crucial so that impacts to watercourses are minimal.

4.1.1 Watershed Characteristics

The proposed Highway 413 Corridor spans four different watersheds within three separate Conservation Authorities' jurisdictions. The following subsections describe the fluvial geomorphic Study Area from west to east and describe the characteristics of each watershed located in the fluvial geomorphic Study Area.

4.1.1.1 Humber River Watershed

4.1.1.1.1 Watershed Characteristics

The Humber River Watershed has an approximate total drainage area of 902.58 km^2 (TRCA 2023b) and drains from the Oak Ridges Moraine in the north to Lake Ontario in the south. It contains five main Subwatersheds: the Main, East, West and Lower Humber, and Black Creek. The Highway 413 Study Area falls within the upper/middle reaches of the Watershed and spans across the Main, East and West Humber River subwatersheds. The Main Humber River subwatershed has an approximate area of 357.48 km^2 while the East and West Humber River subwatersheds have approximate areas of 196.07 km^2 and 203.62 km^2, respectively.

The Main Humber River flows approximately 126 km from its source/headwaters on the Niagara Escarpment and Oak Ridges Moraine to Lake Ontario (TRCA 2023b). The permeable soils and hummocky terrain of the Oak Ridges Moraine result in high recharge, high baseflow rates, and low surface runoff. The Main Humber River Subwatershed contributes over half of the baseflow in the overall Humber Watershed (TRCA 2008b). Within the fluvial geomorphic Study Area channels in the Rainbow Creek system (10 km^2) are part of the Main Humber Subwatershed. Channels in this creek system have been noted to show significant bank instability (TRCA 2008a). Most of the small tributaries of the Rainbow Creek system have been reported to have been altered or lost due to agriculture and development (TRCA 2008a). Also, within a portion of the Study Area, the Robinson Creek Subwatershed has a catchment of less than 10

km^2 with low rates of groundwater discharge resulting in frequent low flow and drying (Clayton et al. 2004). The Main Humber River is the largest system within the Study Area and is fed by headwaters with high rates of groundwater discharge (TRCA 2008b).

The main stem of the East Humber River is a 63 km long low-gradient permanent watercourse flowing along a deep valley with steep valley slopes and originates in the kettle lakes region of the Oak Ridges Moraine (Richmond Hill and King Township), where there is significant groundwater discharge (Clayton et al. 2004; TRCA 2023b). Within the fluvial geomorphic Study Area, the East Humber River main stem exhibits a high degree of sinuosity creating a large meander belt width within the broad floodplain. The Purpleville Creek is also a low gradient watercourse, with headwaters originating in the Study Area east of Kipling Avenue. The high levels of groundwater recharge in the Subwatershed help to maintain water inputs into its headwaters (TRCA 2008a; AECOM 2010).

The West Humber River Subwatershed begins in Caledon, on the South Slope, and flows for approximately 45 km over the Peel Plain before joining the Main Humber River in Toronto (TRCA 2023a). In most of the Subwatersheds within the Peel Plain, baseflow in the West Humber River tributaries tends to be low, with even large tributaries often drying up in the summer months. The primary watercourses of this Subwatershed flowing through the Study Area are (from west to east) Campbell's Cross Creek, Lindsay Creek, Gore Road Tributary, the West Humber River, Salt Creek and Clarkeway Drive Tributary.

Within the fluvial geomorphic Study Area subdivisions, the Humber River's Subwatersheds lie within the following zones: Main Humber, Sections 6 to 8; East Humber, Sections 8 and 9; and West Humber, Sections 5 and 6.

4.1.1.1.2 Physiography and Surficial Geology

The Highway 413 Study Area within the Humber River Watershed is located within the physiographic region of the South Slope Till Plains (Chapman and Putnam 1984). The South Slope is gently inclined to the southeast and consists of shallow shale and till plains. The dominant surficial geology of this portion of the Study Area consists of clay to silt textured tills derived from glaciolacustrine deposits or shale (OGS 2010). The fine-grained clay to silty tills have a lower infiltration rate than sandy soils, and as such they typically have higher runoff rates. Areas of coarse-textured glaciolacustrine deposits of sand and gravel are also present east of Highway 27 (OGS 2010). Areas of coarse sediment textures have generally higher water infiltration rates.

4.1.1.1.3 Topography

The longitudinal profile identifies channel bed forms and local bed gradients, which are important geomorphological considerations. Bed gradient is a primary control of a reach's tractive forces and therefore a major determinant of morphological form and function. The steeper the longitudinal profile the greater the ability of the channel to entrain and transport sediment along its boundaries.

The topography of the Highway 413 Study Area within the Humber River Watershed is generally flat and low-lying. The mean above sea level (asl) elevation along the area traversed by the proposed Highway 413 ranges from approximately 283 metres asl on the west (southeast of Campbells Cross) to approximately 256 mASL on the east limit of the Study Area, adjacent to Highway 400 (ESRI 2021). Within the Humber River Watershed, an area of low relief (215 mASL) exists in the vicinity of Highway 50 and Kleinburg Station and the lower elevation point can be found within the valley of the Main Humber Subwatershed at approximately 187 mASL (ESRI 2021).

4.1.1.1.4 Land Use

Approximately 26.7% of the Watershed is developed (urban), primarily the lower reaches within Toronto, 32.7% is classified as natural cover and the remainder as rural (TRCA 2023a).

4.1.1.2 Etobicoke Creek Watershed

4.1.1.2.1 Watershed Characteristics

The Etobicoke Creek Watershed has an approximate area of 211.8 km^2 (OMMA 2020) and is the most western Watershed within the boundaries of the TRCA's jurisdiction. Etobicoke Creek itself is approximately 59 km long, originating in the Town of Caledon just south of the boundary of the Oak Ridges Moraine, and flows east to form the West Branch of Etobicoke Creek. Spring Creek (also called Etobicoke Creek East) originates in the north end of the City of Brampton in the Heart Lake Wetland Complex and flows southeast to join the Main Branch of Etobicoke Creek.

Sections of Spring Creek have been heavily altered in the past (straightening and concrete lining, etc.), and the creek's lower reaches show even greater signs of impact (TRCA 2006). Recent work by the TRCA has removed the impervious, concrete-lining and re-naturalized this section of the creek.

4.1.1.2.2 Physiography and Surficial Geology of the Etobicoke Creek Watershed

The Study Area within the Etobicoke Creek Watershed is located within the physiographic region of the Till Plains (Chapman and Putnam 1984). The dominant surficial geology of the Study Area consists of clay to silt textured tills derived from glaciolacustrine deposits or shale (OGS 2010). Localized areas of silt and clay, minor sand and gravel and interbedded silt and clay can also be found along the Highway 413 Study Area within the Etobicoke Creek Watershed (OGS 2010). The main branch of Etobicoke Creek is characterized by steep gradients and impermeable soils that rapidly convey surface runoff to the watercourse (TRCA 2006).

4.1.1.2.3 Topography

The topography within the Highway 413 Study Area is generally flat and low lying. The elevation along the area traversed by the proposed Highway 413 within the Etobicoke Creek Watershed ranges from 280 metres asl on the east to 265 metres asl on the west border of the Watershed (ESRI 2021).

4.1.1.2.4 Land Use

Approximately 73% of the Watershed is developed, primarily within the cities of Brampton, Mississauga, and Toronto and 27% is classified as rural, with 13.8% listed as natural cover (TRCA 2020). The land use within the Highway 413 Study Area specifically is predominantly composed of agricultural properties, sparse residential properties, commercial/industrial properties and natural forested areas. The predominant land use in the Etobicoke Creek Headwaters is agricultural. Comparatively, the main branch of the Etobicoke Creek flows primarily through areas of urban land use, and as a result, has experienced significant degradation of habitat and natural features. The headwaters of the Spring Creek Subwatershed flow through several natural areas, but land use becomes predominantly residential along the majority of the stream's length (TRCA 2010).

4.1.1.3 Credit River Watershed

4.1.1.3.1 Watershed Characteristics

The Credit River Watershed has an approximate area of 1000 km^2 (CVC 2008) and drains from the Oak Ridges Moraine to Lake Ontario at Port Credit in the City of Mississauga. The Credit River itself is approximately 90 km in length, and its

headwaters originate in the towns of Orangeville, Erin and Mono (CVC 2024). Owing to its size, the Watershed contains numerous substantial tributaries, the dominant ones being Mullet and Levi Creeks to the south and west of the main stem, and Huttonville and Fletcher's Creeks lying to the north and east.

Levi and Mullet Creeks both originate to the west of the Credit River, just south of the Niagara Escarpment, Levi Creek is on the South Slope, and Mullet Creek is within the Peel Plain (CVC 2007), and both flow through the Peel Plain. Levi Creek joins the Credit River just north of Highway 401, and Mullet Creek joins the Credit River south of Highway 403, closer to the mouth of the river at Lake Ontario. The Headwater reaches of Mullet Creek are influenced mainly by surface runoff events and are seasonally dry (Gartner Lee 1999). In the Study Area Levi Creek largely consists of small tributaries in the upper portion of the Levi Creek Subwatershed. In a 1995 assessment, headwater reaches of Levi Creek were characterized as having an ephemeral flow regime (Gardner Lee 1999).

Huttonville and Fletcher's Creeks originate on the South Slope of the Niagara Escarpment (CVC 2007) north of the current extent of urbanization in the City of Brampton, and flow through the Peel Plain cutting valleys in the clay till in some places to the underlying bedrock (AMEC 2010). Huttonville Creek and Fletcher's Creek outlet to the Credit River just north of the 407 and just south of the 401, respectively. In the Study Area, Huttonville Creek consists of headwater reaches with low gradients (0.4 – 0.7%) and meander belt widths of 10-13 m north of Highway 7 (CVC 2004). Most of the tributaries in the headwaters north of Wanless Drive were dry in mid-summer indicating an ephemeral or intermittent regime (CVC 2004). Fletcher's Creek also consists of headwater reaches within the Study Area. The headwater reaches were described by Paragon Engineering Limited (1997) as intermittent with permanent flow only occurring south of Highway 7 (outside the Study Area) (CVC 2011). An update to the Fletcher's Creek Subwatershed Study (CVC 2011) identifies that the tributaries north of Wanless Drive are ephemeral features that mainly drain agricultural fields and groundwater inputs are limited.

4.1.1.3.2 Physiography and Surficial Geology

The Highway 413 Study Area within the Credit River Watershed is located within the physiographic region of the Till Plains (Chapman and Putnam 1984).

The dominant surficial geology of the Study Area consists of clay to silt textured tills derived from glaciolacustrine deposits or shale (OGS 2010). Localized areas of silt and

clay with minor sand and gravel and interbedded silt and clay can also be found within Section 4 of the Highway 413 Study Area, northwest of the intersection of Mississauga Road and Mayfield Road, at the border of the Credit River and the Etobicoke Creek Watersheds (OGS 2010).

4.1.1.3.3 Topography

The topography within the Highway 413 Study Area is generally flat and low laying. The elevation along the area traversed by the proposed Highway 413 within the Credit River Watershed ranges from 260 metres asl on the north to 220 metres asl on the west border of the Watershed (ESRI 2021).

4.1.1.3.4 Land Use

About a third of the Watershed (35%), primarily in the middle and upper sections, is covered by forests, valley lands, wetlands and meadows, while urban development (31%) dominates the lower watershed, and the remainder (34%) is designated as rural (CVC 2008). Forest cover in the headwaters tends to slow runoff and increase infiltration of water into the ground.

The Study Area is limited to the lower watershed, where agricultural and urban areas (including sparse residential properties and commercial/ industrial properties) are the major land uses (Kennedy & Wilson 2009).

4.1.1.4 Sixteen Mile Creek Watershed

4.1.1.4.1 Watershed Characteristics

The Sixteen Mile Creek Watershed has an approximate area of 357 km^2 and drains into Lake Ontario at the Town of Oakville (CH 2022). Sixteen Mile Creek itself is approximately 30 km long, and its headwaters originate above the Niagara Escarpment (MNR 2021); a network of small tributaries flow over the Escarpment, coalescing into larger streams which then flow through the Peel Plain and eventually into Lake Ontario as the main branch of Sixteen Mile Creek, southwest of the Study Area (AECOM Canada Ltd. and MMM Group 2015).

East Sixteen Mile Creek is the main watercourse of this Watershed in the Study Area. A short headwater section (~1.8 km) of the Hornby Tributary to Middle Sixteen Mile Creek is also located just inside the western boundary of the Study Area. East Sixteen Mile Creek and the Hornby Tributary originate in the Town of Halton Hills, south of the

Niagara Escarpment. The Main and Middle branches of Sixteen Mile Creek originate in the bedrock plain west of the Escarpment; the East and Middle branches of the Creek merge just south of the community of Hornby (AECOM Canada Ltd. and MMM Group 2015).

4.1.1.4.2 Physiography and Surficial Geology

The Highway 413 Study Area within the Sixteen Mile Creek Watershed is located within the physiographic region of the Peel Plain (Chapman and Putnam 1984). In the Study Area, the Peel Plain is characterized by steep-walled valleys with floodplains of varying widths (AECOM Canada Ltd. and MMM Group 2015). The Peel Plain has a relatively flat topography and is characterized by clay soils that have much lower infiltration rates. During storm events high stormwater flows could result in erosion and increased flooding. The Peel Plain extends through the central portions of the Regional Municipalities of York, Peel, and Halton.

The dominant surficial geology of the Study Area consists of clay to silt textured tills derived from glaciolacustrine deposits or shale (OGS 2010). Localized areas of coarse-textured glaciolacustrine deposits of sand and gravel can be found within Section 1 at the border of the Credit Valley River and the Sixteen Mile Creek Watersheds (OGS 2010).

4.1.1.4.3 Topography

The topography within the Highway 413 Study Area is generally flat and low lying. The elevation along the area traversed by the proposed Highway 413 within the Sixteen Mile Creek Watershed ranges from 220 metres asl on the northeast to 210 metres asl on the west border of the transportation corridor section located within the Watershed (ESRI 2021).

4.1.1.4.4 Land Use

Within the Study Area, the Sixteen Mile Creek Watershed is predominantly agricultural, with significant portions remaining as natural areas. More urbanized portions of the Sixteen Mile Creek Watershed include the Town of Halton Hills.

4.1.2 Historic Aerial Imagery Assessment

Analysis of historical imagery provides a multi-decade view of the evolution/response of watercourses in relation to local changes in land use/cover. This analysis/assessment is an important tool in determining the rates of erosion and changes in planform and provides fluvial geomorphologists with an understanding of the area currently occupied

by or expected to be occupied by the watercourse in the future. This in turn informs the risk to structures to be placed over a watercourse and helps in placing such structures away from geomorphically active and unsteady areas.

An analysis of available historical aerial imagery from 1946 – 2023 (including aerial imagery for 1946, 1950, 1960, 1970, 1976, 1978, 1988, 1995, 1999, 2002, 2007, 2012, 2017, 2020, 2021, and 2023) for all defined watercourses traversing the proposed Highway 413 Corridor was undertaken to determine changes in planform, adjacent land use, and artificial (anthropogenic) alterations or modifications of the subject watercourses. Results of the historical aerial imagery analysis are presented in **Appendix A** and are the basis for the determination of a meander belt width and 100-year erosion rate. According to the Belt Width Delineation Procedures page 43 (Parish Geomorphic 2004), historical data must be used to define the meander belt from mapping “to allow for the possibility that the configuration of an existing watercourse/reach may not be in quasi-equilibrium form, historic analysis of the reach should be completed”. It should be noted that older aerial imagery had poor resolution and, in some cases, the feature was not clearly visible either due to the seasonal nature of flow or due to a lack of a defined channel. The empirical method was used when multi-decadal analysis was not possible, due to the limited availability, poor quality of the historical imagery, small size of watercourse, and/or lack of a defined watercourse.

4.1.3 Reach Delineation

Fluvial geomorphic reaches were defined for all watercourses crossing the proposed Highway 413. From a fluvial geomorphic perspective, reaches can be defined as lengths of channels that display similar physical characteristics and have a setting that remains nearly constant along their length. Reaches are relatively homogeneous in channel form, function, and processes. They are influenced by similar controlling (discharge and slope) and modifying factors (vegetation) to which the channel has become or is becoming adjusted.

Reach breaks within the Study Area were first delineated through a desktop assessment of tributary locations, channel gradient, surficial geology, valley setting, sinuosity, and riparian vegetation using available geographic information systems (GIS) data. Watercourse data originated from the Ministry of Natural Resources and Forestry Land Information Ontario and was updated based on field work results and findings.

Identifying reaches through a desktop assessment is an important first step since it provides a detailed overview of the large-scale characteristics that influence the

geomorphological processes that shape and characterize each watercourse. All reaches identified during the desktop assessment are subsequently verified in the field and updated as necessary. The location and rationale for the geomorphological reach breaks are detailed in **Appendix A**.

Reaches were labelled using the system defined in **Table 4-2**, and then numbered sequentially. Maps showing the labelled reaches across the Study Area have been provided in **Figure 4-4** to **Figure 4-12**. A more detailed set of figures showing Reach IDs has also been provided in **Appendix A**.

Table 4-2: Naming Scheme for Reaches

Watershed		Subwatershed		Watercourse	
Watershed Name	Watershed Code	Subwatershed Name	Subwatershed Code	Watercourse Name	Watercourse Code
Humber	HU	East Humber	EH	East Humber River	HER
		Main Humber	MH	Robinson Creek	ROB
				Main Humber River	MHR
				Rainbow Creek	RAI
		West Humber	WH	Campbells Cross Creek	CAC
				Lindsay Creek	LIN
				Gore Road Tributary	GRT
				West Humber River	WHR
				Salt Creek	SAL
				Clarkway Drive Tributary	CDT
				Tributaries of West Humber	TWH
Etobicoke Creek	EC	Spring Creek	SC	Etobicoke Creek East Branch	ETE
		Etobicoke Creek Headwaters	EH	Etobicoke Creek West Branch	ETW
Sixteen Mile Creek	SM	East Branch Lisgar	EL	Sixteen Mile Creek	SIM
		East Branch	EB		
Credit River	CR	Norval to Port Credit	NP	Credit River	CRR
		Glen Williams to Norval	GW		
		Levi Creek	LC	Levi Creek	LEV
		Mullet Creek	MC	Mullet Creek	MUL
		Huttonville Creek	HC	Huttonville Creek	HUT
		Fletcher's Creek	FC	Fletcher's Creek	FLE

Figure 4-4: Fluvial Geomorphology Investigations Section 1

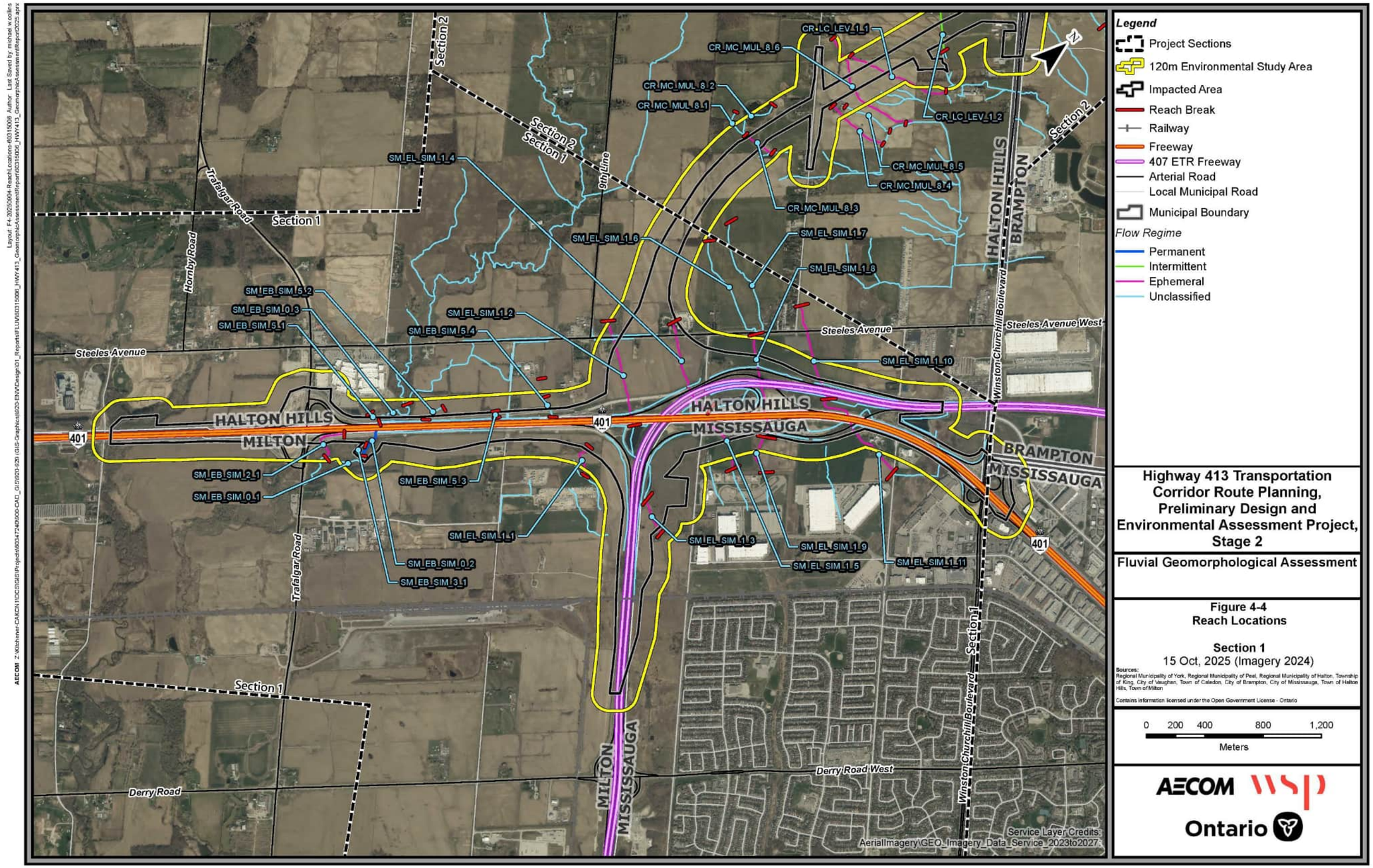


Figure 4-5: Fluvial Geomorphology Investigations Section 2

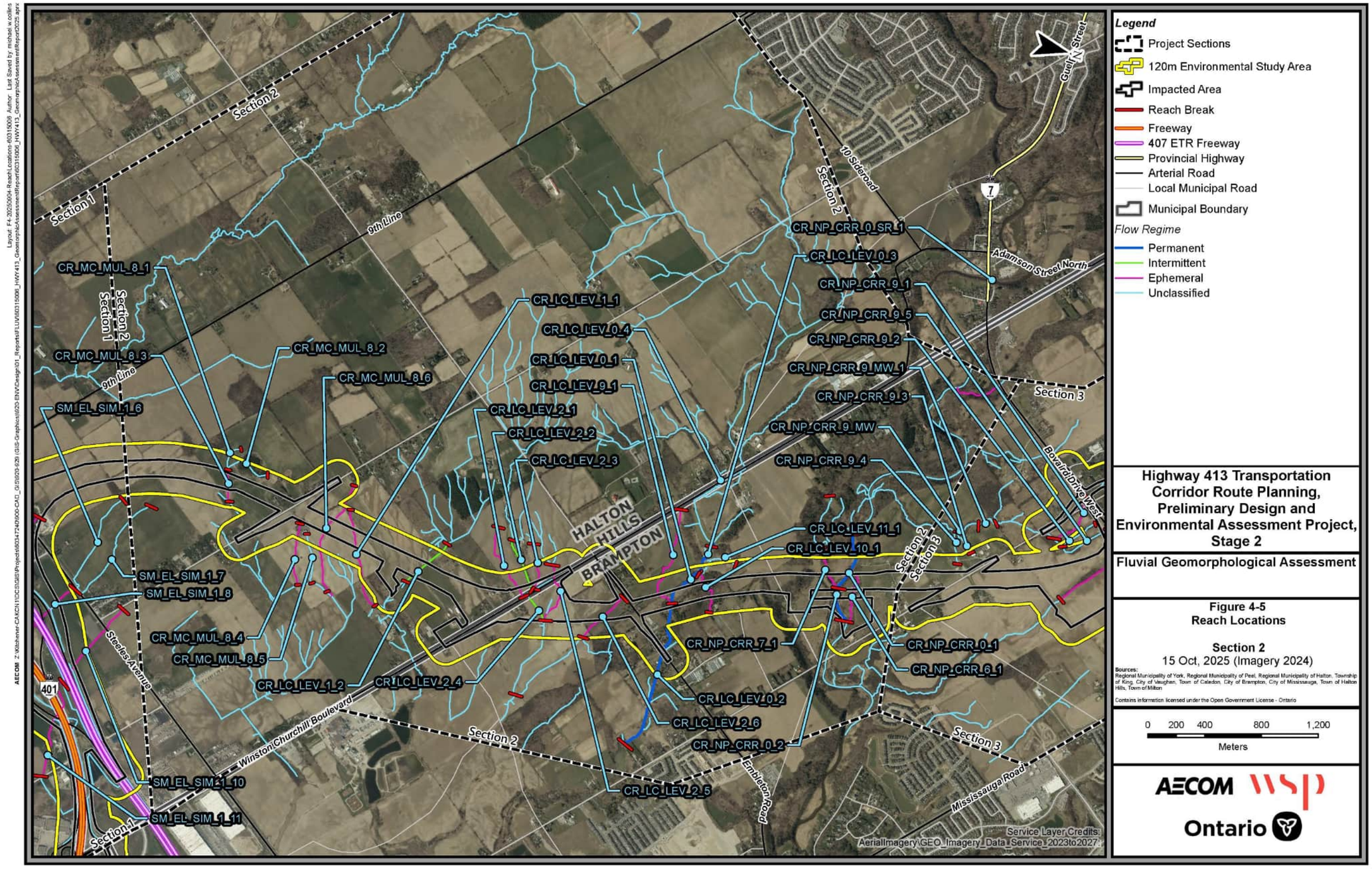


Figure 4-6: Fluvial Geomorphology Investigations Section 3

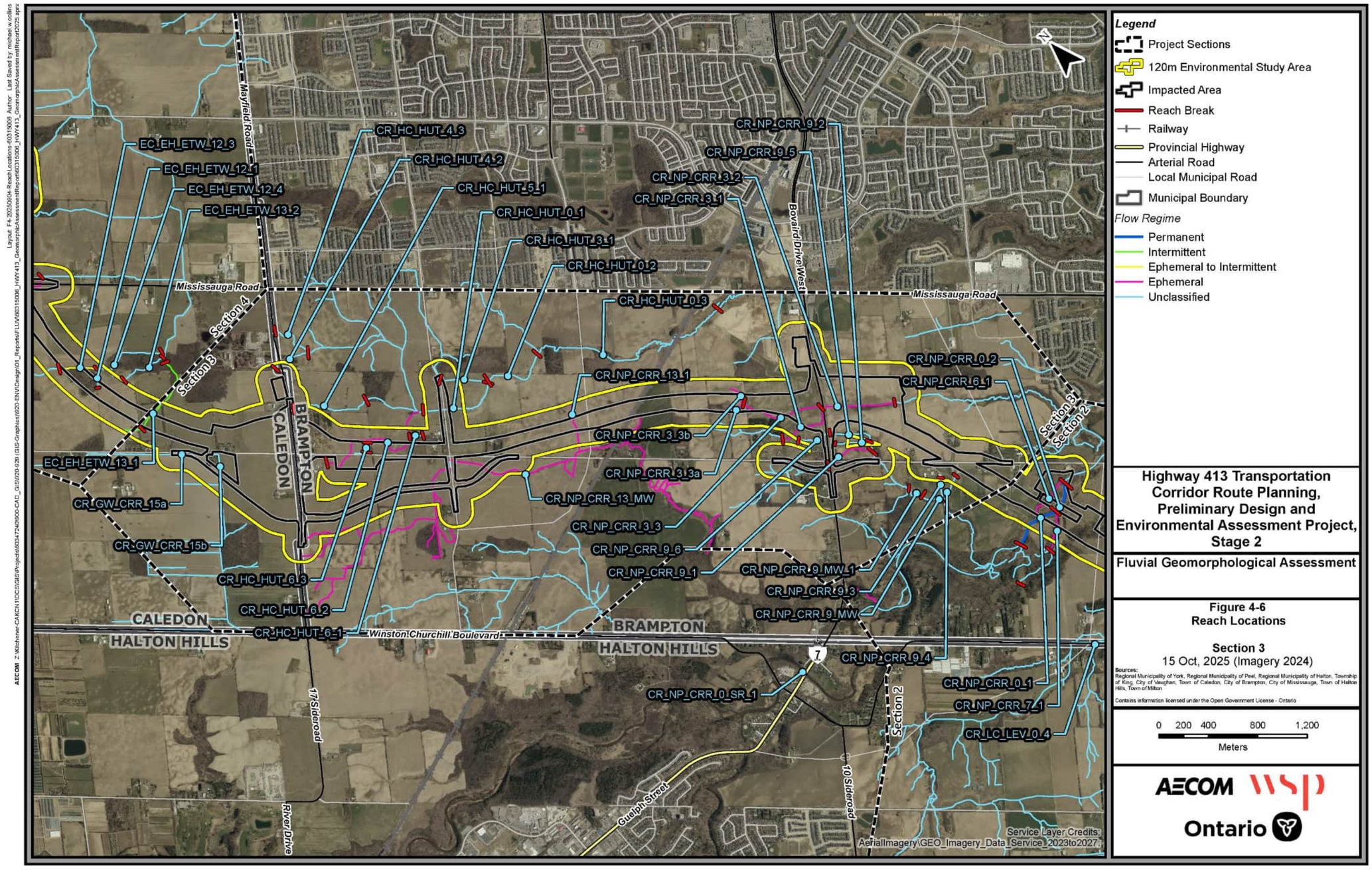


Figure 4-7: Fluvial Geomorphology Investigations Section 4

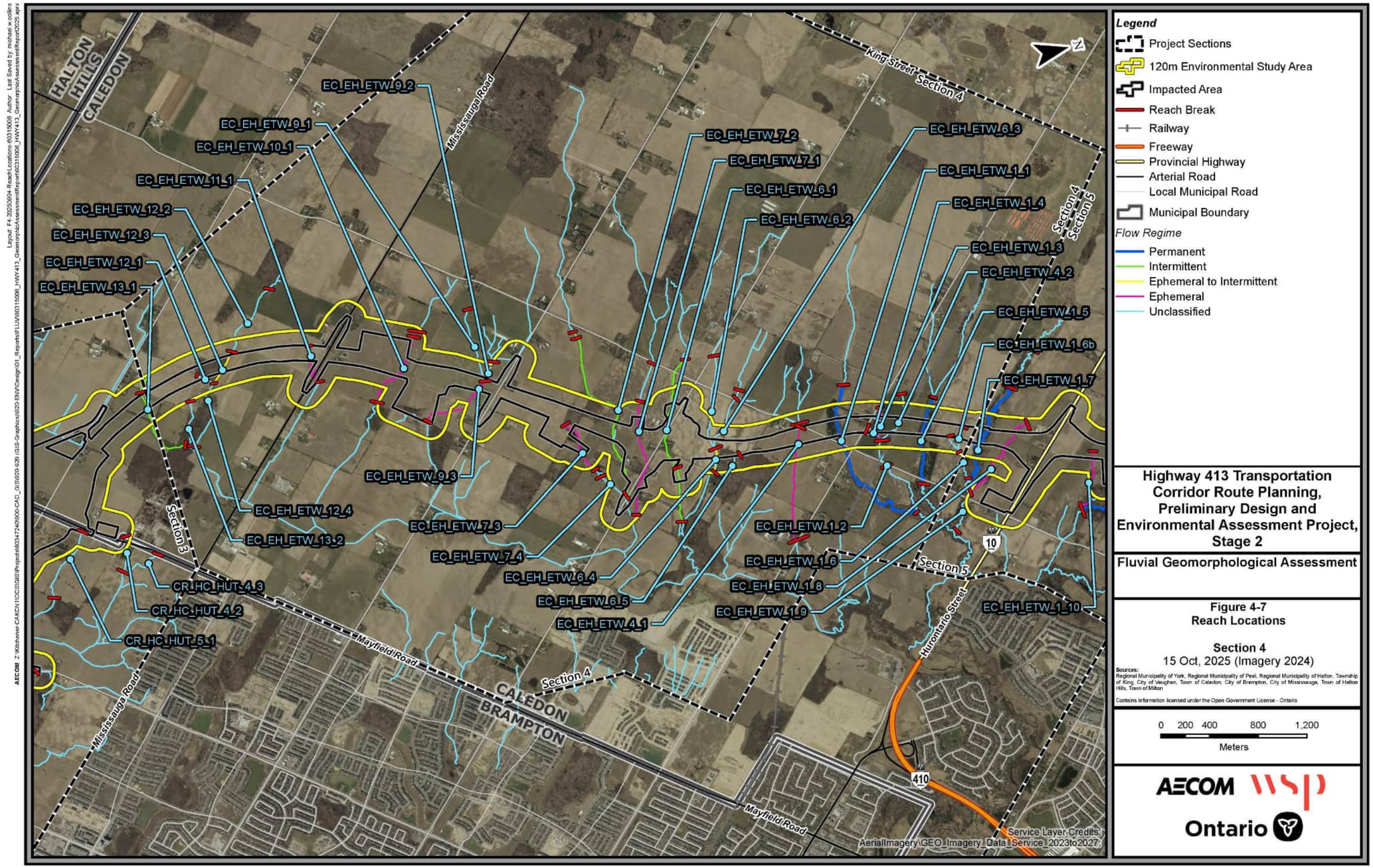


Figure 4-8: Fluvial Geomorphology Investigations Section 5

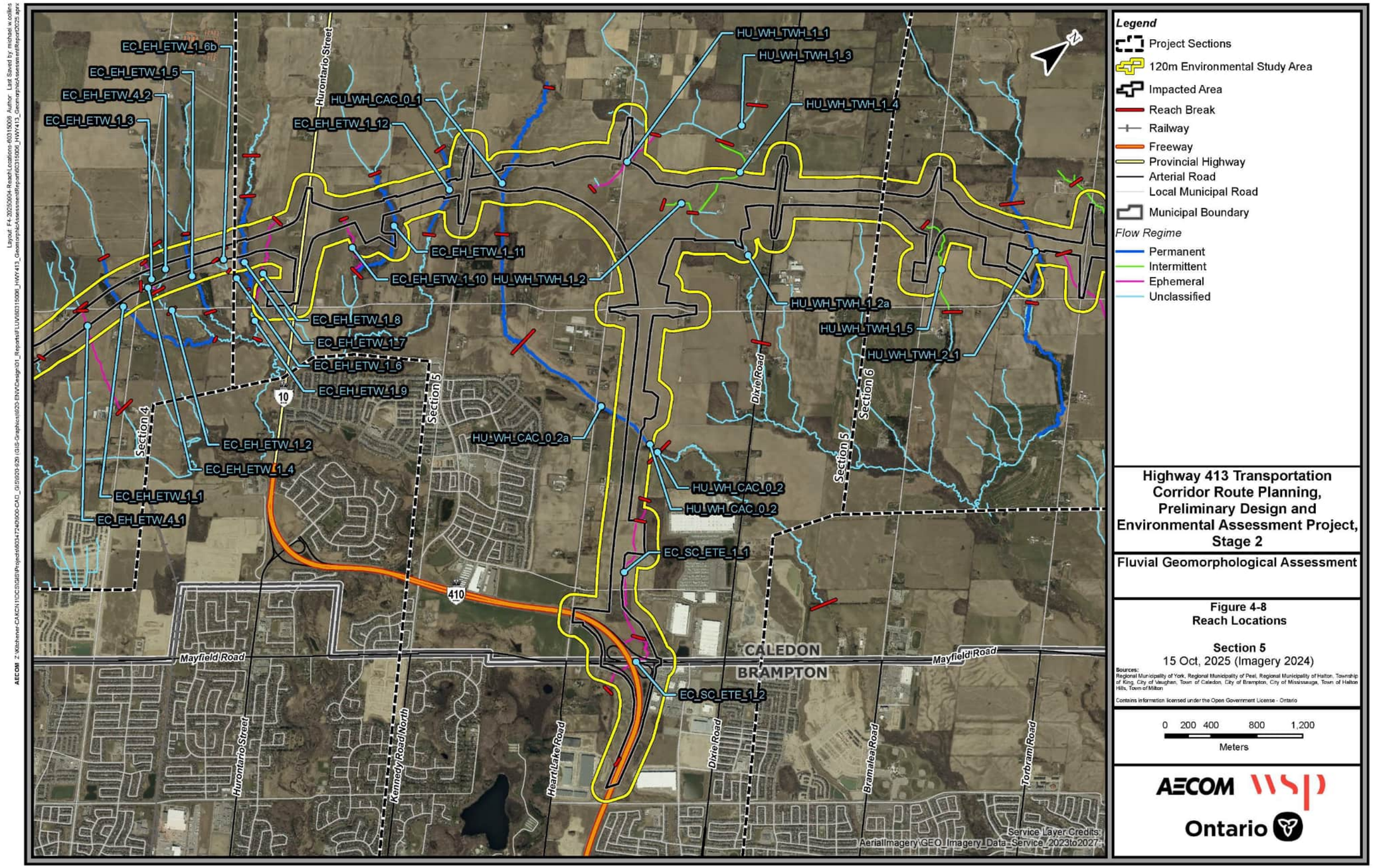


Figure 4-9: Fluvial Geomorphology Investigations Section 6

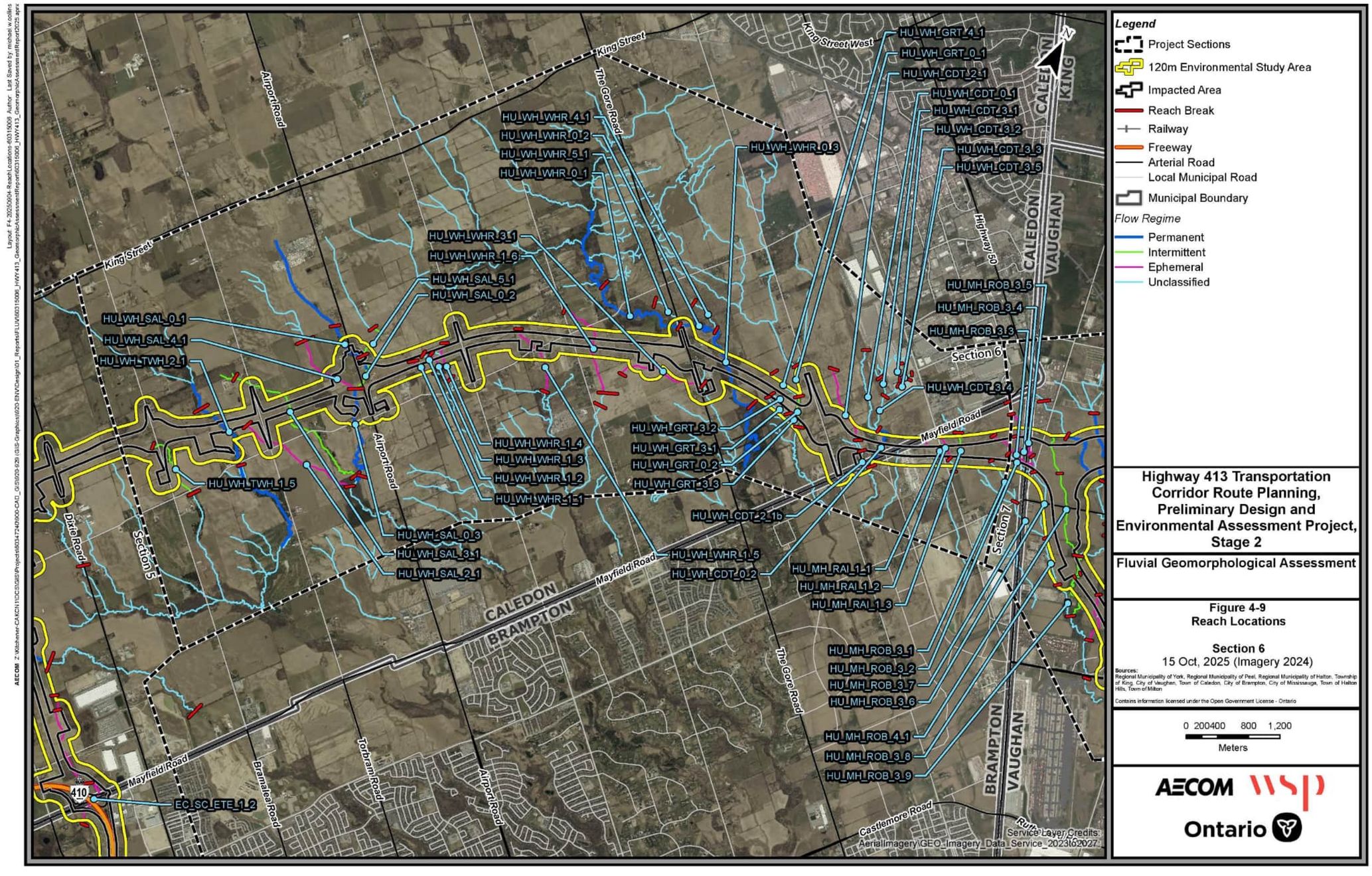


Figure 4-10: Fluvial Geomorphology Investigations Section 7

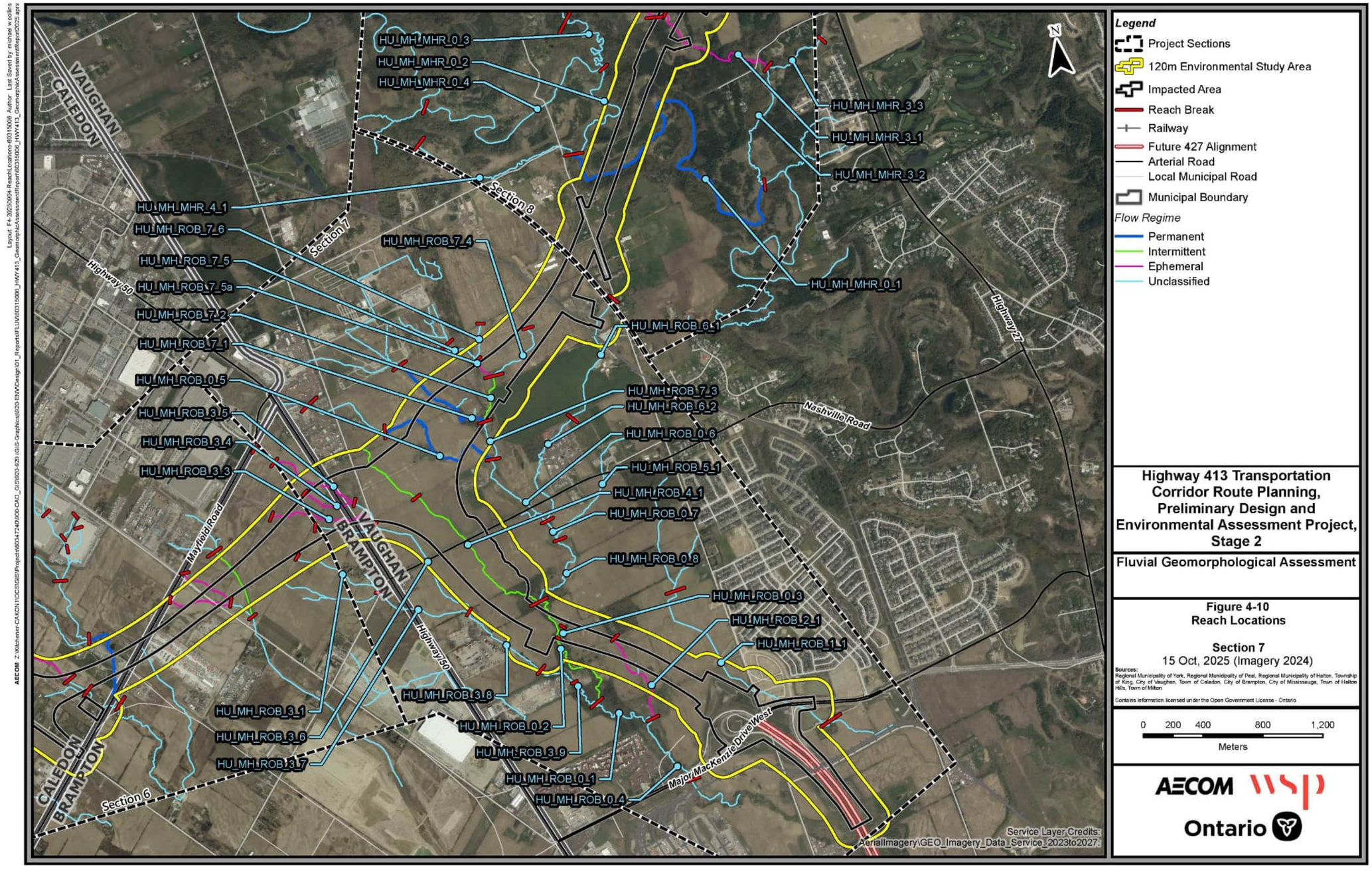


Figure 4-11: Fluvial Geomorphology Investigations Section 8

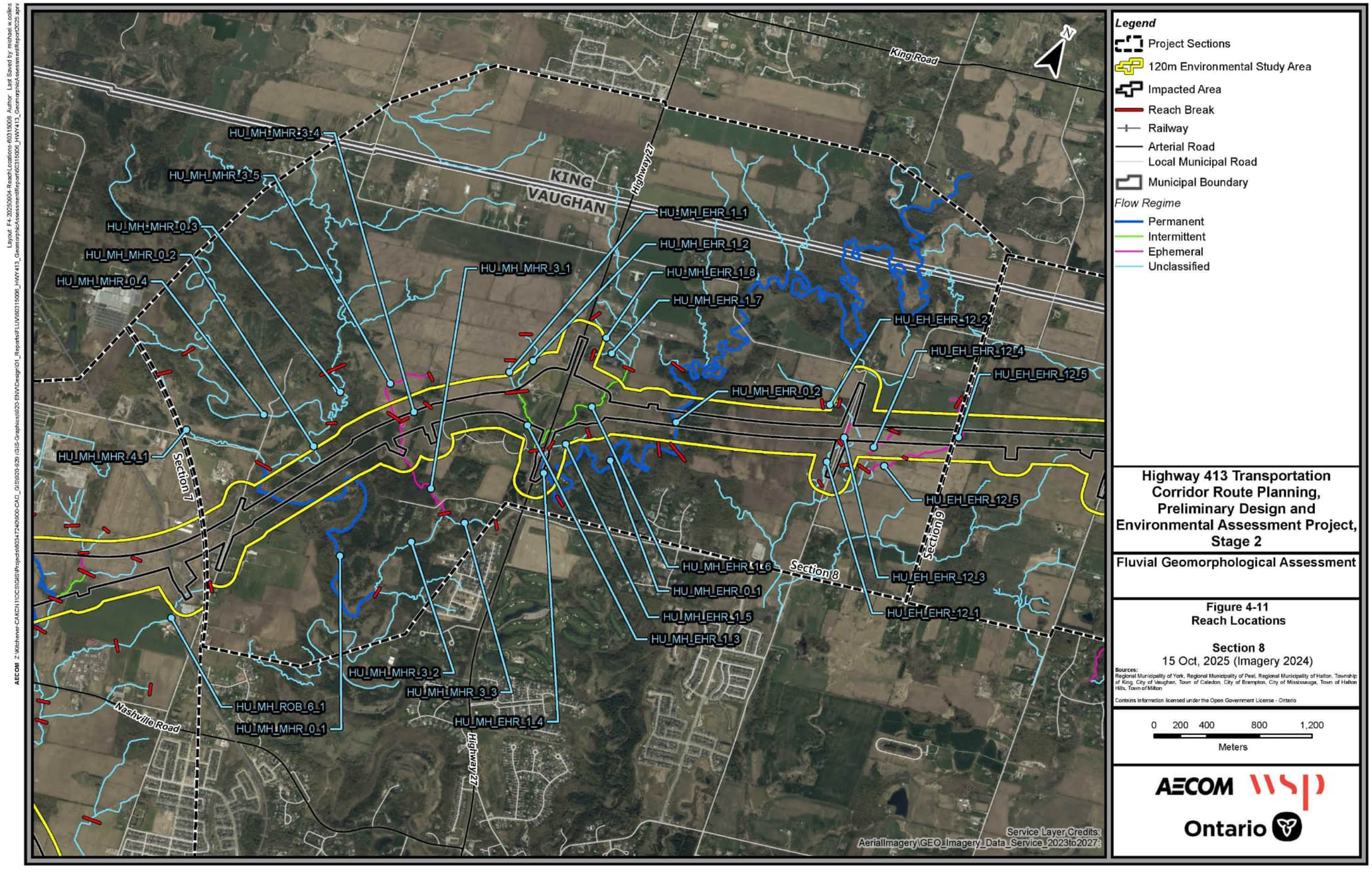
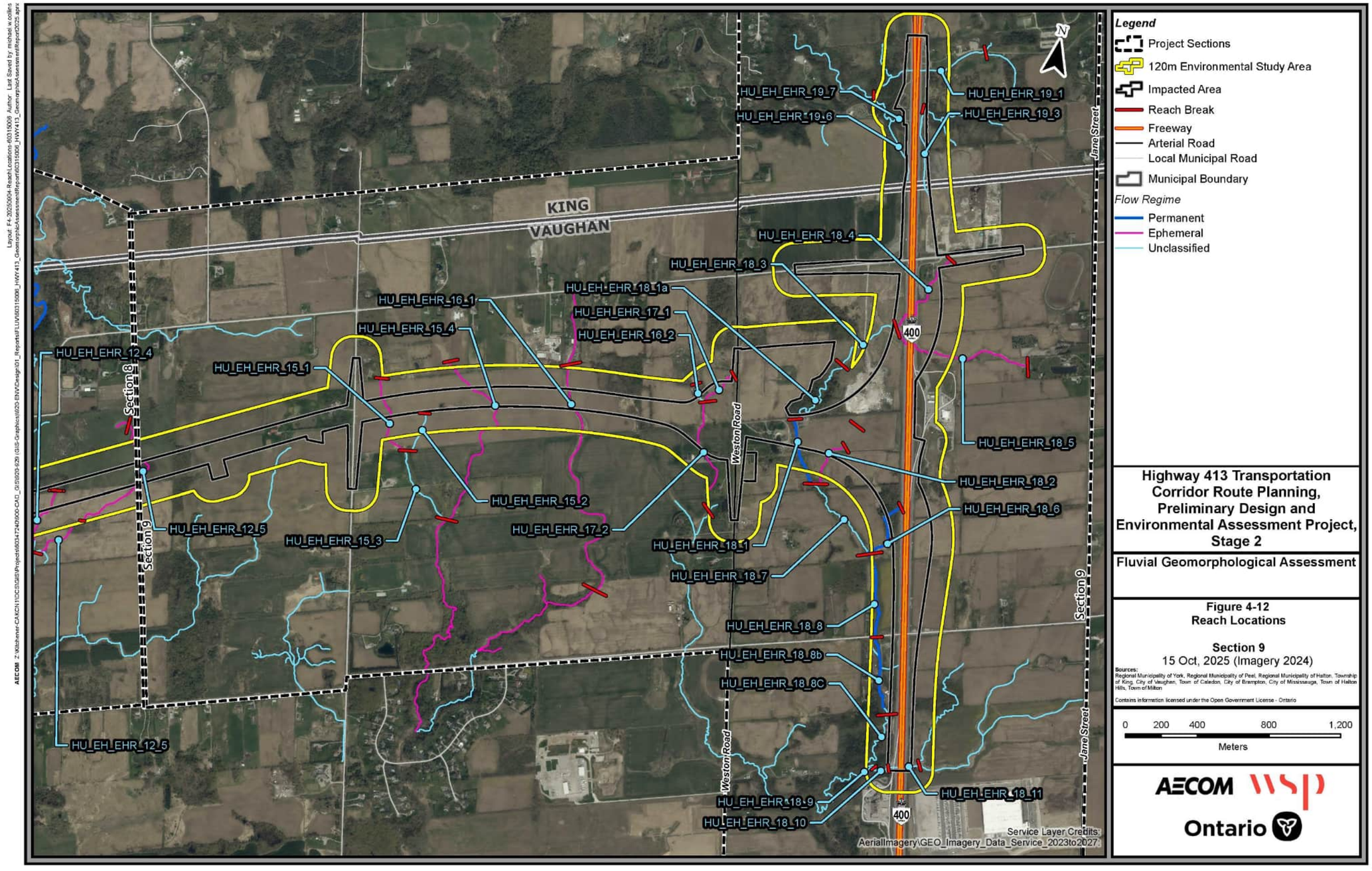


Figure 4-12: Fluvial Geomorphology Investigations Section 9



Note that fluvial geomorphology and aquatic ecology disciplines delineate reaches using similar principles of physical homogeneity, but objectives, and therefore, indicators differ. This can lead to variations in reach breaks between fluvial and aquatic assessments. Fluvial geomorphic reaches are defined based on channel form, function, and processes, with an emphasis on controlling geomorphic factors such as discharge and slope, as well as modifying influences such as vegetation, to group sections that behave similarly from a stability and erosion perspective. In contrast, aquatic reach delineation places greater emphasis on habitat characteristics and fish community considerations, including in-stream vegetation, and features that influence fish passage such as barriers, dams, waterfalls, and road crossings. As a result, aquatic reaches may be subdivided more frequently around ecological or connectivity features, while fluvial geomorphic reaches may encompass longer sections reflecting consistent geomorphic behaviour. These differing but complementary approaches explain minor discrepancies in reach boundaries.

4.2 Field Assessment

Fluvial geomorphological site investigations were conducted throughout the 2020 to 2024 field work seasons. In addition to confirming the findings of the historical and desktop analysis, the purpose of these field assessments is to characterize the dominant geomorphic processes occurring in the reaches that will be affected by the proposed highway thereby defining the existing conditions for each watercourse reach. Field staff walked along the accessible portions of each reach during the assessment and, when possible, visited the site of the proposed crossing location. It was beyond the scope of this investigation to collect detailed geomorphic data for reaches within the Study Area that will not cross or be within the grading limits of the proposed highway system.

4.2.1 Geomorphological Reach Characterization

During field reconnaissance, the reach breaks identified in the desktop analysis (refer to **Section 4.1.3**) were verified or adjusted accordingly, and detailed notes were taken regarding channel characteristics and geomorphic processes occurring along the reach. This included identifying the hydraulic regime, channel definition, channel dimensions including bankfull width and depth for all defined channels, substrate sizing, channel gradient, bank height and material, in-stream and riparian vegetation, channel hardening, and local channel disturbances like evidence of erosion, collection of woody debris, human activities such as farming, or pre-existing structures such as culverts or

bridges. A full description of each reach assessed, and the date of the assessment is available in **Appendix B**. Note that **Appendix B** also includes reaches that were assessed in the early stages that are no longer projected to cross the preferred alignment.

A photographic record (**Appendix C**) was also created to document channel dimensions, bank and bed materials, riparian vegetation, valley walls, and floodplain dynamics. Locations of geomorphological importance and the date each photograph was taken were also photographed including bank erosion sites, channel modifications, and woody material within the watercourse.

4.2.2 Scope of Field Reconnaissance

4.2.2.1 Hydraulic Flow Regime

Watercourse reaches were classified according to a high-level flow regime assessment (refer to **Figure 4-4** to **Figure 4-12**), defined as follows:

1. **Permanent Watercourse** – maintains continuous surface flows most years, well-defined, low-flow.
2. **Intermittent Watercourse** – water flows for several months during the year, typically during the spring and early summer when the water table is high, and late fall; these watercourses have a defined high-flow channel with a poorly defined or absent low-flow channel.
3. **Ephemeral Watercourse** – water flows for a short period of time primarily in response to snow melt (spring freshet) or storm events, typically lack clearly defined high or low-flow channel or sorting of substrate. Frequently occur as vegetated swales or bare soil rills in agricultural fields where they are often ploughed through.

It should be noted that for the purposes of this assessment, the likely hydraulic flow regime was based on the results of the field assessment and aerial imagery analysis. It does not constitute multiple site visits at different times of the year.

4.2.2.2 Channel Definition

While the nuances of a given channel's form are determined by site-specific influences, all streams with well-defined channel forms generally self-develop through shear-related processes rather than external controls such as vegetation. Channel form is intimately

and intricately associated with channel morphology or boundary material resistance, the physical characteristics of the sediment load, and stream energy (specific stream power) (Aquafor Beech 2006).

Results of the field program revealed a diversity of channel forms within the Highway 413 Study Area, ranging from undefined channels that coincide with moist soil conditions, to well-defined channels that are actively incising into the landscape. Additionally, numerous channels had been artificially modified either through historic straightening, or by agricultural cultivation practices. A summary of the types of channel forms noted in the field and their associated characteristics are summarized in **Table 4-3**.

For all defined watercourses where accessibility was granted, a more detailed geomorphic investigation was completed. This consisted of collecting rapid cross-sections and conducting Rapid Geomorphic Assessments, the procedures followed are outlined below. Detailed cross-sections and RGAs were not collected for undefined features.

4.2.2.3 Rapid Cross-sections

Cross-sections were measured for the defined reaches to identify bankfull channel dimensions as close to the proposed crossing location as possible. The number of cross-sections measured along the reach varied per site and typically depended on the length of the channel within the property boundary where access was granted. Cross-sections were measured using a five-point system to record the top of the bankfull channel, the bank toes, and channel thalweg, using a tape measure attached beyond the top of the banks using pins/nails. Measurements of channel depth were recorded using a metre stick at the five points mentioned above, and the measuring tape served as the local datum.

The following parameters were calculated for each defined reach:

1. **Bankfull Channel Width** – the width of the bankfull channel measured at a section perpendicular to streamflow.
2. **Mean Bankfull Depth** – The mean depth of the bankfull channel measured at a section perpendicular to streamflow.
3. **Maximum Bankfull Depth** – The maximum depth of the bankfull channel measured at a section perpendicular to streamflow.

Table 4-3: Summary of Channel Form

Class	Definition
Undefined	■ Reaches classified as undefined included those which did not exhibit channel banks. Hydraulic and site conditions were insufficient to enable channel initiation to occur. These features were visible in the landscape only by spatial differences in soil moisture conditions leading to mottling of soils and/or providing some indication of surface flow (i.e., loss of crop along around the feature). Undefined features are often situated in slight topographic lows and were integrated into the landscape (i.e., cultivation occurred directly through the feature). These drainage features are most often ephemeral or contain no surface flow. It is likely that during periods of high surface runoff, these features become an extension of the more active drainage network, contributing both sediment and water to the downstream watercourse. ■ These reaches lack defined beds and banks but do perform a geomorphic function through the conveyance of flow and sediment.
Poorly Defined	■ Poorly defined reaches were often associated with small drainage features that did not exhibit defined banks or bed morphology. These features were identified in the field due to other indicators including: • Bare soil within an otherwise vegetated area • Dried or cracked soil, indicative of previous flow or standing water • Accumulation of “clean” pebbles/small gravel in general configuration as drainage direction • Subtly defined banks • Presence of moisture or standing water but not associated with any channel form within vegetated areas ■ Poorly defined watercourses can be integrated into the landscape and cultivated. Due to soil moisture conditions or occasional flow, the success of plantings within the drainage feature can be compromised. Poorly defined watercourses, similar to undefined watercourses, appear to lack the energy conditions necessary to define a channel.
Defined	■ Watercourses were classified as “defined” when channel banks were clearly discernible in the field, indicative of a concentration of flow. Features within the channel also provided an indication of flow and a shear-dominated flow regime. Even within very small defined drainage features, a subtle bed morphology could sometimes be discerned. In other cases, some spatial sorting of grain size and/or a “thalweg” could be identified. ■ Defined watercourses can range in dimensions and if sufficiently small, could be cultivated through regular land use practices, but the success of plantings within the channel is typically compromised. If the channels are larger, then a vegetative buffer might be established around them. The presence of measurable banks indicates that flow through these channels is sufficient to erode and transport sediment. ■ A defined channel section can occur along an otherwise undefined or poorly defined reach and coincide with the presence of vegetation (i.e., grassy hedgerow) and tile drains, suggesting that local effects could alter channel-forming processes.
Heavily Modified	■ The “heavily modified” classification refers to channels that have been straightened, typically in conjunction with agricultural activity. The capacity of the channels is often greater than necessary to convey “bankfull” flows from the Study Area and is intended to reduce flooding of adjacent fields. Where tile drains are present, these then are discharged into the channel. Periodic maintenance of heavily modified reaches may occur to maintain conveyance capacity (i.e., reduce flooding potential on the landscape). In heavily modified channels that have a low gradient and small surface flows, vegetation typically establishes within them and chokes the channel. Bed morphology may or may not become established within the heavily modified channel. Where heavily modified channels convey sufficient flows and are not maintained a defined low-flow channel may develop within the larger channel form. That is, since channels are rarely straight in nature, given time and opportunity, watercourses will work toward regaining a natural configuration that is in balance with the factors that determine channel form.

Bank characteristics such as the extent of undercutting, the presence and type of bank vegetation, and substrate composition, were also noted in the rapid sections. All accessible portions of the reach were walked to confirm the cross-section measurements were accurate and representative of the reach. The measurements collected help inform meander belt sizing and will be used to determine the appropriate crossing structure sizing.

4.2.3 Rapid Geomorphic Assessment

Rapid Geomorphic Assessments (RGAs) were completed to document any evidence of channel instability and to identify the major geomorphological and sedimentological conditions occurring within each reach. Streams seek a state of dynamic equilibrium between the imposed conditions of valley slope, discharge, and sediment supply. Over time the channel will adjust in terms of width, depth, velocity, slope, roughness, and sediment supply to attempt to reach this dynamic equilibrium (Lane 1955). A channel is in equilibrium when neither aggradation nor degradation occurs. Changes due to human activity, and climate change such as extreme weather events interfere with this equilibrium, and markers of channel instability can be identified during the site investigation.

The Rapid Geomorphic Assessment (RGA) was designed by the Ontario Ministry of the Environment, Conservation and Parks (MECP) (1999) to assess stream reaches in urban environments. This technique uses visual indicators to document evidence of channel instability using a presence-or-absence approach. Stability is determined by adjustments in slope, either an increase (aggradation) due to sediment deposition or a decrease (degradation) due to bed erosion. It also considers an increase in the bank-to-bank width (widening) and evidence indicating adjustment in the planimetric form regime. The geomorphic indicators are documented throughout the reach and tallied by category. These data are then used to calculate an overall reach stability index which classifies the reach as ‘stable’, ‘transitional’, or ‘in adjustment’, corresponding to their relative sensitivity to altered sediment and flow regimes. The classification and interpretation as defined by the factor value (total score) are identified in **Table 4-4** (MECP 2003).

Table 4-4: Reproduction of Table C.2 from MECP 2003. Rapid Geomorphic Assessment Criteria

Vector Value	Classification	Interpretation
≤ 0.20	In Regime or Stable (Least Sensitive)	Channel morphology is within a range of variance for streams of similar hydrographic characteristics – evidence of instability is isolated or associated with normal river propagation processes.
0.21 – 0.40	Transitional or Stressed (Moderately Sensitive)	Channel morphology is within the range of variance for streams of similar hydrographic characteristics, but the evidence of instability is frequent.
≥ 0.41	In Adjustment (Most Sensitive)	Channel morphology is not within a range of variance and evidence of instability is widespread.

4.2.4 Rapid Geomorphic Assessment Results

A Rapid Geomorphic Assessment was completed for all defined watercourses that cross the preferred alignment within the Study Area. Undefined watercourses were not ranked using the Rapid Geomorphic Assessment classification system because they typically lack the energy to "scour a distinct channel except on steep slopes" (Irwin et al. 2013). Therefore, they lack key visible features that are required for an RGA. Detailed field notes were collected for undefined watercourses within the Study Area instead, noting key features like whether vegetation is present or whether there are short sections that are more defined or that display minor evidence of erosion. The results are presented below in **Table 4-5**.

The Rapid Geomorphic Assessment ranks the stability of watercourses based on four channel processes and then averages the values to define an overall stability index. These four processes are (1) aggradation, (2) degradation, (3) widening, and (4) planimetric form adjustment. The factor values are markers of instability in a watercourse.

Aggradation and degradation are influenced by discharge, sediment load, morphological characteristics and changes in flow regime. Aggradation occurs due to the building up of streambed elevation through sediment deposition. This happens when the channel can no longer transport the sediment load and velocity, and shear stresses fall below the entrainment and transport capacity (for a given discharge and slope). Sources of sediment typically come from upstream erosional areas or agricultural practices with sparse riparian buffers around the watercourse. Conversely, degradation occurs when the bed is actively eroding and incising, leading to an overall decrease in channel bed elevation.

Channel widening occurs when channel banks become unstable causing them to fall. This typically occurs due to changes in flow regime, and results in the channel enlarging beyond its historic margins. Over widened cross-sections have the potential to become disconnected from their floodplains which could result in larger flows being contained within the channel which exert larger erosive forces on the channel boundary. Widening and degradation of the channel result in bank failure and cause the slumped bank material to be deposited into the watercourse.

Channel planform adjustment occurs when a channel actively changes its shape due to meander migration, channel straightening or increasing sinuosity, changing from a single channel to multiple channels, or due to channel cut offs. This indicates that the watercourse may not be stable and is responding to changes in flow, sediment supply, vegetation, valley constraints, or a combination of these.

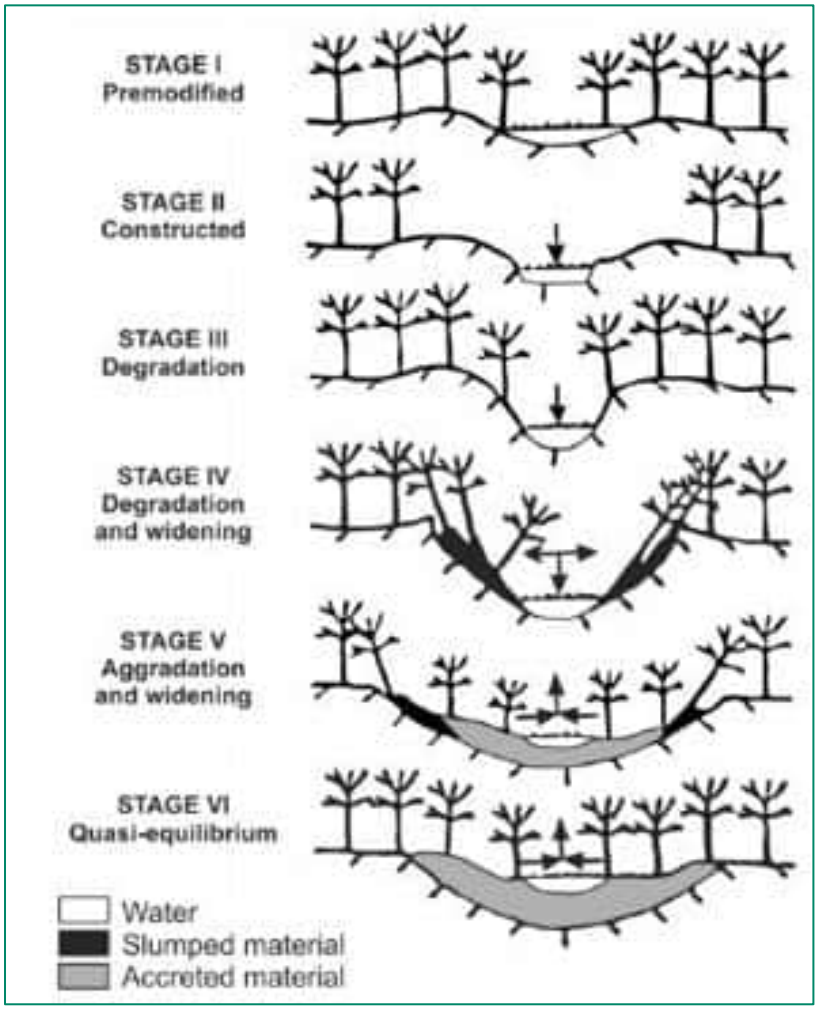
Watercourses aim to achieve a state of equilibrium. Changes to the surrounding lands such as those that result from urbanization or from anthropogenic watercourse alterations (e.g., to accommodate agricultural practices or to reroute a watercourse) can impact watercourse processes. Small changes can have large impacts on the complex inter-relationships that exist between channel dimensions, patterns, sediment supply, streambed roughness, and stream bed steepness as defined by Lane's Stream Balance Relationship (Lane 1955).

The predominant land use within the Study Area includes rural and agricultural land use with pockets of urban sprawl occurring across the Study Area. General likely sources of instability within the Study Area include:

1. Agricultural practices such as the use of drains to reduce waterlogging conditions during the spring melt and accidental contribution of sediment to surrounding watercourses.
2. Urbanization and transportation network development.
3. Removal of riparian vegetation resulting in loss of shear stress resistance.
4. Alteration of watercourses through natural and/or anthropogenic processes for the purposes of realigning, deepening, and/or altering floodplain connect.
5. "Hardening" of channel banks upstream.
6. Flow of water upstream or downstream of the crossing location through culverts or bridges that are undersized.
7. Use of dams or other flow control devices.
8. Changes in flow rate and/or patterns due to climate change.

Numerous channel evolution models have been developed to provide a simplified depiction of morphologic states through which a river or stream progresses in response to disturbance (**Figure 4-13**). A frequently cited channel evolution model was developed by Booth and Fischenich (2015). This model shows how a watercourse may respond after an initial disturbance (i.e., an increase in discharge). The disturbance results in an imposed imbalance between sediment transport capacity and sediment supply, which leads to incision of the channel bed. Further incision of the watercourse results in mass failure of channel banks, ultimately leading to channel widening and aggradation as the slumped bank material is deposited into the watercourse. The final result is a "reestablishment of a lower, inset floodplain channel system, regarded as the new stable condition" (Booth and Fischenich 2015).

Figure 4-13: The 'Classic' Channel Evolution Model (redrawn from Simonn and Hupp (1986) in Booth and Fischenich (2015)



The results of the Rapid Geomorphic Assessment were used to evaluate the potential future hazard of each proposed crossing structure and to inform crossing design recommendations. Rapid Geomorphic Assessments focused on identifying the following:

1. The overall frequency of evidence of instability (i.e., RGA rating).
2. Dominant processes (i.e., aggradation, degradation, widening, and planimetric form adjustment).
3. Likely source of instability (e.g., whether excess soils in the watercourse were likely due to adjacent agricultural activities or the result of aggradation caused from upstream instability).
4. Equilibrium / disequilibrium state (e.g., can the evidence of aggradation be attributed to the fact that the reach is located at the bottom of the watershed where the capacity of the watercourse to transport sediment is decreased due to changes in slope).

All defined features were assessed in the Highway 413 Study Area. Although a number of reaches adjacent to the Study Area were also assessed in early stages of the Project, they are not included in **Table 4-5**, as they do not cross the proposed highway alignment or are not within the Study Area. The Rapid Geomorphic Assessment results of the additional reaches have been provided in **Appendix B**.

Table 4-5: Rapid Geomorphic Assessment (RGA) Results

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
1	**SM_EB_SIM_0_2**	SM_EB_SIM_0_WC1 EXTENSION	CH	Permanent	0.14	0.2	0.38	0.29	0.25	Transitional or Stressed	■ This reach showed minor evidence of aggradation (siltation in pools), degradation (channel work into undisturbed overburden/bedrock), and more detailed evidence of widening (fallen/leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (formation of chute(s) and poorly formed/ reworked/ removed bar forms). The watercourse has historically been altered due to the creation of Highway 401.
2	**CR_LC_LEV_1_2**	CR_LC_LEV_1_WC2	CVC	Intermittent	0	0	0	0.14	0.04	In Regime	■ Feature shows almost no signs of instability. The only sign observed was evidence of planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	CR_LC_LEV_2_2	No proposed crossing ID. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	CVC	Intermittent	0	0	0.38	0.14	0.13	In Regime	■ CR_LC_LEV_2_2 displayed signs of planimetric form adjustment (bar forms poorly formed/ removed/ reworked) as well as evidence of widening (fallen/ leaning trees/ fence posts, exposed tree roots, and basal scour on both sides of channel through riffle.
	CR_LC_LEV_2_4	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.1	CVC	Intermittent	0	0	0	0.29	0.07	In Regime	■ The only signs of instability observed include evidence of planimetric form adjustment (bar forms poorly formed/ reworked/ removed and evolution of a single thread channel to multiple channels).
	CR_LC_LEV_0_2	CR_LC_LEV_0_WC2	CVC	Permanent	0.57	0.2	0.38	0.29	0.36	Transitional or Stressed	■ This reach displayed signs of aggradation (lobate bar, coarse material in riffle embedded, siltation in pools, and poor longitudinal sorting of bed materials), degradation (channel worn into undisturbed overburden/ bedrock), widening (fallen/ leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (evolution of single thread channel to low bed form relief, and bar forms poorly formed/ reworked/ removed).
	CR_LC_LEV_0_1	CR_LC_LEV_0_WC2	CVC	Permanent	0.29	0	0.38	0.14	0.2	In Regime (low Transitional or Stressed)	■ The reach displayed evidence of aggradation (siltation in pools and deposition in the overbank zone), widening (fallen/ leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	CR_NP_CRR_0_2	CREDIT RIVER BRIDGE	CVC	Permanent	0	0.2	0.13	0.14	0.12	In Regime	■ The reach showed minor evidence of aggradation (suspended armor layer visible in bank), widening (exposed tree roots), and degradation (bar forms poorly formed/ reworked/ removed).
	CR_NP_CRR_0_1	CREDIT RIVER BRIDGE	CVC	Permanent	0.14	0.2	0.25	0.29	0.22	Transitional or Stressed (borders Stable)	■ Evidence of instability included aggradation (poor longitudinal sorting of bed materials), degradation (suspended armor layer visible), widening (fallen/ leaning trees/ fence posts and exposed tree roots), and planimetric form adjustment (thalweg alignment out of phase with meander geometry and bar forms poorly formed/ reworked/ removed).

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
3	**EC_EH_ETW_13_1**	EC_EH_ETW_13_WC1	TRCA	Intermittent	0	0	0.13	0.14	0.07	In Regime	■ Only minor evidence of widening (exposed tree roots) and planimetric form adjustment (bar forms poorly formed/ reworked/removed) were observed.
	CR_GW_CRR_15a	No Proposed Crossing	CVC	Permanent	0.14	0.13	0.13	0.14	0.13	In Regime	■ The reach displayed evidence of aggradation (siltation in pools), degradation (scour pool downstream of a culvert), channel widening (basal scour on both sides of the channel through riffles), and planimetric form adjustment (lack of bar forms). The channel is artificially straightened and influenced by nearby agricultural activities. It is entrenched with no access to the floodplain above bankfull. The watercourse includes multiple culverts near the upstream end.
	CR_GW_CRR_15b	CR_GW_CRR_15_WC2.1	CVC	Permanent	/	/	/	/	/	/	■ RGA not completed due to no permission to enter (PTE).
4	**EC_EH_ETW_12_3**	EC_EH_ETW_12_WC1	TRCA	Ephemeral to Intermittent	0	0	0.13	0.14	0.07	In Regime	■ The channel is poorly defined and borders the ephemeral/intermittent classification. The feature is an agricultural drain. Cannot get adequate RGA.
	EC_EH_ETW_7_2	EC_EH_ETW_7_WC3	TRCA	Intermittent	0	0	0	0.14	0.04	In Regime	■ The reach only displayed minor evidence of planimetric form adjustment in the form of poorly formed/reworked/removed bar forms.
	EC_EH_ETW_6_1	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	TRCA	Intermittent	0	0	0.38	0.14	0.13	In Regime	■ The reach displayed evidence of aggradation in the form of fallen/leaning trees/fence posts/etc., occurrence of large organic debris, and exposed tree roots. It also displayed minor evidence of planimetric form adjustment as poorly formed bar forms/ bar forms that were reworked/ removed.
	EC_EH_ETW_6_4	EC_EH_ETW_6_WC3	TRCA	Ephemeral to Intermittent	/	/	/	/	/	/	■ Poorly defined. Only defined for the last 50 to 60 m of reach.
	EC_EH_ETW_1_1	EC_EH_ETW_1_WC1	TRCA	Permanent	0	0	0.38	0.29	0.17	In Regime	■ The reach was assessed twice. To the west of the crossing location the reach showed evidence of widening in the form of falling/leaning trees and fence posts, collections of large organic debris, and exposed tree roots. It also showed evidence of planimetric form adjustment including the evolution of a single thread channel into multiple channels, and poorly formed, reworked, or removed bar forms.
					0	0.17	0.25	0.14	0.14	In Regime	■ To the east of the crossing location, the reach showed more evidence of degradation in the form of a scour pool downstream of a culvert, as well as evidence of widening (occurrence of large organic debris, exposed tree roots), and planimetric form adjustment (poorly formed, reworked, or removed bar forms).
	EC_EH_ETW_1_5	EC_EH_ETW_1_WC3	TRCA	Permanent	0	0.60	0.50	0.29	0.35	Transitional or Stressed	■ Evidence of instability included degradation (cut face on bar forms, head cutting due to knick point migration and channel worn into undisturbed overburden/bedrock), widening (fallen/ leaning trees/ fence posts, the occurrence of large organic debris, exposed tree roots, and length of basal scour > 50% through subject reach), and planimetric form adjustment (evolution of single thread channel to multiple channel and bar forms poorly formed/reworked/removed).

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
5	**EC_EH_ETW_1_7**	EC_EH_ETW_1_WC5	TRCA	Permanent	0.14	0.25	0.57	0.14	0.28	At crossing: Transitional or Stressed	■ Reach EC_EH_EWT_1_7 was assessed at the proposed crossing location and downstream of the proposed crossing location. At the proposed crossing location the reach received a score of Transitional/ Stressed and displayed evidence of aggradation (siltation in pools), degradation (head cutting due to knick point migration), widening (fallen/leaning trees/ fence posts, occurrence of large organic debris, exposed tree roots, and basal scour on both sides of channel through riffle), and planimetric form adjustment (bar forms poorly formed/ reworked/ removed). A beaver dam was noted near the crossing location that clearly impacted the stability of the reach.
					0.71	0.4	0.5	0.14	0.44	Downstream of proposed crossing: In Adjustment	■ Downstream of the crossing, the reach received a rating of “In Adjustment” and had much more prominent evidence of aggradation (coarse material in riffle embedded, siltation in pools, medial bars, poor longitudinal sorting of bed material, and deposition in overbank zone) likely due to the slower water speeds caused by the beaver dam. The feature also showed more prominent signs of degradation (head cutting due to knick point migration and channel work into undisturbed bedrock), and evidence of widening and planimetric form adjustment identical to the evidence at the crossing location.
	EC_EH_ETW_1_11	EC_EH_ETW_1_WC8	TRCA	Permanent	0.5	0	0.43	0.29	0.3	Transitional or Stressed	■ Reach EC_EH_ETW_1_11 showed evidence of aggradation (coarse material in riffle embedded, siltation in pools, poor longitudinal sorting of bed materials, and deposition in overbank zone), widening (fallen/ leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (formation of chute(s) and bar forms poorly formed/ reworked/ removed) and received a rating of Transitional/Stressed.
	EC_EH_ETW_1_12	EC_EH_ETW_1_WC10	TRCA	Permanent	0	0	0.3	0.14	0.11	In Regime	■ Reach EC_EH_ETW_1_12 only showed evidence of widening (fallen/ leaning fence posts, occurrence of large organic debris, and exposed tree roots) and planimetric form adjustment (bar forms poorly formed/ reworked/ removed) and was rated In Regime.
	HU_WH_CAC_0_1	HU_WH_CAC_0_WC1	TRCA	Permanent	0.29	0	0.13	0.14	0.14	At proposed Crossing: In Regime	■ Reach HU_WH_CAC_0_1 was assessed at the crossing location and upstream of the crossing location. At the crossing location, the reach was classified as “In Regime” and displayed minor evidence of aggradation (siltation in pools, poor longitudinal sorting of bed materials), widening (basal scour on inside of meander bends) and planimetric form adjustment (bar forms poorly formed/ reworked/ removed). Overall, at the crossing location, the feature appeared stable.

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
					0.43	0	0.43	0.14	0.25	Upstream of proposed crossing: Transitional or Stressed	■ Upstream of the crossing location the feature was classified as being in a Transitional/ Stressed state and displayed evidence of aggradation (coarse material in riffle embedded, siltation in pools, poor longitudinal sorting of bed materials), widening (fallen/ leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	HU_WH_CAC_0_2a	HU_WH_CAC_0_WC2	TRCA	Permanent	0.14	0	0.38	0.14	0.17	In Regime	■ Reach HU_WH_CAC_0_2a was rated as In Regime and showed only minor signs of aggradation (coarse material in riffle embedded), widening (fallen/ leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	HU_WH_TWH_1_2	HU_WH_TWH_1_WC2.3	TRCA	Intermittent	0.29	0	0	0.14	0.11	In Regime	■ Reach HU_WH_TWH_1_2 displayed evidence of aggradation (siltation in pools and poor longitudinal sorting of bed materials) and planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	HU_WH_TWH_1_4	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	TRCA	Intermittent	0.14	0	0	0.29	0.11	In Regime	■ Reach HU_WH_TWH_1_4 displayed minor evidence of aggradation (siltation in pools) and evidence of planimetric form Adjustment (thalweg out of phase with meander geometry and bar forms poorly formed/ reworked).
6	**HU_WH_TWH_1_5**	HU_WH_TWH_1_WC8.1	TRCA	Intermittent	0.14	0	0	0.29	0.11	In Regime	■ HU_WH_TWH_1_5 displayed evidence of aggradation (coarse material in riffle embedded and siltation in pools) as well as widening (fallen/leaning trees/ fence posts and occurrence of large organic debris), and planimetric form adjustment (bar forms poorly formed/reworked/removed). The feature has likely been altered by human activities, especially upstream of the crossing location where a permanent roughly 30 m wide pond occurs. Further upstream of the crossing location, the feature has a more ephemeral-type hydraulic regime.
	HU_WH_TWH_2_1	HU_WH_TWH_2_WC1	TRCA	Permanent	0.14	0.17	0.38	0.14	0.21	Transitional or Stressed (borders Stable)	■ HU_WH_TWH_2_1 displayed evidence of aggradation (siltation in pools), degradation (scour pools downstream of culvert/ storm sewers), widening (fallen/leaning trees/ fence posts, the occurrence of large organic debris, and exposed tree roots), and planimetric form adjustment (bar forms poorly formed/ reworked).
	HU_WH_SAL_5_1	HU_WH_SAL_0_1	TRCA	Intermittent	/	/	/	/	/	/	■ RGA not collected in the field.
	HU_WH_SAL_3_1	HU_WH_SAL_3_1	TRCA	Intermittent	0.14	0	0	0.14	0.07	In Regime	■ HU_WH_SAL_3_1 displayed minor evidence of aggradation (siltation in pools) and planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	HU_WH_SAL_0_3	Realignment has negated need for crossing	TRCA	Permanent	0.14	0	0.25	0.29	0.17	In Regime	■ HU_WH_SAL_0_3 displayed evidence of aggradation (coarse material in riffle embedded) and planimetric adjustment (formation of chute(s), bar forms poorly formed/ reworked/ removed), as well as evidence of widening (exposed tree roots, basal scour on both sides of the channel through riffle).

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
	HU_WH_SAL_0_2	HU_WH_SAL_0_2	TRCA	Intermittent	0.29	0	0.25	0.29	0.21	Transitional or Stressed (borders Stable)	■ Reaches HU_WH_SAL_0_2 (also called SC-1) and HU_WH_SAL_0_1 (also called SC-2) were assessed in 2018 as part of the Airport Road widening plan completed for the Region of Peel (AECOM 2019) and by Parish Geomorphic Ltd. in 2014. The 2014 and 2018 assessments identified that both reaches were classified as being in a Transitional state. ■ The 2018 study noted that HU_WH_SAL_0_2 was experiencing minor erosion and slumping, and a large pool had developed due to the backwater effect created by a rise in bed elevation downstream of the existing crossing under Airport Road. In the assessment for this report, HU_WH_SAL_0_2 still received a Transitional or Stressed rating, but the rating now borders on In Regime. Evidence of aggradation included siltation in pools and poor longitudinal sorting of bed materials. Evidence of widening included fallen/leaning trees and/or fence posts, and evidence of planimetric form adjustment included the evolution of a single thread channel to multiple channels, and poorly formed/reworked/removed bar forms.
	HU_WH_SAL_0_1	Realignment has negated need for crossing	TRCA	Permanent	0.14	0	0	0.14	0.07	In Regime	■ Reaches HU_WH_SAL_0_2 (also called SC-1) and HU_WH_SAL_0_1 (also called SC-2) were assessed in 2018 as part of the Airport Road widening plan completed for the Region of Peel (AECOM 2019) and by Parish Geomorphic Ltd. in 2014. The 2014 and 2018 assessments identified that both reaches were classified as being in a Transitional state. The 2018 study of HU_WH_SAL_0_1 noted that the bed morphology was poorly defined. In updated assessment for the report HU_WH_SAL_0_1 received a rating of “In Regime”, indicating that it is now stabilizing after the Airport Road widening Project. The new assessment identified only minor evidence of instability including poor longitudinal sorting of bed materials and poorly formed/reworked/removed bar forms.
	HU_WH_WHR_0_2	HU_WH_WHR_0_2	TRCA	Permanent	0.14	0	0.5	0.14	0.2	In Regime (borders Transitional)	■ Reach HU_WH_WHR_0_2 contained minor evidence of aggradation (siltation in pools) and planimetric form adjustment (bar forms poorly formed/reworked/removed), as well as more abundant evidence of widening (fallen/ leaning trees/ fence posts, the occurrence of large organic debris, exposed tree roots, and fracture lines along the top of bank).

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
	HU_WH_WHR_0_3	HU_WH_WHR_0_3	TRCA	Permanent	0.29	0	0.25	0.14	0.17	In Regime Upstream of crossing	■ Reach HU_WH_WHR_0_3 was assessed in two locations. Upstream of the proposed crossing location, the reach received a rating of “In Regime”, while the assessment at the crossing location was classified as “In Adjustment”. ■ There was abundant evidence of instability at the crossing location and an abandoned beaver dam. There was evidence of aggradation (coarse material in riffle embedded, siltation in pools, poor longitudinal sorting of bed materials, and deposition in overbank zone), and widening (fallen/ leaning trees/ fence posts, occurrence of large organic debris, exposed tree roots, basal scour on inside of meander bends, basal scour on both sides of channel through riffle, and fracture lines along the top of the bank). The feature also showed minor evidence of degradation (suspend armor layer visible in the bank and channel worn into undisturbed overburden/ bedrock), and planimetric form adjustment (evolution of single thread channel to multiple channels, and bar forms poorly formed/reworked/removed).
					0.57	0.4	0.75	0.29	0.5	In Adjustment at crossing	
	HU_WH_GRT_0_1	No proposed crossing ID	TRCA	Intermittent	0.29	0.17	0	0.29	0.18	In Regime	■ This altered reach displayed evidence of aggradation (siltation in pools and poor longitudinal sorting of bed materials), degradation (scour pools downstream of culverts), and planimetric form adjustment (thalweg out of phase with meander geometry and bar forms poorly formed, reworked or removed). Anthropogenic alterations to the feature can be a constraint for accurate RGA results.
	HU_WH_GRT_0_2	HU_WH_GRT_0_1, HU_WH_GRT_0_2	TRCA	Intermittent	0.29	0	0.25	0.29	0.21	Transitional or Stressed	■ Reach HU_WH_GRT_0_2 displayed evidence of aggradation (siltation in pools and poor longitudinal sorting of bed materials), widening (occurrence of large organic debris and exposed tree roots), and planimetric form widening (evolution of single thread channel to multiple channel and bar forms poorly formed/reworked/removed).
	HU_WH_CDT_2_1b	No Proposed Crossing	TRCA	Permanent	0.29	0.14	0.11	0.14	0.17	In Regime	■ The reach displayed evidence of aggradation (siltation in pools and poor longitudinal sorting of bed material), degradation (scour pool downstream of a culvert), channel widening (fracture lines along the top of the bank), and planimetric form adjustment (poorly formed bar forms). During the assessment, the culvert outlet under Mayfield Road could not be located and is likely buried. The localized bank erosion downstream of Mayfield Road was observed, attributed to recent construction activities. The reach also includes a culvert crossing beneath a residential driveway, which may influence flow dynamics and sediment transport. Instream vegetation was present on the day of the assessment.

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
	HU_WH_CDT_0_2	HU_WH_CDT_0_1	TRCA	Permanent	0.14	0	0.25	0.29	0.17	In Regime	■ The assessment was performed downstream from the Study Area where it displayed only minor evidence of instability including evidence of widening (exposed tree roots) and planimetric form widening (formation of chutes and bar forms poorly formed/ reworked/ removed).
	HU_MH_RAI_1_3	HU_MH_RAI_1_3_1	TRCA	Intermittent	0.29	0	0	0.14	0.11	In Regime	■ Reach HU_MH_RAI_1_3 displayed minor evidence of instability including aggradation (coarse material in riffle embedded and siltation in pools), and planimetric form adjustment (bar forms poorly formed/reworked/removed).
7	**HU_MH_ROB_0_2**	HU_MH_ROB_0_5	TRCA	Intermittent	0.67	0	0.38	0.43	0.37	Transitional or Stressed	■ Reach HU_MH_ROB_0_2 had evidence of aggradation (coarse material in riffle embedded and siltation in pools), widening (fallen/leaning trees/ fence posts, occurrence of large organic debris, and exposed roots), and planimetric form adjustment (formation of chute(s), cut-off channel(s), and poorly formed/ reworked/ removed bar forms).
	HU_MH_ROB_0_3	HU_MH_ROB_0_5	TRCA	Intermittent	0	0	0.38	0.14	0.13	In Regime	■ HU_MH_ROB_0_3 showed minor signs of widening (fallen/leaning trees/ fence posts, occurrence of large organic debris, and exposed tree roots) and planimetric form adjustment (poorly formed/ reworked/ removed bar forms).
	HU_MH_ROB_0_5	HU_MH_ROB_0_1, HU_MH_ROB_0_2, HU_MH_ROB_0_4	TRCA	Permanent	0.29	0.2	0.38	0.29	0.29	Transitional or stressed	■ Evidence of instability in HU_MH_ROB_0_5 included evidence of aggradation (coarse material in riffle embedded and siltation in pools), degradation (head cutting due to knick point migration), widening (basal scour on inside of meander bends, on both sides of the channel through riffle, and through more than 50% of the subject reach), and planimetric form adjustment (evolution of single thread channel to multiple channel and poorly formed/reworked/removed bar forms).
	HU_MH_ROB_7_1	HU_MH_ROB_0_1, HU_MH_ROB_0_2, HU_MH_ROB_0_4	TRCA	Permanent	0.29	0	0.25	0.14	0.17	In Regime	■ HU_MH_ROB_7_1 showed signs of widening (basal scour on the inside of meander bends and fracture lines along the top of the bank) and planimetric form adjustment as well as minor evidence of aggradation (coarse material in riffle embedded and siltation in pools).
	HU_MH_ROB_7_2	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	TRCA	Intermittent	0	0	0.14	0.14	0.07	In Regime	■ HU_MH_ROB_7_2 showed minor signs of widening (fallen/leaning trees/ fence posts) and planimetric form adjustment (poorly formed/ reworked/ removed bar forms).
	HU_MH_ROB_4_1	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	TRCA	Intermittent	0.57	0.2	0	0.29	0.26	Transitional or stressed	■ Evidence of instability in HU_MH_ROB_4_1 included abundant evidence of aggradation (lobate bar, coarse material in riffle embedded, siltation in pools, and medial bars), degradation (channel worn into undisturbed overburden/ bedrock), and planimetric form adjustment (evolution of single thread channel to multiple channels, and bar forms poorly formed/ reworked/ removed). This reach did not show any evidence of widening.

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
8	**HU_MH_MHR_0_1**	HU_MH_MHR_0_1, HU_MH_MHR_0_2	TRCA	Permanent	0.29	0	0.63	0.14	0.26	Transitional or stressed	■ Evidence of erosion was noted at both the upstream and downstream extent of the reach. Evidence of widening included fallen/leaning trees/ fence posts, occurrences of large organic debris, exposed tree roots, basal scour on the inside of meander bends, and basal scour on both sides of the channel through the riffle. Evidence of aggradation (coarse material in riffle embedded and siltation in pools) and planimetric form adjustment (bar forms poorly formed/ reworked/ removed) were also observed.
	HU_MH_EHR_1_3	HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	TRCA	Intermittent	0.43	0.33	0.5	0.86	0.53	In Adjustment	■ Reach HU_MH_EHR_1_3 had evidence of planimetric form adjustment (formation of chutes, the evolution of single thread channel to multi-thread channel, evolution of pool-riffle form to low bed relief form, cut-off channels, thalweg alignment out of phase with meander geometry, and bar forms poorly formed/reworked/removed), widening (fallen/leaning trees/ fence posts, occurrence of large organic debris, exposed tree roots, and basal scour on inside of meander bends), aggradation (siltation in pools, poor longitudinal sorting of bed materials, deposition in overbank zone), and degradation (head cutting due to knick point migration). The feature was assessed upstream of the crossing location. Further downstream it becomes less defined.
	HU_MH_EHR_1_4	HU_EH_EHT_1_1	TRCA	Permanent	0	0.33	0.50	0.29	0.28	Transitional or Stressed	■ Reach HU_MH_EHR_1_4 displays evidence of Degradation (scour pools d/s of culverts/storm sewers and channel worn into undisturbed overburden/ bedrock). Widening (fallen/learning trees/ fence posts, occurrence of large organic debris, exposed tree roots, and outflanked concrete walls) and planimetric form adjustment (cutoff channel and bar forms poorly formed/reworked/removed) were also observed.
	HU_MH_EHR_1_6	HU_EH_EHT_1_2_1	TRCA	Intermittent	0	0	0.38	0.43	0.2	In Regime (borders Transitional)	■ Reach HU_MH_EHR_1_6 had evidence of widening (fallen/learning trees/ fence posts, the occurrence of large organic debris, and exposed tree roots) and planimetric form adjustment (formation of chutes, the evolution of single thread channel to multi-thread channel, and bar forms poorly formed/reworked/removed). The feature is entrenched but has densely vegetated riparian zone vegetation which likely limits erosion. Downstream there is a large man-made pool with concrete reinforced armored banks leading to the pool. The artificially narrowed and armored portion of the channel likely contributes to the upstream entrenchment of the feature due to the restricted flow capacity during high-flow events.

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
	HU_MH_EHR_0_2	HU_EH_EHR_0_1, HU_EH_EHR_0_2	TRCA	Permanent	0.29	0.4	0.38	0.14	0.3	Transitional or stressed	■ HU_MH_EHR_0_2 had evidence of degradation (terrace cut through older bar material, suspended armor layer visible in the bank), widening (fallen/leaning trees/ fence posts, exposed tree roots, and basal scour on both sides of channel through riffle), aggradation (coarse material in riffle embedded, and siltation in pools), and planimetric form adjustment (bar forms poorly formed/reworked/removed). The feature has entrenched sections and very deep pool sections.
9	**HU_EH_EHR_18_1a**	No Proposed Crossing	TRCA	Permanent	0.29	0	0.29	0.14	0.18	In Regime	■ This reach displayed evidence of aggradation (coarse material in riffle embedded, siltation in pools) and planimetric form adjustment (bar forms poorly formed/ reworked/removed). The feature contained material up to cobble size and there was bank undercutting.
	HU_EH_EHR_18_1b	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	TRCA	Permanent	0.29	0	0.25	0.14	0.17	In Regime	■ This reach displayed evidence of aggradation (coarse material in riffle embedded, siltation in pools) and planimetric form adjustment (bar forms poorly formed/reworked/removed)
	HU_EH_EHR_18_3	No Proposed Crossing	TRCA	Intermittent	0.14	0	0	0.14	0.07	In Regime	■ Reach HU_EH_EHR_18_3 displayed signs of aggradation (poor longitudinal sorting of bed materials) and planimetric form adjustment (bars poorly formed, reworked or removed).
	HU_EH_EHR_18_6	HU_EH_EHT_18_4_1	TRCA	Permanent	0.29	0.4	0.63	0.14	0.36	Transitional or stressed	■ This reach had evidence of aggradation (coarse material in riffle embedded, siltation in pools) and planimetric form adjustment (bar forms poorly formed/reworked/removed), as well as evidence of widening (fallen/leaning trees/fence posts, exposed tree roots, basal scour on inside meander bends, basal scour on both sides of the channel through riffle, and length of basal scour >50% through subject reach) and degradation (suspended armor layer visible in bank and channel worn into undisturbed overburden/bedrock).
	HU_EH_EHR_18_6b	No Proposed Crossing	TRCA	Permanent	/	/	/	/	/	/	■ RGA not collected in field.
	HU_EH_EHR_18_8	No Proposed Crossing	TRCA	Permanent	0.29	0.2	0.67	0.14	0.32	Transitional or Stressed	■ Reach HU_EH_EHR_18_8 displayed evidence of aggradation (siltation in pools and poor longitudinal sorting of bed materials), degradation (channel work into undisturbed overburden), widening (fallen/leaning trees, occurrence of large organic debris, exposed tree roots, and length of basal scour > 50% through subject reach), and planimetric form adjustment (bar forms poorly formed/reworked/removed).
	HU_EH_EHR_18_8b	No Proposed Crossing	TRCA	Permanent	0.29	0.4	0.71	0.14	0.39	Transitional or Stressed	■ Reach HU_EH_EHR_18_8b displayed evidence of aggradation (siltation in pools and medial bars), degradation (cut face on bar forms and channel work into undisturbed overburden), widening (fallen/leaning trees, the occurrence of large organic debris, exposed tree roots, basal scour on both sides of channel through riffle and length of basal scour > 50% through subject reach), and planimetric form adjustment (bar forms poorly formed/reworked/removed).

Section	Reach	Hydraulics Crossing ID	Conservation Authority	Hydraulic Regime	Factor Value Aggradation	Factor Value Degradation	Factor Value Widening	Factor Value Planimetric Form Adjustment	Stability Index	Condition	Description
	HU_EH_EHR_18_8c	No Proposed Crossing	TRCA	Permanent	0	0.40	0.29	0.14	0.21	Transitional or Stressed	■ Reach HU_EH_EHR_18_8c displayed evidence of degradation (head cutting due to knickpoint migration and channel work into undisturbed overburden), widening (fallen/leaning trees and exposed tree roots, basal scour on both sides of channel through riffle and length of basal scour > 50% through subject reach), and planimetric form adjustment (bar forms poorly formed/reworked/removed). Results of the RGA for this reach could be influenced by limited access to the mid portion of the reach.
	HU_EH_EHR_19_1	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	0	0	0.43	0.14	0.14	In Regime	■ Reach HU_EH_EHR_19_1 displayed signs of widening (fallen/leaning trees, occurrence of large organic debris, and exposed tree roots) and planimetric form adjustment (bar forms poorly formed/ reworked/ removed).
	HU_EH_EHR_19_7	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	0.14	0.20	0.57	0.14	0.26	Transitional or Stressed	■ Reach HU_EH_EHR_19_7 displayed evidence of aggradation (siltation in pools), degradation (channel work into undisturbed overburden), widening (fallen/ leaning trees, occurrence of large organic debris, exposed tree roots, and length of basal scour > 50% through subject reach), and planimetric form adjustment (bar forms poorly formed/reworked/removed).

5. General Design Considerations

5.1 Potential Impacts on Crossing Infrastructure

When crossings are placed over a reach without due consideration towards the geomorphic processes occurring within the watercourse, risks to the crossing structure and/or channel form and function may occur. Such risks could lead to the need for continual or emergency maintenance of the crossing and/or could adversely affect channel stability, fish passage potential and aquatic habitat conditions.

Channel processes that may contribute to impacts at a bridge or culvert crossing include:

- Channel bed degradation/lowering – this can lead to undercutting of bridge/culvert abutments/footings.
- Channel migration – movement of meanders could cause erosion of culvert/bridge embankments.
- Channel expansion – enlargement of cross-section areas (e.g., in response to urban hydro modification) may lead to increased stress around the culvert entrance, leading to outflanking of the culvert and flow constriction.
- Knickpoint regression along the channel bed profile.

Moreover, the loss of riparian vegetation can also greatly diminish bank shear resistance, which increases the potential for bank erosion and channel translation.

5.2 Potential Impacts on Channel Processes and Aquatic Habitat

Crossings situated along a watercourse both interact with and exert an influence on natural channel processes. The scientific literature has identified common impacts of watercourse crossings on channel functions and aquatic species (Jackson 2003; Parish Geomorphic 2004; Pushkar 2012). In some situations, the impacts of a crossing on the

channel result in a risk to the crossing structure itself. Typical adverse effects attributed to crossing include:

- Scour of banks at culvert inlet/outlet – due to flow contraction/expansion;
- Establishment of a local base-level control point (e.g., closed bottom culvert) that affects channel bed profile development;
- Perched culvert – affecting channel profile and fish passage;
- Sediment deposition – due to a loss of sediment transport capacity upstream or within the culvert;
- Sediment loading – at road crossings due to the wash of road-based sediment into the channel; and,
- Channel bed degradation and/or instability.

Reduction in the potential impacts to crossing structures can be achieved through proper design (e.g., sufficiently wide span) and appropriate placement of the crossing structure along the watercourse. It is also recommended that crossings be open-footed to maintain continuity and allow for the creation of bed morphology within the structure. This also minimizes the risk of excess sediment deposition and prevents the culvert from becoming perched in the future.

Impacts to culturally important species and habitat integrity have also been considered throughout the design process by the multidisciplinary team and should be considered further during Detail Design. Impact assessments are underway for aquatic and terrestrial habitat and have been provided under a separate cover. Channel instability, sedimentation and fragmentation are being closely considered by the entire team so that mitigation measures can be integrated into all designs. Mitigation and enhancement opportunities are also being considered during off-setting and compensation planning work. The multidisciplinary team, including the fluvial geomorphology team, will continue to provide input on how to minimize risk of channel instability and sedimentation through disciplinary understanding of river processes.

5.3 General Crossing Design Recommendations

A summary of general crossing design recommendations for the proposed crossings are based on guidance documents provided by the Conservation Authorities, MNR and DFO (Parish Geomorphic 2004; CVC 2015; CVC 2019; TRCA 2015; CH 2020, MNR 2002; DFO, 2025b; DFO, 2024a; DFO, 2024b; DFO, 2025a; DFO, 2025c; and DFO,

2025d) as outlined in **Section 2**. In keeping with the potential impacts on infrastructure, natural channel processes, aquatic habitat, and adhering to the guidelines, the following general recommendations should be included as part of appropriate crossing design:

- Minimize the length of channel enclosure.
- Avoid, where possible, the need for substantial channel realignment.
- Place watercourse crossings perpendicular to flow over relatively straight sections of channel planform.
- Crossing structures should be properly sized not only from a hydraulic perspective but also from a fluvial geomorphic perspective so that there are minimal impacts to channel form and function.
- Maintain continuity of channel form and function through the crossing wherever possible (e.g., bed morphology under open-bottomed crossings and embedded in closed-bottom crossings).
- Confinement of the watercourse should be considered as lateral migration is likely in unconfined valleys (wide, flat floodplains) whereas in confined valley watercourses, the valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to downcutting and/or channel widening).
- For unconfined watercourses and confined watercourses that are greater than 15 m from the valley wall:
  - Where feasible, new crossings should span the Meander Belt Width (MBW). This approach would allow natural processes to occur over the next 100 years.
  - At a minimum, the new crossings will need to span the bankfull width of the channel, with an additional allowance (100-year erosion rate) for localized channel adjustment over the lifespan of the structure (e.g., the next 50 years).
  - If the crossing does not span the MBW, additional erosion protection will be required to protect the crossing. Erosion protection disturbs natural geomorphological processes and typically harms watercourse integrity in the long-term.
- For confined systems within 15 m of the valley wall:
  - New crossings do not need to span the MBW but should span the toe erosion allowance to account for the 100-year erosion limit.

- Watercourses identified as actively undergoing adjustments in cross-sectional shape and planform, are expected to continue experiencing instability until an equilibrium state is achieved. Proposed crossings should consider bank protection and properly sized culverts to prevent backwatering and to allow proper transport of sediments and maintain aquatic habitat connectivity.
- For watercourses that are small, stable, ephemeral watercourses with a drainage area lower than 1 km^2 the crossing size was deferred to hydraulic flow requirements as well as any fisheries/terrestrial limiting criteria.
  - For watercourses that met the above criteria but that had defined channel boundaries, a recommended crossing size was provided based on channel characteristics and guidelines from the Conservation Authority (refer to **Section 2**).
- For watercourses with a bankfull width less than 4 m in the CVC jurisdiction, the guidelines recommend that the crossing opening be three times the bankfull channel width.
- For watercourses in the TRCA jurisdiction that have a channel width of 3 m or less or where sufficient historical data were not available due to vegetation cover or past modifications to the channel, the crossing guidelines were followed to define an appropriate crossing width. It is important to note that for channels less than 3 m wide, an appropriate erosion allowance was selected from **Table 2-3**.
- For crossings over watercourses identified as Redside Dace habitat, the recommended width included a 30 m buffer on either side of the channel, in addition to the calculated meander belt width.
- It is recommended that a fluvial geomorphologist be directly involved in the Detail Design stage to specifically address the observed geomorphological issues with the watercourses along the preferred alignment.
- Removal of vegetation surrounding the feature could impact erosional processes and removal of vegetation surrounding watercourses that are mapped as critical habitat could be considered Harmful Alteration, Disruption, or Destruction of fish habitat (HADD). This must be considered in co-ordination with the project team, including the aquatics team. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation.

- Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open-bottom crossings are preferred to maintain geomorphological processes as closed-bottom culverts reduce bed roughness and act as grade controls. The significance of these controls is accentuated when the channel is downcutting and widening. Crossing footings should be perpendicular to valley and stream corridors.

The initial recommendations served as the foundation for the fluvial geomorphology-specific crossing recommendations and conceptual channel realignments and were incorporated wherever possible. Where recommendations could not be implemented, for instance due to conflicting multi-disciplinary requirements, alternative solutions were developed based on site-specific constraints.

6. Channel Dynamics

6.1 Preliminary Crossing Assessment

6.1.1 Workflow

When crossings are placed over a watercourse without due consideration for the geomorphological processes that are occurring within the watercourse and their upstream sub-catchment, risks to the crossing structure and/or channel form and function may occur. This could lead to the need for continual or emergency maintenance of the crossing structure, impede aquatic life, and adversely affect channel stability/aquatic habitat conditions both at and downstream of the crossing.

The meander belt is defined as the area that a channel currently occupies or is expected to occupy at some point in the future. The associated erosion and deposition due to meander development and migration can cause loss or damage to private property and/or infrastructure. For this reason, it is considered best practice to define a corridor based on natural meander and migration processes occurring in the channel. Outside of this corridor, it is assumed that public and private property, and structures beyond the delimited corridor, will not be at risk from fluvial erosion. The footprint containing past, present, and future meander positions, is commonly referred to as the meander belt.

The results of the desktop and field assessment (**Sections 34.1** and **4.2**) were used to determine the meander belt width and erosion rate of all defined channels that cross the proposed Highway 413 Corridor. The meander belt assessment is necessary to inform the sizing of structures (i.e., culverts and bridges) required to convey water flow under the proposed highway. Channels that lacked definition were not considered in the meander belt width assessment as such features generally lack defined banks and have insufficient energy to alter their margins.

6.2 Meander Belt Delineation Procedures

The watercourses in the Study Area fall under the jurisdiction of three regional Conservation Authorities including the TRCA, the CVC, and CH.

Watercourses within the TRCA and CH districts were delineated using the guidance publication “Belt Width Delineation Procedures” (Parish Geomorphic 2004), which provides the basis and protocols used for delimiting appropriate meander belt widths for unconfined and confined systems using mapping and empirical approaches, as discussed in **Section 1.1.1**. Watercourses within the CVC district were delineated using the Fluvial Geomorphic Guidelines published by the CVC (2015), as discussed in **Section 2**.

6.3 Preliminary Meander Belt Width

Preliminary meander belts for the delineated defined watercourses along the corridor of the proposed road were calculated. The planform mapping approach was used to define the meander belt where the watercourse was unaltered, and its meandering history could be tracked using aerial imagery as this is the preferred method identified by Parish Geomorphic (2004) and the CVC (2015) in their guidance documents, as outlined in **Section 2**. Generally, the preliminary belt width is the “width of the meander belt perpendicular to the belt boundaries” (Parish Geomorphic 2004).

LiDAR data was also considered when delineating the preliminary meander belt width using the mapping approach. LiDAR provides high-resolution topographic data that can reveal subtle landscape features, including paleo-channels and ancient meander scars, showing where watercourses have migrated over millennia. While meander belt widths and erosion rates are typically calculated using observations from roughly the past 100 years, LiDAR offers valuable supplementary context by highlighting the full extent of historical channel migration. Identifying these older channel positions helps define the potential lateral limits of a watercourse, informs understanding of long-term geomorphic tendencies, and provides a framework for interpreting contemporary erosion patterns. In this way, LiDAR bridges the gap between short-term monitoring and the long-term evolutionary history of Ontario’s rivers, enhancing the accuracy and interpretation of fluvial assessments.

In instances where the planform of the watercourse has been artificially altered by human activities and surrogate reach could not be identified, the empirical approach was used. The empirical approach uses a range of published empirical models based on channel and drainage metrics drawing on the following input variables: bankfull width (W_{bf}), bankfull depth (D_{bf}), bankfull maximum depth (D_{max}), bankfull area (A_{bf}), drainage area (A_w), and bankfull grade (S). The equations used are presented in **Table 6-1**, below. The values used in the empirical assessment were calculated based on the averages taken from the rapid cross-sections. All results are presented in **Table 6-2**.

Table 6-1: Empirical Equations Used to Calculate Preliminary Meander Belt Width

Source	Conditions/Applications	Input Variable	Equation
Ward et al. (2002)	W_{bf} in feet - no factor of safety	Bankfull Width (ft)	$4.8 * W_{bf}^{1.08}$
Ward et al. (2002)	W_{bf} in feet - with a factor of safety	Bankfull Width (ft)	$6 * W_{bf}^{1.12}$
Williams (1986)	W_{bf} > 1.5 m	Bankfull Width (m)	$4.3 * W_{bf}^{1.12}$
Piegay et al. (2005); Bravard et al. (1999)	Average	Bankfull Width (m)	$10 * W_{bf}$
USDA (2007)		Bankfull Width (m)	$6 * W_{bf}$
Lorenz and Heinze (1985)		Bankfull Width (m)	$7.53 * W_{bf}^{1.01}$
Malavoi et al. (1998)		Bankfull Width (m)	$10 * W_{bf}$
Kline and Dolan (2008)	Vermont - general guidance	Bankfull Width (m)	$6 * W_{bf}$ + 1 W_{bf} on either side = $8 * W_{bf}$
Williams (1986)		Bankfull Depth (m)	$148 * D_{bf}^{1.52}$
Bridge and Mackey (1993)		Bankfull Depth (m)	$59.9 * D_{bf}^{1.8}$
Collinson (1978)		Bankfull Depth (m)	$65.6 * D_{max}^{1.57}$
Williams (1986)	Bankfull area > 0.04 m^2	Bankfull area (m^2)	$18 * A_{bf}^{0.65}$
Chitale (1973)		Bankfull Discharge (m^3/s)	$18.5 * Q_{bf}^{0.5}$
Total Average			Average calculated width

Table 6-2: Preliminary Meander Belt Width

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width from Cross-section (m)	Bankfull Depth from Cross-section (m)	Bankfull Area (m^2)	Ward et al. (2002) No factor of safety (m)	Ward et al. (2002) Factor of Safety (m)	Williams (1986) Input Variable: Bankfull Width (m)	Piegay et al. (2005) and Bravard et al. (1999) (m)	NRCS manual TS14S (2007) (m)	Lorenz and Heinze (1985) (m)	Malavoi et al. (1998) (m)	Kline and Dolan (2008) (m)	Williams (1986) Input Variable: Bankfull Depth (m)	Bridge and Mackey (1993) (m)	Collinson (1978) (m)	Williams (1986) Input Variable: Bankfull Area (m)	Prelim. MBW (m)	Preferred Prelim. MBW Approach Used
1	**SM_EB_SIM_0_2**	SM_EB_SIM_0_WC1 EXTENSION	CH	Permanent	7.3	0.6	4.2	N/A													82.0-140.0	– Based on Mapping
2	**CR_LC_LEV_1_2**	CR_LC_LEV_1_WC2	CVC	Intermittent	1.3	0.4	0.5	7.0	9.3	5.8	13.0	7.8	9.8	13.0	10.4	30.0*	9.1	N/A	10.8	9.6	– Historically Altered – Used Empirical Method
2	**CR_LC_LEV_2_2**	No proposed crossing ID. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	CVC	Intermittent	3.0	0.6	1.8	17.3	23.7	14.7	30.0*	18.0	22.8	30.0	24.0	68.1*	23.9	N/A	26.4	21.4	– Historically Altered – Used Empirical Method
2	**CR_LC_LEV_2_4**	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.1	CVC	Intermittent	2.9	0.5	1.5	16.7	22.8	14.2	29.0*	17.4	22.1	29.0*	23.2	51.6*	17.2	N/A	22.9	19.6	– Historically Altered – Used Empirical Method
2	**CR_LC_LEV_0_1**	CR_LC_LEV_0_WC2	CVC	Permanent	4.1	0.6	2.3	N/A													10.0	– Based on Mapping
2	**CR_LC_LEV_0_2**	CR_LC_LEV_0_WC2	CVC	Permanent	4.2	0.2	1	N/A													14.0	– Based on Mapping
2	**CR_NP_CRR_0_2**	CREDIT RIVER BRIDGE	CVC	Permanent	27.0	0.8	20.3	N/A													450.0-640.0	– Based on Mapping
2	**CR_NP_CRR_0_1**	CREDIT RIVER BRIDGE	CVC	Permanent	27.0	0.8	20.3	N/A													450.0-640.0	– Based on Mapping
3	**EC_EH_ETW_13_1**	EC_EH_ETW_13_WC1	TRCA	Intermittent	1.8	0.3	0.6	9.7	13.0	8.0	17.5	10.5	13.3	17.5	14.0	26.2*	7.7	15.6	12.3	12.6	– Historically Altered – Used Empirical Method
3	**CR_GW_CRR_15a**	CR_GW_CRR_15_WC3	CVC	Permanent	4.0 – 6.0 (Artificially defined roadside drainage ditch. Size estimated from the ROW)	0.2 – 0.4 (Artificially defined roadside drainage ditch. Size estimated from the ROW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.3	– Historically Altered – Used Empirical Method – Due to the artificial nature of the channel (constructed drainage ditch), no reliable bankfull width or depth measurements were available. The Chitale (1973) method was applied, using the 2-year flow in place of bankfull discharge (see **Table 5-1**).
3	**CR_GW_CRR_15b**	CR_GW_CRR_15_WC2.1	CVC	Permanent	4.0 –5.0 (Artificially defined roadside drainage ditch. Size estimated from the ROW)	0.3 – 0.5 (Artificially defined roadside drainage ditch. Size estimated from the ROW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.3	– Historically Altered – Used Empirical Method – Due to the artificial nature of the channel (constructed drainage ditch), no reliable bankfull width or depth measurements were available. The Chitale (1973) method was applied, using the 2-year flow in place of bankfull discharge (see **Table 5-1**).
4	**EC_EH_ETW_12_3**	EC_EH_ETW_12_WC1	TRCA	Ephemeral to Intermittent	2.5	0.3	0.8	14.2	19.3	12.0	25.0*	15.0	19.0	25.0*	20.0	23.7	6.9*	N/A	14.9	17.3	– Historically Altered – Used Empirical Method
4	**EC_EH_ETW_7_2**	EC_EH_ETW_7_WC3	TRCA	Intermittent	1.5	0.3	0.5	8.2	10.9	6.8	15.0	9.0	11.3	15.0	12.0	23.7*	6.9	N/A	10.7	10.6	– Historically Altered – Used Empirical Method
4	**EC_EH_ETW_6_1**	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	TRCA	Intermittent	3.5	0.3	1.2	20.4	28.1	17.5	35.0*	21.0	26.7	35.0*	28.0	27.4	8.1*	N/A	19.8	23.6	– Historically Altered – Used Empirical Method
4	**EC_EH_ETW_6_4**	EC_EH_ETW_6_WC3	TRCA	Ephemeral to Intermittent	2.0 (where defined)	NA	NA	N/A													16.0	– Based on Mapping
4	**EC_EH_ETW_1_1**	EC_EH_ETW_1_WC1	TRCA	Permanent	3.8	0.2	0.8	22.1	30.5	19.0	37.6*	22.6	28.7	37.6*	30.1	13.8	3.6*	13.2	15.4	21.7	– Historically Altered – Used Empirical Method
4	**EC_EH_ETW_1_5**	EC_EH_ETW_1_WC3	TRCA	Permanent	4.2	0.3	1.3	N/A													62.0 – 87.0	– Based on Mapping
5	**EC_EH_ETW_1_7**	EC_EH_ETW_1_WC5	TRCA	Permanent	5.0	0.7	3.5	N/A													66.0 – 83.0	– Based on Mapping
5	**EC_EH_ETW_1_11**	EC_EH_ETW_1_WC8	TRCA	Permanent	2.1	0.7	1.4	N/A													48.0 – 96.0	– Based on Mapping

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width from Cross-section (m)	Bankfull Depth from Cross-section (m)	Bankfull Area (m^2)	Ward et al. (2002) No factor of safety (m)	Ward et al. (2002) Factor of Safety (m)	Williams (1986) Input Variable: Bankfull Width (m)	Piegay et al. (2005) and Bravard et al. (1999) (m)	NRCS manual TS14S (2007) (m)	Lorenz and Heinze (1985) (m)	Malavoi et al. (1998) (m)	Kline and Dolan (2008) (m)	Williams (1986) Input Variable: Bankfull Depth (m)	Bridge and Mackey (1993) (m)	Collinson (1978) (m)	Williams (1986) Input Variable: Bankfull Area (m)	Prelim. MBW (m)	Preferred Prelim. MBW Approach Used
5	**EC_EH_ETW_1_12**	EC_EH_ETW_1_WC10	TRCA	Permanent	2.6	0.6	1.5	N/A													54.0 – 68.0	– Based on Mapping
5	**HU_WH_CAC_0_1**	HU_WH_CAC_0_WC1	TRCA	Permanent	4.5	0.9	4.0	N/A													98.0 – 155.0	– Based on Mapping
5	**HU_WH_TWH_1_2**	HU_WH_TWH_1_WC2.3	TRCA	Intermittent	4.8 – 5.0	0.4	2.2	N/A													34.7	– Historically Altered – Used Empirical Method
5	**HU_WH_TWH_1_4**	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	TRCA	Intermittent	4.6	0.2	1.1	N/A													28.1	– Historically Altered – Used Empirical Method
5	**HU_WH_CAC_0_2a**	HU_WH_CAC_0_WC2	TRCA	Permanent	5.0	0.8	3.8	N/A													46.2	– Based on empirical calculations
6	**HU_WH_TWH_1_5**	HU_WH_TWH_1_WC8.1	TRCA	Intermittent	5.5 (Likely an over-estimate. Upstream of the proposed crossing the feature is an undefined likely headwater feature that becomes more defined within the forested section where based on field work water ponds during spring months. Downstream where the channel goes through the agricultural field is not defined. Downstream of the agricultural field a grate was noted on private property. It is assumed the feature likely flows into the grate. Additionally, further downstream at the Old School Road crossing the channel is also not defined. The 5.5 m bankfull width was collected closer to the residential properties at a section where the channel may have been altered)	0.3	1.7	33.3	46.7	29.0	55.0*	33.0	42.1	55.0*	44.0	23.7	6.9	N/A	24.9	34.6	– Historically Altered – Used Empirical Method – *Used bankfull width of 5.5 but this is likely not correct (5.5 is too large)
6	**HU_WH_TWH_2_1**	HU_WH_TWH_2_WC1	TRCA	Permanent	3.0	0.5	1.5	17.3	23.7	14.7	30.0	18.0	22.8	30.0	24.0	51.6	17.2	N/A	23.4	24.8	– Historically Altered – Used Empirical Method
6	**HU_WH_SAL_5_1**	HU_WH_SAL_0_1	TRCA	Intermittent	1.7	/	/	/	/	/	/	/	/	/	/	/	/	/	/	6.1	– Watercourse will be realigned as part of the proposed works. Empirical meander belt width was calculated using the 2-year flow discharge which yielded a result of 4.0 using the Annable (1996) equation and 8.3 using the Chitale (1973) equation. Average of 6.1 was used as preliminary MBW
6	**HU_WH_SAL_3_1**	HU_WH_SAL_3_1	TRCA	Intermittent	2.7	0.5	1.4	15.7	21.4	13.3	27.4*	16.4	20.8	27.4*	21.9	51.6	17.2	N/A	22.1	18.6	– Historically Altered – Used Empirical Method
6	**HU_WH_SAL_0_1**	Realignment has negated need for crossing	TRCA	Permanent	3.4	0.5	1.7	19.8	27.2	16.9	34.0	20.4	25.9	34.0	27.2	51.6	17.2	N/A	25.4	26.0	– Historically Altered – Used Empirical Method
6	**HU_WH_SAL_0_2**	HU_WH_SAL_0_2	TRCA	Intermittent	3.5	0.3	1.1	20.1	27.7	17.2	34.5	20.7	26.3	34.5	27.6	26.2	7.7	N/A	19.2	26.0	– Historically Altered – Used Empirical Method (Larger value taken for calculations for HU_WH_SAL_0_1)
6	**HU_WH_SAL_0_3**	Realignment has negated need for crossing	TRCA	Permanent	7.3	0.6	4.3	N/A													49.0	– Based on Mapping
6	**HU_WH_WHR_0_2**	HU_WH_WHR_0_2	TRCA	Permanent	8.5	1.1	9.4	N/A													118.0 - 186.0	– Based on Mapping
6	**HU_WH_WHR_0_3**	HU_WH_WHR_0_3	TRCA	Permanent	7.5	1.2	9.0	N/A													100.0 - 294/0	– Based on Mapping
6	**HU_WH_GRT_0_2**	HU_WH_GRT_0_1, HU_WH_GRT_0_2	TRCA	Intermittent	4.0 - 5.2	0.3	1.6	31.3	43.9	27.3	52.0*	31.2	39.8	52.0*	41.6	23.7	6.9*	N/A	24.0	32.9	– Empirical (Not enough resolution on historical data/aerial imagery)

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width from Cross-section (m)	Bankfull Depth from Cross-section (m)	Bankfull Area (m^2)	Ward et al. (2002) No factor of safety (m)	Ward et al. (2002) Factor of Safety (m)	Williams (1986) Input Variable: Bankfull Width (m)	Piegay et al. (2005) and Bravard et al. (1999) (m)	NRCS manual TS14S (2007) (m)	Lorenz and Heinze (1985) (m)	Malavoi et al. (1998) (m)	Kline and Dolan (2008) (m)	Williams (1986) Input Variable: Bankfull Depth (m)	Bridge and Mackey (1993) (m)	Collinson (1978) (m)	Williams (1986) Input Variable: Bankfull Area (m)	Prelim. MBW (m)	Preferred Prelim. MBW Approach Used
6	**HU_WH_CDT_2_1b**	No Proposed Hydraulic Crossing	TRCA	Permanent	1.0 – 2.5 (estimated from ROW)	0.2 – 0.5 (estimated from ROW)	N/A	14.2	19.3*	12.0	25.0	15.0	19.0	25.0*	20.0*	51.6*	17.2	N/A	20.8	16.9	– Historically Altered – Used Empirical Method (Bankfull width of 2.5 m and Bankfull depth of 0.5 m was used in the assessment) The Chitale (1973) method was also applied (**MBW = 11.7**), using the 2-year flow in place of bankfull discharge (see **Table 5-1**).
6	**HU_WH_CDT_0_2**	HU_WH_CDT_0_1	TRCA	Permanent	4.2	0.7	2.9	N/A												39.0 – 83.0	– Based on Mapping
6	**HU_MH_RAI_1_3**	HU_MH_RAI_1_3_1	TRCA	Intermittent	4.4	0.5	2.0	25.8	35.9	22.3	43.5*	26.1	33.2	43.5*	34.8	47.0	15.4	35.8	28.7	29.0	– Historically Altered – Used Empirical Method
7	**HU_MH_ROB_0_2**	HU_MH_ROB_0_5	TRCA	Intermittent	4.8	0.6	2.9	N/A												80.0 – 97.0	– Based on Mapping
7	**HU_MH_ROB_0_3**	HU_MH_ROB_0_5	TRCA	Intermittent	4.5	0.6	2.7	N/A												32.0 – 63.0	– Channel used to be a compound meander bend part of ROB_0_3, but valley infilling cut off the meander. The meander belt for this feature is part of ROB_0_2.
7	**HU_MH_ROB_0_5**	HU_MH_ROB_0_1, HU_MH_ROB_0_2, HU_MH_ROB_0_4	TRCA	Permanent	3.5	0.7	2.3	N/A												19.0	– Based on Mapping
7	**HU_MH_ROB_7_1**	HU_MH_ROB_7_1_1, HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_4	TRCA	Permanent	3.0	1.0	3.0	N/A												35.4	– Based on Mapping
7	**HU_MH_ROB_7_2**	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	TRCA	Intermittent	2.0	0.3	0.5	N/A												31.0	– Based on Mapping
7	**HU_MH_ROB_4_1**	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	TRCA	Intermittent	2.9	0.1	0.3	N/A												26.5	– Based on Mapping
8	**HU_MH_MHR_0_1**	HU_MH_MHR_0_1, HU_MH_MHR_0_2	TRCA	Permanent	15.8	1.0	15.3	N/A												320.0 – 516.0	– Based on Mapping
8	**HU_MH_EHR_1_4**	HU_EH_EHT_1_1	TRCA	Permanent	2.7	0.4	1.0	N/A												30.0	– Based on Mapping (confined watercourse, irregular valley width)
8	**HU_MH_EHR_1_3**	HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	TRCA	Intermittent	5.1	0.6	3.0	N/A												33.0 – 92.0	– Based on Mapping
8	**HU_MH_EHR_1_6**	HU_EH_EHT_1_2_1	TRCA	Intermittent	3.3	0.4	1.3	N/A												32.0 – 58.0	– Based on Mapping
8	**HU_MH_EHR_0_2**	HU_EH_EHR_0_1, HU_EH_EHR_0_2	TRCA	Permanent	11.1	1.2	13.3	N//A												186.0 – 278.0	– Based on Mapping
9	**HU_EH_EHR_18_1a**	No Proposed Crossing	TRCA	Permanent	4.5	0.3	1.1	N/A												35.0 – 75.0	– Based on Mapping
9	**HU_EH_EHR_18_1b**	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	TRCA	Permanent	1.8	0.4	0.6	9.7	13.0	8.0	17.5	10.5	13.3	17.5	14.0	30.0*	9.1	N/A	13.1	13.4	– Based on Empirical
9	**HU_EH_EHR_18_6**	HU_EH_EHT_18_4_1	TRCA	Permanent	2.5	0.5	1.3	N/A												19.1	– Partially confined. Northern portion confined and MBW defined using mapping. Southern portion will have belt width of 19.1 m

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width from Cross-section (m)	Bankfull Depth from Cross-section (m)	Bankfull Area (m^2)	Ward et al. (2002) No factor of safety (m)	Ward et al. (2002) Factor of Safety (m)	Williams (1986) Input Variable: Bankfull Width (m)	Piegay et al. (2005) and Bravard et al. (1999) (m)	NRCS manual TS14S (2007) (m)	Lorenz and Heinze (1985) (m)	Malavoi et al. (1998) (m)	Kline and Dolan (2008) (m)	Williams (1986) Input Variable: Bankfull Depth (m)	Bridge and Mackey (1993) (m)	Collinson (1978) (m)	Williams (1986) Input Variable: Bankfull Area (m)	Prelim. MBW (m)	Preferred Prelim. MBW Approach Used
9	HU_EH_EHR_18_6b	No Proposed Crossing	TRCA	Permanent	2.5	0.5	1.3	N/A													6.5 – 15.0	– Partially confined. Northern portion confined and MBW defined using mapping. Southern portion will have belt width of 19.1 m
9	HU_EH_EHR_18_8	No Proposed Crossing	TRCA	Permanent	3.6	0.4	1.4	N/A													29.0 to 38.0	– Based on Mapping
9	HU_EH_EHR_18_8b	No Proposed Crossing	TRCA	Permanent	3.9	Could not measure from Roadway	Could not measure from Roadway	N/A													28.0 to 66.0	– Based on Mapping
9	HU_EH_EHR_18_8c	No Proposed Crossing	TRCA	Permanent	4.6	Could not measure from Roadway	Could not measure from Roadway	N/A													53.0	– Based on Mapping
9	HU_EH_EHR_19_1	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	8.4	1.0	8.3	N/A													86.0	– Mapping approach was used based on surrogate upstream reach
9	HU_EH_EHR_19_7	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	3.1	0.6	1.8	N/A													50.0	– Based on Mapping (Confined watercourse, irregular valley width)

Note: * Outlier excluded from calculation of preliminary meander belt width

6.4 Erosion Setback – 100-year Erosion Rates

Once the preliminary meander belt width was determined, an erosion allowance was applied to account for the 100-year erosion potential. An erosion allowance represents the long-term (100-year) average lateral migration rate of a watercourse and is typically calculated from historic evidence of channel movement. A minimum of 20-30 years of historical data are required for reliable estimates of erosion rates, which are specific to each reach and are extrapolated to cover the 100-year interval (Parish Geomorphic 2004; TRCA 2015; CVC 2015). This technique is only applicable for natural, unaltered reaches.

For reaches that have been identified as artificially altered, or those for which the aerial imagery is poor in quality, reference numbers outlined in the guidance documents published by the TRCA and CVC were used. As described in **Section 2**, for watercourses within the TRCA jurisdiction, the TRCA Crossings Guideline for Valley and Stream Corridors recommends the criteria outlined in Table 4 of the Ministry of Natural Resources (MNR) Natural Hazards Training Manual (2002) can be used to select an appropriate toe erosion rate based on the conditions encountered including evidence of active erosion and the surficial geology. For watercourses within the CVC's jurisdiction (refer to **Section 2**), the Slope Stability Definition & Determination Guideline (CVC 2014) recommends selecting the appropriate toe-erosion rate based on a table tailored to the CVC jurisdiction based on the conditions encountered. Toe scour represents the most erosion-susceptible part of the watercourse. It typically progresses faster and more unpredictably than long-term migration rates represented by 100-year erosion rates (Sholtes, Yochum, Scott & Bledsoe 2018). Because Ontario's MNR erosion-hazard methodology explicitly includes a Toe Erosion Allowance, toe scour provides a more conservative and appropriate basis for hazard delineation and setback determination in unconfined systems. Where a range was provided for the average erosion rate based on surficial geology and conditions encountered, an appropriate whole number was selected after consideration of pre-existing conditions (i.e., pre-existing erosion, bankfull width and depth, hydraulic regime, bed substrate observed in the field, surrounding land use, and other site-specific features).

The erosion rate has been determined based on historical aerial imagery (**Appendix A**) and/or the surficial geology of each physiographic region (**Section 4.1.1**). Results of the 100-year erosion rates are presented in **Table 6-3**.

Table 6-3: 100-year Erosion Rate

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
1	**SM_EB_SIM_0_2**	SM_EB_SIM_0_WC1 EXTENSION	CH	Permanent	7.3	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to the transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
2	**CR_LC_LEV_1_2**	CR_LC_LEV_1_WC2	CVC	Intermittent	1.3	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	Peel Plain	Not Present	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)
2	**CR_LC_LEV_2_2**	No proposed crossing ID. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	CVC	Intermittent	3.0	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	Peel Plain	Present	8.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)
2	**CR_LC_LEV_2_4**	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.1	CVC	Intermittent	2.9	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	Peel Plain	Not Present	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)
2	**CR_LC_LEV_0_1**	CR_LC_LEV_0_WC2	CVC	Permanent	4.1	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	10.0 (+/-3)	Based on Mapping
2	**CR_LC_LEV_0_2**	CR_LC_LEV_0_WC2	CVC	Permanent	4.2	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	10.0 (+/-3)	Based on Mapping
2	**CR_NP_CRR_0_2**	CREDIT RIVER BRIDGE	CVC	Permanent	27.0	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	20.0 (+/-3)	Based on Mapping
2	**CR_NP_CRR_0_1**	CREDIT RIVER BRIDGE	CVC	Permanent	27.0	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	20.0 (+/-3)	Based on Mapping
3	**EC_EH_ETW_13_1**	EC_EH_ETW_13_WC1	TRCA	Intermittent	1.8	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	South Slope	Not Present	1.0	Watercourse smaller than 3 m. Mapping data not applicable. Used TRCA Table
3	**CR_GW_CRR_15a**	CR_GW_CRR_15_WC3	CVC	Permanent	4.0 – 6.0 (estimated from the ROW)	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	South Slope	Not Present	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)
3	**CR_GW_CRR_15b**	CR_GW_CRR_15_WC2.1	CVC	Permanent	4.0 - 5.0 (estimated from the ROW)	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	South Slope	Not Present	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)
4	**EC_EH_ETW_12_3**	EC_EH_ETW_12_WC1	TRCA	Ephemeral to Intermittent	2.5	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	South Slope	Not Present	1.0	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
4	**EC_EH_ETW_7_2**	EC_EH_ETW_7_WC3	TRCA	Intermittent	1.5	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Not Present	1.0	Based on MNR Table 4 (TRCA 2015) (Bankfull width of reach less than 3 m)
4	**EC_EH_ETW_6_1**	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	TRCA	Intermittent	3.5	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 5 selected as an appropriate erosion date due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
4	**EC_EH_ETW_6_4**	EC_EH_ETW_6_WC3	TRCA	Ephemeral to Intermittent	2.0 (where defined)	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 5 selected as an appropriate erosion date due to lack of channel definition for majority of reach	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
4	**EC_EH_ETW_1_1**	EC_EH_ETW_1_WC1	TRCA	Permanent	3.8	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 5 selected as an appropriate erosion date due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
4	**EC_EH_ETW_1_5**	EC_EH_ETW_1_WC3	TRCA	Permanent	4.2	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 8 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
5	**EC_EH_ETW_1_7**	EC_EH_ETW_1_WC5	TRCA	Permanent	At Crossing: 5.0 Downstream of crossing: approximately 1.90	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	11.0 (+/-3)	Based on Mapping
5	**EC_EH_ETW_1_11**	EC_EH_ETW_1_WC8	TRCA	Permanent	2.1	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 8 was selected as an appropriate erosion rate due to transitional RGA rating and overall moderate-high hazard rating	Watercourse smaller than 3 m. Mapping data not applicable. Used MNR Table 4
5	**EC_EH_ETW_1_12**	EC_EH_ETW_1_WC10	TRCA	Permanent	2.6	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 5 selected as an appropriate erosion rate due to In Regime RGA rating and moderate hazard rating	Watercourse smaller than 3 m. Mapping data not applicable. Used MNR Table 4
5	**HU_WH_CAC_0_1**	HU_WH_CAC_0_WC1	TRCA	Permanent	4.5	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	Erosion rate calculated based on historical mapping and 11.0 (+/- 3 m) Upgraded to 16.0 (+/- 3) due to desktop and field assessment	Based on Mapping

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
5	**HU_WH_TWH_1_2**	HU_WH_TWH_1_WC2.3	TRCA	Intermittent	4.8	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Not Present	5.0 – 8.0 5 selected as an appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
5	**HU_WH_TWH_1_4**	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	TRCA	Intermittent	4.6	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Not Present	5.0 – 8.0 5 selected as an appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
5	**HU_WH_CAC_0_2a**	HU_WH_CAC_0_WC2	TRCA	Permanent	5.0	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 5 selected as an appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
6	**HU_WH_TWH_1_5**	HU_WH_TWH_1_WC8.1	TRCA	Intermittent	5.5 (Likely an over-estimate. Upstream of the proposed crossing the feature is an undefined likely headwater feature that becomes more defined within the forested section where based on field work water ponds during spring months. Downstream where the channel goes through the agricultural field is not defined. Downstream of the agricultural field a grate was noted on private property. It is assumed the feature likely flows into the grate. Additionally, further downstream at the Old School Road crossing the channel is also not defined. The 5.5 m bankfull width was collected closer to the residential properties at a section where the channel may have been altered)	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Not Present	1.0	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
6	**HU_WH_TWH_2_1**	HU_WH_TWH_2_WC1	TRCA	Permanent	3.0 Downstream at Old School Road width is closer to 4.5	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	8.0 – 15.0 12.0 was selected as an appropriate erosion rate due to transitional (borderline stable) RGA rating and moderate hazard rating	Based on MNR Table 4 (Reach bankfull width 3 m or less)
6	**HU_WH_SAL_5_1**	HU_WH_SAL_0_1	TRCA	Intermittent	1.7	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 5.0 selected as an appropriate erosion rate due to small channel size.	Based on MNR Table 4 (Reach bankfull width 3 m or less)
6	**HU_WH_SAL_3_1**	HU_WH_SAL_3_1	TRCA	Intermittent	2.7	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Not Present	5.0 – 8.0 5.0 selected as a more appropriate erosion rate due to In Regime RGA rating and Low hazard rating	Based on MNR Table 4 (Reach bankfull width 3 m or less)

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
6	**HU_WH_SAL_0_1**	Realignment has negated need for crossing	TRCA	Permanent	3.4	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	Watercourse has been historically altered and therefore the erosion rate was calculated using bends that appear more natural within the subject area (as per TRCA (2015) guidelines). 7.0 (+/- 3)	Based on Mapping
6	**HU_WH_SAL_0_2**	HU_WH_SAL_0_2	TRCA	Intermittent	3.5	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	Parish Geomorphic (2014) calculated an erosion rate of 3.2 m based on 10% of meander belt; watercourse has been historically altered and therefore erosion rate was calculated using bends that appear more natural within the subject area (as per TRCA (2015) guidelines. 7.0 (+/- 3)	Based on Mapping
6	**HU_WH_SAL_0_3**	Realignment has negated need for crossing	TRCA	Permanent	7.3 The feature is two-staged with an upper bankfull of 6.0 m and a lower width of 1.5 - 2.0	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	6.5 (+/-3)	Based on Mapping
6	**HU_WH_WHR_0_2**	HU_WH_WHR_0_2	TRCA	Permanent	8.5 (Possible two staged channel)	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	18.0 (+/- 3)	Based on Mapping. Note - TRCA (2023) states that monitoring assessments indicate the channel stability at this site has remained moderate between 2001 and 2021. Erosion sensitivity, which was assessed in 2021, is classified as high.
6	**HU_WH_WHR_0_3**	HU_WH_WHR_0_3	TRCA	Permanent	7.5	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	23.0 (+/- 3)	Based on Mapping
6	**HU_WH_GRT_0_2**	HU_WH_GRT_0_1, HU_WH_GRT_0_2	TRCA	Intermittent	4.0 Downstream seems to be less defined	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
6	**HU_WH_CDT_2_1b**	No Proposed Hydraulic Crossing	TRCA	Permanent	3.0 (based on estimates from the ROW, DEM, and aerial imagery)	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	Peel Plain	Present	5.0 – 8.0 5.0 selected as an appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
6	**HU_WH_CDT_0_2**	HU_WH_CDT_0_1	TRCA	Permanent	4.2	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	5.0 – 8.0 8.0 selected as an appropriate erosion rate due to high meander amplitude	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
6	**HU_MH_RAI_1_3**	HU_MH_RAI_1_3_1	TRCA	Intermittent	4.4	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	Peel Plain	Present	5.0 – 8.0 5.0 selected as an appropriate erosion rate due to In Regime RGA rating and moderate hazard rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)
7	**HU_MH_ROB_0_2**	HU_MH_ROB_0_5	TRCA	Intermittent	4.8 (limited PTE)	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Present	7.0 (+/- 3)	Based on Mapping
7	**HU_MH_ROB_0_3**	HU_MH_ROB_0_5	TRCA	Intermittent	4.5	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	Peel Plain	Not Present	14.0 (+/- 3)	Based on Mapping
7	**HU_MH_ROB_0_5**	HU_MH_ROB_0_1, HU_MH_ROB_0_2, HU_MH_ROB_0_4	TRCA	Permanent	3.5	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	Peel Plain	Present	10.0 (+/- 3)	Based on Mapping
7	**HU_MH_ROB_7_1**	HU_MH_ROB_7_1_1, HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_4	TRCA	Permanent	3.0	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	Peel Plain	Present	5.0 – 8.0 8.0 selected as an appropriate erosion rate due to increase in upstream urbanization (unstable)	Based on MNR Table 4 (Reach bankfull width 3 m or less)
7	**HU_MH_ROB_7_2**	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	TRCA	Intermittent	2.0	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	Peel Plain	Not Present	5.0 – 8.0 5.0 selected as an appropriate erosion rate due to In Regime RGA	Based on MNR Table 4 (Reach bankfull width 3 m or less)
7	**HU_MH_ROB_4_1**	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	TRCA	Intermittent	2.9	8b Fine-textured glaciolacustrine deposits: Silt and clay, minor sand and gravel, Interbedded silt and clay and gritty, pebbly flow till and rainout deposits	Peel Plain	Not Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to low-moderate hazard rating	Based on MNR Table 4 (Reach bankfull width 3 m or less)
8	**HU_MH_MHR_0_1**	HU_MH_MHR_0_1, HU_MH_MHR_0_2	TRCA	Permanent	15.8	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	12.0 (+/-3)	Based on Mapping
8	**HU_MH_EHR_1_3**	HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	TRCA	Intermittent	5.1	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 8.0 selected as an appropriate erosion rate due to RGA rating of In Adjustment	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
8	**HU_MH_EHR_1_4**	HU_EH_EHT_1_1	TRCA	Permanent	2.7	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 8.0 selected as an appropriate erosion rate due to Transitional or stressed RGA and active erosion	Based on MNR Table 4 (Reach bankfull width 3 m or less)
8	**HU_MH_EHR_1_6**	HU_EH_EHT_1_2_1	TRCA	Intermittent	3.3	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	7.3 (+/-3)	Based on Mapping
8	**HU_MH_EHR_0_2**	HU_EH_EHR_0_1, HU_EH_EHR_0_2	TRCA	Permanent	11.1	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	18.0 (+/-3)	Based on Mapping
9	**HU_EH_EHR_18_1a**	No Proposed Hydraulic Crossing	TRCA	Permanent	4.5	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 5.0 was selected as an appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Channel less than 5 m wide)
9	**HU_EH_EHR_18_1b**	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	TRCA	Permanent	1.8	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 5.0 was selected as an appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach less than 3 m wide)
9	**HU_EH_EHR_18_6**	HU_EH_EHT_18_4_1	TRCA	Permanent	2.5	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach less than 3 m wide)
9	**HU_EH_EHR_18_6b**	No Proposed Crossing	TRCA	Permanent	2.5	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach less than 3 m wide)
9	**HU_EH_EHR_18_8**	No Proposed Crossing	TRCA	Permanent	4.0	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.
9	**HU_EH_EHR_18_8b**	No Proposed Crossing	TRCA	Permanent	3.9	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Surficial Geology (The Ontario Geological Survey (OGS), 2003)	Physiographic Region (Chapman & Putman, 1984)	Active Erosion? (Refer to Section 7.1.2 For Description of Active Erosion)	100- Year Erosion Rate (m)	100-Year Erosion Rate Approach Used
9	**HU_EH_EHR_18_8c**	No Proposed Crossing	TRCA	Permanent	4.6	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Present	5.0 – 8.0 6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.
9	**HU_EH_EHR_19_1**	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	8.4	19 Modern Alluvial deposits: clay, silt, sand, gravel, may contain organic remains	South Slope	Minor	9.3	Mapping approach was used based on surrogate reach
9	**HU_EH_EHR_19_7**	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	3.1	5d Till: Clay to silt-textured till (derived from glaciolacustrine deposits or shale)	South Slope	Actively eroding	5.0 – 8.0 6.5 was selected as an appropriate erosion rate due to stressed to transitional RGA rating	Based on MNR Table 4 (Channel less than 5 m wide)

6.5 Final Meander Belt Width

The meander belt width represents the maximum corridor of the meander pattern and therefore this corridor covers the lateral area where the channel could potentially occupy over time. Development within this area could be affected by the meandering nature of the occupying watercourse.

Final meander belts were centred on the delineated meander belt axis, which is a conceptual line that shows the general orientation of the meandering planform. The axis was delineated based on a combination of watercourse linework data, which was provided by the Ministry of Natural Resources and Forestry as Land Information Ontario data, available LiDAR data, and aerial imagery.

The final meander belt width was dependant upon the confining nature of the watercourse, as required by Parish Geomorphic (2004), TRCA (2015), and CVC (2014), and as outlined in **Section 2**. Select watercourses that were identified as Redside Dace (RSD) habitat, based on publicly available data (**refer to Section 2.6**), also required an additional buffer on either side of the meander belt to define the Regulated/Critical Habitat limit.

Based on procedures outlined by Parish Geomorphic (2004) and CVC (2014), the equations listed in **Table 6-4** were used to determine the final meander belt width. Note that for confined and partially confined reaches, the confining valley was delineated between the top and bottom of the confining valley using the methods outlined by Parish Geomorphic (2004) based on site characteristics, slope angle, and proximity of watercourse to the slope. The top of slope was used conservatively for two reaches (CR_GW_CRR_15a and CR_GW_CRR_15b) due to the fact that these reaches are artificially confined.

For meander belts less than 50 m wide, an additional allowance is also typically added to the final meander belt when the historical aerial imagery analysis identifies a shift in the location of the meander belt axis within the floodplain. None of the reaches in the present study identified such changes in the meander belt axis.

Final meander belt widths have been provided in **Table 6-5**. Finalized meander belt maps have been provided in **Appendix D**.

It should be noted that the limits described do not reflect limits of geotechnical stability (i.e., top of stable slope), which are typically considered when delimiting lands subject to natural hazards. The meander belt width does not consider geotechnical or slope stability issues.

Table 6-4: Final Meander Belt Width Equations

System Type	Meander Belt Width Equation
Unconfined Systems Preliminary MBW < 50 m	Final MBW = Preliminary MBW + 2x Erosion Rate
Unconfined Systems Preliminary MBW ≥ 50 m	Final MBW = Preliminary MBW ∗ 1.10
Confined Systems	Final MBW = Preliminary MBW Limited by Confining Walls
Partially Confined Systems	Final MBW = Preliminary MBW + 2x Erosion Rate on unconfined side Preliminary MBW Limited by Confining Walls on Confined Size

Table 6-5: Final Meander Belt Width

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Channel Confinement	Redside Dace Occupied Habitat?*	Prelim. MBW (m)	Prelim. MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final Meander Belt Width (m)	Final Width Justification	RSD Regulatory Limit (if applicable) (m)
1	**SM_EB_SIM_0_2**	SM_EB_SIM_0_WC1 EXTENSION	CH	Permanent	7.3	Confined	No	82.0 – 140.0	Based on Mapping	5.0 – 8.0 6.5 selected as the appropriate erosion rate due to the transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	82.0 – 140.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
2	**CR_LC_LEV_1_2**	CR_LC_LEV_1_WC2	CVC	Intermittent	1.3	Unconfined - might be slightly entrenched downstream	No	9.6	Historically Altered – Used Empirical Method	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	17.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
2	**CR_LC_LEV_2_2**	No proposed crossing ID. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	CVC	Intermittent	3.0	Unconfined	No	21.4	Historically Altered – Used Empirical Method	8.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	37.4	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
2	**CR_LC_LEV_2_4**	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.1	CVC	Intermittent	2.9	Unconfined	No	19.6	Historically Altered – Used Empirical Method	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	27.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
2	**CR_LC_LEV_0_1**	CR_LC_LEV_0_WC2	CVC	Permanent	4.1	Unconfined	Yes	10.0	Based on Mapping	10.0 (+/-3)	Based on Mapping	30.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 90.0**
2	**CR_LC_LEV_0_2**	CR_LC_LEV_0_WC2	CVC	Permanent	4.2	Unconfined	Yes	14.0	Based on Mapping	10.0 (+/-3)	Based on Mapping	34.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 94.0**
2	**CR_NP_CRR_0_2**	CREDIT RIVER BRIDGE	CVC	Permanent	27.0	Confined	No	450.0 – 640.0	Based on Mapping	20.0 (+/-3)	Based on Mapping	450.0 – 640.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
2	**CR_NP_CRR_0_1**	CREDIT RIVER BRIDGE	CVC	Permanent	27.0	Confined	No	450.0 – 640.0	Based on Mapping	20.0 (+/-3)	Based on Mapping	450.0 – 640.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
3	**EC_EH_ETW_13_1**	EC_EH_ETW_13_WC1	TRCA	Intermittent	1.8	Unconfined (access to floodplain partially limited due to entrenchment)	No	12.6	Historically Altered – Used Empirical Method	1.0	Watercourse smaller than 3 m. Mapping data not applicable. Used TRCA Table	14.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
3	**CR_GW_CRR_15a**	CR_GW_CRR_15_WC3	CVC	Permanent	N/A	Confined	No	9.3	Historically Altered – Used Empirical Method	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery	5.0 – 9.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
3	**CR_GW_CRR_15b**	CR_GW_CRR_15_WC2.1	CVC	Permanent	N/A	Confined	No	9.3	Historically Altered – Used Empirical Method	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery	4.0 – 8.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
4	**EC_EH_ETW_12_3**	EC_EH_ETW_12_WC1	TRCA	Ephemeral to Intermittent	2.5	Unconfined	No	17.3	Historically Altered – Used Empirical Method	1.0	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	19.3	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
4	**EC_EH_ETW_7_2**	EC_EH_ETW_7_WC3	TRCA	Intermittent	1.5	Unconfined	No	10.6	Historically Altered – Used Empirical Method	1.0	Based on MNR Table 4 (TRCA 2015) (Bankfull width of reach less than 3 m)	12.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
4	**EC_EH_ETW_6_1**	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	TRCA	Intermittent	3.5	Unconfined	No	23.6	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as an appropriate erosion date due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	33.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
4	**EC_EH_ETW_6_4**	EC_EH_ETW_6_WC3	TRCA	Ephemeral to Intermittent	2.0 (where defined)	Unconfined	No	16.0	Based on Mapping	5.0 – 8.0 5.0 selected as an appropriate erosion date due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	26.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
4	**EC_EH_ETW_1_1**	EC_EH_ETW_1_WC1	TRCA	Permanent	3.8	Unconfined	No	21.7	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as an appropriate erosion date due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	31.7	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Channel Confinement	Redside Dace Occupied Habitat?*	Prelim. MBW (m)	Prelim. MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final Meander Belt Width (m)	Final Width Justification	RSD Regulatory Limit (if applicable) (m)
4	**EC_EH_ETW_1_5**	EC_EH_ETW_1_WC3	TRCA	Permanent	4.2	Confined	No	62.0 – 87.0	Based on Mapping	5.0 – 8.0 8.0 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	62.0 – 87.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
5	**EC_EH_ETW_1_7**	EC_EH_ETW_1_WC5	TRCA	Permanent	5.0	Confined	No	66.0 – 83.0	Based on Mapping	11.0 (+/-3)	Based on Mapping	66.0 – 83.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
5	**EC_EH_ETW_1_11**	EC_EH_ETW_1_WC8	TRCA	Permanent	2.1	Confined	No	48.0 – 96.0	Based on Mapping	5.0 – 8.0 8.0 was selected as the appropriate erosion rate due to transitional RGA rating and overall moderate-high hazard assessment result	Watercourse smaller than 3 m. Mapping data not applicable. Used TRCA Table	48.0 – 96.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
5	**EC_EH_ETW_1_12**	EC_EH_ETW_1_WC10	TRCA	Permanent	2.6	Confined	No	54.0 – 68.0	Based on Mapping	5.0 – 8.0 5.0 selected as the appropriate erosion rate due to In Regime RGA rating and moderate hazard assessment result	Watercourse smaller than 3 m. Mapping data not applicable. Used TRCA Table	54.0 – 68.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
5	**HU_WH_CAC_0_1**	HU_WH_CAC_0_WC1	TRCA	Permanent	4.5	Confined	No	98.0 – 155.0	Based on Mapping	Erosion rate calculated based on historical mapping and 11.0 (+/- 3) Upgraded to 16.0 (+/- 3)	Based on Mapping	98.0 – 155.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
5	**HU_WH_TWH_1_2**	HU_WH_TWH_1_WC2.3	TRCA	Intermittent	4.8 – 5.0	Unconfined (entrenched)	No	34.7	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	44.7	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
5	**HU_WH_TWH_1_4**	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	TRCA	Intermittent	4.6	Unconfined	No	28.1	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	38.1	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
5	**HU_WH_CAC_0_2a**	HU_WH_CAC_0_WC2	TRCA	Permanent	5.0	Unconfined	Yes	46.2	Based on empirical calculations	5.0 – 8.0 5.0 selected as appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	56.2	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 116.2**
6	**HU_WH_TWH_1_5**	HU_WH_TWH_1_WC8.1	TRCA	Intermittent	5.5 (Likely an over-estimate. Upstream of the proposed crossing the feature is an undefined likely headwater feature that becomes more defined within the forested section where based on field work water ponds during spring months. Downstream where the channel goes through the agricultural field is not defined. Downstream of the agricultural field a grate was noted on private property. It is assumed the feature likely flows into the grate. Additionally, further downstream at the Old School Road crossing the channel is also not defined. The 5.5 m bankfull width was collected closer to the residential properties at a section where the channel may have been altered)	Unconfined	No	34.6	Historically Altered – Used Empirical Method *Used bankfull width of 5.5 but this is likely not correct (5.5 is too large)	1.0	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	36.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Channel Confinement	Redside Dace Occupied Habitat?*	Prelim. MBW (m)	Prelim. MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final Meander Belt Width (m)	Final Width Justification	RSD Regulatory Limit (if applicable) (m)
6	**HU_WH_TWH_2_1**	HU_WH_TWH_2_WC1	TRCA	Permanent	3.0	Unconfined	Yes	24.8	Historically Altered – Used Empirical Method	8.0 – 15.0 12.0 was selected as the appropriate erosion rate due to transitional (borderline stable) RGA rating and moderate hazard assessment results	Based on MNR Table 4 (Reach bankfull width 3 m or less)	49.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 109.0**
6	**HU_WH_SAL_5_1**	HU_WH_SAL_0_1	TRCA	Intermittent	1.7	Unconfined	No	6.1	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as the more appropriate erosion rate due to In Regime RGA rating and low hazard assessment results	Based on MNR Table 4 (Reach bankfull width 3 m or less)	16.1	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
6	**HU_WH_SAL_3_1**	HU_WH_SAL_3_1	TRCA	Intermittent	2.7	Unconfined	No	18.6	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as the more appropriate erosion rate due to In Regime RGA rating and low hazard assessment results	Based on MNR Table 4 (Reach bankfull width 3 m or less)	28.6	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
6	**HU_WH_SAL_0_1**	Realignment has negated need for crossing	TRCA	Permanent	3.4	Unconfined	Yes	26.0	Historically Altered – Used Empirical Method	Watercourse has been historically altered and therefore erosion rate calculated using bends that appear more natural within the subject area (as per TRCA (2015) guidelines). 7.0 (+/- 3)	Based on Mapping	40.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limitr = 100.0**
6	**HU_WH_SAL_0_2**	HU_WH_SAL_0_2	TRCA	Intermittent	3.5	Unconfined	Yes	26.0	Historically Altered – Used Empirical Method (Larger value taken for calculations for HU_WH_SAL_0_1)	Watercourse has been historically altered and therefore erosion rate was calculated using bends that appear more natural within the subject area (as per TRCA (2015) guidelines. 7.0 (+/- 3)	Based on Mapping	40.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 100.0**
6	**HU_WH_SAL_0_3**	Realignment has negated need for crossing	TRCA	Permanent	7.3	Unconfined	Yes	49.0	Based on Mapping	6.5 (+/-3)	Based on Mapping	62.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 122.0**
6	**HU_WH_WHR_0_2**	HU_WH_WHR_0_2	TRCA	Permanent	8.5	Confined	Yes	118.0 – 186.0	Based on Mapping	18.0 (+/- 3)	Based on Mapping. Note - TRCA (2023) states that monitoring assessments indicate the channel stability at this site has remained moderate between 2001 and 2021. Erosion sensitivity, which was assessed in 2021, is classified as high.	186.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	**RSD Regulatory Limit = 246.0**
6	**HU_WH_WHR_0_3**	HU_WH_WHR_0_3	TRCA	Permanent	7.5	Confined	Yes	100.0 – 294.0	Based on Mapping	23.0 (+/- 3)	Based on Mapping	294.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	**RSD Regulatory Limit = 354.0**
6	**HU_WH_GRT_0_2**	HU_WH_GRT_0_1, HU_WH_GRT_0_2	TRCA	Intermittent	4.0 - 5.2	Unconfined	No	32.9	Empirical (Not enough resolution on historical data)	5.0 – 8.0 6.5 selected as the appropriate erosion rate due to the transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	46.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
6	**HU_WH_CDT_2_1b**	No Proposed Hydraulic Crossing	TRCA	Permanent	2.5 (Based on estimates from the ROW)	Unconfined	No	16.9	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 selected as appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	26.1	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Channel Confinement	Redside Dace Occupied Habitat?*	Prelim. MBW (m)	Prelim. MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final Meander Belt Width (m)	Final Width Justification	RSD Regulatory Limit (if applicable) (m)
6	**HU_WH_CDT_0_2**	HU_WH_CDT_0_1	TRCA	Permanent	4.2	Confined	No	39.0 – 83.0	Based on Mapping	5.0 – 8.0 8.0 was selected as the appropriate erosion rate due to the high meander amplitude	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	39.0 – 83.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
6	**HU_MH_RAI_1_3**	HU_MH_RAI_1_3_1	TRCA	Intermittent	4.4	Unconfined	No	29.0	Historically Altered – Used Empirical Method	5.0 – 8.0 5.0 was selected as the appropriate erosion rate due to In Regime RGA rating and moderate hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	39.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
7	**HU_MH_ROB_0_2**	HU_MH_ROB_0_5	TRCA	Intermittent	4.8	Confined	No	80.0 – 97.0	Based on Mapping	7.0 (+/- 3)	Based on Mapping	80.0 – 97.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
7	**HU_MH_ROB_0_3**	HU_MH_ROB_0_5	TRCA	Intermittent	4.5	Unconfined	No	32.0 – 63.0	Channel used to be a compound meander bend part of ROB_0_3, but valley infilling cut off the meander. The meander belt for this feature is part of ROB_0_2.	14.0 (+/- 3)	Based on Mapping	60.0 – 91.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate *Channel used to be part of a meander bend of HU_MH_ROB_0_2 but was cut off due to valley infilling. Final meander belt is hosted within meander belt of HU_MH_ROB_0_2.	N/A
7	**HU_MH_ROB_0_5**	HU_MH_ROB_0_1, HU_MH_ROB_0_2, HU_MH_ROB_0_4	TRCA	Permanent	3.5	Unconfined	No	19.0	Based on Mapping	10.0 (+/- 3)	Based on Mapping	39.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
7	**HU_MH_ROB_7_1**	HU_MH_ROB_7_1_1, HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_4	TRCA	Permanent	3.0	Unconfined	No	35.4	Based on Mapping	5.0 – 8.0 8.0 selected as the appropriate erosion rate due to an increase in upstream urbanization (unstable)	Based on MNR Table 4 (Reach bankfull width 3 m or less)	51.4	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
7	**HU_MH_ROB_7_2**	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	TRCA	Intermittent	2.0	Unconfined	No	31.0	Based on Mapping	5.0 – 8.0 5.0 selected as appropriate erosion rate due to In Regime RGA	Based on MNR Table 4 (Reach bankfull width 3 m or less)	41.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
7	**HU_MH_ROB_4_1**	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	TRCA	Intermittent	2.9	Unconfined	No	26.5	Based on Mapping	5.0 – 8.0 6.5 was selected as the appropriate erosion rate due to low-moderate hazard assessment results	Based on MNR Table 4 (Reach bankfull width 3 m or less)	39.5	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
8	**HU_MH_MHR_0_1**	HU_MH_MHR_0_1, HU_MH_MHR_0_2	TRCA	Permanent	15.8	Confined	No	320.0 – 516.0	Based on Mapping	12.0 (+/-3)	Based on Mapping	320.0 – 516.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
8	**HU_MH_EHR_1_4**	HU_EH_EHT_1_1	TRCA	Permanent	2.7	Confined	No	30.0	Based on Mapping	5.0 – 8.0 8.0 was selected as the appropriate erosion rate due to In Regime RGA rating and moderate hazard assessment results	Based on Mapping	30.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
8	**HU_MH_EHR_1_3**	HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	TRCA	Intermittent	5.1	Confined	No	33.0 – 92.0	Based on Mapping	5.0 – 8.0 8.0 selected as the appropriate erosion rate due to the RGA rating of In Adjustment	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	33.0 – 92.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
8	**HU_MH_EHR_1_6**	HU_EH_EHT_1_2_1	TRCA	Intermittent	3.3	Confined	No	32.0 – 58.0	Based on Mapping	7.3 (+/-3)	Based on Mapping	32.0 – 58.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	

Section	Reach	Crossing ID	Conservation Authority	Hydraulic Regime	Bankfull Width (m)	Channel Confinement	Redside Dace Occupied Habitat?*	Prelim. MBW (m)	Prelim. MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final Meander Belt Width (m)	Final Width Justification	RSD Regulatory Limit (if applicable) (m)
8	**HU_MH_EHR_0_2**	HU_EH_EHR_0_1, HU_EH_EHR_0_2	TRCA	Permanent	11.1	Confined	Yes	186.0 – 278.0	Based on Mapping	18.0 (+/-3)	Based on Mapping	278.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	**RSD Regulatory Limit = 338.0**
9	**HU_EH_EHR_18_1a**	No Proposed Crossing	TRCA	Permanent	4.5	Confined	No	35.0 – 75.0	Based on Empirical (Historical imagery obscured by dense tree cover)	5.0 – 8.0 5.0 was selected as appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach less than 5 m wide)	35.0 – 75.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
9	**HU_EH_EHR_18_1b**	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	TRCA	Permanent	1.8	Unconfined	No	13.4	Based on Empirical	5.0 – 8.0 5.0 was selected as appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach less than 3 m wide)	23.4	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
9	**HU_EH_EHR_18_6**	HU_EH_EHT_18_4_1	TRCA	Permanent	2.5	Unconfined	No	19.1	Partially confined. N portion confined and MBW defined using mapping. Southern portion will have belt width of 19.1 m	5.0 – 8.0 6.5 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach less than 3 m wide)	32.1	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	N/A
9	**HU_EH_EHR_18_6b**	No proposed crossing	TRCA	Permanent	2.5	Confined	No	6.5 – 15.0	Partially confined. N portion confined and MBW defined using mapping. Southern portion will have belt width of 19.1 m	5.0 – 8.0 6.5 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach less than 3 m wide)	6.5 – 15.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A
9	**HU_EH_EHR_18_8**	No Proposed Crossing	TRCA	Permanent	4.0	Confined	Yes	29.0 - 38.0	Based on Mapping	5.0 – 8.0 6.5 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.	29.0 to 38.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	**RSD Regulatory Limit = 89.0 – 98.0**
9	**HU_EH_EHR_18_8b**	No Proposed Crossing	TRCA	Permanent	3.9	Confined	Yes	28.0 - 66.0	Based on Mapping	5.0 – 8.0 6.5 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.	28.0 to 66.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	**RSD Regulatory Limit = 88.0 – 126.0**
9	**HU_EH_EHR_18_8c**	No Proposed Crossing	TRCA	Permanent	4.6	Partially Confined	Yes	53.0	Based on Mapping	5.0 – 8.0 6.5 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.	66.0	Unconfined feature. Final MBW = Preliminary MBW + 2x Erosion Rate	**RSD Regulatory Limit = 126.0**
9	**HU_EH_EHR_19_1**	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	8.4	Partially Confined	Yes	86.0	Based on Mapping (defined using surrogate reach)	9.3	Based on Mapping	94.6	Final = Preliminary MBW + safety factor (1.1 x Preliminary MBW) Erosion rate not added for belts larger than 50 m. A 1.1 safety factor is included instead	**RSD Regulatory Limit = 154.6**
9	**HU_EH_EHR_19_7**	No Drainage ID. Culverts will be widened based on existing opening	TRCA	Permanent	3.1	Partially Confined	No	50.0	Based on Mapping	5.0 – 8.0 6.5 selected as appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (channel less than 5 m wide)	50.0	Confined feature. Final MBW = Preliminary MBW due to valley confinement	N/A

Note: * Redside Dace habitat is based on publicly available data.

7. Recommendation Refinement

7.1 Refining the Preliminary Crossing Assessment

Crossing size and alignment recommendations have all been provided in accordance with relevant governing Conservation Authority published guidelines and procedures as well as consideration of relevant federal (i.e., SAR) crossing recommendations. The TRCA, CVC, and CH Guidelines (refer to **Section 2**) state they prefer all new and replacement crossings span the meander belt width to address channel migration. Where crossing the full meander belt is not possible, the crossing should, at a minimum, span the watercourse's 100-year erosion limit to minimize the risk of channel contact with structure abutments, footings, and fill slopes. Additionally, if the structure is placed within the meander belt, then scour and erosion protection should be included in the crossing design (TRCA 2015; CVC 2019; CH 2020).

The preliminary crossing assessment determined the full meander belt width for each reach that crosses the proposed alignment, as well as the 100-year erosion potential. To minimize unnecessarily building oversized crossing structures, the preliminary crossing assessments were refined to determine a suitable crossing width and alignment recommendation. All recommendations were provided with an aim to mitigate future erosion potential to watercourse crossing structures and/or enhance the natural channel processes based on the pre-existing conditions described in this report and associated appendices. The following was considered to refine the crossing assessments:

1. Future flow conditions (refer to **Section 7.1.1**) including an assessment of the HEC-RAS modelling results for pre-existing and proposed conditions to identify any significant changes in the channel and floodplain hydraulics that would increase the local erosion potential as assessed through sediment transport entrainment and transport potential and an assessment of the stream power results. Note that the high-level review was based on preliminary 60% design considerations and was not updated for the purposes of the 90% design submission. It is recommended that fluvial geomorphology re-evaluate sediment transport and entrainment potential during detail design once all recommended crossing widths have been finalized.

2. Development, application, and consideration of a Project-specific hazard assessment (refer to **Section 7.1.2**) to inform whether the crossing structure should span the full meander belt (with or without an additional buffer for habitat considerations as appropriate), span the 100-year erosion rate, or if it should span a width between the 100-year erosion rate and meander belt width.

7.1.1 Future Flow Conditions

Hydraulic modelling was provided by TRCA, CVC, and CH for the major watercourse crossings. The major proposed crossings were modelled in HEC-RAS hydraulic modelling software. In CVC jurisdiction, where hydraulic models were not available CulvertMaster was used to assess the proposed culverts. Methods have been described further in the Drainage and Stormwater Management Reports: (1) TRCA Area (AECOM and WSP 2023a), (2) CVC Area (AECOM and WSP 2023b), and (3) CH Area (AECOM and WSP 2023c).

The effects of climate change have been considered in the design of the watercourse crossing structures. The specific methods used to account for climate change within each of the three Conservation Authority jurisdictions have been described in detail in the relevant Drainage and Stormwater Management Reports (AECOM and WSP 2023a; AECOM and WSP 2023b; AECOM and WSP 2023c). In general, the major proposed crossings were modelled in HEC-RAS hydraulic modelling software based either on flows from the hydrologic model increased by 10% to account for climate change between now and the end of the 75-year design service life or on the hydrologic model results using the 2096 IDF data provided by MTO.

Note that the modelling results presented in **Appendix E** are based on the 60% design and will need to be updated during Detail Design to reflect updated crossing span considerations.

Culverts and bridges were designed for the ultimate conditions to meet hydraulic design criteria set forth by MTO and relevant Conservation Authority guidelines with sizing input from structural, environmental, and fluvial geomorphology.

7.1.1.1 Sediment Transport and Entrainment

Sediment transport and entrainment equations provide valuable estimates of the particle size able to be moved or retained during various flow conditions. Sediment transport equations were developed to estimate sediment discharge over homogeneous river reaches in terms of flow discharge, energy slope and sediment size (Malavoi J.G. 2011).

Sediment entrainment in the crossing vicinities were estimated using the Shields equation (Shields 1936). This predictor aims at determining the size of particles entrained based on the shear stress output for proposed conditions (Q_2), to inform channel stability. The Shields criterion is a ratio between driving forces (tractive force multiplied by the surface of the particle) and stabilizing forces (sediment weight). A given flow can move a sediment grain size if $\tau^* > \tau^*_c$, where τ^*_c was experimentally determined to range from 0.03 in sand bed rivers with very low gradients (Shields 1936) to 0.045 in gravel bed rivers (Reckning 2009).

Equation 7-1: Shields' Shear Stress

$$\tau^* = \frac{\tau}{g(\rho_s - \rho)D} = \frac{\rho g h J}{g(\rho_s - \rho)D} \approx \frac{hJ}{1.65D}$$

Where: τ is the tractive force (N/m^2),
g is the gravitational acceleration: 9.81 m/s^2,
J is the energy slope (m/m),
h is the water depth (m),
ρ_s is the sediment density: 2650 kg/m^3,
ρ is the water density: 1000 kg/m^3, and
D is the particle diameter considered (m).

The hydraulic modelling results were used to determine the predicted sediment size entrained for each major watercourse crossing under pre-existing and proposed conditions. The results have been provided for the 2-, 25-, 50, and 100-year return period events (**Equation 7-1**) where HEC-RAS modelling was available. Results are used to inform erosion potential based on the proposed changes for each major watercourse crossing.

Sediment transport was calculated using Komar's equation (**Equation 7-2**). The velocity data provided by the HEC-RAS model was used to calculate the predicted sediment size transported under pre-existing and proposed conditions. These estimates are also based on the 2-, 25-, 50-, and 100-year return period events.

Equation 7-2: Komar's Sediment Entrainment

$$v = 57D50^{0.46}$$

Where: v is velocity (cm/s),
D50 is the median bed material grain size (cm).

The data provides qualitative information on substrate mobility. The results of the 2-year return period flow identifies the size of particles transported or entrained which can inform channel stability since this flow event is the closest to the channel forming flow event The 25-, 50-, and 100-year return period flows aim to identify the maximum grain size transported or entrained for each crossing to inform erosion mitigation solutions.

Specific analysis of scouring estimates and riprap protection sizing is outside the scope of this report but may be required for hydraulic structure design. The results of the sediment transport and entrainment calculations have been provided in **Appendix E**.

7.1.1.2 Stream Power

Stream power (per unit width) defines the rate that the flow dissipates its excess energy against the channel boundary. As opposed to the entrainment and transport equations outlined in the preceding section that define the flow's sediment transport capacity, or the size of sediment that can be mobilized, stream power is a useful predictor of the flow's sediment transport capacity or the total volume of sediment particles that the river can transport (**Equation 7-3**). Estimates of stream power are based on water density, the local energy slope, and channel discharge per unit width as follows:

Equation 7-3: Stream Power

$$\omega = \frac{\gamma * Q_{bkf} * J}{w} = \frac{(\rho * g) * Q_{bkf} * J}{w}$$

Where: ω [Watts/m^2] is power,
ρ [kg/m^3] is the water density,
g [m/s^2] is the gravitational acceleration,
Q_{bkf} [m^3/s] is the channel discharge,
J [m/m] is the energy slope,
w [m] is the wetted width of channel width

Stream power can be related to sediment transport rates using **Table 7-1**. Conceptually, if the sediment sizes described by **Equation 7-1** and **Equation 7-2** are larger than those found on the channel bed, then an increase in stream power would represent higher sediment transport rates. Stream power was calculated in each HEC-RAS model.

Table 7-1: Sediment Transport Rate Based on Stream Power

Stream Power	Sediment Transport Rates
< 10 W/m^2	No sediment transport, inactive river
10-35 W/m^2	Low sediment transport, slightly active river
35-100 W/m^2	Moderate sediment transport, active river
> 100 W/m^2	High sediment transport, highly active river

7.1.2 Hazard Assessment

To provide insight into geomorphically appropriate sizing recommendations, a hazard assessment was performed. To evaluate potential of future channel migration and incision processes, several geomorphic factors were considered based on desktop and field-based analyses. The hazard assessment relied on existing and historical conditions to determine the potential future hazard to each proposed structure.

In the context of the fluvial geomorphic assessment, hazard refers to the theoretical potential future chance of natural channel migration, specifically related to how each watercourse may shift position over time and threaten nearby infrastructure. While fluvial geomorphology can help predict future watercourse behaviour based on channel dynamics and past channel activity, it cannot guarantee how a watercourse will evolve over time. Typically, channels that have historically been more active or that are currently displaying evidence of adjustment are more likely to shift over the infrastructure's lifetime based on criteria defined in the report and were given higher hazard ratings. Because watercourse processes are powerful and often episodic, any proposed infrastructure located within the watercourses natural zone of adjustment may be exposed to a physical hazard. Fluvial systems can exert substantial forces and are capable of rapid and unpredictable movement under certain conditions so even a relatively small encroachment on infrastructure can be meaningful.

Integrating a hazard assessment into the fluvial geomorphic assessment report provided a structured approach that enabled the team to select an appropriate crossing size that was geomorphically suitable to each specific site that accounts for the potential for future channel adjustments over time based on past channel activity and contemporary conditions.

The criteria considered to generate the hazard assessment is outlined below in **Table 7-2**. The factors considered allowed a comprehensive review of channel stability and adjustment potential, geomorphic context, and valley setting.

The overall geomorphic hazard rating informed whether the recommended opening was at or near the minimum regulatory requirement (i.e., watercourses that ranked with a low to moderate hazard rating) with additional width and clearance recommended where appropriate based on site-specific conditions, or well beyond the minimum regulatory requirements with a geomorphically-based span that matches closer to the meander belt or surrounding valley (high hazard rating). In general, channels with high geomorphic activity or identified instability were identified to require larger opening widths to accommodate future changes. Conversely, channels with a lower sensitivity and that were identified to be more stable allowed for narrower recommended openings. Note that the recommended spans all consider the 100-year erosion rate, which was selected after careful consideration of site-specific conditions using either the mapping method or was taken from guidance tables and refined based on reach characteristics (see **Section 6.4**).

It was also recommended that any proposed bridge piers, abutments, and other bridge components be located a minimum distance equal to the 100-year erosion rate away from top of bank on either side. This recommendation is intended to maximize long-term stability and reduce future risk to the structure. This approach provides several key benefits including:

1. Avoidance of undermining infrastructure which could lead to structural instability,
2. Reduction of maintenance and future capital costs,
3. Protection of natural channel processes, and
4. Improved resilience to extreme weather events.

Where watercourses were undefined, had a low to moderate hazard rating, and had a drainage area less than 100 Ha, recommendations were deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. In some instances, to accommodate the proposed route or to bring the watercourse away from planned infrastructure, high-level channel realignments were necessary. This is discussed further in **Section 8.1**.

A total of 8 reaches received a moderate-high hazard rating, and a total of 4 reaches received a high rating. This is discussed further in **Section 7.2**.

For clarity, results of the hazard assessment have been provided in this report in **Table 7-4** to **Table 7-12**. A detailed summary can also be found in **Appendix F**, along with additional details about each reach assessed as part of this assessment. **Appendix F**

serves as a summary table and provides key details about each reach. It includes the following information:

- Identification of the governing Conservation Authority.
- Watershed and watercourse name details.
- A summary of field observations (bankfull width, RGA results, hydraulic regime, channel definition, identification of active erosion, planform of channel, channel confinement).
- Drainage area for each reach.
- Meander belt and 100-year erosion rate information.
- Meander amplitude.
- A high-level review of hydraulic data and the implications for sediment transport/entrainment and stream power.
- Identification of constraints and opportunities for each reach.
- Recommended crossing size with justification.
- Conservation Authority recommendations for new crossings.
- Hazard assessment results.

Table 7-2: Hazard Assessment Matrix

Criteria		Justification
Feature Type	**Defined Channel –** High hazard **Poorly defined Channel –** Moderate hazard **No defined channel –** Low hazard **Multi-Channel –** Moderate to high hazard **Swale type Feature –** Low hazard, likely topography controlled **Altered –** Moderate hazard	■ If flowing water has sufficient energy, over time it will erode sediment along its flow path eventually producing defined channel banks. Eroded sediment is generally deposited downstream in point bars, resulting in a balance between erosional and depositional processes over time (Sholtes and Giordanengo 2017). In general, intermittent to permanent watercourses have defined banks as the water flowing through these systems has enough energy to produce defined channel banks. Ephemeral channels generally lack the energy to create defined channel banks during periods of flow (i.e., low hazard) (Irwin et al. 2013). For the purposes of this hazard assessment, channels with defined banks were assigned a high hazard rating since they have enough energy to potentially pose a hazard to watercourse crossing structures, while watercourses that lacked defined banks including swale type features were given a low hazard rating. If the watercourse had a poorly defined channel or showed evidence of being altered by human activities, it was given a moderate hazard rating.
RGA Results	**Stable (In Regime) –** Low hazard **Transitional –** Moderate hazard **Unstable –** High hazard **Type of Instability –** i.e., aggradation, degradation, widening, planimetric form adjustment **Likely Source of Instability –** Lower hazard if evidence of instability can be attributed to other source **Equilibrium/ disequilibrium state –** Lower hazard if in equilibrium	■ As discussed in **Section 4.2.3**, the Rapid Geomorphic Assessment is a tool developed by the MECP (1999) to assess the stability of a watercourse based visible evidence of channel processes (aggradation, degradation, widening, and planimetric form adjustment). For the purposes of evaluating ultimate hazard to the crossing structure, the following were considered (1) overall frequency of visible evidence of instability, (2) type of channel process/ evidence of instability, (3) the likely source of instability, and (4) the watercourses equilibrium/ disequilibrium state. In general, watercourses with a greater frequency of instability indicators that could not be accounted for by anthropogenic alteration (e.g., a watercourse that is small and crosses an agricultural field through a dug-out channel) were assigned a high-hazard rating, while watercourses showing little to no evidence of instability were given a low-hazard rating.
Active Erosion	**Present –** Moderate to high hazard depending on how much evidence of active erosion was present at the time of the assessment **Not Present –** Low hazard	■ Erosion is a natural process that is a necessary part of meander migration. In meandering systems sediment is eroded from the outer meander bend, and is deposited on the inner meander bend, resulting in a shift across the meander belt over time. Channel meandering occurs in most alluvial systems (Lagasse et al. 2004). ■ Erosion can also occur because of a channel disturbance. There is a complex inter-relationship between channel dimensions, patterns, sediment supply, streambed roughness, and steepness. Alterations in one component will impact the other components. Alterations can be local or can affect the entire drainage network. ■ Active erosion was recorded by staff in the field during field investigations where there was evidence of new erosion. It serves to compliment the Rapid Geomorphic Assessment (RGA), which is an assessment technique that documents indicators of channel instability based on the presence or absence of specific evidence of aggradation, degradation, channel widening, and planimetric form adjustment. For instance, the presence of leaning and fallen trees near the channel may be visible in the field and would qualify as evidence of channel widening regardless of when the trees started falling or leaning, but a recently fallen tree across the channel combined with evidence of bank erosion would indicate active erosional processes are ongoing. Active erosion can also be identified by exposed roots or leaning vegetation as longer roots tend to recede back to the bank. ■ Abundant evidence of active or newer erosion observed in the field that could not be accounted for as a natural part of meander migration (such as erosion occurring along the inside of a meander bend where deposition is typically expected to occur) was used as an indication that the watercourse reach is in a period of adjustment. These watercourse reaches were given a moderate to high rating, depending on how much erosion was observed.
Drainage Area	**Less than 100 ha –** Low hazard **100 ha to 2500 ha (small) –** Low to moderate hazard (depending on size) **Greater than 2500 ha (Large) –** High hazard	■ The behaviour and morphology of a watercourse reach is strongly impacted by the upstream discharge (Lagasse et al. 2004). Very small drainage areas typically correlate with very small headwater drainage features. Headwater streams are typically stabilized by vegetation on the bed and banks whereas larger streams tend to exceed the forces provided by vegetation. As per the TRCA crossing guidelines (TRCA 2015) “geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km^2 (100 ha) or smaller”. Watercourses that were identified to have a drainage area of less than 100 ha were therefore given a low-hazard rating. Large watercourses are also identified in TRCA (2015) as those with a “drainage area greater than 25 km^2”. These watercourses were assigned a high-hazard rating. Watercourses with a drainage area between 100 and 2500 ha were given a low to moderate hazard rating depending on the drainage area size.

Criteria		Justification
Valley Confinement	**Confined –** Low to moderate hazard **Partially Confined –** Moderate to high hazard **Unconfined –** High hazard	■ Confining valleys constrain and limit where a watercourse can flow. A confined watercourse may over time be able to cause sufficient erosion to increase the width of the valley floor only if the valley walls are relatively erodible. For the purposes of this hazard assessment, watercourses that were confined were considered to have a low to moderate hazard rating compared to unconfined watercourses which were given a high hazard rating.
Planform at Proposed Crossing Location	**Straight –** Channel remains straight if little to no erosion occurs – low hazard **Sinuous –** If sinuous due to topography – low hazard **Meandering** – Requires localized bank erosion – high hazard	■ In southern Ontario most watercourses follow a straight (low sinuosity) or meandering planform (Parish Geomorphic 2004). In general, there are four potential options that should be considered when reviewing the natural hazard and heritage functions for crossings to address the geomorphic hazard. These are (1) spanning the meander belt, (2) spanning the 100-year erosion limit, (3) geomorphic design (span is based on recommendations from geomorphic study), or (4) realigning the watercourse to reduce the erosion hazard to infrastructure. Watercourses that were identified as being relatively straight at the proposed crossing location, that exhibited little to low evidence of erosion, and that had not shifted significantly based on air photo interpretation, are likely not to shift greatly over the next 100-years. These watercourses were assigned a low hazard rating. Similarly, if the watercourse was sinuous because it was following natural topographic lows the watercourse was also assigned a low hazard rating. Meandering watercourses are formed through bank erosion and point bar growth. An actively meandering system evolves during each discharge event that has sufficient stream power to mobilize bed and bank sediment (Lagasse et al. 2004). Meandering watercourses will adjust and move over time, which will pose a more significant hazard if insufficiently sized watercourse crossing structures are installed. For this reason, watercourses that displayed a meandering planform at the proposed crossing location were assigned a high hazard rating.

7.1.3 Additional Recommendation Refinements

A thorough review of species at risk (SAR) and crossing design recommendations was completed (refer to **Section 2**) so that all crossing recommendations were in accordance with governing policies.

Additionally, as the recommendations were refined, any site-specific considerations noted during field work (e.g., a highly sinuous channel that channel may need a larger recommended crossing width) were taken into account at this stage.

7.2 Fluvial Geomorphology-Based Recommended Crossing Widths

Crossing width and alignment recommendations based on the existing conditions fluvial geomorphological assessment have been provided below in **Table 7-4** to **Table 7-12**. Further details regarding constraints and opportunities, crossing size justification, and Conservation Authority recommendations based on published guidelines have been provided in **Appendix F**.

In addition to crossing width and alignment recommendations, channel sinuosity was considered for all watercourse crossing structures. Because watercourses are naturally dynamic and sinuous rather than linear, the recommended crossing span served as a minimum crossing width from a fluvial geomorphic perspective. For each proposed crossing, linework showing the bankfull width, 100-year erosion rate, meander belt, and Redside Dace buffer (if applicable) were prepared for the relevant reaches. This linework was incorporated into all preliminary General Arrangement (GA) drawings so that the natural sinuosity and variability of the channels was appropriately considered and to verify that all proposed infrastructure was positioned outside of the 100-year erosion rate.

A total of 8 reaches received a moderate-high hazard rating, and a total of 4 reaches received a high-hazard rating. Reaches that received a moderate-high hazard rating and how it was accounted for included:

- EC_EH_ETW_1_5: Reach showed evidence of active (contemporary) erosion and has a relatively straight planform however, based on a crossing span of 20 m, there is no anticipated change to the predicted grain size entrained or transported for the 2-, 50-, or 100- year flow events therefore, it was decided

that an 8 m erosion envelope on either side of the 4 m wide channel (maximum erosion rate based on the MNR table 4) was suitable provided all planned infrastructure remain outside of the 100-year local erosion hazard.

- EC_EH_ETW_1_7: Channe realignment proposed (refer to **Section 8.1**)
- EC_EH_ETW_1_11: Reach showed evidence of active (contemporary) erosion and has a meandering planform; however, the reach is relatively small with a drainage area of 154 ha and a bankfull width of 2.1 m. Therefore, it was decided that an 8 m erosion envelope on either side of the channel (maximum erosion rate based on the MNR table 4) was suitable provided all planned infrastructure remain outside of the 100-year local erosion hazard.
- HU_WH_CAC_0_1: Channel realignment proposed (refer to **Section 8.1**)
- HU_MH_ROB_0_3: Recommended that this reach be contained within the crossing envelope of HU_MH_ROB_0_2
- HU_MH_ROB_0_5: Reach showed evidence of active erosion and channel is unconfined however, a conservative 10 m 100-year erosion rate was delineated for the reach and there are only slight changes to the anticipated grain size entrained/transported based on a crossing width of 26 m. It was ultimately decided that provided all planned infrastructure remain outside of the 100-year local erosion hazard, the potential hazard to the crossing structure is likely low.
- HU_MH_MHR_0_1: It was recommended that the crossing should span the full meander belt
- HU_MH_EHR_0_2: It was recommended that the crossing should span the full meander belt plus RSD buffer

For four of the watercourses that had a high-hazard rating (HU_WH_WHR_0_2, HU_WH_WHR_0_3, HU_WH_SAL_0_2, and HU_WH_SAL_0_3), it was recommended that the crossing span the full meander belt plus 30 m riparian buffer on either side of the meander belt. For the remaining high-hazard crossing (HU_MH_EHR_1_3), after careful consideration, it was decided that a recommendation that encompasses the bankfull width of the channel and the largest range from the guidance table for the 100-year erosion rate (i.e., 8 m) was appropriate as it was larger than the crossing size proposed by the hydraulics team (a crossing size of 16 m) and an assessment of sediment transport/entrainment potential based hydraulic modelling results from the HEC-RAS model did not greatly change the sediment transport/entrainment potential of

the reach. However, it was identified that the watercourse in this area is highly sinuous and that this must be carefully considered so that the proposed infrastructure remains outside of the 100-year erosion rate.

Recommendations presented in **Table 7-4** to **Table 7-12** were provided based on a Fluvial Geomorphic perspective. They were shared and discussed with the multi-disciplinary team, including members of the Fisheries, Terrestrial, Structures, Geotechnical and Drainage disciplines to determine an ultimate final recommended crossing width. The multi-disciplinary considerations and recommendations were provided in detail in a Watercourse Crossing Design Report (AECOM 2025) and a Major River Crossing Design Report (2025), available under a separate covert. The recommended crossing size has been reproduced in **Table 7-4** to **Table 7-12**, with minor updates included as provided by the AECOM and WSP teams based on the preliminary design.

7.2.1 Watercourse Crossing Design Report

A Watercourse Crossing Design Report (available under a separate cover, refer to the *Highway 413 Watercourse Crossing Design Report (2025a)*) was prepared to outline a clear and traceable decision-making framework for the proposed watercourse crossing designs in the Study Area. It provides comprehensive documentation for all proposed watercourse crossings and documents relevant Conservation Authorities' requirements.

Included in the report are the recommendations provided to the multi-disciplinary team as they were available during preliminary design to inform the crossing structure design. Refer to the fulsome report for further details on the evaluation.

7.2.2 Major River Crossing Design Report

A Major River Crossing Design Report (available under a separate cover, refer to the *Highway 413 - Major River Crossing Design Report (2025b)*) was prepared to evaluate and determine the preferred alignment for the major river crossings (see **Table 7-3**). As part of this assessment, structural, cost, and natural environment considerations were weighted for the short-list of alignments.

Approximate locations of channel banks, the 100-year erosion rate, and the final meander belt width as determined by the fluvial geomorphic assessment were shown on all preliminary design general arrangement drawings to inform the evaluation of

alternatives. This enabled the multi-disciplinary team to rank the alternatives with consideration for:

1. How many piers would be located within the 100-year erosion rate,
2. Whether any channel realignments would be required to accommodate the proposed crossings,
3. Potential for meander migration over time relative to pier placement, and
4. Any additional site-specific concerns.

Refer to the fulsome report for further details on the evaluation.

Table 7-3: Major River Crossings Assessed

Major River Crossing	Impacted Fluvial Geomorphology Reaches
Credit River	■ Four fluvial geomorphic reaches are present within the crossing corridor. The main branch of the Credit River was subdivided into reach CR_NP_CRR_0_1 to the northwest, and CR_NP_CRR_0_2. Two small tributaries to the Credit River are also present in the corridor. This includes CR_NP_CRR_7_1 which drains into the Credit River and defines the reach break between CR_NP_CRR_0_1 and CR_NP_CRR_0_2, and CR_NP_CRR_6_1, which defines the downstream reach break of CR_NP_CRR_0_2.
West Humber River	■ One fluvial geomorphic reach was delineated within the crossing corridor. Reach HU_WH_WHR_0_3 was identified to be a 7.5 m wide permanent, meandering channel with a large drainage area (>25 km^2).
Main Humber River	■ One fluvial geomorphic reach was delineated within the crossing corridor. Reach HU_WH_MHR_0_1 was identified to be a 15.8 m wide permanent, meandering channel with a large drainage area (>25 km^2).
East Humber River	■ One fluvial geomorphic reach was delineated within the crossing corridor. Reach HU_MH_EHR_0_1 was identified to be an 11.1 m wide permanent, meandering channel with a large drainage area (>25 km^2).

Table 7-4: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 1

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID) (Width x Height)
1	**SM_EB_SIM_2_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is 10.34 ha = Low	**Assume no change** in structure is proposed	Not considered a fisheries site	SM_EB_SIM_2_DR2	W-W3	**SM_EB_SIM_2_DR2:** Maintain existing. Confirm impact in Detail Design.
1	**SM_EB_SIM_0_2**	No	**Hazard Assessment: Low** RGA - Transitional/Stressed = Moderate Defined Channel = High; Erosion present = Mod-High; Planform is sinuous to straight= Low; Confined = Low; Drainage Area is 2105.77 ha = Low-Mod	Extension - **no change** in span (input will be required for channel as part of extension) Pre-existing inner culvert width of 6.1 m	SM_EB_SIM_0_E1	SM_EB_SIM_0_WC1 EXTENSION	W-W4	**SM_EB_SIM_0_WC1 EXTENSION:** 6.1 x 3.8 Extension
1	**SM_EL_SIM_1_1**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is sinuous to straight (topography controlled)= Low; Unconfined = High; Drainage Area is 3.67 ha = Low	**Drainage structure. No further plans for fluvial investigation** **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 3.67 ha)	No ID	Crossing SM_EL_SIM_1_DR1 removed from 90% design	W-W11	Crossing **SM_EL_SIM_1_DR1** removed from preliminary design
1	**SM_EL_SIM_1_2**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 46.97 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (swale type feature with small upstream drainage area 46.97 ha) No work is proposed for SM_EL_SIM_1_WC1.3. No recommendation provided.	SM_EB_SIM_1_E1	SM_EL_SIM_1_WC1.1, SM_EL_SIM_1_WC1.2, SM_EL_SIM_1_WC1.3, SM_EL_SIM_1_WC1.4, SM_EL_SIM_1_WC1.5	W-W14 W-W15 W-W16 W-W17 W-W18	**SM_EL_SIM_1_WC1.1:** 3.3 x 3.0 **SM_EL_SIM_1_WC1.2**: 3.3 x 3.0 **SM_EL_SIM_1_WC1.3:** No culvert work being proposed. Confirm in Detail Design **SM_EL_SIM_1_WC1.4:** Outlet modification required. Confirm hydraulic impact in Detail Design **SM_EL_SIM_1_WC1.5:** 4.0 x 2.1
1	**SM_EL_SIM_1_3**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; Assumed No Erosion (appears to be undefined) = Low; Planform is straight= Low; Unconfined = High; Drainage Area is <100 ha = Low	No PTE - **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** but further assessment required when PTE granted. **SM_EL_SIM_1_WC1:** Extension - no change in span (input will be required for channel as part of extension)	SM_EB_SIM_1_E1	SM_EL_SIM_1_WC1 EXTENSION, SM_EL_SIM_1_WC1.6	W-W21A W-W21B W-W23	**SM_EL_SIM_1_WC1 EXTENSION:** 3.0 x 2.1 Extension **SM_EL_SIM_1_WC1.6:** 4.0 x 2.3
1	**SM_EL_SIM_1_4**	No	**Hazard Assessment: Low** **RGA = N/A** No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 41.74 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (swale type feature at Steeles Road, small upstream drainage area 41.74 ha)	SM_EB_SIM_2_E2	SM_EL_SIM_1_WC2.1, RELOCATED-SM_EL_SIM_1_WC2.2	W-W25 W-W26	**SM_EL_SIM_1_WC2.1:** 4.5 x 2.1 **RELOCATED-SM_EL_SIM_1_WC2.2:** 4.3 x 1.2
1	**SM_EL_SIM_1_5**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 71.53 ha = Low	Extension - **no change** in span (input will be required for channel as part of extension)	SM_EB_SIM_2_E2	SM_EL_SIM_1_WC2.3 EXTENSION	W-W27	**SM_EL_SIM_1_WC2.3 EXTENSION:** 3.5 x 2.1 Extension

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID) (Width x Height)
1	**SM_EL_SIM_1_8**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 89.93 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (swale type feature) small upstream drainage area 89.93 ha)	SM_EB_SIM_3_E3	SM_EL_SIM_1_WC3.1, SM_EL_SIM_1_WC3.2 EXTENSION, SM_EL_SIM_1_WC3.3, SM_EL_SIM_1_WC3.6 RELOCATION,	W-W30 W-W31 W-W33 W-W-36	**SM_EL_SIM_1_WC3.1:** 3.5 x 2.1 **SM_EL_SIM_1_WC3.2 EXTENSION:** 3.5 x 2.1 Extension **SM_EL_SIM_1_WC3.3:** 3.5 x 2.1 Extension **SM_EL_SIM_1_WC3.6 RELOCATION:** 3.5 x 2.4
1	**SM_EL_SIM_1_9**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 105.49 ha = low-mod	Modified structure only. **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	SM_EB_SIM_3_E3	SM_EL_SIM_1_WC3.4 MODIFICATION, SM_EL_SIM_1_WC3.5,	W-W34 W-W35	**SM_EL_SIM_1_WC3.4 MODIFICATION:** 2.4 x 1.8 Structure modification. Remove skewed section downstream, ±55 m **SM_EL_SIM_1_WC3.5:** 3.5 x 2.4
1	**SM_EL_SIM_1_10**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 59.61 ha = Low	Extension - **no change** in span (input may be required for channel as part of extension)	SM_EB_SIM_4_E4	SM_EL_SIM_1_WC4 EXTENSION	W-W37	**SM_EL_SIM_1_WC4 EXTENSION:** 3.5 x 2.1
1	**SM_EL_SIM_1_11**	No	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 62.55 ha = Low	**No change** in structure appear to be proposed	SM_EB_SIM_4_E4	SM_EL_SIM_1_WC4.1 EXTENSION	W-W38	**SM_EL_SIM_1_WC4.1 EXTENSION**: No change in structure proposed

Table 7-5: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 2

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
2	**CR_MC_MUL_8_3**	No	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	CR_MC_MUL_8_E1	CR-MC-MUL-8-WC1	W-W40	**CR-MC-MUL-8-WC1:** Circular – 3.6 x 3.0
2	**CR_MC_MUL_8_4**	No	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Not considered a fisheries site	CR-MC-MUL-8-WC3	W-W42	**CR-MC-MUL-8-WC3**: Circular – 0.9
2	**CR_MC_MUL_8_6**	No	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	CR_MC_MUL_8_E2	CR_MC_MUL_8_WC4	W-W43	**CR_MC_MUL_8_WC4:** Circular – 1.1
2	**CR_LC_LEV_1_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	**N/A**	**Crossing removed from 90% design	N/A	N/A
2	**CR_LC_LEV_1_2**	No	**Hazard Assessment: Low** RGA - In Regime = Low; Defined Channel = High; Erosion not present = Low; Planform is slightly sinuous to straight = Low-Mod; Unconfined=High; Drainage Area is less than 100 ha = Low	**4.5 m:** For the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted. Based on field assessment the bankfull width is approximately 1.3 m wide resulting in a span approximately 4.5 m wide (1.5 x 3.0 m).	CR_LC_LEV_1_E1	CR_LC_LEV_1_WC2	W-W44	**CR_LC_LEV_1_WC2:** Box – 6.0 x 2.1
2	**CR_LC_LEV_2_1**	No	**N/A**	**No proposed crossing**	CR_LC_LEV_2_E3	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_2**	No	**N/A**	**No proposed crossing**	CR_LC_LEV_2_E1	No proposed crossing. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	N/A	N/A
2	**CR_LC_LEV_2_3**	No	**N/A**	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No ID	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_5**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (not defined at proposed crossing location, small upstream drainage area 53.4 ha)	CR_LC_LEV_2_E2	CR_LC_LEV_2_WC2.1 CR_LC_LEV_2_WC2.2 CR_LC_LEV_2_WC2	W-W52 W-W53 W-W54	**CR_LC_LEV_2_WC2.1:** Circular – 1.7 **CR_LC_LEV_2_WC2.2:** Circular – 1.7 **CR_LC_LEV_2_WC2:** Circular – 1.7

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
2	**CR_LC_LEV_2_5a**	No	**N/A**	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No ID	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_5b**	No	**N/A**	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No ID	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_5c**	No	**N/A**	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No ID	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_5d**	No	**N/A**	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No ID	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_5e**	No	**N/A**	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No ID	No proposed crossing	N/A	N/A
2	**CR_LC_LEV_2_4**	No	**Hazard Assessment: Low-Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion not present = Low; Planform is sinuous to straight= Mod; Unconfined=High; Drainage Area is between 100 and 2500 ha = Low-Mod	**9.0 m:** For the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted. Based on field assessment the bankfull width is approximately 2.9 m wide resulting in a span approximately 9 m wide (2.9 x 3 m).	CR_LC_LEV_2_E1	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.1	W-W50 A&B W-W51	**CR_LC_LEV_2_WC1:** Bridge – 14.1 x 3.0 ; Length = 63.9 **CR_LC_LEV_2_WC1.1:** Box – 5.5 x 3.0
2	**CR_LC_LEV_2_6**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	CR_LC_LEV_2_E4	CR_LC_LEV_2_WC6	W-W55	**CR_LC_LEV_2_WC6:** Circular – 1.4
2	**CR_LC_LEV_0_2**	Yes	**Hazard Assessment: Moderate** RGA = Transitional/ Stressed = Moderate; Defined Channel = High; Erosion present = Mod-High; Planform is sinuous = Mod; Unconfined=High; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 10 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including Riparian Buffer 94.0 m**	CR_LC_LEV_0_E1	CR_LC_LEV_0_WC2	W-W56 A&B	**CR_LC_LEV_0_WC2:** Bridge – 65.0 x 2.0; Length = 110

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
2	**CR_LC_LEV_0_1**	Yes	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is sinuous = Mod; Unconfined = High; Drainage Area is less than 100 ha = Low	Proposed bridge piers should be 10 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including Riparian Buffer 90.0 m**	CR_LC_LEV_0_E1	CR_LC_LEV_0_WC2	W-W56 A&B	**CR_LC_LEV_0_WC2:** Bridge – 65.0 x 2.0; Length = 110
2	**CR_LC_LEV_9_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Unconfined=High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low	**Crossing removed from preferred alignment. No recommendations provided at this time.**	CR_NP_CRR_9_E4	**Crossing removed from 90% design	CR_NP_CRR_9_E4	N/A
2	**CR_LC_LEV_10_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	CR_LC_LEV_0_E3	CR_LC_LEV_10_1.1	CR_LC_LEV_0_E3	**CR_LC_LEV_10_1.1:** Circular – 0.9
2	**CR_NP_CRR_7_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Mod; Planform is sinuous (topography controlled) = Low; Partially Confined = Mod-high; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low	**Assumed to be crossed with the Credit River Bridge** Abutments, piers, and other bridge components should remain outside of the 100-year erosion rate. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time.	CR_NP_CRR_0_E1	CREDIT RIVER BRIDGE	CR_NP_CRR_0_E1	**CREDIT RIVER BRIDGE** 600 m The recommended alternative (Alt 2: 7-Span Steel Box Girder) has a total bridge length of 600 m. This spans the entire Credit River Valley, as required to avoid fill in the valley.
2	**CR_NP_CRR_6_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low	**Assumed to be crossed with the Credit River Bridge** Abutments, piers, and other bridge components should remain outside of the 100-year erosion rate. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time.	CR_NP_CRR_0_E1	CREDIT RIVER BRIDGE	CR_NP_CRR_0_E1	**CREDIT RIVER BRIDGE** 600 m The recommended alternative (Alt 2: 7-Span Steel Box Girder) has a total bridge length of 600 m. This spans the entire Credit River Valley, as required to avoid fill in the valley.

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
2	**CR_NP_CRR_0_1**	No	**Hazard Assessment: Moderate** RGA - Transitional = Moderate; Defined Channel = High; Erosion present = Mod-High; Planform is sinuous = Mod; Confined = Low; Drainage Area is Unknown	Proposed bridge piers should be 20.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphic assessment based on 100-year erosion rate of 20.0 +/- 3 m plus bankfull width of 27.0 m. Width should be 27.0+ (2 x 20.0) = 67.0 m. **fluvial geomorphology recommendation: 67.0 m**	CR_NP_CRR_0_E1	CREDIT RIVER BRIDGE	CR_NP_CRR_0_E1	**CREDIT RIVER BRIDGE** 600 m The recommended alternative (Alt 2: 7-Span Steel Box Girder) has a total bridge length of 600 m. This spans the entire Credit River Valley, as required to avoid fill in the valley.
2	**CR_NP_CRR_0_2**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod; Planform is sinuous = Mod-High; Confined = Low; Drainage Area is Unknown	Proposed bridge piers should be 20 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphic assessment based on 100-year erosion rate of 20.0 +/- 3 m plus bankfull width of 27.0 m. Width should be 27.0+ (2x 20) = 67.0 m. **fluvial geomorphology recommendation: 67.0 m**	CR_NP_CRR_0_E1	CREDIT RIVER BRIDGE	CR_NP_CRR_0_E1	**CREDIT RIVER BRIDGE** 600 m The recommended alternative (Alt 2: 7-Span Steel Box Girder) has a total bridge length of 600 m. This spans the entire Credit River Valley, as required to avoid fill in the valley.

Table 7-6: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 3

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
3	**CR_NP_CRR_9_1**	No	**Hazard Assessment: Low-Moderate** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous; multichannel = Mod; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (no defined channel, small upstream drainage area 58.74 ha)	CR_NP_CRR_9_E2 CR_NP_CRR_9_E4	CR_NP_CRR_9_WC1 CR_NP_CRR_9_WC2	W-W64 W-W65	**CR_NP_CRR_9_WC1**: Box – 2.4 x 1.5 **CR_NP_CRR_9_WC2:** Box – 0.9 (x3)
3	**CR_NP_CRR_3_2**	No	**Hazard Assessment: Low-Moderate** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Moderate; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (from roadway appears undefined, small upstream drainage area 73.83 ha)	CR_NP_CRR_3_E1 CR_NP_CRR_3_E2	CR_NP_CRR_3_WC1.1	W-W62 W-W63	**CR_NP_CRR_3_WC1.1:** Box – 3.0 x 1.8
3	**CR_NP_CRR_3_2a**	No	**N/A**	**No proposed crossing.** It is anticipated that CR_NP_CRR_3_2a may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond. The feature was not visible from the ROW during the 2025 field investigation. Upstream reach is ephemeral in nature.	CR_NP_CRR_3_E1	No proposed crossing	N/A	N/A
3	**CR_NP_CRR_3_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous to straight (topography controlled) = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 65.99 ha)	CR_NP_CRR_3_E2 CR_NP_CRR_4_E1	CR_NP_CRR_3_WC3.1 CR_NP_CRR_3_WC3	W-W66 W-W67 W-W68	**CR_NP_CRR_3_WC3.1:** Circular – 1.5 **CR_NP_CRR_3_WC3:** Box – 2.4 x 2.4
3	**CR_NP_CRR_3_3**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (upstream no defined channel, small upstream drainage area 25.27 ha)	CR_NP_CRR_3_E2	CR_NP_CRR_3_WC3.2 CR_NP_CRR_3_WC4	W-W72	**CR_NP_CRR_3_WC3.2:** Circular – 1.2 x 1.2 **CR_NP_CRR_3_WC4:** Box – 1.8 x 1.5
3	**CR_NP_CRR_3_3a**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small drainage area 17.1 ha)	CR_NP_CRR_3_E2	CR_NP_CRR_3_WC5	W-W73	**CR_NP_CRR_3_WC5:** 1-barrel Box – 2 x 2.1 and 2 x 4.5
3	**CR_NP_CRR_3_3b**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small drainage area 17.1 ha)	CR_NP_CRR_3_E2	CR_NP_CRR_3_WC5	W-W73	**CR_NP_CRR_3_WC5:** 2-barrel Box – 2 x 2.1 and 2 x 4.5
3	**CR_NP_CRR_13_1**	No	**Hazard Assessment: Low** RGA - In Regime = Low; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 24.2 ha)	Not considered a fisheries site	CR_NP_CRR_13_WC2	W-W75	**CR_NP_CRR_13_WC2:** Box – 1.2

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
3	**CR_NP_CRR_13_MW**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Moderate; Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 ha = Low-Moderate	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 24.2 ha)	CR_NP_CRR_13_E2	CR_NP_CRR_13_WC3, CR_NP_CRR_13_WC5	W-W76	**CR_NP_CRR_13_WC3:** Box – 3.6 x 2.1 **CR_NP_CRR_13_WC5:** Box – 2.4 x 1.5
3	**CR_HC_HUT_6_3**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 24.2 ha)	CR_HC_HUT_6_E1	CR_HC_HUT_6_WC1	W-W81	**CR_HC_HUT_6_WC1:** Box – 3.3 x 2.1
3	**CR_GW_CRR_15a**	No	**Hazard Assessment: Low** RGA is In Regime = Low; Artificially defined Channel = Low; No Erosion present = Moderate; Planform is straight = Low; Confined = Low; Drainage Area is under 100 ha = Low	**Feature is artificially defined and sized because it is a drainage ditch. Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (small upstream drainage area 1.3 ha)** Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.	CR_GW_CRR_15_E1	CR_GW_CRR_15_WC3	W-W98	**CR_GW_CRR_15_WC3:** Circular – 0.9
3	**CR_GW_CRR_15b**	No	**Hazard Assessment: Low** RGA not completed = NA; Artificially defined Channel = Low; No Erosion present = Moderate; Planform is straight = Low; Confined = Low; Drainage Area is under 100 ha = Low	**Feature is artificially defined and sized because it is a drainage ditch. Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (small upstream drainage area 17.8 ha)** Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.	CR_GW_CRR_15_E1	CR_GW_CRR_15_WC2.1	W-W97	**CR_GW_CRR_15_WC2.1:** Circular – 0.9
3	**CR_GW_CRR_15c**	No	**N/A**	**No Proposed Crossing**	CR_GW_CRR_15_E1	No Proposed Crossing	N/A	N/A
3	**EC_EH_ETW_13_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	Fluvial geomorphology recommendation based on 2x 100 year erosion rate of 1.0 m (TRCA Table) plus bankfull width of 1.8 m **fluvial geomorphology recommendation: 4.0 m**	EC_EH_ETW_13_E0	EC_EH_ETW_13_WC1	W-W99	**EC_EH_ETW_13_WC1:** Box – 6.0 x 1.8
3	**CR_HC_HUT_6_2**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is unknown but is assumed to be less than 100 ha due to lack of channel definition = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area). It is anticipated that CR_HC_HUT_6_2 may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond.	CR_HC_HUT_6_E1	CR_HC_HUT_6_WC1 CR_HC_HUT_6_WC1.1 – Note: this crossing is on the Transit Way and no Structural ID is assigned for this crossing	**W-W81**	**CR_HC_HUT_6_WC1:** 3.3 x 1.5 **CR_HC_HUT_6_WC1.1 -** TBD

Table 7-7: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 4

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
4	**EC_EH_ETW_12_3**	No	**Hazard Assessment: Low** RGA = N/A; Poorly Defined and Altered Channel = Moderate; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	Proposed bridge piers should be 1.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 4.1 m.**	EC_EH_ETW_12_E1	EC_EH_ETW_12_WC1	W-W100	**EC_EH_ETW_12_WC1:** Bridge – 18.0 x 5.2; Length = 89.0
4	**EC_EH_ETW_11_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is sinuous = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition	EC_EH_ETW_11_E1	EC_EH_ETW_11_WC1	W-W101	**EC_EH_ETW_11_WC1**: Box – 6.0 x 1.8
4	**EC_EH_ETW_10_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition	EC_EH_ETW_10_E1	EC_EH_ETW_10_WC1	W-W103 A&B	**EC_EH_ETW_10_WC1:** Bridge – 22.0 x 3.0; Length = 56.4
4	**EC_EH_ETW_9_3**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight (Buried tile drain) = Low; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	**Existing Buried agriculture drain - N/A**	EC_EH_ETW_9_E3	EC_EH_ETW_9_WC2	W-W104	**EC_EH_ETW_9_WC2:** Bridge – 10.0 x 0.7; Length = 60.6
4	**EC_EH_ETW_7_3**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion assumed not present due to lack of channel definition = Low; Planform has been altered by human activities = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria due to lack of channel definition** seen downstream and small upstream drainage area (28.3 ha)	EC_EH_ETW_7_E7	EC_EH_ETW_7_WC2	W-W106	**EC_EH_ETW_7_WC2:** Box – 2.1 x 0.9
4	**EC_EH_ETW_7_2**	No	**Hazard Assessment: Low** RGA = In Regime = Low; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 1.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Recommendation based on 2x 100-year erosion rate of 1.0 m from Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003) plus bankfull width of 1.5 m **fluvial geomorphology recommendation is 3.5 m**	EC_EH_ETW_7_E5	EC_EH_ETW_7_WC3	W-W107 A&B	**EC_EH_ETW_7_WC3:** Bridge – 35.0 x 3.5; Length = 59.4

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
4	**EC_EH_ETW_7_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 6.5 m.**	EC_EH_ETW_7_E4	EC_EH_ETW_7_WC4.1, EC_EH_ETW_7_WC4.2, EC_EH_ETW_7_WC4.3	W-W108A W-W108B W-W108C	**EC_EH_ETW_7_WC4.1:** Box – 6.0 x 1.8 **EC_EH_ETW_7_WC4.2:** Box – 6.0 x 1.8 **EC_EH_ETW_7_WC4.3:** Box – .06 x 1.8
4	**EC_EH_ETW_6_1**	No	**Hazard Assessment: Moderate** RGA = In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 14.0 m.**	EC_EH_ETW_6_E7	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	W-W111A W-W111B W-W111C	**EC_EH_ETW_6_WC1.4:** Bridge – 15.0 x 2.1; Length = 35.0 **EC_EH_ETW_6_WC1.5:** Bridge – 15.0 x 2.1; Length = 45.0 **EC_EH_ETW_6_WC1.6:** Bridge – 15.0 x 2.1; Length = 75.0
4	**EC_EH_ETW_6_4**	No	**Hazard Assessment: Low to Moderate** RGA = NA; Poorly Defined Channel = Low-Mod; Erosion only present downstream of proposed crossing location = Low to moderate Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (2.0 m) = 12.0 m. **fluvial geomorphology recommendation: 12.0 m**	EC_EH_ETW_6_E6	EC_EH_ETW_6_WC3	W-W114 A&B	**EC_EH_ETW_6_WC3:** Bridge – 25.0 x 3.2; Length = 40.9
4	**EC_EH_ETW_4_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Drainage Area is below 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area and lack of channel definition downstream)**)**	EC_EH_ETW_4_E1	EC_EH_ETW_4_WC1	W-W116	**EC_EH_ETW_4_WC1:** Box – 1.5 x 0.9
4	**EC_EH_ETW_1_1**	No	**Hazard Assessment: Moderate** RGA - In Regime= Low; Defined Channel = High; Minor Erosion present = Mod; Planform is meandering = High; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (3.8 m) = 14.0 m. **fluvial geomorphology recommendation: 14.0 m**	EC_EH_ETW_1_E3-E5	EC_EH_ETW_1_WC1	W-W117 A&B	**EC_EH_ETW_1_WC1:** Bridge – 30.0 x 10.5; Length = 56.4
4	**EC_EH_ETW_1_3**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Drainage Area is below 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area and lack of channel definition downstream)	EC_EH_ETW_1_E32	EC_EH_ETW_1_WC2	W-W118	**EC_EH_ETW_1_WC2:** Box – 6.0 x 2.2

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
4	**EC_EH_ETW_1_5**	No	**Hazard Assessment: Moderate - High** RGA - Transitional/Stressed = Moderate; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 ha = Moderate	Watercourse is actively eroding. Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (8.0 m erosion rate) + Bankfull Width (4.2 m) **fluvial geomorphology recommendation: 20.0 m**	EC_EH_ETW_1_E9	EC_EH_ETW_1_WC3	W-W119 A&B	**EC_EH_ETW_1_WC3:** Bridge – 24.0 x 6.0; Length = 56.4

Table 7-8: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 5

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
5	**EC_EH_ETW_1_6b**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel (based on air photo review) = Low; Assumed No Erosion present due to lack of channel definition and low drainage area (9.3 Ha) = low; Planform is straight = low; Confined = Low-Mod; Drainage Area is less than 100 ha = Low	No permission to enter. Recommendation should be finalized during Detail Design **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria due to lack of channel definition and small upstream drainage area (34.6 ha)**	No ID	EC_EH_ETW_1_WC4	W-W120	**EC_EH_ETW_1_WC4:** Box – 6.0 x 1.6
5	**EC_EH_ETW_1_7**	No	**Hazard Assessment: Moderate-High** RGA - In Adjustment to Stressed = High; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low-Moderate; Drainage Area is between 100 and 2500 ha = low-Moderate	Proposed bridge piers should be 11.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 26.9 m.**	EC_EH_ETW_1_E11 -E13	EC_EH_ETW_1_WC5	W-W121A W-W121B	**EC_EH_ETW_1_WC5:** Bridge – 30.0 x 6.0; Length = 80.0
5	**EC_EH_ETW_1_8**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Mod; Planform is sinuous and multichannel = Moderate; Partially Confined = Mod-High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition and small upstream drainage area (34.6 ha)	EC_EH_ETW_1_E14 -E15	EC_EH_ETW_1_WC6	W-W122	**EC_EH_ETW_1_WC6:** Box – 3.0 x 1.2[A]
5	**EC_EH_ETW_1_10**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition and small upstream drainage area (30 ha)	EC_EH_ETW_1_E31	EC_EH_ETW_1_WC7	W-W123	**EC_EH_ETW_1_WC7:** Box – 4.0 x 1.2[A]
5	**EC_EH_ETW_1_11**	No	**Hazard Assessment: Moderate-High** RGA - Transitional/ Stressed= Mod; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (8.0 m erosion rate) + Bankfull Width (2.1 m) = 18.0 m. **Fluvial geomorphic assessment provides a minimum recommended span of 18.0 m.**	EC_EH_ETW_1_E16 -E19	EC_EH_ETW_1_WC8	W-W131 A&B	**EC_EH_ETW_1_WC8:** Bridge – 38.0 x 3.0; Length = 62.6

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
5	**EC_EH_ETW_1_12**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (2.6 m) = 13.0 m. **Fluvial geomorphic assessment provides a minimum recommended span of 13.0 m.**	EC_EH_ETW_1_E26 -E28	EC_EH_ETW_1_WC10	W-W133 A&B	**EC_EH_ETW_1_WC10:** Bridge – 30.0 x 5.0; Length = 62.9
5	**HU_WH_CAC_0_1**	No	**Hazard Assessment: Moderate-High** RGA - Regime to Transitional/Stressed = Low to Mod; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 16.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 37.0 m.**	HU_WH_CAC_0_E4	HU_WH_CAC_0_WC1	W-W141A W-W141B	**HU_WH_CAC_0_WC1:** Bridge – 62.0 x 10.1; Length = 52.0
5	**HU_WH_TWH_1_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; No Erosion present = Low; Planform is straight with one bend = low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition and small upstream drainage area (34.6 ha).	HU_WH_TWH_1_E1	HU_WH_TWH_1_WC1.2 HU_WH_TWH_1_WC1	W-W143 W-W145	**HU_WH_TWH_1_WC1.2**: Box – 3.0 x 1.5 **HU_WH_TWH_1_WC1:** Box – 6.0 x 1.4
5	**HU_WH_TWH_1_2**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined altered Channel = Mod-High; Erosion not present = Low; Planform is straight with some bends = Low-mod; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. AECOM is proposing channel design work to be done in the vicinity of the proposed crossing. HU_WH_TWH_1_2 will be shortened slightly and will join with HU_WH_TWH_1_4 and will then cross under proposed route. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 13.3 m.**	HU_WH_TWH_1_E2	HU_WH_TWH_1_WC2.3	W-W148	**HU_WH_TWH_1_WC2.3:** Bridge – 30.5 x 12.1; Length = 37.8
5	**HU_WH_TWH_1_4**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low; Poorly Defined Channel = Mod; Erosion not present = Low; Planform is slightly meandering = Mod-High; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time.	HU_WH_TWH_1_E2	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	W-W146A&B W-W147	**HU_WH_TWH_1_WC2:** Bridge – 31.0 x 1.4; Length = 56.4 **HU_WH_TWH_1_WC2.1:** Bridge – 34.3 x 9.0; Length = 12.1

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
				The AECOM and WSP team have proposed conceptual channel design work done in the vicinity of the proposed crossing. HU_WH_TWH_1_2 will be shortened slightly and will join with HU_WH_TWH_1_4 and will then cross under proposed route. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 13.3 m.**				
5	**HU_WH_CAC_0_2a**	Yes	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Unconfined = High; Drainage Area is between 100 and 2500 ha = Moderate	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30.0 m buffer on either side due to Regulatory requirements for species at risk. **Final MBW including RSD Riparian Buffer: 116.2 m**	HU_WH_CAC_0_E1-E2	HU_WH_CAC_0_WC2	W-W142 A&B	**HU_WH_CAC_0_WC2:** Bridge – 144.0 x 2.6; Length = 48.9
5	**EC_SC_ETE_1_1**	No	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is below 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 73.8 ha). It is anticipated that EC_SC_ETE_1_1 may need to be realigned during advanced stages of design to accommodate the proposed stormwater pond.	EC_SC_ETE_1_E5-E8	EC_SC_ETE_1_WC1.4, EC_SC_ETE_1_WC1.5	W-W135	**EC_SC_ETE_1_WC1.4:** Box – 6.0 x 2.0 **EC_SC_ETE_1_WC1.5:** **Box – 3.0 x 1.8**
5	**EC_SC_ETE_1_2**	No	**Hazard Assessment: Moderate** RGA = N/A; Defined and altered Channel = Moderate- High; Erosion not present = Low; Planform is sinuous = Mod; Confined = Low-Moderate; Drainage Area is below 100 ha = Low	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 73.8 ha)	EC_SC_ETE_1_E1-E3	EC_SC_ETE_1_WC1.6, EC_SC_ETE_1_WC1.7, EC_SC_ETE_1_WC1.8	Existing Culverts	**EC_SC_ETE_1_WC1.6:** See table note *B **EC_SC_ETE_1_WC1.7:** See table note *B **EC_SC_ETE_1_WC1.8:** See table note *B

Note: A. The size required by the openness criteria cannot be provided due to the minimum cover requirement of 1 metre (at the edge of the pavement). It needs to be revisited by either exempting the openness ratio criteria or by raising the highway profile.
B. Existing culverts at Mayfield Road/HWY 410 Interchange require further assessment at the Detail Design stage.

Table 7-9: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 6

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
6	**HU_WH_TWH_1_5**	No	**Hazard Assessment: Low** RGA - In Regime = low Defined channel / Altered= Moderate; Erosion present = high-mod; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	At a minimum, watercourse crossings should not be less than the bankfull width of the channel (Estimated to be 5.5 m however, field evidence suggests the estimated bankfull width is not natural). Recommend span bankfull width plus the 1.0 m erosion rate on either side of channel. Fluvial geomorphic assessment is based on a bankfull width of 5.5 m and a 1.0 m wide 100-year erosion rate = 7.5 m **fluvial geomorphology recommendation: 7.5 m span**	HU_WH_TWH_1_E6	HU_WH_TWH_1_WC8.1	W-W153	**HU_WH_TWH_1_WC8.1:** Box – 7.5 x 0.9
6	**HU_WH_TWH_2_1**	No	**Hazard Assessment: Moderate** RGA - Transitional/Stressed = Mod Defined channel = High; Minor Erosion present = mod; Planform is straight with small bends = low; Unconfined=high; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 12.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk. **Final MBW Including RSD Riparian Buffer: 109.0 m**	HU_WH_TWH_2_E1	HU_WH_TWH_2_WC1	W-W160 A & B	**HU_WH_TWH_2_WC1:** Bridge – 110.0 x 2.5; Length = 62.4
6	**HU_WH_SAL_2_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_SAL_2_E1	HU_WH_SAL_2_1	Non-Structural Culvert	**HU_WH_SAL_2_1:** Circular – 0.9
6	**HU_WH_SAL_3_1**	No	**Hazard Assessment: Low** RGA - In Regime = low Poorly defined channel = Mod; Erosion not present = Low; Planform is straight = low; Unconfined=high; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate based on Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (2.7 m) = 12.7 m. **fluvial geomorphology recommendation: a 12.7 m span**	HU_WH_SAL_3_E1	HU_WH_SAL_3_1	E-W1A E-W1B	**HU_WH_SAL_3_1:** Bridge – 30.0 x 3.0; Length = 62.3
6	**HU_WH_SAL_5_1**	No	**Hazard Assessment: Moderate** RGA = Not collected Defined channel = High; Minor Erosion present = Mod; Planform is Multi-channel and sinuous = Mod-High; Unconfined = High; Drainage Area is between 100 and 2500 ha = Low-Mod	**The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.** **A recommended crossing size of 6.1 m has been provided based on the two-year flow from the HEC-RAS model**	HU_WH_SAL_0_E6	HU_WH_SAL_0_1	E-W3	**HU_WH_SAL_0_1:** Bridge – 25.0 x 4.0; Length = 23

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
6	**HU_WH_SAL_0_3**	Yes	**Hazard Assessment: High** RGA - In Regime = low Defined channel = High; Erosion present = high-mod; Planform is sinuous = Mod; Unconfined=High; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 6.5 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk Final MBW Including RSD Riparian Buffer: 122.0 m **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	HU_WH_SAL_0_E1-E2	Realignment has negated need for crossing	Realignment has negated need for crossing	N/A
6	**HU_WH_SAL_4_1**	No	**Hazard Assessment: Moderate** RGA = N/A Undefined channel = Low; Minor Erosion present = Low; Planform is straight = low; Partially Confined=Moderate-High; Drainage Area is between 100 and 2500 ha = Low-Mod	Due to small drainage area and lack of a defined feature- Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	HU_WH_SAL_4_E3	Realignment has negated need for crossing	N/A	N/A
6	**HU_WH_SAL_0_2**	Yes	**Hazard Assessment: High** RGA - Transitional/Stressed = Mod Defined channel = High; Erosion present = Mod-High; Planform is Multi-channel and sinuous = Mod-High; Unconfined = High; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 7.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk Final MBW Including RSD Riparian Buffer: 100.0 m **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	HU_WH_SAL_0_E3, HU_WH_SAL_0_E4, HU_WH_SAL_0_E5	HU_WH_SAL_0_2	E-W2A E-W2B	**HU_WH_SAL_0_2:** Bridge – 35.0 x 6.0; Length = 79.0
6	**HU_WH_SAL_0_1**	Yes	**Hazard Assessment: Moderate** RGA - In Regime = Low Defined channel = High; Minor Erosion present = Mod; Planform is Multi-channel and sinuous = Mod-High; Unconfined = High; Drainage Area is below 100 ha = Low-Mod	Proposed bridge piers should be 7.0 m away from top of bank on either side. The span of crossings should be selected based on detailed fluvial geomorphic analyses. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Redside Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for SAR **Final MBW Including RSD Riparian Buffer: 100.0 m** **The AECOM and WSP team have proposed channel realignment to accommodate the preferred alignment. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	HU_WH_SAL_0_E6-E8	Realignment has negated need for crossing	Realignment has negated need for crossing	N/A

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
6	**HU_WH_WHR_1_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_WHR_1_E2	HU_WH_WHT_1_1_1	Non-Structural Culvert	**HU_WH_WHT_1_1_1:** Box – 1.8 x 0.9
6	**HU_WH_WHR_1_3**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_WHR_1_E2	HU_WH_WHT_1_2_1	Non-Structural Culvert	**HU_WH_WHT_1_2_1:** Circular – 0.9
6	**HU_WH_WHR_1_4**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_WHR_1_E3	HU_WH_WHT_1_3_1	Non-Structural Culvert	**HU_WH_WHT_1_3_1:** Box – 1.8 x 0.9
6	**HU_WH_WHR_1_5**	No	**Hazard Assessment: Low-Moderate** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous and multi-channel = mod-high; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_WHR_1_E4	HU_WH_WHT_1_5_1	E-W4A E-W4B	**HU_WH_WHT_1_5_1:** Box – 4.8 x 2.4
6	**HU_WH_WHR_1_6**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled)= Low; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_WHR_1_E5	HU_WH_WHT_1_6_1	Non-Structural Culvert	**HU_WH_WHT_1_6_1** Circular – 1.2
6	**HU_WH_WHR_3_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled)= Low; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_WH_WHR_3_E1	HU_WH_WHT_1_7_1	Non-Structural Culvert	**HU_WH_WHT_1_7_1:** Box – 2.7 x 2.4
6	**HU_WH_WHR_3_1a**	No	**N/A**	**No proposed crossing.** The edge of the reach is within the maintenance yard footprint. At a minimum, infrastructure should stay outside of the meander belt (if appliable) of the watercourse. Field work indicates that the feature is an ephemeral feature.	HU_WH_WHR_3_E1	No Proposed Crossing	N/A	N/A
6	**HU_WH_WHR_3_1b**	No	**N/A**	**No proposed crossing.** It is anticipated that reach HU_WH_WHR_3_1b may need to be realigned to accommodate the proposed carpool lot.	HU_WH_WHR_3_E1	No Proposed Crossing	N/A	N/A

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
6	**HU_WH_WHR_0_2**	Yes	**Hazard Assessment: High** RGA - In Regime= Low Defined channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined= Low; Drainage Area is greater than 2500 ha = High Note - TRCA (2023) states that monitoring assessments indicate the channel stability at this site has remained moderate between 2001 and 2021. Erosion sensitivity, which was assessed in 2021, is classified as high.	This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt. Proposed bridge piers should be 18.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Crossing size of (120.0 m span) from hydraulics indicates no change to sediment size transported/entrained In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20.0 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope) Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including RSD Riparian Buffer: 246.0 m**	HU_WH_WHR_0_E2	HU_WH_WHR_0_1	E-W7B	**HU_WH_WHR_0_2:** **312 m** The preferred alternative (Alt 1: 5-Span Haunched Slab-on-Steel Girder Bridge) uses 312 m long bridges (eastbound and westbound). The is designed to fully span the ~300 m valley width, meeting fluvial and Redside Dace constraints.
6	**HU_WH_WHR_0_3**	Yes	**Hazard Assessment: High** RGA - Unstable at crossing= High Defined channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined= Low; Drainage Area is greater than 2500 ha = High	This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt. Proposed bridge piers should be 23.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Crossing size of (120.0 m span) from hydraulics indicates no change to sediment size transported/entrained In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20.0 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including RSD Riparian Buffer: 354.0 m**	HU_WH_WHR_0_E2	HU_WH_WHR_0_3	E-W7B	**HU_WH_WHR_0_3:** **312 m** The preferred alternative (Alt 1: 5-Span Haunched Slab-on-Steel Girder Bridge) uses 312 m long bridges (eastbound and westbound). The is designed to fully span the ~300 m valley width, meeting fluvial and Redside Dace constraints.

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
6	**HU_WH_GRT_0_2**	No	**Hazard Assessment: Moderate** RGA - Transitional/Stressed = Moderate Poorly defined channel = Moderate; Erosion present = Mod-High; Planform is multi-channel and sinuous=Mod-high; Unconfined= High; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 6.5 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphology recommendation is based on 2 x erosion rate (6.5 m erosion rate) + Bankfull Width (4.0 m) = 17.0 m. **fluvial geomorphology recommendation: a minimum crossing span of 17.0 m**	HU_WH_GRT_0_E1-E2	HU_WH_GRT_0_1, HU_WH_GRT_0_2	E-W9B E-W9D E-W9A	**HU_WH_GRT_0_1:** Bridge – 40.0 x 2.0; Length = 59.4 **HU_WH_GRT_0_2:** Bridge – 40.0 x 2.0; Length = 10.3 Bridge – 40.0 x 2.0; Length = 59.4
6	**HU_WH_CDT_2_1**	No	**Hazard Assessment: Low** RGA = N/A Poorly defined channel = High; Erosion not present = Low; Planform is straight = Low; Unconfined=high; Drainage Area is less than 100 ha = Low	Hydraulic span of 5.4 m results in no major change to sediment size entrained/ transported. Fluvial geomorphology recommendation is based on 2 x erosion rate (1 m erosion rate) + Bankfull Width (1.5 m) = 3.5 m. **fluvial geomorphology recommendation: a minimum crossing span of 3.5 m**	HU_WH_CDT_2_E2	HU_WH_CDT_2_1, HU_WH_CDT_2_2	E-W10B	**HU_WH_CDT_2_1:** Box – 5.4 x 1.8 **HU_WH_CDT_2_2:** Box – 5.4 x 2.4
6	**HU_WH_CDT_2_1a**	No	**N/A**	**No proposed crossing.** It is anticipated that reach HU_WH_CDT_2_1a may need to be realigned to accommodate the proposed carpool lot.	N/A	No Proposed Crossing	N/A	N/A
6	**HU_WH_CDT_2_1b**	No	**N/A**	**No proposed crossing.** It is anticipated that reach HU_WH_CDT_2_1b may need to be realigned to accommodate the proposed carpool lot.	HU_WH_CDT_0_E2-E3	No Proposed Crossing	N/A	N/A
6	**HU_WH_CDT_0_2**	No	**Hazard Assessment: Moderate** RGA - In Regime= Low Defined channel = High; Erosion present = Mod-High; Planform is sinuous = High; Confined= Low; Drainage Area is between 100 and 2500 ha = High	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Hydraulic sizing of 60.0 m results in no major changes to grain size transported/ entrained. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~10.0 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Fluvial geomorphology recommendation is based on 2 x erosion rate (8.0 m erosion rate) + Bankfull Width (4.2 m) = 20.2 m. **fluvial geomorphology recommendation: a minimum crossing span of 20.2 m**	HU_WH_CDT_0_E1	HU_WH_CDT_0_1	E-W11A E-W11B	**HU_WH_CDT_0_1:** Bridge – 50.0 x 12.5; Length = 68.6
6	**HU_MH_RAI_1_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_MH_RAI_1_E5-E6	HU_MH_RAI_1_1_1	Non-Structural Culvert	**HU_MH_RAI_1_1_1:** Circular – 0.9 (minimum) Existing culvert under Coleraine Road

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
6	**HU_MH_RAI_1_2**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_MH_RAI_1_E5-E6	HU_MH_RAI_1_2_1	Non-Structural Culvert	**HU_MH_RAI_1_2_1:** Circular – 0.9
6	**HU_MH_RAI_1_3**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low Poorly Defined channel = Mod; Erosion present = Mod-High; Planform is sinuous (topography controlled) = Low; Unconfined = high; Drainage Area is between 100 and 2500 ha = Low-Moderate	Fluvial geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (4.4 m) = 14.4 m. **fluvial geomorphology recommendation: a minimum crossing span of 14.4 m**	HU_MH_RAI_1_E1-E2	HU_MH_RAI_1_3_1	E-W12A E-W12B E-W12C	**HU_MH_RAI_1_3_1:** Bridge - 30.0 x 7.0; Length = 70.2 Bridge – 20.0 x 8.0; Length = 12.1

Table 7-10: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 7

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
7	**HU_MH_ROB_3_1**	No	**N/A**	**No proposed crossing.** It is anticipated that HU_MH_ROB_3_1 may need to be realigned to accommodate the proposed transit station.	HU_MH_ROB_3_E4	No proposed Crossing	N/A	N/A
7	**HU_MH_ROB_3_2**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is assumed to be less than 100 ha =low	**Due to small drainage area and lack of a defined feature- Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** It is anticipated that HU_MH_ROB_3_2 may need to be realigned to accommodate the proposed transit station.	HU_MH_ROB_3_E3	HU_MH_ROB_3_0	Non-Structural Culvert	**HU_MH_ROB_3_0:** Box - 2.7 x 2.4
7	**HU_MH_ROB_3_3**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** It is anticipated that reach HU_MH_ROB_3_3 may need to be realigned to accommodate the proposed SWP.	HU_MH_ROB_3_E3	HU_MH_ROB_3_3_1 HU_MH_ROB_3_3_2	Non-Structural Culvert	**HU_MH_ROB_3_3_1:** Circular – 0.9 **HU_MH_ROB_3_3_2:** Circular – 0.9
7	**HU_MH_ROB_3_4**	No	**Hazard Assessment: Low** RGA = N/A Poorly defined/manipulated channel= moderate; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_MH_ROB_3_E3	HU_MH_ROB_3_4_1, HU_MH_ROB_3_4_2	Non-Structural Culvert (HU_MH_ROB_3_4_1) and No Structural ID Identified (HU_MH_ROB_3_4_2)	**HU_MH_ROB_3_4_1:** Box – 3.3 x 2.1 **HU_MH_ROB_3_4_2:** Box - 3.3 x 2.14
7	**HU_MH_ROB_3_5**	No	**Hazard Assessment: Low** RGA - In Regime = low Poorly defined/manipulated channel= moderate; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_MH_ROB_3_E3	HU_MH_ROB_3_1 HU_MH_ROB_3_2	Non-Structural Culvert	**HU_MH_ROB_3_1:** Box - 2.7 x 1.2 **HU_MH_ROB_3_2:** Box – 1.8 x 2.4
7	**HU_MH_ROB_0_2**	No	**Hazard Assessment: Moderate** RGA - Transitional/ Stressed = Moderate Defined channel= high; Erosion present = high-moderate; Planform is meandering = high; Confined= low-mod; Drainage Area is 1188 ha = Mod	Proposed bridge piers should be 7 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Assessment is based on 2 x erosion rate (7.0 m erosion rate) + Bankfull Width (4.8 m) = 19.0 m however, this is smaller than meander amplitude so crossing size of at least 30.0 m is recommended to account for this. **It is recommended that HU_MH_ROB_0_3 be contained in the crossing envelope of HU_MH_ROB_0_2** **fluvial geomorphology recommendation: At least 30.0 m**	HU_MH_ROB_0_E1	HU_MH_ROB_0_5	E-W17A E-W17B	**HU_MH_ROB_0_5:** Bridge – 70.0 x 6.0; Length = 21.6

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
7	**HU_MH_ROB_0_3**	No	**Hazard Assessment: Moderate-High** RGA - In Regime = low Defined channel= High; Erosion not present = low; Planform is meandering = High; Unconfined=high; Drainage Area is 1188 ha =mod	**This small channel will need to be looked at during Detail Design. Channel used to be a compound meander bend of HU_MH_ROB_0_2, but it appears that historic valley infilling cut off the meander. It is recommended that HU_MH_ROB_0_3 be contained in the crossing envelope of HU_MH_ROB_0_2**	HU_MH_ROB_0_E1	HU_MH_ROB_0_5	E-W17A/B	**HU_MH_ROB_0_5:** Bridge – 70.0 x 6.0; Length = 21.6
7	**HU_MH_ROB_2_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= Low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha = Low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_MH_ROB_8_E1	HU_MH_ROB_8_1	No Structural ID Identified	**HU_MH_ROB_8_1:** Box – 5.1 x 1.9
7	**HU_MH_ROB_0_5**	No	**Hazard Assessment: Moderate-High** RGA - Transitional = Mod Defined channel= High; Erosion present = mod-high; Planform is sinuous (topography controlled) = High; Unconfined=high; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 10.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~15.0 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Assessment is based on 2 x erosion rate (10.0 m erosion rate) + Bankfull Width (3.5 m) = 24.0 m. **Fluvial geomorphology recommendation: At least 24.0 m**	HU_MH_ROB_0_E4	HU_MH_ROB_0_1, HU_MH_ROB_0_2, HU_MH_ROB_0_4	E-W18 E-W19A E-W19B E-W20	**HU_MH_ROB_0_1:** Bridge – 39.0 x 10.7; Length = 14.1 **HU_MH_ROB_0_2:** Bridge – 26.0 x 4.0; Length = 57.0 **HU_MH_ROB_0_4:** Bridge – 28.0 x 10.7; Bridge = 21.6
7	**HU_MH_ROB_7_1**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low Defined channel= High; Erosion present = mod-high; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is between 100 and 2500 ha = Low-Mod	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. The proposed crossing is located within a sinuous planform location with an amplitude of ~5 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). **Based on the fact that the watercourse is considered unstable according to TRCA 2015, it is recommended that the crossing span the hydraulics recommendation of 30.0 m for HU_MH_ROB_7_1_2 and HU_MH_ROB_7_1_3 and 32.0 m for HU_MH_ROB_7_1_4. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse.**	HU_MH_ROB_7_E2	HU_MH_ROB_7_1_1, HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_4	E-W21 E-W22A E-W22B E-W23-1	**HU_MH_ROB_7_1_1:** Bridge – 42.0 x 6.7; Length = 14.1 **HU_MH_ROB_7_1_2:** Bridge – 35.0 x 3.0; Length = 56.4 **HU_MH_ROB_7_1_4:** Bridge – 37.0 x 2.5; Length = 12.1

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
7	**HU_MH_ROB_7_2**	No	**Hazard Assessment: Low-Moderate** RGA - In Regime = Low Defined channel= High; Erosion not present = low; Planform is Meandering = High; Unconfined=high; Drainage Area is less than 100 ha = Low	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. There has been channel design work done in the vicinity of the proposed crossing. The watercourse has been modified where the proposed road is going. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 12.0 m.**	HU_MH_ROB_7_E3	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	E-W23-2 E-W25A E-W25B	**HU_MH_ROB_7_2_2:** Bridge – 25.0 x 2.0; Length = 56.4 **HU_MH_ROB_7_2_4:** Bridge – 19.0 x 2.4; Length = 12.1
7	**HU_MH_ROB_7_5 a**	No	**Hazard Assessment: Low** RGA = NA Undefined to Poorly defined feature = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha = Low	**Due to small drainage area and lack of a defined feature - Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.**	HU_MH_ROB_7_E3	HU_MH_ROB_7_2_1	E-W24	**HU_MH_ROB_7_2_1:** Bridge – 23.5 x 2.5; Length = 12.1
7	**HU_MH_ROB_4_1**	No	**Hazard Assessment: Low-Moderate** RGA - Transitional = Moderate Poorly defined channel= Moderate; Erosion present = Mod-High; Planform is sinuous (topography controlled & manipulated) = Low-mod; Unconfined=high; Drainage Area is less than 100 ha = Low	**Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 5.9 m.**	HU_MH_ROB_4_E1	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	E-W13A E-W13B E-W15 E-W16 E-W16-1	**HU_MH_ROB_4_2:** Box – 6.0 x 2.7 **HU_MH_ROB_4_4:** Bridge – Box – 4.2 x 2.1 **HU_MH_ROB_4_5:** Box – 3.6 x 2.1 **HU_MH_ROB_4_6** Box – 3.6 x 1.8
7	**HU_MH_ROB_6_1**	No	**N/A**	**No Proposed Crossing.** It is anticipated that HU_MH_ROB_6_1 may need to be realigned to accommodate the proposed stormwater pond.	HU_MH_ROB_6_E2	No Proposed Crossing	N/A	N/A

Table 7-11: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 8

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
8	**HU_MH_MHR_0_1**	No	**Hazard Assessment: Moderate-High** RGA Transitional/stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is meandering = high; Confined=low-mod; Drainage Area is greater than 2500 ha =high	Proposed bridge piers should be 12.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt.**	HU_MH_MHR_0_E4	HU_MH_MHR_0_1, HU_MH_MHR_0_2	E-W26B E-W26A	**HU_MH_MHR_0_1/ HU_MH_MHR_0_2:** 885 m (Westbound Lane Structure) / 895 m (Eastbound Lane Structure) The preferred alternative (Alt 2) is a 9-Span, Segmental Concrete Box Girder (West Spans) and Slab-on-Steel I Girders (East Spans).
8	**HU_MH_MHR_3_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low (channel is only defined at Kirby Road crossing); Erosion not present = low; Planform is sinuous to straight (topography controlled)= low; Confined=low-mod; Drainage Area is less than 100 ha =low	Planform at proposed crossing includes a confluence and a pond, which will need to be considered during Detail Design. Further discussion on channel realignment should be held during Detail Design. **Assessment due to small drainage area and lack of a defined feature- Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_MH_MHR_3_E3	HU_MH_HRT_3_1	E-W27A E-W27B	**HU_MH_HRT_3_1:** Box – 5.4 x 2.14
8	**HU_MH_MHR_3_4**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight (topography controlled)= low; Unconfined= high; Drainage Area is assumed to be less than 100 ha =low	**No Proposed Crossing. Assessment performed since watercourse is close to the proposed route and may be impacted by grading**	HU_MH_MHR_3_E3	No Proposed Crossing	N/A	N/A
8	**HU_MH_MHR_3_5**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled)= low; Unconfined= high; Drainage Area is assumed to be less than 100 ha =low	**No Proposed Crossing. Assessment performed since watercourse is close to the proposed route and may be impacted by grading**	No ID	No Proposed Crossing	N/A	N/A
8	**HU_MH_EHR_1_4**	No	**Hazard Assessment: Moderate** RGA transitional/stressed = Mod Confined = Low-mod; Erosion = Mod-high Planform is meandering = high Confined = low Drainage Area is between 100 and 2500 ha = low-Mod	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphic assessment is 2x erosion rate (8.0 m erosion rate based on Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (2.7 m) = 19.0 m. **Fluvial geomorphic recommendation: a minimum width of 19.0 m.**	HU_EH_EHR_1_E1	HU_EH_EHT_1_1	No Structural ID Identified	**HU_EH_EHT_1_1:** Bridge – 20.0

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
8	**HU_MH_EHR_1_3**	No	**Hazard Assessment: High** RGA = In Adjustment = High Defined channel= High ; Erosion present = Mod-High; Planform is sinuous to meandering= High; Confined=low-mod; Drainage Area is less than 100 ha =low	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~18.0 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). As well, there is a confluence located directly upstream of the proposed crossing. Assessment is 2x erosion rate (8.0 m erosion rate based on Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (5.1 m) = 21.0 m. While hydraulics proposed crossing size of 16.0 m does not result in significant changes to sediment transport/ entrainment, the sinuous planform must be taken into account. **A crossing width of 21.0 m is a more appropriate width.**	HU_EH_EHR_1_E1	HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	E-W28D E-W28B E-W28A E-W28C	**HU_EH_EHT_1_1_1:** Bridge – 16.0 x 4.0; Length = 10.3 **HU_EH_EHT_1_1_2:** Bridge – 41.0 x 10.0; Length = 56.4 **HU_EH_EHT_1_1_3:** Bridge – 35.0 x 110.0; Length = 56.4 **HU_EH_EHT_1_1_4:** Bridge – 21.1 x 8.0; Length = 60.0
8	**HU_MH_EHR_1_3a**	No	**N/A**	**No Proposed Crossing**. It is anticipated that HU_MH_EHR_1_3a may need to be realigned to accommodate the proposed carpool lot.	No ID	No Proposed Crossing	N/A	N/A
8	**HU_MH_EHR_1_6**	No	**Hazard Assessment: Moderate** RGA - In Regime = Low Defined channel= High ; Erosion present = Mod-High; Planform is sinuous to straight and multi-channelled = High; Confined=low-mod; Drainage Area is between 100 and 2500 ha =low-mod	**Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 6.0 m.**	HU_EH_EHR_1_E2	HU_EH_EHT_1_2_1	E-W30A E-W30B E-W30C	**HU_EH_EHT_1_2_1:** Box – 6.0 x 2.4
8	**HU_MH_EHR_0_2**	Yes	**Hazard Assessment: High-Moderate** RGA Transitional/stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is Meandering = high; Confined=low-mod; Drainage Area is between 100 and 2500 ha =high	Proposed bridge piers should be 18.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard (18.0 m). Due to width, it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Crossing size of (120.0 m span) from hydraulics indicates no change to sediment size transported/entrained This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt. Red Side Dace recovery habitat - Crossing must span meander belt + 30.0 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including RSD Riparian Buffer: 338.0 m**	HU_EH_EHR_0_E1	HU_EH_EHR_0_1, HU_EH_EHR_0_2	E-W31B E-W31A	**HU_EH_EHR_0_1/ HU_EH_EHR_0_2:** **312 m** The preferred alternative (Alt 2: 3-Span Slab-on-Haunched Steel I Girder Bridge) has a total crossing span of 312 m. It is designed to avoid valley fill and pipeline and SAR habitat constraints.

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
8	**HU_EH_EHR_12_3**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_12_E1	HU_EH_EHT_12_1_1	E-19	**HU_EH_EHT_12_1_1:** Box – 3.7 x 2.4
8	**HU_EH_EHR_12_4**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Minor Erosion present = moderate; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_12_E2	HU_EH_EHT_12_2_1	No Structural ID Provided	**HU_EH_EHT_12_2_1:** Circular – 2.1 x 0.9
8	**HU_EH_EHR_12_5**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_12_E3	HU_EH_EHT_12_3_3 HU_EH_EHT_12_3_4	No Structural ID Provided (HU_EH_EHT_12_3_3) Non-Structural ID (HU_EH_EHT_12_3_4)	**HU_EH_EHT_12_3_3:** Circular – 4.5 x 2.1 **HU_EH_EHT_12_3_4:** Circular – 2.1 x 0.9

Table 7-12: Final Fluvial Geomorphology Recommended Crossing Size and Justification – Section 9

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
9	**HU_EH_EHR_15_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_15_E2	HU_EH_EHT_15_2_1, HU_EH_EHT_15_2_2	E-W33A E-W33B	**HU_EH_EHT_15_2_1:** Box – 3.6 x 2.1 **HU_EH_EHT_15_2_2:** Box – 5.1 x 2.4
9	**HU_EH_EHR_15_4**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion present = Moderate; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Assessment due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_15_E3	HU_EH_EHT_15_3_1	Non-Structural Culvert	**HU_EH_EHT_15_3_1:** Circular – 2.1 x 0.9
9	**HU_EH_EHR_16_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is between 100 and 2500 ha =low-mod	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_16_E3	HU_EH_EHT_16_1	E-W34A E-W34B	**HU_EH_EHT_16_1:** Bridge – 15.0 x 3.0; Length = 59.6
9	**HU_EH_EHR_16_2**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	No ID	HU_EH_EHT_17_3_2	E-W38B-1	**HU_EH_EHT_17_3_2:** Circular – 0.9
9	**HU_EH_EHR_17_2**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_17_E3	HU_EH_EHT_17_3_1, HU_EH_EHT_17_3_4	E-W35A E-W35B E-W35C	**HU_EH_EHT_17_3_1:** Box – 3.6 x 1.5 **HU_EH_EHT_17_3_4:** Box – 3.6 x 1.8
9	**HU_EH_EHR_17_1**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_17_E3	HU_EH_EHT_17_3_3	Non-Structural Culvert	**HU_EH_EHT_17_3_3:** Circular – 0.9
9	**HU_EH_EHR_18_1a**	No	**N/A**	**No Proposed Crossing.** Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.	HU_EH_EHR_18_E3	No Proposed Crossing	N/A	N/A
9	**HU_EH_EHR_18_1b**	No	**Hazard Assessment: Moderate** RGA In Regime = low Defined channel= high; Erosion present = mod-high; Planform is slightly sinuous = mod; Unconfined=high; Drainage Area is between 100 and 2500 ha =low-mod	Watercourse crossings should not be less than the bankfull width of the channel (1.8 m) plus 2x erosion rate (5.0 m) (Using Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)). Hydraulic data does not show a change in sediment entrainment/ transport with a crossing width of 12.0 m **Fluvial geomorphic assessment: 12.0 m**	HU_EH_EHR_18_E3	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	E-W36B E-W36D E-W36A E-W36C	**HU_EH_EHT_18_3_3:** Bridge – 25.0 x 2.0; Length = 12.1 **HU_EH_EHT_18_3_4:** Bridge – 23.5 x 11.0; Length = 14.1 **HU_EH_EHT_18_3_5:** Bridge – 38.5 x 6.3; Length = 12.1

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
9	**HU_EH_EHR_18_1c**	No	**N/A**	**No proposed crossing.** It is anticipated that HU_EH_EHR_18c may need to be realigned to accommodate the proposed transit station.	No ID	No Proposed Crossing	N/A	N/A
9	**HU_EH_EHR_18_1d**	No	**N/A**	**No Proposed Crossing.** It is anticipated that HU_EH_EHR_18d may need to be realigned to accommodate the proposed transit station.	No ID	No Proposed Crossing	N/A	N/A
9	**HU_EH_EHR_18_2**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha =low	Due to small drainage area and lack of a defined feature- **Defer to hydraulics and ecology**	HU_EH_EHR_18_E7	HU_EH_EHT_18_7_1	UNK_6_1 UNK_6_2 UNK_6_3 UNK_6_4	**HU_EH_EHT_18_7_1:** Circular - 0.9
9	**HU_EH_EHR_18_6**	No	**Hazard Assessment: Moderate** RGA transitional/ stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is sinuous = Mod; Confined=low-mod; Drainage Area is less than 100 ha =low	Crossing likely to be an extension and not a new culvert. If replacement is required, fluvial geomorphology's assessment is 2 x erosion rate (6.5 m erosion rate Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (2.5 m) = **15.5 m.**	HU_EH_EHR_18_E4	HU_EH_EHT_18_4_1	No Structural ID Identified	**HU_EH_EHT_18_4_1:** Bridge – 15.5
9	**HU_EH_EHR_18_6b**	No	**Hazard Assessment: Moderate** RGA transitional/ stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is sinuous = mod; Confined=low-mod; Drainage Area is less than 100 ha =low	No Proposed Crossing	HU_EH_EHR_18_E4	No Proposed Crossing	N/A	N/A
9	**HU_EH_EHR_18_4**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 ha =low	Likely to be a culvert extension Hydraulic assessment shows that the proposed 50-yr and 100-yr flow event crossing sizes do not alter the sediment size predicted to be transported. **Due to small drainage area and lack of a defined feature-Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_18_E5	HU_EH_EHT_18_5_1, HU_EH_EHT_18_5_3	Non-Structural Culvert	**HU_EH_EHT_18_5_1:** Box – 2.7 x 1.5 **HU_EH_EHT_18_5_3:** Box – 2.4 x 1.2
9	**HU_EH_EHR_18_5**	No	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight to sinuous (topography controlled)= low; Unconfined=high; Drainage Area is less than 100 ha =low	**Likely to be a culvert extension** Hydraulic assessment shows that the proposed 50-yr and 100-yr flow event crossing sizes do not alter the sediment size predicted to be transported. Due to small drainage area and lack of a defined feature - **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	HU_EH_EHR_18_E3 HU_EH_EHR_18_E6	HU_EH_EHT_18_6_1, HU_EH_EHT_18_6_2, HU_EH_EHT_18_3_0	Non-Structural Culvert (HU_EH_EHT_18_6_1 and HU_EH_EHT_18_6_2) E-W37	**HU_EH_EHT_18_6_1:** Box – 2.7 x 1.5 **HU_EH_EHT_18_6_2:** Box – 2.7 x 2.4 **HU_EH_EHT_18_3_0:** Box – 3.9 x 2.1
9	**HU_EH_EHR_18_8**	Yes	N/A	No Proposed Crossing. MBW calculated due to presence of Redside Dace	HU_EH_EHR_18_E1 HU_EH_EHR_18_E9	No Proposed Crossing	No proposed crossing	N/A
9	**HU_EH_EHR_18_8b**	Yes	N/A	No Proposed Crossing. MBW calculated due to presence of Redside Dace	HU_EH_EHR_18_E1 HU_EH_EHR_18_E9	No Proposed Crossing	No proposed crossing	N/A
9	**HU_EH_EHR_18_8c**	Yes	N/A	No Proposed Crossing. MBW calculated due to presence of Redside Dace	HU_EH_EHR_18_E1 HU_EH_EHR_18_E9	No Proposed Crossing	No proposed crossing	N/A
9	**HU_EH_EHR_19_1**	No	**Hazard Assessment: Mod - High** RGA in Regime = low Defined channel= High; Minor erosion present = low; Planform is meandering= High; Partially confined=Mod; Drainage Area = High	Potential crossing currently outside of Project limits	HU_EH_EHR_0_E3	No Drainage ID. Culverts will be widened based on existing opening	E-W38	No Drainage ID. Culverts will be widened based on existing opening

Section	Fluvial Geomorphology Reach ID	Redside Dace Habitat?	Hazard Assessment Results	Fluvial Geomorphology Recommended Crossing Size	Ecology ID	Drainage/ Crossing ID	Structural ID	Final Recommended Size Determined by Multi-Disciplinary Team (m) (By Drainage/Crossing ID)
9	**HU_EH_EHR_19_7**	No	**Hazard Assessment: Mod-High** RGA transitional/stressed = Mod Defined channel= High; Erosion present = High; Planform is straight= low; Partially confined=Mod; Drainage Area is less than 500 ha = Mod	Potential crossing currently outside of Project limits	HU_EH_EHR_21_E1	No Drainage ID. Culverts will be widened based on existing opening	E-W39	No Drainage ID. Culverts will be widened based on existing opening

8. Specific Crossing Design Considerations

8.1 Realignment Recommendations and Considerations

Several channel realignments are anticipated where the orientation of the existing watercourse crossing is either severely misaligned with respect to the preferred highway alignment, or where it is not feasible to construct crossing structures, such as at complex highway interchanges. Alternatives to channel realignment were assessed during Route Selection and Preliminary Design and prioritized avoidance where possible and minimizing realignments where unavoidable. The highway alignment was refined as much as possible to reduce or avoid crossings of sensitive watercourses and, where warranted, options to use bridges rather than culverts (e.g., long-span structures at higher-sensitivity crossings) were explored to limit in-channel works and maintain fluvial function. Overall, alignment shifts and bridges have been used where they provide fewer overall impacts. Realignments were only recommended as a last-resort solution but are being designed to replicate natural processes and habitat where unavoidable.

Where channel realignment remains necessary (typically where a perpendicular crossing cannot be achieved due to geometric/safety constraints or complex interchange layouts) channel realignments were required. The footprint of the channel realignments will be limited as much as possible to preserve as much of the natural channel as possible.

To date, only high-level conceptual designs have been performed to determine whether realignments are feasible within the given ROW constraints. The high-level channel realignments considered the location of planned crossing structures and existing topography based on available LiDAR data. There was considerable back and forth between multiple disciplines so that the conceptual designs worked for structural, highway design, ecology, drainage, and fluvial geomorphic considerations. Consideration was given to existing channel morphology including bed slope and bankfull dimensions, discharge and velocity.

The realignments themselves fall into two categories:

1. Instances where minor channel realignments fall within the existing meander belts. These realignments aim to protect the footings and/or grading of the watercourse crossing structures and have no direct impact on crossing size. Consequently, hydraulic model updates and reassessments can be deferred to the Detail Design stage to inform the final channel design configuration.
2. Instances where major channel realignments falling outside of the existing meander belts are required to accommodate the proposed watercourse crossings. Here, the HEC-RAS models are updated with the preliminary channel designs (i.e., planform, long profile and channel sections, but without geomorphic features such as riffles and pools) to inform the structure sizing. The models will subsequently be updated and reassessed during the detail design stage to inform the final natural channel design.

During Detail Design, sites requiring channel realignments should be surveyed designs should be refined to produce robust natural channel designs.

The following general fluvial geomorphology realignment recommendations should be considered during the Detail Design stage of the Project:

1. All channel realignment work should adopt Natural Channel Design principles and be performed in collaboration with a multi disciplinary team to provide a holistic and sustainable approach. This process should integrate fluvial geomorphic principles, hydraulic modelling, and habitat considerations to develop a channel design that preserves and where possible, enhances the form and function of the existing natural system. After all constraints/considerations, opportunities, and design discharge have been identified, the design process will begin. The components of channel design are inherently interconnected (such as cross-sections, profile, and planform), therefore natural channel design is an iterative process where refinements in one element often influence the others. This interdependence means the design must be revisited through multiple iterations, with each refinement evaluated in the context of the whole system to produce a channel configuration that is aligned with the design objectives. The use of natural channel design will promote long-term stability, improve integration with planned infrastructure, support flood resilience, and enhance habitat where possible.

2. All crossings should be designed with due consideration for federal (i.e., SAR) and regional (Conservation Authority) guidance and protocol documents.
   - This means work will need to adhere to the guidelines published by Conservation Authorities including Credit Valley Conservation Authority's Fluvial Geomorphic Guidelines Fact Sheet V: Geomorphological Considerations with Regard to Natural Channel Design (2010) and Toronto and Region Conservation Authority's Channel Modification Design and Submission Requirements (2007).
3. The Natural Channel design measures should be refined in consultation with regulators and Indigenous communities. The natural channel designs should aim to:
   - Maintain bankfull dimensions and floodplain connectivity,
   - Preserve/restore meander planform and channel length where feasible,
   - Provide low-flow connectivity and in-stream habitat features,
   - Reduce impacts to nearby infrastructure. Highway embankments should be located away from watercourses to avoid embankment erosion.
   - Maintain continuity of channel form and process. This includes selection of an appropriate tie-in to the longitudinal profile and channel planform for each channel realignment.
   - Minimize the loss of channel length. There should be no net loss of channel length unless an increase in channel slope is deemed beneficial to the overall design.
   - Channels should flow perpendicularly through the crossing structure, with a straighter path into the culvert inlet, to minimize erosion risk to the culvert inlet.
   - If possible, improve and/or expand Redside Dace habitat where appropriate following the stream realignment and relocation recommendations provided in the Guidance for Development Activities in Redside Dace Protected Habitat. Specifically, the guidance suggests "realigning previously straightened streams to restore their natural forms and functions; and relocating degraded streams to locations that are better lined to supporting features such as wetlands and areas of groundwater discharge." (MNR 2016).

These recommendations should serve as the foundation for more advanced stages of channel design and should be incorporated wherever feasible. Where recommendations cannot be implemented, alternative solutions should be developed based on site-specific constraints and considerations.

8.1.1 Preliminary High-Level Channel Realignments to Accommodate Route

A table summarizing the watercourses that have preliminary high-level realignment work completed to accommodate the route have been provided in **Table 8-1** with accompanying figures in **Appendix G1 and Appendix G2**. See high-level details of the preliminary design of these watercourses including preliminary dimensions and hydraulics in **Table 8-2**. Final details will be confirmed in the subsequent Detail Design stage.

8.1.2 Additional Anticipated Watercourse Modifications

Additional possible modification to the watercourses to accommodate the preferred alignment and associated infrastructure should be assessed by fluvial geomorphologists during the Detail Design stage, in consultation with regulatory agencies (where permits and/or authorizations are required) and Indigenous communities. This includes realignments to accommodate stormwater ponds, maintenance yards, carpool lots, transit stations, transitway ROW, or any other planned infrastructure, as displayed in **Appendix G1**. However, the need for each realignment site will need to be confirmed during Detail Design and avoidance of channel realignments should be prioritized. Route alignment selection is an iterative process between all disciplines and represents a balanced decision-making process.

A table summarizing the watercourses that could require realignment work during more advanced stages of design to accommodate proposed infrastructure has been provided in **Table 8-3**.

Table 8-1: High-Level Preliminary Watercourses Realignment Details

Section	Fluvial Geomorphology Reach ID	Ecology ID	Drainage Culvert ID	Structure ID	Road Location	Rationale for Channel Realignment
1	SIM_EB_SM_0_2	SM_EB_SIM_0_E1	SM_EB_SIM_0_WC1 EXTENSION	W-W4	Highway 401 East of Trafalgar Rd	■ The alignment was selected to connect the outlet of the proposed culvert extension with the existing creek, accommodating the new on/off ramps for the eastbound lanes of Hwy 401.
4	EC_EH_ETW_12_3	EC_EH_ETW_12_E1	EC_EH_ETW_12_WC1	W-W100	West of Mississauga Road	■ The realignment was chosen so that the channel is perpendicular to the road at the crossing location. As a result, the channel length increased from 317.3 m to 436.6 m.
4	EC_EH_ETW_7_1	EC_EH_ETW_7_E4	EC_EH_ETW_7_WC4.1 EC_EH_ETW_7_WC4.2 EC_EH_ETW_7_WC4.3	W-W108A W-W108B W-W108C	West of Chinguacousy Interchange	■ The realignment was necessary due to the number of crossing structures required to accommodate the Hwy 413 / Chinguacousy Interchange. The proposed alignment minimizes the number of crossing structures and increases the channel length from 529.0 m to 541.6 m.
4	EC_EH_ETW_6_1	EC_EH_ETW_6_E7	EC_EH_ETW_6_WC1.1 EC_EH_ETW_6_WC1.4 EC_EH_ETW_6_WC1.5	W-W111A W-W111B W-W111C	Chinguacousy Road	■ The realignment was necessary due to the number of crossing structures required to accommodate the Hwy 413 / Chinguacousy Interchange. The proposed alignment minimizes the number of crossing structures and increases the channel length from 609.0 m to 683.2 m.
5	EC_EH_ETW_1_7	EC_EH_ETW_1_E11-E13	EC_EH_ETW_1_WC5	W-W121A W-W121B	West of Hurontario Street	■ A minor realignment was implemented to pull the channel away from the footings on the upstream side of the crossing structure.
5	HU_WH_CAC_0_1	HU_WH_CAC_0_E4	HU_WH_CAC_0_WC1	W-W141A W-W141B	East of Kennedy Road	■ A minor realignment was chosen to pull the meander bend away from the footings under the upstream section of the crossing structure.
5	HU_WH_CAC_0_2a	HU_WH_CAC_0_E1-E2	HU_WH_CAC_0_WC2	W-W142A W-W142B	Near Heart Lake Road	■ A minor realignment was chosen to pull the channel away from the footings under the downstream section of the crossing structure.
5	HU_WH_THW_1_4 (Includes part of HU_WH_TWH_1_2)	HU_WH_TWH_1_E2	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	W-W146A&B W-W147	West of Dixie Road	■ The channel was realigned to the northeast of the proposed on-ramp because its current alignment ran parallel to and directly underneath the road.
6	HU_WH_SAL_0_3 HU_WH_SAL_0_2 HU_WH_SAL_0_1 HU_WH_SAL_4_1 HU_WH_SAL_5_1	HU_WH_SAL_0_E1-E2 HU_WH_SAL_0_E6-E8 HU_WH_SAL_0_E6 HU_WH_SAL_0_E5 HU_WH_SAL_0_E4 HU_WH_SAL_0_E3 HU_WH_SAL_4_E3	HU_WH_SAL_0_1 HU_WH_SAL_0_2	E-W2A E-W2B E-W3	Airport Road	■ The four reaches covering the Salt Creek channel design had to be realigned due to the number of watercourse crossings required, all of which needed to meet the RSD offsets. This option was deemed unfeasible. ■ The realignment of (HU_WH_SAL_5_1) was chosen to connect the tributary channel at the upstream limit of the design with the realigned section of HU_WH_SAL_0_2. ■ The proposed realignment was recommended to reduce the number of crossings required (and the associated increased shading and reduction in allochthonous inputs associated with the channel enclosures) for the proposed Highway 413 Transportation Corridor and will result in an overall increase in channel length. ■ Refer to the Salt Creek Realignment Conceptual Channel Design Memo for more details about the proposed channel realignment.
7	HU_MH_ROB_4_1 (us) HU_MH_ROB_4_1 (ds)	HU_MH_ROB_4_E1	HU_MH_ROB_4_2 HU_MH_ROB_4_4 HU_MH_ROB_4_5 HU_MH_ROB_4_6	E-W13A E-W13B E-W15 E-W16 E-W16-1	Highway 427	■ The creek was realigned to the east because its current alignment sits underneath the proposed on/off ramps. The channel length increased from 709.9 m to 803.1 m.
7	HU_MH_ROB_7_2	HU_MH_ROB_7_E3	HU_MH_ROB_7_2_2 HU_MH_ROB_7_2_4	E-W23-2 E-W25A E-W25B	Highway 427	■ The channel realignment was performed to cross perpendicularly under the proposed crossing structure, as the existing alignment runs parallel to and underneath the footprint of the proposed on-ramp. The channel length has been reduced from 92.5 m to 91.8 m.
8	HU_MH_EHR_1_6	HU_EH_EHR_1_E2	HU_EH_EHT_1_2_1	E-W30A E-W30B E-W30C	East of Highway 27	■ The channel was realigned because the existing creek alignment runs parallel underneath Hwy 413. The 90% alignment was chosen to reduce future erosion risks to the structure. No changes are required. The drainage team will determine, based on proposed HEC-RAS results, if the valley footprint will be affected, as a significant amount of cut is involved in this design.
8	HU_MH_EHR_1_4	HU_EH_EHR_1_E1	HU_EH_EHT_1_1	No Structural ID Identified	Highway 27	■ The channel downstream of the crossing structure was pulled away from the Highway 27 grading limits to prevent the need of an extensive retaining wall.

Table 8-2: High-Level Preliminary Channel Design Parameters

Section	Fluvial Geomorphology Reach ID	Design Discharge (m^3/s)	Slope (%)	Bankfull Width (m)	Cross-sectional Area (m^2)	Velocity (m/s)	W/D Ratio	Average Bankfull Depth (m)	Maximum Bankfull Depth (m)	Boundary Shear Stress (d_{max}) (Pa)	Boundary Shear (d_{avg}) (Pa)	Froude Number	Stream Power (W)	Unit Stream Power (W/m)
1	SIM_EB_SM_0_2	4.91	0.31	7.00	4.29	1.15	11.44	0.61	0.850	25.80	18.60	0.47	149.39	21.34
4	EC_EH_ETW_12_3	0.42	0.99	2.10	0.46	0.90	9.59	0.22	0.35	34.01	21.29	0.62	40.43	19.25
4	EC_EH_ETW_7_1	0.41	0.51	2.50	0.51	0.82	12.38	0.20	0.40	20.00	10.10	0.58	20.70	8.28
4	EC_EH_ETW_6_1	1.50	0.78	4.00	1.25	1.20	12.80	0.31	0.50	38.24	23.90	0.68	114.37	28.59
5	EC_EH_ETW_1_7	1.46	0.70	4.10	1.31	1.12	12.83	0.32	0.45	30.89	21.94	0.63	100.54	24.52
5	HU_WH_CAC_0_1	0.37	0.23	2.60	0.67	0.55	10.10	0.26	0.40	9.02	5.81	0.35	8.37	3.22
5	HU_WH_CAC_0_2a	0.41	0.40	2.60	0.60	0.68	11.23	0.23	0.35	13.73	9.08	0.45	16.09	6.19
5	HU_WH_THW_1_4 (Includes part of HU_WH_TWH_1_2)	0.69	0.23	3.25	1.06	0.65	9.98	0.33	0.50	11.28	7.35	0.36	15.49	4.77
6	HU_WH_SAL_0_3	1.47	0.38	4.10	1.71	0.86	9.82	0.42	0.55	20.49	15.55	0.43	54.87	13.38
6	HU_WH_SAL_0_2	0.97	0.38	3.70	1.28	0.76	10.73	0.34	0.45	16.77	12.85	0.41	36.05	9.74
6	HU_WH_SAL_0_1	0.61	1.02	2.70	0.64	0.96	11.44	0.24	0.30	30.01	23.62	0.63	61.50	22.78
6	HU_WH_SAL_5_1	0.20	0.19	2.20	0.50	0.41	9.68	0.23	0.30	5.59	4.23	0.27	3.78	1.72
7	HU_MH_ROB_4_1 (us)	0.29	0.74	1.90	0.36	0.81	9.99	0.19	0.25	18.14	13.80	0.60	21.32	11.22
7	HU_MH_ROB_4_1 (ds)	0.30	1.75	1.80	0.28	1.09	11.68	0.15	0.20	34.32	26.46	0.88	51.75	28.75
7	HU_MH_ROB_7_2	0.29	0.60	2.05	0.40	0.74	10.57	0.19	0.35	20.59	11.41	0.54	17.34	8.46
8	HU_MH_EHR_1_6	0.34	1.78	1.40	0.27	1.23	7.26	0.19	0.25	43.64	33.66	0.93	59.97	42.83
8	HU_MH_EHR_1_4	0.75	2.10	2.19	0.49	1.53	9.79	0.22	0.40	82.37	46.07	1.03	153.97	70.31

Table 8-3: Additional Watercourses Anticipated to Require Realignment During Detail Design to Accommodate Proposed Infrastructure

Section	Fluvial Geomorphology Reach ID	Location	Rationale for Channel Realignment
3	CR_NP_CRR_3_2a	■ Approximately 625 m southeast of Bovaird Drive West and 500 m northeast of Heritage Road in the vicinity of CVC Pond 3	■ It is anticipated that CR_NP_CRR_3_2a may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond. The feature was not visible from the ROW during the 2025 field investigation. Upstream reach is ephemeral in nature.
3	CR_HC_HUT_6_2	■ Near the intersection between Mayfield Road and Heritage Road in the vicinity of CVC Pond 4	■ It is anticipated that CR_HC_HUT_6_2 may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond.
3	CR_GW_CRR_15a	■ Off Heritage Road approximately 600 m or more from Mayfield Road (Parallel to Heritage Road)	■ Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.
3	CR_GW_CRR_15b	■ Off Heritage Road approximately 600 m northwest of Mayfield Road (Parallel to Mayfield Road)	■ Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt
5	EC_SC_ETE_1_1	■ Approximately 390 m northeast of Heart Lake Road and 950 m northwest of Mayfield Road in the vicinity of TRCA WET POND W-9	■ It is anticipated that EC_SC_ETE_1_1 will need to be realigned during advanced stages of design to accommodate the proposed SWP.
6	HU_WH_WHR_3_1a	■ East of The Gore Road, approximately 1365 m southeast of Healey Road.	■ The edge of the reach is within the maintenance yard footprint. At a minimum, infrastructure should stay outside of the meander belt (if appliable) of the watercourse.
6	HU_WH_WHR_3_1b	■ East of The Gore Road, approximately 1365 m southeast of Healey Road.	■ It is anticipated that reach HU_WH_WHR_3_1b will need to be realigned to accommodate the proposed carpool lot.
6	HU_WH_CDT_2_1a	■ North of Mayfield Road approximately 340 m northeast of Humber Station Road	■ It is anticipated that reach HU_WH_CDT_2_1a will need to be realigned to accommodate the proposed carpool lot.
6	HU_WH_CDT_2_1b	■ North of Mayfield Road approximately 340 m northeast of Humber Station Road	■ It is anticipated that reach HU_WH_CDT_2_1b will need to be realigned to accommodate the proposed carpool lot.
7	HU_MH_ROB_3_1	■ Approximately 275 m west of Highway 50.	■ It is anticipated that HU_MH_ROB_3_1 will need to be realigned to accommodate the proposed transit station.
7	HU_MH_ROB_3_2	■ Crosses Highway 50	■ It is anticipated that HU_MH_ROB_3_2 will need to be realigned to accommodate the proposed transit station.
7	HU_MH_ROB_3_3	■ Crosses Highway 50 in the vicinity of DRY POND-E8	■ It is anticipated that reach HU_MH_ROB_3_3 will need to be realigned to accommodate the proposed SWP.
7	Unlabelled Reach	■ Approximately 100 m north of Major Mackenzie Drive	■ Unassessed reach (tributary to HU_MH_ROB_0_4) may need to be realigned to accommodate the proposed infrastructure.
7	HU_MH_ROB_6_1	■ West of Huntington Road	■ It is anticipated that HU_MH_ROB_6_1 will need to be realigned to accommodate the proposed stormwater pond.
8	HU_MH_EHR_1_3a	■ Crosses Highway 27	■ It is anticipated that HU_MH_EHR_1_3a will need to be realigned to accommodate the proposed carpool lot.
9	HU_EH_EHR_18_1b	■ Approximately 460 m west of Highway 400	■ Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.
9	HU_EH_EHR_18_1c	■ Approximately 650 m west of Highway 400	■ It is anticipated that HU_EH_EHR_18c will need to be realigned to accommodate the proposed transit station.
9	HU_EH_EHR_18_1d	■ Approximately 650 m west of Highway 400	■ It is anticipated that HU_EH_EHR_18d will need to be realigned to accommodate the proposed transit station.

8.2 Opportunities for Enhancement

8.2.1 Erosion Threshold Assessments and Considerations for Future Development

In natural systems, watercourses experience flows that entrain and transport sediment, maintaining their form and function. Natural erosion rates are expected to preserve channel stability. However, changes in watershed hydrology due to urbanization, agricultural practices, anthropogenic modifications like channel straightening, or additional flows such as from stormwater pond outlets, can destabilize channels and increase erosion. Erosion threshold assessments are a crucial part of future planning to determine the hydraulic conditions at which erosion begins (i.e., the volume of water that a watercourse can convey).

In the context of stormwater management, an erosion threshold, also referred to as a target flow, represents the flow that can theoretically entrain bed or bank sediments within the most sensitive reach in a portion of a watercourse (TRCA 2012). In defined watercourses, these flows are based on bed and bank materials and channel geometry. Watercourses will regularly experience flows that entrain and transport sediment however, issues arise when changes in the watershed's hydrology increase the frequency or duration of erosive events or cumulatively increase the quantity of flow capable of entraining and transporting sediment.

The Highway 413 Project could alter the infiltration and runoff rates of the area due to the increase in impermeable land surfaces from road paving. Runoff from the roadway will be collected in drainage ditches and conveyed into stormwater ponds, which will ultimately discharge flow back into the natural watercourses. An erosion threshold assessment should be completed for each proposed stormwater pond outlet to better quantify the potential geomorphological response of the receiving watercourses and to assess the watercourses ability to assimilate post-development stormwater flows without exacerbating or increasing instream erosion beyond natural rates (CVC 2015).

At this stage in the Highway 413 Project there is no fluvial geomorphic input to stormwater pond sizing and stormwater pond discharge channels into the existing watercourses. In accordance with CVC and TRCA policies, an erosion threshold assessment should be completed during the Detail Design stages of the project anywhere a stormwater pond discharges into a natural watercourse (see **Table 8-4**) to inform discharge rates and stormwater pond capacity.

Table 8-4: Stormwater Pond ID and Associated Watercourse

Section	Conservation Authority	Pond ID (from 90% Design)	Watershed	Drains into Watercourse Reach
West	CH	Relocated 407E Pond 6	Sixteen Mile Creek	South into SM_EL_SIM_1_3
West	CVC	Pond 1	Levi Creek	East into agricultural drain (downstream of CR_LC_LEV_1_2)
West	CVC	Pond 2	Credit	Located on a plateau on the embankment of the Credit River. Flow will discharge directly into the Credit River (downstream of reach CR_NP_CRR_0_2)
West	CVC	Credit River Pond	Credit	North into CR_NP_CRR_0_2
West	CVC	Pond 3	Credit	Into reach southeast of CR_NP_CRR_3_2 (agricultural drain labelled CR_NP_CRR_3_2a). It is anticipated that CR_NP_CRR_3_2a may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond.
West	CVC	Pond 4	Huttonville	East into CR_HC_HUT_6_3. It is anticipated that CR_HC_HUT_6_2 may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond.
West	CVC	Pond 5	Huttonville	East to CR_HC_HUT_5_1
East	TRCA	WET POND-W1	Etobicoke Creek	Northeast into EC_EH_ETW_9_3
East	TRCA	WET POND-W2	Etobicoke Creek	North into EC_EH_ETW_7_3
East	TRCA	WET POND-W3	Etobicoke Creek	East into EC_EH_ETW_1_11
East	TRCA	WET POND-W4	Campbells Creek (Humber River)	West into HU_WH_CAC_0_1
East	TRCA	WET POND-W5	Humber River	Northeast to proposed conceptual realignment of HU_WH_TWH_1_2 & HU_WH_TWH_1_4
East	TRCA	WET POND-W6	Humber River	Southeast to Humber River (unassessed reach southwest of HU_WH_TWH_1_4)
East	TRCA	WET POND-W10	Humber River	East to ditches then to Humber River (unassessed reach southeast of HU_WH_TWH_1_4)
East	TRCA	WET POND-W7	Humber River	Northeast to HU_WH_TWH_2_1
East	TRCA	WET POND W-8	Humber River	South into HU_WH_CAC_0_2a
East	TRCA	WET POND W-9	Humber River	South to drainage ditch and EC_SC_ETE_1_1. It is anticipated that EC_SC_ETE_1_1 will need to be realigned during advanced stages of design to accommodate the proposed SWP
East	TRCA	WET POND-E1	Salt Creek	South into HU_WH_SAL_0_3. Channel realignment will occur in this area. Refer to the Salt Creek Realignment Conceptual Channel Design Memo for more details about the proposed conceptual channel realignment.
East	TRCA	WET POND E-2 (west pond)	West Humber River	East into HU_WH_WHR_1_5
East	TRCA	WET POND E-2 (east pond)	West Humber River	West into HU_WH_WHR_1_5
East	TRCA	DRY POND E-3 (west pond)	West Humber River	South into HU_WH_WHR_3_1
East	TRCA	DRY POND E-3 (east pond)	Humber River	East into ditches and ultimately into HU_WH_WHR_0_3
East	TRCA	DRY POND-E4	Humber River	West into HU_WH_GRT_0_2
East	TRCA	DRY POND-E5	Humber River	West into HU_WH_GRT_0_2/ HU_WH_GRT_0_3
East	TRCA	DRY POND-E6	Humber River	Pond will drain into the ditch and the ditch will drain into the unassessed reach east to HU_WH_CDT_2_1
East	TRCA	DRY POND-E7	Humber River	Pond will drain into the ditch and the ditch will drain into the unassessed reach east to HU_WH_CDT_2_1
East	TRCA	DRY POND-E8	Humber River	Northeast into HU_MH_ROB_3_4. It is anticipated that reach HU_MH_ROB_3_3 will need to be realigned to accommodate the proposed SWP.
East	TRCA	DRY POND-E9	Humber River	East towards HU_MH_ROB_4_1
East	TRCA	WET POND-E5	Humber River	East to HU_MH_ROB_0_2
East	TRCA	WET POND-E6	Humber River	Southwest ultimately to HU_MH_ROB_0_4 and downstream of this reach
East	TRCA	DRY POND-E18	Humber River	Southwest ultimately to HU_MH_ROB_0_4 and downstream of this reach
East	TRCA	DRY POND-E10	Humber River	West to proposed conceptual realignment of HU_MH_ROB_7_2
East	TRCA	WET POND-E4	Humber River	Southeast to HU_MU_ROB_6_1
East	TRCA	DRY POND-E11	Humber River	East to HU_MH_MHR_3_1
East	TRCA	DRY POND-E12	Humber River	It is anticipated that a flow spreader will be used to disperse flow. This should be further investigated during Detail Design
East	TRCA	DRY POND-E13	Humber River	West towards HU_MH_EHR_1_3
East	TRCA	DRY POND-E14	Humber River	East towards HU_MH_EHR_0_1
East	TRCA	DRY POND-E15	Humber River	West to culvert outlet to ultimately flow south to East Humber River (unassessed portion of watercourse)
East	TRCA	DRY POND-E16	Humber River	West to culvert outlet to ultimately flow south to East Humber River (unassessed portion of watercourse)
East	TRCA	DRY POND-E17	Humber River	West to HU_EH_EHR_17_3

General stormwater discharge channel recommendations are as follows:

- Limit stormwater discharge to below the target flows established during the erosion threshold assessment.
- Stormwater discharge channel grade should be kept to a minimum to reduce erosion potential.
- Where grade allows, channels should be open to reduce maintenance needs.

The preliminary proposed stormwater ponds and the receiving watercourse reach ID have been summarized in **Table 8-4**. Reaches that are likely to be realigned to accommodate the proposed stormwater ponds have also been identified in **Table 8-3**.

8.2.1.1 General Stormwater Discharge Channel Recommendations

General stormwater discharge channel recommendations are as follows:

- Limit stormwater discharge to below the target flows established during the erosion threshold assessment.
- Stormwater discharge should drain into larger, less sensitive watercourse reaches with tie-ins to small, undefined headwater features being avoided wherever possible.
- Stormwater discharge channel grade should be kept to a minimum to reduce erosion potential.
- Where grade allows, channels should be open to reduce maintenance needs.
- In steep areas such as the Highway 427 extension, where grade is approximately 20%, it is recommended that the stormwater discharge be piped into the receiving watercourse. Alternatively, energy dissipating structures such as step pools may be considered.
- Where possible convey flows downstream of infrastructure to reduce potential damage due to erosion

8.3 Next Steps

As Detail Design progresses, the following considerations and next steps should be completed. Fluvial geomorphology involvement is essential across all stages so that channel processes, sediment dynamics, and species-at-risk habitat requirements, particularly for Redside Dace, are fully integrated into design decisions.

1. **Offsetting Measures:**
   - Fluvial geomorphology should be directly involved in the development and evaluation of offsetting measures for Redside Dace and other sensitive species.
   - Threats to species and their habitat should be assessed on a site-specific basis so that offsetting measures effectively address the geomorphic processes influencing habitat function and long-term ecological resilience.
2. **Flow Dynamics:**
   - During Detail Design, fluvial geomorphology should reassess updated HEC-RAS model outputs to evaluate any changes to sediment transport and entrainment potential, and overall channel stability.
   - Any channel constriction or channel narrowing resulting from in-water works (e.g., bridge piers) should be evaluated through a geomorphic lens to avoid unintended impacts to channel processes, bank stability, and habitat conditions.
3. **Jeopardy Assessment, Cumulative Effects, and Mitigation Measures:**
   - Mitigation measures will continue to evolve through Detail Design. Ongoing collaboration with the multi-disciplinary team is necessary to minimize impacts on natural features, including fish habitat and aquatic SAR such as Redside Dace.
   - Linkages supporting the jeopardy assessment are being finalized and will be shared with the team as they are completed.
   - Fluvial geomorphology must play a continued role in discussions on cumulative effects and mitigation so that geomorphic processes and channel adjustment potential are appropriately incorporated into assessments.

4. **Erosion and Sediment Control (ESC):**

   - All geomorphic hazards identified in the geomorphic assessment contribute to overall erosion potential.
   - Fluvial geomorphology should work closely with the ESC team to interpret geomorphic implications and to inform the design of ESC measures that reflect site-specific channel processes and sediment dynamics.

5. **Ongoing Consultation for Aquatic Species at Risk:**

   - Redside Dace considerations have been integrated throughout the project. During Detail Design, the fluvial geomorphology team will continue collaborating with the fisheries team so that SAR requirements, particularly related to watercourse crossings, are addressed in a co-ordinated manner.
   - Continued geomorphic input will help protect channel form, flow regime, and sediment processes and will support long-term species recovery.

9. Monitoring and Commitments for the Undertaking

9.1 Environmental Effects Monitoring

Potential environmental impacts relating to watercourse crossing structures have been outlined in **Section 5.1**.

Monitoring work is recommended during construction of the Project. It is recommended that a fluvial geomorphologist be present to perform construction site supervision for any channel design work. If required, post construction monitoring should be undertaken.

10. Approvals Required for the Undertaking

Approvals for in-channel work will be required during later stages of the Project.

11. Summary and Conclusions

This report documents the Fluvial Geomorphological Analysis of the Preliminary Design of Highway 413. This report was prepared to:

1. Provide a multi-criteria evaluation to determine an appropriate crossing size that will have the least impact on the watercourse and the structure itself for watercourses affected by the highway work by defining the pre-existing conditions for all watercourse reaches that cross the preferred alignment, and
2. To identify the preferred alignment concepts for watercourses that presently (a) cross the proposed highway obliquely, and (b) identifies locations where installing a crossing will require channel realignment (**Section 7**).

Desktop and field assessments (**Section 2** to **4**) were completed for all reaches that cross the preferred alignment. The results of these investigations were used to determine the erosion rate and meander belt width of each proposed defined watercourse crossing that contain perennial or intermittent flows with downstream connectivity, to define a baseline preliminary crossing recommendation (**Section 6**).

Preliminary crossing recommendations were refined (**Section 7**) based on an understanding of channel form, function, and future risk using (1) a risk matrix that was developed for the purposes of this report, (2) an assessment of future flow conditions, (3) a review of relevant protocol and guidelines (i.e., crossing design, SAR, channel design, and hazard delineation), and (4) consideration for any site-specific conditions noted during field work, provincial crossing design recommendations, and (4) consideration for any site-specific conditions noted during field work.

Preliminary channel designs were also provided (**Section 8**) where the orientation of the existing watercourse crossing structure is either severely misaligned with respect to the preferred highway alignment, or where it is not feasible to construct a crossing structure, such as at complex highway interchanges.

Additional recommendations for future work including additional anticipated watercourse modifications to accommodate proposed infrastructure (**Section 8.1.2**) and erosion threshold assessments and considerations for future development (**Section 8.2.1**).

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A

Reach Delineation and Historical Aerial Imagery Assessment

A1. Reach Delineation Table and Historical Imagery Analysis

A2. Detailed Reach Map

A1. Reach Delineation Table and Historical Imagery Analysis

Crossing ID	Limit	Coordinates	Justification		1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
SM_EB_SIM_2_WC1	Upstream	43.5727 -79.8271	Road drainage upstream.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5709 -79.8266	Confluence with feature downstream.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EB_SIM_0_WC1 EXTENSION	Upstream	43.5726 -79.8246	Confluence with two features upstream.	**Land Use**	Not Available	Not Available	Area cover is predominantly agricultural. Poor quality image	Not Available	Not Available	The feature no longer has the well defined riparian zone vegetation	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Highway 401 is now present in the vicinity of the feature. To the north of the highway an large shopping plaza is now present. The agricultural land in the vicinity has given place to more urbanized land uses. The riparian zone of the feature is predominantly grasses and woodlot. based on the contour lines the feature is within a valley.
	Downstream	43.5747 -79.8259	Change in planform. Feature becomes more sinuous and meandering.	**Planform**	Not Available	Not Available	Feature is visible meandering in wooded area between agricultural fields	Not Available	Not Available	No significant changes visible due to poor image quality	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature flows from a culvert under Highway 401 into a valley. The planform of the feature is meandering within a confined valley.
No Proposed Hydraulics Crossing	Upstream	43.5747 -79.8270	Storm pond outlet.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5751 -79.8256	Confluence with feature downstream.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.5747 -79.8259	Confluence with feature upstream.	**Land Use**	Not Available	Not Available	Feature is surrounded by agricultural fields but image quality is poor.	Feature has riparian cover with trees present.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A mall has appeared to the south of the feature.
	Downstream	43.5767 -79.8256	Confluence with feature downstream.	**Planform**	Not Available	Not Available	Feature is defined and has a meandering nature.	No significant changes visible due to poor image quality	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant changes to planform observed since 1954.
No Proposed Hydraulics Crossing	Upstream	43.5769 -79.8235	Confluence with undefined features upstream.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5794 -79.8219	Confluence with roadside drainage feature.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.5807 -79.8102	Change in riparian zone of undefined feature.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5804 -79.8107	Confluence with roadside drainage feature.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.5835 -79.8184	Apparent start point of undefined feature.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5831 -79.8165	Confluence with roadside drainage feature.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_DR1	Upstream	43.5836 -79.8128	Confluence of undefined features upstream.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5822 -79.8111	Confluence of undefined features downstream.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC1.1, SM_EL_SIM_1_WC1.2, SM_EL_SIM_1_WC1.3, SM_EL_SIM_1_WC1.4, SM_EL_SIM_1_WC1.5	Upstream	43.5895 -79.8197	Start point of vegetated swale.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5865 -79.8115	Stormwater pond inlet.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC1 EXTENSION, SM_EL_SIM_1_WC1.6	Upstream	43.5842 -79.8063	Pond outlet.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5835 -79.8032	Confluence point of undefined features.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC2.1, RELOCATED-SM_EL_SIM_1_WC2.2	Upstream	43.5925 -79.8161	Pond outlet.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5908 -79.8084	Stormwater pond inlet.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC2.3 EXTENSION	Upstream	43.5908 -79.8094	Storm pond outlet.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5894 -79.8033	Confluence point.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC3.1, SM_EL_SIM_1_WC3.2 EXTENSION, SM_EL_SIM_1_WC3.3, SM_EL_SIM_1_WC3.4 MODIFICATION.	Upstream	43.5960 -79.8109	Confluence with two undefined features upstream.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5949 -79.8088	Stormwater pond inlet.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
Double Check	Upstream	43.5924 -79.8038	Storm pond outlet.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5907 -79.8013	Confluence point.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC4 EXTENSION	Upstream	43.5907 -79.8023	Start point of undefined feature.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5970 -79.8038	Stormwater pond inlet.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
SM_EL_SIM_1_WC4.1	Upstream	43.5967 -79.8023	Storm pond outlet.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5969 -79.7942	Stormwater pond inlet.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6033 -79.8256	Start point of undefined feature.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6036 -79.8240	Confluence of undefined features upstream.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6041 -79.8251	Start point of undefined feature.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6035 -79.8240	Confluence of undefined features upstream.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_MC_MUL_8_WC1	Upstream	43.6235 -79.8240	Confluence of undefined features upstream.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6041 -79.8214	Pond inlet.	**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR-MC-MUL-8-WC3	Upstream	43.6287 -79.8210	Start point of undefined feature.	**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
	Downstream	43.6096 -79.8158	Confluence of undefined features downstream.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6093 -79.8203	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6104 -79.8163	Confluence of undefined features downstream.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_MC_MUL_8_WC4	Upstream	43.6114 -79.8254	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6118 -79.8156	Confluence of undefined features downstream.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_LC_LEV_1_WC1	Upstream	43.6116 -79.8233	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6148 -79.8158	Change in riparian zone of undefined feature.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_LC_LEV_1_WC2	Upstream	43.6181 -79.8225	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is located within agricultural fields	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No visible changes since 1988
	Downstream	43.6161 -79.8184	Pond inlet.		**Planform**	Not Available	Not Available	No defined feature visible. Likely undefined feature	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No visible changes since 1988
No Proposed Hydraulics Crossing	Upstream	43.6210 -79.8249	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6240 -79.8197	Confluence with roadside drainage ditch.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6220 -79.8242	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is located adjacent to an access driveway. Not clearly visible riparian zone	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Small riparian zone present adjacent to the feature. No other major changes detected.
	Downstream	43.6240 -79.8203	Confluence with roadside drainage ditch.		**Planform**	Not Available	Not Available	No defined feature visible. Not clearly visible on aerial imagery	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is defined and linearized along an access driveway
No Proposed Hydraulics Crossing	Upstream	43.6233 -79.8243	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6241 -79.8204	Confluence with roadside drainage ditch.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.2 (downstream of downstream reach break) CR_LC_LEV_2_WC1.1	Upstream	43.6240 -79.8197	Confluence of roadside drainage.		**Land Use**	Not Available	Not Available	Feature is located within agricultural fields	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Small riparian zone present. No other major changes observed since 1954.
	Downstream	43.6252 -79.8181	Confluence with undefined feature.		**Planform**	Not Available	Not Available	No defined feature visible. Likely undefined feature	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is slightly visible. Likely influenced by agricultural activities. No significant changes observed since 1954.
CR_LC_LEV_2_WC2.1 CR_LC_LEV_2_WC2.2 CR_LC_LEV_2_WC2	Upstream	43.6248 -79.8230	Confluence of undefined features upstream.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6252 -79.8181	Confluence of undefined features downstream.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6230 -79.8271	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Not Available	Agricultural Fields	Agricultural Fields
	Downstream	43.6248 -79.8229	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is now visible, appears as drainage swale in an agricultural field.	Channel can be observed in the upstream portion of the feature along with a narrow riparian buffer. The downstream portion of reach has disappeared. Crops appear to have been planted over feature.	Not Available	Not Available	Feature is not clearly visible	A flow path can now be observed along entire reach in aerial imagery, likely due to increased rainfall or snowmelt prior to aerial imagery capture
No Proposed Hydraulics Crossing	Upstream	43.6236 -79.8285	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Not Available	Agricultural Fields	Agricultural Fields - downstream half of reach is cut off by imagery.
	Downstream	43.6248 -79.8229	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Upstream half of feature is now visible (flow path visible likely due to increased rainfall or snowmelt prior to aerial imagery capture), appears as drainage swale in an agricultural field.	Entire feature is now visible in aerial imagery. There appears to be a ponded wetland-type area at the downstream reach break.	Not Available	Not Available	Feature is not clearly visible	Not as visible compared to 2002. Only upstream half of reach is visible in aerial imagery.
No Proposed Hydraulics Crossing	Upstream	43.6248 -79.8229	Confluence point.		**Land Use**	Not Available	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Not Available	Agricultural Fields	Not Available
	Downstream	43.6242 -79.8205	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Undefined feature. Only the upstream portion of the reach is visible and appears as ponded area of agricultural field adjacent to road.	Not Available	Not Available	Feature is not clearly visible	Not Available
No Proposed Hydraulics Crossing	Upstream	43.6257 -79.8261	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Not Available	Agricultural Fields	Not Available
	Downstream	43.6257 -79.8237	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is now visible, appears as drainage swale in an agricultural field.	No feature visible. Area is flooded,	Not Available	Not Available	Feature is not clearly visible	Not Available
No Proposed Hydraulics Crossing	Upstream	43.6263 -79.8253	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Not Available	Agricultural Fields	Agricultural Fields	Not Available	Not Available	Agricultural Fields	Not Available
	Downstream	43.6257 -79.8237	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is now visible, appears as a drainage swale in an agricultural field.	No feature visible. Area is flooded,	Not Available	Not Available	Feature is not clearly visible	Not Available
CR_LC_LEV_2_WC6, CR_LC_LEV_2_WC5.1	Upstream	43.6298 -79.8217	Culvert outlet point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6278 -79.8175	Confluence of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_LC_LEV_9_DR1	Upstream	43.6319 -79.8304	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6328 -79.8222	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_LC_LEV_0_WC2	Upstream	43.6344 -79.8282	Confluence point.		**Land Use**	Not Available	Not Available	Agricultural activities surrounding the watercourse. Some trees present on the right bank.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	Increase in riparian vegetation density	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is located within a dense woodlot. Vegetation cover has increased significantly since 1954.

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1969	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
	Downstream	43.6328 -79.8222	Confluence point.		**Planform**	Not Available	Not Available	Feature appears linearized with little meandering to none meandering shape. Reaches upstream of Winston Churchill Blvd and at Heritage Rd appear more meandering and with larger riparian zones.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976 due to poor image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Watercourse is defined and meandering but not clearly visible due to dense riparian woodlot cover. No significant changes observed since 1954.
CR_LC_LEV_0_WC2.1	Upstream	43.6328 -79.8222	Confluence of two features upstream.		**Land Use**	Not Available	Not Available	Agricultural activities surrounding the watercourse. Some trees present on the right bank.	No major changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The upstream portion of the feature is located within a woodlot that has increased in density since 1954. Immediately downstream of Embelton Rd. the riparian corridor is smaller but it increases significantly in the lower portions of the reach.
	Downstream	43.6321 -79.8094	Pond inlet.		**Planform**	Not Available	Not Available	Feature appears linearized with little meandering to none meandering shape. Reaches upstream of Winston Churchill Blvd and at Heritage Rd appear more meandering and with larger riparian zones.	Online pond has appeared upstream of Heritage Rd. No other significant changes to planform	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Watercourse appears to have regained some sinuosity and meandering planform in the upper portions of the reach since 1954. Downstream (southeast) of Embelton Rd the feature flows and meanders within a linear riparian corridor that significantly increases in size in the lower portion of the reach.
No Proposed Hydraulics Crossing	Upstream	43.6331 -79.8174	Pond inlet.		**Land Use**	Not Available	Not Available	Agricultural fields and woodlots surround the feature.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	2022 - Creek has appeared directly to the west where the feature flows from. Feature flows between agricultural fields.
	Downstream	43.6340 -79.8255	Confluence point.		**Planform**	Not Available	Not Available	No defined feature visible due to poor image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	2023 - Levi's Creek. Feature is defined and permanent.
CR_LC_LEV_10_WC1.1 (CR_LC_LEV_10_WC1.2) CR_LC_LEV_10_WC1.3 - No drainage area)	Upstream	43.6352 -79.8223	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6339 -79.8253	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6357 -79.8272	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6340 -79.8255	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CREDIT RIVER BRIDGE	Upstream	43.6410 -79.8302	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5827 -79.8271	Confluence point. With higher order feature.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CREDIT RIVER BRIDGE	Upstream	43.6429 -79.8330	Change in riparian vegetation. Becomes less wooded.		**Land Use**	Not Available	Not Available	Agricultural fields and woodlots surround the feature.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Significant increase in adjacent riparian zone since 1954.
	Downstream	43.6427 -79.8271	Confluence point.		**Planform**	Not Available	Not Available	Defined permanent meandering watercourse.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No major changes to watercourse planform observed since 1954.
CREDIT RIVER BRIDGE	Upstream	43.5827 -79.8271	Confluence point.		**Land Use**	Not Available	Not Available	Agricultural fields and woodlots surround the feature.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Significant increase in adjacent riparian zone since 1954.
	Downstream	43.5438 -79.8246	Confluence point.		**Planform**	Not Available	Not Available	Defined permanent meandering watercourse	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	No visible changes since 1976	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No major changes to watercourse planform observed since 1954.
CREDIT RIVER BRIDGE	Upstream	43.5835 -79.8268	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5438 -79.8246	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.5495 -79.8336	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5491 -79.8344	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6503 -79.8355	Change in riparian vegetation cover		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A vegetated corridor is present. Appears to be mainly grasses. Adjacent land use/cover is agricultural.	The vegetated corridor had decreased in width since 2009.	Not Available	The feature's vegetated corridor has increased in size. No changes to the adjacent land uses since 2007.
	Downstream	43.5492 -79.8344	Confluence point		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature displays a meandering planform along a narrow vegetated corridor.	Planform not clearly visible due to vegetation cover.	Not Available	No significant changes since 2007
No Proposed Hydraulics Crossing	Upstream	43.6505 -79.8332	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.5492 -79.8344	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6515 -79.8359	Confluence point		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A vegetated corridor is present. Appears to be mainly grasses. Adjacent land use/cover is agricultural.	The vegetated corridor had decreased in width since 2009.	Not Available	The feature's vegetated corridor has increased in size. No changes to the adjacent land uses since 2007.
	Downstream	43.6503 -79.8355	Change in riparian vegetation cover		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature displays a meandering planform along a narrow vegetated corridor.	Planform not clearly visible due to vegetation cover.	Not Available	No significant changes since 2007
No Proposed Hydraulics Crossing	Upstream	43.6576 -79.8481	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6556 -79.8354	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_NP_CRR_9_WC1 CR_NP_CRR_9_WC2	Upstream	43.6569 -79.8368	Change in riparian vegetation. From woodlot to grasses.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6552 -79.8360	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6583 -79.8377	Change in riparian vegetation		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6556 -79.8354	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6596	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.8405																		
	Downstream	43.6583 -79.8377	Change in riparian vegetation		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_NP_CRR_3_WC1.1	Upstream	43.6602 -79.8364	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6566 -79.8309	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6566 -79.8309	Change in riparian vegetation. From trees/shrubs to agricultural fields.		**Land Use**	Agricultural fields. Feature flows through one field.	Agricultural fields. Feature flows through one field.	Agricultural fields. Feature flows through one field.	Agricultural fields. Feature flows through one field.	Not available	Agricultural fields. Feature flows through one field.	Not available	Agricultural fields. Feature flows through one field.	Not available	Not available	Not available	Not available	Not available	Not available	Agricultural fields. Feature flows through one field.
	Downstream	43.6543 -79.8267	Change in riparian vegetation. From agricultural fields to trees/shrubs.		**Planform**	The feature is not clearly visible on aerial imagery	The feature is clearly visible in aerial imagery, but this may be due to the time of the year the imagery was taken	Feature no longer visible. Imagery is clear. Feature is likely ephemeral and planted over in the field.	Upstream half of feature is visible then disappears. Channel has shifted north when compared to 1950.	Not available	Poor image quality, feature is not clearly visible.	Not available	Poor image quality, feature is not clearly visible. A faint outline of the feature is visible and follows a similar path to 1950	Not available	Not available	Not available	Not available	Not available	Not available	Feature follows similar planform to 1950 but is less sinuous. A narrow riparian buffer of grasses is now visible.
CR_NP_CRR_3_WC3.1	Upstream	43.6605 -79.8414	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6602 -79.8364	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_NP_CRR_3_WC2 CR_NP_CRR_3_WC3 CR_NP_CRR_3_WC4	Upstream	43.6644 -79.8417	Start point of undefined feature. Change in riparian vegetation.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6602 -79.8364	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6647 -79.8432	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6643 -79.8417	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_NP_CRR_3_WC5 CR_NP_CRR_3_WC5.1	Upstream	43.6658 -79.8417	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6643 -79.8417	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_NP_CRR_13_WC2	Upstream	43.6731 -79.8541	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6702 -79.8568	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_NP_CRR_13_WC3	Upstream	43.6765 -79.8666	Confluence of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6705 -79.8584	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing. Outside of Study Area.	Upstream	43.6775 -79.8528	Confluence point.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The features is located within small riparian corridor. Agricultural land use/cover within adjacent to the reach.	Increase in vegetation density.	Not Available	No significant changes since 2012..
	Downstream	43.6705 -79.8368	Artificial break due to extent of reach.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature's planform in not visible due to the vegetation cover.	The feature meanders along the vegetated corridor.	Not Available	No significant changes since 2012..
No Proposed Hydraulics Crossing	Upstream	43.6806 -79.8654	Confluence of undefined features.		**Land Use**	Not Available	Not Available	Feature is surrounded by agricultural lands. A woodlot is present to the north of the feature.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant changes observed to the adjacent agricultural lands since 1954.
	Downstream	43.6785 -79.8583	Confluence of undefined features.		**Planform**	Not Available	Not Available	Meandering feature with linearization at the road crossing.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	2023- Feature is defined and flows through between agricultural fields.
No Proposed Hydraulics Crossing	Upstream	43.6810 -79.8616	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6785 -79.8583	Confluence of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6791 -79.8667	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6798 -79.8678	Confluence of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6829 -79.8753	Confluence of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6806 -79.8654	Confluence of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
CR_HC_HUT_6_WC1	Upstream	43.6812 -79.8720	Start point of undefined feature. Culvert outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6817 -79.8709	Confluence of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6872 -79.8741	Start point of undefined feature. Culvert outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6839 -79.8682	Change in riparian vegetation. From agricultural to woodlot.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.6886 -79.8827	Change in riparian vegetation and change from flowing through agricultural fields to being more of a roadside ditch		**Land Use**	Not Available	Not Available	Primarily agricultural fields. Some small forested areas to the northeast. Heritage Rd is adjacent to the feature.	What appears to be a roadside ditch has been dug parallel to Heritage Rd along part of the features length.	Not Available	Some ponding of water in the agricultural field adjacent to the feature.	Not Available	Residential property has been built adjacent to the upstream and also the downstream reach break.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Extensive residential development to the northeast (approx. 2 km away). Some of the agricultural fields in the surrounding area have been forested.
	Downstream	43.6953 -79.8920	Change in riparian vegetation. Changes from being a roadside ditch to flowing through agricultural field.		**Planform**	Not Available	Not Available	Feature is not clearly visible	No feature clearly visible but a drainage ditch has been dug along the future path of the feature.	Not Available	Feature is still not clearly visible. Roadside drainage ditch has been extended further to the southeast.	Not Available	Feature is clearly visible as roadside ditch. The channel has been diverted around a new residential property at the downstream reach break.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Riparian buffer has established. No change in planform since 1988.
No Proposed Hydraulics Crossing	Upstream	43.6869 -79.8845	Change in riparian vegetation. Changes from being a roadside ditch to flowing through agricultural field.		**Land Use**	Not Available	Not Available	Primarily agricultural fields.	No change when compared to previous.	Not Available	No change when compared to previous.	Not Available	Residential property has been constructed adjacent to the feature.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Extensive residential development to the northeast (approx. 2 km away). Some of the agricultural fields in the surrounding area have been forested.
	Downstream	43.6886	Confluence point.		**Planform**	Not Available	Not Available	Undefined feature that is not clearly visible. Border of 2	Feature is now visible as a drainage ditch between two fields	Not Available	No change when compared to previous.	Not Available	The feature is now clearly visible compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Riparian buffer has established. No change in planform since 1988.

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1969	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.8927						agricultural fields.												
No Proposed Hydraulics Crossing	Upstream	43.6993 -79.8977	Apparent start point of undefined feature		**Land Use**	Not Available	Not Available	Primarily agricultural fields.	No change when compared to previous.	Not Available	No change when compared to previous.	Not Available	No change when compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Extensive residential development to the northeast (approx. 2 km away). Some of the agricultural fields in the surrounding area have been forested.
	Downstream	43.6899 -79.8845	Confluence point		**Planform**	Not Available	Not Available	No visible feature	No visible feature	Not Available	Feature is now visible. Feature appears as a drainage swale in an agricultural field.	Not Available	Feature is no longer visible. Has likely been plowed or planted over.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is not clearly visible. Appears as a slight depression in an agricultural field.
EC_EH_ETW_13_WC1, EC_EH_ETW_13_WC1.1	Upstream	43.6948 -79.8879	Change in riparian vegetation. From agricultural to woodlot.		**Land Use**	Not Available	Not Available	Feature is surrounded by agricultural lands. A forest is present to the east of the feature.	No significant changes visible since 1954.	Not Available	No significant changes visible due to poor image quality	Not Available	A small corridor is now present along the location of the feature. Use remains largely agricultural.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant changes observed to the adjacent agricultural lands since 1954. Agricultural activities have given room for a riparian buffer along the feature to increase (first observed in the 1988 imagery). Trees and grasses appear to be the main type of vegetation present within the riparian zone.
	Downstream	43.6965 -79.8795	Confluence point.		**Planform**	Not Available	Not Available	The feature is not clearly visible on the imagery.	No significant changes visible since 1954.	Not Available	No significant changes visible due to poor image quality	Not Available	Feature appears more defined within one of the agricultural fields. The downstream portion of the feature is less visible and less defined. Planform is linearized and has likely been affected by the adjacent agricultural activities.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A larger corridor is now present where the feature is located. The feature itself cannot be observed due to the vegetation cover. The corridor is linearized.
No Proposed Hydraulics Crossing	Upstream	43.6982 -79.8865	Apparent start point of drainage ditch.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6993 -79.8853	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing, Agricultural drain	Upstream	43.6993 -79.8853	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.6966 -79.8759	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_12_WC1	Upstream	43.7012 -79.8879	Apparent start point of drainage ditch.		**Land Use**	Not Available	Not Available	Poor quality imagery. Only a large patch of forest is discernable in the downstream portion of the reach. Agricultural land is present adjacent to the feature.	Poor quality imagery. No discernable changes were observed.	Not Available	Poor quality imagery. No discernable changes were observed.	Not Available	Poor quality imagery. No discernable changes were observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is located within an agricultural field. A forest patch remains present on the west bank of the reach. No other significant changes observed since 1954.
	Downstream	43.6993 -79.8853	Confluence point.		**Planform**	Not Available	Not Available	Poor quality imagery. Feature is not visible.	Poor quality imagery. No discernable changes were observed.	Not Available	Poor quality imagery. No discernable changes were observed.	Not Available	Poor quality imagery. No discernable changes were observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature appears linearized without a meandering planform. Likely an agricultural drain. No significant changes since 1954.
No Proposed Hydraulics Crossing, Agricultural drain	Upstream	43.7050 -79.8932	Apparent start point of drainage ditch.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7012 -79.8879	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_11_WC1,	Upstream	43.7068 -79.8866	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7069 -79.8827	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_10_WC1	Upstream	43.7144 -79.8847	Confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7108 -79.8791	Change in riparian vegetation. From agricultural to woodlot.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.7189 -79.8860	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7197 -79.8794	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.7197 -79.8801	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7197 -79.8794	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_9_WC2	Upstream	43.7197 -79.8794	Confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7138 -79.8759	Change in riparian vegetation. From agricultural to woodlot.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_7_WC2	Upstream	43.7237 -79.8720	Change in riparian vegetation. From woodlot to grasses.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7251 -79.8696	Pond inlet.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_7_WC3	Upstream	43.7260 -79.8809	Change in riparian vegetation. From woodlot to grasses.		**Land Use**	Not Available	Not Available	Feature is located within agricultural fields. A forest patch is present to the south by the central portion of the reach. No other details discernable due to poor image quality.	Poor quality imagery. No discernable changes were observed.	Not Available	No visible changes since 1950 due to poor image quality.	Not Available	No visible changes since 1976 due to poor image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A small riparian corridor is present on the upper and central portion of the reach. The feature remains located within agricultural fields. No significant changes observed since 1954.
	Downstream	43.7266 -79.8633	Confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible due to poor image quality.	Poor quality imagery. No discernable changes were observed.	Not Available	No visible changes since 1950 due to poor image quality.	Not Available	No visible changes since 1976 due to poor image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is undefined and not clearly visible. No significant changes since 1954.
No Proposed Hydraulics Crossing	Upstream	43.7253 -79.8660	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7266 -79.8634	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_7_WC4.1, EC_EH_ETW_7_WC4, EC_EH_ETW_7_WC4.2, EC_EH_ETW_7_WC4.3, EC_EH_ETW_7_WC4.S	Upstream	43.7211 -79.8758	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7269 -79.8611	Confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
EC_EH_ETW_6_WC1.1, EC_EH_ETW_6_WC1.3, EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5	Upstream	43.7335 -79.8757	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is surrounded by agricultural fields. No riparian buffer is visible due to image quality.	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is surrounded by agricultural fields. No significant riparian buffer present. No significant changes since 1954.
	Downstream	43.7303 -79.8595	Change in riparian vegetation. From grasses to woodlot.		**Planform**	Not Available	Not Available	Feature appears linearized without a meandering planform and with low sinuosity. Likely altered by agricultural activity.	Feature remains unchanged. No significant changes since 1954.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is linearized with no meandering planform. Likely altered by agricultural activities. No significant changes since 1954.
No Proposed Hydraulics Crossing	Upstream	43.7339 -79.8659	Start point of undefined feature. Culvert outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7357 -79.8750	Confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.7368 -79.8709	Riparian vegetation change. From agricultural to grasses		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7339 -79.8659	Confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_6_WC3	Upstream	43.7339 -79.8659	Confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is surrounded by agricultural fields. No riparian buffer is visible due to image quality.	Low image quality. There appears to be a small riparian buffer adjacent to the feature. No other significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	There is a small riparian buffer along the location of the feature. Grasses are more predominant with scattered trees present. Agricultural lands remain present adjacent to the watercourse.
	Downstream	43.7335 -79.8634	Confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature appears linearized without a meandering planform and with low sinuosity. Likely altered by agricultural activity.	Feature remains unchanged. No significant changes since 1954.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is not clearly visible as the riparian buffer vegetation appear to hide the channel. Planform is not visible.
No Proposed Hydraulics Crossing	Upstream	43.7356 -79.8645	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7335 -79.8634	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_4_WC1	Upstream	43.7404 -79.8658	Start point of undefined feature. Roadside ditch and road crossing confluence.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7380 -79.8546	Riparian vegetation change. From agricultural to scrubland.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_1_WC1	Upstream	43.7444 -79.8687	Riparian vegetation change. From agricultural to woodlot.		**Land Use**	Not Available	Not Available	Low image quality. There appears to be a riparian buffer adjacent to the feature. Agricultural land is present adjacent to the feature.	Low image quality. No significant changes observed to the adjacent land cover.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The riparian vegetation surrounding the feature appears to have increased in size and density. Reforestation has taken place on the south bank of the feature.
	Downstream	43.7472 -79.8542	Confluence point.		**Planform**	Not Available	Not Available	Feature appears linearized without a meandering planform. Likely altered by agricultural activity.	Low image quality. Feature is not visible.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature's planform is not clearly visible due to the dense riparian vegetation. Downstream of Old School Rd. An online pond is now present.
No Proposed Hydraulics Crossing	Upstream	43.7450 -79.8635	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7454 -79.8633	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_1_WC2	Upstream	43.7466 -79.8656	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7459 -79.8621	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.7459 -79.8621	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7459 -79.8597	Change in channel morphology. Feature appears to become more defined downstream of this point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.7483 -79.8663	Start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7459 -79.8621	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_1_WC3	Upstream	43.7506 -79.8652	Riparian vegetation change. From grasses to woodlot.		**Land Use**	Not Available	Not Available	Low image quality. There appears to be a riparian buffer adjacent to the feature. Agricultural land is present adjacent to the feature.	The valley corridor of the feature appear to be vegetated. Beyond the top of valley agricultural land Is the predominant land use.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The riparian vegetation surrounding the feature appears to have increased in size and density. Reforestation has taken place on the north to of bank of the feature.
	Downstream	43.7481 -79.8569	Change in planform. Feature becomes more sinuous and meandering downstream of break.		**Planform**	Not Available	Not Available	Feature is confined within a valley. Only partially visible on imagery due to poor quality.	Feature is not clearly visible due to image quality.	Not Available	Low image quality. No significant changes observed.	Not Available	Low image quality. No significant changes observed.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature's planform is not clearly visible due to the dense riparian vegetation.
EC_EH_ETW_1_WC3	Upstream	43.7523 -79.8613	Apparent start of undefined feature		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is located within an agricultural field.	Not Available	No significant changes since 1999.	Not Available	Not Available	2023 - No significant changes to the adjacent land use/cover.
	Downstream	43.7514 -79.8591	Change in riparian vegetation. From farmland to woodlot.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is undefined and as it flows into a more vegetated area it appears to become more defined.	Not Available	The feature resembles a series of rills within the agricultural field. I appears to become more defined as it flows into the adjacent valley.	Not Available	Not Available	The rills previously observed on 2007 appeared to have coalesced and a more defined feature appears to be forming.
EC_EH_ETW_1_WC5	Upstream	43.7584 -79.8673	Change in riparian vegetation. From scrubland to woodlot.		**Land Use**	Not Available	Not Available	Poor quality imagery. A riparian corridor is present but no greater detail can be discerned.	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The vegetation cover within the valley is predominantly woodlot and grasses. To the east and west of top of valley the land cover is predominantly agricultural.
	Downstream	43.7515	Confluence of tributaries.		**Planform**	Not Available	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The watercourse displays a meandering planform and is confined within a valley.

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.8563						image quality.	image quality.		image quality.		image quality.							
EC_EH_ETW_1_WC6	Upstream	43.7568 -79.8600	Change in riparian vegetation.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7512 -79.8548	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_1_WC7	Upstream	43.7610 -79.8556	Change in riparian vegetation.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7591 -79.8503	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
EC_EH_ETW_1_WC8	Upstream	43.7651 -79.8575	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The vegetation cover within the valley is predominantly woodlot and grasses. To the east and west of top of valley the land cover is predominantly agricultural.
	Downstream	43.7591 -79.8503	Confluence point		**Planform**	Not Available	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The watercourse is confined within a valley. Planform is not visible due to the dense woodlot cover.
EC_EH_ETW_1_WC10	Upstream	43.7654 -79.8486	Change in riparian vegetation. From scrubland to woodlot.		**Land Use**	Not Available	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Poor quality imagery. A corridor is present but no greater detail can be discerned.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The vegetation cover within the valley is predominantly woodlot and grasses. To the east and west of top of valley the land cover is predominantly agricultural.
	Downstream	43.7704 -79.8551	Change in riparian vegetation. From woodlot to scrubland.		**Planform**	Not Available	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Not Available	Poor quality imagery. The feature is within a valley but is planform is not clearly observable due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The watercourse is confined within a valley. Planform is not visible due to the dense woodlot cover.
HU_WH_CAC_0_WC1	Upstream	43.7801 -79.8534	Change in riparian vegetation.		**Land Use**	Not Available	Not Available	The watercourse is predominantly surrounded by agricultural fields. The riparian vegetation buffer is not clearly visible due to image quality.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The vegetation cover within the valley is predominantly grasses and woodlot. To the east and west of top of valley the land cover is predominantly agricultural.
	Downstream	43.7699 -79.8436	Change in planform. Feature become less sinuous.		**Planform**	Not Available	Not Available	Image quality is poor but the feature's planform can be seen meandering within a confined valley.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The watercourse is confined within a valley and the planform remains meandering.
HU_WH_CAC_0_WC2	Upstream	43.7657 -79.8331	Change in planform. Feature becomes less sinuous.		**Land Use**	Not Available	Not Available	The watercourse is predominantly surrounded by agricultural fields. The riparian vegetation buffer is not clearly visible due to image quality.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	The vegetation cover surrounding the watercourse are predominantly grasses and appears to be a wetland. To the north and south of riparian buffer the land cover is predominantly agricultural with some commercial/industrial buildings and a large residential development further south.
	Downstream	43.7687 -79.8145	Change in riparian vegetation. From grasses to woodlot. Change in valley confinement.		**Planform**	Not Available	Not Available	Image quality is poor but the feature's planform appears linearized with low sinuosity	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	The feature's planform is not clearly visible due to dense vegetation
No Proposed Hydraulics Crossing	Upstream	43.7655 -79.8117	Apparent start point of feature.		**Land Use**	Not Available	Not Available	Agricultural fields and small patches of forest.	No change compared to previous.	Not Available	No change compared to previous.	Not Available	No change compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Industrial development to the northeast of feature. Extensive residential development to the east and west.
	Downstream	43.7641 -79.8102	Change in riparian vegetation. From woodlot to agricultural.		**Planform**	Not Available	Not Available	Undefined feature that is not clearly visible. Forest covers feature.	Undefined feature that is not clearly visible. Forest covers feature.	Not Available	Undefined feature that is not clearly visible. Forest covers feature.	Not Available	Undefined feature that is not clearly visible. Forest covers feature.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No change. Feature is not visible due to forest cover.
EC_SC_ETE_1_WC1.1, 1.2, 1.3, 1.4, EC_SC_ETE_1_WC1.5	Upstream	43.7642 -79.8103	Change in riparian vegetation. From woodlot to agricultural.		**Land Use**	Not Available	Not Available	Agricultural fields and small patches of forest.	No change compared to previous.	Not Available	No change compared to previous.	Not Available	No change compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Industrial development to the northeast of feature. Extensive residential development to the east and west.
	Downstream	43.7584 -79.8001	Change in riparian vegetation. From agricultural to woodlot.		**Planform**	Not Available	Not Available	Faint outline of feature is visible (due to poor image quality). Feature flows through agricultural fields and is slightly sinuous. Reach breaks with forested areas.	Feature is more visible compared to previous.	Not Available	No change compared to previous.	Not Available	No change compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Upstream half of reach appears less defined compared to previous. Downstream half has been channelized and crosses a roadway (Speirs Griffen Ave) which was not visible on previous imagery (1988).
No Proposed Hydraulics Crossing	Upstream	43.7641 -79.8102	Change in riparian vegetation. From agricultural to woodlot.		**Land Use**	Not Available	Not Available	Agricultural fields and small patches of forest.	No change compared to previous.	Not Available	No change compared to previous.	Not Available	No change compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Industrial development to the northeast of feature. Extensive residential development to the east and west.
	Downstream	43.7584 -79.8003	Change in planform from sinuous channel to straightened channel		**Planform**	Not Available	Not Available	Forest covers upstream portion of reach. Undefined feature that is not clearly visible.	Forest covers upstream portion of reach. Downstream half of feature is visible in an agricultural field, poor image quality.	Not Available	No change compared to previous.	Not Available	No change compared to previous.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No channel is visible in the upstream forested portion. The downstream half of the reach is still poorly defined but planform changes are unclear due to poor quality of previous imagery.
EC_SC_ETE_1_WC1.6, EC_SC_ETE_1_WC1.7, EC_SC_ETE_1_WC1.8,	Upstream	43.7584 -79.8001	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7510 -79.7913	Change in planform downstream of Highway 410. Meandering nature of feature downstream appears artificially created.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.7777 -79.8413	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7842 -79.8417	Change in planform, and regime. Feature appears to disappear within an agricultural field.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_WH_TWH_1_WC2.3	Upstream	43.7812 -79.8352	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	The land use surrounding the location of the feature is predominantly agricultural.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is surrounded by agricultural fields. A slight riparian buffer present. No significant changes since 1954.
	Downstream	43.7825 -79.8324	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	The feature is not clearly visible on the imagery.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Agricultural drainage feature between actively plowed agricultural fields.

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
No Proposed Hydraulics Crossing	Upstream	43.7825 -79.8324	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Adjacent land use/cover is agricultural. A riparian corridor is present.. A forest patch is present to the south.	No significant changes to the riparian corridor. A tree row is now present on the south bank/side of the riparian corridor.	Not Available	No significant changes since 2012
	Downstream	43.7806 -79.8177	Change in riparian vegetation. From scrubland to grasses.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Poor image quality. A straight planform is visible. The feature appears to regain sinuosity downstream of the Study Area. Within the Study Area, it appears that the feature has been previously straightened.	No significant changes to the feature's planform.	Not Available	No significant changes since 2012
No Proposed Hydraulics Crossing	Upstream	43.7921 -79.8376	Change in adjacent land cover		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.7880 -79.8370	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_WH_TWH_1_WC2.1	Upstream	43.7881 -79.8369	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	The feature is located within an agricultural field. Poor image quality.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature remains within an agricultural field. There is small riparian buffer if herbaceous vegetation along the flow path of the feature.
	Downstream	43.7825 -79.8324	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	The feature is not clearly visible on aerial imagery.	A sinuous corridor is present along the location of the feature. The corridor might be constrained by the adjacent agricultural activities.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant changes visible since 1954. it is inferred that the planform follows a topographic low point.
HU_WH_TWH_1_WC8, HU_WH_TWH_1_WC8.1	Upstream	43.7962 -79.8157	Change in riparian vegetation. From agricultural to scrubland.		**Land Use**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The upstream portion of the reach is surrounded by woodlots. Residential dwellings and agricultural lands are present around the feature.
	Downstream	43.7934 -79.8065	Change in riparian vegetation.		**Planform**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Dense vegetation covers the watercourse and the planform cannot be observed.
HU_WH_TWH_2_WC1	Upstream	43.7988 -79.8019	Pond outlet.		**Land Use**	Not Available	Not Available	The feature is located in between agricultural fields. There appears to be a small riparian buffer but the image quality does not offer greater detail.	No significant changes since 1954.	Not Available	A large online pond is now visible upstream of the upstream reach break of the feature. No other significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The riparian buffer surrounding the feature is well vegetated with areas of dense forest on the lower portion of the reach. Agricultural activities are still present adjacent to the feature. No major changes to land use since 1954.
	Downstream	43.8026 -79.8117	Pond inlet.		**Planform**	Not Available	Not Available	The feature appears linearized in some sections of the reach. The lower portion of the reach appears to be meandering.	No significant changes since 1954.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	There has not been a significant change in the feature's planform since 1954.
HU_WH_SAL_2_1 HU_WH_SAL_2_2	Upstream	43.8034 -79.8038	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8025 -79.7848	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_WH_SAL_3_1; HU_WH_SAL_3_2	Upstream	43.8075 -79.8091	Confluence point.		**Land Use**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is located within a small riparian corridor. The corridor is located within agricultural fields. The riparian vegetation is predominantly grasses and herbaceous.
	Downstream	43.8033 -79.7843	Confluence point.		**Planform**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A linearized feature is present within a small corridor.
HU_WH_SAL_0_7, HU_WH_SAL_0_8, HU_WH_SAL_0_9	Upstream	43.8127 -79.7911	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within agricultural fields. There are a number of buildings adjacent to the east bank of the feature. No other details discernable due to poor image quality.	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A riparian zone is present along the feature corridor. The riparian zone significantly increases in size downstream of Old School Rd. No other significant changes are observed since 194.
	Downstream	43.8033 -79.7843	Confluence point.		**Planform**	Not Available	Not Available	The feature appears defined with a natural meandering planform. No other details discernable due to poor image quality.	A section of the watercourse downstream of Old School Rd. has been linearized.	Not Available	No significant changes visible due to image quality.	Not Available	The feature appears to meander across the agricultural fields. However, a defined channel is not visible.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant changes observed to the feature's planform since 1960. The planform remains linearized.
HU_WH_SAL_4_1, HU_WH_SAL_4_2, HU_WH_SAL_4_3	Upstream	43.8150 -79.8017	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8127 -79.7911	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_WH_SAL_0_1	Upstream	43.8237 -79.8131	Change in riparian vegetation. From scrubland to grasses.		**Land Use**	Not Available	Not Available	The feature is surrounded by agricultural fields and it appears to have a sizeable riparian buffer	No significant changes since 1954.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is surrounded by a sizeable riparian corridor. Further away from the feature land use is agricultural with sparse residential buildings and roads.
	Downstream	43.8165 -79.7926	Confluence point.		**Planform**	Not Available	Not Available	The feature is defined and appears linearized for the entirety of the selected reach length. Upstream and downstream of the reach breaks the feature displays a meandering planform.	No significant changes since 1954.	Not Available	No significant changes visible due to image quality.	Not Available	The feature appears to meander across the agricultural fields. However, a defined channel is not visible.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature has regained a meandering planform and the watercourse appears to have defined banks. No other significant changes are observed since 1954.
HU_WH_SAL_0_5, HU_WH_SAL_0_6, HU_WH_SAL_0_2, HU_WH_SAL_0_3	Upstream	43.8155 -79.7911	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within agricultural fields. No other details discernable due to poor image quality.	There appears to be several new structures to the east and west of the feature. No other details discernable due to poor image quality.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	There are number of agricultural and residential buildings now present adjacent to the feature. The predominant land use remains agricultural. There is a riparian buffer present that increased in size in the lower portion of the reach and its vegetation is predominantly herbaceous with a section in the upper portion of the reach that is dominated by larger trees.
	Downstream	43.8127	Confluence point.		**Planform**	Not Available	Not Available	The feature appears defined with a natural meandering planform	No significant changes since 1954	Not Available	No significant changes visible due to image quality	Not Available	The feature appears to meander across the agricultural fields	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No major changes to channel planform

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1959	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.7911						No other details discernable due to poor image quality.												
No Proposed Hydraulics Crossing	Upstream	43.8198	Change in riparian vegetation and land cover.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7932																		
	Downstream	43.8165	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7926																		
HU_WH_WHT_1_1_1 HU_WH_WHT_1_1_2	Upstream	43.8187	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7950																		
	Downstream	43.8188	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7812																		
No Proposed Hydraulics Crossing	Upstream	43.8198	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7841																		
	Downstream	43.8188	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7812																		
HU_WH_WHT_1_2_1 HU_WH_WHT_1_2_2	Upstream	43.8202	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7831																		
	Downstream	43.8195	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7794																		
HU_WH_WHT_1_3_1 HU_WH_WHF_1_3_2	Upstream	43.8221	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7819																		
	Downstream	43.8195	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7794																		
HU_WH_WHT_1_4_1 HU_WH_WHT_1_4_2 HU_WH_WHF_1_4_3	Upstream	43.8274	Pont outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7725																		
	Downstream	43.8222	Change in riparian vegetation. From grasses to woodlot.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7643																		
HU_WH_WHT_1_5_1 HU_WH_WHF_1_5_2	Upstream	43.8254	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7558																		
	Downstream	43.8239	Confluence of undefined features		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7552																		
No Proposed Hydraulics Crossing	Upstream	43.8366	Confluence point		**Land Use**	Not Available	Not Available	The feature is located within a valley system. Riparian cover appears to be minimal. Above the valley the predominant land use is agricultural.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is surrounded by forested land with a few residential properties present. The feature also crosses under a road.
		-79.7635																		
	Downstream	43.8362	Road crossing		**Planform**	Not Available	Not Available	The feature is defined and located within a valley with a natural meandering planform.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature has a meandering nature with riparian cover.
		-79.7498																		
HU_WH_WHF_3_1_1	Upstream	43.8202	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7547																		
	Downstream	43.8315	Pond inlet.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7423																		
No Proposed Hydraulics Crossing	Upstream	43.8230	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Agricultural fields. West Humber River is located approximately 500m northeast.	No change compared to previous	Not Available	Not Available	Not Available	No significant changes compared to previous	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Residential / greenhouse built over the feature and the feature it is no longer visible.
		-79.7432																		
	Downstream	43.8220	Feature ends at pond.		**Planform**	Not Available	Not Available	Undefined feature that is not clearly visible due to poor image quality. A patch of wetter soil that appears to be a topographic depression is visible on imagery.	Feature is more visible due to improved image quality. Feature flows through an agricultural field and appears straightened.	Not Available	Not Available	Not Available	No significant changes visible (poor to image quality).	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is no longer visible. A pond now exists at the previous downstream reach break.
		-79.7431																		
No Proposed Hydraulics Crossing	Upstream	43.8213	Start point of feature at pond outlet.		**Land Use**	Not Available	Not Available	Agricultural fields. West Humber River is located approximately 500m northeast.	No change compared to previous	Not Available	Not Available	Not Available	No significant changes compared to previous	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A pond is located at the upstream reach break.
		-79.7430																		
	Downstream	43.8259	Change in planform. channel more sinuous downstream		**Planform**	Not Available	Not Available	Undefined feature that is not clearly visible due to poor image quality. A slight topographic depression is visible on imagery.	Feature is more visible due to improved image quality. Flows has been straightened. Flows along the edge of agricultural fields.	Not Available	Not Available	Not Available	No significant changes visible (poor to image quality).	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant change in planform. Riparian buffer is more established.
		-79.7268																		
No Proposed Hydraulics Crossing	Upstream	43.8373	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7550																		
	Downstream	43.8361	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7499																		
HU_WH_WHR_0_1	Upstream	43.8361	Change in riparian vegetation. Woodlot to scrubland.		**Land Use**	Not Available	Not Available	The feature is located within a valley system. Riparian cover appears to be minimal. Above the valley the predominant land use is agricultural.	No significant changes since 1954.	Not Available	No significant changes visible due to image quality.	Not Available	It appears that the riparian cover surrounding the feature has increased in density. No other changes visible due to poor image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature's riparian zone within the valley has increased in density with more trees and other vegetation visible. The areas beyond the valley remain as agricultural.
		-79.7499																		
	Downstream	43.8378	Confluence point.		**Planform**	Not Available	Not Available	The feature is defined and located within a valley with a natural meandering planform.	No significant changes since 1954.	Not Available	No significant changes visible due to image quality.	Not Available	At least to meander located approximately 300 m downstream of The Gore Rd. have been cut off. In the same area one the meander has increased its radius of curvature and is expanding towards the south valley wall. No other significant changes to the plan form were detected.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A small crossing over the feature is present closer to the downstream reach break. No major changes to the planform observed since 1988.
		-79.7443																		
No Proposed Hydraulics Crossing	Upstream	43.8392	Apparent start of feature in the field		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7488																		
	Downstream	43.8377	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.7446																		
HU_WH_WHR_0_2 HU_WH_WHR_0_3 HU_WH_WHR_0_4	Upstream	43.8378	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within a valley system. Riparian cover appears to be minimal. Above the	No significant changes since 1954.	Not Available	No significant changes visible due to image quality.	Not Available	It appears that the riparian cover surrounding the feature has increased in density. No other	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature's riparian zone within the valley has increased in density with more trees and other vegetation visible. The areas

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.7443						valley the predominant land use is agricultural.					changes visible due to poor image quality.							beyond the valley remain as agricultural.
	Downstream	43.8321 -79.7339	Change in riparian vegetation. Scrubland to woodlot.		**Planform**	Not Available	Not Available	The feature is defined and located within a valley with a natural meandering planform.	A meander located approximately 800 m downstream of The Gore Rd. appears to have been cut off at the neck.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A small crossing over the feature is present closer to the upstream reach break. No major changes to the planform observed since 1960.
No Proposed Hydraulics Crossing	Upstream	43.8365 -79.7331	Feature becomes visible southeast of a tree line.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8353 -79.7279	Confluence with larger fluvial feature.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8341 -79.7318	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8329 -79.7281	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8384 -79.7306	Confluence point		**Land Use**	Not Available	Not Available	Feature is within agricultural land with a residential property to the east.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant changes visible since 2012.
	Downstream	43.83518 -79.7278	Apparent confluence point.		**Planform**	Not Available	Not Available	Feature appears to be defined but the imagery is poor quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is defined with riparian vegetation and some trees. The feature seems to be linearized due to agricultural use.
No Proposed Hydraulics Crossing	Upstream	43.8336 -79.7322	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8329 -79.7281	Apparent confluence point of undefined features.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_WH_GRT_0_1, HU_WH_GRT_0_2, HU_WH_GRT_0_3	Upstream	43.8352 -79.7279	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within agricultural field with no visible riparian zone.	The feature remains located between agricultural fields. There appears to be a small riparian zone forming along the reach.	Not Available	No significant changes visible due to image quality.	Not Available	It appears that the riparian cover surrounding the feature has increased in density. No other changes visible due to poor image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	A small but dense riparian zone has formed along the banks of the feature. The riparian zone is wider in the lower portion of the reach. Agricultural activities remain present in the area surrounding the feature.
	Downstream	43.8321 -79.7256	Confluence point.		**Planform**	Not Available	Not Available	The feature is defined and appears artificially linearized and with no sinuosity.	The feature remains linearized with no changes since 1654.	Not Available	No significant changes visible due to image quality.	Not Available	No significant changes visible due to image quality.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature's planform is not visible due to the dense riparian vegetation.
No Proposed Hydraulics Crossing	Upstream	43.8329 -79.7281	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8321 -79.7256	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_WH_CDT_2_1, HU_WH_CDT_2_2, HU_WH_CDT_2_3	Upstream	43.8399 -79.7251	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8331 -79.7150	Change in planform. From meandering to straight.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8332 -79.7185	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Agricultural fields.	No significant changes since 1954.	Not Available	No significant changes visible (poor image quality)	Not Available	New agricultural fields and residential buildings compared to 1976.	Not Available	New industrial lot (truck parking)	Not Available	No significant changes when compared to previous.	Not Available	Not Available	Industrial development further to the east.
	Downstream	43.8325 -79.7148	Confluence point		**Planform**	Not Available	Not Available	No visible Feature.	No significant changes since 1954.	Not Available	No significant changes visible (poor image quality)	Not Available	No significant changes visible (poor image quality)	Not Available	Part of the feature is now visible as a drainage ditch between two agricultural fields.	Not Available	Feature is not clearly visible. It appears to be piped under a truck parking lot. water is ponded at the inlet and outlet of pipe.	Not Available	Not Available	No significant changes when compared to previous.
No Proposed Hydraulics Crossing	Upstream	43.8325 -79.7148	Confluence point		**Land Use**	Not Available	Not Available	Agricultural fields. Reach crosses Mayfield Rd.	No significant changes since 1954.	Not Available	No significant changes visible (poor image quality)	Not Available	New agricultural fields and residential buildings compared to 1976.	Not Available	No significant changes visible (poor image quality)	Not Available	No significant changes when compared to previous.	Not Available	Not Available	Construction on the east side of Mayfield road.
	Downstream	43.8320 -79.7125	Confluence point		**Planform**	Not Available	Not Available	Feature appears straightened. Poorly defined upstream of road crossing and well defined downstream of crossing.	No significant changes since 1954.	Not Available	No significant changes visible (poor image quality)	Not Available	No significant changes visible (poor image quality)	Not Available	No significant changes visible (poor image quality)	Not Available	No significant changes when compared to previous.	Not Available	Not Available	Channel appears disconnected due to construction activities. Previous crossing under Mayfield Rd is no longer visible.
No Proposed Hydraulics Crossing	Upstream	43.8435 -79.7218	Artificial reach break based on reach length		**Land Use**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	Agricultural land is present adjacent to the feature. There is a riparian buffer present along the watercourse corridor.	Agricultural land is present adjacent to the feature. There is a riparian buffer present along the watercourse corridor.	Not Available	West of the watercourse a gravel road and an open field striped of vegetation are now present. Further west a new building with a gravel parking lot is also present. Agricultural activities and residential properties are present in the vicinity of the feature	There are no significant changes to the riparian vegetation zone. There is a backwater effect caused by what appears to be beaver dams in the vicinity of a pond located to the east of the watercourse	Not Available	A residential building located upstream of Mayfield Rd. on the west bank of the feature has increased its footprint. A large number of trees have been planted around the perimeter of the residential property. Further upstream a gravel access road has been further developed and a concrete culvert has been built within the feature. A wetland type area has developed on the feature's corridor on the upper portion of the reach.
	Downstream	43.8360 -79.7141	Confluence point.		**Planform**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	The feature is only slightly visible upstream of Mayfield Road. At any other locations on the reach the aerial imagery does not display a defined watercourse.	The watercourse appears more defined and is slightly meandering along is corridor. Three meander scars are visible adjacent to the north valley wall/slope of the feature. Further downstream of Mayfield the feature has a more defined and meandering planform	Not Available	The meander scars are still visible on the north slope of the valley corridor. The watercourse appears to be have regained a more meandering planform	The watercourse remains with a meandering planform. Backwatering is taking place are a result of obstructions caused by what appears to be beaver dams in the upstream portion of the reach.	Not Available	The backwatering effect is no longer visible but it could be the result of seasonal flows. The obstructions observed upstream of the gravel access road (possible beaver dams) in 2011 are no longer present/visible. The watercourse remains with a meandering planform in the upper portion of the reach but appears linearized upstream of Mayfield Rd. in the section where the corridor has been narrowed by adjacent development. Constructions activities are present immediately adjacent to the east and west banks of the watercourse downstream of Mayfield Rd.
HU_WH_CDT_0_1, HU_WH_CDT_0_2	Upstream	43.8360	Confluence point.		**Land Use**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	Agricultural land is present adjacent to the feature. There is a riparian buffer present along the	Agricultural land is present adjacent to the feature. There is a riparian buffer present along the	Not Available	West of the watercourse a gravel road and an open field striped of vegetation are now present.	There are no significant changes to the riparian vegetation zone. There is a backwater effect	Not Available	A residential building located upstream of Mayfield Rd. on the west bank of the feature has increased its footprint. A large number

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.7141												watercourse corridor.	watercourse corridor.		Further west a new building with a gravel parking lot is also present. Agricultural activities and residential properties are present in the vicinity of the feature	caused by what appears to be beaver dams in the vicinity of a pond located to the east of the watercourse		of trees have been planted around the perimeter of the residential property. Further upstream a gravel access road has been further developed and a concrete culvert has been built within the feature. A wetland type area has developed on the feature's corridor on the upper portion of the reach.
	Downstream	43.8320 -79.7126	Change in riparian vegetation.		**Planform**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	Poor quality imagery	Not Available	Poor quality imagery	The feature is only slightly visible upstream of Mayfield Road. At any other locations on the reach the aerial imagery does not display a defined watercourse.	The watercourse appears more defined and is slightly meandering along is corridor. Three meander scars are visible adjacent to the north valley wall/slope of the feature. Further downstream of Mayfield the feature has a more defined and meandering planform	Not Available	The meander scars are still visible on the north slope of the valley corridor. The watercourse appears to be have regained a more meandering planform	The watercourse remains with a meandering planform. Backwatering is taking place are a result of downstream obstructions caused by what appears to be beaver dams. Upstream of Mayfield Rd. the watercourse corridor has been narrowed by development.	Not Available	The backwatering effect is no longer visible but it could be the result of seasonal flows. The obstructions observed upstream of the gravel access road (possible beaver dams) in 2011 are no longer present/visible. The watercourse remains with a meandering planform in the upper portion of the reach but appears linearized upstream of Mayfield Rd. in the section where the corridor has been narrowed by adjacent development. Constructions activities are present immediately adjacent to the east and west banks of the watercourse downstream of Mayfield Rd.
HU_MH_RAI_1_1_1	Upstream	43.8376 -79.7070	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8367 -79.7021	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_MH_RAI_1_2_1, HU_MH_RAI_1_2_2	Upstream	43.8390 -79.7052	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8367 -79.7021	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_MH_RAI_1_3_1, HU_MH_RAI_1_3_2	Upstream	43.8357 -79.7004	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is surrounded by agricultural activity without any riparian a buffer.	Feature is surrounded by agricultural activity without any riparian a buffer.	Not Available	Feature is surrounded by agricultural activity without any riparian a buffer.	Agricultural activities are still present but a small riparian buffer has been allowed to grow along the feature.	Not Available	Feature is surrounded by agricultural lands. The riparian buffer has increased in size since 2012.
	Downstream	43.8399 -79.7025	Confluence point.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is slightly defined and linearized. It appears that the feature it's plowed/tilled over.	The feature is slightly defined and linearized. It appears that the feature it's plowed/tilled over.	Not Available	The feature is more defined upstream and is linearized. It appears that the feature has been plowed/tilled over in the downstream portion of the reach and it is barely visible on aerial imagery.	The feature is no longer plowed/tilled over. A defined watercourse is not visible within the corridor.	Not Available	A small defined feature appear to be forming within the riparian corridor. The feature's corridor is linear with little to no sinuosity.
No Proposed Hydraulics Crossing	Upstream	43.8388 -79.6960	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8363 -79.6900	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8404 -79.6941	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8398 -79.6893	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_MH_ROB_3_3_1	Upstream	43.8398 -79.6893	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8414 -79.6975	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_MH_ROB_3_4_1, HU_MH_ROB_3_4_2	Upstream	43.8425 -79.6944	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8414 -79.6905	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_MH_ROB_3_1	Upstream	43.8457 -79.6979	Start point of feature. Discharge point of upstream SW pond.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8414 -79.6905	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8414 -79.6905	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8338 -79.6827	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8357 -79.6896	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8339 -79.6828	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8339 -79.6828	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within an agricultural field. Poor image quality.	No visible changes since 1954	Not Available	No significant changes to the land use of cover since 1954	Not Available	Sparse tree have appeared along the vegetated corridor of the feature. No changes to the adjacent land use or cover.	No significant changes since 1988	No significant changes since 1995	Not Available	Riparian vegetation within the feature's corridor in the lower portion of the reach has increased. A large yard has appeared on the upper west portion of the reach.	No significant changes since 2007	Not Available	A second large yard appeared on the upper west portion of the reach.
	Downstream	43.8296 -79.6776	Change in valley confinement and riparian vegetation cover.		**Planform**	Not Available	Not Available	The feature's planform is not clearly visible but it appears to have been straightened by agricultural activities.	No visible changes since 1954	Not Available	The planform has become slightly more visible but it is still somewhat straight.	Not Available	The lower portion of the reach appear to be regaining sinuosity. The upper portion remains unchanged (straight)	No significant changes since 1988	No significant changes since 1995	Not Available	An online pond is now present in the middle of the delineated reach.	No significant changes since 2007	Not Available	Activities from the new yards have slightly displaced/relocated the channel in the upper portion of the reach.
No Proposed Hydraulics Crossing	Upstream	43.8296 -79.6776	Change in valley confinement and riparian vegetation cover.		**Land Use**	Not Available	Not Available	Low vegetation cover within the valley. Agricultural land uses beyond the top of valley walls.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	Vegetation cover within the valley has increased. No significant changes to the adjacent land use/cover	Vegetation cover within the valley has increased since 1988.. No significant changes to the adjacent land use/cover	No significant changes since 1995	Not Available	There has been valley infilling on the lower east portion of the reach.	A large yard has displaced the agricultural activities formerly present on the west side of the reach. More valley infilling has taken place.	Not Available	No significant changes since 2012
	Downstream	43.8270 -79.6736	Confluence point.		**Planform**	Not Available	Not Available	Planform not clearly visible. Poor image quality.	No visible changes since 1954	Not Available	No visible changes since 1960	Not Available	The feature's planform appears to be increasing in sinuosity.	No significant changes to the feature's planform.	No significant changes since 1995	Not Available	A culvert is now present in the area where the valley infilling has taken place.	No other changes to the planform.	Not Available	No significant changes since 2012
HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6,	Upstream	43.8411 -79.6853	Confluence of undefined features.		**Land Use**	Not Available	Not Available	Low riparian cover along the reach. Agricultural land immediately adjacent to the watercourse.	Image resolution is too poor to observe any changes	Not Available	Image resolution is too poor to observe any changes	Not Available	Image resolution is too poor to observe any changes	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	No significant riparian zone present along the reach. Agricultural land immediately adjacent to the reach.
	Downstream	43.8336	Confluence point.		**Planform**	Not Available	Not Available	Feature appears linearized and it is likely constrained by the	Image resolution is too poor to observe any significant changes	Not Available	Image resolution is too poor to observe any significant changes	Not Available	Image resolution is too poor to observe any significant changes	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Feature is slightly sinuous and is likely constrained by the adjacent agricultural

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1969	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.6768						adjacent agricultural activities.					Watercourse appears to be linearized within agricultural fields.							activities
No Proposed Hydraulics Crossing	Upstream	43.8270 -79.6736	Confluence point.		**Land Use**	Not Available	Not Available	The feature's riparian cover is dominated by a small forest. Agricultural land uses present beyond the top of valley.	Not Available	Not Available	No significant changes since 1954.	Not Available	No significant changes since 1976.	Significant increase in vegetation density within the valley.	No significant changes since 1995	Not Available	No significant changes since 1999.	No significant changes since 2007.	Not Available	No significant changes since 2012.
	Downstream	43.8256 -79.6693	Confluence point.		**Planform**	Not Available	Not Available	The planform is not clearly visible	Not Available	Not Available	The features' planform appears to be meandering within a large valley.	Not Available	No significant changes since 1976.	Planform is not visible due to vegetation cover.	No significant changes since 1995	Not Available	No significant changes since 1999.	No significant changes since 2007.	Not Available	No significant changes since 2012.
HU_MH_RCB_0_6	Upstream	43.8235 -79.6768	Confluence point.		**Land Use**	Not Available	Not Available	Low riparian cover within valley. Agricultural land adjacent to top of valley.	Image resolution is too poor to observe any changes	Not Available	1978: The watercourse is located within a valley. Vegetation cover appears minimal. Agricultural activities are present beyond the top of valley.	Not Available	Agricultural activities appear to have encroached in to the watercourse riparian zone in the upper portion of the reach. No other significant changes to land use or cover were observed.	A large portion to the east of the valley has been infilled by adjacent agricultural activities.	No significant changes to the riparian zone of reach since 1995.	Not Available	Riparian vegetation has increased since 1999. No other significant changes since 1999.	No significant changes since 2007.	Not Available	Riparian vegetation within the feature corridor is dense with primarily trees.
	Downstream	43.8270 -79.6736	Confluence point.		**Planform**	Not Available	Not Available	Meandering planform visible within a confined valley.	Image resolution is too poor to observe any significant changes	Not Available	The watercourse is defined and sinuous.	Not Available	No significant changes to planform detected.	A compound meander bend that was present downstream of the area that was infilled has been cut off. Its upstream break is now disconnected from the large HU_MH_RCB_0_2 reach and take the form of a short tributary. The upstream portion now connects downstream of the compound meander (shortening the length of the watercourse).	No significant changes since 1995.	Not Available	No significant changes since 1999.	No significant changes since 2007.	Not Available	No observable changes to watercourse planform. The watercourse corridor in the upper portion of the reach is constrained/encroached by agricultural field on both banks.
	Upstream	43.8319 -79.6752	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	1978: The watercourse is located within a valley. Vegetation cover appears minimal. Agricultural activities are present beyond the top of valley.	Not Available	No significant changes since 1978.	A large portion to the east of the valley has been infilled by adjacent agricultural activities.	No significant changes to the riparian zone of reach since 1995.	Not Available	Riparian vegetation has increased since 1999. No other significant changes since 1999.	No significant changes since 2007.	Not Available	Riparian vegetation has continued to increase. No significant changes since 2012.
	Downstream	43.8313 -79.6759	Confluence point.		**Planform**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	The feature is part of the larger HU_MH_RCB_0_2 reach. The watercourse is defined and sinuous.	Not Available	No significant changes since 1978.	A compound meander bend that was present downstream of the area that was infilled has been cut off. Its upstream break is now disconnected from the large HU_MH_RCB_0_2 reach and take the form of a short tributary. The upstream portion now connects downstream of the compound meander (shortening the length of the watercourse).	No significant changes since 1995.	Not Available	No significant changes since 1999.	No significant changes since 2007.	Not Available	No significant changes since 2012.
HU_MH_RCB_0_1, HU_MH_RCB_0_2	Upstream	43.8307 -79.6712	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8256 -79.6693	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8232 -79.6654	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8234 -79.6552	Pond inlet.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_MH_RCB_0_1, HU_MH_RCB_0_2, HU_MH_RCB_0_4	Upstream	43.8477 -79.6928	Change in riparian vegetation. From wooded to grasses/scrubland.		**Land Use**	Not Available	Not Available	No riparian vegetation present. Agricultural land adjacent to the reach.	Image resolution is too poor to observe any changes	Not Available	Image resolution is too poor to observe any changes	Not Available	Image resolution is too poor to observe any changes	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Riparian corridor is constrained by the adjacent agricultural land. Vegetation cover appear to be primarily grasses and shrubs. Not a high density of large mature trees.
	Downstream	43.8425 -79.6787	Confluence point.		**Planform**	Not Available	Not Available	Planform appear linearized.	Image resolution is too poor to observe any significant changes	Not Available	Image resolution is too poor to observe any significant changes	Not Available	Image resolution is too poor to observe any significant changes	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Watercourse is meandering and regaining sinuosity within its corridor. No other significant changes were observed since 1954.
No Proposed Hydraulics Crossing	Upstream	43.8475 -79.6774	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within a valley and appears to lack significant riparian cover. Agricultural land use/cover adjacent to the feature.	No significant changes since 1954	Not Available	No significant changes to the surrounding land use/cover since 1954	Not Available	A hydro corridor running north to south in now present in the vicinity of the reach.	A tree row is also now present on the east side of the feature on the upper portion of the reach. It appears that the feature's riparian zone has significantly increased as some of the adjacent agricultural activities have moved away from the feature's valley. No other significant changes since 1988	No significant changes since 1995.	Not Available	No significant changes since 1999.	No significant changes since 2007	Not Available	The riparian buffer has increased in density. The pond south of Nashville Road. No other significant changes to the land used beyond the top of valley.
	Downstream	43.8364 -79.6730	Confluence point.		**Planform**	Not Available	Not Available	Upstream (north) of Nashville road the feature appears to have been previously straightened. The downstream portion of the reach appears to be meandering. A pond on the west bank is present immediately downstream of Nashville Road.	No significant changes since 1954	Not Available	The feature's planform appears to be increasing in sinuosity since 1954.	Not Available	No significant changes since 1976.	No significant changes to the planform since 1988	No significant changes since 1995.	Not Available	No significant changes since 1999.	No significant changes since 2007	Not Available	The feature continues to increase in sinuosity. No other significant changes observed.
No Proposed Hydraulics Crossing	Upstream	43.8384 -79.6750	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within an agricultural field with a small riparian buffer. A few mature trees are present on the east bank.	The mature trees visible on the 1954 imagery are no longer present. No other visible changes to the surrounding land use/cover	Not Available	No significant changes to the surrounding land use/cover since 1954	Not Available	A hydro corridor running north to south in now present in the vicinity of the reach. No other significant changes since 1976.	Trees are now visible along the feature's riparian buffer. No other significant changes 1988.	No significant changes since 1995.	Not Available	No significant changes since 1999.	No significant changes since 2007	Not Available	The riparian buffer has increased in density. No other significant changes to the land used beyond the top of valley.
	Downstream	43.8372 -79.6744	Confluence point.		**Planform**	Not Available	Not Available	The feature's planform in predominantly straight.	No significant changes since 1954	Not Available	The feature's planform appears to be increasing in sinuosity since 1960.	Not Available	No significant changes since 1976.	No significant changes to the planform since 1988	No significant changes since 1995.	Not Available	The feature appears to be regaining sinuosity. No other significant changes since 1999.	It appears that a second channel adjacent to the west valley wall is now present. The channel appears artificial.	Not Available	The artificial channel to the west appear to be have become the main channel , however both the original and new channels low definition close to the downstream reach break.
No Proposed Hydraulics Crossing	Upstream	43.8372 -79.6744	Confluence point.		**Land Use**	Not Available	Not Available	The feature is located within an agricultural field with a small riparian buffer. A few mature trees are present on the east bank.	No significant changes since 1954	Not Available	No significant changes observed.	Not Available	A hydro corridor running north to south in now present in the vicinity of the reach. No other significant changes since 1976.	Vegetation density appears to have increased.	No significant changes since 1995.	Not Available	No significant changes since 1999.	No significant changes since 2007	Not Available	The vegetation within the valley has increased in density.
	Downstream	43.8270	Confluence point.		**Planform**	Not Available	Not Available	The reach is a meandering	No significant changes since	Not Available	No significant changes observed.	Not Available	The upper portion of the reach	The planform is not clearly visible	No significant changes since	Not Available	There seems to be significant	A portion the reach in the	Not Available	The artificial channel to the west of the

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1959	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.6736											It also appears that a new smaller cut off channel is now present on the west side of the valley. No significant changes since 1976.	vegetation.						channel appear to be regaining flow and becoming defined again.
No Proposed Hydraulics Crossing	Upstream	43.8424	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6678																		
	Downstream	43.8372	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6744																		
No Proposed Hydraulics Crossing	Upstream	43.8598	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6664																		
	Downstream	43.8442	Change in riparian vegetation		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6716																		
No Proposed Hydraulics Crossing	Upstream	43.8441	Change in riparian vegetation		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6719																		
	Downstream	43.8384	Confluence point		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6750																		
HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_3, HU_MH_ROB_7_1_3, HU_MH_ROB_7_1_4,	Upstream	43.8448	Confluence point.		**Land Use**	Not Available	Not Available	Low riparian cover along the reach. Agricultural land immediately adjacent to the watercourse.	Image resolution is too poor to observe any changes	Not Available	Image resolution is too poor to observe any changes	Not Available	Image resolution is too poor to observe any changes.	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Riparian corridor is constrained by the adjacent agricultural land. Vegetation cover appear to be primarily grasses and shrubs. Not a high density of large mature trees.
		-79.6788																		
	Downstream	43.8490	Confluence point.		**Planform**	Not Available	Not Available	Watercourse appears linearized and it is likely constrained by the adjacent agricultural activities.	Image resolution is too poor to observe any significant changes	Not Available	Image resolution is too poor to observe any significant changes	Not Available	Image resolution is too poor to observe any significant changes	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Watercourse appears to have regained sinuosity within its corridor. No other observable changes since 1954.
		-79.6848																		
HU_MH_ROB_7_2_1, HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_3, HU_MH_ROB_7_2_4	Upstream	43.8475	Change in riparian zone. Agricultural to scrubland.		**Land Use**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	1976 - The feature is surrounded by agricultural land. There is a riparian zone present that appears to be dominated by shorth vegetation. Very few trees present	Not Available	No significant changes since 1976. Riparian vegetation has increased in density.	Significant increase in vegetation cover within the riparian zone.	No significant changes since 1995.	Not Available	No significant changes since 1999.	Feature's floodplain has been subject to earth works. It appears that infilling took place along the features floodplain. Silt fences are present along the watercourse and large vegetation has been stripped.	Not Available	Vegetation in the upper portion of the reach has partially recovered.
		-79.6774																		
	Downstream	43.8449	Confluence point.		**Planform**	Not Available	Not Available	Poor quality imagery	Poor quality imagery	Not Available	1978 - The watercourse displays a meandering planform and is fed by two upstream tributaries flowing from large agricultural fields.	Not Available	No significant changes since 1976.	No visible changes to the watercourse planform. Feature obscured by vegetation density.	No significant changes since 1995.	Not Available	No significant changes since 1999.	The feature's planform has been altered by the earth works that took place on the riparian zone and floodplain on the upper portion of the reach. Banks are no longer clearly defined.	Not Available	The watercourse planform is now linear with no its upper half. The lower section of the reach remains with some sinuosity.
		-79.6788																		
No Proposed Hydraulics Crossing	Upstream	43.8466	Confluence point of undefined feature/intermittent features.		**Land Use**	Not Available	Not Available	Watercourse is defined and mostly linear. Riparian zone not present. Feature is surrounded by agricultural land with forest cover to the north.	No major changes visible since 1954.	Not Available	1978 - No major changes visible since 1960.	Not Available	Forest cover to the north is reduced.	Hydro corridor constructed over feature.	No major changes visible since 1995.	Not Available	Forest cover reduced to the north.	No significant changes since 2007.	Not Available	2017-2023 - Major construction to the east of the feature for pipeline installation. Forest cover reduced.
		-79.6785																		
	Downstream	43.8475	Confluence point.		**Planform**	Not Available	Not Available	Planform is not clearly visible.	No major changes visible since 1954.	Not Available	1978 - No major changes visible since 1960.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	Pooling of water within the forest cover to the north of the feature.	Not Available	Pooling to the north expanded. No other major changes visible since 1999.	No significant changes since 2007.	Not Available	2017-2023 -Pooling absent. No other major changes visible since 2007.
		-79.6774																		
No Proposed Hydraulics Crossing	Upstream	43.8459	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is within agricultural fields and flows into a woodlot.	No major changes visible since 1954.	Not Available	Not Available	Not Available	No major changes since 1978.	No major changes since 1988.	No major changes since 1995.	Not Available	No major changes since 1999.	No significant changes since 2007.	Not Available	No major changes since 2012.
		-79.6736																		
	Downstream	43.8475	Change in riparian zone. Agricultural to scrubland.		**Planform**	Not Available	Not Available	Feature is not visible due to poor image quality.	No major changes visible since 1954.	Not Available	Not Available	Not Available	Agricultural scale within actively plowed agricultural lands.	No major changes since 1988.	No major changes since 1995.	Not Available	No major changes since 1999.	No significant changes since 2007.	Not Available	No major changes since 2012.
		-79.6774																		
No Proposed Hydraulics Crossing	Upstream	43.8498	Apparent start of feature in the field		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6808																		
	Downstream	43.8486	Confluence with undefined feature.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6795																		
No Proposed Hydraulics Crossing	Upstream	43.8486	Confluence with undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6795																		
	Downstream	43.8476	Confluence with undefined feature.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6779																		
No Proposed Hydraulics Crossing	Upstream	43.8506	Apparent start of feature in the field		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6777																		
	Downstream	43.8486	Confluence with undefined feature.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6795																		
HU_MH_MHR_0_1, HU_MH_MHR_0_2	Upstream	43.8598	Confluence point.		**Land Use**	Not Available	Not Available	Poor image resolution. Within the valley, vegetation cover appear low (low density of woodlots). On top of the alley agricultural land in present	No major changes visible since 1954.	Not Available	1978 - Agricultural fields are present within the valley. Minimal riparian cover present.	Not Available	No major changes since 1978.	Small increase in vegetation in the mid and lower portion of the reach.	No major changes since 1995.	Not Available	No major changes since 1999.	The agricultural field within the valley have been abandoned and forestation has taken place.	Not Available	Vegetation cover within the valley has significantly increase in density. Evidence of reforestation within and on top of the valley
		-79.6677																		
	Downstream	43.8560	Confluence point.		**Planform**	Not Available	Not Available	Naturally meandering planform. Watercourse is confined within a large valley.	No major changes visible since 1954.	Not Available	Feature displays natural meandering planform.	Not Available	No major changes since 1978.	No significant changes to the planform.	No major changes since 1995.	Not Available	No major changes since 1999.	No major changes to the planform since 2007.	Not Available	No observable changes to the watercourse planform.
		-79.6524																		
HU_MH_MHR_0_1, HU_MH_MHR_0_2	Upstream	43.8598	Confluence point.		**Land Use**	Not Available	Not Available	Poor image resolution. Within the valley, vegetation cover appear low (low density of woodlots). On top of the alley agricultural land in present	No major changes visible since 1954.	Not Available	1978 - Agricultural fields are present within the valley. Minimal riparian cover present to the west with a forest to the east.	Not Available	No major changes since 1978.	No major changes since 1988.	No major changes since 1995.	Not Available	No major changes since 1999.	The agricultural field within the valley have been abandoned and forestation has taken place.	Not Available	Vegetation cover within the valley has significantly increase in density. Evidence of reforestation within and on top of the valley
		-79.6677																		
	Downstream	43.8560	Confluence point.		**Planform**	Not Available	Not Available	Naturally meandering planform. Watercourse is confined within a large valley.	No major changes visible since 1954.	Not Available	Feature displays natural meandering planform.	Not Available	No major changes since 1978.	No major changes since 1988.	No major changes since 1995.	Not Available	No major changes since 1999.	No major changes to the planform since 2007.	Not Available	No observable changes to the watercourse planform.
		-79.6524																		
HU_MH_HRT_3_1	Upstream	43.8671	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6581																		
	Downstream	43.8629	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6505																		
No Proposed Hydraulics Crossing	Upstream	43.8640	Change in valley confinement.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6457																		
	Downstream	43.8671	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
		-79.6581																		

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
No Proposed Hydraulics Crossing	Upstream	43.8689 -79.6567	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8671 -79.6581	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8707 -79.6578	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8671 -79.6581	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8743 -79.6521	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8726 -79.6500	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8752 -79.6500	Change in riparian vegetation. Grasses to scrubland.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8726 -79.6500	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	Upstream	43.8726 -79.6500	Confluence point.		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. A small riparian zone is present in the downstream portion of the reach. Agricultural land is present adjacent to the upstream portion of the reach.	No major changes visible since 1954.	Not Available	1978 - Feature is located within a valley. Vegetation is present within the valley. To the west of the valley, agricultural activities are present.	Not Available	The valley vegetation density has increased. No other significant changes visible.	Image resolution is too poor to observe any changes	Increase in vegetation density within the valley and the valley slope.	Not Available	No major changes visible since 1999.	Increase in vegetation density within the valley and the valley slope since 1999.	Not Available	Riparian cover has increase in density since 1954.
	Downstream	43.8698 -79.6456	Confluence point.		**Planform**	Not Available	Not Available	Planform is not clearly visible	No major changes visible since 1954.	Not Available	1978 - The feature appears to be defined and meandering within the valley.	Not Available	No significant changes observed since 1978.	Image resolution is too poor to observe any changes	No significant changes observed since 1995.	Not Available	No major changes visible since 1999.	No significant changes observed since 2007.	Not Available	No observable changes to the watercourse planform.
No Proposed Hydraulics Crossing	Upstream	43.8751 -79.6450	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Primarily Agriculture. The watercourse crosses Highway 27.	Not Available	No major changes	Not available	No major changes	No major changes	Slight increase in riparian buffer near downstream reach break.	No major changes	Not Available	Residential property constructed to the north along the right bank.	No major changes	Not Available	Truck parking lot installed north of channel and residence constructed prior to 2007.
	Downstream	43.8713 -79.6476	Confluence point		**Planform**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. A small riparian zone is present along the upstream of the crossing with Highway 27	Not Available	Channel is appears larger downstream of highway 27 crossing.	Not Available	No major changes	Feature now appears to be wider upstream of crossing with highway 27. (overall still poorly defined)	No major changes	No major changes	Not Available	Channel has been straightened and the channel dug out downstream of highway 27 crossing.	No major changes	Not Available	No major changes. Minor riparian buffer has developed downstream of highway 27 crossing.
HU_MH_EHT_1_1	Upstream	43.8697 -79.6455	Confluence point.		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. A small riparian zone is present along the watercourse corridor.	No major changes visible since 1954.	Not Available	1978 - Feature is located within a valley (east) and road embankment (west) Vegetation is present within the valley.	Not Available	Two buildings are now present in the mid portion of the feature within the valley. No other significant changes visible since 1978.	Significant increase in vegetation cover within the valley.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	The building's footprint , first reported on 1988 has increased in size. Vegetation has been lost in the immediate are of the building but the overall vegetation density appears to have increased.	Not Available	Riparian cover has increase in density since 1954.
	Downstream	43.8676 -79.6411	Confluence point.		**Planform**	Not Available	Not Available	Planform is more visible downstream of Highway 27 and appear to meander naturally.	No major changes visible since 1954.	Not Available	1978 - The feature is confined within a valley and a road embankment. Some sinuosity is present.	Not Available	Minimal increase in sinuosity since 1978.	Image resolution is too poor to observe any changes	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No observable changes to the watercourse planform.
HU_EH_EHT_1_2_2, HU_EH_EHT_1_2_1	Upstream	43.8777 -79.6418	Pond outlet.		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. A small riparian zone is present along the corridor where the watercourse flows. Agricultural land is present adjacent to the watercourse corridor.	No major changes visible since 1954.	Not Available	1978 - A riparian zone is present along the location of the feature. Three online ponds are present along the reach.	Not Available	Image resolution is too poor to observe any changes	Significant increase in vegetation along the features path.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	Riparian cover has increase in density since 2007.
	Downstream	43.8698 -79.6456	Confluence point.		**Planform**	Not Available	Not Available	Planform is not clearly visible.	No major changes visible since 1954.	Not Available	1978 - The feature's planform is not clearly visible.	Not Available	The feature displays defined banks and a meandering planform.	Image resolution is too poor to observe any changes	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No observable changes to the watercourse planform.
HU_EH_EHR_0_1, HU_EH_EHR_0_2	Upstream	43.8795 -79.6379	Change in riparian zone. From scrubland to woodlot. Change in planform. Channel becomes less meandering.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is located within a valley. There is significant vegetation cover within the valley floor. Above the valley agricultural land use is predominant. A large forest patch is present to the east of the valley	Not Available	No major changes visible since 1978.	Significant increase in vegetation cover within the valley.	New residential buildings are present to the east of the valley. NO other significant changes visible.	Not Available	The residential subdivision reported in 1999 has increased in size and density. Vegetation within the valley has increased in density.	No major changes visible since 2007.	Not Available	Vegetation cover within the valley has significantly increase in density.
	Downstream	43.8740 -79.6357	Change in planform. Channel sinuosity increases.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is confined within and valley and displays a natural meandering planform.	Not Available	No major changes visible since 1978.	Image resolution is too poor to observe any changes	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No observable changes to the watercourse planform.
No Proposed Hydraulics Crossing	Upstream	43.8802 -79.6204	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8790 -79.6191	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8820 -79.6243	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8826 -79.6228	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_12_1_1, HU_EH_EHT_12_1_2	Upstream	43.8819 -79.6209	Pond outlet.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8802 -79.6204	Pond inlet.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_12_2_1, HU_EH_EHT_12_2_2	Upstream	43.8813 -79.6179	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8802 -79.6179	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_12_3_3, HU_EH_EHT_12_3_4	Upstream	43.8865 -79.6138	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8816 -79.6148	Change in planform and riparian zone. Channel becomes defined and riparian zone changes from agricultural to scrubland.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_15_2_1, HU_EH_EHR_15_2_2, HU_EH_EHR_15_2_3	Upstream	43.8915 -79.5964	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8881	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1960	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.5939																		
No Proposed Hydraulics Crossing	Upstream	43.8901 -79.5929	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8881 -79.5939	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_15_3_1, HU_EH_EHT_15_3_2	Upstream	43.8929 -79.5920	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8850 -79.5902	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_16_1, HU_EH_EHT_16_2	Upstream	43.8975 -79.5844	Change in riparian vegetation. Riparian zone increases in vegetation cover.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8820 -79.5822	Change in riparian vegetation. From grasses to woodlot.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_17_3_2	Upstream	43.8940 -79.5750	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8934 -79.5741	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_17_3_3	Upstream	43.8950 -79.5724	Start point of feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8934 -79.5741	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_17_3_1, HU_EH_EHT_17_3_4, HU_EH_EHT_17_3_5	Upstream	43.8934 -79.5741	Confluence point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8880 -79.5723	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8934 -79.5677	Change in riparian vegetation From woodlot to grasses.		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. Agricultural land is present adjacent to the watercourse corridor. Watercourse flows through a forest.	No major changes visible since 1954.	Not Available	1978 - Residential home built to the south of the feature. No other major changes visible since 1960.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	Cement quarry built to the east of the feature. No other major changes visible since 1999.	Cement quarry doubles in size. No other major changes visible since 2007.	Not Available	No significant changes since 2012.
	Downstream	43.8904 -79.5657	Confluence point.		**Planform**	Not Available	Not Available	Planform is not clearly visible	No major changes visible since 1954.	Not Available	1978 - Watercourse is defined and mostly linear.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	Watercourse is defined and meandering.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	Upstream	43.8934 -79.5677	Change in riparian vegetation From grasses to woodlot.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is surrounded by agricultural fields with a small riparian zone present along the feature's path.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	Riparian vegetation has increased since 1999. No other significant changes observed	No major changes visible since 2007.	Not Available	No significant changes since 2012.
	Downstream	43.8904 -79.5657	Change in riparian vegetation From woodlot to grasses.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature appears to be slightly defined and linearized. A small pond is present at downstream reach break.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8913 -79.5688	Beginning of feature at a pond		**Land Use**	Not Available	Not Available	Agricultural Fields	Not Available	Pond is now visible at the beginning of the feature.	Not Available	No major changes in land use	No major changes visible since 1978.	A few new residential dwellings in the surrounding area. Primarily agricultural fields.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
	Downstream	43.8915 -79.5668	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible in aerial imagery	Not Available	Feature is not clearly visible in aerial imagery	Not Available	Flow appears to be more channelized, appears as a straight agricultural drainage ditch from a small pond.	No major changes visible since 1978.	No major changes visible since 1988.	No major changes. Aerial imagery is better quality than in previous years.	Not Available	No major changes. Aerial imagery is better quality than in previous years.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8906 -79.5673	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Agricultural Fields	Not Available	Agricultural fields are flooded in the surrounding area.	Not Available	No major changes in land use	No major changes visible since 1978.	A few new residential dwellings in the surrounding area. Primarily agricultural fields.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
	Downstream	43.8904 -79.5657	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible in aerial imagery	Not Available	Feature occurs in an agricultural field.	Not Available	Feature is more visible in aerial imagery. it appears to be a slightly sinuous feature that occurs within an agricultural field likely at a topographic low (crops	A pond is now present at the downstream reach break.	No major changes visible since 1988.	No major changes. Aerial imagery is better quality than in previous years.	Not Available	Minor development of a narrow riparian buffer. Feature occurs within an agricultural field.	Feature is no longer visible. Agricultural crops have been planted through the feature.	Not Available	No significant changes since 2012.
HU_EH_EHT_18_7_1	Upstream	43.8936 -79.5633	Apparent start point of undefined feature.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8904 -79.5657	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.8989 -79.5620	Confluence point.		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. Agricultural land and a road are present adjacent to the watercourse corridor. No riparian zone present.	Not Available	Not Available	1978 - The feature crosses two private roadways. Highway 400 to the east.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	Private road crossings expanded and paved for the cement quarry.	No major changes visible since 2007.	Not Available	2020 - Highway 400 to the east widened. Cement quarry to the south expanded.
	Downstream	43.8965 -79.5651	Change in riparian vegetation From grasses to woodlot.		**Planform**	Not Available	Not Available	Planform is not clearly visible	Not Available	Not Available	1978 - The feature is defined and mostly linear. Convergence of two features into one on the north end of the feature.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	Feature has more meandering nature.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	2020 - No major changes visible since 2012.
HU_EH_EHT_18_5_2, HU_EH_EHT_18_5_1	Upstream	43.8997 -79.5608	Culvert outlet point.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8989 -79.5620	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_18_6_1, HU_EH_EHT_18_6_2, HU_EH_EHT_18_3_6	Upstream	43.8982 -79.5525	Confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8989 -79.5620	Confluence point.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
HU_EH_EHT_18_4_1, HU_EH_EHT_18_4_2	Upstream	43.8901 -79.5592	Culvert outlet point.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is surrounded by agricultural fields to the west. A small riparian zone present along the feature and Hwy 400 is present to the east.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	The riparian buffer surrounding the feature has increased in density and is primarily covered by trees.	Not Available	No significant changes since 2012.
	Downstream	43.8875	Confluence point.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is defined and linearized. Based on topographic	Not Available	No major changes visible since 1978	No major changes visible since 1988	No major changes visible since 1995	Not Available	No major changes visible since 1999	No major changes visible since 2007	Not Available	No significant changes since 2012.

Crossing ID	Limit	Coordinates	Justification			1946	1950	1954	1959	1970	1976	1978	1988	1995	1999	2002	2007	2012	2017	2020 / 2021 / 2023
		-79.5609									contours it is also confined.									
HU_EH_EHT_18_4_1 HU_EH_EHT_18_4_2	Upstream	43.8885 -79.5598	Change in riparian vegetation from woodlot to grasses.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	1970 - The feature is surrounded by agricultural fields to the west. A small riparian zone is present along the feature and Hwy 400 is present to the east.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	The riparian buffer surrounding the feature has increased in density and is primarily covered by trees.	Not Available	No significant changes since 2012.
	Downstream	43.8876 -79.5607	Confluence point.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	1976 - The feature is defined and linearized. Based on topographic contours it is also confined.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8903 -79.5656	Confluence point.		**Land Use**	Not Available	Not Available	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed
	Downstream	43.8875 -79.5609	Confluence point.		**Planform**	Not Available	Not Available	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed	Ephemera to intermittent feature. No analysis completed	Not Available	Ephemera to intermittent feature. No analysis completed
No Proposed Hydraulics Crossing	Upstream	43.8875 -79.5609	Confluence point of features.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	1976 - The feature is surrounded by agricultural fields to the west. A small riparian zone present along the feature and Hwy 400 is present to the east.	Not Available	Evidence of possible valley infilling.	It appears that infilling has taken place on the areas adjacent to the feature.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	A staging area has appeared on the west close to the downstream reach break. No other significant changes since 2012.
	Downstream	43.8835 -79.5592	Change in valley confinement.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is defined, linearized, and located within a valley.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8835 -79.5592	Change in valley confinement.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	1976 - The feature is surrounded by agricultural fields. A small riparian zone present along the feature.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	The feature's riparian zone has increased in density. No other major changes observed.	Not Available	No significant changes since 2012.
	Downstream	43.8795 -79.5575	Change in valley confinement. Valley opens up and the feature becomes less confined in with more access to the floodplain.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	1978 - The feature is not clearly visible. No evidence of a defined watercourse.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8795 -79.5575	Change in valley confinement. Valley is more confined upstream.		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	The feature is located within a forested area. To the southeast the valley is poorly vegetated.	Not Available	The valley vegetation density has increased. No other significant changes visible.	No major changes visible since 1988. The service station located to the south has increased its footprint.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
	Downstream	43.8775 -79.5277	Confluence point.		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	Features meanders through a poorly vegetated valley.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8770 -79.5577	Confluence point of features.		**Land Use**	Not Available	Not Available	Agricultural lands adjacent to the feature's location.	Not Available	Not Available	The footprint of Highway 400 has increased. Low riparian cover adjacent to the feature	Not Available	No major changes visible since 1978.	The footprint of the rest area to the south has increased significantly. No other major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	The vegetation cover has increased significantly.
	Downstream	43.8743 -79.5609	Confluence point of features.		**Planform**	Not Available	Not Available	The feature is not visible.	Not Available	Not Available	The feature meanders downstream (west) of Highway 400.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No visible changes to the feature's meandering planform
No Proposed Hydraulics Crossing	Upstream	43.8771 -79.5568	Plunge pool outlet		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. Agricultural land and a road are present adjacent to the watercourse corridor.	No major changes visible since 1954.	Not Available	1976 - The feature is surrounded by agricultural fields. A small riparian zone present along the feature. Feature crosses under the Highway. Highway rest stop under construction immediately south of the feature.	Not Available	Rest stop is constructed to the south. No other major changes visible since 1976.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	2023 - A large hot has appeared to the east of the Highway just south of the feature. No other significant changes since 2012.
	Downstream	43.8770 -79.5577	Confluence point		**Planform**	Not Available	Not Available	Planform is not clearly visible	No major changes visible since 1954.	Not Available	1976 - The feature is defined and slightly meandering	Not Available	Pool begins to form at culvert outlet at Highway 400.	No major changes visible since 1988.	Box culvert visible at the outlet where pool has formed.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	2023 - New culvert installed at highway. Pool has grown larger.
No Proposed Hydraulics Crossing	Upstream	43.8775 -79.5546	Apparent confluence point of undefined features.		**Land Use**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
	Downstream	43.8771 -79.5568	Feature discharges into a plunge pool.		**Planform**	Not Available	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible	Feature is not clearly visible	Not Available	Feature is not clearly visible
No Proposed Hydraulics Crossing	Upstream	43.9130 -79.5508	Change in riparian vegetation from grasses/meadow to forested.		**Land Use**	Not Available	Not Available	Imagery resolution does not clearly display the watercourse. Agricultural land is present adjacent to the watercourse corridor. Watercourse flows through a forest and under Highway 400. Riparian zone present.	No major changes visible since 1954.	Not Available	1978 - Residential home built adjacent to the feature on the east side of Highway 400 and the forest was removed. No riparian zone present.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	Culvert replaced and extended for highway widening. Storm water management pond constructed south of the feature.
	Downstream	43.9101 -79.5666	Confluence point.		**Planform**	Not Available	Not Available	Planform is not clearly visible	Feature is defined and meandering by nature.	Not Available	1978 - The feature is linearized from its meandering nature on the east side of the highway. Pond created off of the feature.	Not Available	No major changes visible since 1978.	Pond has dried up and a small riparian zone is present along the feature.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.
No Proposed Hydraulics Crossing	Upstream	43.8776 -79.5546	Apparent confluence point		**Land Use**	Not Available	Not Available	Not Available	Not Available	Not Available	Agricultural activities are present to the south and north of the feature.	Not Available	No major changes visible since 1978.	No major changes visible since 1988. Vegetation density has increased substantially.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	Highway 400 has increased in size and the embankments has encroached into the watercourse. No other significant changes observed.
	Downstream	43.9099 -79.5630	Apparent confluence point		**Planform**	Not Available	Not Available	Not Available	Not Available	Not Available	A defined feature is observed within a forested corridor. The feature flows west under Highway 400.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	The feature is observed meandering through the forested corridor.	No major changes visible since 2007.	Not Available	Highway 400 has increased in size and the embankments has encroached into the watercourse. No other significant changes observed.
No Proposed Hydraulics Crossing	Upstream	43.9099 -79.5630	Apparent confluence point of undefined feature and defined features.		**Land Use**	Not Available	Not Available	Agricultural lands adjacent to watercourse corridor. Feature flows through a forest and under Highway 400. Riparian zone present.	No major changes visible since 1954.	Not Available	No major changes visible since 1960.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	Culvert replaced and extended for highway widening. Storm water management pond constructed north of the feature.
	Downstream	43.9101 -79.5666	Confluence point		**Planform**	Not Available	Not Available	Planform is not clearly visible.	No major changes visible since 1954.	Not Available	1976 - Feature is mostly obscured by forest cover but water is present at culvert outlet and shows meandering nature.	Not Available	No major changes visible since 1978.	No major changes visible since 1988.	No major changes visible since 1995.	Not Available	No major changes visible since 1999.	No major changes visible since 2007.	Not Available	No significant changes since 2012.

A2. Detailed Reach Map

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CR_MC_MUL_8_2
CR_MC_MUL_8_1
CR_MC_MUL_8_3
9th Line
Steeles Avenue
Winston Churchill Boulevard
401
Section 1
Section 2
Section 2
Section 1
SM_EL_SIM_1_7
SM_EL_SIM_1_10
SM_EL_SIM_1_6
SM_EL_SIM_1_11
HALTON HILLS
MISSISSAUGA
SM_EL_SIM_1_8
SM_EL_SIM_1_4
SM_EL_SIM_1_9
SM_EL_SIM_1_5
SM_EL_SIM_1_2
401
SM_EL_SIM_1_3
SM_EL_SIM_1_1
SM_EB_SIM_5_4
Steeles Avenue
SM_EB_SIM_5_3
SM_EB_SIM_5_2
Section 1
Trafalgar Road
SM_EB_SIM_0_3
SM_EB_SIM_5_1
SM_EB_SIM_0_2
SM_EB_SIM_3_1
Hornby Road
SM_EB_SIM_2_1
SM_EB_SIM_0_1
401
Trafalgar Road
Derry Road West
MISSISSAUGA
MILTON
Derry Road
Steeles Avenue
Section 1
HALTON HILLS
MILTON
Section 1
Section 1

Service Layer Credits:
Reach Break Points: AECOM

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Railway
- Freeway
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

N

Appendix A2 -
Reach Locations - 1

25 Feb, 2026 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 200 400 800 1,200
Meters

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Layout: F5-20260225-ReachLocations-60315006 Author: Last Saved by: michael.w.collins

CR_NP_CRR_0_SR_1
CR_NP_CRR_0_1
CR_NP_CRR_6_1
CR_NP_CRR_0_2
CR_NP_CRR_7_1
CR_NP_CRR_0_SR_2
CR_LC_LEV_11_1
CR_LC_LEV_10_1
CR_LC_LEV_0_3
CR_LC_LEV_0_1
CR_LC_LEV_0_2
CR_LC_LEV_0_4
CR_LC_LEV_9_1
CR_LC_LEV_2_6
CR_LC_LEV_2_5e
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CR_LC_LEV_2_5c
CR_LC_LEV_2_4
CR_LC_LEV_2_5b
CR_LC_LEV_2_3
CR_LC_LEV_2_5a
CR_LC_LEV_2_2
CR_LC_LEV_2_1
CR_LC_LEV_1_2
CR_LC_LEV_1_1
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CR_MC_MUL_8_5
CR_MC_MUL_8_4
CR_MC_MUL_8_2
CR_MC_MUL_8_1
CR_MC_MUL_8_3

Section 3
Section 2
Section 2
Section 2
Section 1
Section 1

Winston Churchill Boulevard
HALTON HILLS
BRAMPTON
10 Sideroad
9th Line
Embleton Road
Mississauga Road
Steeles Avenue West
Steeles Avenue

Service Layer Credits:
Reach Break Points: AECOM

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- 407 ETR Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

Appendix A2 - Reach Locations - 2

N

25 Feb, 2026 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Layout: F5-20260225-ReachLocations-60315006 Author: Last Saved by: michael.w.collins

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CR_GW_CRR_15b
CR_HC_HUT_5_1
CR_HC_HUT_6_3
CR_HC_HUT_6_2
CR_HC_HUT_6_1
CR_HC_HUT_3_1
CR_HC_HUT_0_1
CR_HC_HUT_0_2
CR_HC_HUT_0_3
CR_NP_CRR_13_1
CR_NP_CRR_13_MW
CR_NP_CRR_3_3
CR_NP_CRR_3_1
CR_NP_CRR_3_2
CR_NP_CRR_9_6
CR_NP_CRR_9_5
CR_NP_CRR_9_1
CR_NP_CRR_9_2
CR_NP_CRR_3_2a
CR_NP_CRR_9_MW_1
CR_NP_CRR_9_3
CR_NP_CRR_9_MW
CR_NP_CRR_9_4
CR_NP_CRR_0_SR_1
CR_NP_CRR_0_1

CALEDON
BRAMPTON
CALEDON
HALTON HILLS
BRAMPTON
HALTON HILLS
Mayfield Road
17 Sideroad
Winston Churchill Boulevard
Mississauga Road
Bovaird Drive West
Section 3
Section 2
Adamson Street North
Guelph Street
7

Service Layer Credits:
Reach Break Points: AECOM

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Railway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

Appendix A2 - Reach Locations - 3

N

25 Feb, 2026 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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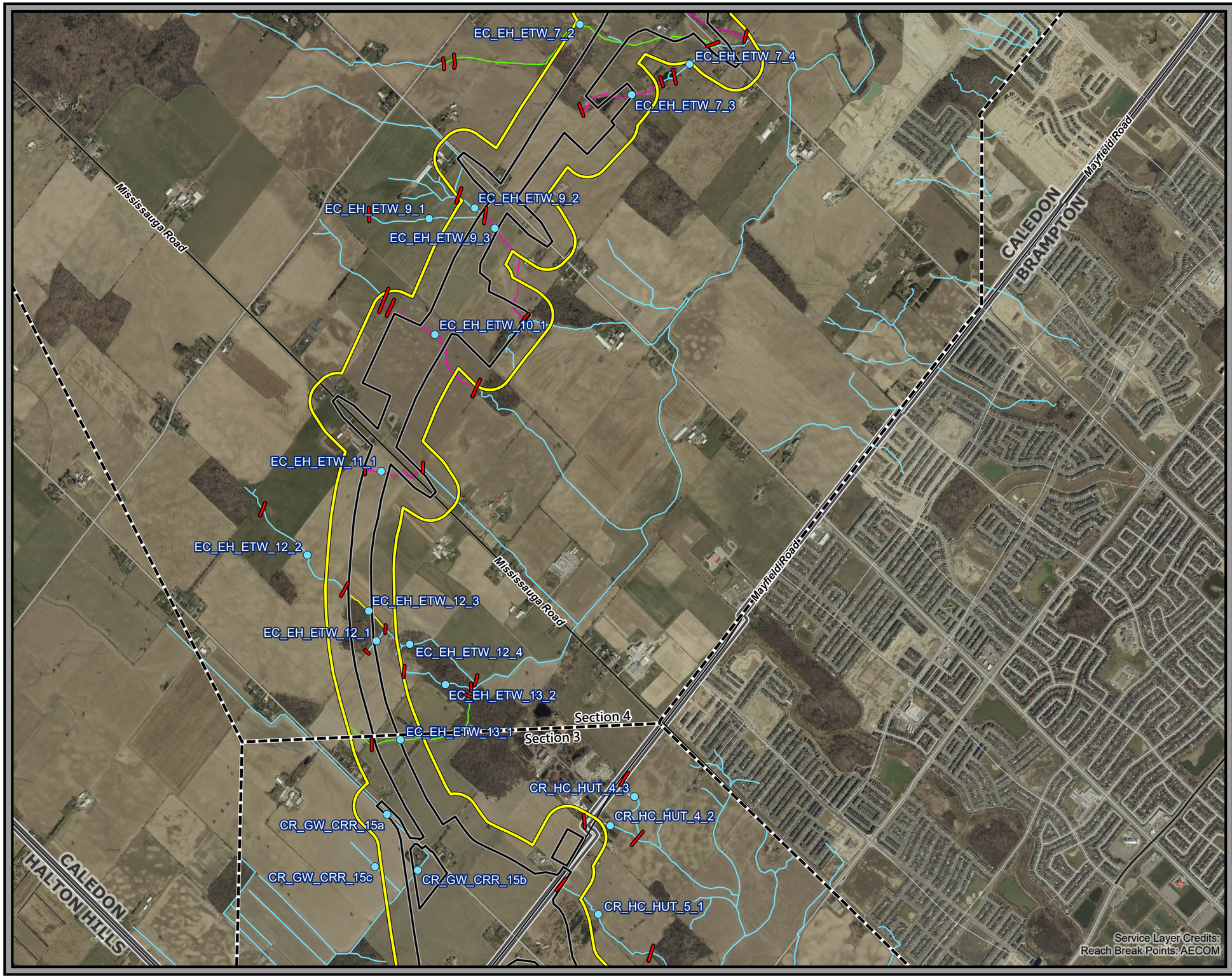

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Intermittent
- Ephemeral to Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

N

Appendix A2 - Reach Locations - 4

25 Feb, 2026 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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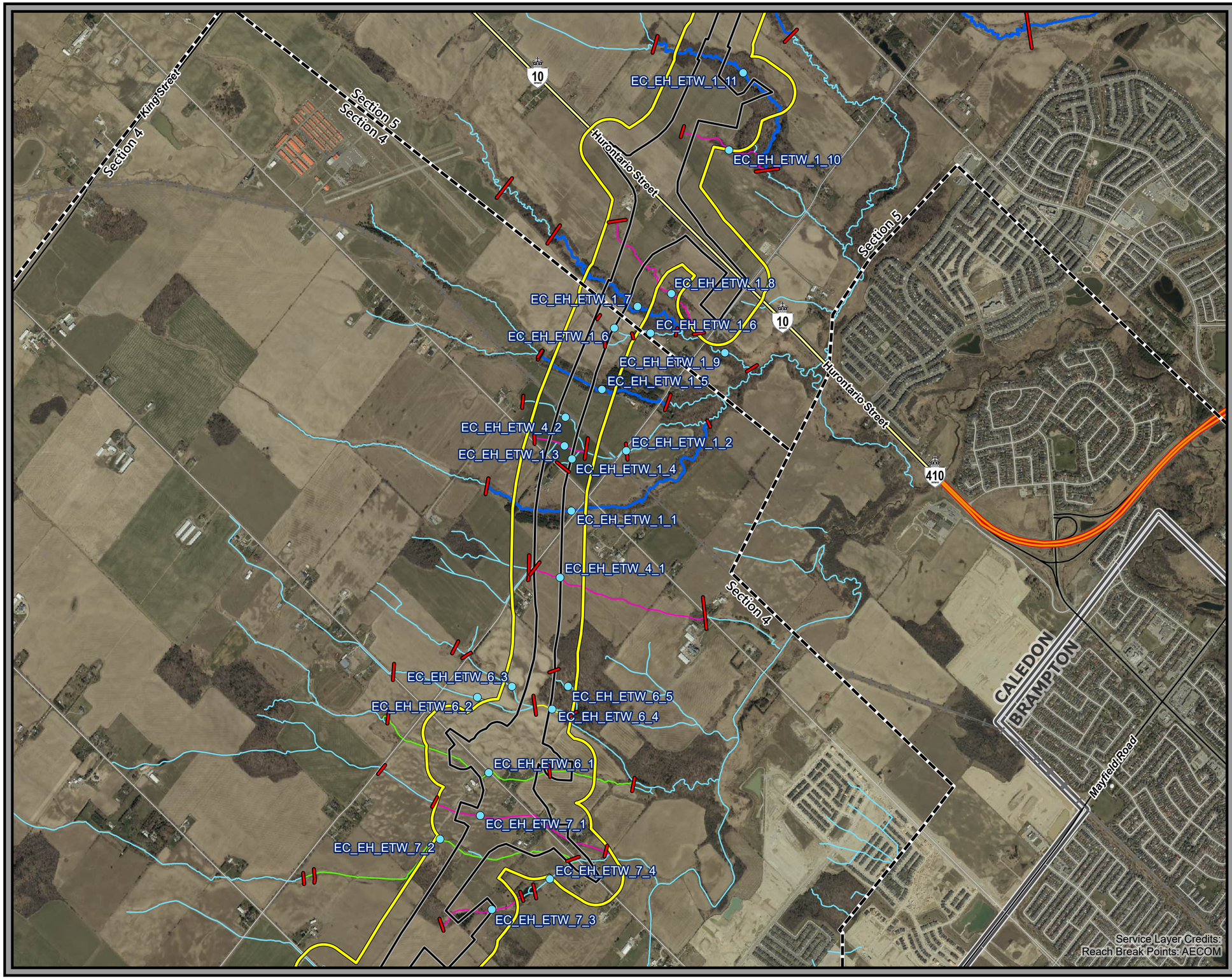

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Railway
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral to Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

N

Appendix A2 - Reach Locations - 5

25 Feb, 2026 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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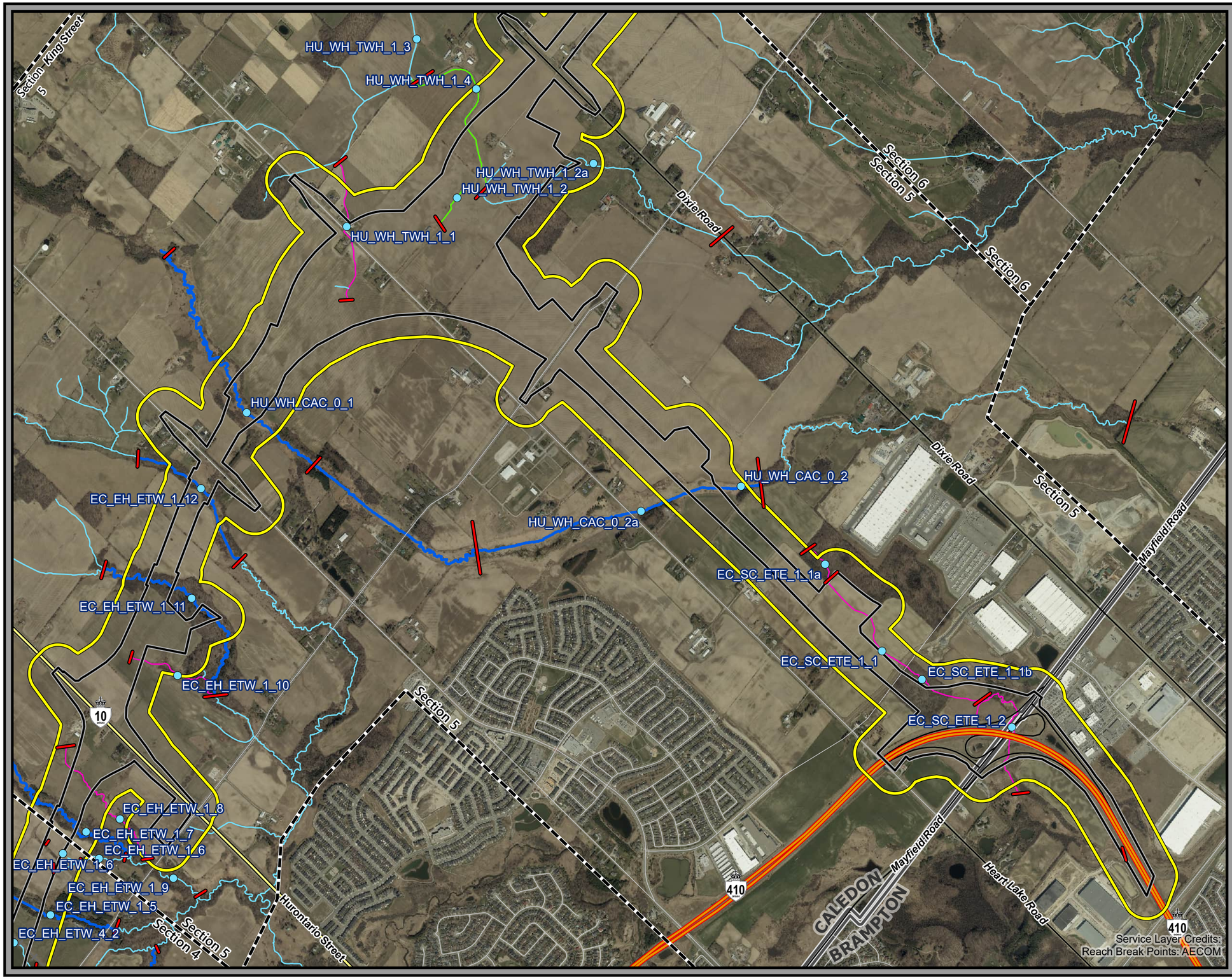

Service Layer Credits:
Reach Break Points: AECOM

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Railway
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

N

Appendix A2 - Reach Locations - 6

25 Feb, 2026 (Imagery 2024)

Sources:
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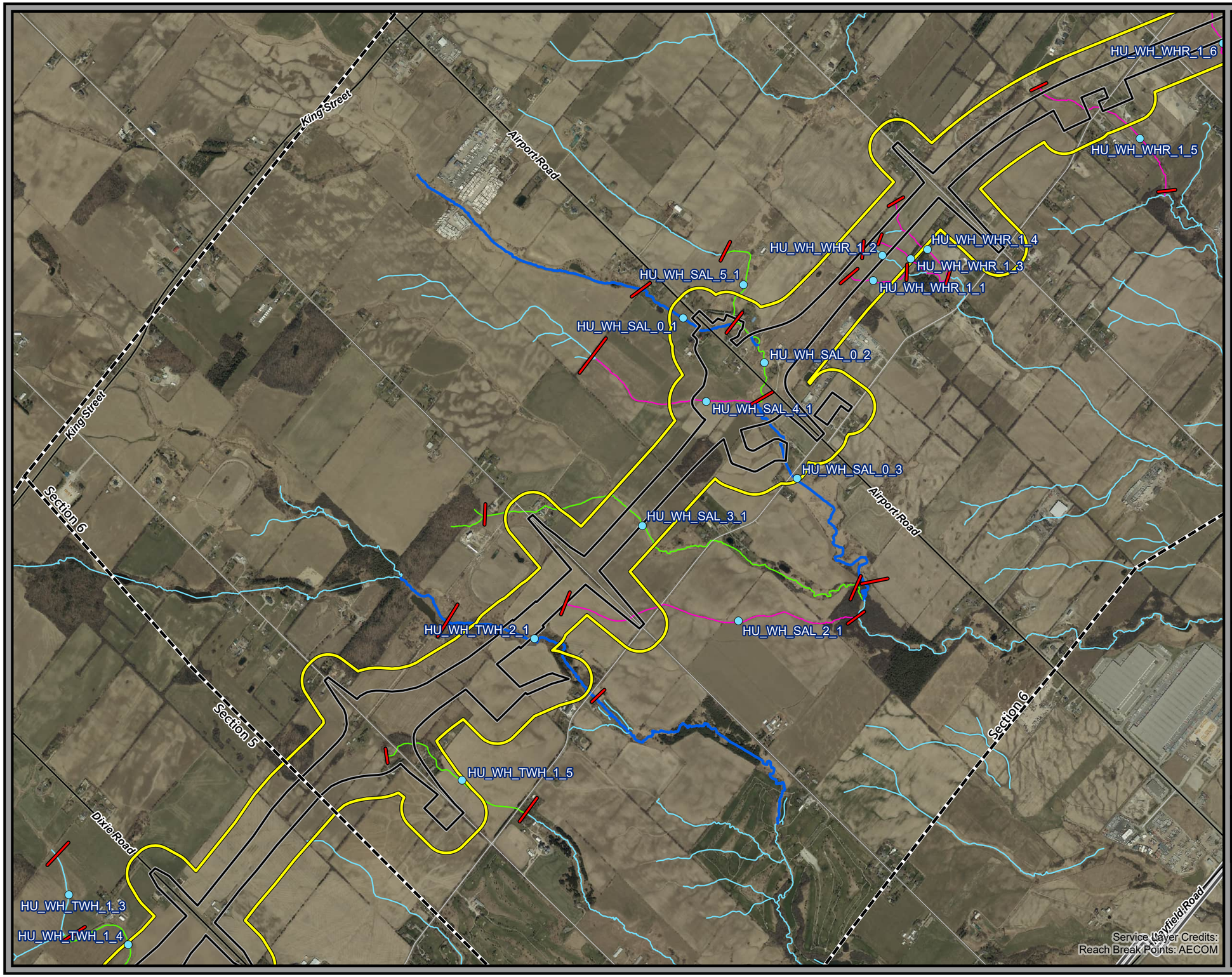

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

N

Appendix A2 -
Reach Locations - 7

25 Feb, 2026 (Imagery 2024)

Sources:
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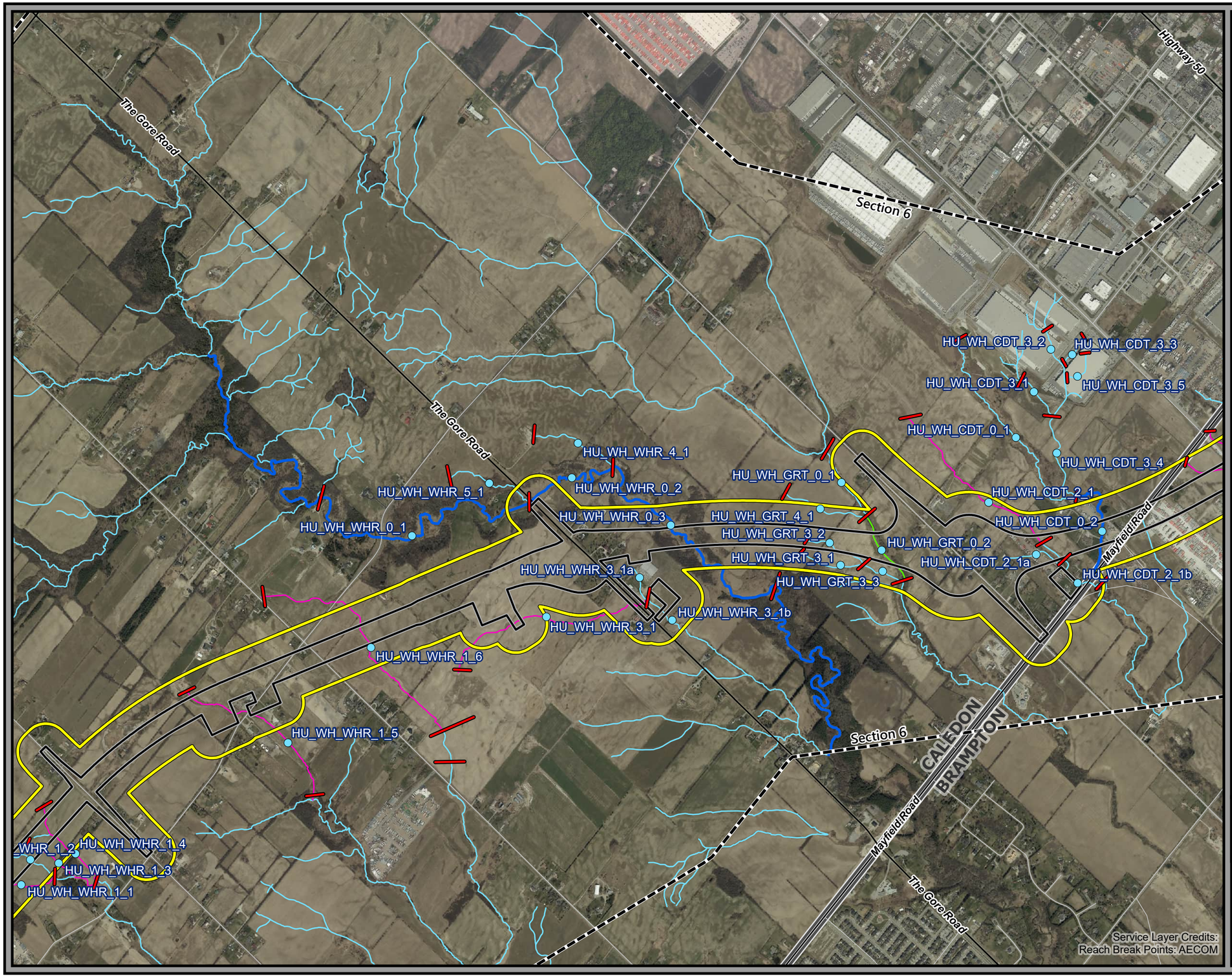

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

Appendix A2 - Reach Locations - 8

N

25 Feb, 2026 (Imagery 2024)

Sources:
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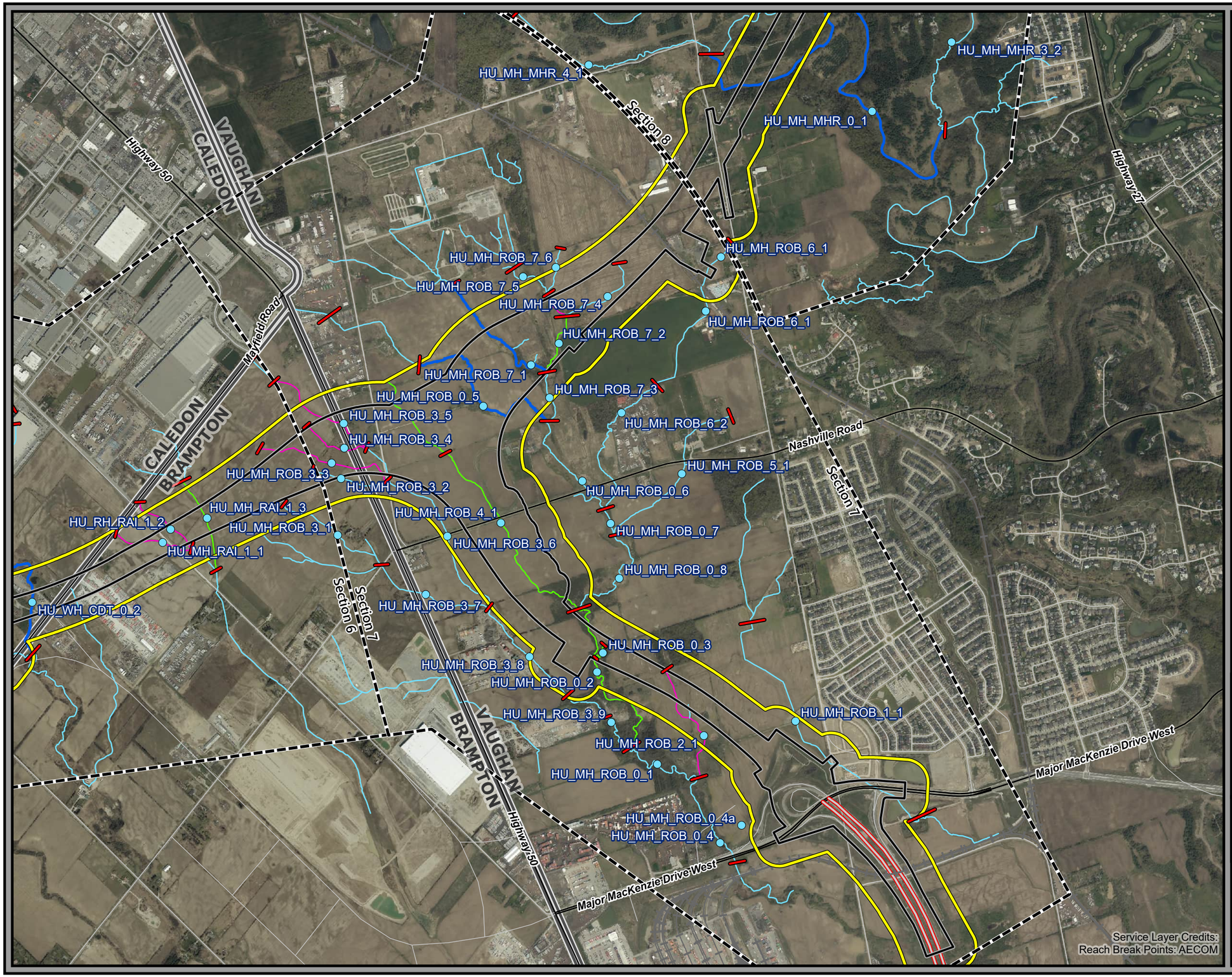

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Railway
- Future 427 Alignment
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

Appendix A2 - Reach Locations - 9

N

25 Feb, 2026 (Imagery 2024)

Sources:
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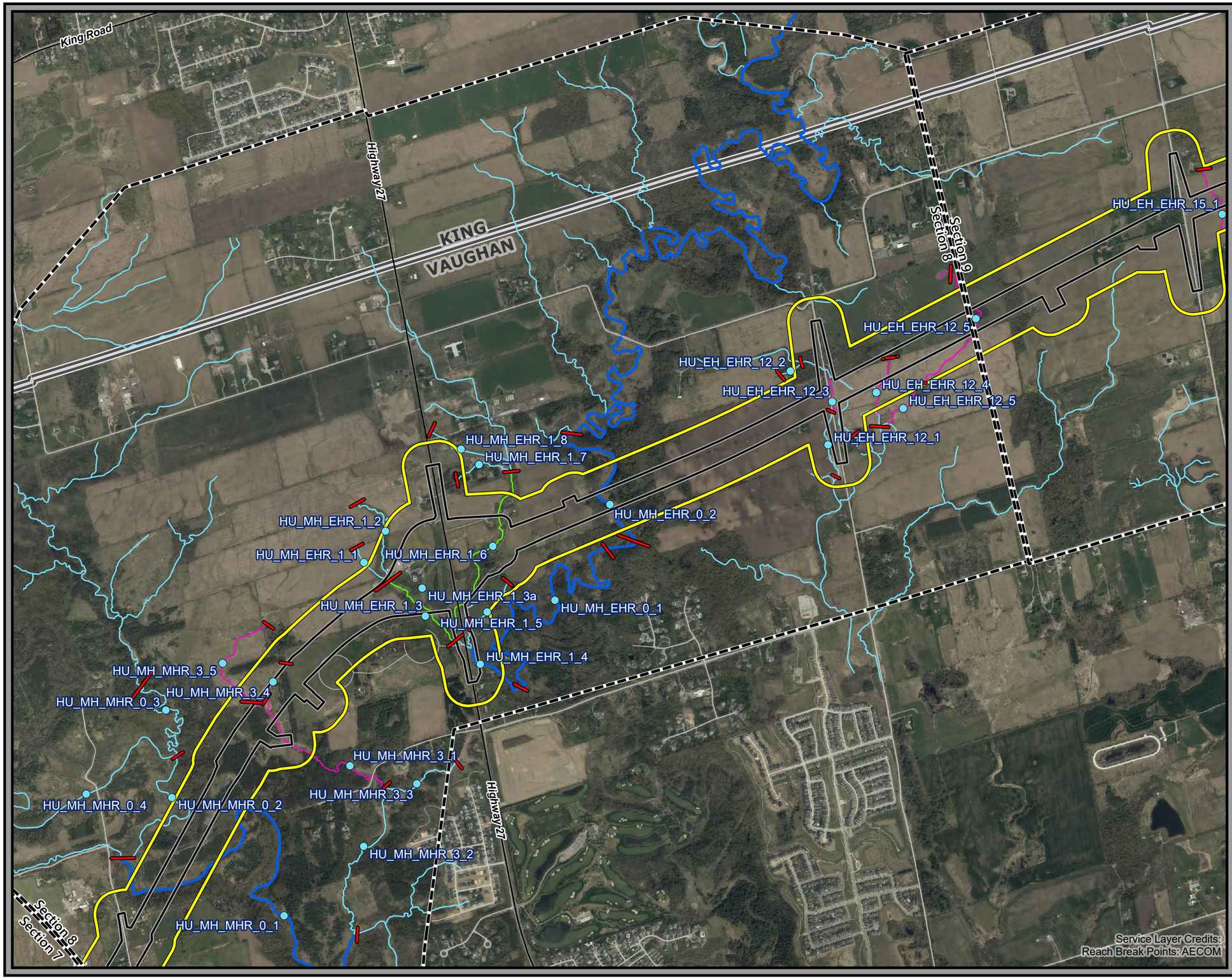

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

N

Appendix A2 - Reach Locations - 10

25 Feb, 2026 (Imagery 2024)

Sources:
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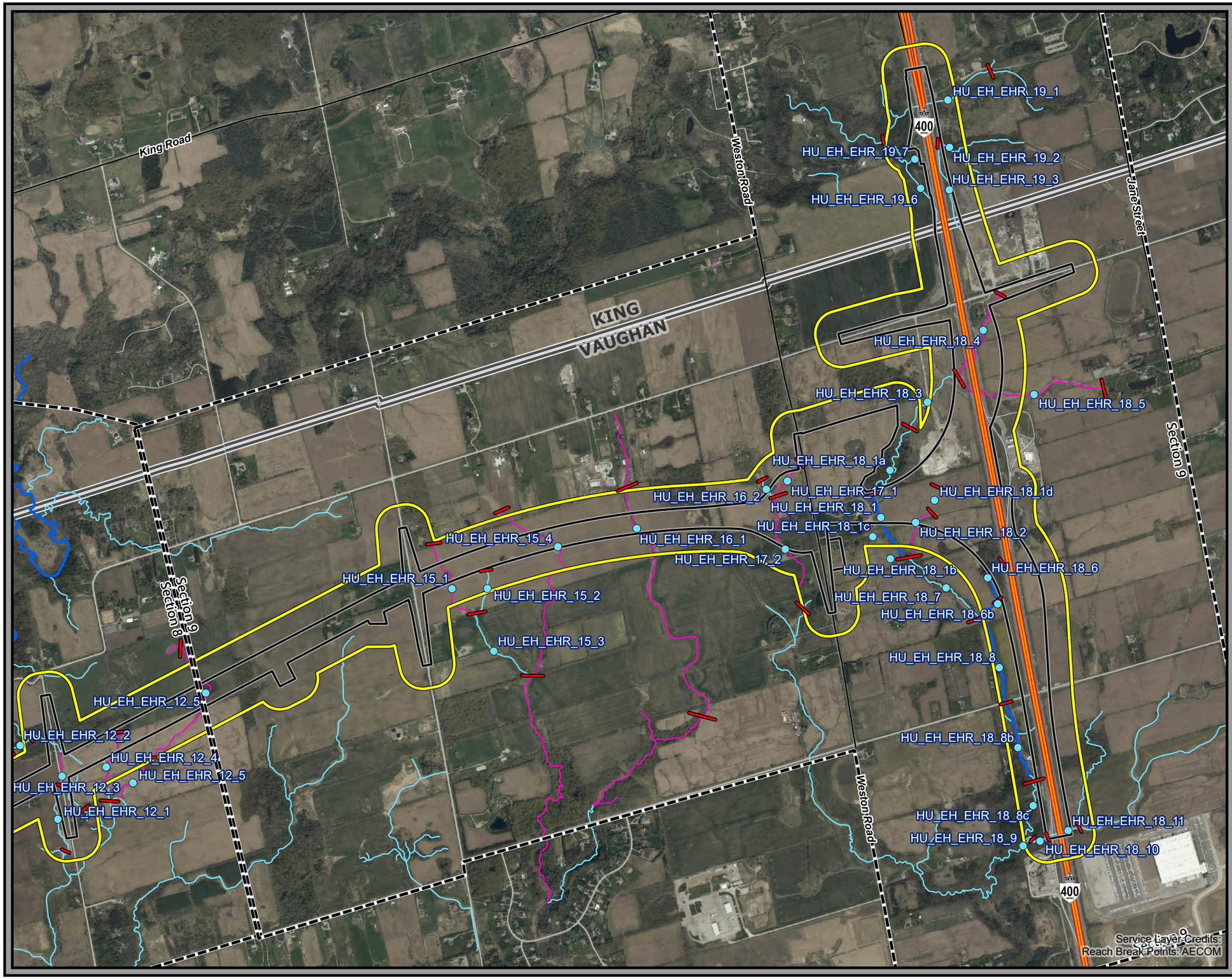

Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Location
- Reach Break
- Freeway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Fluvial Geomorphological Assessment

Appendix A2 - Reach Locations - 11

N

25 Feb, 2026 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters

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B

Reach Descriptions

Appendix B - Section 1

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_2_1**	SM_EB_SIM_2_DR2	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. There was no channel visible on the day of the assessment. Only a dry, likely ephemeral feature that resembled a gully was observed. The feature was located along the steepest portion of the reach and extends approximately 9 m in length. The gully is located on the west bank of the main watercourse. Access to the area closer to Highway 401 was restricted by a metal fence. The feature is unconfined with access to the floodplain. It is surrounded by scrubland vegetation. No evidence of erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	713	2022-07-29	2022 Ministry Order
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_0_2**	SM_EB_SIM_0_WC1 EXTENSION	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The feature is a defined meandering feature of permanent hydrological regime. It is entrenched in some sections, particularly downstream of Highway 401 where bank erosion, widening, and leaning trees are more evident. The feature is confined, with limited access to the floodplain beyond the entrenched banks. A large accumulation of branches and vegetation leaning over the channel was visible downstream of the highway, blocking access further upstream. A well defined riffle-pool morphology was present spaced approximately 20 m apart. A rapid cross section was collected at a run section of the reach. The bankfull width and depth were measured at approximately 7.3 m and 0.57 m, respectively. Along the watercourse the wetted width ranged from 0.5 m to 2 m and the depth was 0.1 m to 0.5 m. The bank angle was moderate to steep and the riparian zone of the feature consisted of scrubland type vegetation consisting of herbaceous and grassy vegetation as well as shrubs and trees. During assessment a chute channel cutting behind a vegetated point bar was observed. Although, there was no flow through the chute at the time of assessment but there was water present. No channel hardening was observed on the section on the reach that was investigated. However, aerial imagery shows a large pool is present downstream of the highway and the area around the pool appears to be lined with riprap.	Transitional or Stressed	Widening, planimetric form adjustment, degradation, and aggradation	713	2022-07-29	2022 Ministry Order
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_5_1**	No proposed crossing	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. At this time there is no proposed hydraulic crossing for the reach. Based on air photo interpretation the channel is an unconfined ephemeral feature. Could not be assessed due to access.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	662	Property Not Visited	Property Not Visited
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_0_3**	No proposed crossing	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The feature is a meandering permanent watercourse that has a bankfull width of approximately 3.5 m. The channel is confined but there is access to the floodplain. The feature follows a moderate bed slope with poorly defined riffle-pool morphology and is surrounded by herbaceous vegetation and woodlot land use. Evidence of erosion was not observed in the field.	In Regime	Widening with aggradation and planimetric form adjustment	644 / 662	2020-08-13	2020 Field Program
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_5_2**	No proposed crossing	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The feature is an undefined straight ephemeral feature that is unconfined. It has an undefined bed morphology and is surrounded by agricultural land. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	644	2020-08-13	2020 Field Program
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_5_3**	No proposed crossing	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The feature is an undefined straight ephemeral feature that appears to be swale-like and undefined. It is surrounded by agricultural crops and there is in-channel vegetation (crops planted through). No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	644	2020-08-13	2020 Field Program
Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_5_4**	No proposed crossing	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The feature is an undefined straight ephemeral feature that appears to be swale-like and undefined. It is surrounded by agricultural crops and there is in-channel vegetation (crops planted through). No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	628	2020-08-13	2020 Field Program
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_1**	Crossing SM_EL_SIM_1_DR1 removed from 90% design	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The reach appears to be a straight to slightly sinuous ephemeral feature based on aerial imagery. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. Could not be assessed on the field due to access restrictions	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	706	Property Not Visited	Property Not Visited
								705	Property Not Visited	Property Not Visited
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_2**	SM_EL_SIM_1_WC1.1, SM_EL_SIM_1_WC1.2, SM_EL_SIM_1_WC1.3, SM_EL_SIM_1_WC1.4, SM_EL_SIM_1_WC1.5	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The reach was assessed upstream of the proposed crossing location along Steeles Avenue near the intersection with 9th line. At this location, there is a double span concrete box culvert that is constricted by very dense aquatic vegetation. The culvert has a 3.5 m span and a 1 m depth with an open bottom. The wetted depth at the culvert is 0.05 m but there is ephemeral channel through it. The water is stagnant. The substrate in the culvert consists of fines (silt, clay, and sand) with some gravel that is likely from the road. Overall the feature can be described as a straight vegetated swale with undefined banks that are approximately 5 to10 m wide. The feature is unconfined with access to the floodplain. The surrounding vegetation consists of wetland-type vegetation through the culvert, surrounded by agricultural vegetation. No erosion or woody debris were noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	651 / 652	2020-08-13	2020 Field Program - Viewed from roadway
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_3**	SM_EL_SIM_1_WC1 EXTENSION, SM_EL_SIM_1_WC1.6	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The reach appears to be a straight, slightly defined ephemeral feature in Google Earth. Not assessed due to access restrictions.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	223	Property Not Visited	Property Not Visited
								224	Property Not Visited	Property Not Visited
								226	Property Not Visited	Property Not Visited
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_4**	SM_EL_SIM_1_WC2.1, RELOCATED, SM_EL_SIM_1_WC2.2	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The reach was assessed upstream of the proposed crossing location at Steeles Ave where there is a concrete box culvert with an open or embedded bottom. The culvert is approximately 3.55 by 1.55 m. There is riprap embankment protection along both banks. The water spreads out downstream of the culvert beyond the span of the culvert into a wetland type feature. Overall the reach can be described as a straight, slightly defined, ephemeral swale-like feature that is 1 to 2 m wide. It is unconfined with access to the floodplain. It is surrounded by agricultural fields. No erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	636	2020-08-13	2020 Field Program - Viewed from roadway
								642	Property Not Visited	Property Not Visited

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_5**	SM_EL_SIM_1_WC2.3 EXTENSION	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. It is a straightened ephemeral feature located within a golf driving range in a topographic low. The swale feature is approximately 1 m to 1.7 m wide with no true bankfull since the feature is undefined. It is also unconfined and has access to the floodplain. The feature is surrounded by grasses, with dense wetland-type riparian vegetation. In the upstream portion of the reach, downstream (south) of Highway 401, the feature becomes less visible as the area is dense with wetland type vegetation. A concrete box culvert in present under the highway and a large pond is also present on the right bank of the feature immediately downstream of the culvert. No flow was present in feature during on the day of assessment except in the ponded portion. No evidence of erosion or woody debris was noted.	Undefined feature. RGA Not Applicable	Not Applicable	225	2022-07-29	2022 Ministry Order
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_8**	SM_EL_SIM_1_WC3.1, SM_EL_SIM_1_WC3.2 EXTENSION, SM_EL_SIM_1_WC3.3 SM_EL_SIM_1_WC3.6 RELOCATION,	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The reach was assessed from upstream along on the south side of Steeles Avenue where a double span concrete culvert that measures 3.5x1.5 m occurs. There was no water present in the feature on the day of the assessment. The feature appears to be a straight vegetated swale-like ephemeral feature. It is approximately 10 meter wide. The sediment consists of fines (silt, clay, and sand) with some gravel. It is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. No erosion or woody debris were noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	629	2020-08-13	2020 Field Program - Viewed from roadway
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_9**	SM_EL_SIM_1_WC3.4 MODIFICATION, SM_EL_SIM_1_WC3.5,	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. It is a straight ephemeral feature approximately 4 m to 5 m wide and it appears to receive discharges from under Highway 401 via 1900 mm plastic twin culverts encased in concrete. The ephemeral feature has been artificially straightened. A circular plunge pool, approximately 10 m in diameter, is present at the outlet point of the culverts and its banks are protected by riprap. Roadside swales connect to the pool from the east and west. The feature is surrounded by grasses and has dense riparian wetland-type vegetation. It is unconfined and there was no flow on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	225	2022-07-29	2022 - Ministry Order
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_10**	SM_EL_SIM_1_WC4 EXTENSION	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. In the field no feature was clearly visible on the day of the assessment. Air-photo analysis, suggests the feature is a straight, swale-like ephemeral feature with a low gradient. It lacks defined banks and is unconfined with access to the floodplain. The culvert is overgrown with herbaceous vegetation and the feature is surrounded by agricultural vegetation. No erosion or woody debris was noted on the day of the assessment. The reach was assessed from upstream, along the south side of Steeles Avenue, where a double span concrete culvert exists which measures 3.5 m by 1.5 m.	Undefined feature. RGA Not Applicable	Not Applicable	640	2020-08-13	2020 Field Program - Viewed from roadway
Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_11**	SM_EL_SIM_1_WC4.1 EXTENSION	The reach is part of the Sixteen Mile Creek watershed in the Conservation Halton Regulatory Area. The feature is a straight swale-like ephemeral feature that was dry on the day of the assessment. It follows a low channel gradient and has likely been straightened by agricultural activities. It is unconfined with access to the floodplain. The feature is surrounded by agricultural vegetation except close to the road crossing where there is wetland type (cattails) vegetation and herbaceous vegetation. The feature was assessed from downstream along 10th Line W where a 300 mm wide triple-span corrugated steel crossing appears to connect roadside ditches. At the downstream end of the feature, there is a storm water pond which we were unable to assess due to restricted access.	Undefined feature. RGA Not Applicable	Not Applicable	227	2022-06-29	2022 Field Program - Viewed from Roadway

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. Based on air photo interpretation the feature is an undefined and unconfined ephemeral type feature. The feature was not clearly identified in the field during the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	681	2021-09-30	2021 Field Program
Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_2**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. Based on air photo interpretation the feature is an undefined and unconfined ephemeral type feature. The feature was not clearly identified in the field during the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	681	2021-09-30	2021 Field Program
Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_3**	CR-MC-MUL-8-WC1	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach contains a vegetated swale-like ephemeral feature approximately 2 m wide and 0.3 m deep. The feature has a low gradient, relatively straight planform but there is no defined channel. During assessment there was no flow for most of the reach but the bed substrate was saturated and soft with a poorly defined bed morphology. The feature has likely been straightened due to agricultural activities and is unconfined with access to the floodplain. It is surrounded by grasses. Groundwater likely contributes to this feature as well which was inferred from the presence of low amounts of watercress. Further downstream the feature is fed by small channel rills. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	681	2021-09-30	2021 Field Program
Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_4**	CR-MC-MUL-8-WC3	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a sinuous ephemeral feature with a low gradient and no defined channel. The feature is unconfined with access to the floodplain and has a width of approximately 0.71 m. The substrate consists of fines with some gravel to cobble-sized material. However, this appears to be placed rather than natural. The ephemeral feature has been altered and it follows along the margin of a parking area until it crosses under the driveway through a 0.5 m wide culvert. There is herbaceous vegetation around the feature close to the driveway and the remaining portion of the reach is surrounded by agricultural lands. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	679	2020-07-17	2020 Field Program
Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_5**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is an undefined straight ephemeral type feature. It is unconfined and has no defined bed morphology. It is surrounded by agricultural land. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	679	2020-07-17	2020 Field Program
Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_6**	CR-MC-MUL-8-WC4	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. It consists of a slightly sinuous ephemeral feature with a low gradient and has no defined channel. The feature is about 1.5 m wide and there was no flow present on the day of the assessment. The landowner stated that the ephemeral feature only contains flow in the spring and during large flow events. The bed substrate consists of silt, clay, sand, and small gravel. No bed morphology is present. The feature is unconfined with access to the floodplain. The surrounding vegetation is agricultural crops. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	679	2020-07-17	2020 Field Program
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_1_1**	**Crossing removed from 90% design	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a slightly sinuous ephemeral feature with no defined channel and a low gradient. It has an approximate width of 1 m and a depth of about 5 cm. The bed substrate consists of silt, clay, sand, and small pebbles. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	679	2020-07-17	2020 Field Program
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_1_2**	CR_LC_LEV_1_WC2	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a slightly sinuous and defined intermittent watercourse with a bankfull width of 1.3 m and a bankfull depth of 0.4 m. It follows a moderate channel gradient and has a poorly defined bed morphology at the upstream end of the reach. Downstream the reach follows a steeper channel gradient and has coarser bed material. The intermittent watercourse is unconfined with access to the floodplain. It is surrounded by scrubland (grasses, minor trees, and shrubs). Bank erosion and woody debris were not identified on the day of the assessment but the downstream end of the feature was noted to be entrenched.	In Regime (low end score)	Planimetric form Adjustment	698 694	2021-09-30 2020-04-24	2021 Field Program 2020 Field Program
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature was observed from the south-west side of Winston Churchill Boulevard where an undefined, ephemeral feature occurs. No channel was observed beyond crossing. At the road crossing the feature flows through a single span concrete box culvert. The culvert measures 10,973 by 2,438 mm. The culvert accepts flow from the roadside drainage ditch and from CR_LC_LEV_2_2. At the culvert the feature has a bed substrate consisting of silt, clay, sand, and gravel (likely placed). The vegetation upstream and downstream of the culvert constricts the flow and causes the water to pool in the crossing where it has a 5 m wetted width and a 0.25 m wetted depth. Beyond the culvert there is no flow. The feature is unconfined with access to the floodplain. The feature is surrounded by crops, scrubland, and herbaceous material. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	701	2022-04-28	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_2**	No proposed crossing ID. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a straight, defined, intermittent watercourse that follows a low channel gradient. The feature was assessed from the roadway where it is more of a drainage ditch along an access road than a natural feature. It receives flow from more than one location and it links to a pool upstream. The feature is 3 m wide from top of bank to top of bank and it has a bankfull depth of 0.60 m. The bed substrate consists of fines (silt, clay, sand) to gravel sized material. No bed morphology was observed. The feature is unconfined with access to the floodplain. The surrounding vegetation includes agriculture and scrubland. There was evidence of groundwater contribution. Erosion, including bank erosion, exposed roots, leaning trees, was observed on the day of the assessment. No woody debris was noted. The feature was not entrenched. The feature has clearly been altered and straightened.	In regime Assessed from roadway - limited PTE	Widening followed by planimetric form adjustment	701	2022-04-28	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_3**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a small, straight, ephemeral feature. On the day of the assessment, an isolated pool of standing water that drains into the drainage ditch beside Winston Churchill Road was observed. No defined channel was observed in the field. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation and agricultural crops were planted over the feature. There was no evidence of erosion or woody debris on the day of the assessment. It has likely been altered by agricultural activities.	Undefined feature. RGA Not Applicable	Not Applicable	701	2022-04-28	2022 Ministry Order

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_4**	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.2 (downstream of downstream reach break) CR_LC_LEV_2_WC1.1	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, intermittent watercourse with a low gradient. It accepts flow contributions from the roadside drainage ditch as well as from watercourses up reach. The feature is approximately 2.9 m wide and has a bankfull depth of 0.5 m. The substrate consists of fines (silt, clay sand). A pool-riffle morphology was observed but is poorly defined. The feature is unconfined with access to the floodplain and appears it may have been altered. The intermittent watercourse has in-channel grassy vegetation, is surrounded by dense grassy and herbaceous riparian vegetation on the banks, and is adjacent to agricultural vegetation. There was no evidence of erosion or woody debris on the day of the assessment. Additionally, the feature was not entrenched. It does not look like a natural watercourse and has likely been altered and straightened. The feature crosses through a culvert along Winston Churchill Blvd.	In Regime	Planimetric form adjustment	212	2022-07-08	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5**	CR_LC_LEV_2_WC2.1 CR_LC_LEV_2_WC2.2 CR_LC_LEV_2_WC2	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The ephemeral feature was assessed upstream from the crossing with Winston Churchill Boulevard. At the crossing with Winston Churchill Boulevard, there is a circular concrete culvert which is approximately 1.18 m wide. The culvert is clogged by vegetated debris and at this location, the feature is undefined and is likely fed by roadside drainage. No feature was observed in the agricultural field. The ditch has a low gradient and a straight planform and is ephemeral. The bed morphology is poorly defined. It appears to have been straightened and altered by agricultural activities. The feature is unconfined with access to the floodplain and the surrounding vegetation includes both agricultural crops and scrubland. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	212	2022-04-28	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5a**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The ephemeral feature was assessed from the Right-Of-Way (ROW) at 5th side Rd. The feature is located far away from the ROW. A long 30 m stretch of phragmites was visible in the vicinity of the feature. No defined feature or flow was observed. The feature is located within an agricultural field. The vegetation in the area includes phragmites and crop plantings. The overall morphology is poorly defined based on historical imagery and the feature is unconfined. Based on historical imagery, it appears to have been straightened and altered by agricultural activities. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5b**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The ephemeral feature was assessed from the ROW at 5th Side Road at the upstream reach break. The feature flows east through an agricultural field. The feature is located north of and is parallel to Cr_LC_LEV_2_5a. No defined feature was observed, although a small patch of phragmites and cattails was visible from the ROW. The presence of flow was not able to be determined from the ROW. The feature is located within an agricultural field. The vegetation in the area includes phragmites, cattails, and crop plantings. Based on the historical imagery, the overall morphology is poorly defined and the feature is unconfined. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5c**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The ephemeral feature was assessed from the ROW at Winston Churchill Boulevard. The feature flows east through an agricultural field before draining into the ditch parallel to Winston Churchill Boulevard. Stgnant water, phragmites, and instream vegetation were observed in the drainage ditch parallel to the road. There are two culverts (0.2m and 0.4m in diameter) with debris blockages, providing flow to the drainage feature but not following the same path. Based on the historical imagery, the overall morphology was poorly defined and has been straightened adjacent to Winston Churchill Boulevard. The feature was unconfined. The feature is located within an agricultural field. The vegetation in the area includes phragmites, cattails, and crop plantings. There was no evidence of erosion or woody debris on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5d**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The ephemeral feature was assessed from the ROW at 5th Side Road at the upstream reach break. The feature flows east through an agricultural field. Flow likely follows a topographic low during the spring freshet or after large rain events in the agricultural field.No defined feature or flow path was visible from the ROW, and no water was observed. Based on the historical imagery, the feature is straight, and has likely been straightened for agricultural purposes. It is located upstream (west) of CR_LC_LEV_2_5C. The feature is unconfined.	Undefined feature. RGA Not Applicable	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5e**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The ephemeral feature was assessed from the ROW at 5th Side Road at the upstream reach break. The feature flows east through an agricultural field. No defined feature was visible from the ROW. Flow likely follows a topographic low during the spring freshet or after large rain events in the agricultural field. It is located upstream (west) of CR_LC_LEV_2_5C. The feature is unconfined. Based on historical imagery, the feature is slightly sinuous, likely straightened for agricultural purposes.	Undefined feature. RGA Not Applicable	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_6**	CR_LC_LEV_2_WC6	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a small ephemeral feature that was not visible at the time of the assessment. It is unconfined with access to the floodplain. It is surrounded by fallow type fields that are predominantly herbaceous vegetation. On the day of the assessment no evidence of erosion or woody debris was noted.	Undefined feature. RGA Not Applicable	Not Applicable	70	2020-08-14	2020 Field Program - Viewed from Roadway
								212	Property Not Visited	Property Not Visited
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_9_1**	CR_LC_LEV_9_DR1 **Crossing removed from 90% design	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, unconfined, ephemeral feature that follows a topographic low. There was no defined channel observed on the day of the assessment, only small pools of standing water and a clear area of darker vegetation (and wet soil). Pools of water occur throughout the valley and are up to 10 cm deep within the vegetation clumps. The feature is not entrenched and has a low gradient. The substrate consists of fines and It is unconfined with access to the floodplain. It is surrounded by grasses and herbaceous material. No erosion or woody debris was observed on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	220	2022-04-28	2022 Ministry Order

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_0_1**	CR_LC_LEV_0_WC2	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, permanent watercourse. The bankfull width is approximately 4.1 m and the depth ranges from 0.45 to 0.65 m. Up reach the feature is wider, closer to 4.1 m wide, and it narrows down reach to approximately 2 m in width. It is suspected that a beaver dam is obstructing part of the reach. The feature has a low channel gradient and it is not entrenched. The Bed substrate consists of fines (silt, clay, sand) to gravel-sized material. Thick unconsolidated sediment was noted along the entire reach. This sediment was especially pronounced in the upstream section of the reach where it is estimated to be 25 cm thick. The feature had well-formed pools and riffles and is unconfined with access to the floodplain. The feature comes close to the valley wall downstream and is surrounded by scrubland consisting of trees, herbaceous vegetation, shrubs, and grasses. On the day of the assessment, multiple instances of leaning trees, bank undercutting on outside bends, and debris jams were noted but not all of the woody debris was fluvial related.	In Regime (borders Transitional)	Widening, followed by aggradation and then planimetric form adjustment	220	2022-04-28	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_0_2**	CR_LC_LEV_0_WC2	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, permanent watercourse with a moderate channel gradient and defined boundaries. It has a bankfull width of 4.2 m and a bankfull depth of 0.2 m. The wetted width was 0.75 m and the wetted depth 0.05 m on the day of the assessment. The bed substrate consists of fines (silt, clay, and sand) with gravel and some cobbles and it has a well-defined riffle-pool morphology. It is unconfined with access to the floodplain and is surrounded by scrubland and forest vegetation. Erosion and woody debris were noted. The Rapid Geomorphic Assessment classified the reach as transitional or stressed. It is surrounded by scrubland and forest vegetation. The reach flows through a concrete box culvert along Embleton Road. The culvert is single-span and measures 5.8 by 1.5 m. At the crossing, the channel is defined with overgrown vegetation upstream and downstream of the crossing.	Transitional or Stressed	Aggradation, followed by widening, planimetric adjustment, degradation	54	2020-08-14	2020 Field Program - Viewed from Roadway
								64	2020-04-16	2020 Field Program
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_0_3**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, defined permanent watercourse with a bankfull width of approximately 4.1 m and a bankfull depth of 0.6 m. The channel bed is steeper at the upstream end of the reach by the dam outlet and has a poorly defined riffle pool morphology. It is unconfined and has access to the floodplain. The feature is surrounded by scrubland-type riparian vegetation. Erosion was noted on the day of the assessment.	Transitional or stressed	Aggradation, followed by widening and planimetric from adjustment	221	2022-04-28	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_10_1**	CR_LC_LEV_10_WC1.1	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is represented by a large pool of water at the upstream end of the reach that is roughly 30 m wide and over a m deep. There is no flow inlet upstream. A small flow outlet occurs to the south west of the pond, where a defined channel roughly 0.5 m wide occurs for a few m and then the channel dissipates and spreads out. No defined channel occurs more than a few m away from the pond. Smaller pools of water are present that are up to 10 cm deep. The feature follows a low channel gradient and is not entrenched. Overall the feature likely consists of a permanent pond and a sinuous ephemeral drainage feature. The bed substrate consists of fines (silt, clay, sand). It is unconfined with access to the floodplain. The feature is surrounded by scrubland consisting of trees, herbaceous vegetation, shrubs, and grasses. There is in-channel vegetation away from the pond feature. No erosion was observed on the day of the assessment. Woody debris was abundant but there are a lot of dead trees in the area that likely contribute woody debris during wind storm events.	Undefined feature. RGA Not Applicable	Not Applicable	28	Property Not Visited	Property Not Visited
								220	2022-04-28	2022 Ministry Order
Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_11_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. Based on air photo interpretation the feature is an undefined and unconfined ephemeral type feature. The feature was not clearly identified in the field during the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	220	2020-04-16	2020 Field Program
								221	Property Not Visited	Property Not Visited
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_0_1**	CREDIT RIVER BRIDGE	The reach is part of the Credit River and its tributaries, which is located in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous to meandering, permanent feature with a bankfull width of approximately 27 m and a bankfull depth of 0.8 m. On the day of the assessment the feature had a wetted width of 27 m and a wetted depth of 0.3 to 0.5 m. It follows a low channel gradient and is entrenched in some areas. In areas where the feature was entrenched the bank scour was 0.9 m from the bottom of the bank. The bed substrate consists of fines with cobbles to boulder-sized material and is poorly sorted. Most of the substrate was coarse and there were small amounts of fines. The banks had a low to moderate angle and consisted of fines with gravel. The pool riffle spacing was poorly defined. The feature is confined where it is entrenched, but otherwise has access to the floodplain. It is surrounded by scrubland and forested-type vegetation with tall herbaceous and grassy vegetation. On the day of the assessment evidence of erosion was observed.	Transitional or Stressed (borderline In Regime)	Planimetric form adjustment, followed by widening, degradation, and aggradation	107	2022-06-29	2022 Ministry Order
Credit River	Norval to Port Credit	Credit River	**CN_NP_CRR_0_2**	CREDIT RIVER BRIDGE	The reach is part of the Credit River and its tributaries, which is located in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, permanent watercourse with a bankfull width of 27 m and a bankfull depth of 0.8 m. It is defined, with a moderate channel gradient and a well-formed riffle-pool morphology. The feature is confined but the watercourse still has access to the floodplain. It is surrounded by scrubland and forest type vegetation. Bank erosion and partial channel spanning debris was noted on the day of the assessment.	In Regime	Degradation, followed by widening, planimetric form adjustment	105	2020-07-17	2020 Field Program
								107	Property Not Visited	Property Not Visited
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_6_1**	CREDIT RIVER BRIDGE	The reach is part of the Credit River and its tributaries, which is located in the Credit Valley Conservation Authority Regulatory Area. The feature is a straight, undefined, ephemeral feature with an approximate width of 1 to 1.5 m. No flow was present on the day of the assessment. It follows a low channel gradient, is not entrenched, and has a substrate consisting of silt, sand, and clay. The feature is unconfined with access to the floodplain. It is surrounded by herbaceous material and some trees. No erosion or woody debris was observed on the day of the assessment. There was limited permission to enter on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	105	2020-07-17	2020 Field Program
								107	Property Not Visited	Property Not Visited

Appendix B - Section 2

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_7_1**	CREDIT RIVER BRIDGE	The reach is part of the Credit River and its tributaries, which is located in the Credit Valley Conservation Authority Regulatory Area. The feature is a sinuous, ephemeral feature that hugs the valley wall to the south and then curves further to the North as it progresses east towards the downstream reach break. The feature lacks defined banks and no flow was present on the day of the assessment even though it rained. The feature follows a low to moderate gradient and no erosion was noted on the day of the assessment. The feature was not observed to be entrenched and the bed substrate consisted of fines with gravel. There was a man-made crossing to the east of the forested area where 2 to 3 inches of aggregate is placed across the feature. Further upstream from the proposed crossing location, the feature appears to be slightly defined with a width of approximately 2.5 to 3 m. The feature is partially confined and has partial access to the floodplain. It is surrounded by scrubland and forested type vegetation. No erosion was noted on the day of the assessment. Woody debris was observed however it is likely blow-down from the valley slope and is not likely fluvial-related.	Undefined feature. RGA Not Applicable	Not Applicable	107	2022-06-29	2022 Ministry Order

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_1**	CR_NP_CRR_9_WC1 CR_NP_CRR_9_WC2	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. No identifiable channel within the vegetated corridor. The feature is likely ephemeral and is surrounded by dense grasses and cattails. Standing water (no visible flow) observed along the vegetated corridor. Upstream of Heritage Road the feature connects to a roadside ditch. The feature has a low gradient and the surrounding vegetation is predominantly meadows and agriculture. No erosion or woody debris was noted during the assessment. The reach crosses Bovard Drive West through an open bottom concrete box culvert. The culvert has dense in-channel vegetation and is partially obstructed by sediments. It also crosses Heritage Road through a damaged 900 metal Corrugated steel pipe.	Undefined feature. RGA Not Applicable	Not Applicable	19 23 13	2020-06-17 2020-06-17 2024-03-22	2021 Field Program - Viewed from Roadway 2021 Field Program - Viewed from Roadway 2024 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_2**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is an undefined ephemeral type feature. No identifiable flow path or defined channel. Only a vegetated corridor was observed at the time of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	13	2024-03-22	2024 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_3**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. At this time there is no proposed hydraulics crossing for the reach.	Undefined feature. RGA Not Applicable	Not Applicable	114	Reach not Assessed	Reach not Assessed
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_4**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. The feature is an undefined ephemeral type feature at the upstream end. As the slope increases down reach channel boundaries become more apparent and on the day of the assessment there was water present in the defined channel area. The feature has a high bed gradient and a poorly-defined channel morphology. It is surrounded by scrubland riparian vegetation with the surrounding land use being forested land. There was erosion noted on the day of the assessment but it may not have been related to fluvial processes.	Undefined feature. RGA Not Applicable	Not Applicable	114	Reach not Assessed	Reach not Assessed
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_5**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is an undefined ephemeral type feature. No identifiable flow path or defined channel. Only a vegetated corridor was observed at the time of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	13	2024-03-22	2024 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_6**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. Based on air photo interpretation the feature is a straight, unconfined ephemeral feature that follows a low bed gradient and is surrounded by agricultural vegetation. The feature has not been assessed in the field.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	14	Property Not Visited	Property Not Visited
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_MW1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a permanent feature with a bankfull width of 4-5 m and a bankfull depth of 0.25 m. The feature is a permanent feature that is surrounded by agricultural vegetation. There was erosion noted on the day of the assessment. There was limited permission to enter during the assessment.	In Regime	Aggradation followed by planimetric form adjustment	114	2020-04-22 2020-04-20	2020 Field Program 2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_MW**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a permanent feature with a bankfull width of 3.5 to 4 m and a bankfull depth of 0.1 to 0.4 m. The feature is a permanent feature that is surrounded by agricultural vegetation. There was erosion noted on the day of the assessment. There was limited permission to enter during the assessment.	Transitional to Stressed	Widening, degradation, aggradation and planimetric form adjustment	114	2020-04-20	2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_1**	CR_NP_CRR_3_WC3.1 CR_NP_CRR_3_WC3	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature was assessed upstream from the crossing area. The feature is a sinuous to straight ephemeral channel with a low to moderate gradient. It has an approximate width of 1.3-1.8 m and a depth of 0.2-0.35 m. The channel appears to have been altered for agricultural purposes. The bed substrate consists of silt, clay, and sand. The feature is unconfined with access to the floodplain. It is surrounded by scrubland and agricultural fields. There is dense vegetation growth within the channel. No erosion or woody debris were observed on the day of the assessment. There is no permission to enter at the proposed crossing location so the crossing was only assessed upstream of the proposed location.	In Regime (channel may be altered here)	Upstream of proposed 413 crossing location: aggradation and planimetric form adjustment	14 80 / 91	Property Not Visited 2020-07-17	Property Not Visited 2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_2**	CR_NP_CRR_3_WC1.1	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a straight, ephemeral channel with a low gradient. The feature is only defined at the culvert outlet and is approximately 0.8 m wide. Flows were present at the time of the assessment. As the feature flows into the vegetated corridor banks and bed morphology become undefined and the flows become less focused. Two small depressions flowing on either side of the vegetated corridor become visible. The feature to the east portion of the vegetated corridor appears more slightly defined, but it is likely the result agricultural practices (drainage swale). A second feature (0.6 m to 1.8 m wide) to the west of the vegetated corridor, meanders into the agricultural field following a topographic low point, and then the flows back into the vegetated corridor. At the downstream confluence of the two small depressions, and where the vegetated corridor ends, the feature was observed to have more defined banks (0.6 m wide by 0.3 m deep) and to meander along a smaller vegetated corridor. Overall, the feature has been likely subjected to alterations for agricultural purposes, has poorly defined banks and bed morphology. Bed substrate consists of fines (silt, clay, sand), gravel, and cobbles. The feature is unconfined with access to the floodplain. It is surrounded by scrubland, agricultural fields, and forest. Erosion and sediment deposition was noted along Bovaird Dr W. on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	13 110 115	2024-03-22 Property Not Visited Property Not Visited	2024 Field Program - Viewed from Roadway Property Not Visited Property Not Visited

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_2a**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature was not visible from the ROW and therefore, was solely assessed from aerial imagery. With the exception of some short discontinuous portions of ponded water, the feature is not readily visible on aerial imagery. This suggests that it is an undefined to poorly defined feature that follows a topographic low and likely does not contain flow throughout the year. Watercourse data from the CVC suggests that the feature is located in a lightly vegetated topographic depression oriented in a southeast direction, situated entirely within an agricultural field. The reach is relatively short and unconfined, with access to the floodplain. The riparian buffer is poorly developed and narrow, consisting of grasses. Both upstream and downstream of the reach, the feature is contained within a densely vegetated corridor. Downstream of the reach, the channel flows into a pond.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	Not Applicable	Not visible from ROW - assessed from aerial imagery	2025-06-04	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_3**	CR_NP_CRR_3_WC3.2 CR_NP_CRR_3_WC4	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a straight ephemeral feature that was viewed upstream where the feature lacks a defined channel and has a low gradient. The bed substrate consists of fines (silt, clay, and sand). The feature is unconfined with access to the floodplain. The surrounding vegetation is predominantly agriculture and scrubland. No erosion or woody debris were observed on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	14 80	Property Not Visited 2020-07-17	Property Not Visited 2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_3a**	CR_NP_CRR_3_WC5	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a straight ephemeral feature with no defined channel boundaries. It follows a low gradient controlled by topography. The substrate consists of fines (silt, clay, and sand). The feature is unconfined with access to the floodplain. The surrounding vegetation is predominantly agriculture and scrubland. No erosion or woody debris were observed on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	80	2020-07-17	2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_3b**	CR_NP_CRR_3_WC5	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a straight ephemeral feature with no defined channel boundaries. It follows a low gradient controlled by topography. The substrate consists of fines (silt, clay, and sand). The feature is unconfined with access to the floodplain. The surrounding vegetation is predominantly agriculture and scrubland. No erosion or woody debris were observed on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	80	2020-07-17	2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_13_1**	CR_NP_CRR_13_WC2	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. This ephemeral feature is located within an agricultural field and follows a topographic low point. The feature appears to be a tile drain. A more defined and recently dredged drainage feature is present in the area but CR_NP_CRR_13_1 does not connect directly to it as aerial imagery initially suggested. There was no flow on the day of the assessment. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. Additionally, no erosion or woody debris were noted on the day of the assessment	Undefined feature. RGA Not Applicable	Not Applicable	78 208	2022-07-29 2022-03-18	2022 Ministry Order 2022 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_13_MW**	CR_NP_CRR_13_WC3, CR_NP_CRR_13_WC5	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is a straight, vegetation-filled, swale-like ephemeral feature that is undefined. It has an approximate width of 1 to 3 m and a depth of approximately 0.25 m. On the day of the assessment in 2022 the feature had a wetted width of 1 to 3 m and a wetted depth of 20 cm. It has a low gradient, is unconfined, and is surrounded by agricultural crops. The substrate consists of fines, sands, and gravel, and the feature had a poorly defined bed morphology. The planform of the feature appears to have been straightened and has access to the floodplain. The feature crosses through a concrete box culvert off of Wanless Drive. The culvert has a span of 2.1 m and a depth of 1.2 m. There was notable erosion along the right bank on the downstream end of the feature off of Wanless Drive.	Undefined feature. RGA Not Applicable	Not Applicable	88	2022-03-18	2022 Ministry Order
Credit River	Norval to Port Credit	Credit River	**CR_HC_HUT_0_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is an agricultural drain of ephemeral hydrological regime (dry on April) with an average bank height of 0.5 m.	Transitional to Stressed	Aggradation, widening, planimetric form adjustment.	99 83	2020-09-04 2020-04-29	2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_HC_HUT_0_3**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is relatively meandering feature surrounded by herbaceous and deciduous shrubs and trees. A berm is present on the right bank. There is vegetation within the channel no defined bed morphology. Large stones are present and are likely placed. The feature becomes more defined in open area of less in channel vegetation and some pools are present. Several debris jam are present consisting of woody materials and grasses. The bed is soft with clay, silt and sand and other debris, causing stagnant areas. Some as large as 7 m wide. Channel width narrows downstream. Channel width averages 4.7 m with a depth of 0.7 m.	In Regime	Aggradation, widening, planimetric form adjustment.	150	2020-06-17	2020 Field Program
Credit River	Norval to Port Credit	Credit River	**CR_HC_HUT_3_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The reach is an ephemeral feature within and agricultural field. Not assessed in the field.	Undefined feature. RGA Not Applicable	Not Applicable	83	Not assessed	Not assessed
Credit River	Huttonville Creek	Huttonville Creek	**CR_HC_HUT_5_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a straight, undefined ephemeral feature that follows a low gradient and has no defined bed morphology. It is unconfined with access to the floodplain and is surrounded by agricultural vegetation. Agricultural crops are also planted through the feature. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	139	2020-04-29	2020 Field Program - Viewed from Roadway
Credit River	Huttonville Creek	Huttonville Creek	**CR_GW_CRR_15a**	CR_GW_CRR_15_WC3	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. It's a permanent watercourse with an estimated bankfull width of 4 - 6 m and a bankfull depth of 0.4 - 0.6 m. The feature flows adjacent and parallel to Heritage Road in a northwest direction. On the day of 2025 assessment, the feature had a wetted width and depth of approximately 3 - 5 m and 0.2 – 0.4 m, respectively (values are estimates from the ROW). Bank height was estimated at 0.5 m with moderate bank angles. The channel had a straight planform (it has likely been artificially straightened and channelized to accommodate Heritage Road), and it is likely influenced by nearby agricultural activities and Heritage Road. The bed material includes a silty clay substrate with muck. In-stream vegetation includes algae, burr weed, lesser duckweed, eel grass, cattails, and canary grass, with grasses, minor shrubs, and minor trees along the riparian. No woody debris was observed. The channel is entrenched with no access to the floodplain above bankfull. Small-bodied fish were seen on the day of the assessment. Vegetation coverage was estimated at 20-40% instream cover and 0-20% overhanging cover. The watercourse includes a multiple culverts near the upstream end. The downstream culverts are undersized from a fluvial geomorphic perspective.	In Regime	Aggradation and Planimetric Form Adjustment, followed by Degradation and Widening.	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Credit River	Huttonville Creek	Huttonville Creek	**CR_GW_CRR_15b**	CR_GW_CRR_15_WC2.1	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. It's a permanent watercourse with an approximate bankfull width of 4 - 5 m and an approximate bankfull depth of 0.3 - 0.5 m (estimated from the ROW). The feature is located within an agricultural field and drains in a northeast direction. On the day of assessment in 2025, the feature had a wetted width and depth of approximately 3 - 4 m and 0.2 m, respectively as observed from the ROW. The majority of the reach could not be assessed from the ROW.The channel has a straight planform (it has likely been artificially straightened between the two agricultural fields), and is likely influenced by nearby agricultural activities. The bed material consists of a silty clay substrate with muck. Only, minor instream vegetation was observed with riparian covered by grasses and a few small trees. Bank height was estimated to be 0.5 m, and banks followed a moderate to steep angles. The channel is highly entrenched and has no access to the floodplain above bankfull. No woody debris was observed during the assessment.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	RGA not completed due to no permission to enter.	Viewed from ROW	2025-06-04	2025 Field Program - Viewed from Roadway
Credit River	Huttonville Creek	Huttonville Creek	**CR_GW_CRR_15c**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature was not visible from the ROW. The feature was assessed in 2025 from aerial imagery. The feature was not visible in the aerial imagery which suggests that it is an undefined to poorly defined feature that follows a topographic low. It is unconfined with access to the floodplain and is surrounded by agricultural vegetation. Agricultural crops were also planted through where feature should be (based on CVC watercourse data), suggesting the feature is dry during the growing season.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	Not Applicable	Not visible from ROW - assessed from aerial imagery	2025-06-04	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Credit River	Huttonville Creek	Huttonville Creek	**CR_HC_HUT_6_1**	No proposed crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature appears to be a straight, undefined agricultural drain of ephemeral hydrologic regime. This reach was not assessed in the field.	Undefined feature. RGA Not Applicable	Not Applicable	99	Reach not Assessed	Reach not Assessed
Credit River	Huttonville Creek	Huttonville Creek	**CR_HC_HUT_6_2**	CR_HC_HUT_6_WC1 CR_HC_HUT_6_WC1.1 – Note: this crossing is on the Transit Way and no Structural ID is assigned for this crossing	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a straight, undefined ephemeral feature that follows a depression and it has no defined bed morphology. It is unconfined with access to the floodplain and is surrounded by agricultural vegetation. Crops are also planted through the feature. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	99	2020-09-24	2020 Field Program
Credit River	Huttonville Creek	Huttonville Creek	**CR_HC_HUT_6_3**	CR_HC_HUT_6_WC1	The reach is part of the Credit River watershed in the Credit Valley Conservation Authority Regulatory Area. The feature is a straight, ephemeral feature with no defined channel and a poorly defined bed morphology. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation and crops are planted through the feature. No erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	79 82	2020-06-17	2020 Field Program - Viewed from Roadway Property Not Visited
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_13_1**	EC_EH_ETW_13_WC1	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. This intermittent watercourse is located within an agricultural field and appears to have been straightened. It is entrenched in some sections. Bankfull width was measured at 1.8 m with a bankfull depth of 0.29 m. The feature has riparian zone vegetation cover (grasses, herbaceous material, trees, shrubs), and has in-channel grassy vegetation. Access to the flood plain was limited due to bank entrenchment. There was evidence of erosion in the form of undercut banks. No evidence of woody debris was observed. No flow was present on the day of the assessment.	In Regime	Planimetric form adjustment and widening	434 554	2022-07-28 Property Not Visited	2022 Ministry Order Property Not Visited

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_1_1**	EC_EH_ETW_1_WC1	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is an unconfined, meandering to sinuous, permanent channel with a bankfull width of 3.8 m, and a bankfull depth of 0.2 m. The feature is defined, with a low to moderate gradient and defined riffle-pool morphology. The bed substrate consists of fines (silt, clay, and sand) with gravel to boulder sided material. The feature is unconfined with access to the floodplain. It is surrounded by herbaceous and scrubland vegetation. Evidence of erosion and woody debris (multiple debris jams) were noted on the day of the assessment. The feature passes through a concrete box culvert that is approximately 3 m wide along Old School Road. The culvert contains placed boulders along both banks on the downstream end. The feature also passes through a 2 m wide concrete box culvert along McLaughlin Rd. Large boulders are placed around the culvert.	In Regime	Widening, Degradation, Planimetric Form Adjustment	547	2022-03-25	2022 Field Program
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_1_2**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. Based on air photo interpretation the feature is a slightly sinuous intermittent feature that is unconfined. There was no access to the feature due to construction on the roadway and no permission to enter. The feature has not been assessed in the field.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	543	Property Not Visited	Property Not Visited
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_1_3**	EC_EH_ETW_1_WC2	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was assessed at the Old School Road crossing. It is a straight swale-like ephemeral feature with a poorly defined bed morphology. It is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. The feature has only been viewed from the road way since there was no permission to enter.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	543	2020-07-15	2020 Field Program - Assessed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_1_4**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was viewed from McLaughlin road (no permission to enter) where an undefined, straight, ephemeral feature was observed. The feature is unconfined with access to the floodplain.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	543	2020-07-15	2020 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_1_5**	EC_EH_ETW_1_WC3	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a meandering multichannel within a confined valley. The hydrological regime is permanent and the bankfull width and depth were measured at approximately 1.0 m to 1.2 m, and 0.3 m to 0.6 m, respectively. The south channel (closest to the valley) has defined banks and bed morphology (riffle-pool spacing at approximately 20 m), with a moderate gradient, and is incising. The north channel appears to be intermittent, also shows signs of incision, and its bed morphology was not well defined. The bed substrates on both channels consisted of fines (silt, clay, and sand) up to boulder-sized materials. The features are confined with little to no access to the valley, particularly in the locations where the channel banks become more defined. Upstream of an observed knick point (on the south channel), the feature has more access to the floodplain. The two channels eventually converge approximately 80 m upstream of Old School Rd. The surrounding vegetation is primarily forested areas. Erosion and woody debris were noted in the field although some of the woody debris might not be fluvial related. A large jam created by a fallen tree was observed at the upstream portion of valley, at this location the multi-channel feature appears to originate. In the downstream section the feature flows southeast through a concrete box culvert (approximately 2.5 m wide) under Old School Road. Erosion was noted at the concrete box crossing on both banks. Exposed tree roots, leaning trees, banks scours were also observed throughout the reach.	Transitional or Stressed	Widening, planimetric form adjustment, degradation	580	2024-03-22	2024 Field Program
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_4_1**	EC_EH_ETW_4_WC1	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a sinuous swale-type ephemeral feature that follows a topographic low. The feature is approximately 1-1.2 m wide. It is undefined with a low gradient. It is unconfined with access to the floodplain. It is surrounded by agricultural fields. No erosion or woody debris were observed. There is a plastic corrugated culvert that the feature passes through along Old School Road that is 600 mm wide but it is clogged and submerged. On the day of the assessment the feature was approximately 1-1.2 m wide and 0.17 m deep at the culvert.	In Regime	Aggradation and planimetric form adjustment followed by widening	547	2022-03-25 2021-09-28	2022 Field Program - Viewed from Roadway 2021 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_4_2**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a slightly sinuous ephemeral feature surrounded by agricultural land. It is unconfined with access to the floodplain. The feature was viewed from the roadway due to no permission to enter.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	543	2020-07-15	2020 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_6_1**	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was assessed from the roadway. It is a straight, intermittent feature with a bankfull width of approximately 1.5 -3 m and a bankfull depth of 0.7 m at Old School Road, and a bankfull width of 3-4 m with a depth of 0.5 m at Chinguacousy Road. On the day of the assessment the feature had a wetted width of 1.1 m and a wetted depth of 0.17 m. The channel is slightly defined with a low to moderate gradient and a poorly defined bed morphology. Bed substrate consists of fines (silt, clay, sand) and gravel. The feature is unconfined with access to the floodplain. There is also in-channel herbaceous vegetation. Erosion and the presence of woody debris were noted at the time of the assessment, including near the culvert at Old School Road. It is surrounded by herbaceous and agricultural vegetation. The feature crosses Old School Road through a 1600 mm double-barrel culvert made of corrugated steel. There is placed boulder-sized material at the culvert. The feature has only been viewed from the road way since there is no permission to enter.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	296 298 313	Property Not Visited Property Not Visited 2020-04-29	Property Not Visited Property Not Visited 2020 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_6_2**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. The feature is a straight permanent feature that is unconfined with access to the floodplain. The surrounding land is scrubland-type land. The feature was viewed from the roadway due to no permission to enter.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	297	2020-04-29	2020 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_6_3**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is an undefined and ephemeral swale-type feature that follows a topographic low. The feature has a low gradient and some wetland vegetation, trees and shrubs present. At the time of assessment only a vegetated corridor with no defined channel and standing water were present.	Undefined feature. RGA Not Applicable.	Not Applicable	297	2024-03-22	2024 Field Program
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_6_4**	EC_EH_ETW_6_WC3	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. Within most of Study Area the reach is an undefined ephemeral feature located within a vegetated corridor. The feature is densely vegetated by grasses with access to the floodplain. Two small meandering channels appear in the last 50 to 60 m of the vegetated corridor (close to the Study Area limits) and should be considered part of a different reach.	No defined feature. RGA Not Applicable.	Not Applicable	297	2024-03-22	2024 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_6_5**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The reach is an is an undefined ephemeral feature of low gradient, that follows a topographic low. There are no identifiable banks of bed morphology present. The feature becomes more defined (approximately 0.6 m wide and 0.3 m deep) approximately 30 m upstream of a confluence. The reach is only partially located within the Study Area. The defined section located outside of the highway Study Area and should be considered part of a different reach based on the changes in morphology. The reach is surrounded by a forest. Flow was present at the time of the assessment.	Undefined feature. RGA Not Applicable.	Not Applicable	297	2024-03-22	2024 Field Program
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_7_1**	EC_EH_ETW_7_WC4.1, EC_EH_ETW_7_WC4.2, EC_EH_ETW_7_WC4.3	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was assessed from the roadway. It is an undefined, straight, ephemeral feature with an approximate width of approximately 1-2 m. It has a low channel gradient. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. No erosion was noted during the assessment. The feature crosses through Chinguacousy Road through a concrete box culvert 2 m wide and 90 m tall. The feature has only been assessed from the roadway since there is no permission to enter.	No defined feature. RGA Not Applicable	Not Applicable	313 / 307a	2020-07-15	2020 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_7_2**	EC_EH_ETW_7_WC3	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was assessed upstream of the crossing location along Old School Road and Chinguacousy Road. It is an unconfined, straight, multi-channeled, swale-type ephemeral feature with an approximate width of 1.5-4 m. The feature lacks defined banks and follows a low channel gradient. A poorly defined bed morphology was observed. It has access to the floodplain. It is surrounded by grasses and agricultural crops. In-channel vegetation (trees and grasses) contribute to formation of multiple channels. No erosion was observed during the assessment. The feature crosses through a double span culvert across Old School Road. There was a large debris-jam noted downstream of the culvert. The feature does not continue up-reach of Old School road.	No defined feature. RGA Not Applicable	Not Applicable	304	2020-07-15	2020 Field Program - Viewed from Roadway
								331	2021-09-28	2021 Field Program
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_7_3**	EC_EH_ETW_7_WC2	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The reach appears to be an ephemeral to intermittent feature and is unconfined with access to the floodplain based on air photo analysis. Could not assess due to no permission to access.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	307a	Property Not Visited	Property Not Visited
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_7_4**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The reach appears to be an ephemeral to intermittent feature and is unconfined with access to the floodplain based on air photo analysis. Could not assess due to no permission to access.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	307a	Property Not Visited	Property Not Visited
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_9_1**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was not identified during the field assessment. Likely an ephemeral feature.	No defined feature. RGA Not Applicable	Not Applicable	330	2020-04-30	Not assessed
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_9_2**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was not identified during the field assessment. Likely an ephemeral feature.	No defined feature. RGA Not Applicable	Not Applicable	330	Not assessed	Not assessed
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_9_3**	EC_EH_ETW_9_WC2	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, ephemeral buried tile agricultural drain. The feature was dry on the day of the assessment with no sign of recent flow. The feature is estimated to be 0.5 m wide. It has likely been altered by agricultural activities. The feature has a low channel gradient with fines (silt, clay, sand) as a bed substrate and a poorly defined channel morphology. The feature is unconfined with access to the floodplain. The feature is surrounded by agricultural vegetation	Buried tile agricultural drain. RGA Not Applicable	Not Applicable	325	2020-04-29	2020 Field Program
								327	Property Not Visited	Property Not Visited
								330	Property Not Visited	Property Not Visited
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_10_1**	EC_EH_ETW_10_WC1	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is an straight ephemeral feature that follows a topographic low. It has a low channel gradient and it has no defined banks. On the day of the assessment there were isolated spots of ponded water concentrated between rows of agricultural crops were observed. It has a poorly defined bed morphology and the entire feature measures approximately 10 m wide and 0.1 m deep at the deepest point. No definable feature was observed. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. Crops are planted through the feature. The feature has likely been straightened by agricultural activities.	No defined feature. RGA Not Applicable	Not Applicable	557	2022-04-28	2022 Field Program
									2021-09-28	2021 Field Program
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_11_1**	EC_EH_ETW_11_WC1	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The reach is a sinuous, undefined, ephemeral feature with a low gradient. it is approximately 1 m wide. It has a bed substrate consisting of fines with gravel. It has a poorly defined bed morphology. The feature is unconfined with access to the floodplain. It is surrounded by agricultural crops. Erosion was also not noted during the assessment. No flow was present when the feature was assessed in 2020, but flow was present in the spring of 2022. The feature flows to the East through a culvert on Mississauga road that is 0.45 m wide and is partially submerged.	No defined feature. RGA Not Applicable	Not Applicable	558	2022-03-25	2022 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_12_1**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. This feature is a small agricultural drainage swale.	Undefined feature. RGA Not Applicable.	Not applicable	555	2021-09-30	2021 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_12_2**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is intermittent with a width of approximately 4.3 m and a depth of 0.3 m. The feature may have been altered. A tile drain was present. It follows a low to moderate bed gradient and has no defined bed morphology. The channel is unconfined with access to the floodplain. It is surrounded by agricultural land. Erosion was not noted on the day of the assessment.	In Regime	Planimetric Form Adjustment	553	2020-05-07	2020 Field Program
								558	2020-05-07	2020 Field Program - Viewed from adjacent property
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_12_3**	EC_EH_ETW_12_WC1	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The reach is a straight, defined, ephemeral to intermittent feature that varied in width. Overall the feature is approximately 2-7 m wide and 0.5- 1.5 m deep. At the cross section location however, the feature has a bankfull width of 2.5 m and a bankfull depth of 0.3 m. It is likely not a natural feature. It appears to be an artificially created agricultural drain. The substrate consists of fines and it has a poorly defined bed morphology. The feature is unconfined with access to the floodplain. It is surrounded by agricultural and woodlot vegetation. The feature has been artificially entrenched. To the north the channel disappears and the watercourse is not observed again on adjacent properties. The property owner mentioned that there is a drain and that the upstream portion of the feature was backfilled and a tile-drain was installed. Multiple tile drains were also observed along the left bank of the feature which discharge into the feature. Erosion was noted at the toe, along with exposed roots that are likely due to the steepness of the slopes.	In Regime However, feature is altered and poorly defined.	Aggradation and planimetric form adjustment	555	2021-09-30	2021 Field Program - Viewed from Roadway

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Etobicoke Creek	Etobicoke Creek Headwater	Etobicoke Creek West Branch	**EC_EH_ETW_12_4**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a straight ephemeral to intermittent agricultural drain. It has a width of approximately 2.8 m and a depth of 0.3 m. The feature follows a low channel gradient and lacks a defined bed morphology. The channel is unconfined and has access to the floodplain. It is surrounded by scrubland and forested land. No erosion was noted on the day of the assessment.	In Regime	Aggradation and planimetric form adjustment followed by widening	554	Property Not Visited	Property Not Visited
								555	2021-09-30	2021 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_6b**	EC_EH_ETW_1_WC4	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The reach appears to be a straight feature that is confined based on air photo interpretation. It is surrounded by scrubland. There was no access to the feature due to fences blocking access during the 2022 visit to property 475. The reach will be further assessed in the field during later stages of the project.	No permission to enter. Assessment not completed	No permission to enter. Assessment not completed	475	Property Not Visited	Property Not Visited
Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_7**	EC_EH_ETW_1_WC5	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a meandering, permanent feature with a defined channel and a bankfull width of 5 m and depth of 0.7 m. The channel has a low to moderate gradient and well-formed pool-riffle morphology. The bed substrate is unconsolidated sediment (40 cm) on top of fines (silt, clay, sand) up to small cobble-sized material. The feature is impacted by a beaver dam in the vicinity of the proposed crossing. Up reach of the beaver dam the feature has flooded the valley floor and appears to have created a backup of pooled water. Up reach of the beaver dam the feature is 2-2.5 m wide and 0.6 m deep. Down reach of the beaver dam the feature is closer to 5.6 m wide with a depth of 0.7 m. The feature is confined but it has access to the floodplain on the valley floor. It is surrounded by scrubland. On the day of the assessment, evidence of erosion and numerous woody debris jams were noted. Potential groundwater seeps were noted adjacent to the watercourse upstream of the crossing location.	At proposed 413 crossing location: Transitional or Stressed (Borders Stable) Downstream of proposed 413 crossing location: In Adjustment	Aggradation, Widening, Degradation, Planimetric Form Adjustment, degradation	475 479	2022-05-05 2020-06-05	2022 Ministry Order 2020 Field Program
Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_8**	EC_EH_ETW_1_WC6	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is an undefined, multi-channel ephemeral feature at the crossing location. Down reach closer to Old School Road the feature appears to have sections with more defined banks however, this may be influenced by the culvert along Old School Road constraining flow. At the proposed crossing location the valley width is about 30 m. Flow occurs as small isolated pools that weave along the valley floor. The pools are no deeper than 0.2 m at the deepest. It follows a low channel gradient and it is not entrenched. The substrate consists of fines with sections of up to 10 cm of unconsolidated sediments. It appears to be partially confined and has access to the valley floor. The feature is located in a grassy valley between agricultural fields. It is surrounded by shrubs and trees and the feature itself is densely vegetated with grasses. Flow branches out across the valley floor likely controlled by vegetation. No evidence of erosion or woody debris were noted near the proposed road crossing on the day of the assessment. Down reach closer to Old School Road the feature had small amounts of erosion but this may be due to the flow getting constrained and focused to pass through the culvert along Old School Road.	Undefined feature. RGA Not Applicable	N/A	475	2022-05-05	2022 Ministry Order
Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_10**	EC_EH_ETW_1_WC7	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a sinuous undefined ephemeral feature that follows a topographic low. It is not entrenched, the bed and bank substrate consist of fines (silt, clay, sand). The feature is unconfined and has access to the floodplain. It is surrounded by agricultural fields to the west and scrubland/forested lands to the west. No evidence of erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	N/A	582	2022-07-08	2022 Ministry Order
Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_11**	EC_EH_ETW_1_WC8	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a defined, meandering, permanent feature with a bankfull width of approximately 2.1 m and a bankfull depth of 0.7 m. The feature has a moderate to steep gradient and the riffle-pool morphology is poorly defined. The bed substrate consists of fines (silt, clay, sand). It is confined and does but still has access to the floodplain. It is surrounded by scrubland and forest vegetation. Evidence of erosion and woody debris were noted on the day of the assessment.	Transitional or Stressed	Aggradation, widening, planimetric form adjustment	508 582 558	2020-07-23 Property Not Visited 2022-03-25	2020 Field Program Property Not Visited 2022 Field Program - Viewed from Roadway
Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_12**	EC_EH_ETW_1_WC10	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a defined, slightly meandering, permanent feature with a bankfull width of 2.6 m and a bankfull depth of 0.6 m. The feature has a low to steep gradient and a poorly defined riffle-pool morphology. The bed substrate consists of silt, clay, and sand. It is confined but still has access to the floodplain. It is surrounded by scrubland. Evidence of erosion and woody debris were noted on the day of the assessment.	In Regime	Widening Planimetric Form Adjustment	508	2020-07-23	2020 Field Program
Humber River	West Humber River	Campbells Cross Creek	**HU_WH_CAC_0_1**	HU_WH_CAC_0_WC1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a defined, slightly meandering, permanent feature with a bankfull width of 4.5 m and a bankfull depth of 0.9 m. The feature has a low to moderate gradient with steep banks and a poorly defined riffle-pool morphology. The bed substrate consists of silt, clay, sand, and gravel and there is up to 0.2 m of soft unconsolidated sediments on top of the substrate. Boulder sized substrate was noted in one area however it was likely artificially introduced. It is confined but it still has access to the floodplain on the valley floor. It is surrounded by scrubland and agriculture. Wetland-type vegetation surrounds the feature in the vicinity of the crossing location. Evidence of erosion and woody debris were noted on the day of the assessment.	At proposed 413 crossing location: In Regime Upstream of proposed 413 crossing location: Transitional or Stressed	Aggradation, widening, planimetric form adjustment	505 507	2020-05-06 2022-05-05	2020 Field Program 2022 Ministry Order
Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_1**	HU_WH_TWH_1_WC1.2 HU_WH_TWH_1_WC1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight, undefined ephemeral feature that is likely a buried tile drain. It lacks a defined bed morphology. It is unconfined with access to the floodplain. The feature is surrounded by agricultural crops. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	N/A	426 507	2020-05-29 Property Not Visited	2020 Field Program Property Not Visited
Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_2**	HU_WH_TWH_1_WC2.3	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is straight, entrenched intermittent system that is constrained by tile drains downstream. It has an approximate bankfull width of 4.7 m and a bankfull depth of 0.6 m. It is defined and likely has been altered for agricultural purposes. The feature has a low to moderate gradient and has a poorly defined bed morphology. The feature is unconfined and has access to the floodplain. It is surrounded by scrubland type and agriculture vegetation. No evidence of erosion or woody debris were noted on the day of the assessment.	In Regime	Aggradation, Planimetric Form Adjustment	425 586	2020-05-29 2021-09-28	2020 Field Program 2021 Field Program
Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_2a**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is straight, entrenched intermittent system that is constrained by tile drains downstream. It has an approximate bankfull width of 4.7 m and a bankfull depth of 0.6 m. It is defined and likely has been altered for agricultural purposes. The feature has a low to moderate gradient and has a poorly defined bed morphology. The feature is unconfined and has access to the floodplain. It is surrounded by scrubland type and agriculture vegetation. No evidence of erosion or woody debris were noted on the day of the assessment.	In Regime	Aggradation, Planimetric Form Adjustment	334 586	2020-05-07 2021-09-28	2020 and 2021 Field Program
Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_3**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. Vegetation is present within the feature (long grass type species), poorly developed bed morphology likely due to vegetation. A culvert (500 mm) is present mid-way through the reach and loose sediment was present at this location 500 mm. Vegetation was observed blocking the downstream side of the culvert. The feature is mainly undefined and ephemeral.	Undefined feature. RGA Not Applicable	N/A			
Humber River	West Humber River	Tributaries of West	**HU_WH_TWH_1_4**	HU_WH_TWH_1_WC2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. It is a slightly sinuous to	In Regime	Planimetric Form	338	2021-09-24	2021 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
		Humber		HU_WH_TWH_1_WC2.1	meandering, intermittent feature. It has a bankfull width of approximately 4.7 m and a depth of approximately 0.5 m. The feature is poorly defined with a moderate to steep gradient and poorly defined riffle-pool morphology. The feature is unconfined and has access to the floodplain. It is surrounded by agriculture and herbaceous vegetation. No evidence of erosion or woody debris were noted on the day of the assessment. The feature was assessed upstream of the crossing location due to lack of permission to enter.		Adjustment and Aggradation	343	2020-05-13	2020 Field Program
Humber River	West Humber River	Campbells Cross Creek	**HU_WH_ CAC_0_2a**	HU_WH_CAC_0_WC2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering, permanent feature with a bankfull width of 5 m. The feature has a bankfull depth of 0.8 m. The channel was defined with a moderate gradient and a poorly defined riffle-pool morphology. The feature is unconfined and has access to the floodplain. It is surrounded by wetland-type vegetation. Groundwater indicators were present. The bed substrate consists of fines (silt, clay, and sand) with gravel to cobble sized material. The feature had evidence of erosion and woody debris at on the day of the assessment.	At Dixie Road - In Regime	At Dixie Road - Widening, aggradation, planimetric form adjustment	405	2021-09-24	2021 Field Program
Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_1a**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature was not visible from the ROW during the 2025 assessment and was not visible in aerial imagery due to the dense forest cover. The feature is located upstream (northwest) of EC_SC_ETE_1_1 and based on its location in the watershed (uppermost branch), and the fact that EC_SC_ETE_1_1 is a ephemeral feature, it is likely that EC_SC_ETE_1_1a is also likely an ephemeral feature.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	N/A	Not visible from ROW - assessed from aerial imagery	2025-06-04	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_1**	EC_SC_ETE_1_WC1.4, EC_SC_ETE_1_WC1.5	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a straight, swale-like ephemeral feature with a width of approximately 2 m. It lacks a defined channel and has a low gradient. The bed substrate consists of fines (silt, clay, and gravel). The feature is unconfined and has access to the floodplain. It is surrounded by agricultural and herbaceous vegetation. Groundwater indicators were present. On the day of the assessment no evidence of erosion or woody debris was observed.	Undefined feature. RGA Not Applicable	N/A	386	2020-05-07	2020 Field Program
Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_1b**	No proposed crossing	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The features was not visible from the ROW during the 2025 assessment and was assessed from aerial imagery. The feature is located downstream (southeast) of EC_SC_ETE_1_1 (downstream of Speirs Griffen Ave). The upstream half of the reach is located within a dense forest on the south east side of Speirs Griffen Ave. In this portion of the reach, no feature was visible in the imagery due to the dense forest cover. A poorly defined channel is visible in the downstream half of the reach where the feature crosses through an agricultural field.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	N/A	Not visible from ROW - assessed from aerial imagery	2025-06-04	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_2**	EC_SC_ETE_1_WC1.6, EC_SC_ETE_1_WC1.7, EC_SC_ETE_1_WC1.8,	The reach is part of the Etobicoke Creek watershed in the TRCA Regulatory Area. The feature is a sinuous, ephemeral feature with a short section that seems to be intermittent that has a width of approximately 2.25 m and a depth of approximately 1.15 m. The feature has defined banks but has likely been altered to create the ponded water. The channel gradient is low and it lacks a defined bed morphology. The feature is confined (due to highway ramps) but it stull has access to the floodplain. It is surrounded by scrubland type vegetation. On the day of the assessment no evidence of erosion or woody debris was observed. The feature flows through two double barrel culverts approximately 2.25 m wide and 1.15 m tall under highway 410 and Mayfield Road. There are some small round culverts entering the channel as well in the area. The banks are protected by riprap.	Not completed - ponded water	No permission to enter. Assessment not completed.	163 383	2020-10-02 Property Not Visited	2020 Field Program - Viewed from Roadway Property Not Visited

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID		Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_5**	HU_WH_TWH_1_WC8.1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is an unconfined, straight, intermittent to ephemeral feature. To the West (upstream) past Bramalea Road the feature is undefined and appears to be a headwater type feature that likely drains the agricultural fields. The feature crosses Bramalea Road through a double-barrel plastic CSP. The feature becomes more defined within the forested section where, based on fieldwork, water ponds during spring months. To the East, the feature crosses Old School Road through a 60 cm wide CSP plastic culvert. To the East past Old School Road (downstream) the feature appears to disappear in the agricultural fields. Additionally, further downstream at the Old School Road crossing the channel is also not defined. Within the middle of the reach in the forested section near residential properties the channel is defined. In this area, it has a bankfull width of 5.5 m and a bankfull depth of 0.3 m however, this is likely an over-estimate due to the lack of a defined channel upstream and downstream of this. It has likely been altered in this section. The feature has a low channel gradient and it lacks riffle-pool bed morphology. The bed substrate consists of fines (silt, clay, and sands). The feature has access to the floodplain. The feature is surrounded by scrubland, forest, and agricultural fields. Evidence of erosion and woody debris were noted on the day of the assessment in the forested area. The watercourse has also likely been straightened. Downstream of the agricultural field a grate was noted on private property. It is assumed the feature likely flows into the grate.	In Regime	Aggradation widening, planimetric form adjustment	263	Property Not Visited	Property Not Visited
								264	Property Not Visited	Property Not Visited
								265	Property Not Visited	Property Not Visited
								266	2020-05-12	2020 Field Program - Viewed from Roadway
								268	Property Not Visited	Property Not Visited
								588	2020-07-31	2020 Field Program - Viewed from Roadway
Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_2_1**	HU_WH_TWH_2_WC1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, permanent feature with a bankfull width of 3 m and a bankfull depth of 0.55 m. On the day of the assessment the feature had a wetted width of 2.5 m and a wetted depth of 0.25 m. The feature has a defined channel morphology, has a moderate gradient, and has a well formed riffle-pool morphology. The bed substrate consists of fines (silt, clay, sand) and gravel to large cobble sized material. The feature has access to the floodplain. It is surrounded by scrubland/ meadowland. The feature contains meandering riffle-run sequences. Evidence of erosion and woody debris on the banks and in the channel were present downstream at Old School Road on the day of the assessment. The feature crosses Old School Road through a culvert that has a span of 5.8 m and a height of approximately 1.5 m	Transitional or stressed (borders stable)	Widening, degradation, Aggradation, Planimetric Form Adjustment	588	2020-09-24	2020 Field Program
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_2_1**	HU_WH_SAL_2_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was assessed from the roadway at Torbram Road. The reach is an unconfined, straight, swale-type ephemeral feature with no defined channel. It is likely a surface drainage feature across the agricultural field into a roadside drainage ditch. It follows a low channel gradient and lacks a bed morphology. The feature has access to the floodplain. It is surrounded by agricultural fields. On the day of the assessment no erosion or woody debris was noted.	Undefined feature. RGA Not Applicable	Not Applicable	590	2020-05-07	2020 Field Program - Viewed from Roadway
								621	2020-05-07	2020 Field Program - Viewed from Roadway
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_3_1**	HU_WH_SAL_3_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is an unconfined, straight, intermittent feature. It has a bankfull width of 2.7 m and a bankfull depth of 0.5 m. The watercourse appears to be surrounded by a berm-type feature. The channel is poorly defined and follows a moderate gradient with a poorly defined bed morphology. The bed substrate consists of fines (silt, clay, sand). The feature has access to the floodplain. The feature is surrounded by herbaceous and scrubland vegetation. It also has in-channel vegetation. In-channel vegetation has resulted in a multi-channel watercourse. A deep refuge pool at the culvert crossing on Old School Road was observed (dry channel with sparse standing water upstream and downstream). The watercourse feature appears to be surrounded by a berm-type feature (possible dredging). No evidence of erosion or woody debris were noted on the day of the assessment. The feature runs into a ditch downstream through an approximately 3.75 m wide concrete culvert.	In Regime	Aggradation, Planimetric Form Adjustment	239	Property Not Visited	Property Not Visited
								621	2020-05-12	2020 Field Program - Viewed from Roadway
								623	Property Not Visited	Property Not Visited
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_4_1**	Realignment has negated need for crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, ephemeral feature that is entrenched for roughly 100 m before the lower reach break where it seems to be more of a gully. In the gully section the feature has a width of approximately 0.8-1.2 m and a depth of 0.4-0.6 m. There was no flow on the day of the assessment. The feature appears to follow a topographic low and has a bed substrate of fines to file gravel sized material. The bank angle is steep where it is entrenched. No defined bed morphology was observed. It is likely that agricultural activities have impacted the feature. The feature has access to the floodplain beyond the entrenched banks but is limited by the valley walls. It is surrounded by grassy and herbaceous vegetation. There was evidence of erosion on the day of the assessment in the entrenched portion of the feature (bank toe erosion)	Undefined feature. RGA Not Applicable	Not Applicable	236	2022-06-29	2022 Field Program
								251	Property Not Visited	Property Not Visited
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_5_1**	HU_WH_SAL_0_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The upper portion of the reach is located within an agricultural field with a small riparian buffer of herbaceous vegetation. The channel is filled with herbaceous vegetation and the feature is difficult to identify. The channel is only defined midway where the slope is steeper. Becomes undefined again when the slope decreases. The feature's corridor has likely been altered by the adjacent agricultural activities. No bed morphology in the upper section of the reach. Closer to Airport Road, and upstream of an access driveway, a wetland/marsh is present upstream of the driveway crossing. This is likely the result of elevated and perched culverts. Downstream of the culvert the reach is defined and has a meandering nature. In this section, bed substrates range from gravel to small boulder in size. Grasses present on riparian zone. Bed morphology is primarily runs and riffles. A scour pool is present downstream of perched culverts.	Undefined feature. RGA Not Applicable	Not Applicable	253	2024-05-28	2024 Field Program
								234	2020-07-31	2020 Field Program
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_0_1**	Realignment has negated need for crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous, permanent feature with a bankfull width of 3.4 m and a bankfull depth of 0.5 m. The channel is defined and follows a low to moderate channel gradient with a riffle-pool morphology. The bed substrate consists of fines (silt, clay, sand) and gravel to cobble sized material. The feature has access to the floodplain. It is surrounded by herbaceous vegetation. Minor evidence of erosion was noted on the day of the assessment however no woody debris was noted. At the upstream end of the feature there is a man-made weir that holds back flow and is causing flooding in the property upstream (2x4 wood berm). At the Airport Road crossing the feature passes through an open bottom box culvert that measures 2.8 x 1.7 m.	In Regime	Aggradation, Planimetric Form Adjustment	251	2020-05-12	2020 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID		Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_0_2**	HU_WH_SAL_0_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, slightly sinuous, multi-channel, intermittent feature with a bankfull width of 3.5 m and a bankfull depth of 0.3 m. It has a defined channel that follows a low to moderate gradient with a well-formed riffle-pool morphology. Bed material consists of fines (silt, clay, sand), and gravel to cobble sized material. It is slightly entrenched. The feature has access to the floodplain. It is surrounded by scrubland. Evidence of erosion (exposed roots, areas of undercutting) and woody debris were noted on the day of the assessment. The feature crosses Airport Road through a culvert. Upstream of the culvert there is a deep pool that is densely vegetated that likely formed due to backwater. The pool feature has a bankfull width of 6.4 m and a bankfull depth of 1.25 m. This watercourse was assessed previously as part of the Airport Road widening project.	Transitional or Stressed (borders Stable)	Aggradation, Planimetric Form Adjustment, Widening	244 / 246	2020-07-31	2020 Field Program
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_0_3**	Realignment has negated need for crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous, permanent feature. It appears to be two-staged and it is suspected that it was likely altered to form the two-stage channel. The upper bankfull width is 7.3 m with a depth of 0.6 m and the lower bankfull width is 1.5-2 m with a depth of 0.45 m. The channel is defined and follows a moderate channel gradient with a well-developed pool-riffle bed morphology. The bed substrate consists of fines (silt, clay, sand) with gravel to cobble sized material. The feature has access to the floodplain. It is surrounded by herbaceous material. Evidence of erosion was noted on the day of the assessment (leaning trees, exposed roots) however no woody debris was noted.	In Regime	Planimetric Form Adjustment, Widening Aggradation	236 239 596	Property Not Visited Property Not Visited 2020-05-13	Property Not Visited Property Not Visited 2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_1**	HU_WH_WHT_1_1_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, ephemeral feature. It is undefined with a feature width of approximately 0.5 m. The bed substrate consists of fines (silt, clay, gravel). The feature follows a low channel gradient and lacks a bed morphology. There was no flow on the day of the assessment although it looks like the feature has likely been straightened. The feature has access to the floodplain. It is surrounded by agricultural vegetation. No evidence of erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	426 507 483	Property Not Visited Property Not Visited 2020-05-29	Property Not Visited Property Not Visited 2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_3**	HU_WH_WHT_1_2_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, ephemeral feature. It is undefined with a feature width of approximately 0.5 m. The bed substrate consists of fines (silt, clay, gravel). The feature follows a low channel gradient and lacks a bed morphology. There was no flow on the day of the assessment although it looks like the feature has likely been straightened. The feature has access to the floodplain. It is surrounded by agricultural vegetation. No evidence of erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	483	2020-05-29	2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_4**	HU_WH_WHT_1_3_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, swale-type ephemeral feature. It is undefined with a width of approximately 5 m. The bed substrate consists of fines (silt, clay, gravel). The feature follows a low channel gradient and lacks a bed morphology. There was no flow on the day of the assessment although it looks like the feature has likely been straightened. The feature has access to the floodplain. It is surrounded by agricultural vegetation. No evidence of erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	483	2020-05-29	2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_5**	HU_WH_WHT_1_5_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous, swale-type ephemeral feature. The feature is approximately 2.5-4 m wide. It is undefined. The bed substrate consists of fines (silt, clay, gravel) and it has an undefined channel morphology. The feature has access to the floodplain. It is surrounded by meadowlands and agricultural vegetation. The feature is densely vegetated. The feature gets slightly more defined further upstream however this is likely due to modification for agricultural activity. A pond has also been formed upstream. Downstream the feature crosses Healey Road through a culvert measuring 1.25 x 0.8 m. Beyond this, the feature is a multi-channel swale-like feature.	Undefined feature. RGA Not Applicable	Not Applicable	367	2021-09-24	2021 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_6**	HU_WH_WHT_1_6_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. Overall, the feature appears to be an unconfined, sinuous, ephemeral feature. It follows a low channel gradient and the bed substrate consists of fines (silt, clay, sand). The feature has access to the floodplain. It is surrounded by agricultural vegetation. The feature was assessed upstream of the crossing location off of Healey Road where The feature passes through Healey Road via a culvert CSP measuring 0.58 x 0.47 m. Downstream of Healey Road no channel was observed.	Undefined feature. RGA Not Applicable	Not Applicable	295 370 371	Property Not Visited 2021-09-24 2021-09-24	Property Not Visited 2021 Field Program - Assessed from Roadway 2021 Field Program - Assessed from Roadway
Humber River	West Humber River	West Humber River	**HU_WH_WHR_3_1**	HU_WH_WHT_1_7_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight to slightly sinuous, swale-like ephemeral feature with no defined channel. The width of the feature is about 8 m wide and it drains into a roadside a roadside drainage ditch along The Gore Road that was dry on the day of the assessment. The feature follows a low gradient and has a poorly defined bed morphology. The bed substrate consists of fines (silt, clay, and sand). The feature has access to the floodplain. It is surrounded by agricultural vegetation. No erosion or woody debris were noted on the day of the assessment. The culvert along The Gore Road is a CSP pipe measuring 900 m wide and it was noted to have collected sediment (fines to gravel sized material) on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	295 604	2021-09-21 2020-07-29	2021 Field Program 2020 Field Program - Assessed from Roadway
Humber River	West Humber River	West Humber River	**HU_WH_WHR_3_1a**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was not visible from the ROW and was assessed in 2025 from aerial imagery. The feature was not visible in the aerial imagery which suggests that it is an undefined to poorly defined feature that follows a topographic low. Flow drains in a southeast direction through a narrow corridor between adjacent residential and agricultural properties based on watercourse data from the TRCA. The reach ends at the online inlet to a small pond that is approximately 22 x 40 m in size.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Humber River	West Humber River	West Humber River	**HU_WH_WHR_3_1b**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was not fully visible from the ROW and was assessed in 2025 from aerial imagery. The feature was not visible in the aerial imagery which suggests that it is an undefined to poorly defined feature that follows a topographic low. The feature begins at a small pond that is approximately 22 x 40 m in size and flows in a southeast direction through agricultural fields with a narrow riparian buffer comprised of grasses and minimal shrubs and trees.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	Not Applicable	Viewed from ROW	2025-06-04	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID		Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	West Humber River	West Humber River	**HU_WH_WHR_4_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, slightly sinuous, swale-like ephemeral feature with poorly defined bad and banks. The feature is located within an agricultural field.	Undefined feature. RGA Not Applicable	Not Applicable	619	2020-05-29	2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_0_2**	HU_WH_WHR_0_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a confined, slightly meandering, permanent feature with a bankfull width of approximately 8.5 m and a bankfull depth of 0.75 m. The feature has a defined channel with a moderate gradient and well-formed pool-riffle morphology. The bed substrate consists of fines (silt, clay, sand) to cobble-sized material. The feature is confined but has access to the floodplain along the valley floor. It is surrounded by scrubland type vegetation. Evidence of erosion (scour and leaning fences) and woody debris along the banks of the feature were noted on the day of the assessment.	In Regime (borders Transitional)	Widening, aggradation, planimetric form adjustment	619	2020-05-29	2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_0_3**	HU_WH_WHR_0_3	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering, permanent feature. It has a bankfull width of approximately 5-10 m and a bankfull depth of about 1.5 - 2.5 m. On the day of the assessment the feature had a wetted width of 2-5 m and a wetted depth of 0.3 - 0.6 m. It follows a low channel gradient and it is entrenched. Bed substrate consists of fines (silt, clay, sand) with cobbles to small boulder sized material and bank substrate consists of fines. There are sections with 10 cm thick unconsolidated sediments upstream close to a beaver dam. The bank angle is steep throughout the reach. The pool-riffle morphology is poorly defied in some sections and is absent upstream. The feature does not appear to have been straightened. The feature is partially blocked by a beaver dam at the upstream end of the proposed crossing location. The feature is confined but has access to the floodplain beyond entrenched banks. It is surrounded by grasses and herbaceous material. Erosion in the form of bank slumping, bank scour, medial bars, abandoned oxbow lakes, overbank deposition, cracks in the top of the bank, and embedded sediment was observed. Minor woody debris was also noted on the day of the assessment.	Upstream of proposed 413 crossing location: In Regime At proposed 413 crossing location: In Adjustment	Upstream of proposed 413 crossing location: Aggradation, widening, planimetric form adjustment At proposed 413 crossing location: Widening, aggradation, degradation, and planimetric form adjustment	465 603 613	Property Not Visited 2021-09-20 2022-06-29	Property Not Visited 2021 Field Program 2022 Field Program
Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_0_2**	HU_WH_GRT_0_1, HU_WH_GRT_0_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous and multi-channeled, intermittent feature. It has a width of approximately 4 m and a wetted width of 0.3 m. The channel is poorly defined and has a low gradient. No bed morphology was observed and the bed substrate consists of fines (silt, clay, sand). The feature has access to the floodplain. It is surrounded by scrubland. Evidence of erosion (scour, slumping banks) and woody debris were noted on the day of the assessment.	Transitional or Stressed (poorly defined)	Aggradation, planimetric form adjustment, widening	460	2020-06-05	2020 Field Program
Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_2_1**	HU_WH_CDT_2_1, HU_WH_CDT_2_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight, undefined, ephemeral feature that is approximately 2 m wide. It follows a low channel gradient, is not entrenched, and has a bed substrate consisting of fines (silt, clay, sand). It lacks a defined bed morphology. The feature is unconfined and has access to the floodplain. It is surrounded by meadowland and scrubland, and it is adjacent to agriculture. There is densely vegetated herbaceous riparian vegetation immediately surrounding the feature. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened by human activities.	Undefined feature. RGA Not Applicable	Not Applicable	533	2021-09-20	2021 Field Program
Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_2_1a**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was not visible from the ROW. The feature was assessed in 2025 from aerial imagery. The feature was not visible in the aerial imagery which suggests that it is an undefined to poorly defined feature that follows a topographic low. Based on watercourse data from the TRCA, the feature is unconfined with access to the floodplain and is surrounded by agricultural vegetation. Agricultural crops are also planted through the feature, suggesting that the feature is likely dry during growing seasons.	Undefined feature. RGA Not Applicable	Not Applicable	Not visible from ROW - assessed from aerial imagery	2025-06-11	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_2_1b**	No proposed crossing	The reach is part of the Humber River watershed within the TRCA Regulatory Area. Due to a lack of PTE, the feature was assessed from the ROW where it was identified to be a straight, permanent channel with no connectivity to the adjacent floodplain at the bankfull stage. The feature has a bankfull width and depth of approximately 1 – 2.5 m and 0.2 – 0.5 m, respectively. The flow was noted to be slowly moving on the day of the assessment and the wetted width and depth were 0.2 – 1.5 and 0.1 – 0.2 m, respectively. The channel bed substrate consisted primarily of silt, coarse sands, and gravel, with occasional deposits of cobble. Notably, the gravel and cobble materials appear to be anthropogenic in origin, likely introduced through recent construction activities in the area. Bank heights were estimated to be between 0.5 - 1.0 m, followed a steep slope, and were covered in placed gravels and cobbles (fill). The culvert outlet under Mayfield Road could not be located, and most likely was buried. Localized bank erosion downstream of Mayfield Road was observed and was attributed to the influence recent construction activities. The reach also includes a culvert crossing beneath a residential driveway, which may influence flow dynamics and sediment transport. Some instream vegetation was also present on the day of the assessment.	In Regime (assessed from ROW)	Aggradation, degradation planimetric form adjustment, widening.	Viewed from ROW	2025-06-05	2025 Field Program - Viewed from Roadway
Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_0_2**	HU_WH_CDT_0_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a confined, sinuous, permanent feature with a bankfull width of 4.2 m and a bankfull depth of 0.8 m. The feature has a defined channel with a low to moderate gradient and poorly formed to well-developed riffle-pool morphology. Bed substrate consists of fines and cobbles. The feature is confined and only has access to the floodplain during high flow events. It is surrounded by scrubland and was identified to contain dense herbaceous vegetation covering the riparian zone. A portion of the feature crosses through marsh-type vegetation. Here the feature appears to be 30-40 m wide although the watercourse itself is 3-4 m wide and meanders through the marsh area. Erosion and minor woody debris were noted on the day of the assessment along the entire watercourse. Downstream of the crossing at Mayfield Road there is a concrete box culvert that is 5 m wide and 15 m tall with erosion along the outer right bank. There is an accumulation of sediment within one half of the culvert. Dumped riprap was observed upstream of a concrete box culvert and downstream of culvert concrete fragments are visible on the channel bed.	In Regime	Planimetric Form adjustment, widening, aggradation	33 536	2020-08-05 2021-09-20	2020 Field Program 2021 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID		Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	West Humber River	Rainbow Creek	**HU_MH_RAI_1_1**	HU_MH_RAI_1_1_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous, swale-type ephemeral feature with an approximate feature width of 5.3 m. It has a poorly defined bed morphology and has a low channel gradient. The bank and bed substrate consists of fines (silt, clay, sand). The feature has access to the floodplain. It is surrounded by herbaceous vegetation and agriculture. Feature also contains in-channel vegetation. No erosion or woody debris were noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	162	2020-06-10	2020 Field Program
Humber River	West Humber River	Rainbow Creek	**HU_MH_RAI_1_2**	HU_MH_RAI_1_2_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, straight, swale-type ephemeral feature with an approximate width of 6 m and a depth of 0.25 m. It has a poorly defined bed morphology and has a low channel gradient. The bank and bed substrate consists of fines (silt, clay, sand). The feature has access to the floodplain. It is surrounded by herbaceous vegetation and agriculture. No erosion or woody debris were noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	37 / 192	2020-06-10	2020 Field Program
Humber River	West Humber River	Rainbow Creek	**HU_MH_RAI_1_3**	HU_MH_RAI_1_3_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous, intermittent feature with a bankfull width of 4.4 m and a bankfull depth of 0.5 m. It has a defined channel with a low to moderate gradient and a poorly defined bed morphology. The bed substrate consists of fines (silt, clay, sand) to cobble-sized material. The feature has access to the floodplain but was noted to be slightly entrenched in some sections. The feature is surrounded by agricultural vegetation. In-channel vegetation was also noted. Erosion was noted on the day of the assessment along the outer bends of the channel although no woody debris was noted.	In Regime	Aggradation, Planimetric Form Adjustment	37	2020-06-10	2020 Field Program
Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_0_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed crossing for the reach however, it is located within the Study Area. The feature is an unconfined, straight, intermittent to permanent channel flowing along a vegetated corridor placed between two agricultural fields. The reach appears to have been altered by the adjacent agricultural activities. More than one channel was present within the corridor. Given the observed conditions and alterations, determining a bankfull was not feasible. A perched culvert and soft sediment accumulation along the feature were observed.	In Regime. Results at the time of the assessment might be influenced by anthropogenic alterations to the watercourse as interpreted by evidence in the field and historical assessment.	Not Applicable	460	2024-03-15	2024 Field Program
								603	2024-03-15	2024 Field Program
Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_3_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a small meandering channel constrained within a corridor surrounded by an agricultural field. At time of assessment flow and sediment transport were observed. The feature appears to be actively meandering within the corridor. Small banks and recently deposited sediments were observed during the assessment. The hydrological regime is likely ephemeral to intermittent. The feature is unconfined with access to the floodplain.	In Regime	Planimetric form adjustment	460	2024-03-15	2024 Field Program
Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_3_2**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a small meandering channel constrained within a corridor surrounded by an agricultural field. At time of assessment flow and sediment transport were observed. The feature appears to be actively meandering within the corridor. Small banks and recently deposited sediments were observed during the assessment. The hydrological regime is likely ephemeral to intermittent. The feature is unconfined with access to the floodplain.	In Regime	Planimetric form adjustment	603	2024-03-15	2024 Field Program
								460	Property Not Visited	Property Not Visited
Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_3_3**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a small meandering channel constrained within a corridor surrounded by an agricultural field. At time of assessment flow was present and sediment transport were observed. The feature appears to be actively meandering within the corridor. Small banks and recently deposited sediments were observed during the assessment. The downstream portion of the feature becomes less defined and the flow disperses overland on an area where there is evidence of plowing/tilling. The hydrological regime is likely ephemeral to intermittent. The feature is unconfined with access to the floodplain.	In Regime	Planimetric Form Adjustment, Widening	460	2024-03-15	2024 Field Program
Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_4_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, meandering, ephemeral to intermittent feature with a poorly defined bed morphology. At time of assessment flow was present and sediment transport were observed. The feature appears to be actively meandering within a corridor surrounded by agricultural crops. Small banks and recently deposited sediments were observed during the assessment. The downstream portion of the feature becomes less defined and the flow disperses overland on an area where there is evidence of plowing/tilling. The upstream portion of the feature is less defined and flows through a sinuous topographic low. It also appears that the feature has been tilled/plowed over on the upstream portion.	In Regime (downstream portion)	Planimetric form adjustment	603	2024-03-15	2024 Field Program
								460	Property Not Visited	Property Not Visited
Humber River	West Humber River	West Humber River	**HU_WH_WHR_0_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. The feature is a defined, meandering, permanent feature with a bankfull width of approximately 7 m. The feature follows a moderate channel gradient and has a poorly defined riffle-pool morphology. No erosion was noted during the assessment. The feature was assessed form the roadway as there was no permission to enter.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	370	2020-05-08	2020 Field Program - Assessed from Roadway
Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_2**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight, undefined, ephemeral feature that follows a low channel gradient and has no defined bed morphology. The channel is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	483	2020-05-29	2020 Field Program
Humber River	West Humber River	West Humber River	**HU_WH_WHR_5_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. Based on air photo interpretation, the feature is confined. The feature has not been assessed in the field.	No permission to enter. Assessment not completed.	No Permission to enter. Assessment not completed.	619	Property Not Visited	Property Not Visited
Humber River	West Humber River	Salt Creek	**HU_WH_SAL_5_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight, undefined, ephemeral feature that follows a low channel gradient (locally it is steep). It has a poorly defined bed morphology and it is unconfined with access to the floodplain. The feature is surrounded by scrubland type riparian vegetation. The assessment was performed upstream of the proposed crossing location due to no permission to enter. No erosion was noted where the feature was assessed.	Undefined feature. RGA Not Applicable	Not Applicable	234	2020-07-31	2020 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID		Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_0_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering intermittent feature with a bankfull width of approximately 3 m and a depth of 0.7 m. The waters were very turbid on the day of the assessment. It is surrounded by herbaceous and woody vegetation and has in-channel vegetation.	In Regime (borders Transitional)	Not completed	536	2021-09-20	2021 Field Program
Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_3_4**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach however, it is located within the Study Area. The feature is an unconfined straight feature. It feature has not been fully assessed in the field.	No permission to enter. Assessment not completed.	No permission to enter. Assessment not completed.	322	Property Not Visited	Property Not Visited

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_1_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an undefined straight swale-type ephemeral feature. It follows a low bed slope and does not have a defined bed morphology. It is unconfined with access to the floodplain and is surrounded by agricultural land. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not applicable	727	2022-04-22	2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an undefined sinuous swale-type ephemeral feature. It follows a low bed slope and does not have a defined bed morphology. It is unconfined with access to the floodplain and is surrounded by agricultural land. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not applicable	47	2020-06-11	2020 Field Program - Viewed from Roadway
								123	2020-07-28	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_2**	HU_MH_ROB_3_0	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an undefined straight swale-type ephemeral feature. It follows a low bed slope and does not have a defined bed morphology. It is unconfined with access to the floodplain and is surrounded by agricultural land. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not applicable	123	2020-07-28	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_3**	HU_MH_ROB_3_3_1 HU_MH_ROB_3_3_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a swale-type ephemeral feature that was difficult to locate in the field due to the abundant vegetation. It follows a low channel gradient and lacks defined banks. It also has a poorly defined bed morphology. It is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. No erosion or woody debris was noted on the day of the assessment. There is some ponding in the middle of the feature which may have been artificially created.	Undefined feature. RGA Not Applicable	Not applicable	123	2020-07-28	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_4**	HU_MH_ROB_3_4_1, HU_MH_ROB_3_4_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight swale-type ephemeral feature with a width of approximately 1.5 m and a depth of 0.3 m. The channel is poorly defined and appears to be man-made or manipulated (agricultural drain). It looks like it has been altered, especially downstream of Highway 50. It follows a low channel gradient and lacks a defined bed morphology. The bed and channel substrate consists of fines (silt, clay, and sand). The feature is unconfined and has access to the floodplain. It is surrounded by agriculture (soy) and scrub land-type vegetation. No erosion or woody debris was noted on the day of the assessment. Only a short distance downstream of Highway 50 the channel is vegetated with no/ poorly defined morphology.	Undefined feature. RGA Not Applicable	Not Applicable	123	2020-07-28	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_5**	HU_MH_ROB_3_1 HU_MH_ROB_3_5	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight swale-type ephemeral feature. It has a low channel gradient and a poorly defined bed morphology. Downstream of Highway 50 the feature appears to have been altered. Here, the feature seems to be slightly defined with an approximate width of 1.6 m and an approximate depth of 0.28 m where the feature is defined downstream. The bed substrate consists of fines (sit, clay, sand), and gravel to cobble sized material. The feature is unconfined and has access to the floodplain. It is surrounded by herbaceous vegetation with some shrubs and agricultural vegetation. No erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	Not Applicable	129	2020-06-10	2020 Field Program
								807	2020-06-11	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_6**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous ephemeral to intermittent feature. Isolated pools of water have an apparent width of approximately 4.8 m and a depth of 0.24 m. The feature follows a steep (at the upstream end) to low (at downstream end) channel gradient and lacks a defined riffle-pool bed morphology. It is unconfined with access to the floodplain. It is surrounded by agricultural land. Erosion was noted upstream where the feature had a steeper channel gradient.	Undefined feature. RGA Not Applicable	Not Applicable	863	2020-07-09	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_7**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous ephemeral to intermittent feature. The feature follows a low channel and lacks a defined riffle-pool bed morphology. It is unconfined with access to the floodplain. It is surrounded by agricultural land. Fines and small gravel were present.	Undefined feature. RGA Not Applicable	Not Applicable	863	2020-07-09	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_8**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach and therefore it is outside of the 2022 Study Area. The feature is a meandering intermittent feature that is approximately 2-5 m wide and 0.6 m deep. It follows a low to moderate channel gradient and substrate consists of fines with gravel and boulder sized material. It is confined due to the entrenched banks but has access to the floodplain beyond entrenched banks. It is surrounded by agricultural and scrubland-type vegetation. Where the feature is surrounded by scrubland-type vegetation the feature is more defined and is entrenched (possibly artificially entrenched). There is a culvert at the property boundary that is made of CSP and is approximately 1 m wide. Here the feature has been hardened with placed concrete slabs. Erosion was noted on the day of the assessment.	In Regime	Widening and planimetric form adjustment	770	2022-07-07	2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_9**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach and it is just outside of the Study Area. The feature is a defined meandering intermittent feature with a bankfull width of approximately 3 m and a depth of 0.17 m. The feature has a moderate channel gradient and no defined riffle-pool morphology. It is confined within a valley but it still has access to the floodplain. It is surrounded by scrubland type riparian vegetation. Erosion was noted on the day of the assessment.	In Regime	Widening, aggradation, planimetric form adjustment	753	2020-07-08	2020 Field Program
								775	2021-09-21	2021 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_4_1**	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous intermittent feature with a bankfull width of 2.9 m and a bankfull depth of 0.1 m. The feature is defined on the property that it was assessed from but directly downstream from the property the channel loses its definition. The defined portion appears to have been altered for agricultural purposes. It follows a low to moderate channel gradient. The feature lacks a bed morphology. The bed substrate consists of fines (silt, clay, sand) up to small gravel. The clay bed is exposed in areas and there are rills on the banks. The feature is unconfined and has access to the floodplain. It is surrounded by agricultural vegetation with no riparian buffer. No evidence of erosion or woody debris was noted on the day of the assessment. The upstream end of the reach looks like it has been straightened, likely for agricultural purposes.	Transitional or stressed	Aggradation, planimetric form adjustment, and degradation	863	2020-06-11	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach and therefore it is outside of the Study Area. The feature is a defined meandering permanent feature with a bankfull width of approximately 5.6 m and a depth of 0.58 m. The feature has a moderate channel gradient and defined riffle-pool morphology. Undercut banks, exposed roots, fallen trees and debris/jams were also observed. Bed and bank substrates consisted of clay, silt and sand up to gravel and small cobbles.	In Regime	Aggradation, planimetric form adjustment, widening	753	2020-07-08	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_2**	HU_MH_ROB_0_5	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous	Transitional or Stressed	Aggradation, planimetric	753	2020-07-08	2020 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
					to meandering intermittent feature with a bankfull width of 4.8 m and a bankfull depth of 0.6 m. The channel is defined and follows a moderate channel gradient. It has a poorly defined bed morphology. The bed and channel substrate consists of fines (silt, clay, sand). The feature is confined within a valley but has access to the floodplain along the valley floor. It is surrounded by dense riparian vegetation (scrubland type). The feature also hosts dense in-channel vegetation. Evidence of groundwater discharge was noted in the field. Evidence of erosion and woody debris were noted on the day of the assessment. The feature is not entrenched.		form adjustment, widening	872	2021-09-21	2021 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_3**	HU_MH_ROB_0_5	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a meandering intermittent feature with no flow on the day of the assessment. It had defined banks with a bankfull width of 4.5 m and a bankfull depth of 0.6 m. The feature is not entrenched and has a bed substrate consisting of fines with gravel. It did not have defined pool-riffle spacing. The feature is unconfined and has access to the floodplain. It is surrounded by scrubland. No evidence of erosion was noted on the day of the assessment however abundant woody debris was present.	In Regime	Widening and planimetric form adjustment	770	2022-07-07	2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_5**	HU_MH_ROB_0_1., HU_MH_ROB_0_2, HU_MH_ROB_0_4	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous permanent feature with a bankfull width of approximately 3.5 m and a bankfull depth of 0.7 m. The channel has defined banks and follows a moderate channel gradient. It has a poorly-formed pool-riffle morphology. The bed and bank substrate consists of fines (silt, clay sand) and gravel to cobble sized material. The feature is multi-channel in sections. The feature is unconfined and has access to the floodplain. It is surrounded by scrubland type vegetation. Evidence of erosion (undercutting along the outer banks and bank failure noted in the reach) and woody debris were noted on the day of the assessment. The feature is slightly entrenched upstream. It has possibly been straightened upstream due to agricultural practices.	Transitional or stressed	Widening, aggradation, planimetric form adjustment, degradation	892	2020-06-29	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_6**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous permanent feature with an estimated bankfull width of approximately 3.5 m and a bankfull depth of 0.45 m. The channel is defined meandering feature flowing through herbaceous vegetation. No erosion identified on day of assessment. At Nashville Road flow is conveyed through a 3100 mm concrete box culvert. Slight backwatering at crossing noted on day of inspection likely due to beaver activity. Channel becomes multichannel further downstream.	In Regime	Widening and planimetric form adjustment	872	2021-09-21	2020 and 2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_7**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is confined to a valley. It splits at this point. The west branch becomes less defined and loses any bank definition as it flows onto the valley floor and the water disperses forming a shallow pool. Entire feature here is about 4-6 m wide and ~20 cm deep. Abundant in channel vegetation. The west branch looks to be ephemeral in nature. Substrate consists of fines. In channel grassy vegetation. The east branch conveys most of the flow through a densely vegetated channel that has submerged banks. The bankfull width 6-8 m is the bankfull depth is ~30 cm (submerged) and at its deepest point the wetted depth is 60 cm deep. The east branch looks to be intermittent here. Substrate consists of fines. In channel grassy vegetation	Not completed		872	2022-07-04	2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_8**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature appears to have been artificially straightened in sections. The feature has poorly defined riffle-pool morphology. Erosion can be seen on east bank where two features meet (scour and exposed roots). Banks are vegetated with grasses. Bankfull width was measured at approximately 3.6 m and a bankfull depth at 0.45m. Wetted width was approximately 2.2 m and a wetted depth of 0.25 m. Hydrological regime appears to be permanent. The feature has access to valley floor (floodplain) and has a sinuous platform (has likely been altered). Further downstream banks are higher (0.5 m). Flows through double barrel metal culvert measuring 90 cm width each. Boulders present immediately downstream of the culvert. Erosion on inner banks of channel downstream of the culvert (undercutting). Slumped bank material in center of channel. Multiple slumps on runs and outer meanders.	Transitional or Stressed	Aggradation, widening, degradation, and planimetric form adjustment	872	2022-07-04	2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_5_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a defined but possibly altered feature for agricultural practices. Gravel and finer material on bed with some cobble. Larger sediments appear to sink into bed in places due to fine sediment. Poorly defined bed morphology but channel is fairly uniform in width. A tractor crossing is present through channel.	Undefined feature. RGA Not Applicable	Not applicable	863	2020-07-09	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_6_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was a sinuous, ephemeral, poorly defined and likely altered feature. A culvert (1.24 m wide) is present under the adjacent at railway. Water was observed in the culvert but not downstream. The feature is defined downstream of the culvert but further downstream appears to be impacted by agricultural practices and lacks definition. Vegetation was present within the channel, which also lacks a defined bed morphology. The channel width ranged from 1.8 to 3 m. The feature was revisited in 2025 and assessed from Huntington Rd (upstream reach break). A this location the feature is a sinuous, ephemeral undefined feature that follows a topographic low within an agricultural field. No flow was observe on the day of the assessment.	Undefined feature. RGA Not Applicable	Not applicable	885 Viewed from ROW	2020-07-24 2025-06-06	2020 Field Program 2025 Field Program - Viewed from Roadway
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_6_2**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. Sinuous ephemeral feature about 8-10m wide. Wetted width is about 2 m and the depth is about 10-30cm (at the deepest portion). Channel is vegetated. Flow is present. Access to floodplain. Channel undefined with no defined banks. Unconfined. Follows topographic low.	Undefined feature. RGA Not Applicable	Not applicable	859 872 874	2020-07-24 2022-04-22 2020-07-24	2020 and 2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_2_1**	HU_MH_ROB_8_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous, ephemeral feature that follows a topographic low with a low channel gradient. It lacks a defined channel but the feature wetted width was approximately 1.5 m. The bed substrate consists of fines (silt, clay, sand). The feature is unconfined and has access to the floodplain. It is surrounded by agricultural vegetation and scrubland. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened due to agricultural activities.	Undefined feature. RGA Not Applicable	N/A	727	2022-04-22	2022 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_1**	HU_MH_ROB_7_1_1, HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_3, HU_MH_ROB_7_1_4,	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is an unconfined, sinuous permanent feature with a bankfull width of 3 m and a bankfull depth of 0.1 m. The channel has defined banks and follows a moderate channel gradient. It has a well-formed pool-riffle morphology. The bed and substrate consists of fines (silt, clay, sand) and gravel. The feature is entrenched 1-2 m but has access to the floodplain beyond entrenched banks. It is surrounded by scrubland, agricultural crops, and herbaceous type vegetation including small trees and shrubs. There is also in-channel vegetation for a portion of the feature. Evidence of erosion was noted on the day of the assessment (undercutting and exposed roots) however no woody debris was noted.	In Regime	Aggradation, widening, planimetric form adjustment	892	2020-06-29	2020 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_2**	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering, intermittent, defined feature. It has a bankfull width of 2 m and a bankfull depth of 0.3 m. On the day of the assessment the feature had a wetted width of 1.6 m and a wetted depth of 0.25 m. It follows a low to moderate channel gradient and it is not entrenched. The bed substrate consists of fines. The feature is confined with access to the valley floor. It is surrounded by grasses and there is in-channel vegetation (grasses). On the day of the assessment no woody debris or erosion was noted.	In Regime	Widening and planimetric form adjustment	792	2022-05-06	2022 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_3**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. The reach is a meandering watercourse of permanent hydrological regime located within a wide valley. The feature has access to the floodplain, but flows close to the right (west) valley wall. The feature has steep banks (0.8 - 0.9 m) that appear to be undercutting and actively eroding throughout. Signs of bed downcutting were observed in the lower portion of the reach. The feature has a low to moderate gradient with a riffle-pool morphology present. In sections of the reach, the bankfull was observed to be below the top of bank and at least one fracture mark was observed on the banks. Bankfull width was measured at approximately 0.8 - 1.0 m and bankfull depth at approximately 0.5-0.6 m. Wetted width was measured at approximately 0.4 - 0.7 m and the depth at approximately 0.05 - 0.4 m at the time of the assessment. Riparian vegetation throughout this reach was dominated by grasses and shrubs and substrate was fine to boulders.	In Regime (bordering Transitional to Stressed)	Widening	792	2024-03-21	2024 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_5**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach however, it is located within the Study Area. The reach is an undefined ephemeral feature that appears to follow a low topographic point and is surrounded by grasses and shrubs. In the lower portion of the reach sheet flow was observed. A 300 mm culvert was also present within the field. There were no significant signs of erosion at the time of the assessment.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	792	2024-03-21	2024 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_5a**	HU_MH_ROB_7_2_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is an undefined ephemeral feature that appears to follow a low topographic point and is surrounded by grasses and trees. There is in-channel vegetation. The watercourse follows a relatively straight path along a low channel gradient and appears to be more of a drainage ditch than a natural channel. The bed substrate consists of fines and gravel.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	792	2024-03-21	2024 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_6**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach however, it is located partially within the Study Area. The reach is an unconfined sinuous ephemeral feature. Not clearly visible during the 2024 Field Program	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	914	2024-03-21	2024 Field Program
Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_4**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach however, it is located within the Study Area. The reach is a sinuous, poorly defined channel that follows a topographic low point within an agricultural field. Low flow and rill type erosion was observed at the time of the assessment. The hydrological regime is likely ephemeral and the feature morphology is likely altered by the onsite agricultural activities.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	914	2024-03-21	2024 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_0_1**	HU_MH_MHR_0_1, HU_MH_MHR_0_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering permanent feature with a bankfull width of 15.8 m and a bankfull depth of 1.0 m. The feature has a defined channel, follows a moderate to steep channel gradient, and has a well-formed riffle-pool morphology. The bed substrate consists of fines (silt, clay, sand) and gravel to cobble-sized material and the bank substrate consists of fines. The feature is confined but is connected to the floodplain. Some areas of the feature appear to be entrenched. It is surrounded by herbaceous vegetation, deciduous trees with some coniferous, and shrubs. Erosion and woody debris were noted on the day of the assessment. Erosion includes a large erosion scar at the upstream end of the reach, a large gravel bar formed downstream of a bend, partial debris jams, exposed banks and undercutting, fallen vegetation, and erosion scars along much of the reach.	Transitional or stressed	Widening, Aggradation, Planimetric Form Adjustment	824 / 890	2020-06-19	2020 Field Program
Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_1**	HU_MH_HRT_3_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous to straight ephemeral to wetland-type feature. The feature is undefined except for a small section that is defined at the Kirby Road crossing. Here the feature has an approximate width of 3.5 m and a depth of 0.25 m. The feature follows a low channel gradient. It does not have a defined bed morphology. The feature is confined within a valley area that is 40 m wide and has access to the floodplain within the confined valley. Herbaceous vegetation, shrubs, and trees surround the feature. Erosion and woody debris were noted on the day of the assessment. The feature crosses Kirby Road through a 900 mm corrugated CSP culvert. The channel has been hardened near the crossing with gabion baskets. The feature has possibly been straightened.	Undefined feature. RGA Not Applicable	N/A	857	2020-07-10	2020 Field Program
Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_4**	HU_EH_EHT_1_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering watercourse of permanent hydrological regime surrounded by forest cover. For the most part, the feature has access to the floodplain, although access is limited on the right bank (west) downstream (southeast) of the crossing due to the Highway 27 road embankment. Woody debris jams present in at least two locations downstream of the crossing. Also downstream of the crossing, on the left bank, an undermined and collapsed concrete wall was observed. A large scour pool was present at the culvert outlet. Substrate consisted of fines and suspended sediments were observed in the flow during the inspection. Fines sediment deposition was present at the upstream of debris jams. Bankfull width was measured at approximately 2-4 m and bankfull depth at approximately 0.5-0.8 m. Wetted width was measured at approximately 2-3 m and the depth at approximately 0.1-0.4 m at the time of the assessment. In one section downstream the reach morphology consisted of a large pool. Substrates along the bed ranged from sand to boulder sized particles. Vegetation present in the reach included grasses, shrubs, trees, and some in stream vegetation. Although riffles, pools, and run were present, the sequence and was not consistent. A knick point was present approximately 80 m downstream of the crossing under Highway 27. A cut off channel and steep banks in relation to the channel width were also observed, indicating that the channel is likely downcutting its bed. The feature has a moderate to steep gradient and is confined by the road embankment on the west and a valley wall on the east. at approximately 100 me downstream of the crossing the valley becomes wider and the feature's access to the floodplain is less restricted.	Transitional to Stressed	Widening, degradation, and planimetric form adjustment	876	2024-03-15	2024 Field Program
Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_3**	HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous to meandering intermittent to permanent feature. It has a bankfull width of 5.1 m and a bankfull depth of 0.6 m. The feature is only defined at the crossing. It follows a low to moderate channel gradient. The bed substrate consists of fines (silt, clay, sand) and gravel. The feature has pool-riffle spacing however it is not well defined. The feature is confined within a valley that is 20-25 m wide but it still has access to the floodplain. It is surrounded by herbaceous vegetation and grasses as well as woody plants. Evidence of erosion (exposed roots, knickpoint) and woody debris were noted on the day of the assessment. A culvert across the access roadway is 500 mm wide and made of corrugated plastic. Upstream of the roadway the flow is undefined with multiple channels and access to the floodplain. It is surrounded by wetland-type vegetation there.	In Adjustment	Planimetric form adjustment, widening, aggradation, degradation	731	2022-03-31	2022 Field Program
Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_3a**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was ephemeral with no defined channel or banks and is situated within a rural landscape dominated by agricultural fields. The feature drains to the southwest. The bed substrate consisted of muck but within the culvert under Highway 27, sand, silt, and other fine sediments were observed. The feature is unconfined, allowing for access to the floodplain. At the time of assessment, the feature exhibited no continuous flow and was characterized by isolated stagnant water downstream (southwest) of the culvert crossing under Highway 27. Within the ROW, the wetted width was approximately 0.4 m, with a wetted depth of approximately 0.5 m. The culvert outlet was partially obstructed by garbage. Upstream of the culvert, no water or defined channel was visible, and the area was densely vegetated with dead or standing Phragmites grasses. In-channel vegetation was abundant and no woody debris was observed during the assessment. The culvert structure is a 1-m-wide box culvert.	Undefined feature. RGA Not Applicable	N/A	Viewed from ROW	2025-06-09	2025 Field Program - Viewed from Roadway
Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_6**	HU_EH_EHT_1_2_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous to straight, multi-channel, intermittent feature. It has a bankfull width of approximately 1 m and a bankfull depth of approximately 0.4 m. It is defined and follows a moderate to steep channel gradient. The feature has a well-defined riffle-pool morphology. The bed substrate consists of fines (silt, clay, sand) to cobble-sized material. The feature is confined within a valley but it still has access to the floodplain. It is surrounded by herbaceous vegetation, shrubs, and trees. Evidence of groundwater contributions was also noted. Evidence of erosion was noted on the day of the assessment. Woody debris was also observed but it was unclear if it was fluvial-related. The feature crosses Highway 27 through a closed-bottom box culvert that measures 1.45 m wide and 1 m high. The culvert is perched by 0.15 m.	In Regime (borders Transitional)	Planimetric form adjustment and widening	823	2022-07-07	2022 Ministry Order

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	East Humber River	East Humber River	**HU_MH_EHR_0_2**	HU_EH_EHR_0_1, HU_EH_EHR_0_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous to meandering permanent feature with a bankfull width of 16.1 m and a bankfull depth of 0.69 m. It has a defined channel and follows a moderate channel gradient. The feature has a bed substrate consisting of fines to boulder sized material. Some of the larger substrate seems to be embedded as well. The feature has a well-formed widely-spaced riffle-pool morphology. The feature is confined and does not have access to the floodplain. It is surrounded by woodlot and herbaceous vegetation. Evidence of erosion was noted on the day of the assessment. The feature was entrenched and the armor later was exposed which consisted of clay and cobble sized materials. Minor woody debris was noted however not all seemed to be fluvial-associated. No evidence of channel hardening was observed.	Transitional or stressed	Degradation, widening, aggradation, and planimetric form adjustment	823	2022-07-07	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_3**	HU_EH_EHT_12_1_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. It is an ephemeral feature with no defined channel and it follows a low channel gradient. No channel was observed in the field but the ground was wet 0.2 m deep in some locations. The bed substrate consists of fines (silts, clays, sand). The feature is unconfined and has access to the floodplain. It is surrounded by herbaceous vegetation and there is in-channel vegetation. The feature has dense cattails around a pond at the down-stream section of the reach. Evidence of groundwater contributions was also noted. No evidence of erosion or woody debris noted on the day of the assessment. There is a large pond downstream of the lower reach break that is approximately 50 m wide.	Undefined feature. RGA Not Applicable	N/A	897	2022-05-06	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_4**	HU_EH_EHT_12_2_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous swale-type ephemeral feature that follows a topographic low. The feature has an approximate width of 2-5 m. It does not have defined banks and it is not entrenched. The bed substrate consists of fines with gravel. The feature is unconfined and has access to the floodplain. It is located in an agricultural field and is surrounded by crops and grasses. Evidence of groundwater contributions was also noted. The feature flows through a metal circular culvert between fields that is 0.4 m wide. A small amount of erosion was noted around the culvert likely due to the constrained flows. It has likely been straightened by agricultural activities.	Undefined feature. RGA Not Applicable	N/A	897	2022-05-06	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_5**	HU_EH_EHT_12_3_3, HU_EH_EHT_12_3_4	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous swale-type ephemeral feature that follows a topographic low. It does not have a definable width or depth. It follows a low gradient and it is not entrenched. Bed substrate consists of fines with gravel. The feature is unconfined and has access to the floodplain. It is surrounded by agricultural crops and crops have been planted within the feature. In the middle of the reach where the feature flows through dense brush the feature has created multi-channel gullies. On either side of the brush it is clearly an ephemeral feature. No erosion or woody debris near the crossing location was observed on the day of the assessment. Erosion was observed at the lower end of the reach however this may be impacted by entrenchment due to human interference.	Undefined feature. RGA Not Applicable	N/A	897	2022-05-06	2022 Ministry Order
Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_0_2**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a meandering, defined, permanent feature with a bankfull width of approximately 14.7 m and a bankfull depth of 1.0 m. It follows a moderate bed slope and has a well-formed riffle-pool morphology. The feature is confined but it still has access to the floodplain and it is surrounded by herbaceous plants, trees, and shrubs (scrubland-type riparian vegetation). On the day of the assessment erosion was noted.	In Regime (borders Transitional)	Widening, Aggradation, Planimetric Form Adjustment	857	2020-08-07	2020 Field Program
Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_3**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach. The feature if in a wetland type area and within a valley. No defined watercourse observed.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	910	2020-06-29	2020 Field Program
Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_4**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach however, it is located within the Study Area. The reach is an undefined ephemeral feature located within a topographic low. No discernable banks or evidence of erosion present at the time of the assessment.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	857	2025-03-21	2024 Field Program
Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_5**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. At this time there is no proposed hydraulics crossing for the reach however, it is located within the Study Area. The reach is an undefined ephemeral feature located within a topographic low. No discernable banks or evidence of erosion present at the time of the assessment.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	857	2025-03-21	2024 Field Program
Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight ephemeral feature as assessed from the desktop. Not assessed in the field.	Undefined feature. RGA Not Applicable.	Undefined feature. RGA Not Applicable.	768	Not assessed in the field	Not assessed in the field
Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_2**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous intermittent feature that follows a moderate to high bed slope and has no defined riffle-pool morphology. The feature is confined but still has access to the floodplain and is surrounded by herbaceous and woodlot type riparian vegetation. Erosion was noted on the day of the assessment. There was limited permission to enter at the time of the assessment.	Limited permission to enter. Assessment not completed.	N/A	721	2020-07-28	2020 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_1**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous ephemeral feature that has a low channel gradient and no defined bed morphology. The feature is unconfined with access to the floodplain and it is surrounded by herbaceous riparian cover. No erosion was noted on the day of the assessment. There was limited permission to enter.	Undefined feature. RGA Not Applicable	N/A	745 781	2020-07-24 2020-06-12	2020 Field Program 2020 Field Program - Viewed from Roadway

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_15_1**	HU_EH_EHT_15_2_1, HU_EH_EHR_15_2_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a sinuous swale-type ephemeral feature that is approximately 0.8-2 m wide. It is undefined and it follows a low to moderate channel gradient. The feature lacks a bed morphology. The bed substrate consists of fines (silt, clay, sand) and gravel to boulder sized material. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened by agricultural activities.	Undefined feature. RGA Not Applicable	N/A	769	2022-03-18	2022 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_15_2**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous swale-type ephemeral feature. It lacks a defined bed morphology and it is unconfined with access to the floodplain. No erosion was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	N/A	769	2022-03-18	2022 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_15_4**	HU_EH_EHT_15_3_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a swale-type ephemeral feature that is approximately 1-2.5 m wide and 0.15 m deep. It is undefined and it follows a low channel gradient. The feature lacks a bed morphology. The bed substrate consists of fines (silt, clay, sand) and gravel to cobble sized material. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. Minor evidence of erosion was noted on the day of the assessment. No woody debris was observed. It has likely been straightened by agricultural activities.	Undefined feature. RGA Not Applicable	N/A	769	2022-03-18	2022 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_16_1**	HU_EH_EHT_16_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a sinuous ephemeral, wetland-type feature located between agricultural fields. The feature resides within a riparian corridor that is approximately 20-40 m wide. On the day of the assessment isolated pools of water were observed within the riparian corridor. It lacks a defined channel and follows a low channel gradient. No defined bed morphology was present. There are isolated pools of standing water. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. The channel is heavily vegetated. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened by agricultural activities.	Undefined feature. RGA Not Applicable	N/A	769	2022-03-18 2020-08-05	2022 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_16_2**	HU_EH_EHT_17_3_2	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a straight, undefined, ephemeral feature that consists of sparse isolated pools of water across a 10 - 25 m wide corridor. Pools of water are up to 0.25 m deep. The feature follows an overall low channel gradient and it is not entrenched. The bed substrate consists of fines (silt, clay, sand). The feature is unconfined with access to the floodplain. The feature has grassy in-channel vegetation and it is surrounded by agricultural vegetation. It has likely been straightened by agricultural activities. No evidence of erosion or woody debris was noted on the day of the assessment.	Undefined feature. RGA Not Applicable	N/A	875	2022-05-06	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_17_2**	HU_EH_EHT_17_3_1, HU_EH_EHT_17_3_4	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight, undefined, ephemeral feature with an estimated width of 2-4 m. The feature follows a low channel gradient. The bed substrate consists of fines. The feature is unconfined with access to the floodplain. The feature has grassy in-channel vegetation and it is surrounded by agricultural vegetation. It has likely been straightened by agricultural activities. No evidence of erosion or woody debris were noted on the day of the assessment. Two culverts at the downstream end of the property were observed. On the day of the assessment flow outflanked the culverts, indicating that they are undersized to convey flow. The first culvert is a rusted metal culvert that is 0.4 m wide and the second one that is just off the property is 0.9-1 m wide.	Undefined feature. RGA Not Applicable	N/A	875	2022-05-04 2020-08-05	2022 Ministry Order 2020 Field Program - Viewed from Roadway
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_17_1**	HU_EH_EHT_17_3_3	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a sinuous, undefined, ephemeral feature that has an approximate width of 3-10 m. It follows a low channel gradient and it is not entrenched. The bed substrate consists of fines and loose unconsolidated sediments (0.05 m). The feature is unconfined with access to the floodplain. The feature has grassy in-channel vegetation and in-channel phragmites and it is surrounded by agricultural vegetation. It has likely been straightened by agricultural activities. The feature crosses Weston Road through a CSP 1.50 m oval culvert which is partially submerged.	Undefined feature. RGA Not Applicable	N/A	875	2022-05-06	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1a**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a meandering, permanent feature with a bankfull width of approximately 3 - 3.55 m and a bankfull depth of 0.4 m. On the day of the assessment the feature had a wetted width of 1.5 - 2 m and a wetted depth of 0.1 - 0.2 m. The feature is within a wide valley with good access to the valley floor (floodplain) and low entrenchment with low banks. The valley wall is in contact with the watercourse midway through the reach, for only for a limited portion. The bank angle was moderate and the maximum bank height was approximately 0.5 m. Some erosion was present with siltation and sediment deposition in the overbank zone. The bed substrate consisted of sand and silt and woody debris was observed within channel throughout, the reach. The watercourse did not displayed significant signs of widening or degradation.	In Regime	Aggradation, widening, planimetric form adjustment	818 739	2024-03-07	2024 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1b**	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a slightly sinuous permanent feature with a bankfull width of 1.8 m and a bankfull depth of 0.4 m. On the day of the assessment the feature had a wetted width of 0.5-2 m and a wetted depth of 0.15-0.5 m. It has a defined channel which follows a moderate channel gradient. It also has a well-formed riffle-pool morphology that has a 15-20 m spacing. The bed substrate consists of fines (silt, clay, sand) and gravel with a few sporadic cobbles. The feature is unconfined with access to the floodplain. It is surrounded by woodlot and herbaceous vegetation. The feature also has in-channel vegetation. Evidence of erosion and woody debris were noted on the day of the assessment. Siltation in pools was also noted. The feature crosses an access road through a box culvert-like structure that consists of wood beams lying on top of placed/piled concrete slabs. The structure has an open bottom and is ~800-900 mm wide. The feature has very likely been altered and it splits into two stages close to the agricultural road crossing. One portion of the feature is a pool along the right bank of the channel that is approximately 10 mx10 m.	In Regime	Aggradation, widening, planimetric form adjustment	862	2020-06-12	2020 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1c**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was not visible from the ROW and was assessed in 2025 using aerial imagery. The feature was not visible in the aerial imagery which suggests that it is an undefined to poorly defined feature that follows a topographic low. Based on TRCA watercourse lines, it follows a topographic low between agricultural fields within a vegetated corridor of trees and shrubs. The feature begins at a small pond and flows east, ending at its confluence with HU_EH_EHR_18_1b.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	N/A	Viewed from ROW	2025-06-06	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1d**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature was not visible from the ROW and was assessed in 2025 using aerial imagery. The feature was not visible in the aerial imagery which suggests that it is an undefined to poorly defined feature that follows a topographic low. It is located within an agricultural field with crops planted through the feature, suggesting that the feature is likely dry during the growing season. It is unconfined with access to the floodplain and is surrounded by crop plantings. The feature flows east towards a small pond located at the reach break with HU_EHR_18_1b.	Assessment completed from aerial imagery due to lack of PTE. RGA not performed.	N/A	Viewed from ROW	2025-06-06	2025 Field Program - Not visible from roadway. Assessed from aerial imagery.
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_2**	HU_EH_EHT_18_7_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a straight, swale-type ephemeral feature with a wetted width of 0.25-0.5 m. It does not have a defined channel and it lacks bed morphology. It follows a low channel gradient. The feature is unconfined with access to the floodplain. It is surrounded by wetland-type, herbaceous, and agricultural vegetation. It also has in-channel vegetation. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened by agricultural activities.	Undefined feature. RGA Not Applicable	N/A	862	2020-06-12	2020 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_4**	HU_EH_EHT_18_5_1, HU_EH_EHT_18_5_3	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a sinuous ephemeral feature with an approximate feature width of 0.5-1.8 m and a depth of 0.1-0.55 m. No defined channel was observed and the feature lacked a defined bed morphology. The feature follows a topographic low. Bank substrate consists of fines (silt, clay, sand) and gravel. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation as well as grasses and herbaceous vegetation. Evidence of erosion was noted on the day of the assessment. Woody debris was not observed. The feature crosses King Vaughan Road through a high density black plastic culvert measuring 900 mm wide.	Undefined feature. RGA Not Applicable	N/A	767	2022-03-25	2022 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_5**	HU_EH_EHT_18_6_1, HU_EH_EHT_18_6_2, HU_EH_EHT_18_3_0	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a straight, swale-type ephemeral feature with a width of 6-7 m and a depth of 20 cm. It had a wetted width of 5 m and a wetted depth of 20 cm on the day of the assessment. No defined channel was observed on the day of the assessment and the feature lacked a bed morphology. It follows a topographic low. The feature is unconfined with access to the floodplain. It is surrounded by agricultural vegetation. It is heavily vegetated by grasses and herbaceous material. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened by agricultural activities. The feature crosses the access road through a drainable culvert at the up-reach end of the property near Highway 400. The concrete open bottom outer diameter is 1.8 m (inner diameter of 1.2 m).	Undefined feature. RGA Not Applicable	N/A	717	2022-03-31	2022 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_6**	HU_EH_EHT_18_4_1	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a permanent defined feature surrounded by scrubland consisting of grasses, herbaceous material, trees, and shrubs. The feature is partially confined within a valley. The feature is less confined and wider than the upstream reach (HU_EH_EHT_18_6b). The confining valley is approximately 100 m wide. The feature still has access to the floodplain. Bankfull width was measured at 2.5 m and bankfull depth was measured at approximately 0.6 m. The channel gradient was low to moderate, the substrate along the bed consisted of fines with gravel to boulder sized material while the banks consisted of fines with an exposed clay armor layer in some locations. It has a moderately well-formed riffle pool morphology.	Transitional or Stressed	Widening, degradation, aggradation, and planimetric form adjustment	849	2022-07-28	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_6b**	No Proposed Crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is an intermittent to permanent defined feature surrounded by scrubland consisting of grasses, herbaceous material, trees, and shrubs. The feature is partially confined within a valley and entrenched with clear evidence of erosion in the form of bank scours, bank undercuts, toe scours, and exposed clay layers. Most of the heavy erosion is localized in the area immediately downstream of Highway 400 where the feature is more confined. The confining valley is approximately 20 m wide and 4 m high, widening downstream of the reach break (HU_EH_EHR_18_6). The feature still has access to the floodplain. Downstream of the concrete box culvert under the highway the bed of the feature is lined with rounded cobbles. Bankfull width was measured at 2.5 m and bankfull depth was measured at approximately 0.6 m. The channel gradient was low to moderate, the substrate along the bed consisted of fines with gravel to boulder sized material while the banks consisted of fines with an exposed clay armor layer in some locations. It has a moderately well-formed riffle pool morphology.	Transitional or Stressed	Widening, degradation, aggradation, and planimetric form adjustment	849	2022-07-28	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_7**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The reach is a straight, swale-type intermittent feature. No defined bed morphology. It follows a topographic low. The feature is entrenched with little access to the floodplain and is surrounded by agricultural vegetation. No evidence of erosion or woody debris was noted on the day of the assessment. The feature has likely been straightened by agricultural activities.	Undefined feature. RGA Not Applicable	N/A	849	2022-07-28	2022 Ministry Order
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_3**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area . The feature is defined only in sections of the delineated reach. Upstream of the access driveway the feature's banks are poorly defined and obscured by dense vegetation cover (grasses). Downstream of the access driveway the feature banks become even less visible and the flow disperses over a densely vegetated area. The banks become more defined approximately 40 m downstream of the access driveway and the flows become focalized. In the more defined portion of the reach has access to the floodplain, appears to be actively meandering and incising. The bed morphology remains poorly defined. Vegetation is present within the channel and flow was present at the time of the assessment. Bankfull was measured at approximately 5.25 m wide by 0.4 deep.	Poorly defined feature. RGA Not Applicable.	N/A	818	2024-03-08	2024 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	East Humber River	east Humber River	**HU_EH_EHR_18_8**	No proposed crossing	The reach is part of the Humber River watershed in the TRCA Regulatory Area. The feature is a straight, slightly meandering, and confined watercourse of permanent hydrological regime surrounded by forest cover. The feature flows at the toe of the valley walls (3 - 4m high - east valley wall is steepest and highest). Evidence of erosion was observed along the entire reach in the form of undercut banks and minor downcutting. Bed substrates consisted of fines to cobbles. Woody debris was observed within the channel and in some locations it the obstructions directed flows towards the valley walls, resulting in bank scours. Bankfull width was measured at approximately 3.2 - 4.9 m and bankfull depth at approximately 0.5 - 0.8 m. Wetted width was measured at approximately 1.2 - 3.0 m and the wetted depth at 0.1 - 0.6 m at the time of the assessment. The channel gradient was moderate and channel bed morphology was poorly defined, although riffles and runs were observed. Pools were observed a locations of pinch points (valley narrowing) or adjacent to debris jams. A portion of the reach meandered through a marsh section where there was only partial confinement as the west valley wall disappeared. At the end of the marsh section, a weir was present and downstream of the weir a section of concrete rubble and other materials hardening the bed were present. A large woody debris jam was observed downstream of this section. Soft sediments accumulation (0.15 m deep) observed upstream of the Kirby Road crossing.	Transitional or Stressed	Widening, aggradation, degradation, planimetric form adjustment	782	2024-04-17	2024 Field Program
Humber River	East Humber River	east Humber River	**HU_EH_EHR_18_8b**	No proposed crossing	The reach is part of the East Humber River subwatershed in the TRCA Regulatory Area. The feature is a meandering watercourse of permanent hydrological regime surrounded by forest cover. The feature is within a narrow valley, entrenched, with poor access to the floodplain, and actively eroding (widening). The bank angles are steep and the bank height is between 1-2 m. There was evidence of erosion in the form of undercut banks, bed downcutting, exposed tree roots and leaning trees. At least two knickpoints were identified and exposed overburden (stiff clays/till), was observed throughout the reach. Sediment aggradation was also observed in several locations along the reach. The substrates consisted of sand, gravel, cobble, and boulders and several location of in channel woody debris were also observed. Concrete and construction rubble were present in the downstream section of the reach. A large valley wall scour was observed midway through the reach in a location where the valley wall was estimated at approximately 8-10 m high. . Evidence of beaver activity closer to the downstream reach causing woody debris build up. Bankfull width was measured at approximately 3-5 m and bankfull depth (below top of bank for most of the reach) at approximately 0.5 - 0.7 m. Wetted width was measured at approximately 1.5 - 3 m and the wetted depth at 0.1-0.5 m at the time of the assessment. The channel gradient was moderate and the valley confinement disappears further downstream. It is likely that the entrenchment has been caused by anthropogenic activities adjacent to the watercourse.	Transitional or Stressed (borderline "in Adjustment")	Widening, degradation, aggradation, and planimetric form adjustment	828	2024-03-07	2024 Field Program
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_8c**	No proposed crossing	Access to the feature was limited. The reach was assessed at the downstream and upstream sections. The feature is a meandering channel of permanent hydrological regime, located within a valley and surrounded by a forest. In the downstream portion, the channel flows at the toe of the east valley wall and a knick point was also observed. At least one woody debris jam was present in this area. There was no significant evidence of erosion along the investigated sections. Bankfull width and depth measurement was collected downstream at 3.9 m and 0.5 m, respectively. Based on the assessed portions, the feature does not display significant evidence of erosion and its banks and bed appear stable.	In Regime	N/A	921	2025-06-06	2025 Field Program
Humber River	East Humber River	East Humber River	**HU_EH_EHR_18_9**	No proposed crossing	The reach is part of the East Humber River subwatershed in the TRCA Regulatory Area. The feature is a meandering watercourse of permanent hydrological regime surrounded by forest cover. The feature is within a wide valley with good access to the valley floor (floodplain) and low to moderate entrenchment. There was evidence of erosion in the form of undercut banks. The substrate consisted of sand, gravel, and cobble with woody debris throughout. Beaver activity within the feature caused woody debris build up. Bankfull width was measured at approximately 2-5 m and bankfull depth at approximately 0.6 m. Wetted width was measured at approximately 1-3 m and the wetted depth at 0.1-0.4 m at the time of the assessment. The channel gradient was moderate. The banks were well vegetated with grasses, trees, and shrubs.	In Regime (borderline "Transitional or Stressed")	Widening, aggradation, and planimetric form adjustment	921	2024-03-07	2024 Field Program
Humber River	East Humber River	East Humber River	**HU_EH_EHR_18_10**	No proposed crossing	The reach is part of the East Humber River subwatershed in the TRCA Regulatory Area. The feature is a narrow meandering watercourse with steep banks and permanent hydrological regime. The riparian vegetation was predominantly forest cover. The feature is located within a wide valley with partial access to the valley floor (mainly on the left/south bank) and moderate entrenchment. The bed substrates were fines to cobbles with some boulders spread throughout the reach. The channel pool-riffle spacing was approximately 5-10 m. Small amounts of in channel woody debris were also observed. Bankfull width was measured at approximately 2.5-4 m and bankfull depth at approximately 0.6 m. Wetted width was measured at approximately 2-3 m and the wetted depth at 0.1-0.3 m at the time of the assessment. The channel gradient was moderate. The banks were well vegetated with grasses, trees, and shrubs. An upstream culvert flow from under Hwy 400 discharges into a large plunge pool. Terraced chute channel was present downstream of this this reach.	Transitional or Stressed	Widening, degradation, and planimetric form adjustment	921	2024-03-07	2024 Field Program
Humber River	East Humber River	East Humber River	**HU_EH_EHR_18_11**	No proposed crossing	The reach is part of the East Humber River subwatershed in the TRCA Regulatory Area. The reach is an undefined ephemeral feature surrounded by terrestrial grasses. The feature is within a wide valley with good access to the valley floor (floodplain) and no entrenchment. Flow was observed along the toe of the north valley wall, but no identifiable banks were present, and dense grasses lined the entire valley floor. Several areas had water present along the valley floor with no defined channels and the water discharged to a concrete box culvert under Highway 400. This feature had no evidence of erosion. No measurements could be estimated due to the lack of feature present. The channel gradient was low. The feature was heavily vegetated with terrestrial grasses and was within an agricultural field.	Undefined feature. RGA Not Applicable.	N/A	922	2024-04-17	2024 Field Program
Humber River	East Humber River	East Humber River	**HU_EH_EHR_19_1**	No Drainage ID. Culverts will be widened based on existing opening	The reach is part of the East Humber River subwatershed in the TRCA Regulatory Area. The feature is a meandering watercourse of permanent hydrological regime surrounded by forest cover. The feature is confined within a valley with some to minimal access to the valley floor (floodplain). There was evidence of erosion in the form of bank scours, bank undercuts, exposed roots and leaning trees, but these are signs of a naturally meandering watercourse. Woody debris and fallen trees spanning from bank to bank were encountered in at least two locations. Bankfull width was measured from approximately 8.4 m to 10 m and depth at approximately 1.0 m. Wetted width varied from approximately 6 m to 8 m at the time of the assessment. The channel gradient was low to moderate, and the substrates along the bed ranged from sand to boulder sized particles. Materials in the banks were observed to range from fines (clay/silt) to cobbles. The channel bed morphology was well defined with a riffle-pool spacing of approximately 20 m to 30 m.	In Regime	Widening	918	2024-03-08	2024 Field Program

Watershed	Subwatershed	Watercourse Name	Fluvial Geomorphic Reach	Proposed 413 Crossing ID	Reach Description	Rapid Geomorphic Assessment Result - Condition	Rapid Geomorphic Assessment Result – Dominant Channel Process (descending order)	Key ID	Date Accessed	Access Type
Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_19_7**	No Drainage ID. Culverts will be widened based on existing opening	The reach is part of the East Humber River subwatershed in the TRCA Regulatory Area. The feature is a meandering watercourse of permanent hydrological regime surrounded by forest cover. The feature is confined within a valley with some to minimal access to the valley floor (floodplain) and at some locations it flows at the toe of the valley walls. There was evidence of erosion in the form of bank scours, bank undercuts, bed degradation (exposed clay overburden is some locations), exposed roots and leaning and fallen trees. This reach displays signs of instability. Siltation in pools and runs, and recent sediment deposition was observed in some of the poorly formed bars encountered along the reach. Numerous locations (at least 4) of woody debris and fallen trees spanning from bank to bank were encountered along the reach. In one location, closer to the Highway 400 culvert, a large bed scour (~0.8 m) was present downstream of a debris jam. Bankfull width was measured at approximately 3 m and depth at approximately 0.4 m. Wetted width was measured at approximately 1.5 m at the time of the assessment. The channel gradient was moderate to steep. In one section the reach morphology resembled a step-pool sequence. Substrates along the bed ranged from sand to boulder sized particles. Materials in the banks were observed to range from fines (clay/silt) to cobbles. The channel displayed a poorly defined bed morphology. Although riffles, pools, and run were present, the sequence and was not consistent.	Transitional or Stressed	Widening, degradation, aggradation, and planimetric form adjustment	717 918	2022-03-31 2024-03-08	2024 Field Program

C

Photographic Record

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C2. Photographic Record Section 2
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C5. Photographic Record Section 5
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C9. Photographic Record Section 9

C1. Photographic Record Section 1

Photographic Log

Client Name:
Ontario Ministry of Transportation

Report Name
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Project No.
60315006

Section 1

SM_EB_SIM_2_1

Photograph 1. ↑
The upper extent of the undefined feature with dense vegetation cover. Looking upstream to the northwest. Photo taken July 29th, 2022.

Photograph 2. ↑
Looking downstream to the southeast at the steeper portion of the reach. Photo taken July 29th, 2022.

SM_EB_SIM_0_2

Photograph 3. ↑
Defined watercourse with woody debris. Looking north. Photo taken July 29th, 2022.

Photograph 4. ↑
Defined watercourse with slightly entrenched banks. Looking south. Photo taken July 29th, 2022.

SM_EB_SIM_0_3

Photograph 5. ↑
Defined watercourse surrounded by herbaceous and woodlot-type vegetation. Photo taken August 13th, 2020.

Photograph 6. ↑
Defined watercourse surrounded by herbaceous and woodlot-type vegetation. Woody debris pile present. Photo taken August 13th, 2020.

SM_EB_SIM_5_3

Photograph 7. ↑
Undefined feature covered in vegetation. Photo taken August 13th, 2020.

Photograph 8. ↑
Undefined feature covered in vegetation. Photo taken August 13th, 2020.

SM_EL_SIM_1_2

Photograph 9.
Undefined feature. Site was assessed from Steeles Avenue Road crossing. Looking south from the culvert. Photo taken August 13th, 2020.

Photograph 10.
The site was assessed from Steeles Avenue Road crossing where there is a double span concrete box culvert that is constricted by dense vegetation. Photo taken August 13th, 2020.

SM_EL_SIM_1_4

Photograph 11.
Photo taken from the southeast side of Steeles Avenue. Located downstream of the undefined vegetated swale-type feature. Photo taken August 13th, 2020.

Photograph 12.
A photo showing riprap embankment protection placed along the northeast side of the concrete box culvert. Photo taken August 13th, 2020.

SM_EL_SIM_1_5

Photograph 13. ↑
Undefined feature in the middle of a driving range. The feature is surrounded by dense riparian vegetation. Looking to the southeast. Photo taken July 29th, 2022.

Photograph 14. ↑
Pond southeast of the highway crossing. Looking southwest. Photo taken July 29th, 2022.

SM_EL_SIM_1_8

Photograph 15. ↑
Undefined feature with a vegetated swale as viewed from south of Steeles Avenue. Looking southwest. Photo taken August 13th, 2020.

Photograph 16. ↑
Looking downstream to the south at the vegetated swale-like undefined feature through an agricultural field off Steeles Avenue. Photo taken August 13th, 2020.

SM_EL_SIM_1_9

Photograph 17. Looking downstream to the south at the undefined feature which exists between an agricultural field to the east and a driving range to the right. Surrounded by dense riparian vegetation. Photo taken July 29th, 2022.

Photograph 18. Double-wide culverts along the highway crossing and a pool immediately downstream of the culverts. Looking to the northwest. Photo taken July 29th, 2022.

SM_EL_SIM_1_10

Photograph 19. Vegetated swale-like undefined feature as observed from the south side of Steeles Avenue. Looking northeast. Photo taken August 13th, 2020.

Photograph 20. Vegetated swale-like undefined feature as observed from the south side of Steeles Avenue. Looking northwest. Photo taken August 13th, 2020.

SM_EL_SIM_1_11

Photograph 21. ↑
A vegetated, swale-like undefined feature as observed from the southwest side of 10th Line W. Looking southwest. Photo taken June 29th, 2022.

Photograph 22. ↑
Triple span-culvert crossing 10th line W. Photo taken June 29th, 2022.

C2. Photographic Record Section 2

Photographic Log

Client Name:
Ontario Ministry of Transportation

Report Name
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Project No.
60315006

Section 2

CR_MC_MUL_8_3

Photograph 1. ↑
Vegetated swale-like undefined feature. Looking northwest. Photo taken September 30th, 2021.

Photograph 2. ↑
Vegetated swale-like undefined feature. Looking northeast. Photo taken September 30th, 2021.

CR_MC_MUL_8_4

Photograph 3. ↑
Undefined feature close to a driveway which leads into a parking lot. The feature is surrounded by grasses and agricultural vegetation. Photo taken July 17th, 2020.

Photograph 4. ↑
A deteriorated culvert, 0.50 meters wide, located under the driveway. Photo taken July 17th, 2020.

CR_MC_MUL_8_5

Photograph 5. ↑
Undefined feature surrounded by agricultural vegetation. The feature did not have flow on the day of the assessment. Photo taken July 17th, 2020.

Photograph 6. ↑
Undefined feature surrounded by agricultural vegetation. The feature did not have flow on the day of the assessment. Photo taken July 17th, 2020.

CR_MC_MUL_8_6

Photograph 7. ↑
Undefined feature surrounded by agricultural vegetation. The feature did not have flow on the day of the assessment. Photo taken July 17th, 2020.

Photograph 8. ↑
Undefined feature surrounded by agricultural vegetation. The feature did not have flow on the day of the assessment. Photo taken July 17th, 2020.

CR_LC_LEV_1_1

Photograph 9.
Undefined feature surrounded by agricultural vegetation. The feature did not have flow on the day of the assessment. Photo taken July 17th, 2020.

Photograph 10.
Undefined feature surrounded by agricultural vegetation. The feature did not have flow on the day of the assessment. Photo taken July 17th, 2020.

CR_LC_LEV_1_2

Photograph 11.
Poorly defined watercourse surrounded by grasses and herbaceous vegetation. Looking southeast. Photo taken September 30th, 2021.

Photograph 12.
Defined watercourse surrounded by grasses and herbaceous vegetation. Pooled water is present at the crossing. Looking southwest. September 30th, 2021.

CR_LC_LEV_2_1

Photograph 13. Concrete box culvert along the southwest side of Winston Churchill Boulevard looking northwest. Photo taken April 28th, 2022.

Photograph 14. Dense vegetation is adjacent to the culvert followed by agricultural fields. Looking southwest at the undefined feature. Photo taken April 28th, 2022.

CR_LC_LEV_2_1

Photograph 15. Dense vegetation occurs at each end of the culvert, constricting flow and causing the water to pool in the culvert. Photo taken April 28th, 2022.

Photograph 16. Pooled water in the culvert, the flow does not extend beyond the culvert. Bed substrate in the culvert consists of fines and placed gravel. Photo taken April 28th, 2022.

CR_LC_LEV_2_2

Photograph 17. ↑
A defined watercourse along the side of an access road looking upstream to the southwest. Photo taken April 28th, 2022.

Photograph 18. ↑
Defined watercourse along the side of an access road looking downstream to the northeast. Photo taken April 28th, 2022.

CR_LC_LEV_2_3

Photograph 19. ↑
Undefined swale-like feature as observed in a field. Looking to the southwest. Photo taken April 28th, 2022.

Photograph 20. ↑
A roadside drainage ditch that accepts flow from the poorly defined watercourse during high-flow events. Looking north. Photo taken April 28th, 2022.

CR_LC_LEV_2_4

Photograph 21. ↑
Poorly to undefined watercourse looking upstream to the northeast. Photo taken July 8th, 2022.

Photograph 22. ↑
A narrow section of the channel with flow/ pooled water within the watercourse. Photo taken July 8th, 2022.

CR_LC_LEV_2_5

Photograph 23. ↑
A culvert that accepts flow from the undefined feature. Assessed upstream from Winston Churchill Boulevard. Looking northeast. Photo taken April 28th, 2022.

Photograph 24. ↑
An image looking southwest at the field site. Assessed upstream from Winston Churchill Boulevard. No defined feature was observed in the field. Photo taken April 28th, 2022.

CR_LC_LEV_2_5a

Photograph 25. Looking south at the upstream end of the feature (arrow). A long 30-meter stretch of phragmites was visible. No defined feature visible from ROW. Photo taken June 4th, 2025.

Photograph 26. Looking southeast at the upstream end of the feature. No defined feature visible from ROW (arrow). Photo taken June 4th, 2025.

CR_LC_LEV_2_5b

Photograph 27. No defined feature was observed from ROW. Looking east. Photo taken June 4th, 2025.

Photograph 28. Looking east at upstream end of feature. Patch of cattails and phragmites present. Photo taken June 4th, 2025.

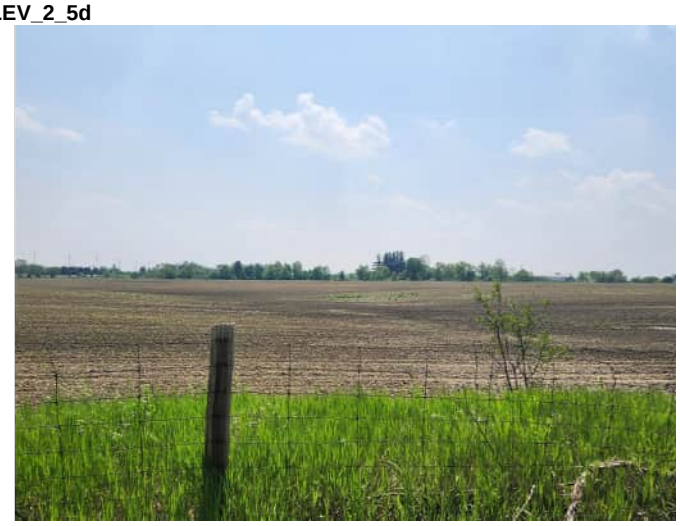
CR_LC_LEV_2_5c

Photograph 29. Culvert inlet near the location of the feature identified. No flow observed near inlet. Looking southeast. Photo taken June 4th, 2025.

Photograph 30. Looking west towards agricultural field. No defined feature observed. Photo taken June 4th, 2025.

CR_LC_LEV_2_5d

Photograph 31. No defined feature observed from ROW. A small amount of water is visible in the agricultural field. Looking south. Photo taken June 4th, 2025.



Photograph 32. Appears to be topographic depression, however no defined feature observed. Looking southeast. Photo taken June 4th, 2025.

CR_LC_LEV_2_5e

Photograph 33. ↑
No defined feature observed from ROW. Appears to be topographic depression. Looking south. Photo taken June 4th, 2025.

CR_LC_LEV_2_6

Photograph 34. ↑
The undefined feature with pooled water in a short section of the reach. Looking southeast. Photo taken August 14th, 2020.

Photograph 35. ↑
The unconfined undefined feature. Looking northwest. Photo taken August 14th, 2020.

CR_LC_LEV_0_1

Photograph 36. ↑
An image of the wider section in the defined watercourse located at the upstream end of the reach. Looking upstream to the east. Photo taken April 28th, 2022.

Photograph 37. ↑
The upstream end of the reach, looking downstream to the southeast. Photo taken April 28th, 2022.

CR_LC_LEV_0_1

Photograph 38. ↑
The downstream end of the reach looking at a narrower section of the defined watercourse. Facing upstream to the northwest. Photo taken April 28th, 2022.

Photograph 39. ↑
The downstream end of the reach looking at a narrower section of the defined watercourse. Facing downstream to the south. Photo taken April 28th, 2022.

CR_LC_LEV_0_2

Photograph 40. ↑
The crossing with Embleton Road. Heavy vegetation surrounds the culvert. Looking southwest. Photo taken August 14th, 2020.

Photograph 41. ↑
The crossing with Embleton Road. Heavy vegetation surrounds the culvert. Looking southeast. Photo taken August 14th, 2020.

CR_LC_LEV_0_3

Photograph 42. ↑
A sinuous defined watercourse looking upstream to the northwest. Photo taken April 28th, 2020.

Photograph 43. ↑
A sinuous defined watercourse looking upstream to the southwest. Photo taken April 28th, 2020.

CR_LC_LEV_9_1

Photograph 44. ↑
The undefined feature. Looking upstream to the west. Photo taken April 28th, 2022.

Photograph 45. ↑
The undefined feature. Looking upstream to the east. Photo taken April 28th, 2022.

CR_LC_LEV_10_1

Photograph 46. ↑
A pond at the upstream end of reach with no flow. Looking south. Photo taken April 28th, 2022.

Photograph 47. ↑
Downstream of the pond, a small undefined drainage feature is present. Looking south. Photo taken April 28th, 2022.

CR_NP_CRR_7_1

Photograph 48. A dry undefined feature through a wooded area adjacent to the valley wall. Looking southwest. Photo taken June 29th, 2022.

Photograph 49. A dry undefined feature through a wooded area adjacent to the valley wall. Looking northeast. Photo taken June 29th, 2022.

CR_NP_CRR_0_1

Photograph 50. A wide and shallow defined watercourse looking upstream to the west. Photo taken June 29th, 2022.

Photograph 51. Evidence of channel instability in the form of bank erosion, exposed roots, and leaning trees along the bank. Looking south. Photo taken June 29th, 2022.

CR_NP_CRR_0_1

Photograph 52. A leaning tree and wetland-type vegetation along the channel bank. Looking south. Photo taken June 29th, 2022.

Photograph 53. Evidence of channel instability in the form of bank undercutting, exposed roots, and leaning trees along the channel bank. Looking southeast. Photo taken June 29th, 2022.

CR_NP_CRR_0_2

Photograph 54. The defined watercourse, upstream of the Heritage Road crossing. Photo taken July 17th, 2020.

Photograph 55. The Credit River Crossing with Heritage Road. Looking East. Photo taken July 17th, 2020.

CR_NP_CRR_6_1

Photograph 56. ↑
Dry undefined feature surrounded by herbaceous material and trees. Photo taken July 17th, 2020.

Photograph 57. ↑
Dry undefined feature surrounded by herbaceous material and trees. Photo taken July 17th, 2020.

C3. Photographic Record Section 3

Section 3

CR_NP_CRR_9_1

Photograph 1.
Vegetated undefined feature. Some standing water is visible along the channel. Looking east. Photo taken June 17th, 2020.

Photograph 2.
Vegetated undefined feature. Looking east. Photo taken June 17th, 2020.

CR_NP_CRR_9_1

Photograph 3.
Partially obstructed culvert off Bovaird Drive West. Looking southwest. Photo taken June 17th, 2020.

Photograph 4.
Partially obstructed culvert off Bovaird Drive West. Looking west. Photo taken June 17th, 2020.

CR_NP_CRR_9_5

Photograph 5. ↑
Looking north. No defined feature present at the location of CR_NP_CRR_9_5. Photo taken March 22nd, 2024.

Photograph 6. ↑
Looking upstream to the north at southern portion of the reach. A vegetated corridor is present, but no defined feature present. Photo taken March 22nd, 2024.

CR_NP_CRR_3_2

Photograph 7. ↑
Looking south. Straight, undefined feature surrounded by scrubland and agricultural fields. Photo taken March 22nd, 2024.

Photograph 8. ↑
Culvert under Bovaird Drive West. Flowing south. Looking southwest. Photo taken March 22nd, 2024.

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CR_NP_CRR_3_2a

Photograph 9.
Assessed from Heritage Rd, looking northeast into an agricultural field. No feature visible from the ROW (arrow). Photo taken June 4th, 2025.

Photograph 10.
Assessed from Heritage Rd, looking north into an agricultural field. No feature visible from the ROW. Photo taken June 4th, 2025.

CR_NP_CRR_3_1

Photograph 11.
Undefined feature with dense in-channel vegetation surrounded by scrubland and agricultural fields. Looking to the southeast. Photo taken July 17th, 2020.

Photograph 12.
Culvert present upstream of crossing location. Looking southwest. Photo taken July 17th, 2020.

CR_NP_CRR_3_3*

Photograph 13. ↑
Dry, undefined feature surrounded by agricultural vegetation and scrublands. Looking North. Photo taken July 17th, 2020.

Photograph 14. ↑
Dry, undefined feature surrounded by agricultural vegetation and scrublands. Looking northeast. Photo taken July 17th, 2020.

*Photos for CR_NP_CRR_3_3a and CR_NP_CRR_3_3b not provided. Undefined headwater drainage features. CR_NP_CRR_3_3 occurs after the confluence between CR_NP_CRR_3_3a and CR_NP_CRR_3_3b

CR_NP_CRR_13_1

Photograph 15. Dry undefined feature following topographic low in an agricultural field. Looking north. Photo taken July 29th, 2022.

Photograph 16. Undefined feature in an agricultural field with a drainage feature (a yellow trap with a culvert). No flow present. Looking northeast. Photo taken July 29th, 2022.

CR_NP_CRR_13_MW

Photograph 17. Undefined feature. Looking northeast. Photo taken March 18th, 2022.

Photograph 18. Roadside drainage feature along Wanless Drive. Looking southeast. Photo taken March 18th, 2022.

CR_NP_CRR_13_MW

Photograph 19. ↑
Spring meltwater filling undefined feature in March 2022. Looking northwest. Photo taken March 18th, 2022.

Photograph 20. ↑
The culvert off Wanless Drive. In-channel vegetation present. Looking east. Photo taken March 18th, 2022.

CR_HC_HUT_0_1

Photograph 21. ↑
Poorly defined watercourse that appears to have been altered for agricultural purposes. Looking southeast. Photograph taken September 24th, 2020

Photograph 22. ↑
Abundant in-stream vegetation within feature. Looking northeast. Photograph taken September 24th, 2020

CR_HC_HUT_5_1

Photograph 23. ↑
Undefined feature with evidence of agricultural vegetation planted through feature. Looking southeast. Photo taken April 29th, 2020.

Photograph 24. ↑
Undefined feature with evidence of agricultural vegetation planted through feature. Looking southeast. Photo taken April 29th, 2020.

CR_GW_CRR_15a

Photograph 25. ↑
Looking southwest, defined permanent feature. The feature has vegetated banks and instream vegetation was present on the day of the assessment. Photo taken June 4th, 2025.

Photograph 26. ↑
Culvert located near the downstream reach break. Culvert width is estimated at 3 m. Water was slow moving on day of assessment. Photo taken June 4th, 2025.

CR_GW_CRR_15b

Photograph 27. Culvert draining into the permanent feature. Instream vegetation present on the day of assessment. Looking southwest. Photo taken June 4th, 2025.

Photograph 28. Looking upstream to the southwest. The permanent feature occurs between agricultural fields. The riparian buffer consists of trees, grasses, and shrubs. Photo taken June 4th, 2025.

CR_GW_CRR_15c

Photograph 29. Looking southwest towards an agricultural field. No feature visible from the ROW. Photo taken June 4th, 2025.

Photograph 30. Looking south towards an agricultural field. No feature visible from the ROW. Photo taken June 4th, 2025.

CR_HC_HUT_6_2

Photograph 31. ↑
Undefined feature with agricultural vegetation adjacent and through the feature. Looking east. Photo taken September 24th, 2020.

Photograph 32. ↑
Undefined feature with agricultural vegetation adjacent and through the feature. Looking west. Photo taken September 24th, 2020.

CR_HC_HUT_6_3

Photograph 33. ↑
Undefined feature with agricultural vegetation adjacent and through the feature. Looking northeast. Photo taken June 17th, 2020.

Photograph 34. ↑
A deteriorated culvert providing additional flow to feature from roadside drainage. Photo taken June 17th, 2020.

EC_EH_ETW_13_1

Photograph 35. ↑
Defined watercourse with entrenched banks. No flow on the day of the assessment. Looking southwest. Photo taken July 28th, 2022.

Photograph 36. ↑
Poorly defined portion of watercourse. No flow on the day of the assessment. Looking east. Photo taken July 28th, 2022.

C4. Photographic Record Section 4

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Section 4

EC_EH_ETW_12_3

Photograph 1.
A straight, unconfined, poorly defined watercourse surrounded by woodlot and agricultural lands. Looking southeast. Photo taken September 30th, 2021.

Photograph 2.
A straight, unconfined, poorly defined watercourse surrounded by woodlot and agricultural lands. Looking northeast. Photo taken September 30th, 2021.

EC_EH_ETW_11_1

Photograph 3.
Dry undefined feature photographed in 2020. Looking northwest. Photo taken March 25th, 2022.

Photograph 4.
Dry undefined feature photographed in 2020. Looking downstream to the southwest. Photo taken March 25th, 2022.

EC_EH_ETW_11_1

Photograph 5. ↑
Spring flow through the undefined feature in March 2022. Looking downstream to the southwest. Photo taken March 25th, 2022.

Photograph 6. ↑
Spring meltwater flowing east into the culvert across Mississauga Road looking northwest. Photo taken March 25th, 2022.

EC_EH_ETW_10_1

Photograph 7. ↑
The undefined feature, located between rows of agricultural vegetation. Looking upstream to the northwest. Photo taken April 28th, 2022.

Photograph 8. ↑
The undefined feature, located between rows of agricultural vegetation. Looking downstream to the southeast. Photo taken April 28th, 2022

EC_EH_ETW_9_1

Photograph 9. ↑
Agricultural swale flowing to an isolated pool with vulnerable banks. Photo taken April 30th, 2020.

Photograph 10. ↑
Shallow depression (isolated pocket of water) flowing through a woodlot with woody debris present in the channel. Photo taken April 30th, 2020.

EC_EH_ETW_9_2

Photograph 11. ↑
Agricultural swale flowing to a moderately defined drainage feature. Photo taken April 30th, 2020.

Photograph 12. ↑
Agricultural swale flowing to a moderately defined, drainage feature. Photo taken April 30th, 2020.

EC_EH_ETW_9_3

Photograph 13. ↑
Unconfined undefined feature, with buried agricultural drain tiles. Surrounded by agricultural vegetation. Looking northwest. Photo taken April 29th, 2020.

Photograph 14. ↑
Unconfined undefined feature, with buried agricultural drain tiles. Surrounded by agricultural vegetation. Looking East. Photo taken April 29th, 2020.

EC_EH_ETW_7_2

Photograph 15. ↑
Swale-type undefined feature with in-stream vegetation. Looking northeast. Photo taken April 29th, 2020.

Photograph 16. ↑
Box culvert crossing through Old School Road. Looking north. Photo taken April 29th, 2020.

EC_EH_ETW_7_1

Photograph 17. ↑
A culvert located off of Old School Road. Heavy in-stream vegetation is present along the feature. Looking southeast. Photo taken July 15th, 2020.

Photograph 18. ↑
Undefined feature as viewed from Chinguacousy Road. Looking west. Photo taken July 15th, 2020.

EC_EH_ETW_6_1

Photograph 19. ↑
Double-barrel culvert crossing under old school road. Looking east. Photo taken April 29th, 2020.

Photograph 20. ↑
Evidence of bank erosion and undercutting. Photo taken April 29th, 2020.

EC_EH_ETW_6_1

Photograph 21. ↑
Double-barrel culvert crossing under old school road. Photo taken April 29th, 2020.

Photograph 22. ↑
Ponded water at the upstream end of the reach to the north of Old School Road. Looking north. Photo taken April 29th, 2020.

EC_EH_ETW_6_3

Photograph 23. ↑
Undefined agricultural drainage feature. Photo taken March 22nd, 2024.

Photograph 24. ↑
Agricultural drainage feature with no defined banks. Photo taken March 22nd, 2024.

EC_EH_ETW_6_4

Photograph 25. ↑
Poorly defined feature. Located within a vegetated corridor. Photo taken March 22nd, 2024.

Photograph 26. ↑
Channel with defined banks in the last 50 to 60 meters of the vegetated corridor. Photo taken March 22nd, 2024.

EC_EH_ETW_6_5

Photograph 27. ↑
Poorly defined watercourse flowing through a woodlot. Photo taken March 22nd, 2024.

Photograph 28. ↑
Poorly defined watercourse flowing through woodlot. Photo taken March 22nd, 2024.

EC_EH_ETW_4_1

Photograph 29.
Dry, sinuous swale-type undefined feature. Looking southeast. Photo taken July 15th, 2020.

Photograph 30.
Culvert under Old School Road. Culvert drains to the southeast. Photo taken July 15th, 2020.

EC_EH_ETW_4_1

Photograph 31.
Wet undefined feature. Looking south. Photo taken March 25th, 2022.

Photograph 32.
Culvert under Old School Road was blocked and plugged with vegetation. Culvert drains to the southeast. Photo taken March 25th, 2022.

EC_EH_ETW_1_1

Photograph 33.
2-4 m wide poorly defined feature through woodlot. Photo taken March 25th, 2022.

Photograph 34.
Concrete box culvert under McLaughlin Rd. Photo taken March 25th, 2022.

EC_EH_ETW_1_1

Photograph 35.
Woody debris present. Photo taken September 28th, 2021.

Photograph 36.
Rail crossing. Photo taken September 28th, 2021.

EC_EH_ETW_1_4

Photograph 37. Dry undefined feature. The assessment was limited to the roadway due to no permission to enter. Looking northeast from McLaughlin Road. Photo taken July 15th, 2020.

Photograph 38. Dry undefined feature. Photo taken July 15th, 2020.

EC_EH_ETW_1_3

Photograph 39. A dry undefined feature was observed on the day of the assessment. The assessment was limited to the roadway due to no permission to enter. Looking east. Photo taken July 15th, 2020.

Photograph 40. Dry undefined feature. Looking southeast. Photo taken July 15th, 2020.

EC_EH_ETW_1_5

Photograph 41. ↑
Defined watercourse as observed near Old School Road. Looking west. Photo taken March 22nd, 2024.

Photograph 42. ↑
Concrete box culvert under Old School Road. Photo taken March 22nd, 2024.

C5. Photographic Record Section 5

Photographic Log

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Section 5

EC_EH_ETW_1_7

Photograph 1.
Meandering defined watercourse. Looking upstream to the west, towards a beaver dam. Photo taken May 5th, 2022.

Photograph 2.
Meandering defined watercourse. Looking downstream to the southeast. Note evidence of woody debris and erosion. Photo taken May 5th, 2022.

EC_EH_ETW_1_7

Photograph 3.
Exposed roots and bank erosion. Looking to the east. Photo taken May 5th, 2022.

Photograph 4.
Looking upstream towards the south at the location of the first cross-section. Photo taken May 5th, 2022.

EC_EH_ETW_1_8

Photograph 5. ↑
Undefined feature looking upstream to the southeast. Photo taken May 5th, 2022.

Photograph 6. ↑
Undefined feature looking downstream to the northwest. Photo taken May 5th, 2022.

EC_EH_ETW_1_10

Photograph 7. ↑
Dry undefined portion of feature in agricultural field looking up reach to the northwest. Photo taken July 8th, 2022.

Photograph 8. ↑
The location where the feature enters scrubland-type vegetation from the agricultural field. Looking northeast. Photo taken July 8th, 2022.

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EC_EH_ETW_1_10

Photograph 9.
Dry undefined feature in scrubland looking upstream to the northwest. Photo taken July 8th, 2022.

Photograph 10.
Dry undefined feature in scrubland looking downstream to the southeast. Photo taken July 8th, 2022.

EC_EH_ETW_1_11

Photograph 11.
Defined, meandering feature flowing through forested land. Bank undercutting and exposed roots present at this location. Photo taken July 23rd, 2020.

Photograph 12.
Defined, meandering feature approximately flowing through forested land. Photo taken July 23rd, 2020.

EC_EH_ETW_1_12

Photograph 13. ↑
Defined feature flowing through scrubland. Photo taken July 23rd, 2020.

Photograph 14. ↑
Defined feature flowing through scrubland. Photo taken July 23rd, 2020.

HU_WH_CAC_0_1

Photograph 15. ↑
Defined, slightly meandering watercourse. Facing upstream at the south end of the reach. Looking towards the north. Photo taken May 6th, 2020.

Photograph 16. ↑
Defined, slightly meandering watercourse. Facing downstream at the south end of the reach. Looking towards the south. Photo taken May 6th, 2020.

HU_WH_CAC_0_1

Photograph 17. ↑
Defined watercourse. Looking upstream to the southeast. Photo taken May 5th, 2022.

Photograph 18. ↑
Defined watercourse. Looking downstream to the northwest. Photo taken May 5th, 2022.

HU_WH_CAC_0_2a

Photograph 19. ↑
Facing west at the pond next to the culvert. Photo taken September 24th, 2021.

Photograph 20. ↑
Facing southwest upstream of the culvert. Photo taken September 24th, 2021.

EC_SC_ETE_1_1

Photograph 21. Dry undefined swale-type feature. Facing south. Photo taken May 7th 2020.

Photograph 22. Dry undefined swale-type feature. Facing north. Photo taken May 7th 2020.

EC_SC_ETE_1_1a

Photograph 23. Looking northeast. The feature (not visible from ROW) is located past the trees in an agricultural field. Assessed from Hearth Lake Rd. Photo taken June 4th, 2025.

Photograph 24. Looking east. Looking northeast. The feature (not visible from ROW) is located past the trees in an agricultural field. Assessed from Hearth Lake Rd. Photo taken June 4th, 2025.

EC_SC_ETE_1_1b

Photograph 25. ↑
Looking north. The feature (not visible from ROW) is located past the trees in an agricultural field. Assessed from Hearth Lake Rd. Photo taken June 4th, 2025.

Photograph 26. ↑
Looking northeast. The feature (not visible from ROW) is located past the residential property in an agricultural field. Assessed from Hearth Lake Rd. Photo taken June 4th, 2025.

EC_SC_ETE_1_2

Photograph 27. ↑
Sinuous undefined feature. Looking southwest. (Note: watermark due to software trial). Photo taken October 2nd, 2020.

Photograph 28. ↑
Looking to the northeast at the placed riprap protection on the margins of the roadway. Photo taken October 2nd, 2020.

EC_SC_ETE_1_2

Photograph 29.
Looking west at the concrete box culvert crossing. (Note: watermark due to software trial). Photo taken October 2nd, 2020.

Photograph 30.
Looking northwest through one of the concrete box culverts. (Note: watermark due to software trial). Photo taken October 2nd, 2020.

HU_WH_TWH_1_1

Photograph 31.
Looking southeast at the feature from the access road. The feature is a dry undefined feature. Photo taken May 29th, 2020.

Photograph 32.
Looking south towards the undefined feature. The feature appears to have been altered by agricultural activities. Photo taken May 29th, 2020.

HU_WH_TWH_1_2

Photograph 33. ↑
Straight, entrenched, undefined to poorly defined feature that has likely been manipulated for agricultural purposes. Looking downstream to the northeast. May 29th, 2020.

Photograph 34. ↑
Straight, entrenched, poorly defined feature that has likely been manipulated for agricultural purposes. Looking upstream to the southwest. May 29th, 2020.

HU_WH_TWH_1_2a

Photograph 35. ↑
Straight to sinuous feature confined within a valley. Looking upstream to the west. September 28th, 2021.

Photograph 36. ↑
Straight to sinuous feature confined within a valley. Looking upstream to the west. September 28th, 2021.

HU_WH_TWH_1_2a

Photograph 37. ↑
Straight to sinuous feature confined within a valley setting. Looking downstream to the northeast. September 28th, 2021.

Photograph 38. ↑
Culvert crossing within agricultural field. Double-span culvert in poor condition. The ground above the culvert is caved in and there is debris blocking the flow at the inlet. Looking southwest. September 28th, 2021.

HU_WH_TWH_1_4

Photograph 39. ↑
Undefined feature through agricultural field and grassland. Looking northwest. Photo taken September 24th, 2021.

Photograph 40. ↑
Undefined feature through agricultural field and grassland. Looking south. Photo taken September 24th, 2021.

C6. Photographic Record Section 6

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Section 6

HU_WH_TWH_1_5

Photograph 1.
Looking towards the northwest towards the start of the feature west of Bramalea Road. Photo taken May 13th, 2020.

Photograph 2.
Double-barrel culvert across Bramalea Road. Photo taken May 13th, 2020.

HU_WH_TWH_1_5

Photograph 3.
Pooled water in the forested area near Bramalea Road looking northeast. Photo taken May 13th, 2020.

Photograph 4.
Crops planted through feature during summer months. (Viewed from roadway). Photo taken July 31th, 2020.

HU_WH_TWH_1_5

Photograph 5. ↑
Drainage feature off Old School Road. Watercourse does not continue east past this feature. Photo taken May 13th, 2020.

Photograph 6. ↑
Drainage feature off Old School Road. Watercourse does not continue east past this feature. Photo taken May 13th, 2020.

HU_WH_TWH_2_1

Photograph 7. ↑
An unconfined, straight, defined watercourse. Facing southeast downstream of the culvert. Photo taken September 24th, 2020.

Photograph 8. ↑
Box culvert under Old School Road at the outlet. Photo taken September 24th, 2020.

HU_WH_SAL_2_1

Photograph 9.
Swale-like undefined feature. Looking northeast. Photo taken May 7th, 2020.

Photograph 10.
Culvert under Old School Road. Photo taken May 7th, 2020.

HU_WH_SAL_3_1

Photograph 11.
Likely altered, poorly defined watercourse. Looking upstream to the east. Photo taken May 12th, 2020.

Photograph 12.
Likely altered, poorly defined watercourse. Looking downstream to the west. Photo taken May 12th, 2020.

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HU_WH_SAL_3_1

Photograph 13. ↑
Upstream end of reach near the road crossing. Looking to the east. Photo taken May 12th, 2020.

Photograph 14. ↑
Box culvert under Old School Road crossing. Photo taken May 12th, 2020.

HU_WH_SAL_0_3

Photograph 15. ↑
An unconfined, sinuous, defined watercourse. Looking at a wide portion of the feature at the upstream end of the reach. Photo taken May 13th, 2020.

Photograph 16. ↑
Wide upstream channel at culvert-crossing. Photo taken May 13th, 2020.

HU_WH_SAL_0_3

Photograph 17. ↑
Narrower portion of channel at the downstream end of reach. Photo taken May 13th, 2020.

Photograph 18. ↑
Narrower portion of the channel at the downstream end of reach. Photo taken May 13th, 2020.

HU_WH_SAL_4_1

Photograph 19. ↑
Dry undefined feature to the west transitioning into an entrenched feature to the east close to the downstream reach break. Looking east. Photo taken May 29th, 2020.

Photograph 20. ↑
Dry undefined feature to the west transitioning into an entrenched feature to the east close to downstream reach break. Looking down at entrenched feature. Photo taken May 29th, 2020.

HU_WH_SAL_0_1

Photograph 21. ↑
An unconfined, sinuous, defined watercourse with entrenchment. Looking northwest. Photo taken May 12th, 2020.

Photograph 22. ↑
The upstream end of the reach, looking at a berm-type structure causing pooling. Photo taken May 12th, 2020.

HU_WH_SAL_0_2

Photograph 23. ↑
An unconfined, slightly sinuous, multi-channel, defined watercourse. Looking at a section of the channel with dense vegetation. Photo taken July 31st, 2020.

Photograph 24. ↑
Flow through feature close to Airport Road. Photo taken July 31st, 2020.

HU_WH_SAL_0_2

Photograph 25. ↑
Evidence of woody debris. It is likely that not all woody debris can be attributed to fluvial processes in this case. Photo taken July 31st, 2020.

Photograph 26. ↑
Evidence of bank undercutting and exposed roots. Photo taken July 31st, 2020.

***No photos available for HU_WH_WHR_1_1**

HU_WH_WHR_1_2

Photograph 27. ↑
Defined feature with a meandering nature and vulnerable banks. Photo taken May 29th, 2020.

Photograph 28. ↑
Defined feature with vulnerable banks and erosion present, flowing through a grassland. Photo taken May 29th, 2020.

HU_WH_WHR_1_3

Photograph 29.
Facing west at the other two features. All features were agricultural swales. Photo taken May 29th, 2020.

Photograph 30.
Facing southwest at the other two features. All features were agricultural swales. Photo taken May 29th, 2020.

HU_WH_WHR_1_4

Photograph 31.
Facing northwest at an agricultural field and an unconfined, straight, swale-type undefined feature. Photo taken May 29th, 2020.

Photograph 32.
Facing southeast towards undefined feature. Photo taken May 29th, 2020.

HU_WH_WHR_1_5

Photograph 33. ↑
Unconfined swale-like feature. Looking northwest. Photo taken September 24th, 2021.

Photograph 34. ↑
Unconfined swale-like feature. Looking East. Photo taken September 24th, 2021.

HU_WH_WHR_1_6

Photograph 35. ↑
Upstream section of the undefined feature as observed from Healey Road. Looking to the west. Photo taken September 24th, 2021.

Photograph 36. ↑
The culvert that crosses Healey Road. Photo taken September 24th, 2021.

HU_WH_WHR_3_1

Photograph 37. ↑
Swale-like undefined feature. Looking to the southwest. Photo taken July 28th, 2020.

Photograph 38. ↑
Culvert under Gore Road. Photo taken July 28th, 2020.

HU_WH_WHR_3_1a

Photograph 39. ↑
Looking north towards feature (not visible from ROW). Assessed from The Gore Rd. Photo taken July 4th, 2025.

Photograph 40. ↑
Looking northeast towards feature (not visible from ROW). Assessed from The Gore Rd. Photo taken July 4th, 2025.

HU_WH_WHR_3_1b

Photograph 41. ↑
Looking northeast towards the downstream reach break of the feature (not fully visible from ROW). Assessed from The Gore Rd. Photo taken July 4th, 2025.

Photograph 42. ↑
Looking northeast towards feature (not fully visible from ROW). Located approximately in the middle of the reach. Assessed from The Gore Rd. Photo taken July 4th, 2025.

HU_WH_WHR_0_2

Photograph 43. ↑
Facing west at the first cross-section looking at the culvert. Photo taken May 29th, 2020.

Photograph 44. ↑
Facing east and looking downstream at the first cross-section. Photo taken May 29th, 2020.

HU_WH_WHR_0_2

Photograph 45.
Facing east and looking downstream at erosion on the right bank. Photo taken May 29th, 2020.

Photograph 46.
Facing east at the downstream end of the property. Photo taken May 29th, 2020.

HU_WH_WHR_0_3

Photograph 47.
Confined, defined, meandering feature. Looking downstream to the east. Photo taken September 21st, 2021.

Photograph 48.
Confined, defined, meandering feature. Looking upstream to the west. Photo taken September 21st, 2021.

HU_WH_GRT_4_1

Photograph 49. ↑
Dry undefined feature looking northwest. Photo taken March 15th, 2024.

Photograph 50. ↑
Dry undefined feature looking southeast. Photo taken March 15th, 2024.

HU_WH_GRT_3_2

Photograph 51. ↑
Swale-type undefined to poorly defined feature in an agricultural field looking east. Photo taken March 15th, 2024.

Photograph 52. ↑
Swale-type undefined feature in an agricultural field looking west. Photo taken March 15th, 2024.

HU_WH_GRT_0_1

Photograph 53. Dry undefined feature. Looking upstream to the northwest. Photo taken March 15th, 2024.

Photograph 54. Dry undefined to poorly defined feature. Looking upstream to the north. Photo taken March 15th, 2024.

HU_WH_GRT_3_1

Photograph 55. Swale-type undefined to poorly defined feature in an agricultural field looking west. Photo taken March 15th, 2024.

Photograph 56. Swale-type undefined feature in an agricultural field looking southeast. Photo taken March 15th, 2024.

HU_WH_GRT_0_2

Photograph 57. ↑
Small pool of standing water along feature. Channel is poorly defined. Looking to the southeast. Photo taken July 5th, 2020.

Photograph 58. ↑
Dry poorly defined feature surrounded by scrubland. Facing north. Photo taken July 5th, 2020.

HU_WH_GRT_3_3

Photograph 59. ↑
Swale-type feature with a poorly defined channel, looking southwest. Photo taken March 15th, 2024.

Photograph 60. ↑
Swale-type poorly defined feature. Looking southeast. Photo taken March 15th, 2024.

HU_WH_CDT_2_1

Photograph 61. ↑
Undefined feature surrounded by agricultural vegetation. No flow was present on the day of the assessment. Looking north. Photo taken September 20th, 2021.

Photograph 62. ↑
Undefined feature surrounded by agricultural vegetation. No flow was present on the day of the assessment. Looking northwest. Photo taken September 20th, 2021.

HU_WH_CDT_2_1a

Photograph 63. ↑
Looking upstream to the northwest at reach HU_WH_CDT_2_1b. HU_WH_CDT_2_1a (not visible from the ROW) is located further away in this direction. Photo taken June 11th, 2025.

Photograph 64. ↑
Looking northwest towards feature (not visible from ROW). Assessed from Mayfield Rd. Photo taken June 11th, 2025.

HU_WH_CDT_2_1b

Photograph 65. Looking upstream to the northwest at culvert outlet under private property driveway Located upstream of the crossing at Mayfield Rd. Photo taken June 5th, 2025.

Photograph 66. Looking downstream to the southeast. Watercourse appears to have been disturbed from recent construction activities. Located immediately downstream of the Mayfield Rd crossing. Photo taken June 5th, 2025.

HU_WH_CDT_0_2

Photograph 67. Confined, sinuous, defined channel surrounded by scrubland. Photo taken August 5th, 2020.

Photograph 68. Confined, sinuous, defined channel surrounded by scrubland. Photo taken August 5th, 2020.

HU_WH_CDT_0_2

Photograph 69. ↑
Portion of the feature with pooled water that is wider than other more channelized sections. Photo taken August 5th, 2020.

HU_MH_RAI_1_1

Photograph 70. ↑
Swale-type undefined feature in an agricultural field. Looking to the west. Photo taken June 10th, 2020.

Photograph 71. ↑
Swale-type undefined feature in an agricultural field. Looking to the west. Photo taken June 10th, 2020.

HU_MH_RAI_1_2

Photograph 72. Swale-type undefined feature in an agricultural field. Looking southeast. Photo taken June 10th, 2020.

Photograph 73. Swale-type undefined feature in an agricultural field. Looking east. Photo taken June 10th, 2020.

HU_MH_RAI_1_3

Photograph 74. Undefined portion of watercourse surrounded by agricultural vegetation. Looking north. Photo taken June 10th, 2022.

Photograph 75. Poorly defined portion of watercourse surrounded by agricultural vegetation. Slightly entrenched. Looking north. Photo taken June 10th, 2022.

C7. Photographic Record Section 7

Client Name:
Ontario Ministry of Transportation

Report Name
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Project No.
60315006

Section 7

HU_MH_ROB_3_1

Photograph 1. ↑
Undefined swale-like feature in agricultural field. Photo taken on June 11th, 2020.

Photograph 2. ↑
Undefined swale-like feature in agricultural field. Photo taken on June 11th, 2020.

HU_MH_ROB_3_2

Photograph 3. ↑
Undefined feature looking upstream to the west. Photo taken on July 28th, 2020.

Photograph 4. ↑
Undefined feature looking downstream to the east towards Highway 50. Photo taken on July 28th, 2020.

HU_MH_ROB_3_3

Photograph 5. ↑
Dry undefined feature surrounded by agricultural vegetation. Photo taken on July 28th, 2020.

Photograph 6. ↑
Dry undefined feature surrounded by agricultural vegetation. Photo taken on July 28th, 2020.

HU_MH_ROB_3_4

Photograph 7. ↑
Dry undefined feature surrounded by agricultural vegetation. Looking southwest towards Highway 50. Photo taken on July 28th, 2020.

Photograph 8. ↑
Dry undefined feature surrounded by agricultural vegetation. Looking southwest towards Highway 50. Photo taken on July 28th, 2020.

HU_MH_ROB_3_5

Photograph 9.
Straight swale-like undefined feature (short section of pooled water) that looks like it has been altered surrounded by herbaceous vegetation. Photo taken June 11th, 2020.

Photograph 10.
Straight swale-like undefined feature (short section of pooled water) that looks like it has been altered surrounded by herbaceous vegetation. Photo taken June 11th, 2020.

HU_MH_ROB_3_5

Photograph 11.
Culverts providing flow to feature off the side of Highway 50. Photo taken June 11th, 2020.

HU_MH_ROB_4_1

Photograph 12. ↑
Sinuous undefined watercourse following topographic low surrounded by agricultural vegetation. Photo taken June 11th, 2020.

Photograph 13. ↑
Sinuous more defined portion of watercourse surrounded by agricultural vegetation. Photo taken June 11th, 2020.

HU_MH_ROB_0_2

Photograph 14. ↑
Sinuous, defined watercourse surrounded by dense riparian vegetation. Photo taken on September 21st, 2021.

Photograph 15. ↑
Sinuous, defined watercourse surrounded by dense riparian vegetation. Photo taken on September 21st, 2021.

HU_MH_ROB_0_3

Photograph 16. Sinuous, defined watercourse surrounded by dense vegetation and abundant woody debris (not exclusively attributed to fluvial processes) looking upstream to the northeast. Photo taken on September 21st, 2021.

Photograph 17. Sinuous, defined watercourse surrounded by dense vegetation and abundant woody debris (not exclusively attributed to fluvial processes) looking downstream to the southwest. Photo taken on September 21st, 2021.

HU_MH_ROB_2_1

Photograph 18. Undefined feature looking upstream to the north. Photo taken April 22nd, 2022.

Photograph 19. Undefined feature looking downstream to the south. Photo taken April 22nd, 2022.

HU_MH_ROB_1_1

Photograph 20. ↑
Agricultural swale through an actively plowed agricultural field. Photo taken April 22nd, 2022.

Photograph 21. ↑
Undefined agricultural swale along an actively plowed agricultural field. Photo taken April 22nd, 2022.

HU_MH_ROB_0_5

Photograph 22. ↑
A sinuous, defined watercourse, looking upstream. Photo taken June 29th, 2020.

Photograph 23. ↑
A sinuous, defined watercourse, looking downstream. Photo taken June 29th, 2020.

HU_MH_ROB_0_5

Photograph 24. ↑
Narrow section of the feature looking downstream. Photo taken July 29th, 2020.

Photograph 25. ↑
Looking downstream at the culvert crossing. Photo taken July 29th, 2020.

HU_MH_ROB_7_1

Photograph 26. ↑
Sinuous defined watercourse surrounded by scrubland with in-channel vegetation. Photo taken July 29th, 2020.

Photograph 27. ↑
Sinuous defined watercourse surrounded by scrubland with in-channel vegetation. Photo taken July 29th, 2020.

HU_MH_ROB_7_2

Photograph 28. ↑
Looking upstream to the northeast. Photo taken May 6th, 2022.

Photograph 29. ↑
Looking downstream to the southwest. Photo taken May 6th, 2022.

HU_MH_ROB_7_3

Photograph 30. ↑
Defined sinuous watercourse. Photo taken March 21st, 2024.

Photograph 31. ↑
Defined sinuous watercourse. Photo taken March 21st, 2024.

HU_MH_ROB_7_4

Photograph 32.
Looking upstream to the east of an undefined feature located within an agricultural field. Photo taken March 21st, 2024.

Photograph 33.
Looking downstream to the southwest of an undefined feature located within an agricultural field. Photo taken March 21st, 2024.

HU_MH_ROB_7_5

Photograph 34.
Looking downstream to the southeast at the undefined feature with no defined banks. Small amounts of pooled water present in this portion of the feature. Photo taken March 21st, 2024.

Photograph 35.
Looking downstream to the southeast at the undefined feature with no defined banks. Photo taken March 21st, 2024.

HU_MH_ROB_7_5a

Photograph 36. ↑
Looking downstream to the southeast. Undefined feature with no defined banks. Pooled water stagnant water present for this part of the feature. Photo taken March 21st, 2024.

Photograph 37. ↑
Downstream portion of feature looking downstream to the south. Feature is undefined. Photo taken March 21st, 2024.

HU_MH_ROB_6_1

Photograph 38. ↑
Looking southeast at a culvert that crosses under Huntington Rd. Assessed from Huntington Rd at the upstream reach break. Photo taken June 6th, 2025.

Photograph 39. ↑
Close up view of the culvert. Assessed from Huntington Rd at the upstream reach break. Photo taken June 6th, 2025.

HU_MH_ROB_6_1

Photograph 40. ↑
Looking southwest into an agricultural field. No defined feature visible from the ROW. Assessed from Huntington Rd at the upstream reach break. Photo taken June 6th, 2025.

Photograph 41. ↑
Looking at two culverts that likely contribute or receive flow from feature during higher flow events. No defined feature visible. Assessed from Huntington Rd at the upstream reach break. Photo taken June 6th, 2025.

C8. Photographic Record Section 8

Client Name:
Ontario Ministry of Transportation

Report Name
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Project No.
60315006

Section 8

HU_MH_MHR_0_1

Photograph 1.
Meandering defined watercourse with evidence of partial debris jams, looking upstream to the northeast. Photo taken June 19th, 2020.

Photograph 2.
Meandering defined watercourse, looking downstream to the west. Photo taken June 19th, 2020.

HU_MH_MHR_0_2

Photograph 3.
Defined meandering watercourse. Photo taken August 7th, 2020.

Photograph 4.
Defined, meandering watercourse. Photo taken August 7th, 2020.

Client Name:
Ontario Ministry of Transportation

Report Name
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Project No.
60315006

HU_MH_MHR_3_1

Photograph 5.
Straight undefined feature. Photo taken July 10th, 2020.

Photograph 6.
Straight undefined feature where it crosses Kirby Road through a 900-millimeter corrugated steel pipe culvert and has been hardened by gabion baskets. Photo taken July 10th, 2020.

HU_MH_MHR_3_4

Photograph 7.
Looking southwest. No defined features are present. Photo taken March 21st, 2025.

Photograph 8.
Looking northeast. No defined features are present. Photo taken March 21st, 2025.

HU_MH_MHR_3_5

Photograph 9. ↑
Looking north at the middle portion of delineated reach. undefined feature present within a topographic low. Photo taken March 21st, 2025.

Photograph 10. ↑
Looking southwest. No defined channels are present. Photo taken March 21st, 2025.

HU_MH_EHR_1_2

Photograph 11. ↑
Looking downstream to the south from the middle section of the reach. No defined channels. Photo taken July 28th, 2020.

Photograph 12. ↑
Looking downstream from the upstream end of the reach. Photo taken July 28th, 2020.

HU_MH_EHR_1_3

Photograph 13. ↑
Defined watercourse looking downstream. Photo taken March 31st, 2022.

Photograph 14. ↑
Defined watercourse looking upstream. Photo taken March 31st, 2022.

HU_MH_EHR_1_3a

Photograph 15. ↑
Looking upstream (northeast) at the ephemeral feature. Located on the upstream (east) side of the Highway 27 crossing. Photo taken June 9th, 2025.

Photograph 16. ↑
Looking downstream (west) at the culvert under Highway 27. Photo taken June 9th, 2025.

HU_MH_EHR_1_3a

Photograph 17 ↑
Bed composition on the downstream side of the culvert crossing Highway 27. Photo taken June 9th, 2025.

Photograph 18. ↑
Looking downstream (southwest) at the ephemeral feature, marked by tall grasses. Assessed from ROW where the feature crosses Highway 27. Photo taken June 9th, 2025.

HU_MH_EHR_1_4

Photograph 19. ↑
Defined watercourse looking northwest. Photo taken March 15th, 2024.

Photograph 20. ↑
Defined watercourse looking southeast. Photo taken March 15th, 2024.

HU_MH_EHR_1_6

Photograph 21. ↑
Sinuous multi-channel watercourse surrounded by herbaceous vegetation. Photo taken July 7th, 2022.

Photograph 22. ↑
Sinuous multi-channel watercourse surrounded by herbaceous vegetation. Photo taken July 7th, 2022.

HU_MH_EHR_0_2

Photograph 23. ↑
Wide defined watercourse looking upstream to the north. Photo taken July 7th, 2022.

Photograph 24. ↑
Wide defined watercourse looking downstream to the south. Photo taken July 7th, 2022.

HU_MH_EHR_0_2

Photograph 25. ↑
Bank undercutting along the left bank. Photo taken July 7th, 2022.

Photograph 26. ↑
Exposed armour layer visible. Wide defined watercourse looking downstream to the south. Photo taken July 7th, 2022.

HU_MH_EHR_12_1

Photograph 27. ↑
Looking north in the middle of the reach of the undefined feature. Photo taken June 12th 2020.

Photograph 28. ↑
Looking north from downstream reach-break of the undefined feature. Photo taken June 12th 2020.

HU_EH_EHR_12_3

Photograph 29.
The ponded area at the downstream end of the reach of the undefined feature. Photo taken May 6th, 2022.

Photograph 30.
The downstream pond is surrounded by dense cattails. Photo taken May 6th, 2022.

HU_EH_EHR_12_4

Photograph 31.
Undefined feature looking upstream to the northeast. Photo taken May 6th, 2022.

Photograph 32.
Undefined feature looking downstream to the south. Photo taken May 6th, 2022.

HU_EH_EHR_12_5

Photograph 33. ↑
Undefined feature looking upstream to the northwest. Photo taken May 6th, 2022.

Photograph 34. ↑
Appearance of feature where it flows through dense brush between agricultural fields. Photo taken May 6th, 2022.

C9. Photographic Record Section 9

Client Name:
Ontario Ministry of Transportation

Report Name
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Project No.
60315006

Section 9

HU_EH_EHR_15_1

Photograph 1. ↑
Undefined feature looking upstream to the north. Photo taken March 18th, 2022.

Photograph 2. ↑
Undefined feature looking downstream to the southeast. Photo taken March 18th, 2022.

HU_EH_EHR_15_2

Photograph 3. ↑
Looking at the undefined feature. Facing south. Photo taken March 18th, 2022.

Photograph 4. ↑
Looking north at the undefined feature. A small culvert is present in the middle of the agricultural field. Photo taken March 18th, 2022.

HU_EH_EHR_15_4

Photograph 5.
Looking upstream to the north at the undefined feature. Photo taken March 18th, 2022.

Photograph 6.
Looking downstream to the southwest at the undefined feature. Photo taken March 18th, 2022.

HU_EH_EHR_16_1

Photograph 7.
The culvert at the road crossing located at the upstream end of the reach, near King Vaughan Road. Photo taken August 5th, 2020.

Photograph 8.
The culvert at the road crossing located at the upstream end of the reach, near King Vaughan Road. Photo taken August 5th, 2020.

HU_EH_EHR_16_1

Photograph 9. ↑
Looking upstream at the undefined feature, Spring 2022. Facing south. Photo taken March 18th, 2022.

Photograph 10. ↑
Looking downstream at the undefined feature, Spring 2022. Facing northwest. Photo taken March 18th, 2022.

HU_EH_EHR_16_2

Photograph 11. ↑
An undefined feature. Looking upstream towards the reach break. Facing south. Photo taken May 6th, 2022.

Photograph 12. ↑
An undefined feature Looking downstream from the upstream reach break. Facing north. Photo taken May 6th, 2022.

HU_EH_EHR_17_1

Photograph 13. Looking west at the undefined feature from Weston Road. Photo taken May 6th, 2022.

Photograph 14. A culvert road crossing along Weston Road. Photo taken May 6th, 2022.

HU_EH_EHR_17_2

Photograph 15. Looking downstream to the north at the undefined feature. Photo taken May 4th, 2022.

Photograph 16. Looking upstream to the south of the undefined feature. Photo taken May 4th, 2022.

HU_EH_EHR_18_1a

Photograph 17. Crossing along agricultural road. Photograph taken March 7th 2024.

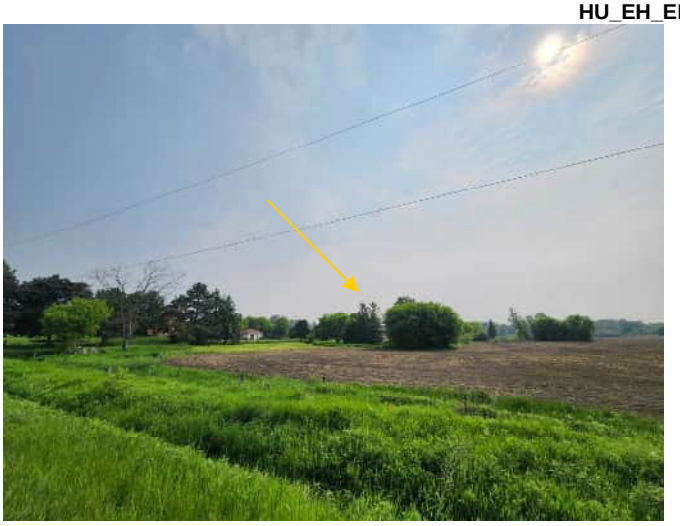
Photograph 18. Further from road, watercourse in a woody area. Photograph taken March 7th 2024.

HU_EH_EHR_18_1b

Photograph 19. A watercourse with a defined channel. Surrounded by herbaceous and woodlot vegetation. Looking northeast. Photograph taken March 7th 2024.

Photograph 20. A watercourse with a defined channel. Surrounded by herbaceous and woodlot vegetation. Looking southwest. Photograph taken March 7th 2024.

HU_EH_EHR_18_1c



Photograph 21. Looking northeast towards feature (not visible from ROW). Assessed from Weston Rd. Photograph taken July 6th, 2025.

Photograph 22. Looking east towards feature (not visible from ROW). Assessed from Weston Rd. Photograph taken July 6th, 2025.

HU_EH_EHR_18_1d

Photograph 23. Looking east towards ephemeral feature (not visible from ROW). Assessed from Weston Rd. Photograph taken July 6th, 2025.

Photograph 24. Looking east towards ephemeral feature (not visible from ROW). Assessed from Weston Rd. Photograph taken July 6th, 2025.

HU_EH_EHR_18_2

Photograph 25. ↑
Undefined feature situated between agricultural fields. Facing north. Photo taken June 12th, 2020.

Photograph 26. ↑
Undefined feature situated between agricultural fields. Facing south. Photo taken June 12th, 2020.

HU_EH_EHR_18_3

Photograph 27. ↑
Poorly defined to undefined feature. Looking upstream to the north from the downstream reach break. Photo taken March 8th, 2024.

Photograph 28. ↑
Undefined feature surrounded by herbaceous vegetation looking southeast, downstream of access driveway. Photo taken March 8th, 2024.

HU_EH_EHR_18_4

Photograph 29. ↑
Undefined feature looking upstream to the northwest. Photo taken March 25th, 2022.

Photograph 30. ↑
Undefined feature looking downstream to the southeast. Photo taken March 25th, 2022.

HU_EH_EHR_18_4

Photograph 31. ↑
Downstream drainage ditch along Highway 400. Looking south. Photo taken March 25th, 2022.

Photograph 32. ↑
Culvert upstream along King Vaughan Road. Photo taken March 25th, 2022.

HU_EH_EHR_18_5

Photograph 33. ↑
Undefined feature looking upstream to the east. Photo taken March 31st, 2022.

Photograph 34. ↑
Undefined feature looking downstream to the west. Photo taken March 31st, 2022.

HU_EH_EHR_18_6

Photograph 35. ↑
Less defined feature to the south of HU_EH_EHR_18_6b. Looking upstream to the east. Photo taken July 28th, 2022.

Photograph 36. ↑
Less defined feature to the south of HU_EH_EHR_18_6b. Looking the southeast. Photo taken July 28th, 2022.

HU_EH_EHR_18_6b

Photograph 37. ↑
Entrenched defined watercourse. Looking upstream to the northeast. Photo taken July 28th, 2022.

Photograph 38. ↑
Entrenched defined watercourse. Looking downstream to the southwest. Photo taken July 28th, 2022.

HU_EH_EHR_18_8

Photograph 39. ↑
A weir acting as a potential fish barrier within a defined watercourse looking north. Photo taken April 17th, 2024.

Photograph 40. ↑
A defined watercourse. Looking north at a straight section of the channel. Photo taken April 17th, 2024.

HU_EH_EHR_18_8b

Photograph 41. ↑
Defined watercourse looking southeast. Photo taken March 7th, 2024.

Photograph 42. ↑
Defined feature looking north. Photo taken March 7th, 2024.

HU_EH_EHR_18_8c

Photograph 43. ↑
Defined watercourse looking downstream to the south from the upstream reach break. Photo taken March 7th, 2024.

Photograph 44. ↑
Defined watercourse looking upstream to the north from the downstream end of the reach. Photo taken March 7th, 2024.

HU_EH_EHR_18_11

Photograph 45.
Undefined feature looking west. Photo taken April 11th, 2024.

Photograph 46.
A box culvert with water present looking west. Photo taken April 11th, 2024.

HU_EH_EHR_19_1

Photograph 47.
Meandering channel with woody debris and fallen trees spanning the banks. Photo taken March 8th, 2024.

HU_EH_EHR_19_7

Photograph 48. ↑
Meandering watercourse with evidence of instability (exposed tree roots, leaning trees). Clay to cobble sized bed substrate. Photograph taken March 8th, 2024.

Photograph 49. ↑
Meandering watercourse with evidence of instability (exposed tree roots, leaning trees, bank erosion). Photograph taken March 8th, 2024.

D

Meander Belt Maps

Author: Last Saved by: michael.w.collins
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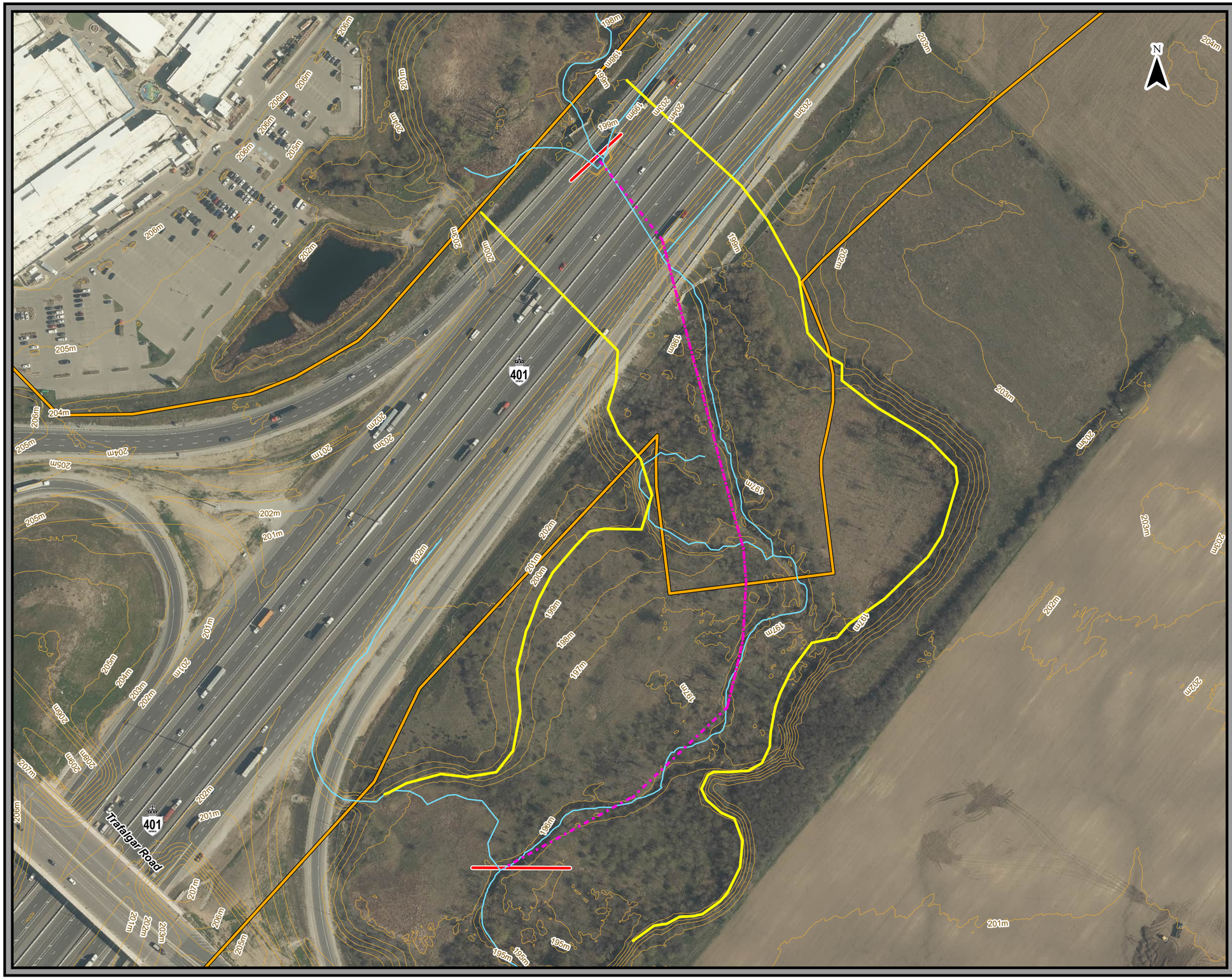

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
SM_EB_SIM_0_2
26 Feb, 2026

0 25 50 75 100
Metres

AECOM WSP Ontario

Author: Last Saved by: michael.w.collins

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Legend

Contour (1m)

Reach Break

Watercourse

Axis

Final

Preliminary

Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_LC_LEV_1_2
07 Oct, 2025

0 20 40 60 80
Metres

AECOM WSP Ontario

Author: Last Saved by: michael.w.collins
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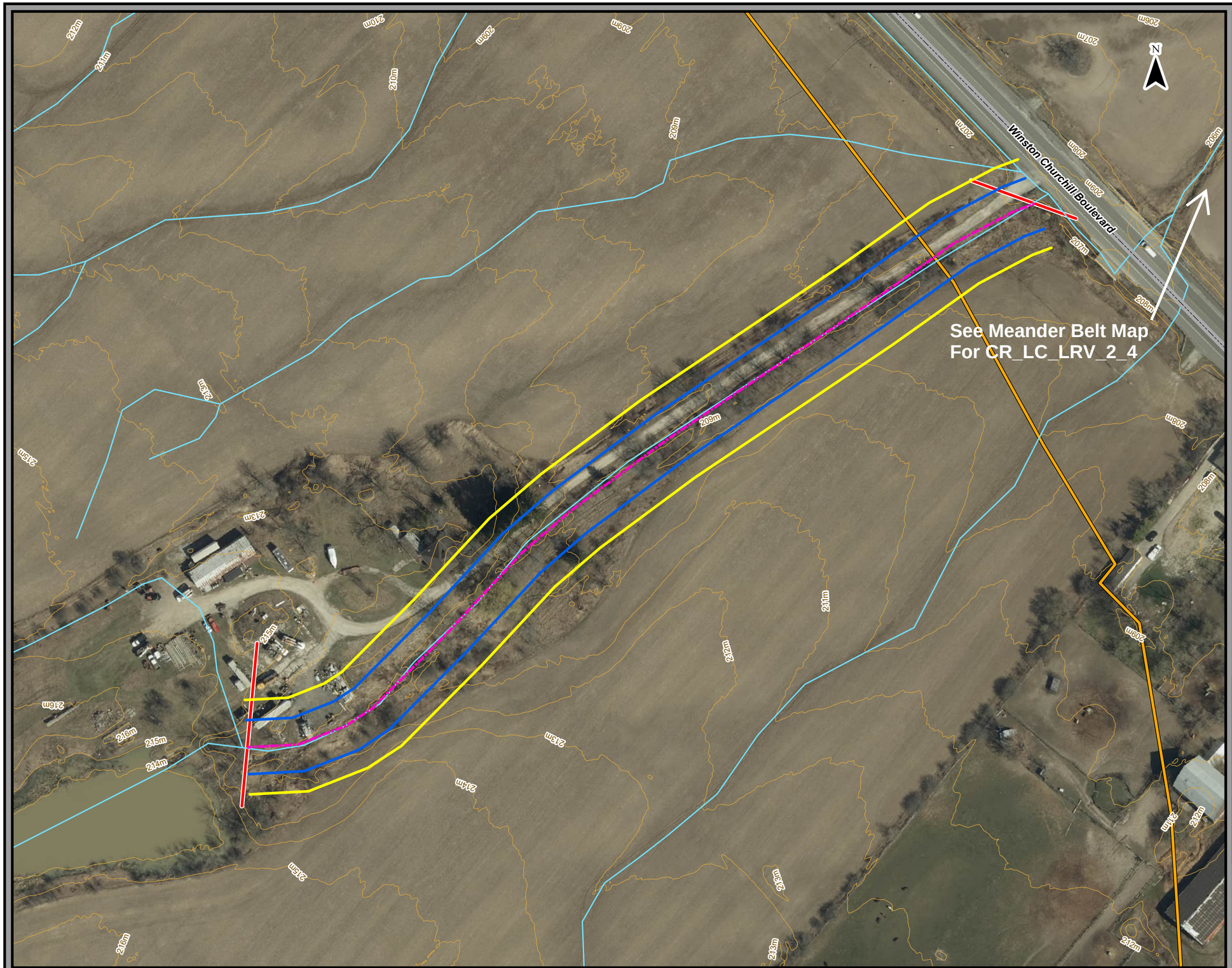

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

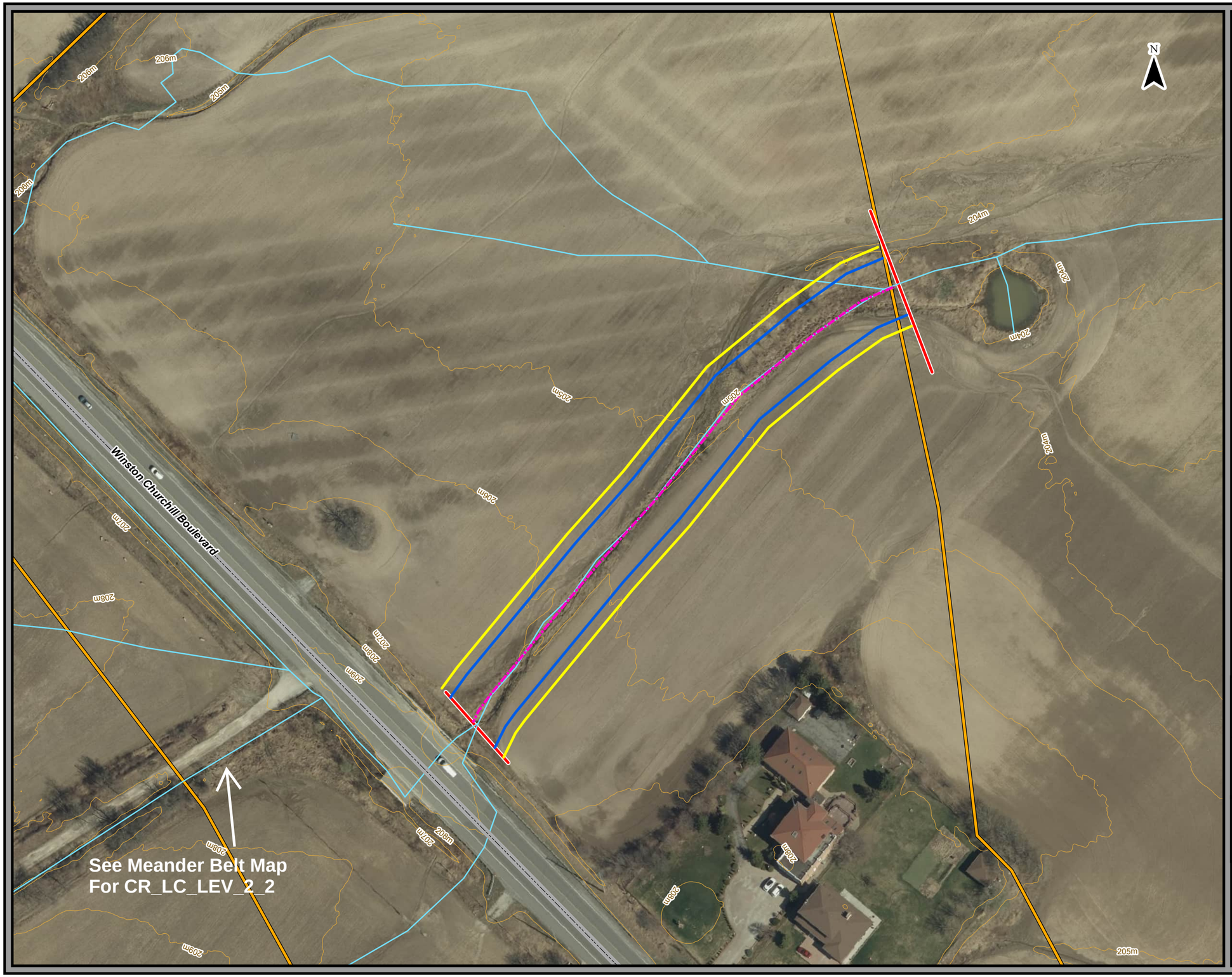
Meander Belt
CR_LC_LEV_2_2

07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

AECOM Z:\Kitchener-CAKCN1\DCS\GIS\Projects\60347240\900-CAD_GIS\920-929 (GIS-Graphics)\920-ENV\Design\01_Reports\FLUV\60315006 FLUV Memo 2025.aprx
Author: Last Saved by: michael.w.collins



Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_LC_LEV_2_4

07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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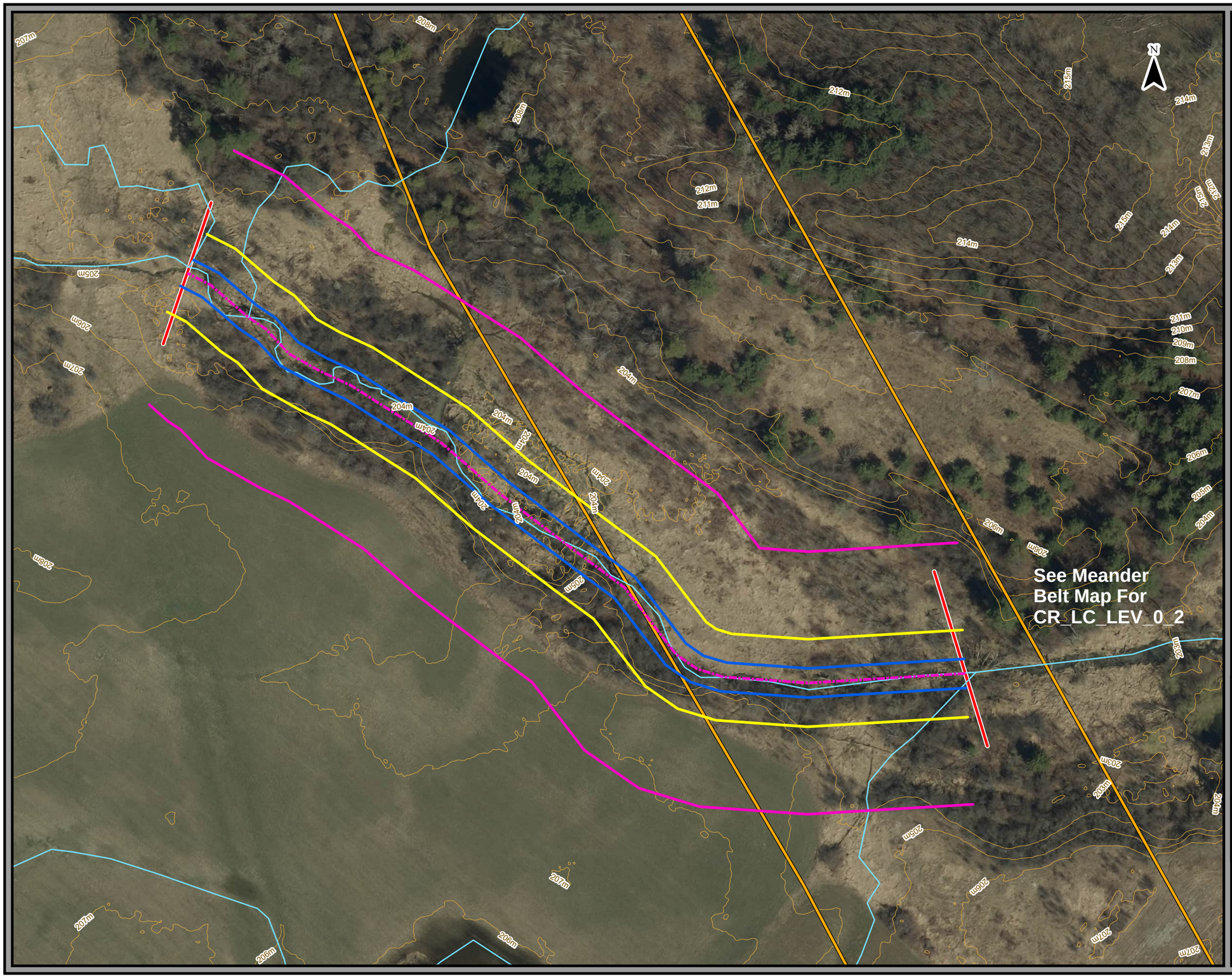

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_LC_LEV_0_1
26 Feb, 2026

0 10 20 30 40
Metres

AECOM WSP Ontario

Author: Last Saved by: michael.w.collins
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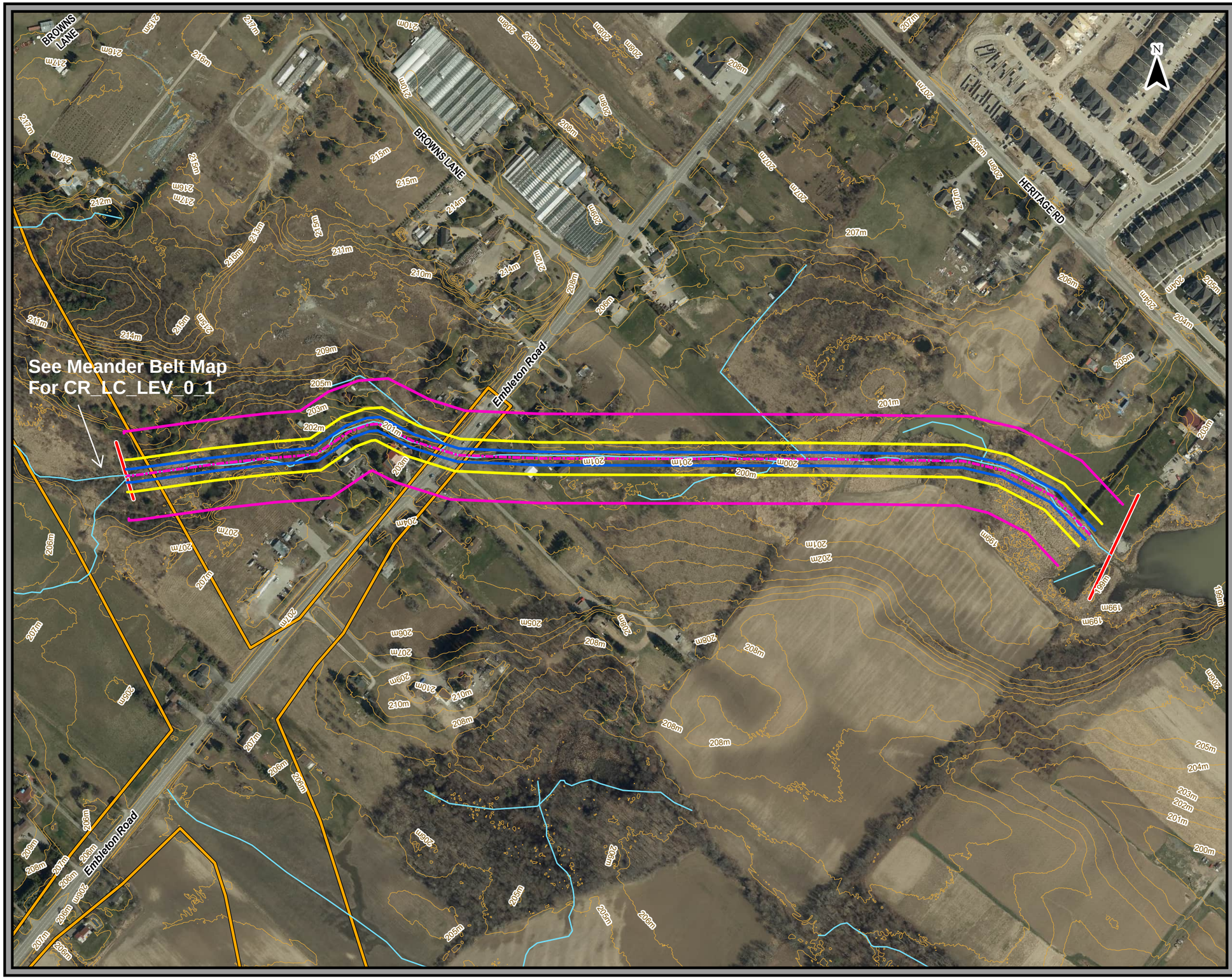

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_LC_LEV_0_2

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_NP_CRR_0_2

07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP
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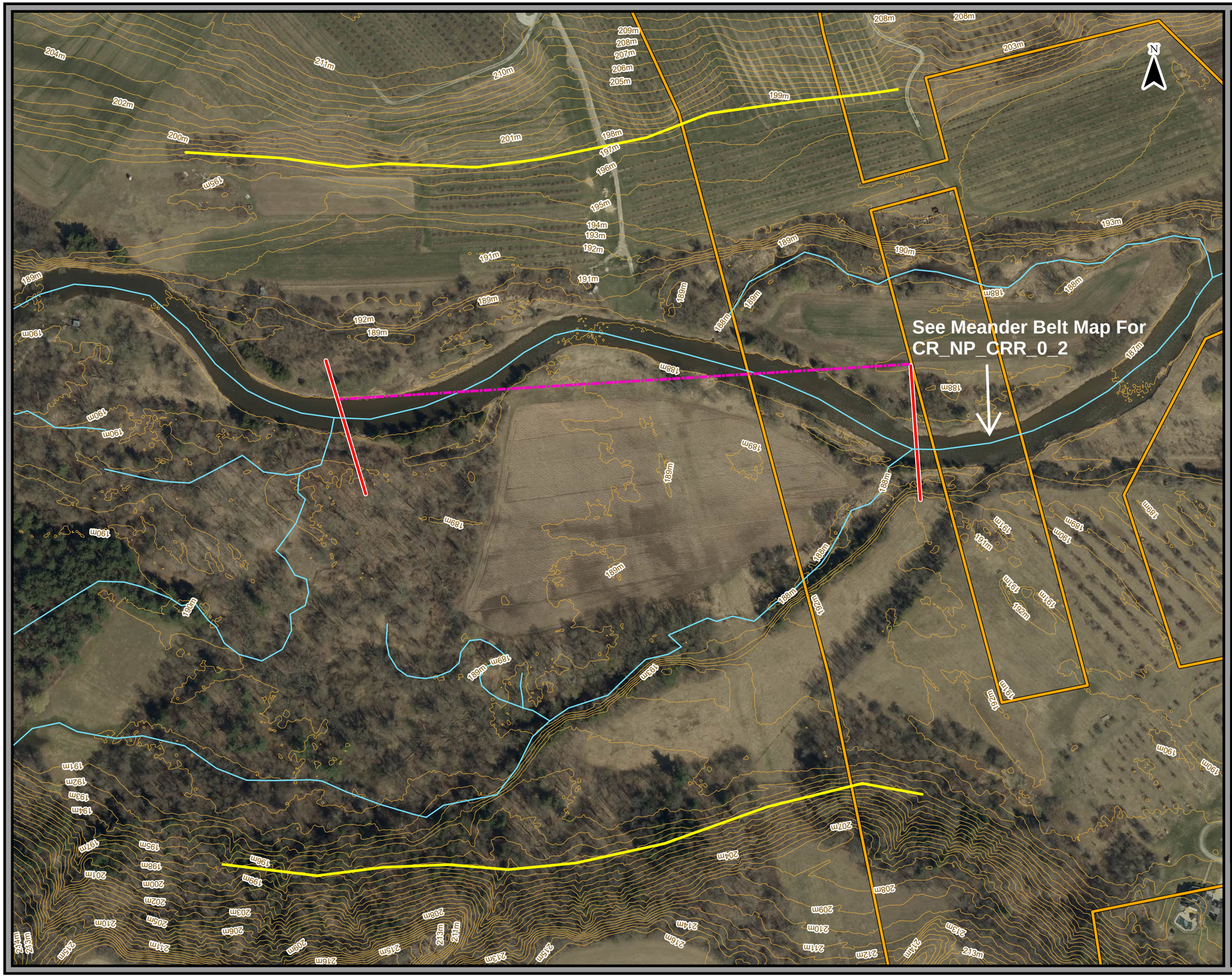

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Meander Belt
CR_NP_CRR_0_1
07 Oct, 2025

0 25 50 75 100
Metres

AECOM WSP Ontario

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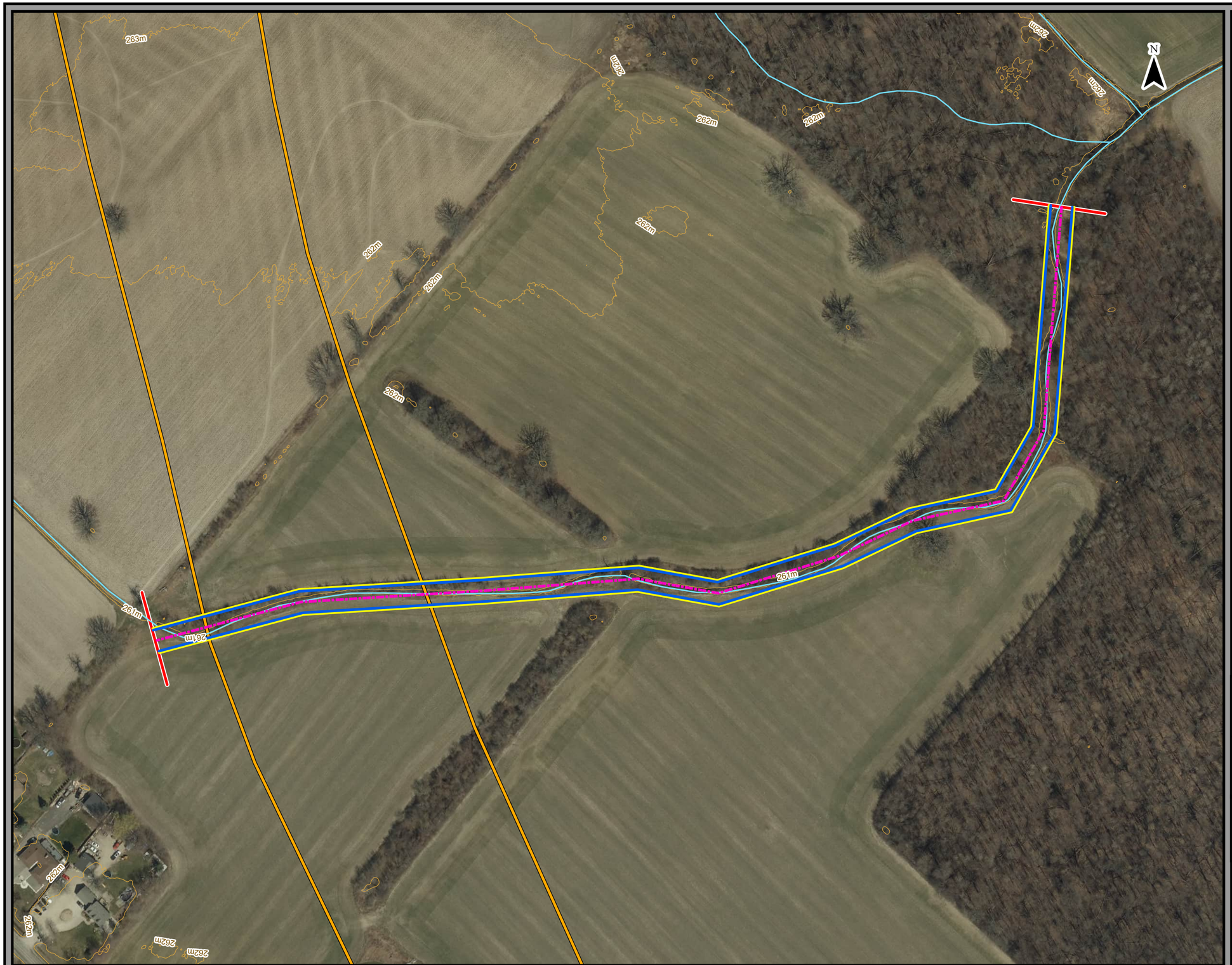

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
EC_EH_ETW_13_1

07 Oct, 2025

0 25 50 75 100
Metres

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_GW_CRR_15a

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
CR_GW_CRR_15b
07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
EC_EH_ETW_12_3

07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_7_2
07 Oct, 2025

0 60 120 180 240
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_6_1

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
EC_EH_ETW_6_4

07 Oct, 2025

0 10 20 30 40
Metres

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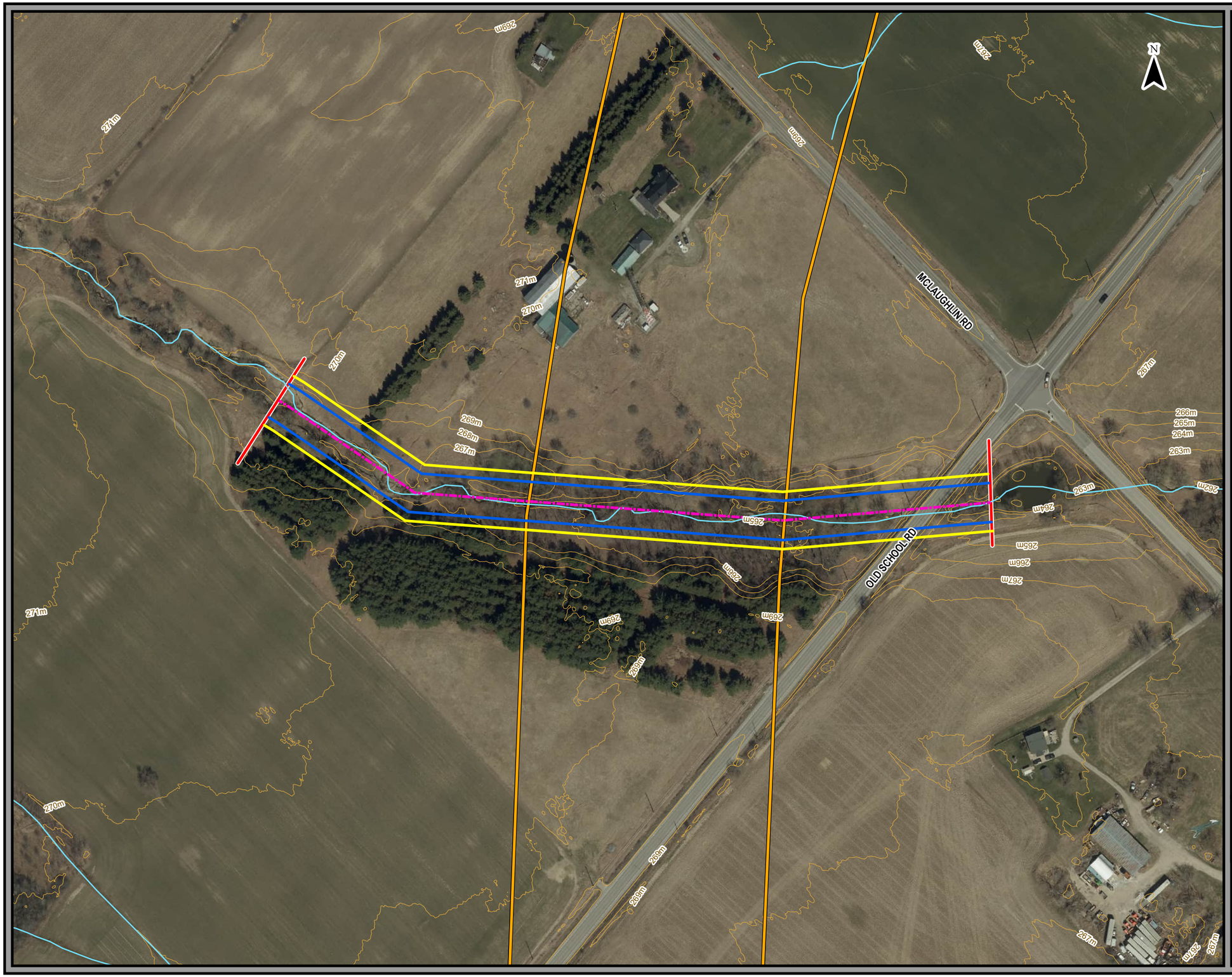

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_1_1

07 Oct, 2025

0 20 40 60 80
Metres

AECOM WSP Ontario

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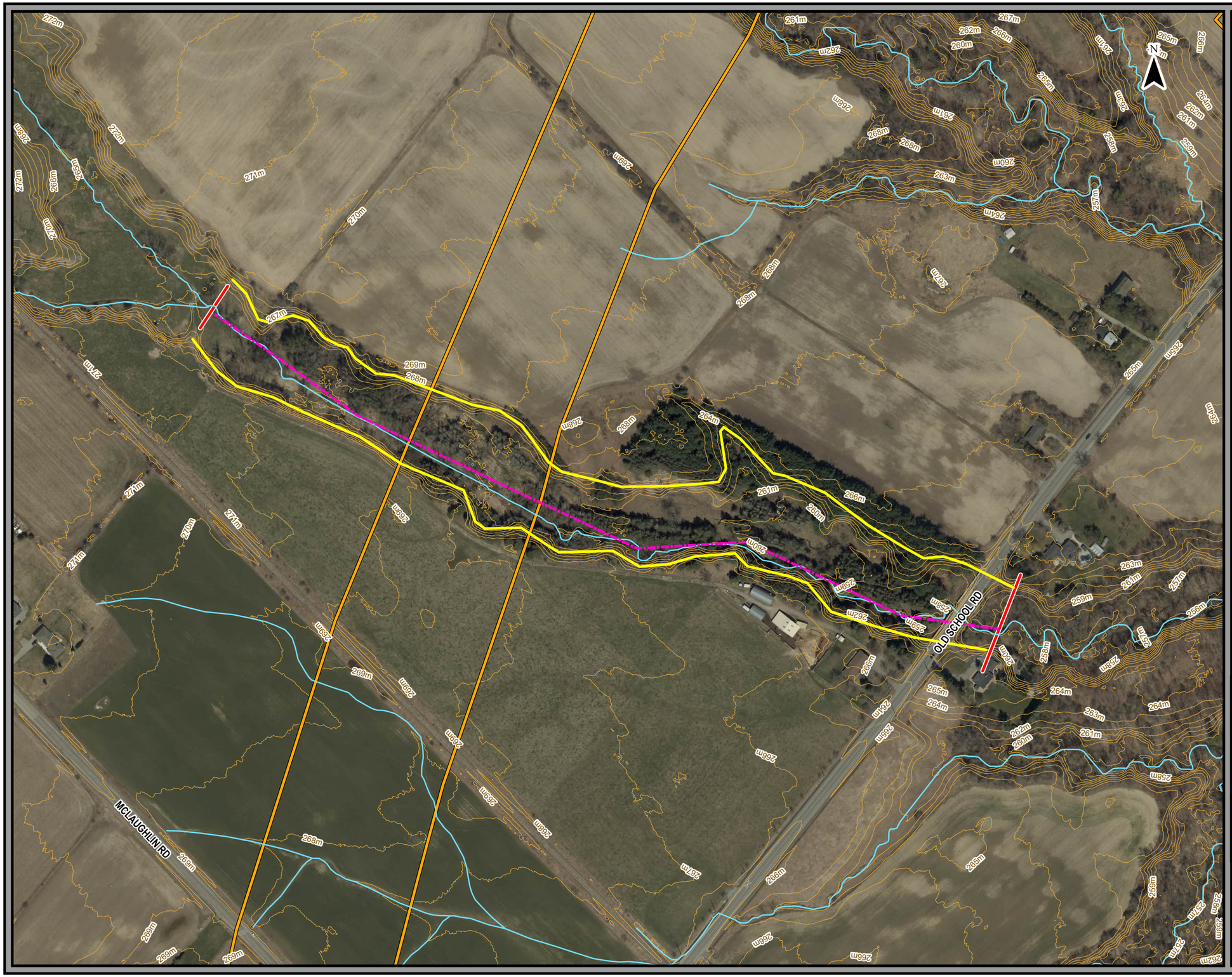

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_1_5
07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP Ontario

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Author: Last Saved by: michael.w.collins

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_1_7

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP
Ontario

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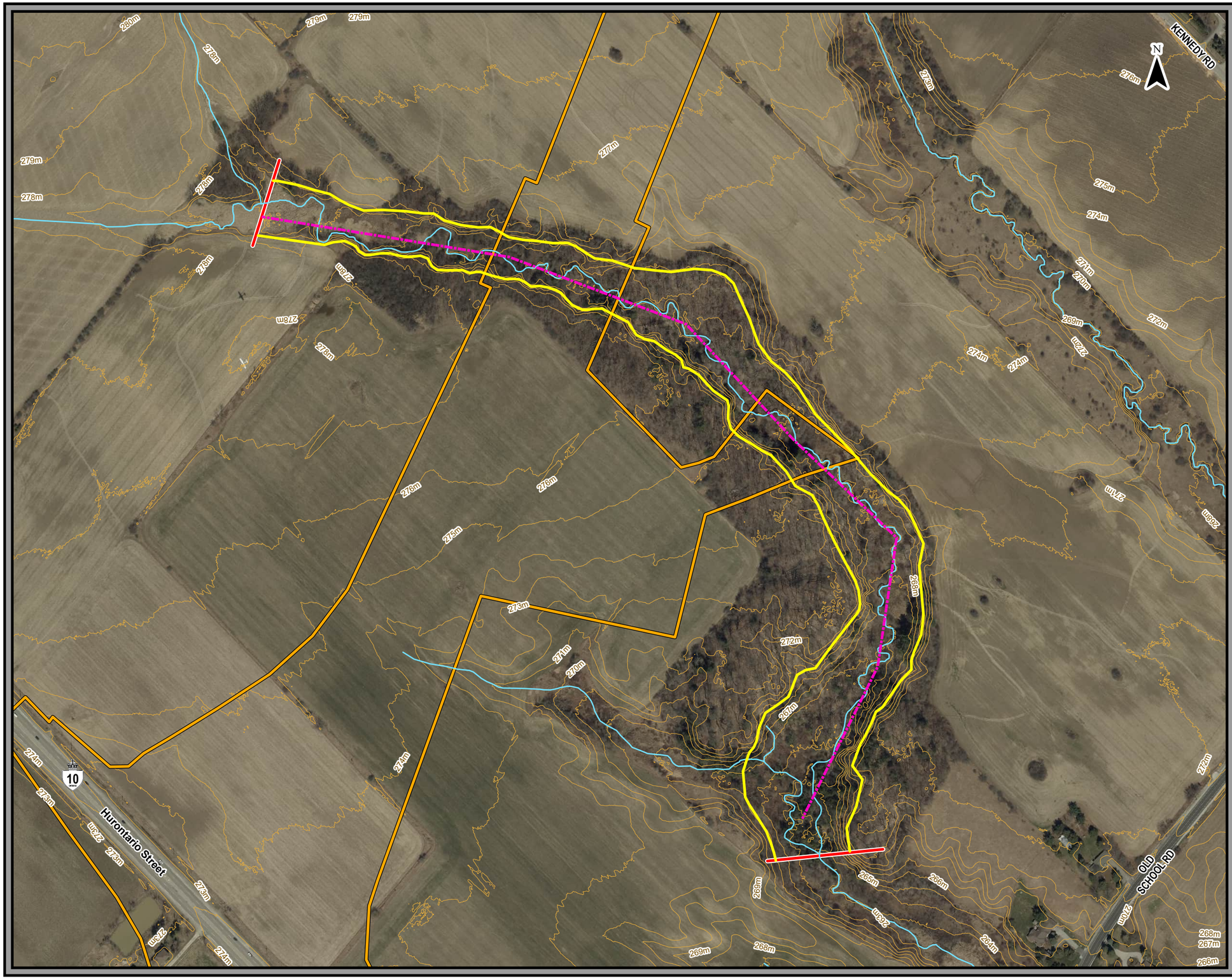
Author: Last Saved by: michael.w.collins



Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_1_11

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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Author: Last Saved by: michael.w.collins

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
EC_EH_ETW_1_12

07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_CAC_0_1

07 Oct, 2025

0 70 140 210 280
Metres

AECOM WSP Ontario

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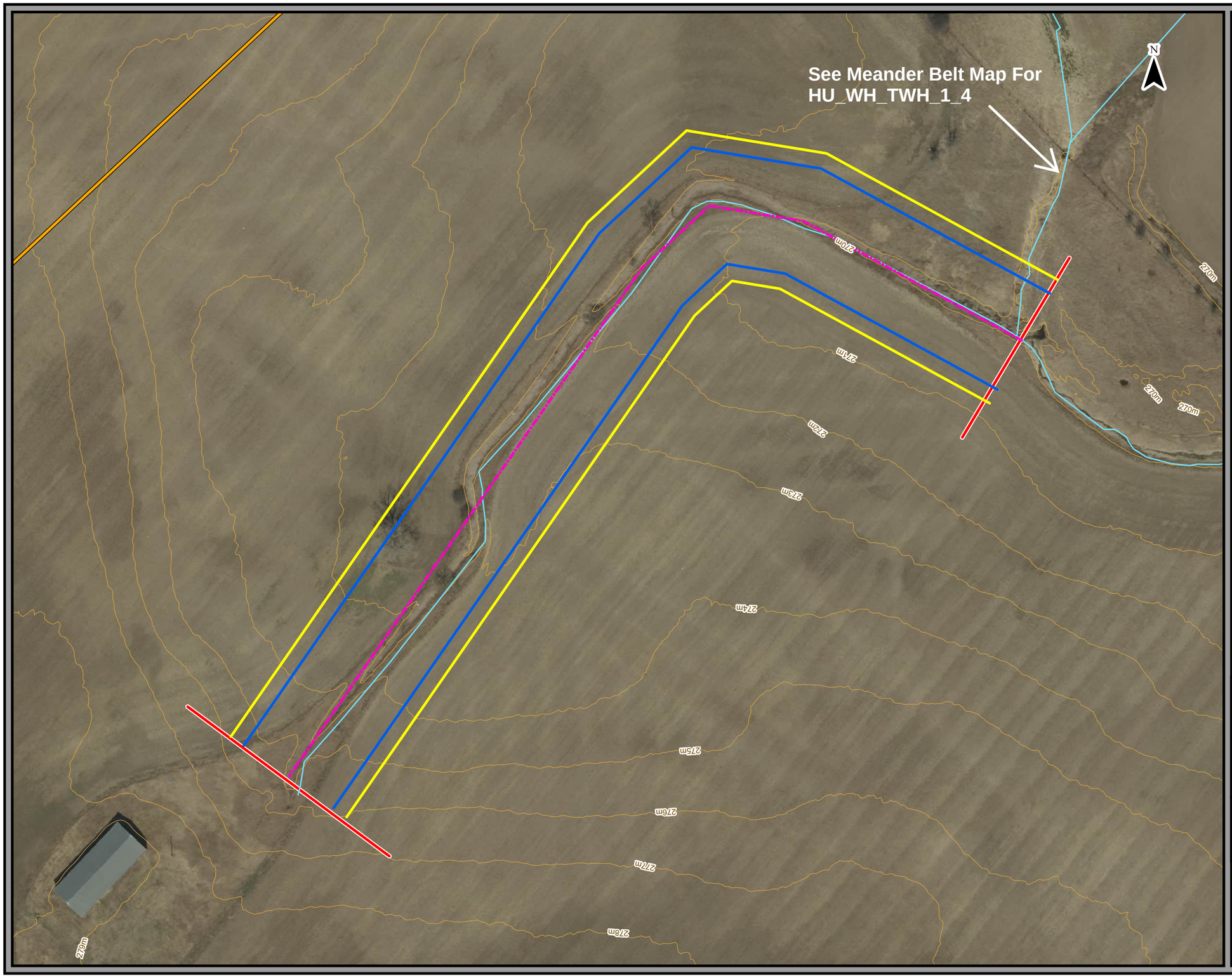

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
HU_WH_TWH_1_2
07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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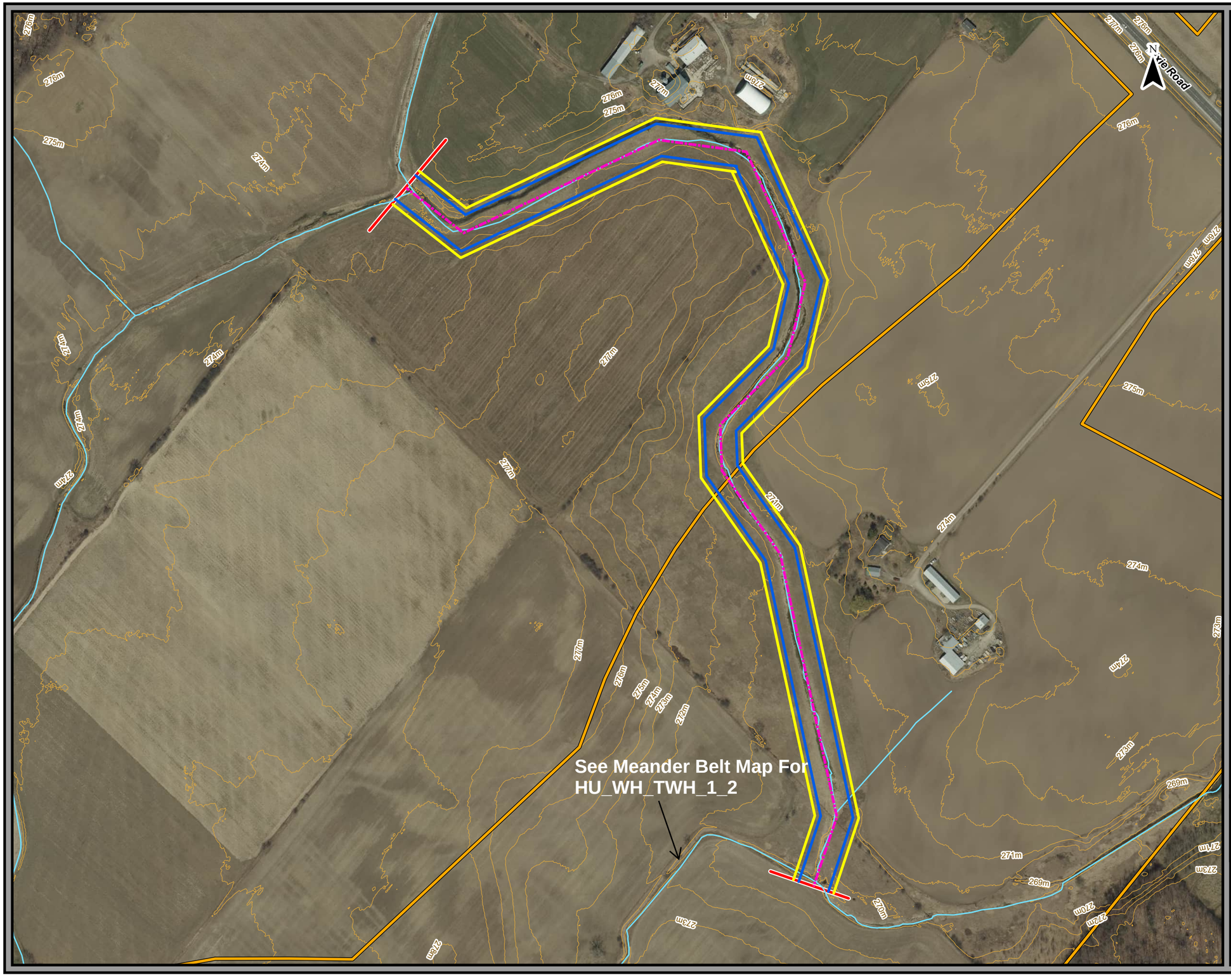

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt HU_WH_TWH_1_4

07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP Ontario

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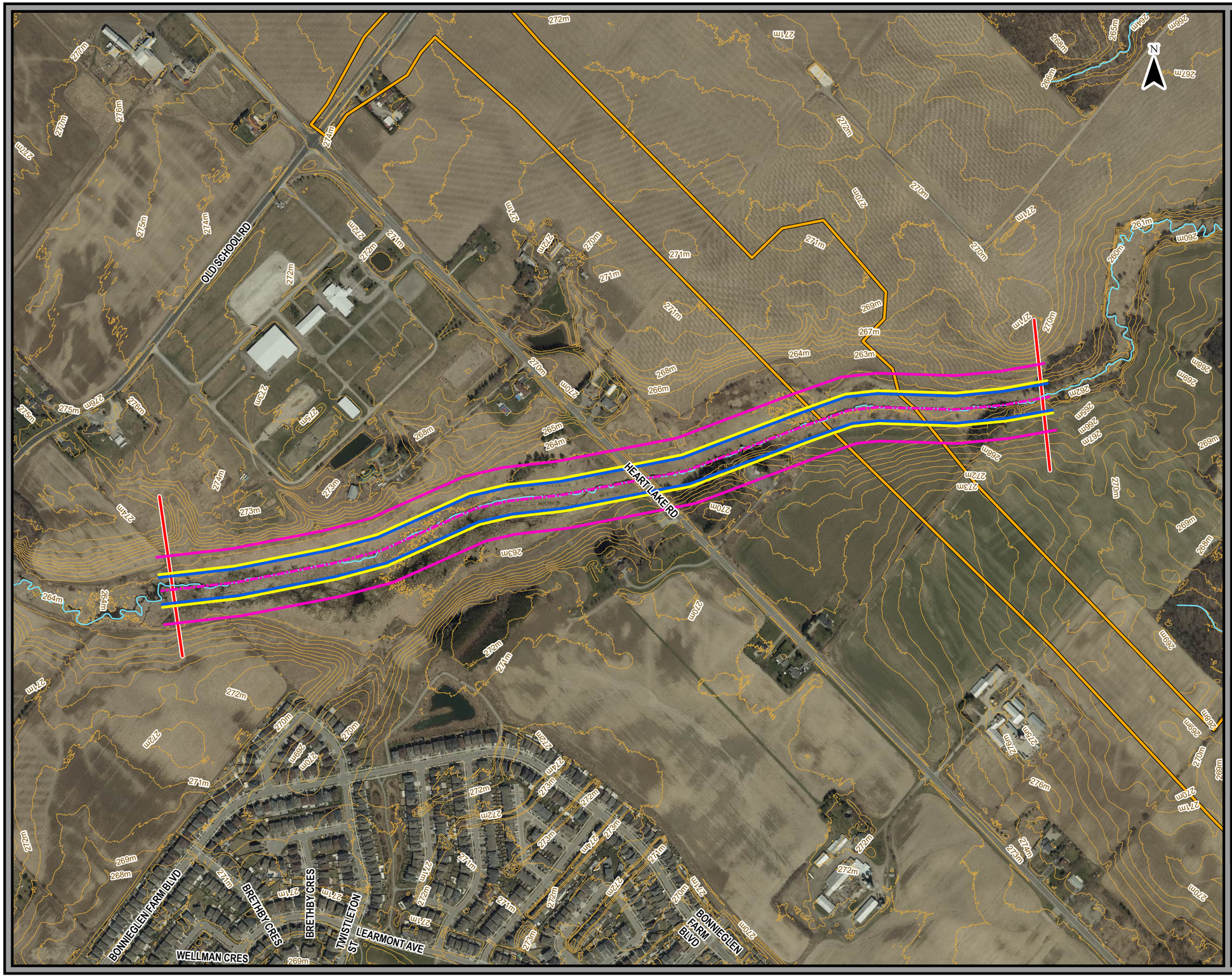

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_CAC_0_2a

07 Oct, 2025

0 70 140 210 280

Metres

AECOM WSP Ontario

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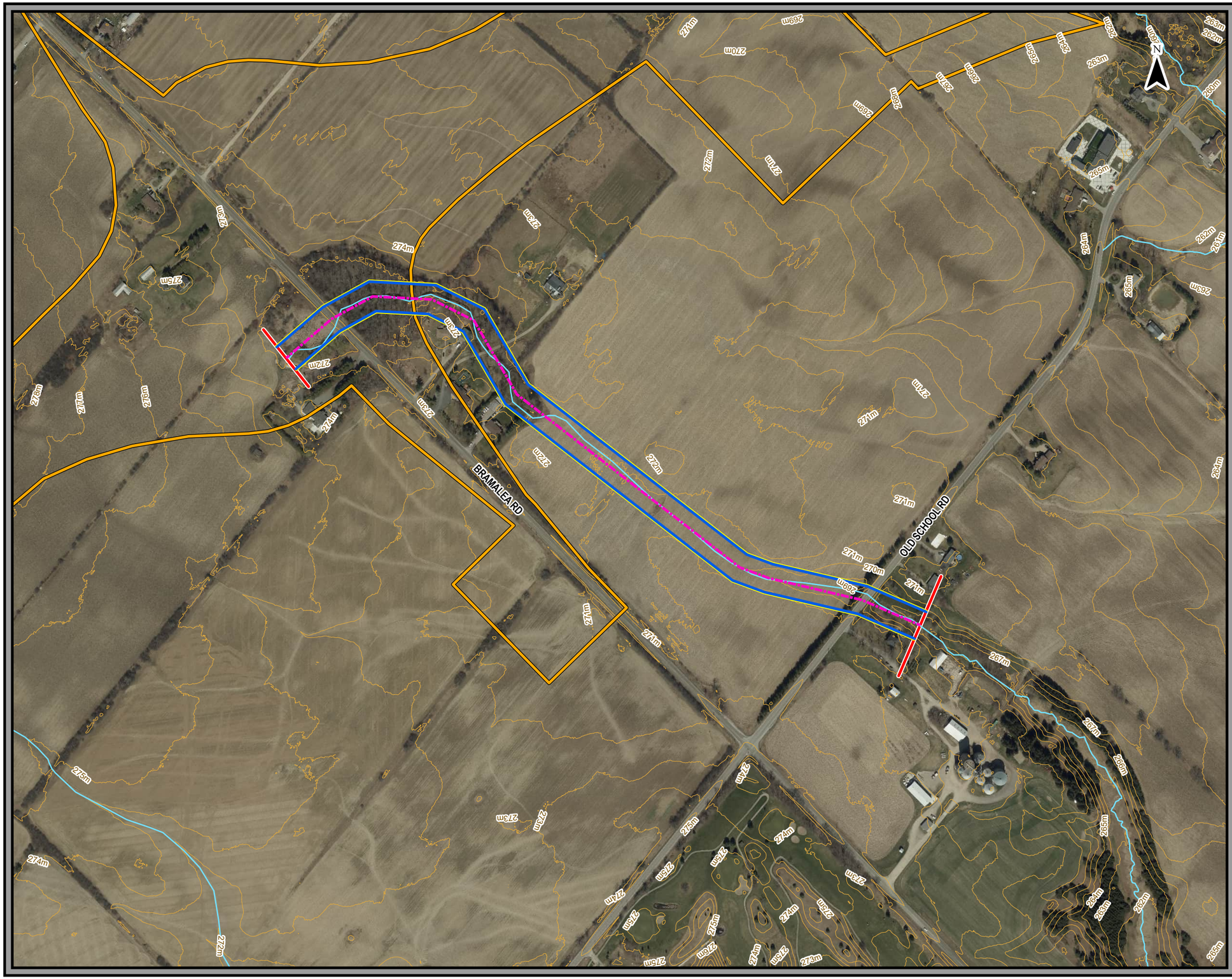

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_TWH_1_5

07 Oct, 2025

0 50 100 150 200
Metres

AECOM WSP Ontario

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Legend

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- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

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Meander Belt
HU_WH_TWH_2_1

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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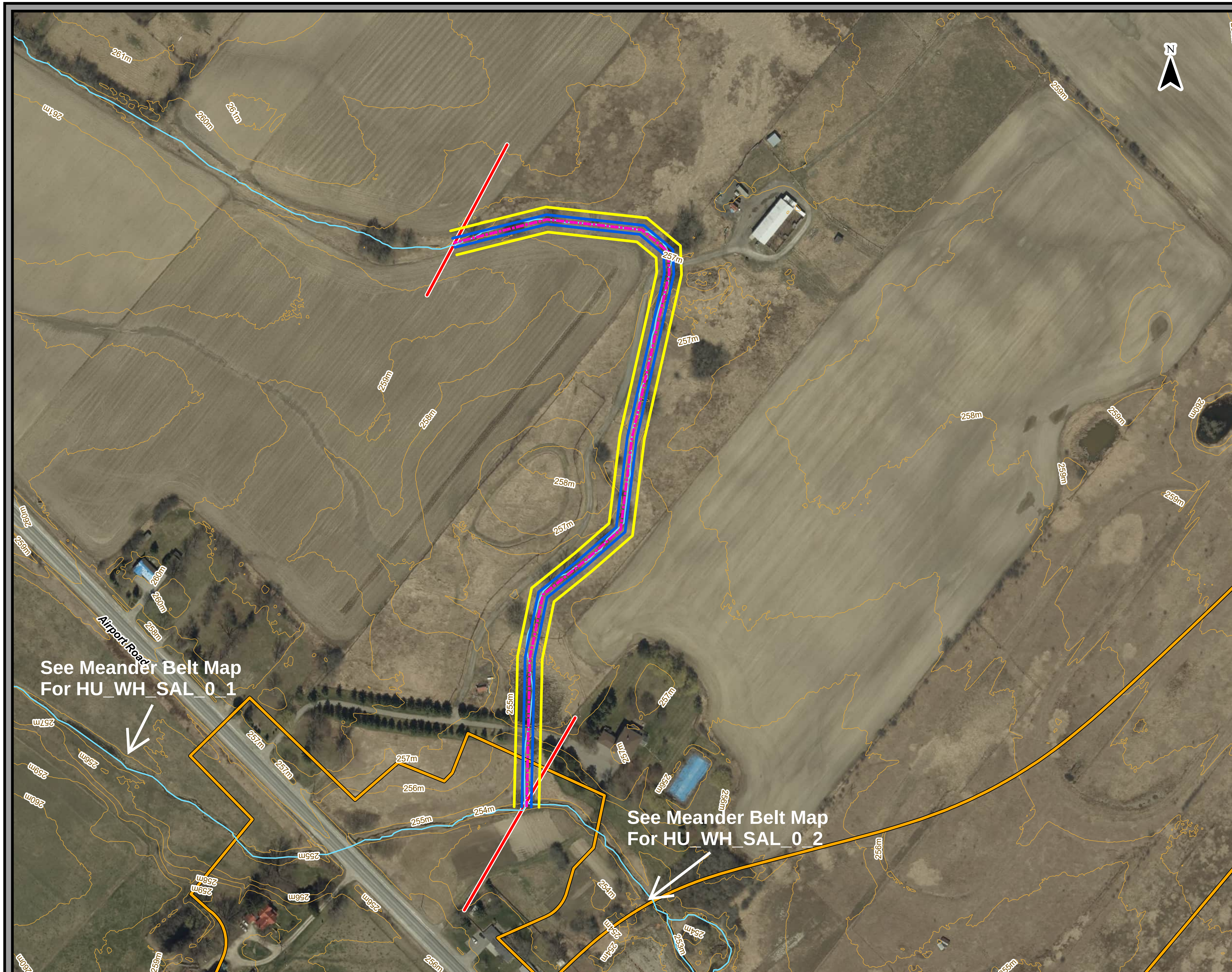

Legend

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- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
HU_WH_SAL_5_1
07 Oct, 2025

0 25 50 75 100
Metres

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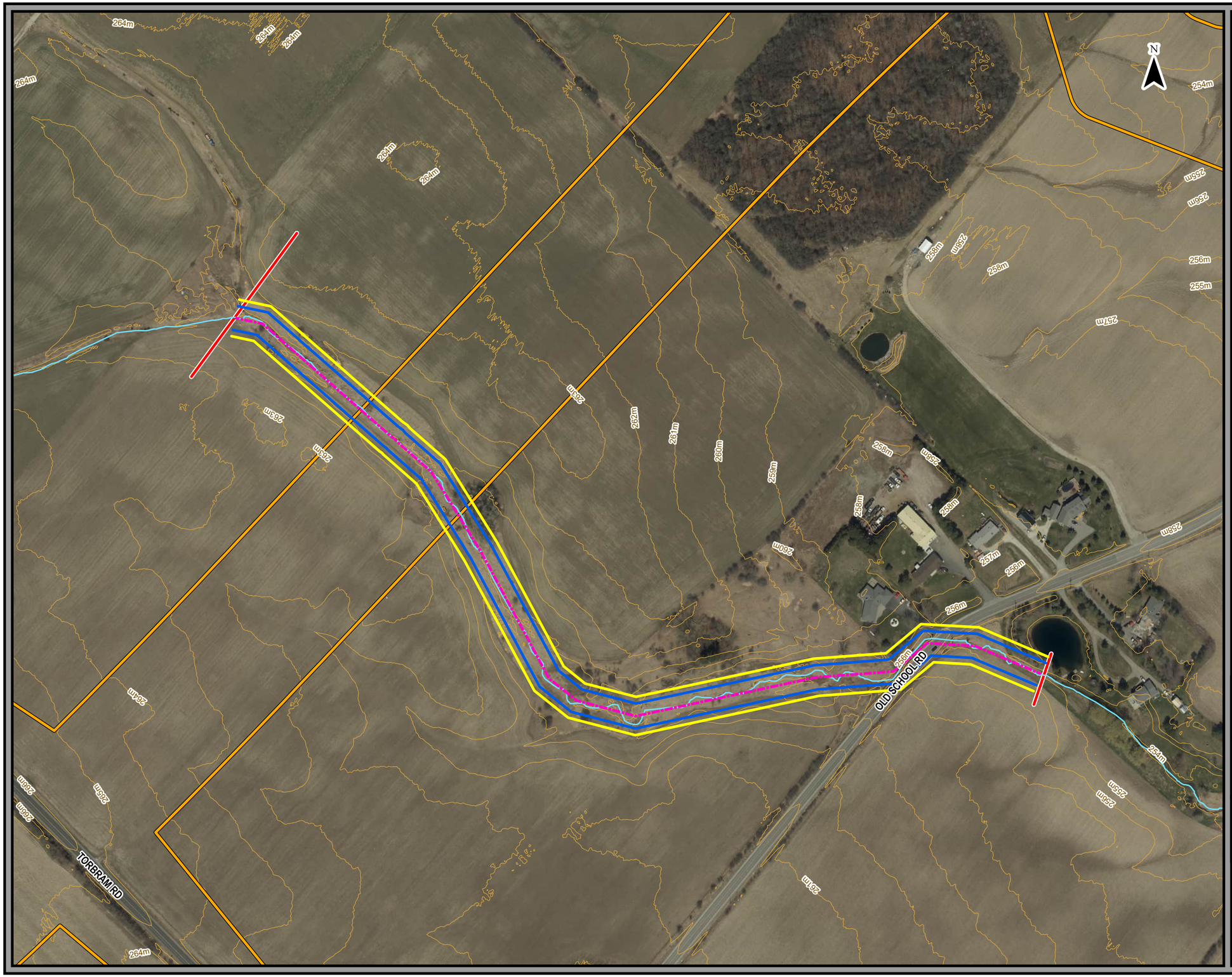

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_SAL_3_1
07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP
Ontario

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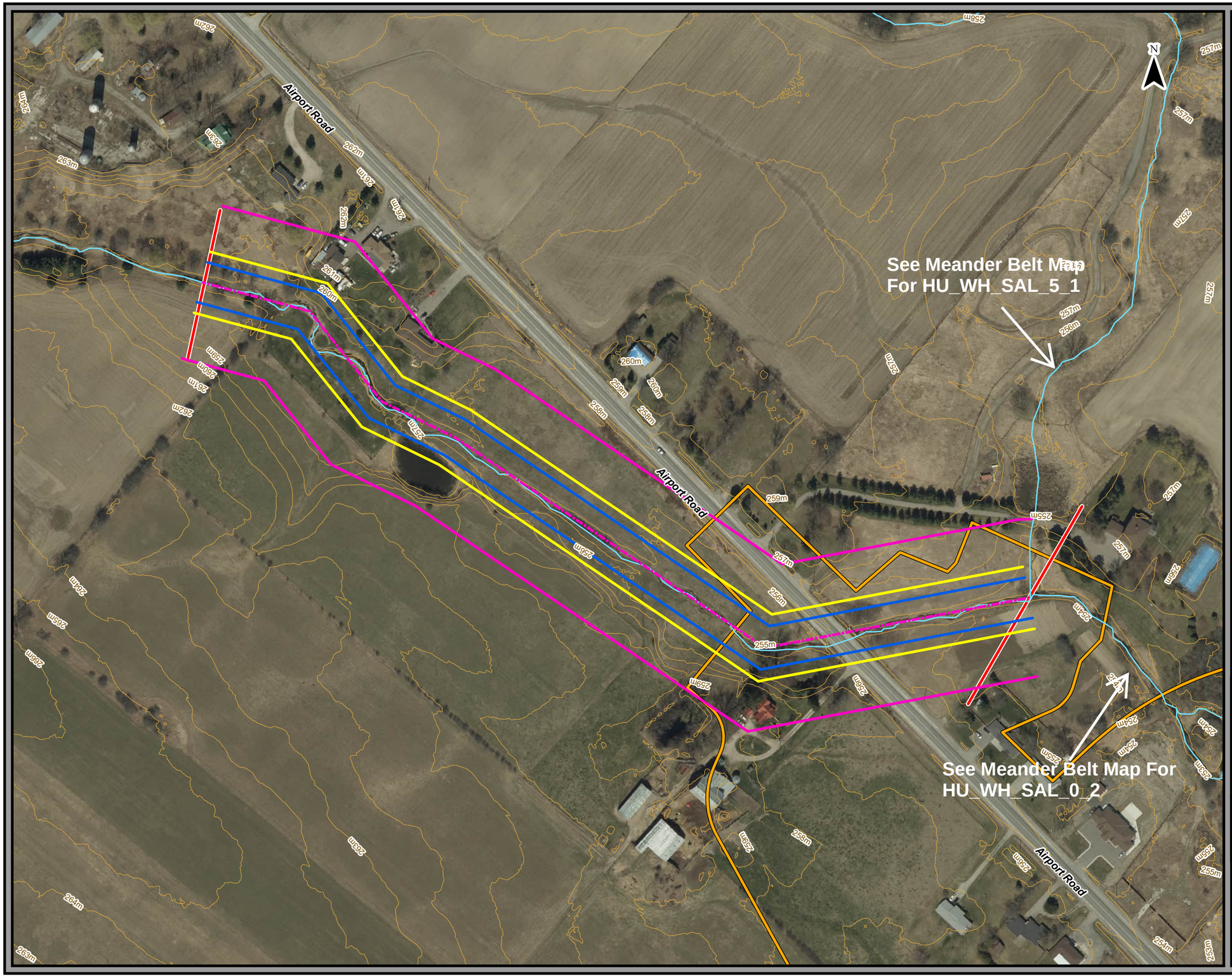

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt HU_WH_SAL_0_1

07 Oct, 2025

0 25 50 75 100
Metres

AECOM WSP Ontario

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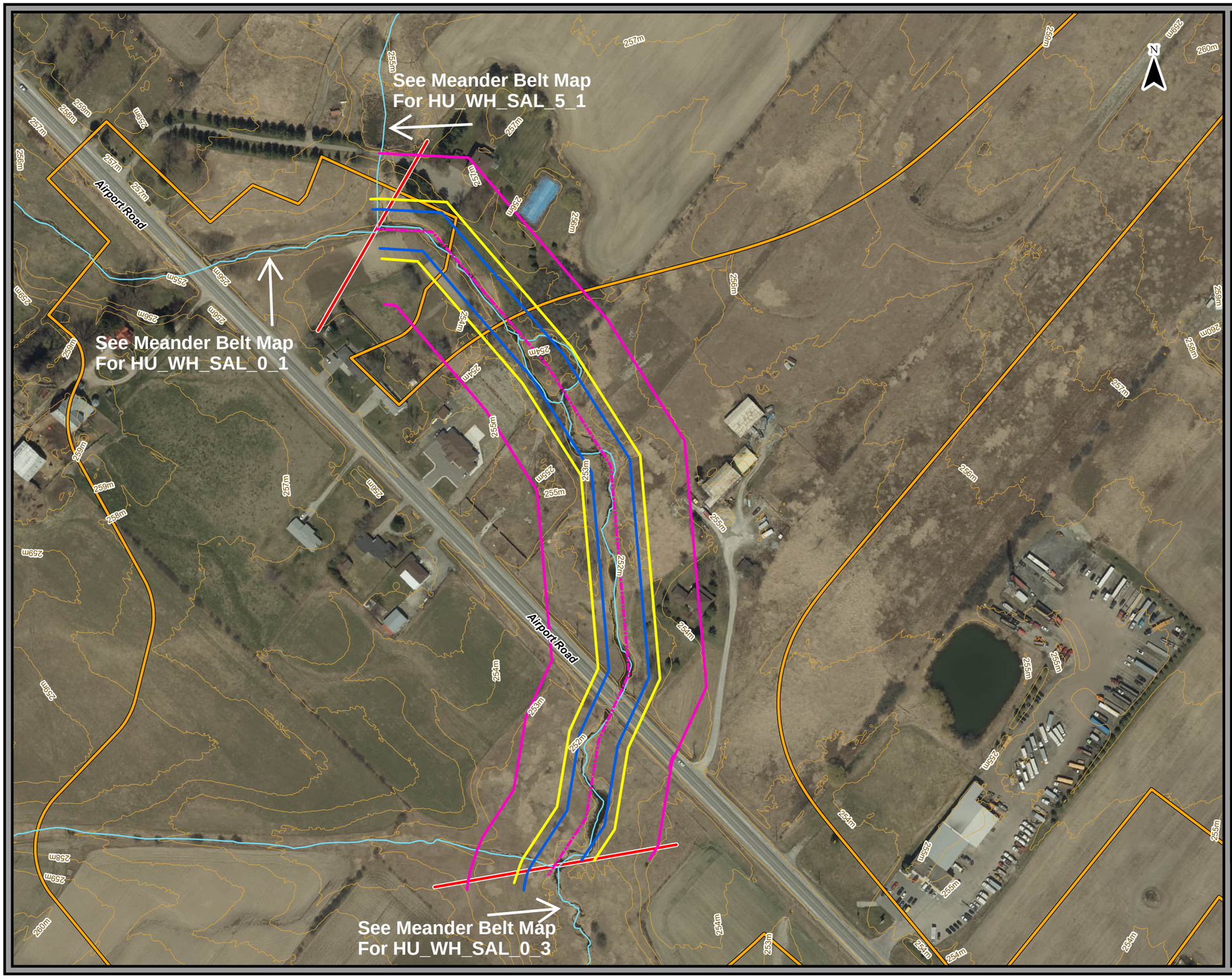

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_SAL_0_2
07 Oct, 2025

0 25 50 75 100
Metres

AECOM WSP Ontario

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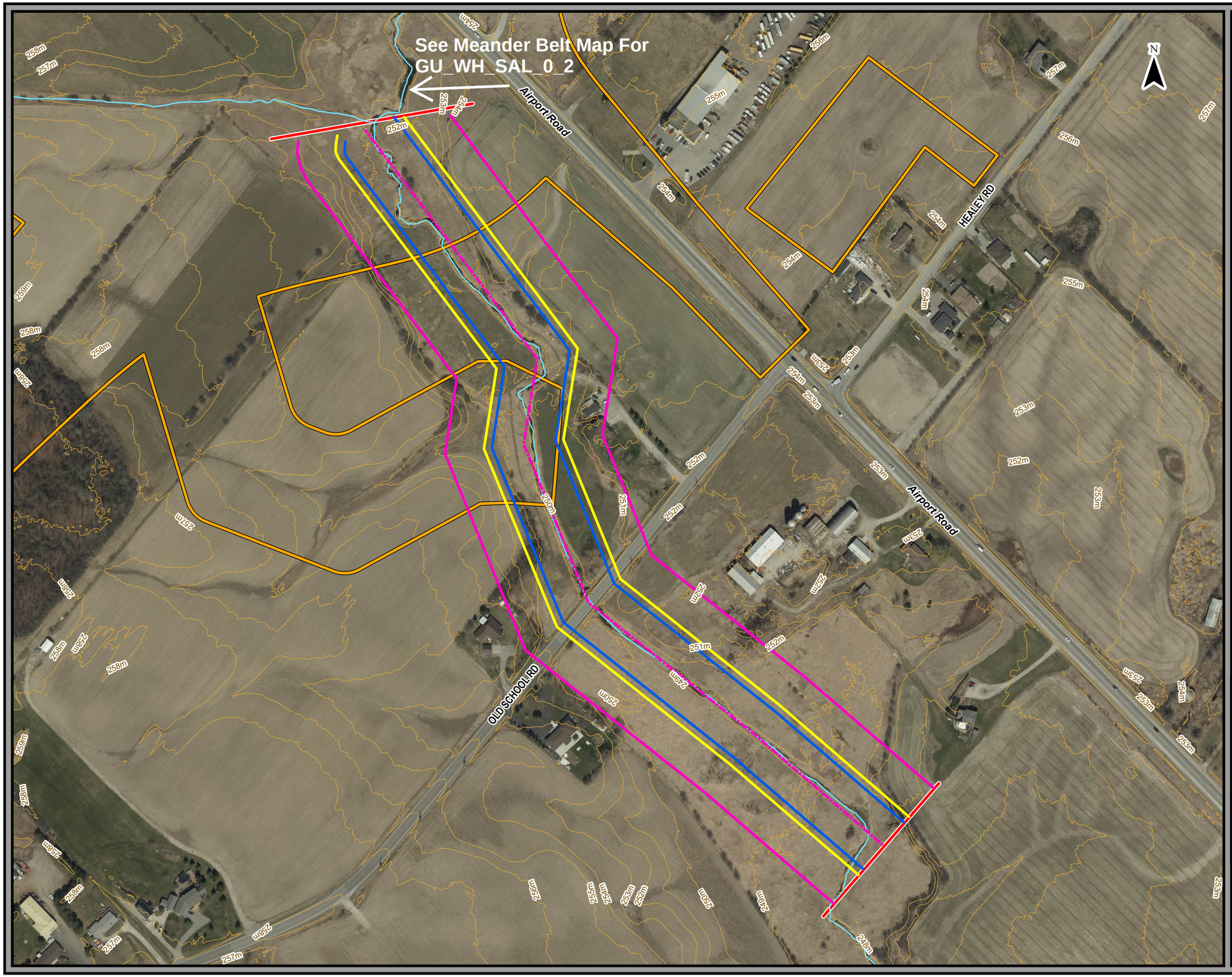

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

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Meander Belt
HU_WH_SAL_0_3

07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP
Ontario

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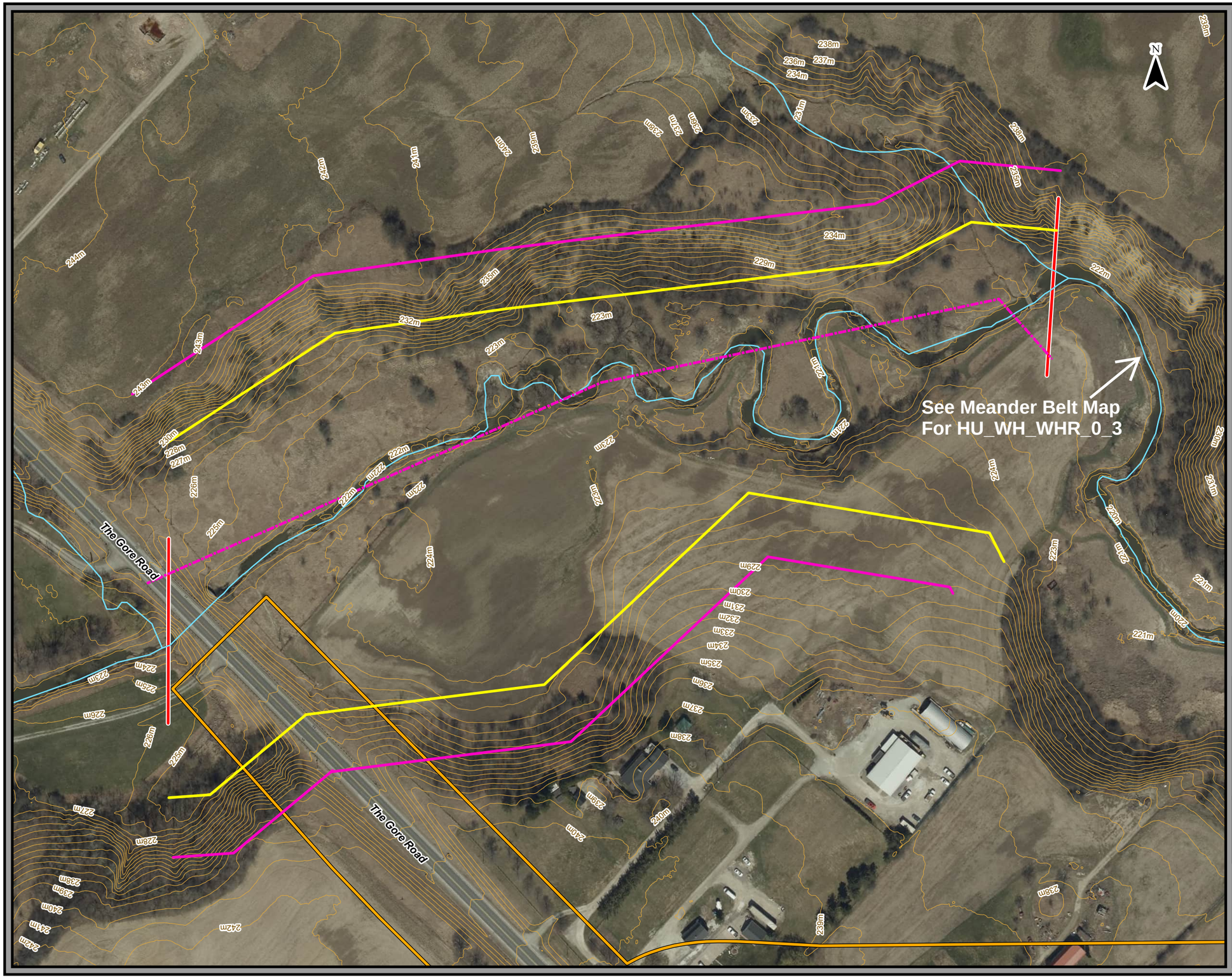

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_WHR_0_2
07 Oct, 2025

0 20 40 60 80
Metres

AECOM WSP Ontario

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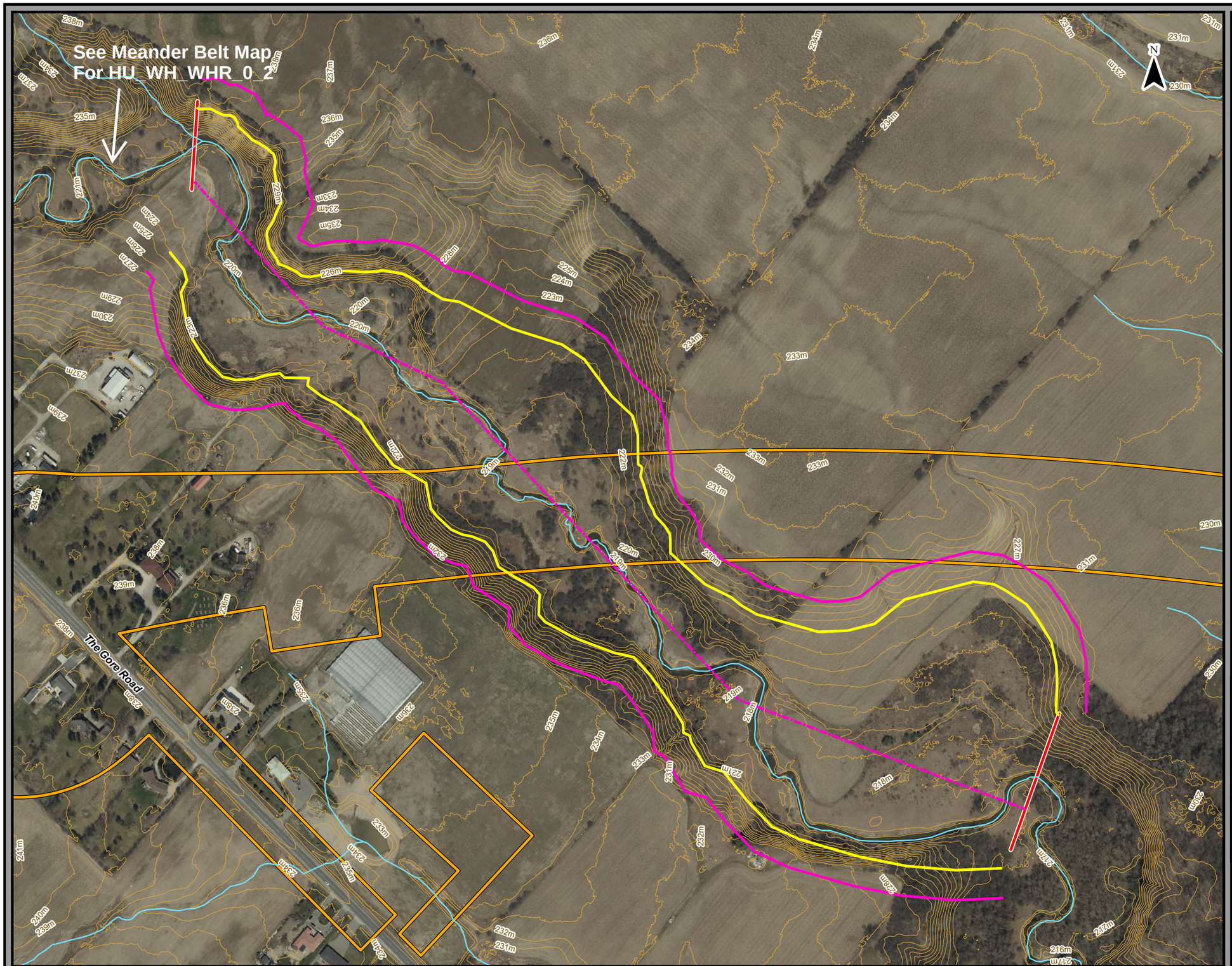

Legend

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- Axis
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- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

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Meander Belt HU_WH_WHR_0_3

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
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Meander Belt
HU_WH_GRT_0_2

07 Oct, 2025

0 20 40 60 80
Metres

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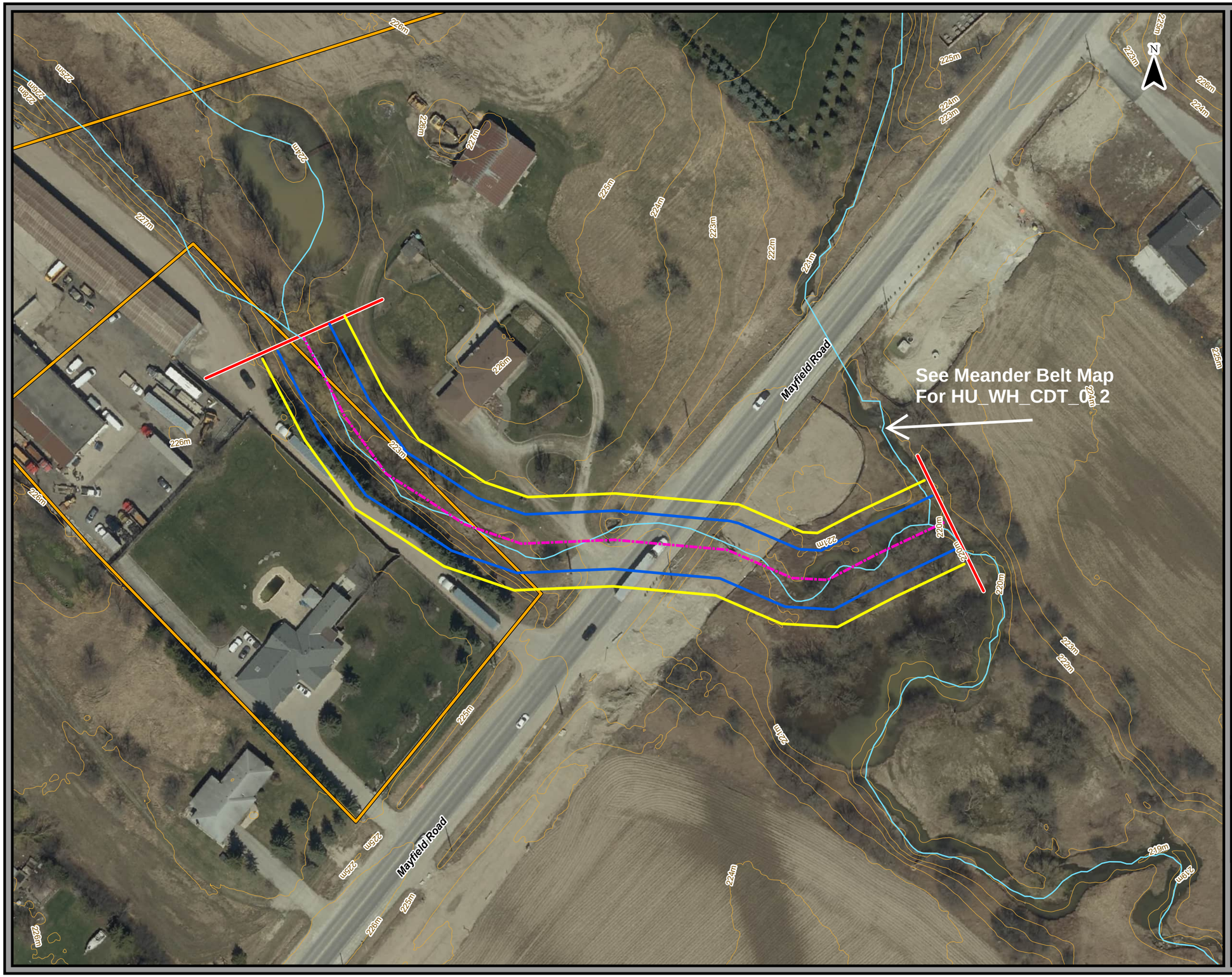

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
HU_WH_CDT_2_1b

07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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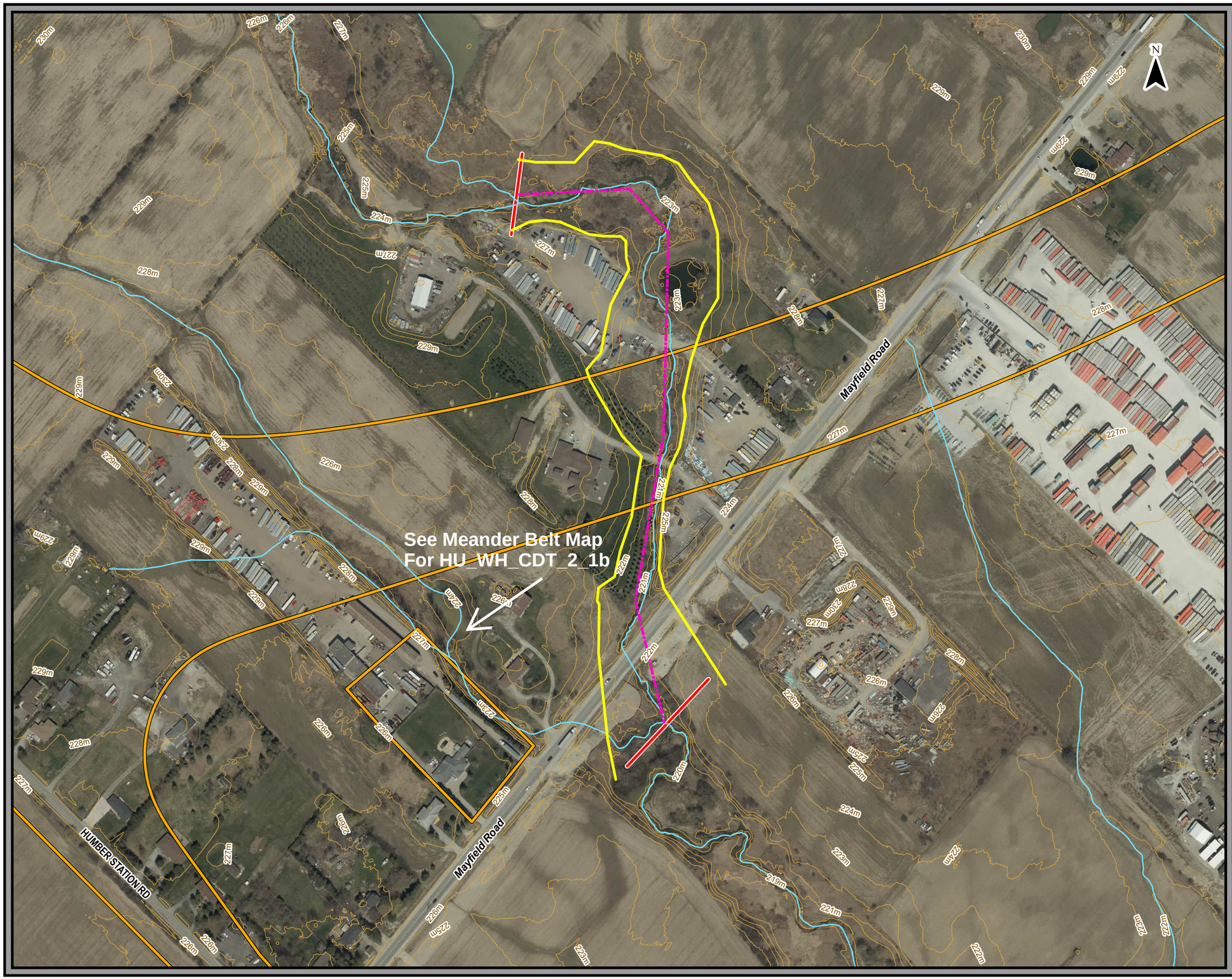

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_WH_CDT_0_2

07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP Ontario

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Legend

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- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_MH_RAI_1_3

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP
Ontario

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See Meander Belt Map For HU_MH_ROB_4_1

HU_MH_ROB_0_3

Highway 50

N

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt HU_MH_ROB_0_2

07 Oct, 2025

0 40 80 120 160
Metres

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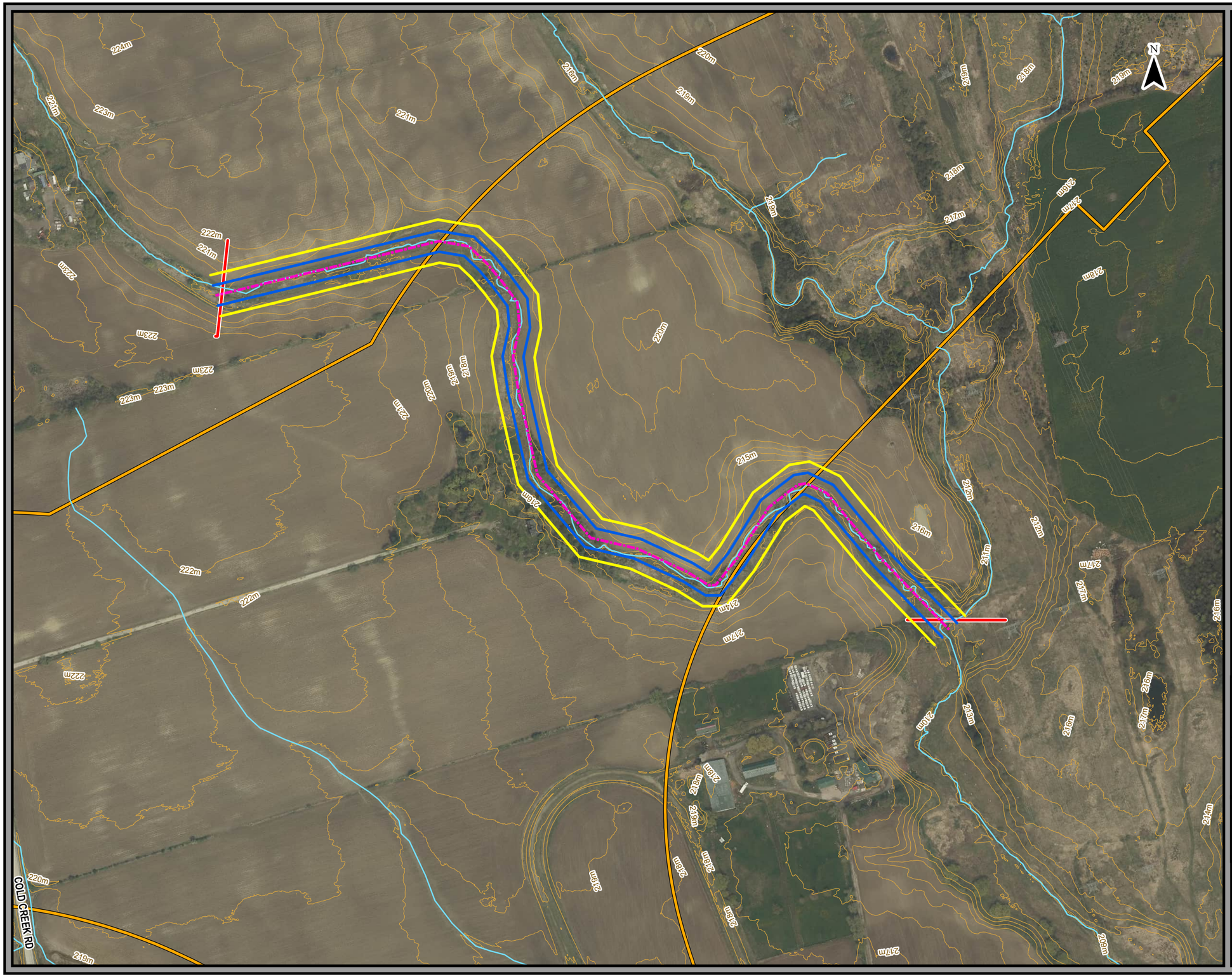

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_MH_ROB_0_5

07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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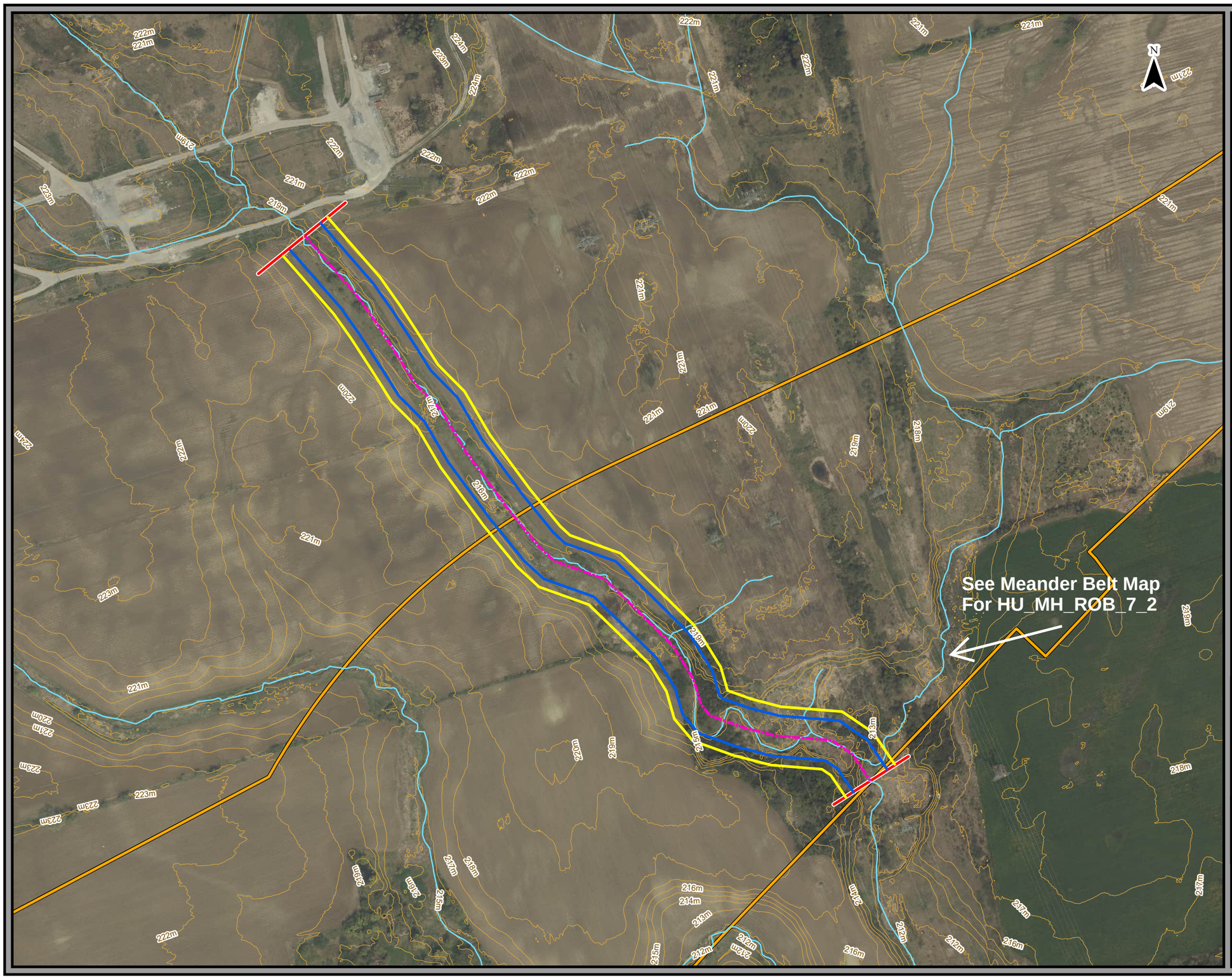

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_MH_ROB_7_1

07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP
Ontario

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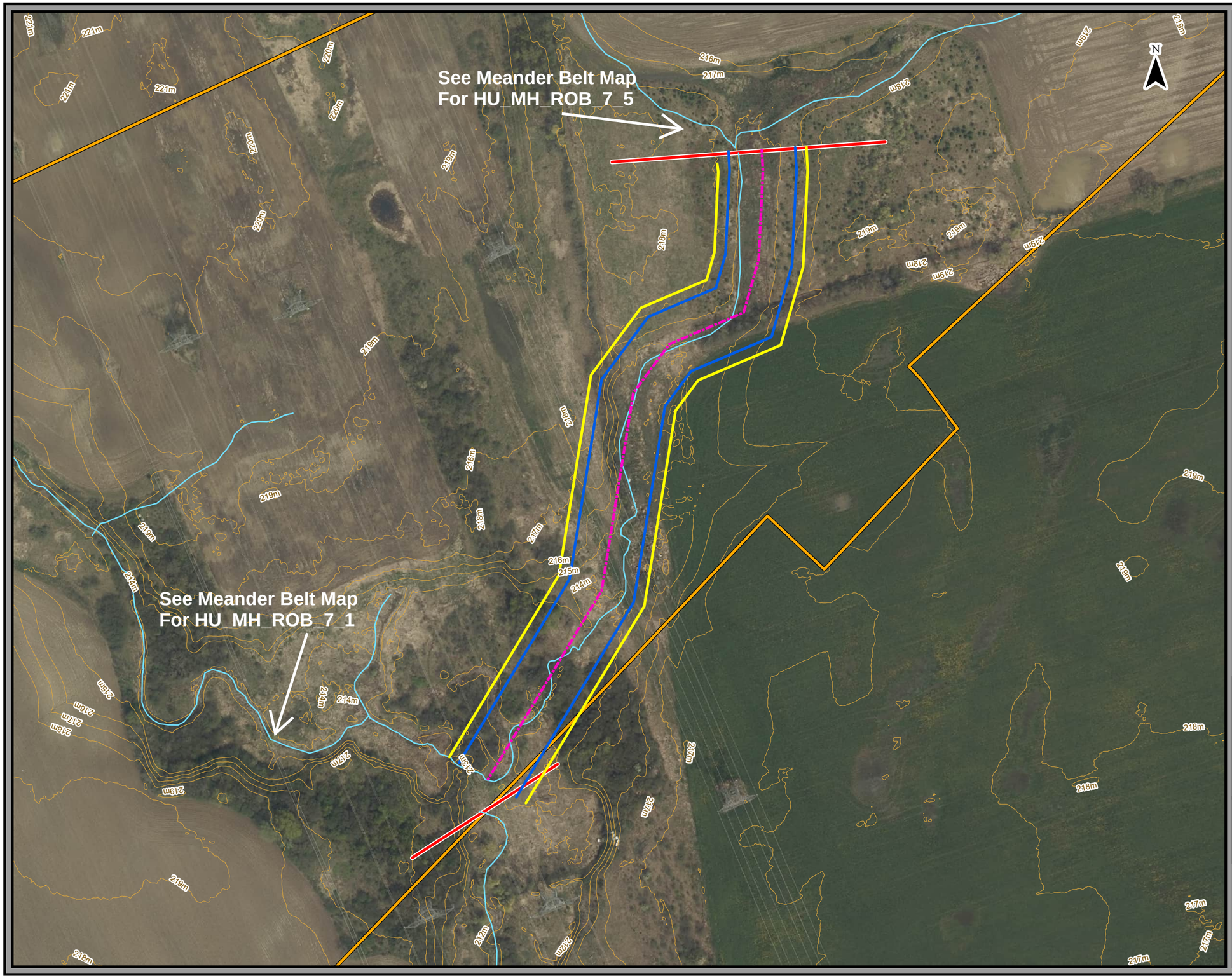
Author: Last Saved by: michael.w.collins



Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
HU_MH_ROB_7_2
07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP
Ontario

Author: Last Saved by: michael.w.collins
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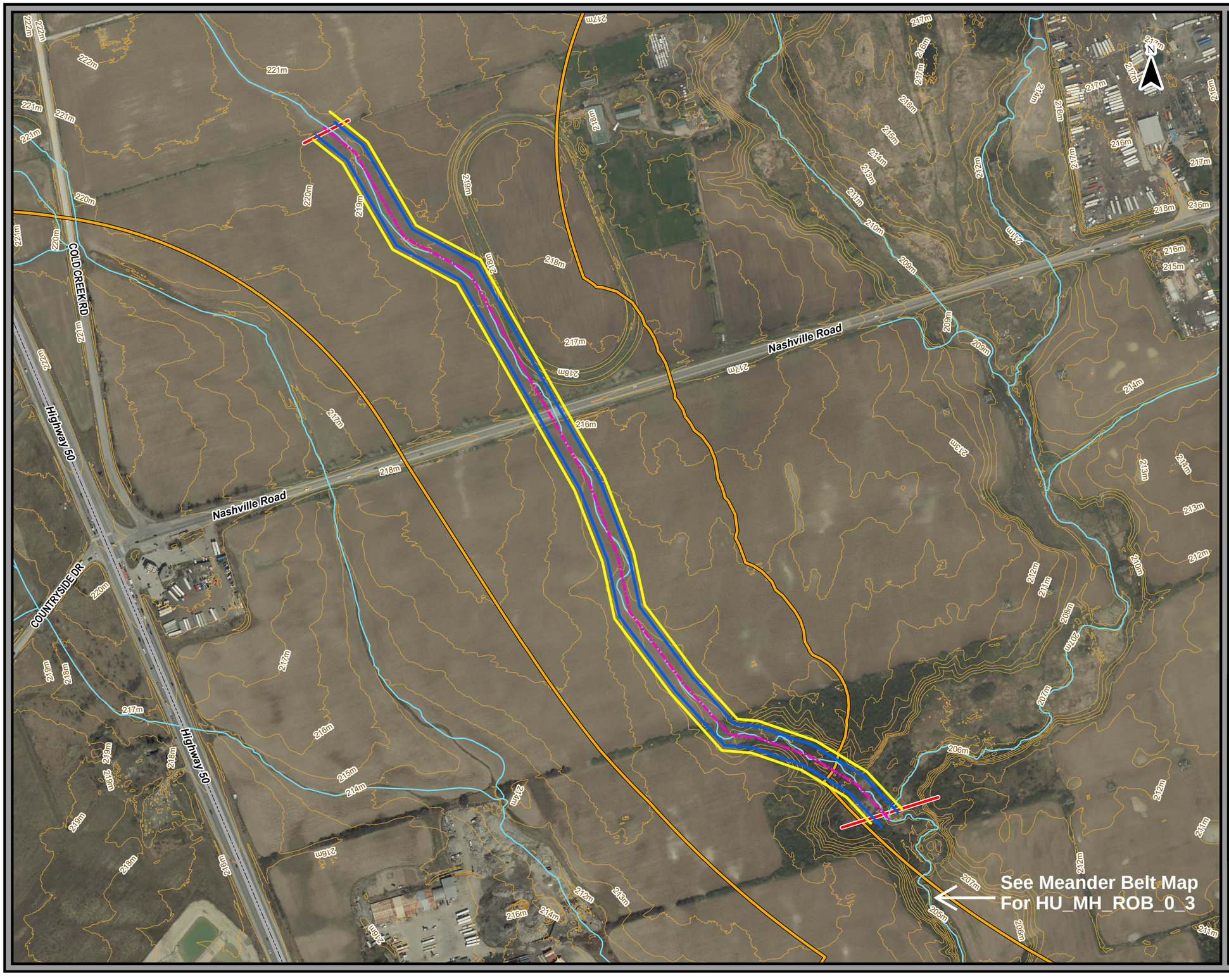

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

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Meander Belt
HU_MH_ROB_4_1

07 Oct, 2025

0 50 100 150 200
Metres

AECOM WSP
Ontario

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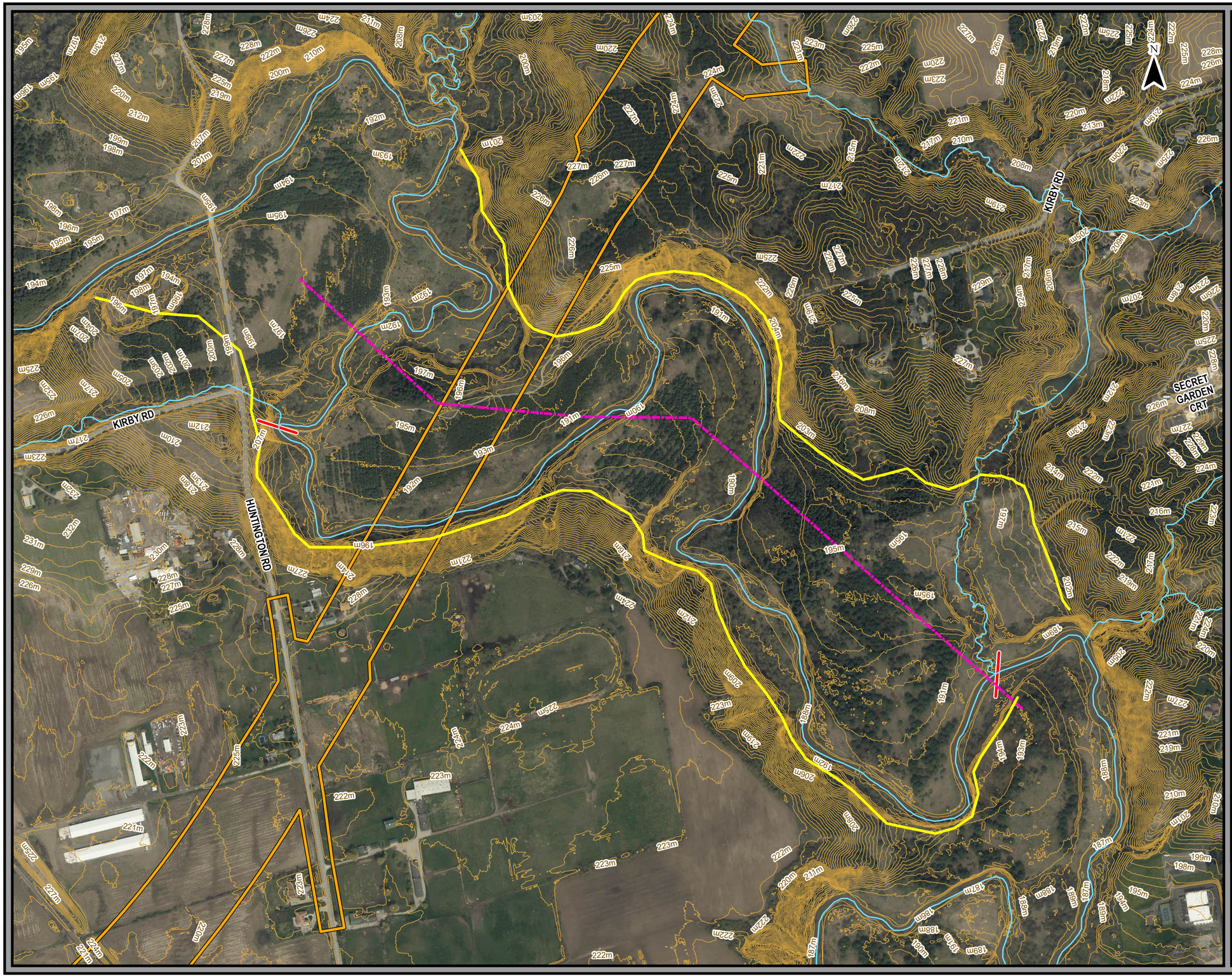

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_MH_MHR_0_1

26 Feb, 2026

0 70 140 210 280
Metres

AECOM WSP Ontario

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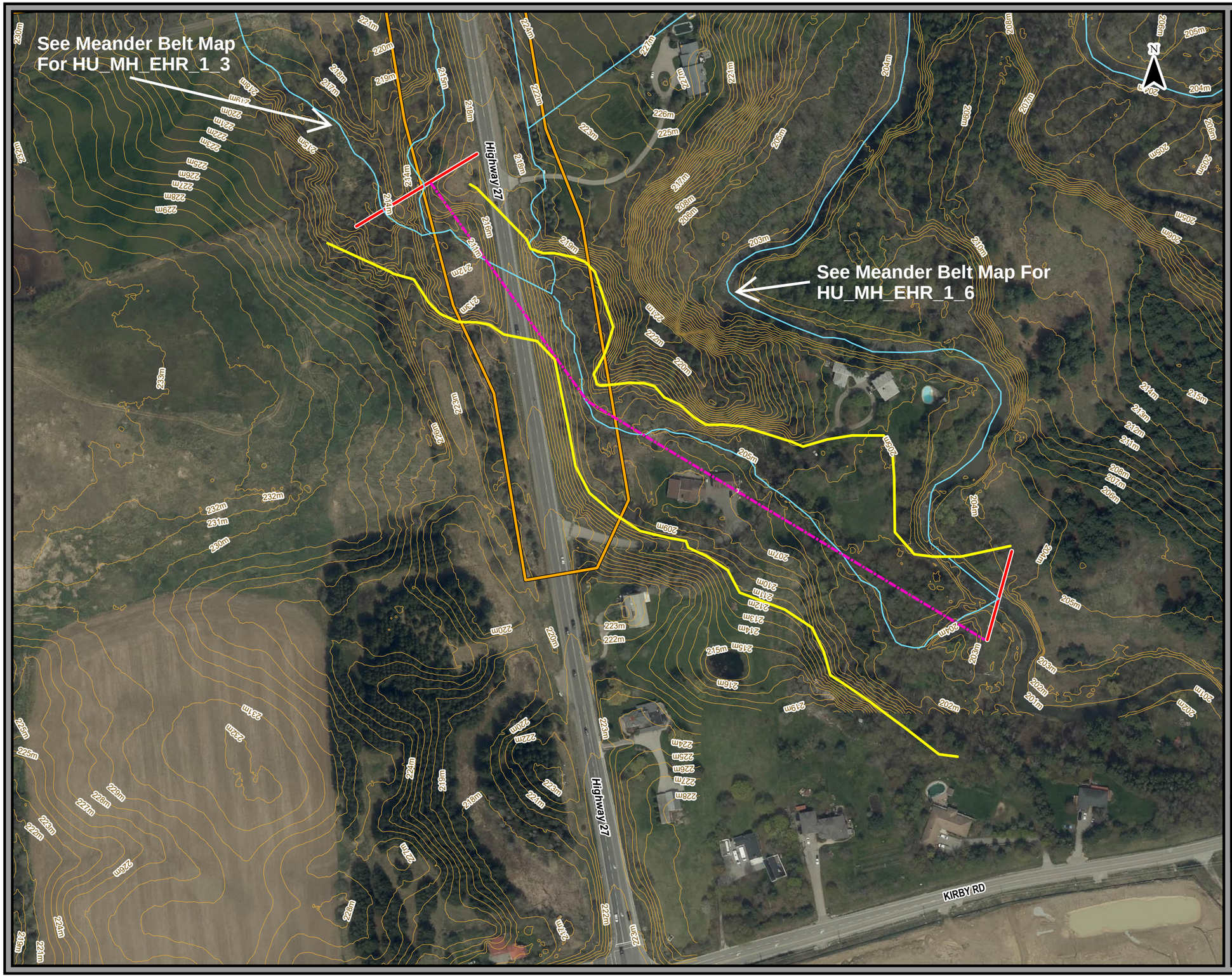

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Meander Belt
HU_MH_EHR_1_4
26 Feb, 2026

0 25 50 75 100
Metres

AECOM WSP Ontario

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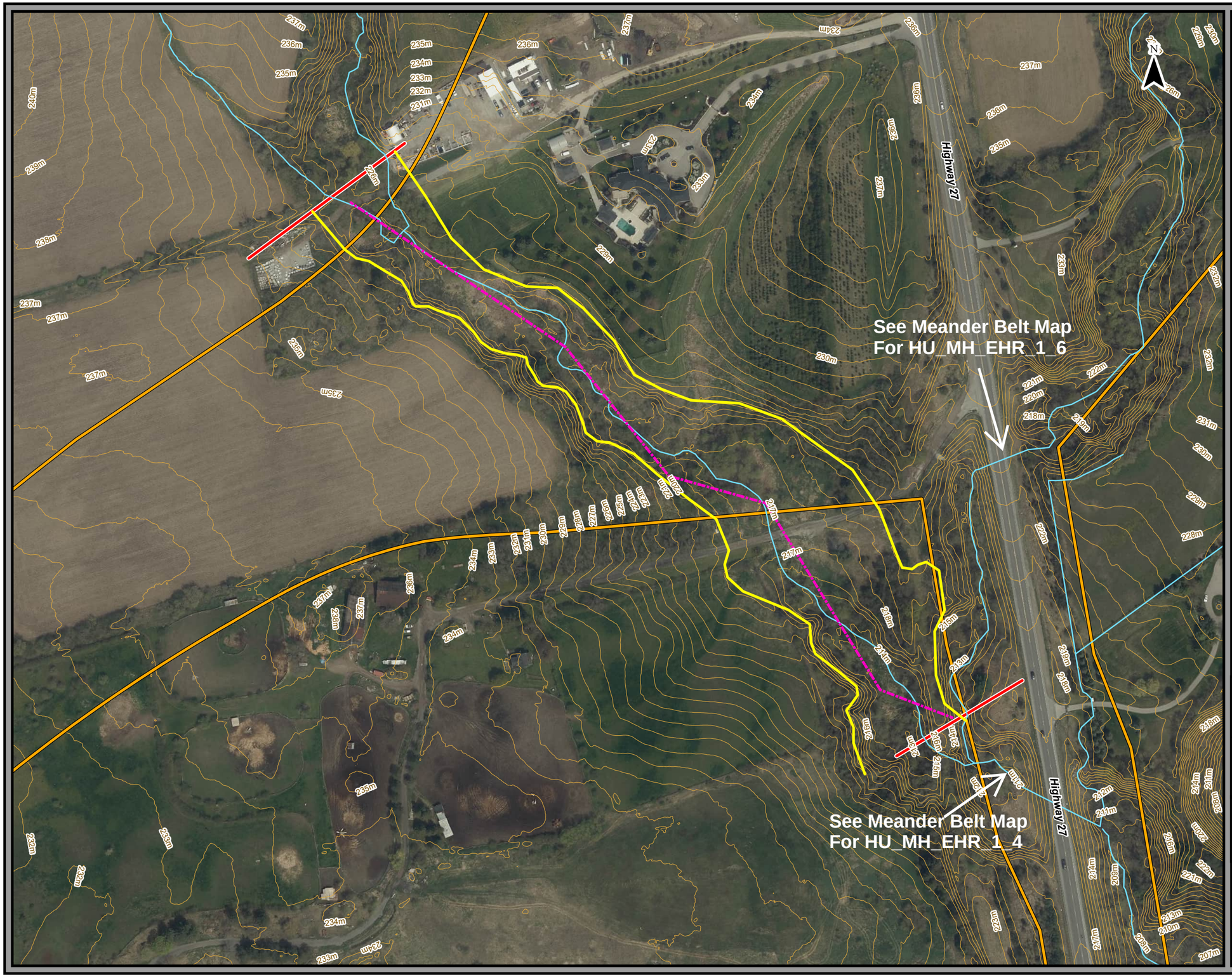

Legend

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- Reach Break
- Watercourse
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Meander Belt
HU_MH_EHR_1_3
07 Oct, 2025

0 25 50 75 100
Metres

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Ontario

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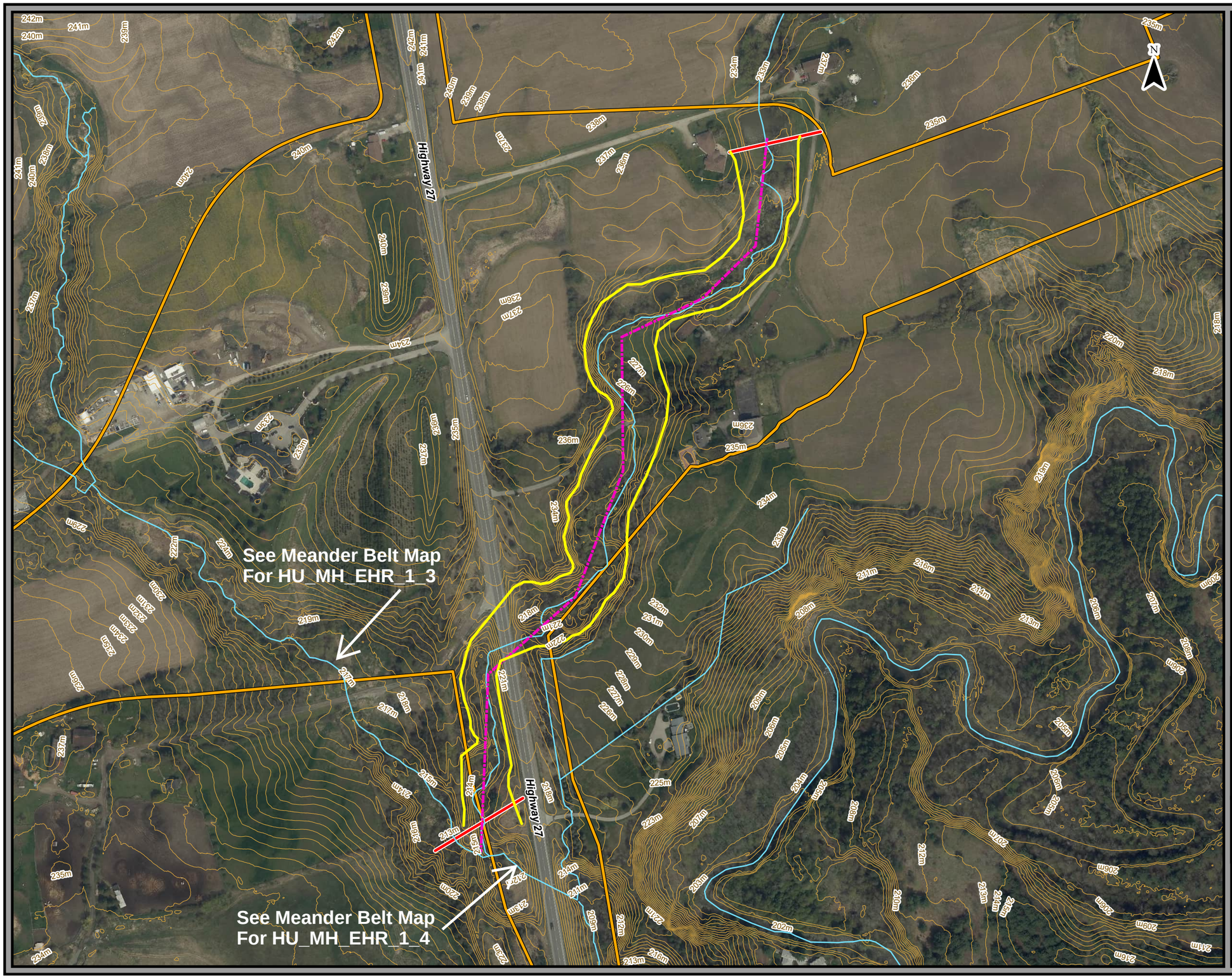

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_MH_EHR_1_6
07 Oct, 2025

0 30 60 90 120
Metres

AECOM WSP Ontario

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Author: Last Saved by: michael.w.collins

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
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Meander Belt
HU_MH_EHR_0_2
07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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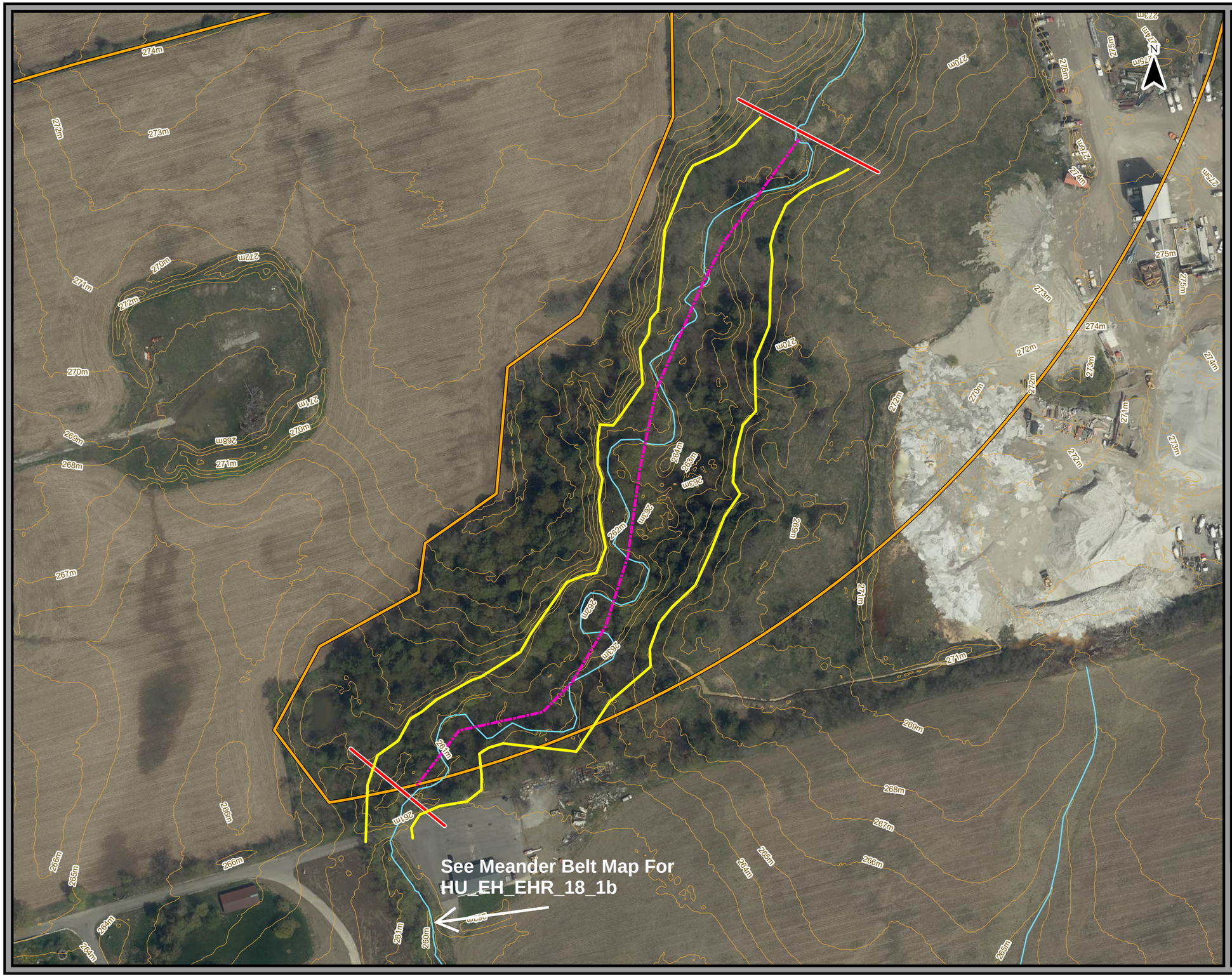

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

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Meander Belt
HU_EH_EHR_18_1a

26 Feb, 2026

0 20 40 60 80
Metres

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Author: Last Saved by: michael.w.collins

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_18_1b

07 Oct, 2025

0 20 40 60 80
Metres

AECOM WSP Ontario

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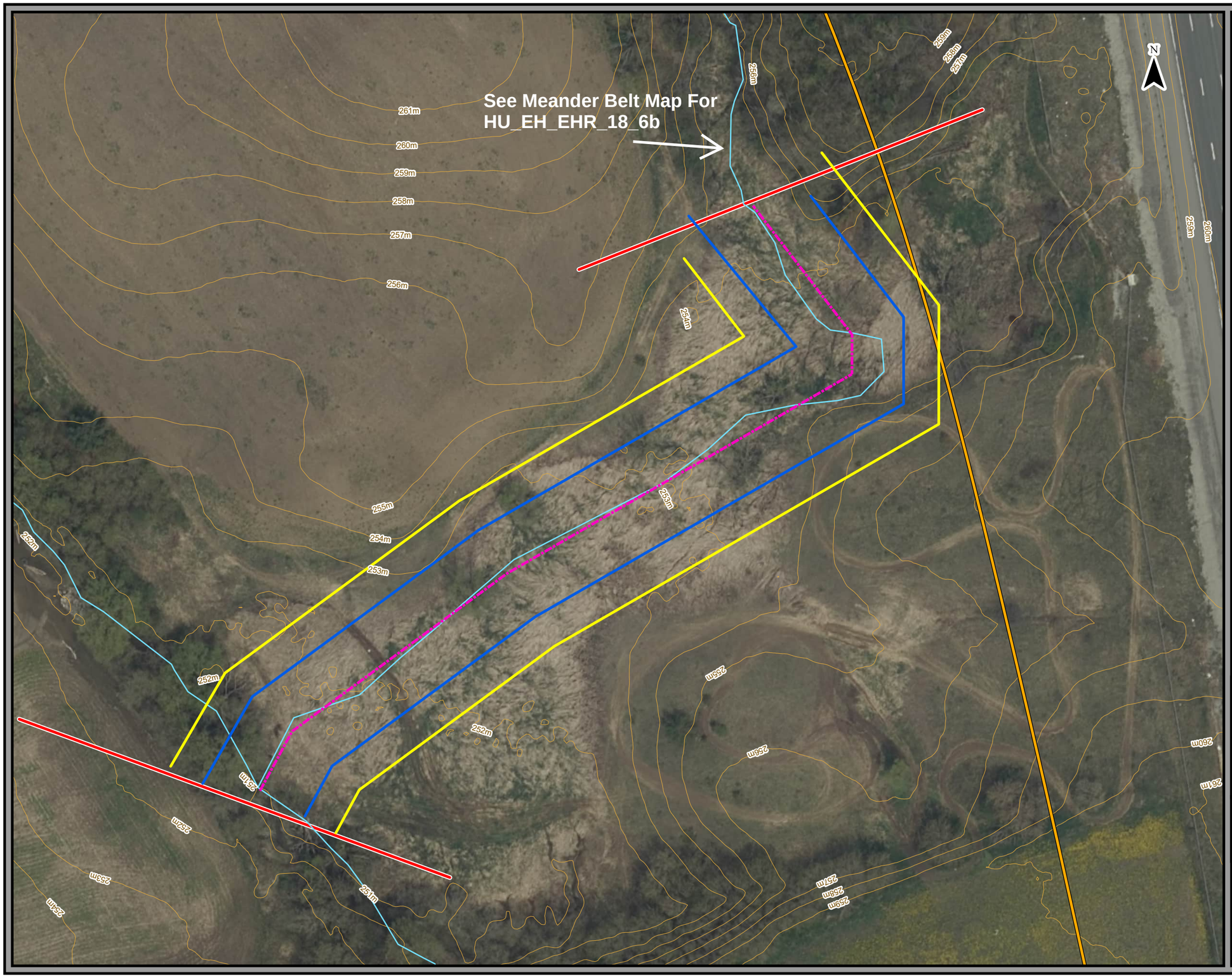

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
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Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_18_6

07 Oct, 2025

0 8 16 24 32
Metres

AECOM WSP Ontario

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Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_18_6b

07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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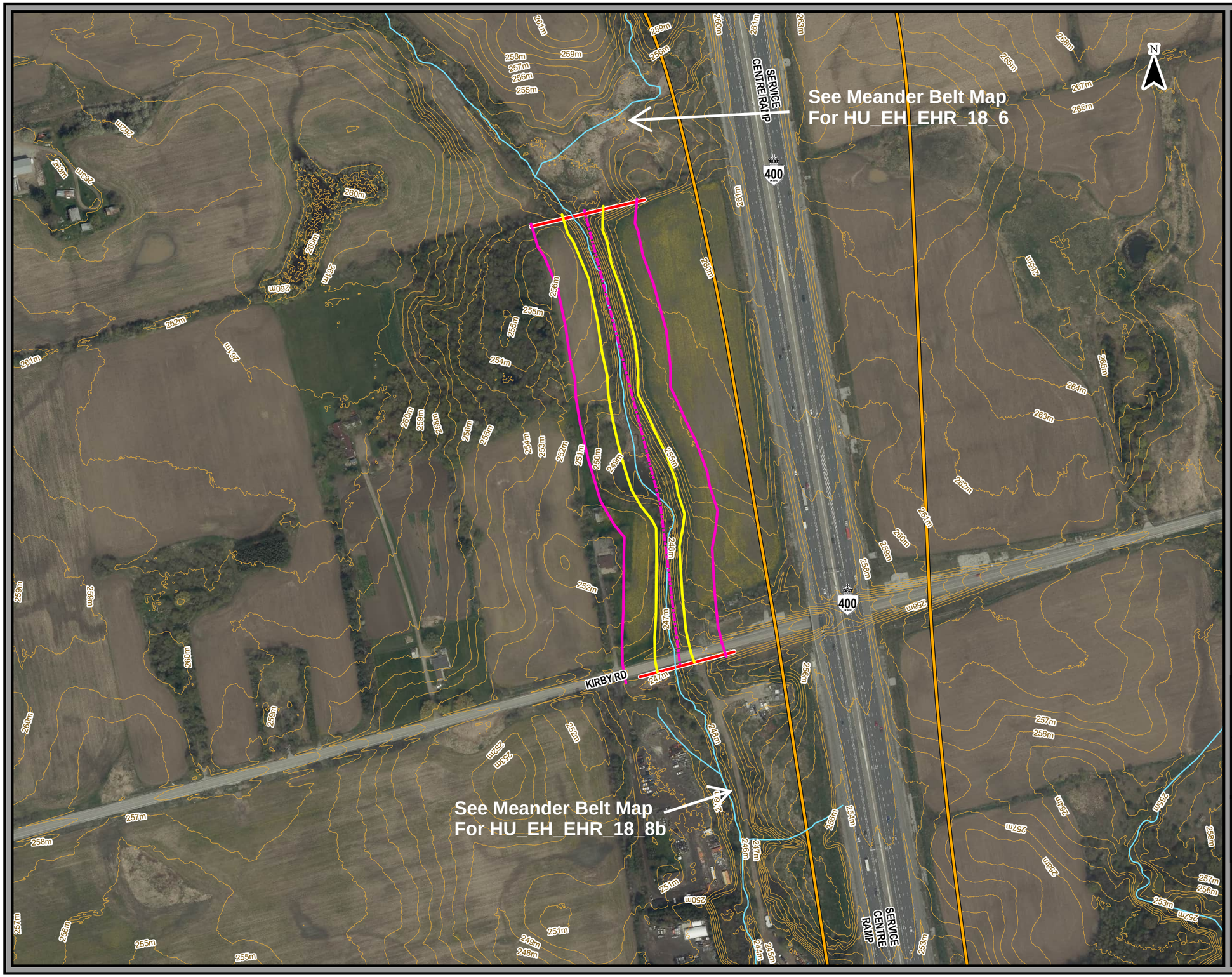

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_18_8
07 Oct, 2025

0 40 80 120 160
Metres

AECOM WSP Ontario

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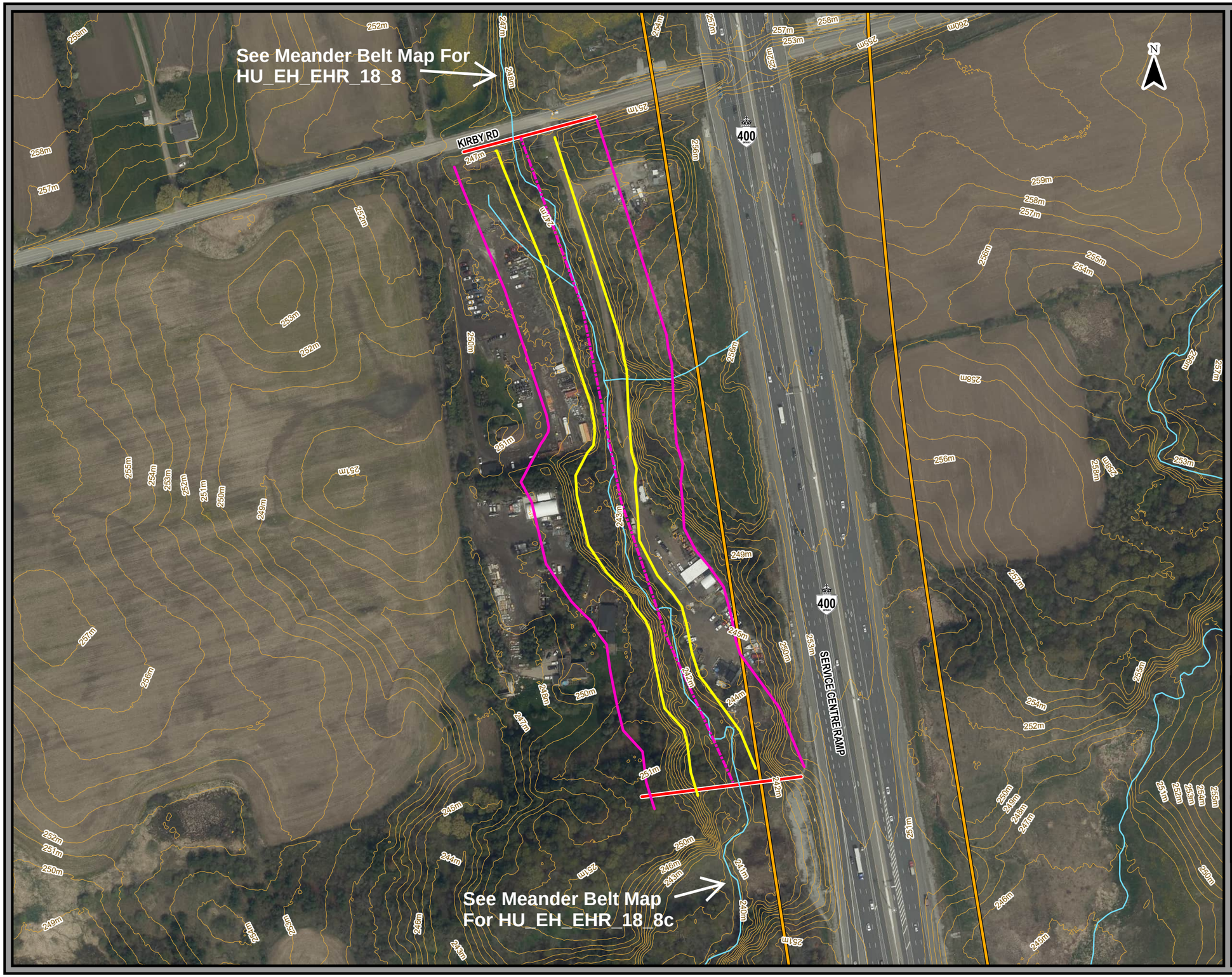

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_18_8b

07 Oct, 2025

0 25 50 75 100
Metres

AECOM WSP
Ontario

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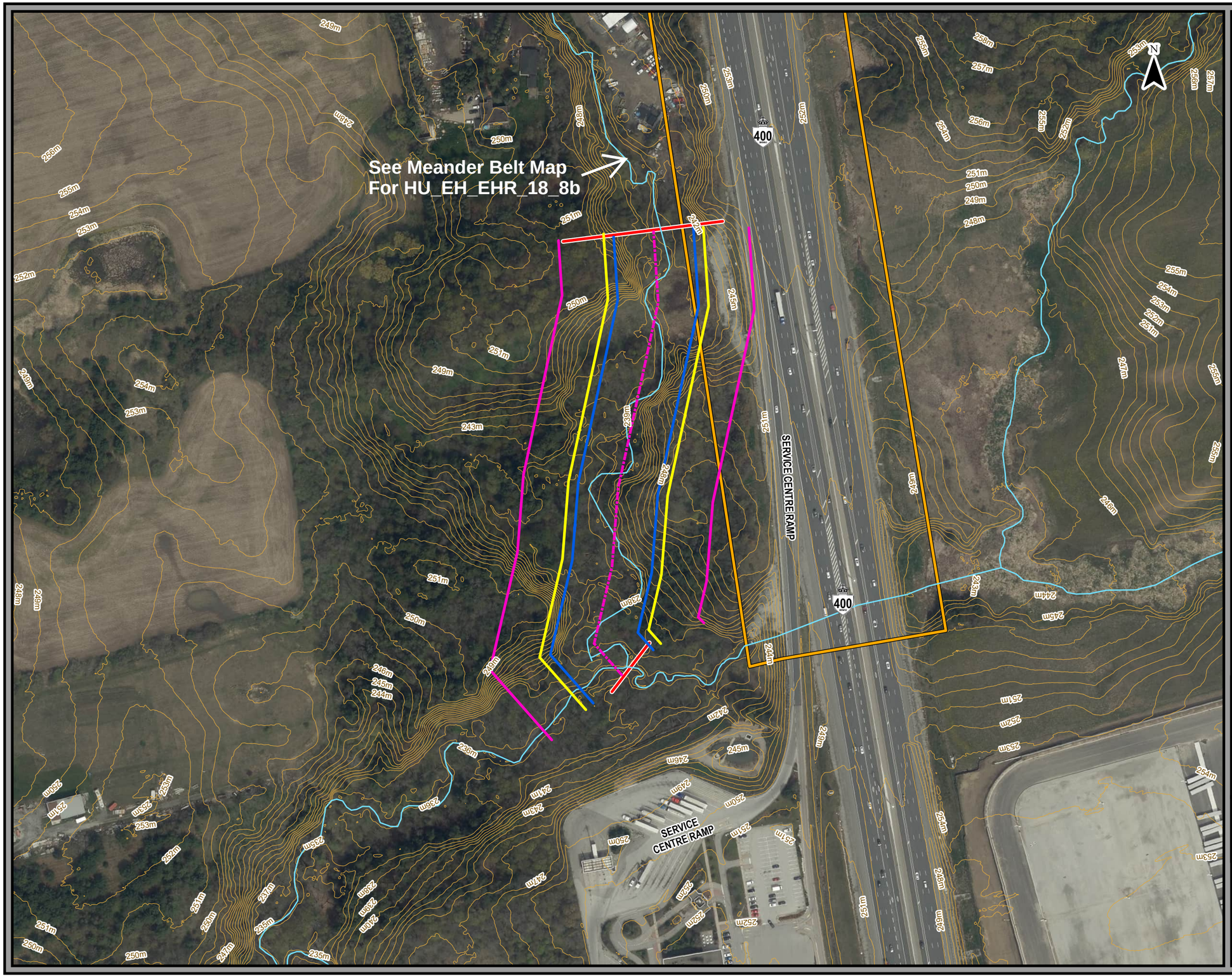

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
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Sources:
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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_18_8c

07 Oct, 2025

0 25 50 75 100
Metres

AECOM WSP
Ontario

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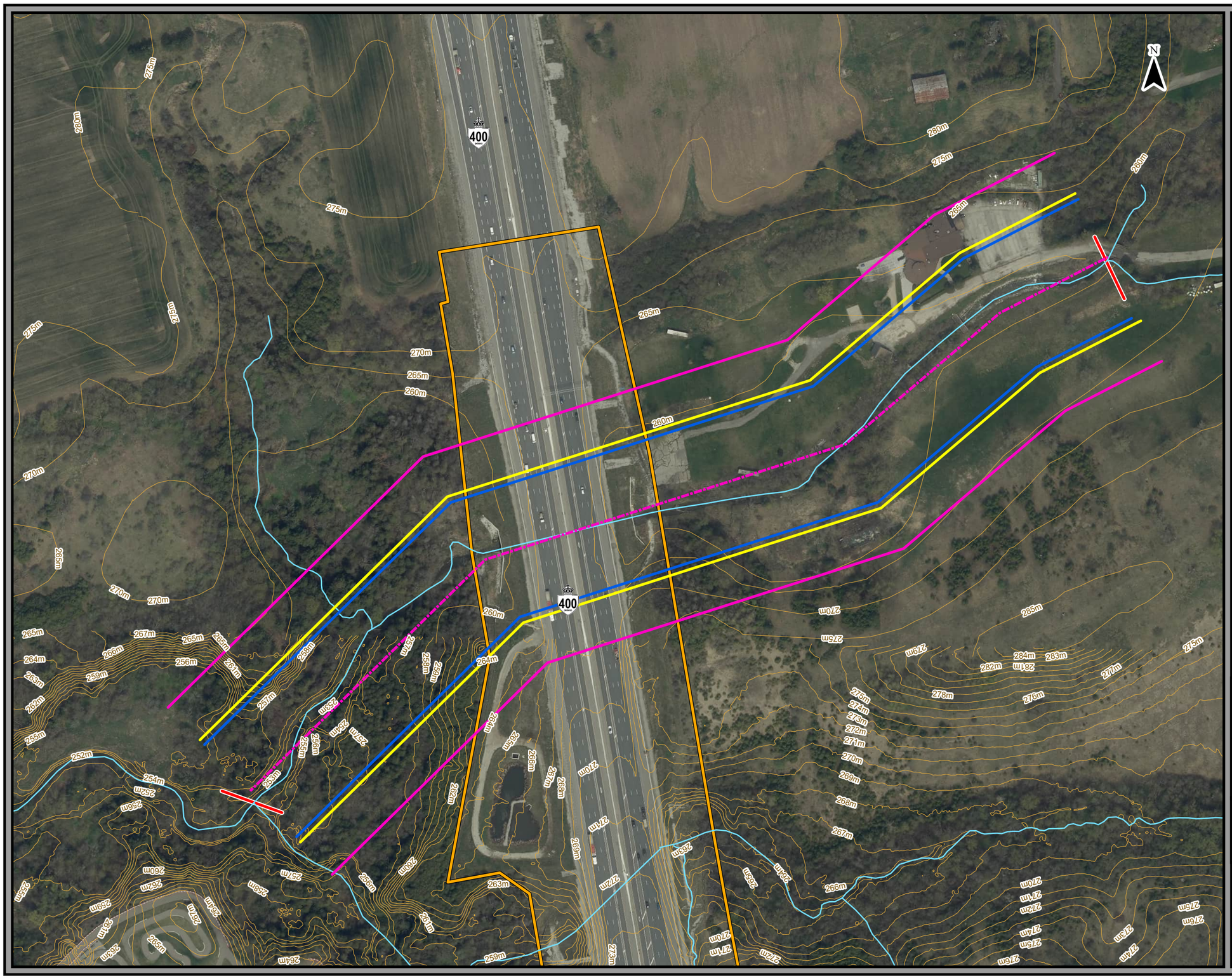

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_19_1

07 Oct, 2025

0 25 50 75 100
Metres

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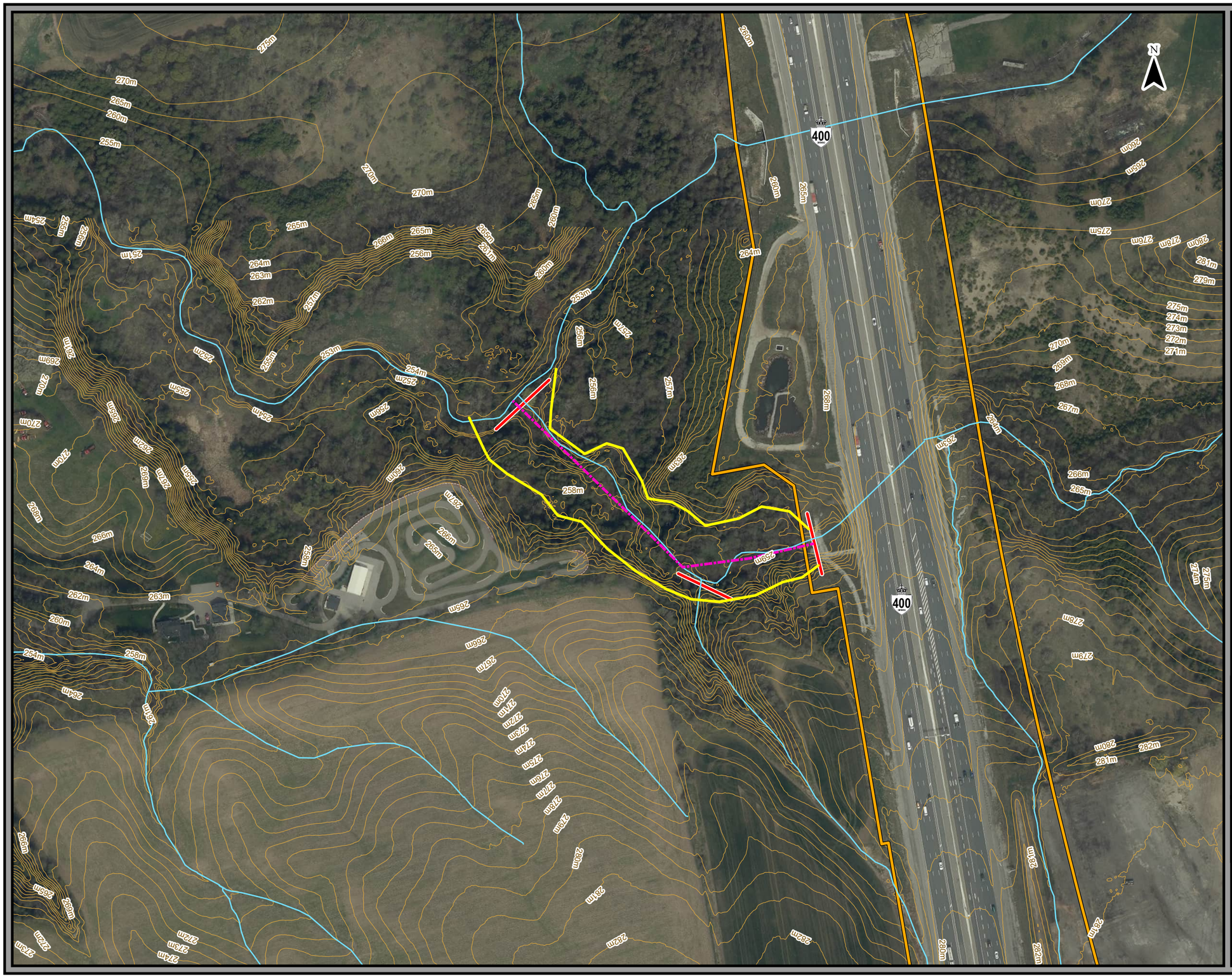

Legend

- Contour (1m)
- Reach Break
- Watercourse
- Axis
- Final
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Meander Belt
HU_EH_EHR_19_7

07 Oct, 2025

0 25 50 75 100
Metres

AECOM WSP Ontario

E

Sediment Transport and Entrainment

2-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
1	SIM_EB_SM_0_3		63.167	0.28	None	0.28	None	No Change	1.6	Coarse Sand	1.4	Coarse Sand	No Change	1.5	Coarse Sand	1.5	Coarse Sand	No Change
			63	0.20	None	0.20	None	No Change	1.2	Coarse Sand	1.1	Coarse Sand	No Change	1.3	Coarse Sand	1.1	Coarse Sand	No Change
	SIM_EB_SM_0_2	W-W4 (401 culvert extension)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			60.5	1.60	None	1.60	None	No Change	5.1	Pebbles	34.2	Very Coarse Gravel	Increase in Grain Size	5.4	Pebbles	40.1	Very Coarse Gravel	Increase in Grain Size
			60	31.08	Low	31.08	Low	No Change	37.8	Very Coarse Gravel	15.5	Medium Gravel	Decrease in Grain Size	44.3	Very Coarse Gravel	18.7	Coarse Gravel	Decrease in Grain Size
1	SM_EL_SIM_1_2	SM_EL_SIM_1_WC1.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC1.2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC1.5		Flow event not modelled					Flow event not modelled					Flow event not modelled				
1	SM_EL_SIM_1_3	SM_EL_SIM_1_WC1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC1.6		Flow event not modelled					Flow event not modelled					Flow event not modelled				
1	SM_EL_SIM_1_4	SM_EL_SIM_1_WC2.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC2.2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
1	SM_EL_SIM_1_5	SM_EL_SIM_1_WC2.3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
1	SM_EL_SIM_1_8	SM_EL_SIM_1_WC3.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC3.2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC3.3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		SM_EL_SIM_1_WC3.6		Flow event not modelled					Flow event not modelled					Flow event not modelled				
1	SM_EL_SIM_1_10	SM_EL_SIM_1_WC4		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_MC_MUL_8_3	CR-MC-MUL-8-WC1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_MC_MUL_8_4	CR-MC-MUL-8-WC3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_MC_MUL_8_6	CR-MC-MUL-8-WC4		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_LC_LEV_1_2	CR_LC_LEV_1_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_LC_LEV_0_1		55567	97.00	Moderate	116.20	High	Increase	69.9	Small Cobble	78.7	Small Cobble	No Change	138.6	Large Cobble	158.2	Large Cobble	No Change
			55408	26.13	Low	26.17	Low	No Change	28.9	Coarse Gravel	28.9	Coarse Gravel	No Change	54.2	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change
		W-W56		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	CR_LC_LEV_0_2		55270	16.55	Low	18.60	Low	No Change	23.2	Coarse Gravel	25.0	Coarse Gravel	No Change	32.5	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
			55202	74.00	Moderate	68.72	Moderate	No Change	61.6	Very Coarse Gravel	58.4	Very Coarse Gravel	No Change	100.8	Small Cobble	96.9	Small Cobble	No Change
			54959	11.57	Low	10.69	Low	No Change	16.9	Coarse Gravel	15.8	Medium Gravel	Decrease in Grain Size	29.7	Coarse Gravel	29.0	Coarse Gravel	No Change
			54949	6.58	None	5.98	None	No Change	11.6	Medium Gravel	10.7	Medium Gravel	No Change	19.8	Coarse Gravel	19.2	Coarse Gravel	No Change
		Embleton Road		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			54909	8.13	None	8.25	None	No Change	12.9	Medium Gravel	12.9	Medium Gravel	No Change	25.1	Coarse Gravel	25.7	Coarse Gravel	No Change
			54867	18.96	Low	17.55	Low	No Change	22.6	Coarse Gravel	21.3	Coarse Gravel	No Change	46.0	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
2	CR_LC_LEV_2_4		42344	20.14	Low	20.14	Low	No Change	27.8	Coarse Gravel	27.8	Coarse Gravel	No Change	33.9	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
		CR_LC_LEV_2_WC1.1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			42314	75.73	Moderate	75.73	Moderate	No Change	29.4	Coarse Gravel	29.4	Coarse Gravel	No Change	36.2	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
			42249	97.00	Moderate	116.20	High	Increase	65.7	Small Cobble	65.7	Small Cobble	No Change	91.7	Small Cobble	91.7	Small Cobble	No Change
2	CR_LC_LEV_2_5	CR_LC_LEV_2_WC2.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_LC_LEV_2_WC2.2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_LC_LEV_2_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_LC_LEV_2_6	CR_LC_LEV_2_WC6		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_LC_LEV_10_1	CR_LC_LEV_10_WC1.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_9_1	CR_NP_CRR_9_WC1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_NP_CRR_9_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_3_2	CR_NP_CRR_3_WC1.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_3_1	CR_NP_CRR_3_WC3.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_NP_CRR_3_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_NP_CRR_3_WC3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_3_3	CR_NP_CRR_3_WC4		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_13_1	CR_NP_CRR_13_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_13_MW (near)	CR_NP_CRR_13_WC3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_HC_HUT_6_3	CR_HC_HUT_6_WC1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_12_3		2280	0.44	None	0.77	None	No Change	2.4	Very Coarse Sand	3.5	Very Coarse Sand	No Change	1.7	Coarse Sand	2.5	Very Coarse Sand	Increase in Grain Size
			2224	36.69	Moderate	6.07	None	Decrease	43.4	Very Coarse Gravel	12.6	Medium Gravel	Decrease in Grain Size	46.9	Very Coarse Gravel	13.8	Medium Gravel	Decrease in Grain Size
		Post_ETW_12_WC1 (234.08)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2136	5.85	None	6.30	None	No Change	12.2	Medium Gravel	12.8	Medium Gravel	No Change	13.8	Medium Gravel	14.7	Medium Gravel	No Change
			2087	4.43	None	4.48	None	No Change	10.1	Medium Gravel	10.1	Medium Gravel	No Change	11.2	Medium Gravel	11.6	Medium Gravel	No Change
4	EC_EH_ETW_10_1 (Bridge)		1745	1.51	None	4.64	None	No Change	5.2	Pebbles	11.2	Medium Gravel	Increase in Grain Size	4.6	Very Coarse Sand	10.0	Medium Gravel	Increase in Grain Size
			1673	2.81	None	2.26	None	No Change	8.5	Medium Gravel	3.1	Very Coarse Sand	Decrease in Grain Size	6.0	Pebbles	2.3	Very Coarse Sand	Decrease in Grain Size
		Post_ETW_10_W1 (234.06)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1610	0.69	None	0.70	None	No Change	3.3	Very Coarse Sand	3.3	Very Coarse Sand	No Change	2.3	Very Coarse Sand	2.3	Very Coarse Sand	No Change
			1578	0.17	None	0.17	None	No Change	1.3	Coarse Sand	1.3	Coarse Sand	No Change	0.8	Coarse Sand	0.8	Coarse Sand	No Change
4	EC_EH_ETW_9_3		1549	2.09	None	2.20	None	No Change	6.2	Fine Gravel	6.4	Fine Gravel	No Change	6.3	Fine Gravel	6.6	Fine Gravel	No Change
			1526	3.48	None	3.58	None	No Change	8.9	Medium Gravel	9.0	Medium Gravel	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change
		Post_ETW_9_WC2 (234.03)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

Section	Reach ID	Drainage Crossing ID	Station ID	2-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
			1441	12.21	Low	9.56	None	Decrease	23.0	Coarse Gravel	19.2	Coarse Gravel	No Change	17.1	Coarse Gravel	14.7	Medium Gravel	Decrease in Grain Size
			1373	0.04	None	0.04	None	No Change	0.5	Medium Sand	0.5	Medium Sand	No Change	0.3	Medium Sand	0.4	Medium Sand	No Change
			800	0.95	None	0.58	None	No Change	3.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change	3.5	Very Coarse Sand	2.5	Very Coarse Sand	No Change
			791	28.37	Low	1.44	None	Decrease	37.4	Very Coarse Gravel	5.1	Pebbles	Decrease in Grain Size	37.0	Very Coarse Gravel	4.4	Very Coarse Sand	Decrease in Grain Size
4	EC_EH_ETW_7_2 (Bridge)	Post_Upper_Etobicoke_CH_IC (233.03)	750	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			723	1.25	None	1.31	None	No Change	4.5	Very Coarse Sand	4.6	Very Coarse Sand	No Change	4.4	Very Coarse Sand	4.4	Very Coarse Sand	No Change
			708	3.82	None	4.26	None	No Change	9.1	Medium Gravel	9.7	Medium Gravel	No Change	10.4	Medium Gravel	11.2	Medium Gravel	No Change
			759	21.39	Low	20.54	Low	No Change	31.7	Coarse Gravel	30.5	Coarse Gravel	No Change	29.0	Coarse Gravel	28.3	Coarse Gravel	No Change
			745	2.19	None	3.12	None	No Change	7.0	Fine Gravel	8.8	Medium Gravel	Increase in Grain Size	5.4	Pebbles	7.2	Fine Gravel	Increase in Grain Size
4	EC_EH_ETW_7_1	W-W108	TBD	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			639	0.49	None	0.80	None	No Change	2.6	Very Coarse Sand	3.6	Very Coarse Sand	No Change	1.8	Coarse Sand	2.5	Very Coarse Sand	Increase in Grain Size
			623	15.84	Low	0.94	None	Decrease	26.7	Coarse Gravel	3.7	Very Coarse Sand	Decrease in Grain Size	21.5	Coarse Gravel	3.5	Very Coarse Sand	Decrease in Grain Size
			848	17.97	Low	19.03	Low	No Change	25.0	Coarse Gravel	25.8	Coarse Gravel	No Change	33.2	Very Coarse Gravel	34.7	Very Coarse Gravel	No Change
			841	72.48	Moderate	76.42	Moderate	No Change	64.3	Small Cobble	66.3	Small Cobble	No Change	88.0	Small Cobble	91.7	Small Cobble	No Change
		EC_EH_ETW_6_WC1.1 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			816	41.49	Moderate	42.27	Moderate	No Change	45.0	Very Coarse Gravel	45.3	Very Coarse Gravel	No Change	57.1	Very Coarse Gravel	58.0	Very Coarse Gravel	No Change
		EC_EH_ETW_6_WC1.2, Existing (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			794	45.06	Moderate	49.83	Moderate	No Change	58.8	Very Coarse Gravel	62.3	Very Coarse Gravel	No Change	37.7	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
4	EC_EH_ETW_6_1 (Culvert)		723	0.17	None	0.21	None	No Change	1.1	Coarse Sand	1.2	Coarse Sand	No Change	1.1	Coarse Sand	1.4	Coarse Sand	No Change
			708	12.75	Low	17.85	Low	No Change	19.6	Coarse Gravel	24.6	Coarse Gravel	No Change	26.3	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
		EC_EH_ETW_6_WC1.4 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			616	63.23	Moderate	66.77	Moderate	No Change	59.4	Very Coarse Gravel	61.4	Very Coarse Gravel	No Change	77.3	Small Cobble	80.8	Small Cobble	No Change
			606	32.35	Low	35.37	Moderate	Increase	37.8	Very Coarse Gravel	40.0	Very Coarse Gravel	No Change	47.7	Very Coarse Gravel	52.3	Very Coarse Gravel	No Change
		EC_EH_ETW_6_WC1.5 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			587	17.06	Low	13.97	Low	No Change	24.3	Coarse Gravel	21.1	Coarse Gravel	No Change	31.8	Coarse Gravel	27.6	Coarse Gravel	No Change
			568	28.25	Low	33.38	Low	No Change	34.2	Very Coarse Gravel	38.2	Very Coarse Gravel	No Change	44.3	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			746	1.27	None	0.13	None	No Change	4.8	Very Coarse Sand	1.0	Coarse Sand	Decrease in Grain Size	3.7	Very Coarse Sand	0.7	Coarse Sand	Decrease in Grain Size
			737	3.28	None	0.21	None	No Change	9.3	Medium Gravel	1.4	Coarse Sand	Decrease in Grain Size	7.2	Fine Gravel	1.1	Coarse Sand	Decrease in Grain Size
4	EC_EH_ETW_6_4 (Bridge)	Post_ETW_6_WC3 -25m 232.02-Lower	700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			635	0.92	None	1.01	None	No Change	3.9	Very Coarse Sand	4.1	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.3	Very Coarse Sand	No Change
			629	0.82	None	0.88	None	No Change	3.7	Very Coarse Sand	3.8	Very Coarse Sand	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change
			858	26.37	Low	25.68	Low	No Change	34.2	Very Coarse Gravel	33.7	Very Coarse Gravel	No Change	38.5	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
			833	2.95	None	3.17	None	No Change	8.0	Medium Gravel	8.4	Medium Gravel	No Change	7.9	Fine Gravel	8.2	Medium Gravel	Increase in Grain Size
		Post_ETW_1_WC1 230.18	800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			768	24.47	Low	25.62	Low	No Change	34.4	Very Coarse Gravel	35.5	Very Coarse Gravel	No Change	32.5	Very Coarse Gravel	33.2	Very Coarse Gravel	No Change
			726	4.43	None	4.03	None	No Change	10.4	Medium Gravel	9.7	Medium Gravel	No Change	10.4	Medium Gravel	10.0	Medium Gravel	No Change
			703	0.58	None	0.62	None	No Change	2.4	Very Coarse Sand	2.5	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.3	Very Coarse Sand	No Change
			671	0.58	None	0.62	None	No Change	2.4	Very Coarse Sand	2.5	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.3	Very Coarse Sand	No Change
			663	0.58	None	0.62	None	No Change	2.4	Very Coarse Sand	2.5	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.3	Very Coarse Sand	No Change
4	Culvert (pre existing)	Post_ETW_1_WC1 230.18	660	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			637	0.31	None	0.35	None	No Change	1.6	Coarse Sand	1.7	Coarse Sand	No Change	2.0	Coarse Sand	2.1	Very Coarse Sand	Increase in Grain Size
			621	0.00	None	0.00	None	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			588	0.00	None	0.00	None	No Change	0.0		0.0	Very Fine Sand		0.0	Silt	0.0	Silt	No Change
			551	0.00	None	0.00	None	No Change	0.0	Very Fine Sand	0.0	Very Fine Sand	No Change	0.0	Very Fine Sand	0.0	Very Fine Sand	No Change
			545	51.30	Moderate	53.57	Moderate	No Change	52.5	Very Coarse Gravel	53.7	Very Coarse Gravel	No Change	64.1	Small Cobble	67.3	Small Cobble	No Change
		Post_ETW_1_WC1 230.18	540	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			522	66.31	Moderate	66.68	Moderate	No Change	61.4	Very Coarse Gravel	61.2	Very Coarse Gravel	No Change	79.6	Small Cobble	81.9	Small Cobble	No Change
			510	6.86	None	7.25	None	No Change	13.6	Medium Gravel	14.0	Medium Gravel	No Change	15.6	Medium Gravel	16.1	Coarse Gravel	Increase in Grain Size
			2746	0.31	None	0.30	None	No Change	1.7	Coarse Sand	1.6	Coarse Sand	No Change	1.8	Coarse Sand	1.7	Coarse Sand	No Change
			2660	42.94	Moderate	4.20	None	Decrease	47.6	Very Coarse Gravel	9.9	Medium Gravel	Decrease in Grain Size	54.2	Very Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size
4	EC_EH_ETW_1_5 (Bridge)	Post_ETW_1_WC3 230.12	1170	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	8.96	None	9.98	None	No Change	15.4	Medium Gravel	16.5	Coarse Gravel	Increase in Grain Size	20.9	Coarse Gravel	22.6	Coarse Gravel	No Change
			2401	2.49	None	2.62	None	No Change	6.9	Fine Gravel	7.1	Fine Gravel	No Change	7.5	Fine Gravel	7.9	Fine Gravel	No Change
			554	4.51	None	5.77	None	No Change	10.2	Medium Gravel	12.0	Medium Gravel	No Change	11.6	Medium Gravel	13.8	Medium Gravel	No Change
			523	71.72	Moderate	14.90	Low	Decrease	63.6	Very Coarse Gravel	21.6	Coarse Gravel	Decrease in Grain Size	88.0	Small Cobble	30.4	Coarse Gravel	Decrease in Grain Size
5	EC_EH_ETW_1_7 (Bridge)	Post_ETW_1_WC5 (230.07)	500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			413	2.95	None	3.11	None	No Change	7.6	Fine Gravel	7.8	Fine Gravel	No Change	8.9	Medium Gravel	9.3	Medium Gravel	No Change
			380	10.65	Low	10.40	Low	No Change	18.2	Coarse Gravel	17.9	Coarse Gravel	No Change	20.9	Coarse Gravel	20.9	Coarse Gravel	No Change
			499	4.88	None	3.25	None	No Change	11.0	Medium Gravel	8.4	Medium Gravel	No Change	11.6	Medium Gravel	8.5	Medium Gravel	No Change
			456	10.19	Low	33.59	Low	No Change	18.4	Coarse Gravel	41.4	Very Coarse Gravel	Increase in Grain Size	18.7	Coarse Gravel	42.6	Very Coarse Gravel	Increase in Grain Size
			439	36.71	Moderate	0.83	None	Decrease	43.6	Very Coarse Gravel	3.5	Very Coarse Sand	Decrease in Grain Size	46.9	Very Coarse Gravel	3.0	Very Coarse Sand	Decrease in Grain Size
5	EC_EH_ETW_1_8 (Culvert)	Post_ETW_1_WC6 230.05	400	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			358	5.87	None	5.87	None	No Change	13.9	Medium Gravel	13.9	Medium Gravel	No Change	10.4	Medium Gravel	10.4	Medium Gravel	No Change

2-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
			345	16.91	Low	16.91	Low	No Change	27.9	Coarse Gravel	27.9	Coarse Gravel	No Change	22.6	Coarse Gravel	22.6	Coarse Gravel	No Change
5	EC_EH_ETW_1_11 (Bridge)		1958	5.86	None	9.55	None	No Change	13.5	Medium Gravel	18.8	Coarse Gravel	Increase in Grain Size	10.8	Medium Gravel	15.6	Medium Gravel	No Change
			1920	4.74	None	3.51	None	No Change	11.0	Medium Gravel	8.8	Medium Gravel	No Change	10.8	Medium Gravel	8.9	Medium Gravel	No Change
		Post_ETW_1_WC8 229.07	1900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1568	40.21	Moderate	42.48	Moderate	No Change	45.8	Very Coarse Gravel	47.3	Very Coarse Gravel	No Change	51.4	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
5	EC_EH_ETW_1_12 (Bridge)		2746	0.31	None	0.30	None	No Change	1.7	Coarse Sand	1.6	Coarse Sand	No Change	1.8	Coarse Sand	1.7	Coarse Sand	No Change
			2660	42.94	Moderate	4.20	None	Decrease	47.6	Very Coarse Gravel	9.9	Medium Gravel	Decrease in Grain Size	54.2	Very Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size
		Post_ETW_1_WC10 229.01	2600	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	8.96	None	9.98	None	No Change	15.4	Medium Gravel	16.5	Coarse Gravel	Increase in Grain Size	20.9	Coarse Gravel	22.6	Coarse Gravel	No Change
			2401	2.49	None	2.62	None	No Change	6.9	Fine Gravel	7.1	Fine Gravel	No Change	7.5	Fine Gravel	7.9	Fine Gravel	No Change
5	HU_WH_CAC_01 (Bridge)		3401	0.02	None	0.02	None	No Change	0.4	Medium Sand	0.4	Medium Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			3302	0.06	None	0.07	None	No Change	0.8	Coarse Sand	0.8	Coarse Sand	No Change	0.2	Medium Sand	0.3	Medium Sand	No Change
		West_WH_CAC	3000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2982	0.06	None	0.09	None	No Change	0.9	Coarse Sand	1.1	Coarse Sand	No Change	0.2	Medium Sand	0.3	Medium Sand	No Change
			2918	0.03	None	0.03	None	No Change	0.5	Coarse Sand	0.5	Coarse Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			2842	0.09	None	0.10	None	No Change	1.1	Coarse Sand	1.1	Coarse Sand	No Change	0.3	Medium Sand	0.3	Medium Sand	No Change
		West_WH_CAC	2800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2762	0.15	None	0.20	None	No Change	1.5	Coarse Sand	1.8	Coarse Sand	No Change	0.4	Medium Sand	0.5	Coarse Sand	Increase in Grain Size
			2657	8.88	None	17.26	Low	Increase	27.2	Coarse Gravel	42.1	Very Coarse Gravel	Increase in Grain Size	6.0	Pebbles	9.6	Medium Gravel	Increase in Grain Size
5	Culvert (Existing)		513.703	0.28	None	0.28	None	No Change	1.5	Coarse Sand	1.5	Coarse Sand	No Change	1.7	Coarse Sand	1.7	Coarse Sand	No Change
			513.696	0.25	None	0.25	None	No Change	1.5	Coarse Sand	1.5	Coarse Sand	No Change	1.5	Coarse Sand	1.5	Coarse Sand	No Change
		West_WH_CAC	513.682	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			513.664	0.41	None	0.41	None	No Change	2.0	Very Coarse Sand	2.0	Very Coarse Sand	No Change	2.1	Very Coarse Sand	2.1	Very Coarse Sand	No Change
			513.656	0.19	None	0.19	None	No Change	1.2	Coarse Sand	1.2	Coarse Sand	No Change	1.3	Coarse Sand	1.3	Coarse Sand	No Change
5	Culvert (Existing)		512.119	1.03	None	1.03	None	No Change	4.0	Very Coarse Sand	4.0	Very Coarse Sand	No Change	3.7	Very Coarse Sand	3.7	Very Coarse Sand	No Change
			512.109	0.09	None	0.09	None	No Change	0.7	Coarse Sand	0.7	Coarse Sand	No Change	0.7	Coarse Sand	0.7	Coarse Sand	No Change
		West_WH_CAC	512.088	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			512.06	0.59	None	0.59	None	No Change	2.6	Very Coarse Sand	2.6	Very Coarse Sand	No Change	2.9	Very Coarse Sand	2.9	Very Coarse Sand	No Change
			512.053	3.33	None	3.33	None	No Change	8.3	Medium Gravel	8.3	Medium Gravel	No Change	9.3	Medium Gravel	9.3	Medium Gravel	No Change
5	HU_WH_TWH_1_4 (Bridge Pre-existing)		5300	10.71	Low	10.83	Low	No Change	18.6	Coarse Gravel	18.4	Coarse Gravel	No Change	20.3	Coarse Gravel	21.5	Coarse Gravel	No Change
			5083	1.37	None	1.71	None	No Change	4.6	Very Coarse Sand	5.3	Pebbles	Increase in Grain Size	4.9	Very Coarse Sand	5.7	Pebbles	Increase in Grain Size
		HU_WH_TWH_1_WC2.1	5000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4962	1.42	None	1.82	None	No Change	4.7	Very Coarse Sand	5.5	Pebbles	Increase in Grain Size	4.9	Very Coarse Sand	6.0	Pebbles	Increase in Grain Size
			4945	2.12	None	2.58	None	No Change	6.2	Fine Gravel	7.0	Fine Gravel	No Change	6.6	Fine Gravel	7.5	Fine Gravel	No Change
			4881	1.41	None	1.53	None	No Change	4.8	Very Coarse Sand	5.0	Very Coarse Sand	No Change	4.6	Very Coarse Sand	5.1	Pebbles	Increase in Grain Size
		HU_WH_TWH_1_WC2.1	4700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4625	0.29	None	0.35	None	No Change	1.7	Coarse Sand	1.9	Coarse Sand	No Change	1.5	Coarse Sand	1.7	Coarse Sand	No Change
			4597	0.22	None	0.25	None	No Change	1.4	Coarse Sand	1.5	Coarse Sand	No Change	1.1	Coarse Sand	1.3	Coarse Sand	No Change
5	HU_WH_TWH_1_2 (Bridge)		4047	22.68	Low	27.10	Low	No Change	32.7	Very Coarse Gravel	36.4	Very Coarse Gravel	No Change	30.4	Coarse Gravel	35.4	Very Coarse Gravel	Increase in Grain Size
			4006	0.13	None	0.19	None	No Change	1.0	Coarse Sand	1.3	Coarse Sand	No Change	0.8	Coarse Sand	1.1	Coarse Sand	No Change
		HU_WH_TWH_1_WC2.3	3900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3865	2.43	None	3.39	None	No Change	7.2	Fine Gravel	8.8	Medium Gravel	Increase in Grain Size	6.6	Fine Gravel	8.5	Medium Gravel	Increase in Grain Size
			3822	0.59	None	0.78	None	No Change	3.0	Very Coarse Sand	3.5	Very Coarse Sand	No Change	2.0	Coarse Sand	2.5	Very Coarse Sand	Increase in Grain Size
5	HU_WH_CAC_02a (Culvert)		511.957	0.55	None	0.55	None	No Change	2.5	Very Coarse Sand	2.5	Very Coarse Sand	No Change	2.5	Very Coarse Sand	2.5	Very Coarse Sand	No Change
			511.762	0.67	None	0.67	None	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change
		West_WH_CAC	511.615	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			511.563	0.84	None	0.84	None	No Change	3.5	Very Coarse Sand	3.5	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change
			511.364	2.73	None	2.73	None	No Change	7.1	Fine Gravel	7.1	Fine Gravel	No Change	8.5	Medium Gravel	8.5	Medium Gravel	No Change
6	HU_WH_TWH_2_1 (Bridge)		3541.743	22.45	Low	22.45	Low	No Change	30.0	Coarse Gravel	30.0	Coarse Gravel	No Change	36.2	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
			3520	2.81	None	2.81	None	No Change	7.4	Fine Gravel	7.4	Fine Gravel	No Change	8.2	Medium Gravel	8.2	Medium Gravel	No Change
		HU_WH_TWH_2_WC1	3500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3438	12.25	Low	12.25	Low	No Change	19.7	Coarse Gravel	19.7	Coarse Gravel	No Change	23.8	Coarse Gravel	23.8	Coarse Gravel	No Change
			3420	3.03	None	3.03	None	No Change	7.5	Fine Gravel	7.5	Fine Gravel	No Change	9.6	Medium Gravel	9.6	Medium Gravel	No Change
6	HU_WH_TWH_2_1 Old School Culvert 5 m * 1.5m (to be confirmed)		2868.124	2.19	None	2.19	None	No Change	6.1	Fine Gravel	6.1	Fine Gravel	No Change	7.2	Fine Gravel	7.2	Fine Gravel	No Change
			2839.686	59.45	Moderate	59.45	Moderate	No Change	57.6	Very Coarse Gravel	57.6	Very Coarse Gravel	No Change	72.7	Small Cobble	72.7	Small Cobble	No Change
		HU_WH_TWH_2_WC1	2836	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2835.774	23.43	Low	23.43	Low	No Change	30.8	Coarse Gravel	30.8	Coarse Gravel	No Change	37.0	Very Coarse Gravel	37.0	Very Coarse Gravel	No Change
			2733.596	11.96	Low	11.96	Low	No Change	19.2	Coarse Gravel	19.2	Coarse Gravel	No Change	24.5	Coarse Gravel	24.5	Coarse Gravel	No Change
6	HU_WH_SAL_3_1 (Proposed Bridge)		1.698	1.71	None	11.82	Low	Increase	6.0	Fine Gravel	22.4	Coarse Gravel	Increase in Grain Size	4.4	Very Coarse Sand	16.6	Coarse Gravel	Increase in Grain Size
			1.677	1.14	None	0.17	None	No Change	4.7	Very Coarse Sand	1.3	Coarse Sand	Decrease in Grain Size	3.0	Very Coarse Sand	0.8	Coarse Sand	Decrease in Grain Size
		HU_WH_SAL_3_1	1.637	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1.604	15.93	Low	28.99	Low	No Change	25.2	Coarse Gravel	38.0	Very Coarse Gravel	Increase in Grain Size	25.1	Coarse Gravel	37.7	Very Coarse Gravel	Increase in Grain Size
			1.562	6.36	None	2.63	None	No Change	13.5	Medium Gravel	7.5	Fine Gravel	Decrease in Grain Size	13.3	Medium Gravel	7.2	Fine Gravel	Decrease in Grain Size
		HU_WH_SAL_3_2	1.55	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1.537	0.54	None	0.53	None	No Change	2.8	Very Coarse Sand	2.8	Very Coarse Sand	No Change	1.8	Coarse Sand	1.8	Coarse Sand	No Change

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Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
			1.475	21.38	Low	21.38	Low	No Change	31.8	Coarse Gravel	31.8	Coarse Gravel	No Change	28.3	Coarse Gravel	28.3	Coarse Gravel	No Change
6	HU_WH_SAL_5_1		1013.632	1.46	None	1.44	None	No Change	4.9	Very Coarse Sand	4.9	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.9	Very Coarse Sand	No Change
			1013.624	1.17	None	1.15	None	No Change	4.2	Very Coarse Sand	4.2	Very Coarse Sand	No Change	4.1	Very Coarse Sand	4.1	Very Coarse Sand	No Change
		HU_WH_SAL_5_1	1013	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1013.598	0.43	None	0.44	None	No Change	2.1	Very Coarse Sand	2.2	Very Coarse Sand	No Change	2.1	Very Coarse Sand	2.1	Very Coarse Sand	No Change
6	HU_WH_SAL_0_1		1013.741	6.04	None	6.03	None	No Change	12.3	Medium Gravel	12.3	Medium Gravel	No Change	14.2	Medium Gravel	14.2	Medium Gravel	No Change
			1013.064	6.78	None	6.58	None	No Change	13.0	Medium Gravel	12.7	Medium Gravel	No Change	16.6	Coarse Gravel	16.1	Coarse Gravel	No Change
6	HU_WH_SAL_0_2		1013.048	6.65	None	6.21	None	No Change	12.8	Medium Gravel	12.2	Medium Gravel	No Change	16.1	Coarse Gravel	15.6	Medium Gravel	Decrease in Grain Size
		E-W2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1012.967	6.82	None	6.69	None	No Change	13.0	Medium Gravel	12.8	Medium Gravel	No Change	16.6	Coarse Gravel	16.6	Coarse Gravel	No Change
			1012.924	6.85	None	7.61	None	No Change	13.1	Medium Gravel	14.0	Medium Gravel	No Change	16.6	Coarse Gravel	17.6	Coarse Gravel	No Change
			983.78	0.43	None	7.44	None	No Change	2.3	Very Coarse Sand	16.3	Coarse Gravel	Increase in Grain Size	1.8	Coarse Sand	12.4	Medium Gravel	Increase in Grain Size
			962.71	4.70	None	12.04	Low	Increase	11.8	Medium Gravel	21.6	Coarse Gravel	Increase in Grain Size	9.3	Medium Gravel	19.2	Coarse Gravel	Increase in Grain Size
		Proposed Culvert WHR_1-5_1	961.2	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			857.44	1.27	None	8.63	None	No Change	4.9	Very Coarse Sand	16.1	Coarse Gravel	Increase in Grain Size	3.5	Very Coarse Sand	17.6	Coarse Gravel	Increase in Grain Size
			802.03	7.70	None	13.29	Low	Increase	17.6	Coarse Gravel	24.4	Coarse Gravel	No Change	11.2	Medium Gravel	18.2	Coarse Gravel	Increase in Grain Size
6	HU_WH_WHR_1_5	Proposed Culvert WHR_1-5_2	800.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			760.98	0.27	None	0.38	None	No Change	1.6	Coarse Sand	2.0	Very Coarse Sand	Increase in Grain Size	1.3	Coarse Sand	1.8	Coarse Sand	No Change
			658.28	26.58	Low	26.58	Low	No Change	36.0	Very Coarse Gravel	36.0	Very Coarse Gravel	No Change	34.7	Very Coarse Gravel	34.7	Very Coarse Gravel	No Change
		Culvert	643.98	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			615.92	4.97	None	4.90	None	No Change	11.5	Medium Gravel	11.4	Medium Gravel	No Change	10.8	Medium Gravel	10.8	Medium Gravel	No Change
			570.46	8.23	None	8.23	None	No Change	17.0	Coarse Gravel	17.0	Coarse Gravel	No Change	13.8	Medium Gravel	13.8	Medium Gravel	
			681.3	1.53	None	8.90	None	No Change	5.7	Pebbles	19.2	Coarse Gravel	Increase in Grain Size	3.9	Very Coarse Sand	12.9	Medium Gravel	Increase in Grain Size
			659.93	0.47	None	0.79	None	No Change	2.6	Very Coarse Sand	3.4	Very Coarse Sand	No Change	1.7	Coarse Sand	2.7	Very Coarse Sand	Increase in Grain Size
		Main Highway		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_1_6		587.4	4.37	None	4.37	None	No Change	11.4	Medium Gravel	11.3	Medium Gravel	No Change	8.5	Medium Gravel	8.5	Medium Gravel	No Change
			548.14	4.64	None	5.88	None	No Change	12.0	Medium Gravel	14.0	Medium Gravel	No Change	8.5	Medium Gravel	10.4	Medium Gravel	No Change
		Transitway		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			516.76	2.86	None	3.60	None	No Change	8.3	Medium Gravel	9.6	Medium Gravel	No Change	6.6	Fine Gravel	8.2	Medium Gravel	Increase in Grain Size
			453.57	6.77	None	6.77	None	No Change	15.8	Medium Gravel	15.8	Medium Gravel	No Change	10.8	Medium Gravel	10.8	Medium Gravel	No Change
			1353.908	54.10	Moderate	54.10	Moderate	No Change	52.1	Very Coarse Gravel	52.1	Very Coarse Gravel	No Change	73.9	Small Cobble	73.9	Small Cobble	No Change
			1353.896	9.52	None	9.52	None	No Change	16.0	Coarse Gravel	16.0	Coarse Gravel	No Change	22.0	Coarse Gravel	22.0	Coarse Gravel	No Change
6	HU_WH_WHR_0_2	HU_WH_WHR_0_1 (Highway west bound lane + Ramp)	1353.855	3.26	None	3.26	None	No Change	7.7	Fine Gravel	7.7	Fine Gravel	No Change	10.4	Medium Gravel	10.4	Medium Gravel	No Change
			1353.844	4.69	None	4.69	None	No Change	9.6	Medium Gravel	9.6	Medium Gravel	No Change	14.2	Medium Gravel	14.2	Medium Gravel	No Change
			1352.611	18.35	Low	21.43	Low	No Change	24.0	Coarse Gravel	26.7	Coarse Gravel	No Change	37.7	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
			1352.576	58.24	Moderate	11.63	Low	Decrease	56.6	Very Coarse Gravel	18.2	Coarse Gravel	Decrease in Grain Size	71.6	Small Cobble	25.7	Coarse Gravel	Decrease in Grain Size
			1352.506	0.58	None	0.61	None	No Change	2.4	Very Coarse Sand	2.5	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.3	Very Coarse Sand	No Change
		HU_WH_WHR_0_2 (Highway east bound lane + Ramp)	1352.455	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_0_3		1352.49	6.74	None	6.08	None	No Change	13.0	Medium Gravel	12.0	Medium Gravel	No Change	16.1	Coarse Gravel	15.6	Medium Gravel	Decrease in Grain Size
			1352.414	12.66	Low	15.69	Low	No Change	18.8	Coarse Gravel	21.6	Coarse Gravel	No Change	28.3	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
			1352.37	3.17	None	4.60	None	No Change	7.4	Fine Gravel	9.5	Medium Gravel	Increase in Grain Size	10.8	Medium Gravel	14.2	Medium Gravel	No Change
		HU_WH_WHR_0_3 (Transit Bridge)	1352.355	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1352.347	2.76	None	4.23	None	No Change	6.6	Fine Gravel	8.8	Medium Gravel	Increase in Grain Size	10.4	Medium Gravel	13.8	Medium Gravel	No Change
			1352.293	0.41	None	0.41	None	No Change	1.9	Coarse Sand	1.9	Coarse Sand	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change
			1415.673	45.39	Moderate	56.66	Moderate	No Change	44.7	Very Coarse Gravel	52.1	Very Coarse Gravel	No Change	69.4	Small Cobble	80.8	Small Cobble	No Change
			1415.625	4.16	None	2.99	None	No Change	9.8	Medium Gravel	7.8	Fine Gravel	Decrease in Grain Size	10.4	Medium Gravel	8.2	Medium Gravel	No Change
		Proposed Bridge HU_WH_GRT_0_1	1415.602	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.577	5.18	None	5.18	None	No Change	11.3	Medium Gravel	11.2	Medium Gravel	No Change	12.4	Medium Gravel	12.4	Medium Gravel	No Change
			1415.564	12.02	Low	4.81	None	Decrease	19.7	Coarse Gravel	10.4	Medium Gravel	Decrease in Grain Size	23.2	Coarse Gravel	12.9	Medium Gravel	Decrease in Grain Size
6	HU_WH_GRT_0_2	Proposed Bridge HU_WH_GRT_0_2	1415.547	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.505	1.41	None	5.84	None	No Change	4.8	Very Coarse Sand	12.9	Medium Gravel	Increase in Grain Size	4.6	Very Coarse Sand	12.0	Medium Gravel	Increase in Grain Size
			1415.406	17.50	Low	1.77	None	Decrease	26.4	Coarse Gravel	5.5	Pebbles	Decrease in Grain Size	27.6	Coarse Gravel	5.7	Pebbles	Decrease in Grain Size
		Proposed Bridge HU_WH_GRT_0_3 (Transit)	1415.38	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.353	1.72	None	3.02	None	No Change	5.3	Pebbles	7.7	Fine Gravel	Increase in Grain Size	6.0	Pebbles	8.9	Medium Gravel	Increase in Grain Size
			1415.311	0.10	None	0.10	None	No Change	0.8	Coarse Sand	0.8	Coarse Sand	No Change	0.8	Coarse Sand	0.8	Coarse Sand	No Change
			1514.853	8.13	None	6.63	None	No Change	15.4	Medium Gravel	13.4	Medium Gravel	No Change	17.1	Coarse Gravel	14.7	Medium Gravel	Decrease in Grain Size
			1514.841	15.92	Low	36.89	Moderate	Increase	24.2	Coarse Gravel	43.6	Very Coarse Gravel	Increase in Grain Size	27.0	Coarse Gravel	46.9	Very Coarse Gravel	Increase in Grain Size
		HU_WH_CDT_2_1	1514.818	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.795	15.15	Low	5.73	None	Decrease	26.0	Coarse Gravel	12.9	Medium Gravel	Decrease in Grain Size	20.9	Coarse Gravel	11.6	Medium Gravel	Decrease in Grain Size
			1514.773	1.88	None	18.17	Low	Increase	5.9	Pebbles	29.0	Coarse Gravel	Increase in Grain Size	5.4	Pebbles	24.5	Coarse Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	2-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
6	HU_WH_CDT_2_1	HU_WH_CDT_2_2	1514.75	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.717	19.28	Low	2.13	None	Decrease	5.7	Pebbles	8.4	Medium Gravel	Increase in Grain Size	5.7	Pebbles	8.2	Medium Gravel	Increase in Grain Size
			1514.687	45.39	Moderate	56.66	Moderate	No Change	30.1	Coarse Gravel	6.5	Fine Gravel	Decrease in Grain Size	25.7	Coarse Gravel	6.0	Pebbles	Decrease in Grain Size
		HU_WH_CDT_2_3 (Transit)	1514.671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.656	0.00	None	0.12	None	No Change	0.1	Fine Sand	0.9	Coarse Sand	Increase in Grain Size	0.1	Fine Sand	0.9	Coarse Sand	Increase in Grain Size
			1514.605	15.72	Low	15.72	Low	No Change	24.8	Coarse Gravel	24.8	Coarse Gravel	No Change	25.1	Coarse Gravel	25.1	Coarse Gravel	No Change
			1514.549	36.74	Moderate	36.74	Moderate	No Change	43.2	Very Coarse Gravel	43.2	Very Coarse Gravel	No Change	47.7	Very Coarse Gravel	47.7	Very Coarse Gravel	No Change
			1514.507	0.56	None	0.56	None	No Change	2.3	Very Coarse Sand	2.3	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change
		Culvert (Mayfield Road)	1514.475	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.447	35.90	Moderate	35.90	Moderate	No Change	42.6	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change	46.9	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
6	HU_WH_CDT_0_2		1514.598	129.82	High	129.82	High	No Change	85.6	Small Cobble	85.6	Small Cobble	No Change	166.8	Large Cobble	166.8	Large Cobble	No Change
			1514.575	7.21	None	6.47	None	No Change	12.4	Medium Gravel	11.5	Medium Gravel	No Change	20.9	Coarse Gravel	19.2	Coarse Gravel	No Change
		Proposed Bridge HU_WH_CDT_0_1	1514.573	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.501	21.03	Low	19.92	Low	No Change	24.4	Coarse Gravel	23.5	Coarse Gravel	No Change	48.6	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
			1514.487	7.66	None	7.44	None	No Change	12.2	Medium Gravel	11.9	Medium Gravel	No Change	24.5	Coarse Gravel	24.5	Coarse Gravel	No Change
		Proposed Bridge HU_WH_CDT_0_2 Transit	1514.479	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.467	15.53	Low	15.31	Low	No Change	19.6	Coarse Gravel	19.4	Coarse Gravel	No Change	40.9	Very Coarse Gravel	40.1	Very Coarse Gravel	No Change
			1514.353	0.56	None	0.56	None	No Change	2.3	Very Coarse Sand	2.3	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change
			1514.345	89.81	Moderate	89.81	Moderate	No Change	108.1	Small Cobble	108.1	Small Cobble	No Change	45.1	Very Coarse Gravel	45.1	Very Coarse Gravel	No Change
			1514.312	35.90	Moderate	35.90	Moderate	No Change	42.6	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change	46.9	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
		Culvert	4.331 x-80 (43.04-	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.306	35.90	Moderate	35.90	Moderate	No Change	42.6	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change	46.9	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
		Culvert	4.331 x-80 (43.04-	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_MH_RAI_1_3		24.6	8.25	None	31.09	Low	Increase	14.1	Medium Gravel	35.5	Very Coarse Gravel	Increase in Grain Size	20.9	Coarse Gravel	50.4	Very Coarse Gravel	Increase in Grain Size
			24.59	64.26	Moderate	7.26	None	Decrease	56.8	Very Coarse Gravel	13.1	Medium Gravel	Decrease in Grain Size	88.0	Small Cobble	18.7	Coarse Gravel	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.55	62.45	Moderate	16.21	Low	Decrease	9.3	Medium Gravel	4.7	Very Coarse Sand	Decrease in Grain Size	13.8	Medium Gravel	6.9	Fine Gravel	Decrease in Grain Size
			24.54	1.53	None	8.90	None	No Change	55.7	Very Coarse Gravel	22.0	Coarse Gravel	Decrease in Grain Size	86.8	Small Cobble	34.7	Very Coarse Gravel	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.52	4.37	None	4.37	None	No Change	11.9	Medium Gravel	14.2	Medium Gravel	No Change	16.1	Coarse Gravel	20.3	Coarse Gravel	No Change
			24.51	4.64	None	5.88	None	No Change	36.4	Very Coarse Gravel	36.4	Very Coarse Gravel	No Change	56.1	Very Coarse Gravel	56.1	Very Coarse Gravel	No Change
7	HU_MH_ROB_3_5		1739	1.49	None	8.01	None	No Change	5.6	Pebbles	17.3	Coarse Gravel	Increase in Grain Size	3.9	Very Coarse Sand	12.9	Medium Gravel	Increase in Grain Size
			1699	4.77	None	12.21	Low	Increase	10.8	Medium Gravel	20.1	Coarse Gravel	Increase in Grain Size	11.6	Medium Gravel	23.2	Coarse Gravel	Increase in Grain Size
		Propsed Culvert_HU_MH_ROB_3_1 (3.3 x 2.1 m)	1697	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1655	21.45	Low	7.17	None	Decrease	29.9	Coarse Gravel	13.9	Medium Gravel	Decrease in Grain Size	33.2	Very Coarse Gravel	16.1	Coarse Gravel	Decrease in Grain Size
			1641	0.55	None	4.44	None	No Change	2.7	Very Coarse Sand	10.7	Medium Gravel	Increase in Grain Size	2.1	Very Coarse Sand	10.0	Medium Gravel	Increase in Grain Size
7	HU_MH_ROB_0_2		1750	114.72	High	107.36	High	No Change	76.2	Small Cobble	72.8	Small Cobble	No Change	165.0	Large Cobble	158.2	Large Cobble	No Change
			1739	32.77	Low	29.45	Low	No Change	32.6	Very Coarse Gravel	30.3	Coarse Gravel	Decrease in Grain Size	68.4	Small Cobble	64.1	Small Cobble	No Change
		HU_MH_ROB_0_6 at Highway 427	1706	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1657	4.69	None	4.49	None	No Change	8.6	Medium Gravel	8.4	Medium Gravel	No Change	18.2	Coarse Gravel	17.6	Coarse Gravel	No Change
			1618	0.70	None	0.70	None	No Change	2.3	Very Coarse Sand	2.3	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.9	Very Coarse Sand	No Change
7	HU_MH_ROB_0_5		825	46.34	Moderate	46.54	Moderate	No Change	49.4	Very Coarse Gravel	49.5	Very Coarse Gravel	No Change	59.0	Very Coarse Gravel	59.0	Very Coarse Gravel	No Change
			822	117.84	High	49.89	Moderate	Decrease	82.7	Small Cobble	45.6	Very Coarse Gravel	Decrease in Grain Size	146.6	Large Cobble	81.9	Small Cobble	Decrease in Grain Size
		HU_ROB-0-1	821	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			800	7.64	None	1.03	None	No Change	16.0	Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size	13.8	Medium Gravel	3.5	Very Coarse Sand	Decrease in Grain Size
			782	69.85	Moderate	72.12	Moderate	No Change	69.4	Small Cobble	70.9	Small Cobble	No Change	68.4	Small Cobble	70.5	Small Cobble	No Change
			740	15.40	Low	13.41	Low	No Change	21.5	Coarse Gravel	19.5	Coarse Gravel	No Change	32.5	Very Coarse Gravel	29.7	Coarse Gravel	Decrease in Grain Size
		HU_ROB-0-2	737	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			672	13.85	Low	15.04	Low	No Change	19.6	Coarse Gravel	20.6	Coarse Gravel	No Change	31.8	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
			653	8.31	None	9.48	None	No Change	14.1	Medium Gravel	15.1	Medium Gravel	No Change	21.5	Coarse Gravel	24.5	Coarse Gravel	No Change
		HU_ROB-0-3 (Transit)	651	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			636	9.06	None	8.52	None	No Change	14.7	Medium Gravel	14.0	Medium Gravel	No Change	23.8	Coarse Gravel	23.2	Coarse Gravel	No Change
			616	106.62	High	119.29	High	No Change	73.8	Small Cobble	79.7	Small Cobble	No Change	151.5	Large Cobble	161.6	Large Cobble	No Change
			549	117.52	High	92.94	Moderate	Decrease	80.9	Small Cobble	68.8	Small Cobble	No Change	151.5	Large Cobble	130.8	Large Cobble	No Change
			492	85.56	Moderate	117.00	High	Increase	63.8	Very Coarse Gravel	79.0	Small Cobble	Increase in Grain Size	127.8	Small Cobble	158.2	Large Cobble	Increase in Grain Size
			429	65.50	Moderate	37.22	Moderate	No Change	73.7	Small Cobble	49.9	Very Coarse Gravel	Decrease in Grain Size	52.3	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
			418	34.60	Low	34.97	Low	No Change	36.0	Very Coarse Gravel	35.9	Very Coarse Gravel	No Change	62.1	Very Coarse Gravel	64.1	Small Cobble	Increase in Grain Size
		HU_ROB-0-4	416	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			400	44.32	Moderate	67.57	Moderate	No Change	44.7	Very Coarse Gravel	59.1	Very Coarse Gravel	No Change	66.2	Small Cobble	90.5	Small Cobble	No Change
			384	44.32	Moderate	67.57	Moderate	No Change	44.7	Very Coarse Gravel	59.1	Very Coarse Gravel	No Change	66.2	Small Cobble	90.5	Small Cobble	No Change
			1825	0.53	None	0.53	None	No Change	1.9	Coarse Sand	1.9	Coarse Sand	No Change	3.9	Very Coarse Sand	3.9	Very Coarse Sand	No Change

2-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
7	HU_MH_ROB_0_6		1817.18	14.19	Low	14.19	Low	No Change	17.4	Coarse Gravel	17.4	Coarse Gravel	No Change	43.4	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
			1787.86	78.68	Moderate	78.68	Moderate	No Change	58.5	Very Coarse Gravel	58.5	Very Coarse Gravel	No Change	129.3	Large Cobble	129.3	Large Cobble	No Change
			1737.61	104.41	High	104.41	High	No Change	72.8	Small Cobble	72.8	Small Cobble	No Change	148.2	Large Cobble	148.2	Large Cobble	No Change
7	HU_MH_ROB_7_1		791	82.19	Moderate	82.19	Moderate	No Change	67.1	Small Cobble	67.1	Small Cobble	No Change	104.8	Small Cobble	104.8	Small Cobble	No Change
			766	10.76	Low	8.98	None	Decrease	17.2	Coarse Gravel	15.2	Medium Gravel	Decrease in Grain Size	24.5	Coarse Gravel	21.5	Coarse Gravel	No Change
		HU_MH_ROB_7_1_1	763	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			739	7.70	None	7.80	None	No Change	13.7	Medium Gravel	13.7	Medium Gravel	No Change	19.2	Coarse Gravel	19.8	Coarse Gravel	No Change
			694	101.59	High	110.06	High	No Change	75.3	Small Cobble	79.3	Small Cobble	No Change	129.3	Large Cobble	138.6	Large Cobble	No Change
			666	53.65	Moderate	37.10	Moderate	No Change	49.2	Very Coarse Gravel	38.1	Very Coarse Gravel	No Change	81.9	Small Cobble	64.1	Small Cobble	No Change
		HU_MH_ROB_7_1_2	664	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			600	11.58	Low	11.10	Low	No Change	17.5	Coarse Gravel	17.0	Coarse Gravel	No Change	27.6	Coarse Gravel	27.0	Coarse Gravel	No Change
			587	115.88	High	49.12	Moderate	Decrease	80.2	Small Cobble	44.7	Very Coarse Gravel	Decrease in Grain Size	149.8	Large Cobble	83.1	Small Cobble	Decrease in Grain Size
		HU_MH_ROB_7_1_3	585	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			568	7.63	None	7.36	None	No Change	13.3	Medium Gravel	12.9	Medium Gravel	No Change	20.3	Coarse Gravel	19.8	Coarse Gravel	No Change
			529	10.50	Low	10.34	Low	No Change	16.3	Coarse Gravel	16.1	Coarse Gravel	No Change	26.3	Coarse Gravel	25.7	Coarse Gravel	No Change
			444	65.39	Moderate	67.67	Moderate	No Change	57.6	Very Coarse Gravel	58.9	Very Coarse Gravel	No Change	89.2	Small Cobble	91.7	Small Cobble	No Change
			416	44.32	Moderate	26.71	Low	Decrease	43.9	Very Coarse Gravel	30.9	Coarse Gravel	Decrease in Grain Size	69.4	Small Cobble	49.5	Very Coarse Gravel	Decrease in Grain Size
			390	7.64	None	1.03	None	No Change	16.0	Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size	13.8	Medium Gravel	3.5	Very Coarse Sand	Decrease in Grain Size
		HU_MH_ROB_7_1_4	388	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			371	7.64	None	1.03	None	No Change	16.0	Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size	13.8	Medium Gravel	3.5	Very Coarse Sand	Decrease in Grain Size
			355	8.19	None	8.19	None	No Change	14.4	Medium Gravel	14.4	Medium Gravel	No Change	19.8	Coarse Gravel	19.8	Coarse Gravel	No Change
7	HU_MH_ROB_7_2		477.94	1.28	None	1.45	None	No Change	4.8	Very Coarse Sand	5.2	Pebbles	Increase in Grain Size	3.7	Very Coarse Sand	4.1	Very Coarse Sand	No Change
			461.73	8.49	None	1.14	None	No Change	17.0	Coarse Gravel	4.4	Very Coarse Sand	Decrease in Grain Size	15.1	Medium Gravel	3.7	Very Coarse Sand	Decrease in Grain Size
		HU_HM_ROB_7_2_1	459.8	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			431.8	3.29	None	3.17	None	No Change	8.7	Medium Gravel	8.5	Medium Gravel	No Change	8.2	Medium Gravel	7.9	Fine Gravel	Decrease in Grain Size
			389.94	19.03	Low	19.29	Low	No Change	29.8	Coarse Gravel	30.1	Coarse Gravel	No Change	25.7	Coarse Gravel	25.7	Coarse Gravel	No Change
			347.68	5.14	None	1.27	None	No Change	12.0	Medium Gravel	4.8	Very Coarse Sand	Decrease in Grain Size	10.8	Medium Gravel	3.7	Very Coarse Sand	Decrease in Grain Size
		HU_HM_ROB_7_2_2	346.18	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			270.76	3.41	None	27.01	Low	Increase	8.8	Medium Gravel	36.4	Very Coarse Gravel	Increase in Grain Size	8.5	Medium Gravel	35.4	Very Coarse Gravel	Increase in Grain Size
			205.88	9.08	None	0.89	None	No Change	19.5	Coarse Gravel	3.8	Very Coarse Sand	Decrease in Grain Size	12.9	Medium Gravel	2.9	Very Coarse Sand	Decrease in Grain Size
		HU_HM_ROB_7_2_3 (Transit)	203.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			179.53	8.88	None	17.26	Low	Increase	27.2	Coarse Gravel	42.1	Very Coarse Gravel	Increase in Grain Size	6.0	Pebbles	9.6	Medium Gravel	Increase in Grain Size
			1739	0.44	None	0.70	None	No Change	2.3	Very Coarse Sand	3.2	Very Coarse Sand	No Change	1.8	Coarse Sand	2.7	Very Coarse Sand	Increase in Grain Size
		HU_HM_ROB_7_2_4	138.45	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			100.22	0.78	None	0.95	None	No Change	3.6	Very Coarse Sand	4.0	Very Coarse Sand	No Change	2.5	Very Coarse Sand	2.9	Very Coarse Sand	No Change
			82.64	5.42	None	5.42	None	No Change	13.7	Medium Gravel	13.7	Medium Gravel	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change
7	HU_MH_ROB_4_1		1874	2.79	None	0.40	None	No Change	9.2	Medium Gravel	2.4	Very Coarse Sand	Decrease in Grain Size	5.1	Pebbles	1.4	Coarse Sand	Decrease in Grain Size
			1859	0.28	None	9.07	None	No Change	1.8	Coarse Sand	19.6	Coarse Gravel	Increase in Grain Size	1.1	Coarse Sand	12.4	Medium Gravel	Increase in Grain Size
		HU_MH_ROB_4_1	1840	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1823	5.72	None	10.40	Low	Increase	13.6	Medium Gravel	20.5	Coarse Gravel	Increase in Grain Size	10.4	Medium Gravel	15.6	Medium Gravel	No Change
			1811	2.20	None	1.09	None	No Change	7.3	Fine Gravel	4.5	Very Coarse Sand	Decrease in Grain Size	4.9	Very Coarse Sand	3.0	Very Coarse Sand	No Change
			1802	2.08	None	9.19	None	No Change	7.2	Fine Gravel	19.7	Coarse Gravel	Increase in Grain Size	4.6	Very Coarse Sand	12.9	Medium Gravel	Increase in Grain Size
		HU_MH_ROB_4_2	1780	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1719	0.45	None	0.57	None	No Change	2.3	Very Coarse Sand	2.7	Very Coarse Sand	No Change	2.0	Coarse Sand	2.3	Very Coarse Sand	Increase in Grain Size
			1681	12.65	Low	13.66	Low	No Change	23.6	Coarse Gravel	24.6	Coarse Gravel	No Change	17.6	Coarse Gravel	18.7	Coarse Gravel	No Change
		HU_MH_ROB_4_3	1671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1646	10.98	Low	8.46	None	Decrease	20.0	Coarse Gravel	16.7	Coarse Gravel	No Change	18.7	Coarse Gravel	15.6	Medium Gravel	Decrease in Grain Size
			1588	0.00	None	9.20	None	No Change	0.0	Very Fine Sand	16.8	Coarse Gravel	Increase in Grain Size	0.0	Silt	18.2	Coarse Gravel	Increase in Grain Size
			1487	101.59	High	110.06	High	No Change	75.3	Small Cobble	79.3	Small Cobble	No Change	129.3	Large Cobble	138.6	Large Cobble	No Change
		HU_MH_ROB_4_4	1482	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1451	53.65	Moderate	37.10	Moderate	No Change	49.2	Very Coarse Gravel	38.1	Very Coarse Gravel	No Change	81.9	Small Cobble	64.1	Small Cobble	No Change
			1353	11.58	Low	11.10	Low	No Change	17.5	Coarse Gravel	17.0	Coarse Gravel	No Change	27.6	Coarse Gravel	27.0	Coarse Gravel	No Change
			1252	115.88	High	49.12	Moderate	Decrease	80.2	Small Cobble	44.7	Very Coarse Gravel	Decrease in Grain Size	149.8	Large Cobble	83.1	Small Cobble	Decrease in Grain Size
			1202	44.32	Moderate	26.71	Low	Decrease	43.9	Very Coarse Gravel	30.9	Coarse Gravel	Decrease in Grain Size	69.4	Small Cobble	49.5	Very Coarse Gravel	Decrease in Grain Size
			1166	7.64	None	1.03	None	No Change	16.0	Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size	13.8	Medium Gravel	3.5	Very Coarse Sand	Decrease in Grain Size
		HU_MH_ROB_4_5	1143	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1114	13.98	Low	10.76	Low	No Change	23.6	Coarse Gravel	18.7	Coarse Gravel	No Change	21.5	Coarse Gravel	20.3	Coarse Gravel	No Change
			1062	0.04	None	25.36	Low	Increase	0.5	Medium Sand	33.7	Very Coarse Gravel	Increase in Grain Size	0.4	Medium Sand	36.2	Very Coarse Gravel	Increase in Grain Size
			1015	0.00	None	9.20	None	No Change	0.0	Very Fine Sand	16.8	Coarse Gravel	Increase in Grain Size	0.0	Silt	18.2	Coarse Gravel	Increase in Grain Size
			997	0.00	None	36.56	Moderate	Increase	0.1	Fine Sand	43.3	Very Coarse Gravel	Increase in Grain Size	0.1	Fine Sand	46.9	Very Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_6	979	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			965	30.15	Low	11.40	Low	No Change	38.6	Very Coarse Gravel	19.5	Coarse Gravel	Decrease in Grain Size	39.3	Very Coarse Gravel	21.5	Coarse Gravel	Decrease in Grain Size
			948	4.32	None	24.72	Low	Increase	10.5	Medium Gravel	33.1	Very Coarse Gravel	Increase in Grain Size	10.0	Medium Gravel	36.2	Very Coarse Gravel	Increase in Grain Size
			23547	2.55	None	2.51	None	No Change	5.8	Pebbles	5.7	Pebbles	No Change	11.6	Medium Gravel	11.2	Medium Gravel	No Change
			23517	3.68	None	3.64	None	No Change	7.4	Fine Gravel	7.3	Fine Gravel	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
		HU_MH_MHR_01	23516	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

2-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
8	HU_MH_MHR_0_1		23493	3.14	None	3.11	None	No Change	6.6	Fine Gravel	6.6	Fine Gravel	No Change	13.3	Medium Gravel	13.3	Medium Gravel	No Change
			23474	3.44	None	3.40	None	No Change	7.1	Fine Gravel	7.0	Fine Gravel	No Change	13.8	Medium Gravel	13.8	Medium Gravel	No Change
		HU_MH_MHR_02	23473	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23421	0.88	None	0.87	None	No Change	2.9	Very Coarse Sand	2.8	Very Coarse Sand	No Change	5.1	Pebbles	5.1	Pebbles	No Change
			23307	1.72	None	1.72	None	No Change	4.3	Very Coarse Sand	4.3	Very Coarse Sand	No Change	9.3	Medium Gravel	9.3	Medium Gravel	No Change
8	HU_MH_MHR_3_1		1117.01	2.22	None	2.29	None	No Change	7.1	Fine Gravel	7.3	Fine Gravel	No Change	5.4	Pebbles	5.4	Pebbles	No Change
			1084.93	9.62	None	12.76	Low	Increase	20.1	Coarse Gravel	23.5	Coarse Gravel	No Change	13.8	Medium Gravel	18.2	Coarse Gravel	Increase in Grain Size
		Culvert # HU_MH_MHR_3_1	1054	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			936.63	62.45	Moderate	16.21	Low	Decrease	3.4	Very Coarse Sand	4.5	Very Coarse Sand	No Change	2.7	Very Coarse Sand	3.9	Very Coarse Sand	No Change
			884.25	1.53	None	8.90	None	No Change	3.9	Very Coarse Sand	3.9	Very Coarse Sand	No Change	2.9	Very Coarse Sand	2.9	Very Coarse Sand	No Change
8	HU_MH_EHR_1_4		508.348	5.14	None	1.27	None	No Change	14.8	Medium Gravel	13.4	Medium Gravel	No Change	18.7	Coarse Gravel	16.6	Coarse Gravel	No Change
			490.725	3.41	None	27.01	Low	Increase	60.7	Very Coarse Gravel	13.1	Medium Gravel	Decrease in Grain Size	78.4	Small Cobble	16.6	Coarse Gravel	Decrease in Grain Size
		Existing Hwy 27 Culvert Proposed Replacement HU_EH_EHT_1_1 (16 m span)	460	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			425.936	47.44	Moderate	47.44	Moderate	No Change	48.3	Very Coarse Gravel	48.3	Very Coarse Gravel	No Change	65.2	Small Cobble	65.2	Small Cobble	No Change
			400.386	11.46	Low	11.46	Low	No Change	19.5	Coarse Gravel	19.5	Coarse Gravel	No Change	21.5	Coarse Gravel	21.5	Coarse Gravel	No Change
8	HU_MH_EHR_1_3		542.039	1.46	None	1.29	None	No Change	4.9	Very Coarse Sand	4.5	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.4	Very Coarse Sand	No Change
			531.454	45.10	Moderate	13.32	Low	Decrease	49.0	Very Coarse Gravel	21.0	Coarse Gravel	Decrease in Grain Size	57.1	Very Coarse Gravel	25.1	Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			515.797	5.24	None	5.97	None	No Change	11.8	Medium Gravel	12.9	Medium Gravel	No Change	11.6	Medium Gravel	12.4	Medium Gravel	No Change
			507.016	38.08	Moderate	4.65	None	Decrease	47.3	Very Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size	42.6	Very Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			421.237	38.44	Moderate	10.65	Low	Decrease	44.7	Very Coarse Gravel	18.6	Coarse Gravel	Decrease in Grain Size	48.6	Very Coarse Gravel	20.3	Coarse Gravel	Decrease in Grain Size
			418.126	7.96	None	6.48	None	No Change	15.8	Medium Gravel	13.7	Medium Gravel	No Change	15.1	Medium Gravel	13.3	Medium Gravel	No Change
		HU_EH_EHT_1_1_3		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			394.723	25.52	Low	23.99	Low	No Change	34.1	Very Coarse Gravel	32.7	Very Coarse Gravel	No Change	36.2	Very Coarse Gravel	34.7	Very Coarse Gravel	No Change
			390.543	23.21	Low	23.21	Low	No Change	32.5	Very Coarse Gravel	32.5	Very Coarse Gravel	No Change	32.5	Very Coarse Gravel	32.5	Very Coarse Gravel	No Change
		HU_EH_EHT_1_1_4 (Transit)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			367.965	8.49	None	1.14	None	No Change	17.0	Coarse Gravel	4.4	Very Coarse Sand	Decrease in Grain Size	15.1	Medium Gravel	3.7	Very Coarse Sand	Decrease in Grain Size
			350.966	3.29	None	3.17	None	No Change	8.7	Medium Gravel	8.5	Medium Gravel	No Change	8.2	Medium Gravel	7.9	Fine Gravel	Decrease in Grain Size
8	HU_MH_EHR_1_6		691.945	11.60	Low	19.89	Low	No Change	21.0	Coarse Gravel	28.5	Coarse Gravel	No Change	18.7	Coarse Gravel	31.1	Coarse Gravel	No Change
			643.653	31.21	Low	38.59	Moderate	Increase	39.6	Very Coarse Gravel	44.9	Very Coarse Gravel	No Change	40.1	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
		Proposed Culvert HU_EH_EHT_1_2_1 (Channel Realignment)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			533.859	17.88	Low	6.93	None	Decrease	28.1	Coarse Gravel	14.1	Medium Gravel	Decrease in Grain Size	25.7	Coarse Gravel	14.2	Medium Gravel	Decrease in Grain Size
			496.432	30.57	Low	30.57	Low	No Change	39.2	Very Coarse Gravel	39.2	Very Coarse Gravel	No Change	39.3	Very Coarse Gravel	39.3	Very Coarse Gravel	No Change
8	HU_MH_EHR_1_6		295.252	58.80	Moderate	58.80	Moderate	No Change	57.6	Very Coarse Gravel	57.6	Very Coarse Gravel	No Change	70.5	Small Cobble	70.5	Small Cobble	No Change
			253.906	29.14	Low	29.14	Low	No Change	37.9	Very Coarse Gravel	37.9	Very Coarse Gravel	No Change	37.7	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
		Existing Hwy 27 culvert/Proposed Culvert HU_EH_EHT_1_2_2	243.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			188.519	5.49	None	5.17	None	No Change	11.7	Medium Gravel	11.2	Medium Gravel	No Change	12.9	Medium Gravel	12.4	Medium Gravel	No Change
			165.049	25.29	Low	25.29	Low	No Change	34.1	Very Coarse Gravel	34.1	Very Coarse Gravel	No Change	35.4	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
8	HU_MH_EHR_0_2		16040	10.55	Low	10.07	Low	No Change	14.7	Medium Gravel	14.3	Medium Gravel	No Change	32.5	Very Coarse Gravel	31.8	Coarse Gravel	Decrease in Grain Size
			16019	9.00	None	8.56	None	No Change	13.3	Medium Gravel	12.8	Medium Gravel	No Change	29.0	Coarse Gravel	28.3	Coarse Gravel	No Change
		HU_EH_EHR_01	16014	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15989	6.43	None	6.15	None	No Change	10.6	Medium Gravel	10.3	Medium Gravel	No Change	22.6	Coarse Gravel	22.0	Coarse Gravel	No Change
			15969	9.62	None	9.22	None	No Change	13.9	Medium Gravel	13.5	Medium Gravel	No Change	30.4	Coarse Gravel	29.7	Coarse Gravel	No Change
		HU_EH_EHR_02	15951	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15925	29.56	Low	28.94	Low	No Change	29.6	Coarse Gravel	29.1	Coarse Gravel	No Change	67.3	Small Cobble	66.2	Small Cobble	No Change
			15887	13.65	Low	13.65	Low	No Change	17.7	Coarse Gravel	17.7	Coarse Gravel	No Change	38.5	Very Coarse Gravel	38.5	Very Coarse Gravel	No Change
9	HU_EH_EHR_15_1		2607.261	18.14	Low	9.75	None	Decrease	27.6	Coarse Gravel	18.1	Coarse Gravel	No Change	27.0	Coarse Gravel	17.6	Coarse Gravel	No Change
			2543.462	2543.46	2543.462	2543.46	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change
		Proposed Culvert HU_EH_EHT_15_2_1	2500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2474.157	15.59	Low	9.75	None	Decrease	26.5	Coarse Gravel	19.2	Coarse Gravel	No Change	21.5	Coarse Gravel	15.6	Medium Gravel	Decrease in Grain Size
			2424.009	5.05	None	18.26	Low	Increase	12.0	Medium Gravel	29.0	Coarse Gravel	Increase in Grain Size	10.4	Medium Gravel	24.5	Coarse Gravel	Increase in Grain Size
			2390.711	14.43	Low	2.70	None	Decrease	25.4	Coarse Gravel	8.0	Fine Gravel	Decrease in Grain Size	19.8	Coarse Gravel	6.6	Fine Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_15_2_2	2350	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.737	24.46	Low	23.16	Low	No Change	34.7	Very Coarse Gravel	33.4	Very Coarse Gravel	No Change	31.8	Coarse Gravel	30.4	Coarse Gravel	No Change
			2274.82	8.99	None	11.62	Low	Increase	18.9	Coarse Gravel	22.0	Coarse Gravel	No Change	13.3	Medium Gravel	16.6	Coarse Gravel	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_15_2_3 (Transit)	2270.82	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2238.847	14.30	Low	14.21	Low	No Change	24.0	Coarse Gravel	23.9	Coarse Gravel	No Change	22.0	Coarse Gravel	22.0	Coarse Gravel	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	2-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			2168.715	6.47	None	6.47	None	No Change	14.9	Medium Gravel	14.9	Medium Gravel	No Change	11.2	Medium Gravel	11.2	Medium Gravel	No Change
9	HU_EH_EHR_15_1		553.4597	0.2	None	0.2	None	No Change	1.208791209	Coarse Sand	1.222527473	Coarse Sand	No Change	1.39046049	Coarse Sand	1.39046049	Coarse Sand	No Change
			440.7852	0.86	None	0.86	None	No Change	3.173076923	Very Coarse Sand	3.173076923	Very Coarse Sand	No Change	3.908543334	Very Coarse Sand	3.908543334	Very Coarse Sand	No Change
		Existing Kriby Road Culvert	399.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			379.0983	27.34	Low	27.34	Low	No Change	36.64835165	Very Coarse Gravel	36.64835165	Very Coarse Gravel	No Change	35.43258691	Very Coarse Gravel	35.43258691	Very Coarse Gravel	No Change
			260.5125	2.38	None	2.06	None	No Change	6.936813187	Fine Gravel	6.291208791	Fine Gravel	No Change	6.574702284	Fine Gravel	5.981649972	Pebbles	Decrease in Grain Size
9	HU_EH_EHR_16_1		6169.405	0.64	None	2.42	None	No Change	3.2	Very Coarse Sand	7.8	Fine Gravel	Increase in Grain Size	2.1	Very Coarse Sand	5.1	Pebbles	Increase in Grain Size
			6131.176	0.43	None	0.44	None	No Change	2.5	Very Coarse Sand	2.4	Very Coarse Sand	No Change	1.5	Coarse Sand	1.7	Coarse Sand	No Change
		Proposed Bridge HU_EH_EHT_16_1	6126.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			6048.088	0.83	None	4.84	None	No Change	4.0	Very Coarse Sand	12.8	Medium Gravel	Increase in Grain Size	2.1	Very Coarse Sand	8.2	Medium Gravel	Increase in Grain Size
			6006.68	0.80	None	0.49	None	No Change	3.7	Very Coarse Sand	2.6	Very Coarse Sand	No Change	2.5	Very Coarse Sand	1.8	Coarse Sand	Decrease in Grain Size
		Proposed Bridge HU_EH_EHT_16_2 (Transit)	6001	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			5969.339	2.52	None	0.97	None	No Change	8.2	Medium Gravel	4.2	Very Coarse Sand	Decrease in Grain Size	5.1	Pebbles	2.9	Very Coarse Sand	Decrease in Grain Size
			5932.436	0.26	None	0.71	None	No Change	1.8	Coarse Sand	3.6	Very Coarse Sand	Increase in Grain Size	1.0	Coarse Sand	2.0	Coarse Sand	No Change
9	HU_EH_EHR_16_1		3894.471	0.62	None	0.62	None	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change	2.1	Very Coarse Sand	2.1	Very Coarse Sand	No Change
			3788.84	33.75	Low	33.75	Low	No Change	41.4	Very Coarse Gravel	41.4	Very Coarse Gravel	No Change	43.4	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
		Existing Kriby Road Culvert	3773.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3753.025	22.02	Low	22.02	Low	No Change	30.7	Coarse Gravel	30.7	Coarse Gravel	No Change	33.2	Very Coarse Gravel	33.2	Very Coarse Gravel	No Change
			3685.87	25.44	Low	25.44	Low	No Change	35.2	Very Coarse Gravel	35.2	Very Coarse Gravel	No Change	33.2	Very Coarse Gravel	33.2	Very Coarse Gravel	No Change
9	HU_EH_EHR_17_2		3222.018	7.35	None	23.93	Low	Increase	15.1	Medium Gravel	33.8	Very Coarse Gravel	Increase in Grain Size	14.2	Medium Gravel	31.8	Coarse Gravel	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_1	3218	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3137.33	3.16	None	16.31	Low	Increase	9.4	Medium Gravel	27.4	Coarse Gravel	Increase in Grain Size	6.3	Fine Gravel	22.0	Coarse Gravel	Increase in Grain Size
			3076.886	12.06	Low	2.73	None	Decrease	23.0	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size	16.6	Coarse Gravel	6.6	Fine Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_4	3068.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3032.119	1.02	None	0.85	None	No Change	4.0	Very Coarse Sand	3.5	Very Coarse Sand	No Change	3.5	Very Coarse Sand	3.0	Very Coarse Sand	No Change
			2949.172	16.29	Low	24.64	Low	No Change	26.2	Coarse Gravel	34.5	Very Coarse Gravel	Increase in Grain Size	23.8	Coarse Gravel	32.5	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_5 (Transit)	2949.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2886.632	3.56	None	19.52	Low	Increase	10.1	Medium Gravel	30.2	Coarse Gravel	Increase in Grain Size	6.9	Fine Gravel	26.3	Coarse Gravel	Increase in Grain Size
			2788.101	1.46	None	1.46	None	No Change	4.8	Very Coarse Sand	4.8	Very Coarse Sand	No Change	5.1	Pebbles	5.1	Pebbles	No Change
9	HU_EH_EHR_17_2		1812.26	5.38	None	4.28	None	No Change	12.6	Medium Gravel	10.7	Medium Gravel	No Change	10.8	Medium Gravel	9.3	Medium Gravel	No Change
			1625.92	2.52	None	2.52	None	No Change	6.8	Fine Gravel	6.8	Fine Gravel	No Change	7.9	Fine Gravel	7.9	Fine Gravel	No Change
		Culvert	1568.03	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1530.3	1.69	None	1.68	None	No Change	5.1	Pebbles	5.1	Pebbles	No Change	6.0	Pebbles	6.0	Pebbles	No Change
			1415.195	15.94	Low	15.94	Low	No Change	26.8	Coarse Gravel	26.8	Coarse Gravel	No Change	22.0	Coarse Gravel	22.0	Coarse Gravel	No Change
9	HU_EH_EHR_18_1b		2370.437	19.21	Low	31.13	Low	No Change	29.3	Coarse Gravel	41.3	Very Coarse Gravel	Increase in Grain Size	27.0	Coarse Gravel	37.0	Very Coarse Gravel	Increase in Grain Size
			2346.795	8.21	None	4.56	None	No Change	15.7	Medium Gravel	10.5	Medium Gravel	No Change	16.6	Coarse Gravel	11.2	Medium Gravel	Decrease in Grain Size
		HU_EH_EHT_18_3_3	2344.79	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.705	21.76	Low	20.72	Low	No Change	30.7	Coarse Gravel	29.7	Coarse Gravel	No Change	31.8	Coarse Gravel	31.1	Coarse Gravel	No Change
			2275.007	1.81	None	1.67	None	No Change	5.6	Pebbles	5.3	Pebbles	No Change	5.7	Pebbles	5.4	Pebbles	No Change
		HU_EH_EHT_18_3_4	2274	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2254.425	21.73	Low	35.11	Moderate	Increase	29.6	Coarse Gravel	41.1	Very Coarse Gravel	Increase in Grain Size	34.7	Very Coarse Gravel	47.7	Very Coarse Gravel	No Change
			2242.197	34.85	Low	9.67	None	Decrease	41.5	Very Coarse Gravel	17.3	Coarse Gravel	Decrease in Grain Size	46.9	Very Coarse Gravel	19.2	Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_18_3_5	2238.19	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2213.417	3.73	None	3.84	None	No Change	8.9	Medium Gravel	9.1	Medium Gravel	No Change	10.4	Medium Gravel	10.4	Medium Gravel	No Change
			2133.69	37.39	Moderate	31.68	Low	Decrease	43.2	Very Coarse Gravel	38.6	Very Coarse Gravel	No Change	49.5	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
9	HU_EH_EHR_18_1b		928.912	23.26	Low	23.26	Low	No Change	29.2	Coarse Gravel	29.2	Coarse Gravel	No Change	40.9	Very Coarse Gravel	40.9	Very Coarse Gravel	No Change
			893.029	65.52	Moderate	65.52	Moderate	No Change	60.5	Very Coarse Gravel	60.5	Very Coarse Gravel	No Change	80.8	Small Cobble	80.8	Small Cobble	No Change
		Kriby Road Culvert	881.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			854.967	6.52	None	6.52	None	No Change	12.2	Medium Gravel	12.2	Medium Gravel	No Change	17.1	Coarse Gravel	17.1	Coarse Gravel	No Change
			773.018	66.71	Moderate	66.71	Moderate	No Change	61.3	Very Coarse Gravel	61.3	Very Coarse Gravel	No Change	80.8	Small Cobble	80.8	Small Cobble	No Change
9	HU_EH_EHR_18_4		3924.49	11.77	Low	17.14	Low	No Change	22.6	Coarse Gravel	28.2	Coarse Gravel	No Change	16.6	Coarse Gravel	23.2	Coarse Gravel	No Change
		HU_EH_EHT_18_5_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3777.79	1.46	None	1.45	None	No Change	5.1	Pebbles	5.1	Pebbles	No Change	4.4	Very Coarse Sand	4.4	Very Coarse Sand	No Change
			3687.29	20.37	Low	20.37	Low	No Change	31.0	Coarse Gravel	31.0	Coarse Gravel	No Change	27.0	Coarse Gravel	27.0	Coarse Gravel	No Change
		HU_EH_EHT_18_5_2	3673.29	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3645.09	1.96	None	3.54	None	No Change	6.5	Fine Gravel	9.3	Medium Gravel	Increase in Grain Size	5.1	Pebbles	8.2	Medium Gravel	Increase in Grain Size
			3582.79	5.75	None	5.31	None	No Change	13.4	Medium Gravel	12.7	Medium Gravel	No Change	10.8	Medium Gravel	10.4	Medium Gravel	No Change
		Existing Hwy400 culvert	3544.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3717.174	0.03	None	0.23	None	No Change	0.4	Medium Sand	1.6	Coarse Sand	Increase in Grain Size	0.3	Medium Sand	0.9	Coarse Sand	Increase in Grain Size
			3434.259	10.37	Low	1.93	None	Decrease	18.6	Coarse Gravel	5.8	Pebbles	Decrease in Grain Size	19.2	Coarse Gravel	6.3	Fine Gravel	Decrease in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	2-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
9	HU_EH_EHR_18_5	HU_EH_EHT_18_3_6		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3359.886	0.18	None	0.71	None	No Change	1.2	Coarse Sand	3.0	Very Coarse Sand	Increase in Grain Size	0.9	Coarse Sand	2.9	Very Coarse Sand	Increase in Grain Size
			3349.546	0.01	None	0.01	None	No Change	0.2	Fine Sand	0.2	Fine Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			3311.742	0.04	None	0.04	None	No Change	0.4	Medium Sand	0.4	Medium Sand	No Change	0.4	Medium Sand	0.4	Medium Sand	No Change
		Existing Private Culvert	3307	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3287.195	6.82	None	7.98	None	No Change	14.3	Medium Gravel	15.9	Medium Gravel	No Change	13.3	Medium Gravel	15.1	Medium Gravel	No Change
			3218.272	3.98	None	3.32	None	No Change	10.6	Medium Gravel	9.4	Medium Gravel	No Change	7.9	Fine Gravel	7.2	Fine Gravel	No Change
9	HU_EH_EHR_18_5		3717.174	0.03	None	0.23	None	No Change	0.4	Medium Sand	1.6	Coarse Sand	Increase in Grain Size	0.3	Medium Sand	0.9	Coarse Sand	Increase in Grain Size
		HU_EH_EHT_18_6_1	3670	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3630.589	1.01	None	1.26	None	No Change	4.2	Very Coarse Sand	4.8	Very Coarse Sand	No Change	3.0	Very Coarse Sand	3.7	Very Coarse Sand	No Change
			3600.859	17.18	Low	12.90	Low	No Change	28.1	Coarse Gravel	23.8	Coarse Gravel	No Change	23.2	Coarse Gravel	18.2	Coarse Gravel	No Change
		HU_EH_EHT_18_6_2	3594	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3222.018	7.35	None	23.93	Low	Increase	15.1	Medium Gravel	33.8	Very Coarse Gravel	Increase in Grain Size	14.2	Medium Gravel	31.8	Coarse Gravel	Increase in Grain Size
			3137.33	3.16	None	16.31	Low	Increase	9.4	Medium Gravel	27.4	Coarse Gravel	Increase in Grain Size	6.3	Fine Gravel	22.0	Coarse Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
1	SIM_EB_SM_0_3		63.167	0.11	None				0.7	Coarse Sand				1.0	Coarse Sand			
			63	0.07	None				0.5	Coarse Sand				0.7	Coarse Sand			
	SIM_EB_SM_0_2	W-W4 (401 culvert extension)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			60.5	5.05	None				10.0	Medium Gravel				15.1	Medium Gravel			
			60	90.95	Moderate				72.9	Small Cobble				108.9	Small Cobble			
1	SM_EL_SIM_1_2	SM_EL_SIM_1_WC1.1		Flow event not modelled					Flow event not modelled							45.1	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC1.2		Flow event not modelled					Flow event not modelled							34.7	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC1.5		Flow event not modelled					Flow event not modelled							88.0	Small Cobble	No Existing Velocity Provided
1	SM_EL_SIM_1_3	SM_EL_SIM_1_WC1		Flow event not modelled					Flow event not modelled					40.9	Very Coarse Gravel	253.1	Large Cobble	Increase in Grain Size
		SM_EL_SIM_1_WC1.6		Flow event not modelled					Flow event not modelled							40.1	Very Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_4	SM_EL_SIM_1_WC2.1		Flow event not modelled					Flow event not modelled							24.5	Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC2.2		Flow event not modelled					Flow event not modelled							22.0	Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_5	SM_EL_SIM_1_WC2.3		Flow event not modelled					Flow event not modelled					111.7	Small Cobble	111.7	Small Cobble	No Change
1	SM_EL_SIM_1_8	SM_EL_SIM_1_WC3.1		Flow event not modelled					Flow event not modelled							60.0	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC3.2		Flow event not modelled					Flow event not modelled					143.3	Large Cobble	73.9	Small Cobble	Decrease in Grain Size
		SM_EL_SIM_1_WC3.3		Flow event not modelled					Flow event not modelled							143.3	Large Cobble	No Existing Velocity Provided
		SM_EL_SIM_1_WC3.6		Flow event not modelled					Flow event not modelled							45.1	Very Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_10	SM_EL_SIM_1_WC4		Flow event not modelled					Flow event not modelled					43.4	Very Coarse Gravel	266.4	Small Boulder	Increase in Grain Size
2	CR_MC_MUL_8_3	CR-MC-MUL-8-WC1		Flow event not modelled					Flow event not modelled					60.0	Very Coarse Gravel	280.1	Small Boulder	Increase in Grain Size
2	CR_MC_MUL_8_4	CR-MC-MUL-8-WC3		Flow event not modelled					Flow event not modelled					3.0	Very Coarse Sand	113.1	Small Cobble	Increase in Grain Size
2	CR_MC_MUL_8_6	CR-MC-MUL-8-WC4		Flow event not modelled					Flow event not modelled					4.6	Very Coarse Sand	141.7	Large Cobble	Increase in Grain Size
2	CR_LC_LEV_1_2	CR_LC_LEV_1_WC2		Flow event not modelled					Flow event not modelled					25.1	Coarse Gravel	338.9	Small Boulder	Increase in Grain Size
2	CR_LC_LEV_0_1		55567	160.65	High	164.71	High	No Change	93.7	Small Cobble	95.3	Small Cobble	No Change	217.5	Large Cobble	223.5	Large Cobble	No Change
			55408	50.80	Moderate	49.92	Moderate	No Change	43.0	Very Coarse Gravel	42.5	Very Coarse Gravel	No Change	96.9	Small Cobble	95.6	Small Cobble	No Change
		W-W56		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	CR_LC_LEV_0_2		55270	72.34	Moderate	74.88	Moderate	No Change	57.8	Very Coarse Gravel	59.0	Very Coarse Gravel	No Change	110.3	Small Cobble	113.1	Small Cobble	No Change
			55202	85.08	Moderate	89.80	Moderate	No Change	62.9	Very Coarse Gravel	65.1	Small Cobble	Increase in Grain Size	130.8	Large Cobble	135.4	Large Cobble	No Change
			54959	12.39	Low	13.14	Low	No Change	15.8	Medium Gravel	16.4	Coarse Gravel	Increase in Grain Size	40.1	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
			54949	5.39	None	5.62	None	No Change	9.0	Medium Gravel	9.3	Medium Gravel	No Change	22.0	Coarse Gravel	22.6	Coarse Gravel	No Change
		Embleton Road		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			54909	47.21	Moderate	49.15	Moderate	No Change	39.1	Very Coarse Gravel	40.1	Very Coarse Gravel	No Change	102.1	Small Cobble	104.8	Small Cobble	No Change
			54867	177.65	High	199.16	High	No Change	95.9	Small Cobble	103.5	Small Cobble	No Change	257.5	Small Boulder	280.1	Small Boulder	No Change
			42344	52.12	Moderate	52.12	Moderate	No Change	48.7	Very Coarse Gravel	48.7	Very Coarse Gravel	No Change	78.4	Small Cobble	78.4	Small Cobble	No Change
2	CR_LC_LEV_2_4	CR_LC_LEV_2_WC1.1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			42314	76.29	Moderate	76.29	Moderate	No Change	67.3	Small Cobble	67.3	Small Cobble	No Change	103.5	Small Cobble	103.5	Small Cobble	No Change
			42249	160.65	High	164.71	High	No Change	62.2	Very Coarse Gravel	62.2	Very Coarse Gravel	No Change	104.8	Small Cobble	104.8	Small Cobble	No Change
2	CR_LC_LEV_2_5	CR_LC_LEV_2_WC2.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_LC_LEV_2_WC2.2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_LC_LEV_2_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_LC_LEV_2_6	CR_LC_LEV_2_WC6		Flow event not modelled					Flow event not modelled					Flow event not modelled				
2	CR_LC_LEV_10_1	CR_LC_LEV_10_WC1.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_9_1	CR_NP_CRR_9_WC1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_NP_CRR_9_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_3_2	CR_NP_CRR_3_WC1.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_3_1	CR_NP_CRR_3_WC3.1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_NP_CRR_3_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
		CR_NP_CRR_3_WC3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_3_3	CR_NP_CRR_3_WC4		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_13_1	CR_NP_CRR_13_WC2		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_NP_CRR_13_MW (near)	CR_NP_CRR_13_WC3		Flow event not modelled					Flow event not modelled					Flow event not modelled				
3	CR_HC_HUT_6_3	CR_HC_HUT_6_WC1		Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_12_3		2280	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			2224	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_12_WC1 (234.08)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2136	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			2087	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_10_1 (Bridge)		1745	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			1673	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_10_W1 (234.06)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1610	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			1578	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_9_3		1549	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			1526	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_9_WC2 (234.03)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1441	Flow event not modelled					Flow event not modelled					Flow event not modelled				

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event												
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			1373	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_7_2 (Bridge)		800	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			791	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_Upper_Etobicoke_CH_IC (233.03)	750	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			723	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			708	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_7_1		759	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			745	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		W-W108	TBD	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			639	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			623	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_6_1 (Culvert)		848	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			841	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		EC_EH_ETW_6_WC1.1 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			816	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		EC_EH_ETW_6_WC1.2, Existing (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			794	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			723	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			708	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		EC_EH_ETW_6_WC1.4 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			616	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			606	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		EC_EH_ETW_6_WC1.5 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			587	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			568	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_6_4 (Bridge)		746	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			737	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_6_WC3 -25m 232.02-Lower	700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			635	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			629	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	Culvert (pre existing)		858	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			833	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC1 230.18	800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			768	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			726	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			703	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			671	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			663	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC1 230.18	660	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	Culvert (pre existing)		637	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			621	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			588	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			551	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			545	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC1 230.18	540	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			522	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			510	Flow event not modelled					Flow event not modelled					Flow event not modelled				
4	EC_EH_ETW_1_5 (Bridge)		2746	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			2660	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC3 230.12	1170	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			2401	Flow event not modelled					Flow event not modelled					Flow event not modelled				
5	EC_EH_ETW_1_7 (Bridge)		554	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			523	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC5 (230.07)	500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			413	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			380	Flow event not modelled					Flow event not modelled					Flow event not modelled				
5	EC_EH_ETW_1_8 (Culvert)		499	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			456	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			439	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC6 230.05	400	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			358	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			345	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			1958	Flow event not modelled					Flow event not modelled					Flow event not modelled				

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
5	EC_EH_ETW_1_11 (Bridge)		1920	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC8 229.07	1900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1568	Flow event not modelled					Flow event not modelled					Flow event not modelled				
5	EC_EH_ETW_1_12 (Bridge)		2746	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			2660	Flow event not modelled					Flow event not modelled					Flow event not modelled				
		Post_ETW_1_WC10 229.01	2600	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	Flow event not modelled					Flow event not modelled					Flow event not modelled				
			2401	Flow event not modelled					Flow event not modelled					Flow event not modelled				
5	HU_WH_CAC_01 (Bridge)		3401	0.71	None	0.44	None	No Change	3.5	Very Coarse Sand	2.5	Very Coarse Sand	No Change	2.0	Coarse Sand	1.5	Coarse Sand	No Change
			3302	1.81	None	2.47	None	No Change	6.6	Fine Gravel	7.9	Fine Gravel	No Change	4.1	Very Coarse Sand	5.4	Pebbles	Increase in Grain Size
		West_WH_CAC	3000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2982	2.02	None	3.75	None	No Change	7.2	Fine Gravel	10.6	Medium Gravel	Increase in Grain Size	4.1	Very Coarse Sand	6.9	Fine Gravel	Increase in Grain Size
			2918	1.25	None	1.06	None	No Change	5.2	Pebbles	4.6	Very Coarse Sand	Decrease in Grain Size	3.0	Very Coarse Sand	2.9	Very Coarse Sand	No Change
			2842	6.35	None	5.28	None	No Change	15.5	Medium Gravel	13.4	Medium Gravel	No Change	9.6	Medium Gravel	8.9	Medium Gravel	No Change
		West_WH_CAC	2800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2762	9.55	None	12.53	Low	Increase	20.7	Coarse Gravel	24.5	Coarse Gravel	No Change	12.4	Medium Gravel	15.6	Medium Gravel	No Change
			2657	111.88	High	119.82	High	No Change	119.9	Small Cobble	123.5	Small Cobble	No Change	58.0	Very Coarse Gravel	63.1	Very Coarse Gravel	No Change
5	Culvert (Existing)		513.703	0.29	None	0.29	None	No Change	1.3	Coarse Sand	1.3	Coarse Sand	No Change	2.5	Very Coarse Sand	2.5	Very Coarse Sand	No Change
			513.696	3.72	None	3.72	None	No Change	7.2	Fine Gravel	7.2	Fine Gravel	No Change	16.1	Coarse Gravel	16.1	Coarse Gravel	No Change
		West_WH_CAC	513.682	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			513.664	45.93	Moderate	45.93	Moderate	No Change	41.0	Very Coarse Gravel	41.0	Very Coarse Gravel	No Change	86.8	Small Cobble	86.8	Small Cobble	No Change
			513.656	11.38	Low	11.38	Low	No Change	16.1	Coarse Gravel	16.1	Coarse Gravel	No Change	31.8	Coarse Gravel	31.8	Coarse Gravel	No Change
5	Culvert (Existing)		512.119	0.03	None	0.03	None	No Change	0.3	Medium Sand	0.3	Medium Sand	No Change	0.5	Coarse Sand	0.5	Coarse Sand	No Change
			512.109	1.59	None	1.59	None	No Change	4.0	Very Coarse Sand	4.0	Very Coarse Sand	No Change	9.3	Medium Gravel	9.3	Medium Gravel	No Change
		West_WH_CAC	512.088	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			512.06	60.81	Moderate	60.81	Moderate	No Change	50.6	Very Coarse Gravel	50.6	Very Coarse Gravel	No Change	100.8	Small Cobble	100.8	Small Cobble	No Change
			512.053	12.93	Low	12.93	Low	No Change	17.7	Coarse Gravel	17.7	Coarse Gravel	No Change	33.9	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
5	HU_WH_TWH_1_4 (Bridge Pre-existing)		5300	29.56	Low	24.26	Low	No Change	31.3	Coarse Gravel	27.1	Coarse Gravel	No Change	60.0	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
			5083	12.54	Low	10.64	Low	No Change	17.8	Coarse Gravel	15.7	Medium Gravel	Decrease in Grain Size	31.8	Coarse Gravel	29.0	Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.1	5000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4962	9.79	None	34.32	Low	Increase	15.5	Medium Gravel	34.2	Very Coarse Gravel	Increase in Grain Size	25.1	Coarse Gravel	68.4	Small Cobble	Increase in Grain Size
			4945	33.40	Low	21.48	Low	No Change	34.1	Very Coarse Gravel	25.0	Coarse Gravel	Decrease in Grain Size	64.1	Small Cobble	48.6	Very Coarse Gravel	Decrease in Grain Size
			4881	7.66	None	10.68	Low	Increase	12.9	Medium Gravel	15.9	Medium Gravel	No Change	22.0	Coarse Gravel	28.3	Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.1	4700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4625	2.16	None	3.31	None	No Change	5.5	Pebbles	7.2	Fine Gravel	Increase in Grain Size	8.9	Medium Gravel	12.4	Medium Gravel	No Change
			4597	1.93	None	1.96	None	No Change	5.1	Pebbles	5.1	Pebbles	No Change	8.2	Medium Gravel	8.5	Medium Gravel	No Change
5	HU_WH_TWH_1_2 (Bridge)		4047	184.69	High	195.96	High	No Change	110.0	Small Cobble	113.5	Small Cobble	No Change	209.5	Large Cobble	221.5	Large Cobble	No Change
			4006	5.29	None	7.67	None	No Change	10.1	Medium Gravel	12.7	Medium Gravel	No Change	16.6	Coarse Gravel	22.6	Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.3	3900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3865	42.64	Moderate	75.67	Moderate	No Change	41.9	Very Coarse Gravel	61.1	Very Coarse Gravel	No Change	70.5	Small Cobble	107.6	Small Cobble	No Change
			3822	13.34	Low	14.00	Low	No Change	19.5	Coarse Gravel	19.9	Coarse Gravel	No Change	29.7	Coarse Gravel	31.1	Coarse Gravel	No Change
5	HU_WH_CAC_02a (Culvert)		511.957	24.87	Low	24.87	Low	No Change	27.8	Coarse Gravel	27.8	Coarse Gravel	No Change	53.2	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
			511.762	2.13	None	2.13	None	No Change	5.4	Pebbles	5.4	Pebbles	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change
		West_WH_CAC	511.615	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			511.563	5.44	None	5.44	None	No Change	9.8	Medium Gravel	9.8	Medium Gravel	No Change	18.7	Coarse Gravel	18.7	Coarse Gravel	No Change
			511.364	60.62	Moderate	60.62	Moderate	No Change	48.3	Very Coarse Gravel	48.3	Very Coarse Gravel	No Change	110.3	Small Cobble	110.3	Small Cobble	No Change
6	HU_WH_TWH_2_1 (Bridge)		3541.743	10.40	Low	10.40	Low	No Change	16.5	Coarse Gravel	16.5	Coarse Gravel	No Change	25.1	Coarse Gravel	25.1	Coarse Gravel	No Change
			3520	4.52	None	4.52	None	No Change	9.1	Medium Gravel	9.1	Medium Gravel	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
		HU_WH_TWH_2_WC1	3500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3438	2.10	None	2.10	None	No Change	5.5	Pebbles	5.5	Pebbles	No Change	8.5	Medium Gravel	8.5	Medium Gravel	No Change
			3420	1.45	None	1.45	None	No Change	4.0	Very Coarse Sand	4.0	Very Coarse Sand	No Change	7.2	Fine Gravel	7.2	Fine Gravel	No Change
6	HU_WH_TWH_2_1 Old School Culvert 5 m * 1.5m (to be confirmed)		2868.124	1.15	None	1.15	None	No Change	3.4	Very Coarse Sand	3.4	Very Coarse Sand	No Change	6.3	Fine Gravel	6.3	Fine Gravel	No Change
			2839.686	306.02	High	306.02	High	No Change	144.5	Large Cobble	144.5	Large Cobble	No Change	346.1	Small Boulder	346.1	Small Boulder	No Change
		HU_WH_TWH_2_WC1	2836	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2835.774	150.36	High	150.36	High	No Change	91.5	Small Cobble	91.5	Small Cobble	No Change	199.8	Large Cobble	199.8	Large Cobble	No Change
			2733.596	244.99	High	244.99	High	No Change	127.0	Small Cobble	127.0	Small Cobble	No Change	282.4	Small Boulder	282.4	Small Boulder	No Change
6	HU_WH_SAL_3_1 (Proposed Bridge)		1.698	10.79	Low	17.59	Low	No Change	18.5	Coarse Gravel	26.1	Coarse Gravel	No Change	20.9	Coarse Gravel	29.0	Coarse Gravel	No Change
			1.677	11.67	Low	4.26	None	Decrease	19.7	Coarse Gravel	9.6	Medium Gravel	Decrease in Grain Size	21.5	Coarse Gravel	11.6	Medium Gravel	Decrease in Grain Size
		HU_WH_SAL_3_1	1.637	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1.604	15.84	Low	47.91	Moderate	Increase	23.0	Coarse Gravel	49.7	Very Coarse Gravel	Increase in Grain Size	30.4	Coarse Gravel	62.1	Very Coarse Gravel	Increase in Grain Size
			1.562	53.52	Moderate	11.76	Low	Decrease	52.5	Very Coarse Gravel	18.3	Coarse Gravel	Decrease in Grain Size	70.5	Small Cobble	25.7	Coarse Gravel	Decrease in Grain Size
		HU_WH_SAL_3_2	1.55	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1.537	11.84	Low	12.20	Low	No Change	19.7	Coarse Gravel	20.0	Coarse Gravel	No Change	22.0	Coarse Gravel	23.2	Coarse Gravel	No Change
			1.475	6.87	None	6.87	None	No Change	13.9	Medium Gravel	13.9	Medium Gravel	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
6	HU_WH_SAL_5_1		1013.632	4.34	None	4.34	None	No Change	8.4	Medium Gravel	8.4	Medium Gravel	No Change	16.1	Coarse Gravel	16.1	Coarse Gravel	No Change
			1013.624	3.87	None	3.87	None	No Change	7.8	Fine Gravel	7.8	Fine Gravel	No Change	15.1	Medium Gravel	15.1	Medium Gravel	No Change
		HU_WH_SAL_5_1	1013	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

25-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
			1013.598	2.70	None	2.70	None	No Change	6.1	Fine Gravel	6.0	Fine Gravel	No Change	11.6	Medium Gravel	11.6	Medium Gravel	No Change
6	HU_WH_SAL_0_1		1013.741	140.38	High	139.79	High	No Change	86.7	Small Cobble	86.5	Small Cobble	No Change	192.2	Large Cobble	192.2	Large Cobble	No Change
			1013.064	66.79	Moderate	65.85	Moderate	No Change	51.1	Very Coarse Gravel	50.6	Very Coarse Gravel	No Change	120.3	Small Cobble	120.3	Small Cobble	No Change
			1013.048	66.68	Moderate	65.48	Moderate	No Change	51.1	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change	120.3	Small Cobble	118.9	Small Cobble	No Change
6	HU_WH_SAL_0_2	E-W2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1012.967	67.29	Moderate	66.32	Moderate	No Change	51.4	Very Coarse Gravel	50.9	Very Coarse Gravel	No Change	121.8	Small Cobble	120.3	Small Cobble	No Change
			1012.924	67.37	Moderate	65.12	Moderate	No Change	51.4	Very Coarse Gravel	50.2	Very Coarse Gravel	No Change	121.8	Small Cobble	118.9	Small Cobble	No Change
			983.78	4.99	None	29.72	Low	Increase	10.4	Medium Gravel	35.9	Very Coarse Gravel	Increase in Grain Size	13.8	Medium Gravel	45.1	Very Coarse Gravel	Increase in Grain Size
			962.71	5.96	None	17.18	Low	Increase	11.8	Medium Gravel	23.5	Coarse Gravel	Increase in Grain Size	15.1	Medium Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert WHR_1-5_1	961.2	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			857.44	177.70	High	156.82	High	No Change	123.8	Small Cobble	100.6	Small Cobble	No Change	148.2	Large Cobble	177.4	Large Cobble	No Change
			802.03	3.50	None	8.73	None	No Change	8.4	Medium Gravel	14.6	Medium Gravel	No Change	10.0	Medium Gravel	22.0	Coarse Gravel	Increase in Grain Size
6	HU_WH_WHR_1_5	Proposed Culvert WHR_1-5_2	800.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			760.98	0.07	None	1.84	None	No Change	0.6	Coarse Sand	4.9	Very Coarse Sand	Increase in Grain Size	0.7	Coarse Sand	7.9	Fine Gravel	Increase in Grain Size
			658.28	13.69	Low	13.69	Low	No Change	18.3	Coarse Gravel	18.3	Coarse Gravel	No Change	36.2	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
		Culvert	643.98	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			615.92	114.46	High	113.53	High	No Change	82.8	Small Cobble	82.3	Small Cobble	No Change	137.0	Large Cobble	135.4	Large Cobble	No Change
			570.46	20.46	Low	20.46	Low	No Change	28.3	Coarse Gravel	28.3	Coarse Gravel	No Change	33.2	Very Coarse Gravel	33.2	Very Coarse Gravel	
			681.3	10.82	Low	31.31	Low	No Change	18.5	Coarse Gravel	38.8	Very Coarse Gravel	Increase in Grain Size	20.9	Coarse Gravel	42.6	Very Coarse Gravel	Increase in Grain Size
			659.93	2.82	None	2.95	None	No Change	7.5	Fine Gravel	7.1	Fine Gravel	No Change	8.2	Medium Gravel	10.0	Medium Gravel	No Change
6	HU_WH_WHR_1_6	GTAW		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			587.4	31.15	Low	53.61	Moderate	Increase	37.7	Very Coarse Gravel	53.8	Very Coarse Gravel	No Change	44.3	Very Coarse Gravel	67.3	Small Cobble	Increase in Grain Size
			548.14	24.37	Low	6.12	None	Decrease	31.4	Coarse Gravel	11.8	Medium Gravel	Decrease in Grain Size	39.3	Very Coarse Gravel	16.1	Coarse Gravel	Decrease in Grain Size
		Transitway		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			516.76	28.25	Low	51.23	Moderate	Increase	34.9	Very Coarse Gravel	50.8	Very Coarse Gravel	No Change	42.6	Very Coarse Gravel	69.4	Small Cobble	Increase in Grain Size
			453.57	19.02	Low	19.02	Low	No Change	27.1	Coarse Gravel	27.1	Coarse Gravel	No Change	31.8	Coarse Gravel	31.8	Coarse Gravel	No Change
			1353.908	80.31	Moderate	80.31	Moderate	No Change	54.2	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change	159.9	Large Cobble	159.9	Large Cobble	No Change
			1353.896	43.42	Moderate	43.42	Moderate	No Change	35.6	Very Coarse Gravel	35.6	Very Coarse Gravel	No Change	104.8	Small Cobble	104.8	Small Cobble	No Change
6	HU_WH_WHR_0_2	HU_WH_WHR_0_1 (GTAW WBL + Ramp)	1353.855	38.92	Moderate	38.92	Moderate	No Change	33.7	Very Coarse Gravel	33.7	Very Coarse Gravel	No Change	93.0	Small Cobble	93.0	Small Cobble	No Change
			1353.844	121.23	High	121.23	High	No Change	72.5	Small Cobble	72.5	Small Cobble	No Change	207.5	Large Cobble	207.5	Large Cobble	No Change
			1352.611	28.08	Low	14.84	Low	No Change	29.3	Coarse Gravel	18.9	Coarse Gravel	No Change	62.1	Very Coarse Gravel	40.1	Very Coarse Gravel	No Change
			1352.576	121.68	High	77.67	Moderate	Decrease	75.9	Small Cobble	55.5	Very Coarse Gravel	Decrease in Grain Size	188.4	Large Cobble	140.1	Large Cobble	No Change
			1352.506	9.93	None	12.39	Low	Increase	13.7	Medium Gravel	15.9	Medium Gravel	No Change	33.2	Very Coarse Gravel	39.3	Very Coarse Gravel	No Change
		HU_WH_WHR_0_2 (GTAW EBL + Ramp)	1352.455	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_0_3		1352.49	18.87	Low	23.26	Low	No Change	21.4	Coarse Gravel	24.5	Coarse Gravel	No Change	51.4	Very Coarse Gravel	60.0	Very Coarse Gravel	No Change
			1352.414	17.29	Low	22.40	Low	No Change	20.0	Coarse Gravel	23.7	Coarse Gravel	No Change	49.5	Very Coarse Gravel	60.0	Very Coarse Gravel	No Change
			1352.37	26.18	Low	39.03	Moderate	Increase	26.2	Coarse Gravel	34.2	Very Coarse Gravel	Increase in Grain Size	67.3	Small Cobble	90.5	Small Cobble	No Change
		HU_WH_WHR_0_3 (Transit Bridge)	1352.355	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1352.347	16.38	Low	25.29	Low	No Change	19.2	Coarse Gravel	25.8	Coarse Gravel	No Change	47.7	Very Coarse Gravel	65.2	Small Cobble	Increase in Grain Size
			1352.293	9.17	None	9.17	None	No Change	12.8	Medium Gravel	12.8	Medium Gravel	No Change	33.2	Very Coarse Gravel	33.2	Very Coarse Gravel	No Change
			1415.673	171.15	High	171.99	High	No Change	101.3	Small Cobble	101.6	Small Cobble	No Change	211.5	Large Cobble	211.5	Large Cobble	No Change
			1415.625	17.39	Low	12.46	Low	No Change	23.4	Coarse Gravel	18.5	Coarse Gravel	No Change	35.4	Very Coarse Gravel	29.0	Coarse Gravel	Decrease in Grain Size
		Proposed Bridge HU_WH_GRT_0_1	1415.602	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.577	19.83	Low	17.82	Low	No Change	25.3	Coarse Gravel	23.2	Coarse Gravel	No Change	40.1	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
			1415.564	41.06	Moderate	20.53	Low	Decrease	41.2	Very Coarse Gravel	25.3	Coarse Gravel	Decrease in Grain Size	67.3	Small Cobble	42.6	Very Coarse Gravel	Decrease in Grain Size
6	HU_WH_GRT_0_2	Proposed Bridge HU_WH_GRT_0_2	1415.547	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.505	7.68	None	12.68	Low	Increase	13.8	Medium Gravel	19.3	Coarse Gravel	Increase in Grain Size	19.2	Coarse Gravel	27.0	Coarse Gravel	No Change
			1415.406	19.29	Low	10.70	Low	No Change	25.8	Coarse Gravel	16.7	Coarse Gravel	No Change	36.2	Very Coarse Gravel	25.7	Coarse Gravel	Decrease in Grain Size
		Proposed Bridge HU_WH_GRT_0_3 (Transit)	1415.38	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.353	4.26	None	10.00	Low	Increase	8.8	Medium Gravel	15.6	Medium Gravel	No Change	13.8	Medium Gravel	25.7	Coarse Gravel	Increase in Grain Size
			1415.311	0.70	None	0.70	None	No Change	2.6	Very Coarse Sand	2.6	Very Coarse Sand	No Change	3.9	Very Coarse Sand	3.9	Very Coarse Sand	No Change
			1514.853	31.07	Low	26.00	Low	No Change	35.1	Very Coarse Gravel	30.9	Coarse Gravel	Decrease in Grain Size	51.4	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
			1514.841	51.49	Moderate	65.74	Moderate	No Change	50.0	Very Coarse Gravel	59.0	Very Coarse Gravel	No Change	71.6	Small Cobble	85.5	Small Cobble	No Change
		HU_WH_CDT_2_1	1514.818	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.795	40.25	Moderate	54.59	Moderate	No Change	45.2	Very Coarse Gravel	54.6	Very Coarse Gravel	No Change	52.3	Very Coarse Gravel	67.3	Small Cobble	Increase in Grain Size
			1514.773	4.42	None	12.60	Low	Increase	9.6	Medium Gravel	19.6	Coarse Gravel	Increase in Grain Size	12.4	Medium Gravel	25.7	Coarse Gravel	Increase in Grain Size
		HU_WH_CDT_2_2	1514.75	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.717	13.15	Low	3.55	None	Decrease	17.8	Coarse Gravel	16.5	Coarse Gravel	No Change	24.5	Coarse Gravel	23.2	Coarse Gravel	No Change
6	HU_WH_CDT_2_1		1514.687	171.15	High	171.99	High	No Change	20.4	Coarse Gravel	8.2	Medium Gravel	Decrease in Grain Size	26.3	Coarse Gravel	11.2	Medium Gravel	Decrease in Grain Size
		HU_WH_CDT_2_3 (Transit)	1514.671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.656	0.04	None	1.04	None	No Change	0.4	Medium Sand	3.5	Very Coarse Sand	Increase in Grain Size	0.4	Medium Sand	4.9	Very Coarse Sand	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			1514.605	67.98	Moderate	67.98	Moderate	No Change	61.2	Very Coarse Gravel	61.2	Very Coarse Gravel	No Change	85.5	Small Cobble	85.5	Small Cobble	No Change
			1514.549	0.82	None	0.82	None	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.9	Very Coarse Sand	No Change
			1514.507	0.07	None	0.07	None	No Change	0.5	Coarse Sand	0.5	Coarse Sand	No Change	0.9	Coarse Sand	0.9	Coarse Sand	No Change
		Culvert (Mayfield Road)	1514.475	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.447	51.56	Moderate	44.40	Moderate	No Change	48.6	Very Coarse Gravel	43.8	Very Coarse Gravel	No Change	77.3	Small Cobble	69.4	Small Cobble	No Change
6	HU_WH_CDT_0_2		1514.598	25.81	Low	20.35	Low	No Change	26.2	Coarse Gravel	22.2	Coarse Gravel	No Change	66.2	Small Cobble	56.1	Very Coarse Gravel	Decrease in Grain Size
			1514.575	7.25	None	5.98	None	No Change	11.2	Medium Gravel	9.8	Medium Gravel	No Change	26.3	Coarse Gravel	23.2	Coarse Gravel	No Change
		Proposed Bridge HU_WH_CDT_0_1	1514.573	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.501	80.78	Moderate	70.82	Moderate	No Change	55.6	Very Coarse Gravel	50.8	Very Coarse Gravel	No Change	153.2	Large Cobble	140.1	Large Cobble	No Change
			1514.487	34.23	Low	31.83	Low	No Change	30.8	Coarse Gravel	29.3	Coarse Gravel	No Change	85.5	Small Cobble	80.8	Small Cobble	No Change
		Proposed Bridge HU_WH_CDT_0_2 Transit	1514.479	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.467	68.14	Moderate	65.20	Moderate	No Change	48.9	Very Coarse Gravel	47.5	Very Coarse Gravel	No Change	138.6	Large Cobble	135.4	Large Cobble	No Change
			1514.353	0.07	None	0.07	None	No Change	0.5	Coarse Sand	0.5	Coarse Sand	No Change	0.9	Coarse Sand	0.9	Coarse Sand	No Change
			1514.345	4.33	None	4.33	None	No Change	13.1	Medium Gravel	13.1	Medium Gravel	No Change	6.0	Pebbles	6.0	Pebbles	No Change
			1514.312	51.56	Moderate	44.40	Moderate	No Change	48.6	Very Coarse Gravel	43.8	Very Coarse Gravel	No Change	77.3	Small Cobble	69.4	Small Cobble	No Change
		Culvert	514.331 x-80 (43.04-02	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.306	51.56	Moderate	44.40	Moderate	No Change	48.6	Very Coarse Gravel	43.8	Very Coarse Gravel	No Change	77.3	Small Cobble	69.4	Small Cobble	No Change
		Culvert	514.331 x-80 (43.04-02	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.6	17.80	Low	50.62	Moderate	Increase	22.7	Coarse Gravel	46.9	Very Coarse Gravel	Increase in Grain Size	40.1	Very Coarse Gravel	79.6	Small Cobble	Increase in Grain Size
			24.59	98.37	Moderate	14.15	Low	Decrease	72.6	Small Cobble	19.7	Coarse Gravel	Decrease in Grain Size	130.8	Large Cobble	33.2	Very Coarse Gravel	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_MH_RAI_1_3		24.55	103.45	High	30.53	Low	Decrease	16.6	Coarse Gravel	8.9	Medium Gravel	Decrease in Grain Size	29.0	Coarse Gravel	15.1	Medium Gravel	Decrease in Grain Size
			24.54	10.82	Low	31.31	Low	No Change	75.3	Small Cobble	32.5	Very Coarse Gravel	Decrease in Grain Size	135.4	Large Cobble	59.0	Very Coarse Gravel	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.52	31.15	Low	53.61	Moderate	Increase	19.4	Coarse Gravel	25.7	Coarse Gravel	No Change	31.1	Coarse Gravel	42.6	Very Coarse Gravel	Increase in Grain Size
			24.51	24.37	Low	6.12	None	Decrease	45.0	Very Coarse Gravel	45.0	Very Coarse Gravel	No Change	77.3	Small Cobble	77.3	Small Cobble	No Change
			1739	3.88	None	32.02	Low	Increase	10.8	Medium Gravel	43.2	Very Coarse Gravel	Increase in Grain Size	7.2	Fine Gravel	35.4	Very Coarse Gravel	Increase in Grain Size
			1699	15.58	Low	9.17	None	Decrease	22.3	Coarse Gravel	15.4	Medium Gravel	Decrease in Grain Size	31.1	Coarse Gravel	22.0	Coarse Gravel	No Change
7	HU_MH_ROB_3_5	Propsed Culvert_HU_MH_ROB_3_1 (3.3 x 2.1 m)	1697	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1655	57.70	Moderate	18.70	Low	Decrease	55.0	Very Coarse Gravel	25.4	Coarse Gravel	Decrease in Grain Size	75.0	Small Cobble	34.7	Very Coarse Gravel	Decrease in Grain Size
			1641	1.50	None	12.83	Low	Increase	5.0	Pebbles	20.6	Coarse Gravel	Increase in Grain Size	4.9	Very Coarse Sand	24.5	Coarse Gravel	Increase in Grain Size
			1750	98.86	Moderate	98.86	Moderate	No Change	65.1	Small Cobble	65.1	Small Cobble	No Change	168.5	Large Cobble	168.5	Large Cobble	No Change
			1739	80.25	Moderate	59.17	Moderate	No Change	57.3	Very Coarse Gravel	46.5	Very Coarse Gravel	No Change	141.7	Large Cobble	114.6	Small Cobble	Decrease in Grain Size
7	HU_MH_ROB_0_2	HU_MH_ROB_0_6 at Highway 427	1706	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1657	9.45	None	8.99	None	No Change	13.4	Medium Gravel	13.0	Medium Gravel	No Change	31.8	Coarse Gravel	30.4	Coarse Gravel	No Change
			1618	2.64	None	2.74	None	No Change	5.6	Pebbles	5.7	Pebbles	No Change	13.3	Medium Gravel	13.8	Medium Gravel	No Change
			825	49.33	Moderate	37.91	Moderate	No Change	49.4	Very Coarse Gravel	41.2	Very Coarse Gravel	No Change	67.3	Small Cobble	56.1	Very Coarse Gravel	Decrease in Grain Size
			822	139.90	High	72.90	Moderate	Decrease	88.6	Small Cobble	56.4	Very Coarse Gravel	Decrease in Grain Size	182.9	Large Cobble	118.9	Small Cobble	Decrease in Grain Size
		HU_ROB-0-1	821	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			800	11.69	Low	2.85	None	Decrease	20.4	Coarse Gravel	7.7	Fine Gravel	Decrease in Grain Size	20.3	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size
			782	100.29	High	77.80	Moderate	Decrease	88.4	Small Cobble	74.5	Small Cobble	No Change	89.2	Small Cobble	73.9	Small Cobble	No Change
			740	23.36	Low	20.53	Low	No Change	27.1	Coarse Gravel	24.6	Coarse Gravel	No Change	48.6	Very Coarse Gravel	45.1	Very Coarse Gravel	No Change
		HU_ROB-0-2	737	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			672	14.78	Low	17.64	Low	No Change	19.4	Coarse Gravel	21.7	Coarse Gravel	No Change	37.0	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
			653	9.26	None	11.31	Low	Increase	14.5	Medium Gravel	16.1	Coarse Gravel	Increase in Grain Size	25.7	Coarse Gravel	31.8	Coarse Gravel	No Change
7	HU_MH_ROB_0_5	HU_ROB-0-3 (Transit)	651	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			636	7.84	None	10.21	Low	Increase	12.6	Medium Gravel	15.0	Medium Gravel	No Change	23.8	Coarse Gravel	29.7	Coarse Gravel	No Change
			616	177.56	High	189.00	High	No Change	99.7	Small Cobble	104.1	Small Cobble	No Change	238.1	Large Cobble	246.6	Large Cobble	No Change
			549	257.98	High	213.55	High	No Change	132.0	Large Cobble	115.6	Small Cobble	Decrease in Grain Size	289.4	Small Boulder	257.5	Small Boulder	No Change
			492	137.46	High	201.29	High	No Change	85.1	Small Cobble	110.5	Small Cobble	No Change	192.2	Large Cobble	248.8	Large Cobble	No Change
			429	109.49	High	38.25	Moderate	Decrease	100.4	Small Cobble	48.8	Very Coarse Gravel	Decrease in Grain Size	81.9	Small Cobble	40.1	Very Coarse Gravel	Decrease in Grain Size
			418	74.92	Moderate	101.38	High	Increase	58.4	Very Coarse Gravel	70.8	Small Cobble	Increase in Grain Size	116.0	Small Cobble	148.2	Large Cobble	Increase in Grain Size
		HU_ROB-0-4	416	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			400	69.46	Moderate	119.19	High	Increase	57.8	Very Coarse Gravel	82.9	Small Cobble	Increase in Grain Size	100.8	Small Cobble	149.8	Large Cobble	Increase in Grain Size
			384	69.46	Moderate	119.19	High	Increase	57.8	Very Coarse Gravel	82.9	Small Cobble	Increase in Grain Size	100.8	Small Cobble	149.8	Large Cobble	Increase in Grain Size
			1825	0.74	None	0.74	None	No Change	2.3	Very Coarse Sand	2.3	Very Coarse Sand	No Change	5.7	Pebbles	5.7	Pebbles	No Change
7	HU_MH_ROB_0_6		1817.18	0.52	None	0.52	None	No Change	1.8	Coarse Sand	1.8	Coarse Sand	No Change	4.4	Very Coarse Sand	4.4	Very Coarse Sand	No Change
			1787.86	507.22	High	507.22	High	No Change	198.3	Large Cobble	198.3	Large Cobble	No Change	520.2	Medium Boulder	520.2	Medium Boulder	No Change
			1737.61	129.01	High	129.01	High	No Change	80.6	Small Cobble	80.6	Small Cobble	No Change	188.4	Large Cobble	188.4	Large Cobble	No Change
			791	163.61	High	163.61	High	No Change	101.2	Small Cobble	101.2	Small Cobble	No Change	192.2	Large Cobble	192.2	Large Cobble	No Change
			766	16.61	Low	12.72	Low	No Change	21.5	Coarse Gravel	17.9	Coarse Gravel	No Change	38.5	Very Coarse Gravel	32.5	Very Coarse Gravel	No Change
		HU_MH_ROB_7_1_1	763	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
7	HU_MH_ROB_7_1		739	7.74	None	9.78	None	No Change	12.8	Medium Gravel	14.9	Medium Gravel	No Change	22.6	Coarse Gravel	27.0	Coarse Gravel	No Change
			694	127.83	High	127.83	High	No Change	87.4	Small Cobble	87.4	Small Cobble	No Change	154.8	Large Cobble	154.8	Large Cobble	No Change
			666	170.65	High	75.62	Moderate	Decrease	102.0	Small Cobble	57.9	Very Coarse Gravel	Decrease in Grain Size	207.5	Large Cobble	120.3	Small Cobble	Decrease in Grain Size
		HU_MH_ROB_7_1_2	664	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			600	28.45	Low	25.97	Low	No Change	30.6	Coarse Gravel	28.7	Coarse Gravel	No Change	58.0	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change
			587	226.94	High	113.32	High	No Change	121.5	Small Cobble	75.4	Small Cobble	No Change	264.2	Small Boulder	163.3	Large Cobble	Decrease in Grain Size
		HU_MH_ROB_7_1_3	585	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			568	17.96	Low	19.36	Low	No Change	22.4	Coarse Gravel	23.5	Coarse Gravel	No Change	41.8	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
			529	34.08	Low	28.43	Low	No Change	34.5	Very Coarse Gravel	30.4	Coarse Gravel	Decrease in Grain Size	66.2	Small Cobble	58.0	Very Coarse Gravel	Decrease in Grain Size
			444	61.14	Moderate	90.09	Moderate	No Change	52.0	Very Coarse Gravel	67.8	Small Cobble	Increase in Grain Size	95.6	Small Cobble	126.3	Small Cobble	No Change
			416	109.48	High	46.41	Moderate	Decrease	76.8	Small Cobble	42.5	Very Coarse Gravel	Decrease in Grain Size	146.6	Large Cobble	81.9	Small Cobble	Decrease in Grain Size
			390	11.69	Low	2.85	None	Decrease	20.4	Coarse Gravel	7.7	Fine Gravel	Decrease in Grain Size	20.3	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size
		HU_MH_ROB_7_1_4	388	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			371	11.69	Low	2.85	None	Decrease	20.4	Coarse Gravel	7.7	Fine Gravel	Decrease in Grain Size	20.3	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size
			355	11.98	Low	11.98	Low	No Change	17.4	Coarse Gravel	17.4	Coarse Gravel	No Change	30.4	Coarse Gravel	30.4	Coarse Gravel	No Change
7	HU_MH_ROB_7_2		477.94	3.55	None	3.56	None	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change	9.3	Medium Gravel	9.3	Medium Gravel	No Change
			461.73	9.13	None	2.55	None	No Change	17.2	Coarse Gravel	7.1	Fine Gravel	Decrease in Grain Size	17.1	Coarse Gravel	7.5	Fine Gravel	Decrease in Grain Size
		HU_HM_ROB_7_2_1	459.8	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			431.8	6.02	None	5.83	None	No Change	12.7	Medium Gravel	12.4	Medium Gravel	No Change	13.3	Medium Gravel	13.3	Medium Gravel	No Change
			389.94	33.24	Low	33.24	Low	No Change	41.0	Very Coarse Gravel	41.0	Very Coarse Gravel	No Change	42.6	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
			347.68	2.63	None	1.76	None	No Change	7.5	Fine Gravel	5.7	Pebbles	Decrease in Grain Size	6.9	Fine Gravel	5.1	Pebbles	Decrease in Grain Size
		HU_HM_ROB_7_2_2	346.18	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			270.76	10.61	Low	45.73	Moderate	Increase	18.4	Coarse Gravel	49.2	Very Coarse Gravel	Increase in Grain Size	20.3	Coarse Gravel	58.0	Very Coarse Gravel	Increase in Grain Size
			205.88	12.63	Low	3.49	None	Decrease	22.3	Coarse Gravel	9.0	Medium Gravel	Decrease in Grain Size	19.8	Coarse Gravel	8.5	Medium Gravel	Decrease in Grain Size
		HU_HM_ROB_7_2_3 (Transit)	203.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			179.53	111.88	High	119.82	High	No Change	119.9	Small Cobble	123.5	Small Cobble	No Change	58.0	Very Coarse Gravel	63.1	Very Coarse Gravel	No Change
			1739	1.45	None	1.74	None	No Change	4.8	Very Coarse Sand	7.7	Fine Gravel	Increase in Grain Size	4.9	Very Coarse Sand	5.7	Pebbles	Increase in Grain Size
		HU_HM_ROB_7_2_4	138.45	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			100.22	2.67	None	3.25	None	No Change	7.6	Fine Gravel	26.9	Coarse Gravel	Increase in Grain Size	6.9	Fine Gravel	8.2	Medium Gravel	Increase in Grain Size
			82.64	16.32	Low	16.32	Low	No Change	26.9	Coarse Gravel	30.7	Coarse Gravel	No Change	22.6	Coarse Gravel	22.6	Coarse Gravel	No Change
7	HU_MH_ROB_4_1		1874	6.34	None	0.56	None	No Change	15.1	Medium Gravel	2.8	Very Coarse Sand	Decrease in Grain Size	10.4	Medium Gravel	2.0	Coarse Sand	Decrease in Grain Size
			1859	0.73	None	18.77	Low	Increase	3.3	Very Coarse Sand	29.5	Coarse Gravel	Increase in Grain Size	2.7	Very Coarse Sand	25.1	Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_1	1840	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1823	7.93	None	24.52	Low	Increase	15.9	Medium Gravel	34.2	Very Coarse Gravel	Increase in Grain Size	15.1	Medium Gravel	33.2	Very Coarse Gravel	Increase in Grain Size
			1811	8.85	None	2.19	None	No Change	17.8	Coarse Gravel	6.8	Fine Gravel	Decrease in Grain Size	14.7	Medium Gravel	5.7	Pebbles	Decrease in Grain Size
			1802	2.74	None	20.01	Low	Increase	8.0	Medium Gravel	30.7	Coarse Gravel	Increase in Grain Size	6.6	Fine Gravel	27.0	Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_2	1780	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1719	1.11	None	1.59	None	No Change	4.0	Very Coarse Sand	5.0	Pebbles	Increase in Grain Size	4.1	Very Coarse Sand	5.4	Pebbles	Increase in Grain Size
			1681	17.40	Low	25.46	Low	No Change	27.9	Coarse Gravel	34.9	Very Coarse Gravel	Increase in Grain Size	24.5	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_3	1671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1646	10.74	Low	15.13	Low	No Change	18.3	Coarse Gravel	23.1	Coarse Gravel	No Change	21.5	Coarse Gravel	27.0	Coarse Gravel	No Change
			1588	0.00	None	9.00	None	No Change	0.0	Very Fine Sand	16.5	Coarse Gravel	Increase in Grain Size	0.0	Very Fine Sand	18.2	Coarse Gravel	Increase in Grain Size
			1487	127.83	High	127.83	High	No Change	87.4	Small Cobble	87.4	Small Cobble	No Change	154.8	Large Cobble	154.8	Large Cobble	No Change
		HU_MH_ROB_4_4	1482	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1451	170.65	High	75.62	Moderate	Decrease	102.0	Small Cobble	57.9	Very Coarse Gravel	Decrease in Grain Size	207.5	Large Cobble	120.3	Small Cobble	Decrease in Grain Size
			1353	28.45	Low	25.97	Low	No Change	30.6	Coarse Gravel	28.7	Coarse Gravel	No Change	58.0	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change
			1252	226.94	High	113.32	High	No Change	121.5	Small Cobble	75.4	Small Cobble	No Change	264.2	Small Boulder	163.3	Large Cobble	Decrease in Grain Size
			1202	109.48	High	46.41	Moderate	Decrease	76.8	Small Cobble	42.5	Very Coarse Gravel	Decrease in Grain Size	146.6	Large Cobble	81.9	Small Cobble	Decrease in Grain Size
			1166	11.69	Low	2.85	None	Decrease	20.4	Coarse Gravel	7.7	Fine Gravel	Decrease in Grain Size	20.3	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size
		HU_MH_ROB_4_5	1143	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1114	0.25	None	11.60	Low	Increase	1.4	Coarse Sand	19.5	Coarse Gravel	Increase in Grain Size	1.5	Coarse Sand	22.0	Coarse Gravel	Increase in Grain Size
			1062	0.03	None	25.60	Low	Increase	0.3	Medium Sand	34.1	Very Coarse Gravel	Increase in Grain Size	0.3	Medium Sand	36.2	Very Coarse Gravel	Increase in Grain Size
			1015	0.00	None	9.00	None	No Change	0.0	Very Fine Sand	16.5	Coarse Gravel	Increase in Grain Size	0.0	Very Fine Sand	18.2	Coarse Gravel	Increase in Grain Size
			997	0.00	None	64.85	Moderate	Increase	0.0		60.4	Very Coarse Gravel		0.0	Clay	79.6	Small Cobble	Increase in Grain Size
		HU_MH_ROB_4_6	979	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			965	67.57	Moderate	11.65	Low	Decrease	61.3	Very Coarse Gravel	19.5	Coarse Gravel	Decrease in Grain Size	83.1	Small Cobble	22.0	Coarse Gravel	Decrease in Grain Size
			948	14.29	Low	28.23	Low	No Change	22.1	Coarse Gravel	36.5	Very Coarse Gravel	Increase in Grain Size	26.3	Coarse Gravel	38.5	Very Coarse Gravel	Increase in Grain Size
8	HU_MH_MHR_0_1		23547	7.63	None	7.28	None	No Change	11.0	Medium Gravel	10.6	Medium Gravel	No Change	31.1	Coarse Gravel	29.7	Coarse Gravel	No Change
			23517	7.21	None	9.23	None	No Change	10.6	Medium Gravel	12.5	Medium Gravel	No Change	29.7	Coarse Gravel	35.4	Very Coarse Gravel	Increase in Grain Size
		HU_MH_MHR_01	23516	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23493	6.46	None	8.02	None	No Change	9.8	Medium Gravel	11.3	Medium Gravel	No Change	27.6	Coarse Gravel	32.5	Very Coarse Gravel	Increase in Grain Size
			23474	4.97	None	6.70	None	No Change	8.3	Medium Gravel	10.1	Medium Gravel	No Change	22.0	Coarse Gravel	27.6	Coarse Gravel	No Change
		HU_MH_MHR_02	23473	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23421	2.82	None	2.78	None	No Change	5.7	Pebbles	5.6	Pebbles	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
			23307	12.41	Low	12.41	Low	No Change	14.9	Medium Gravel	14.9	Medium Gravel	No Change	45.1	Very Coarse Gravel	45.1	Very Coarse Gravel	No Change
			1117.01	12.06	Low	9.95	None	Decrease	20.0	Coarse Gravel	17.5	Coarse Gravel	No Change	22.6	Coarse Gravel	19.8	Coarse Gravel	No Change
			1084.93	29.79	Low	47.71	Moderate	Increase	38.3	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change	39.3	Very Coarse Gravel	60.0	Very Coarse Gravel	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
8	HU_MH_MHR_3_1	Culvert # HU_MH_MHR_3_1	1054	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			936.63	103.45	High	30.53	Low	Decrease	9.8	Medium Gravel	16.6	Coarse Gravel	Increase in Grain Size	11.2	Medium Gravel	21.5	Coarse Gravel	Increase in Grain Size
			884.25	10.82	Low	31.31	Low	No Change	12.1	Medium Gravel	12.1	Medium Gravel	No Change	12.9	Medium Gravel	12.9	Medium Gravel	No Change
8	HU_MH_EHR_1_4		508.348	2.63	None	1.76	None	No Change	13.9	Medium Gravel	19.2	Coarse Gravel	Increase in Grain Size	20.9	Coarse Gravel	29.0	Coarse Gravel	No Change
			490.725	10.61	Low	45.73	Moderate	Increase	18.5	Coarse Gravel	16.9	Coarse Gravel	No Change	32.5	Very Coarse Gravel	22.0	Coarse Gravel	Decrease in Grain Size
		Existing Hwy 27 Culvert Proposed Replacement HU_EH_EHT_1_1 (16 m span)	460	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			425.936	134.28	High	126.54	High	No Change	93.0	Small Cobble	89.3	Small Cobble	No Change	149.8	Large Cobble	144.9	Large Cobble	No Change
			400.386	20.88	Low	20.88	Low	No Change	27.8	Coarse Gravel	27.8	Coarse Gravel	No Change	36.2	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
8	HU_MH_EHR_1_3		542.039	1.61	None	1.33	None	No Change	4.9	Very Coarse Sand	4.3	Very Coarse Sand	No Change	6.0	Pebbles	5.1	Pebbles	No Change
			531.454	71.49	Moderate	29.06	Low	Decrease	62.3	Very Coarse Gravel	33.3	Very Coarse Gravel	No Change	91.7	Small Cobble	50.4	Very Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			515.797	25.36	Low	19.41	Low	No Change	32.2	Very Coarse Gravel	26.7	Coarse Gravel	Decrease in Grain Size	40.1	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
			507.016	77.38	Moderate	15.55	Low	Decrease	71.3	Small Cobble	22.9	Coarse Gravel	Decrease in Grain Size	80.8	Small Cobble	29.0	Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			421.237	61.10	Moderate	20.57	Low	Decrease	58.1	Very Coarse Gravel	27.6	Coarse Gravel	Decrease in Grain Size	75.0	Small Cobble	36.2	Very Coarse Gravel	Decrease in Grain Size
			418.126	20.72	Low	16.87	Low	No Change	28.1	Coarse Gravel	24.2	Coarse Gravel	No Change	34.7	Very Coarse Gravel	31.1	Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_3		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			394.723	45.48	Moderate	48.91	Moderate	No Change	47.1	Very Coarse Gravel	49.3	Very Coarse Gravel	No Change	63.1	Very Coarse Gravel	66.2	Small Cobble	Increase in Grain Size
			390.543	49.21	Moderate	49.21	Moderate	No Change	50.4	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change	64.1	Small Cobble	64.1	Small Cobble	No Change
		HU_EH_EHT_1_1_4 (Transit)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			367.965	9.13	None	2.55	None	No Change	17.2	Coarse Gravel	7.1	Fine Gravel	Decrease in Grain Size	17.1	Coarse Gravel	7.5	Fine Gravel	Decrease in Grain Size
			350.966	6.02	None	5.83	None	No Change	12.7	Medium Gravel	12.4	Medium Gravel	No Change	13.3	Medium Gravel	13.3	Medium Gravel	No Change
8	HU_MH_EHR_1_6		691.945	28.98	Low	44.18	Moderate	Increase	36.3	Very Coarse Gravel	46.5	Very Coarse Gravel	No Change	41.8	Very Coarse Gravel	61.0	Very Coarse Gravel	No Change
			643.653	51.32	Moderate	62.11	Moderate	No Change	52.9	Very Coarse Gravel	58.7	Very Coarse Gravel	No Change	63.1	Very Coarse Gravel	76.1	Small Cobble	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_1_2_1 (Channel Realignment)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			533.859	38.44	Moderate	15.26	Low	Decrease	44.6	Very Coarse Gravel	22.9	Coarse Gravel	Decrease in Grain Size	48.6	Very Coarse Gravel	28.3	Coarse Gravel	Decrease in Grain Size
			496.432	50.78	Moderate	50.78	Moderate	No Change	52.4	Very Coarse Gravel	52.4	Very Coarse Gravel	No Change	63.1	Very Coarse Gravel	63.1	Very Coarse Gravel	No Change
8	HU_MH_EHR_1_6		295.252	62.66	Moderate	62.66	Moderate	No Change	58.0	Very Coarse Gravel	58.0	Very Coarse Gravel	No Change	79.6	Small Cobble	79.6	Small Cobble	No Change
			253.906	13.13	Low	50.78	Moderate	Increase	20.1	Coarse Gravel	52.2	Very Coarse Gravel	Increase in Grain Size	27.0	Coarse Gravel	64.1	Small Cobble	Increase in Grain Size
		Existing Hwy 27 culvert/Proposed Culvert HU_EH_EHT_1_2_2	243.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			188.519	15.94	Low	15.07	Low	No Change	22.6	Coarse Gravel	21.7	Coarse Gravel	No Change	31.8	Coarse Gravel	30.4	Coarse Gravel	No Change
			165.049	51.91	Moderate	51.91	Moderate	No Change	53.1	Very Coarse Gravel	53.1	Very Coarse Gravel	No Change	64.1	Small Cobble	64.1	Small Cobble	No Change
8	HU_MH_EHR_0_2		16040	30.77	Low	28.55	Low	No Change	28.4	Coarse Gravel	27.0	Coarse Gravel	No Change	80.8	Small Cobble	76.1	Small Cobble	No Change
			16019	25.49	Low	23.75	Low	No Change	25.1	Coarse Gravel	23.9	Coarse Gravel	No Change	69.4	Small Cobble	66.2	Small Cobble	No Change
		HU_EH_EHR_01	16014	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15989	17.78	Low	16.65	Low	No Change	19.7	Coarse Gravel	18.9	Coarse Gravel	No Change	54.2	Very Coarse Gravel	51.4	Very Coarse Gravel	No Change
			15969	25.86	Low	23.91	Low	No Change	25.5	Coarse Gravel	24.1	Coarse Gravel	No Change	70.5	Small Cobble	66.2	Small Cobble	No Change
		HU_EH_EHR_02	15951	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15925	89.29	Moderate	85.37	Moderate	No Change	58.6	Very Coarse Gravel	56.8	Very Coarse Gravel	No Change	168.5	Large Cobble	163.3	Large Cobble	No Change
			15887	41.09	Moderate	41.09	Moderate	No Change	35.1	Very Coarse Gravel	35.1	Very Coarse Gravel	No Change	95.6	Small Cobble	95.6	Small Cobble	No Change
9	HU_EH_EHR_15_1		2607.261	22.14	Low	18.70	Low	No Change	30.2	Coarse Gravel	26.9	Coarse Gravel	No Change	34.7	Very Coarse Gravel	30.4	Coarse Gravel	Decrease in Grain Size
			2543.462	2543.46	2543.462	2543.46	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change
		Proposed Culvert HU_EH_EHT_15_2_1	2500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2474.157	20.03	Low	26.63	Low	No Change	29.8	Coarse Gravel	35.4	Very Coarse Gravel	Increase in Grain Size	28.3	Coarse Gravel	36.2	Very Coarse Gravel	Increase in Grain Size
			2424.009	31.54	Low	31.54	Low	No Change	39.8	Very Coarse Gravel	39.8	Very Coarse Gravel	No Change	40.9	Very Coarse Gravel	40.9	Very Coarse Gravel	No Change
			2390.711	1.98	None	3.12	None	No Change	6.0	Fine Gravel	7.9	Fine Gravel	No Change	6.0	Pebbles	8.9	Medium Gravel	Increase in Grain Size
9	HU_EH_EHR_15_1	Proposed Culvert HU_EH_EHT_15_2_2	2350	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.737	27.99	Low	40.77	Moderate	Increase	35.9	Very Coarse Gravel	46.2	Very Coarse Gravel	No Change	39.3	Very Coarse Gravel	51.4	Very Coarse Gravel	No Change
			2274.82	10.91	Low	4.21	None	Decrease	20.5	Coarse Gravel	9.8	Medium Gravel	Decrease in Grain Size	17.1	Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_15_2_3 (Transit)	2270.82	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2238.847	26.01	Low	32.19	Low	No Change	35.1	Very Coarse Gravel	39.8	Very Coarse Gravel	No Change	35.4	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
			2168.715	11.56	Low	11.56	Low	No Change	20.7	Coarse Gravel	20.7	Coarse Gravel	No Change	19.2	Coarse Gravel	19.2	Coarse Gravel	No Change
9	HU_EH_EHR_15_1		553.4597	0.3	None	0.3	None	No Change	1.456043956	Coarse Sand	1.456043956	Coarse Sand	No Change	2.132438274	Very Coarse Sand	2.132438274	Very Coarse Sand	No Change
			440.7852	1.68	None	1.68	None	No Change	4.56043956	Very Coarse Sand	4.56043956	Very Coarse Sand	No Change	7.852172413	Fine Gravel	7.852172413	Fine Gravel	No Change
		Existing Kriby Road Culvert	399.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			379.0983	61.7	Moderate	61.7	Moderate	No Change	58.18681319	Very Coarse Gravel	58.18681319	Very Coarse Gravel	No Change	77.26728501	Small Cobble	77.26728501	Small Cobble	No Change
			260.5125	5.91	None	5.08	None	No Change	12.12912088	Medium Gravel	10.9478022	Medium Gravel	No Change	14.21047453	Medium Gravel	12.86349414	Medium Gravel	No Change
			6169.405	1.48	None	3.56	None	No Change	5.2	Pebbles	9.5	Medium Gravel	Increase in Grain Size	4.4	Very Coarse Sand	7.9	Fine Gravel	Increase in Grain Size
			6131.176	1.68	None	1.41	None	No Change	5.9	Pebbles	4.9	Very Coarse Sand	Decrease in Grain Size	4.4	Very Coarse Sand	4.4	Very Coarse Sand	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
9	HU_EH_EHR_16_1	Proposed Bridge HU_EH_EHT_16_1	6126.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			6048.088	1.30	None	8.65	None	No Change	5.0	Very Coarse Sand	17.5	Coarse Gravel	Increase in Grain Size	3.7	Very Coarse Sand	14.7	Medium Gravel	Increase in Grain Size
			6006.68	3.57	None	1.41	None	No Change	9.6	Medium Gravel	4.9	Very Coarse Sand	Decrease in Grain Size	7.9	Fine Gravel	4.4	Very Coarse Sand	Decrease in Grain Size
		Proposed Bridge HU_EH_EHT_16_2 (Transit)	6001	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			5969.339	2.18	None	3.12	None	No Change	6.9	Fine Gravel	8.6	Medium Gravel	Increase in Grain Size	5.4	Pebbles	7.5	Fine Gravel	Increase in Grain Size
			5932.436	1.42	None	1.47	None	No Change	5.4	Pebbles	5.5	Pebbles	No Change	3.7	Very Coarse Sand	3.9	Very Coarse Sand	No Change
9	HU_EH_EHR_16_1		3894.471	2.34	None	2.34	None	No Change	7.0	Fine Gravel	7.0	Fine Gravel	No Change	6.3	Fine Gravel	6.3	Fine Gravel	No Change
			3788.84	14.09	Low	14.09	Low	No Change	20.8	Coarse Gravel	20.8	Coarse Gravel	No Change	29.0	Coarse Gravel	29.0	Coarse Gravel	No Change
		Existing Kriby Road Culvert	3773.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3753.025	58.92	Moderate	58.92	Moderate	No Change	56.2	Very Coarse Gravel	56.2	Very Coarse Gravel	No Change	75.0	Small Cobble	75.0	Small Cobble	No Change
			3685.87	40.71	Moderate	40.71	Moderate	No Change	46.1	Very Coarse Gravel	46.1	Very Coarse Gravel	No Change	51.4	Very Coarse Gravel	51.4	Very Coarse Gravel	No Change
9	HU_EH_EHR_17_2		3222.018	13.40	Low	37.99	Moderate	Increase	21.8	Coarse Gravel	44.3	Very Coarse Gravel	Increase in Grain Size	23.2	Coarse Gravel	48.6	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_1	3218	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3137.33	8.11	None	34.94	Low	Increase	16.8	Coarse Gravel	42.1	Very Coarse Gravel	Increase in Grain Size	13.8	Medium Gravel	45.1	Very Coarse Gravel	Increase in Grain Size
			3076.886	21.87	Low	2.80	None	Decrease	32.3	Very Coarse Gravel	7.3	Fine Gravel	Decrease in Grain Size	29.0	Coarse Gravel	8.5	Medium Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_4	3068.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3032.119	3.25	None	2.57	None	No Change	8.1	Medium Gravel	6.8	Fine Gravel	Decrease in Grain Size	9.3	Medium Gravel	8.2	Medium Gravel	No Change
			2949.172	23.21	Low	33.03	Low	No Change	32.5	Very Coarse Gravel	40.8	Very Coarse Gravel	No Change	32.5	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
		Proposed Culvert HU_EH_EHT_17_3_5 (Transit)	2949.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2886.632	1.66	None	38.23	Moderate	Increase	6.1	Fine Gravel	43.8	Very Coarse Gravel	Increase in Grain Size	4.1	Very Coarse Sand	50.4	Very Coarse Gravel	Increase in Grain Size
			2788.101	2.25	None	2.25	None	No Change	6.2	Fine Gravel	6.2	Fine Gravel	No Change	7.5	Fine Gravel	7.5	Fine Gravel	No Change
9	HU_EH_EHR_17_2		1812.26	13.19	Low	10.38	Low	No Change	21.7	Coarse Gravel	18.4	Coarse Gravel	No Change	22.6	Coarse Gravel	19.2	Coarse Gravel	No Change
			1625.92	4.69	None	4.69	None	No Change	9.5	Medium Gravel	9.5	Medium Gravel	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
		Culvert	1568.03	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1530.3	6.95	None	6.92	None	No Change	12.4	Medium Gravel	12.3	Medium Gravel	No Change	19.2	Coarse Gravel	19.2	Coarse Gravel	No Change
			1415.195	32.21	Low	32.21	Low	No Change	40.3	Very Coarse Gravel	40.3	Very Coarse Gravel	No Change	41.8	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
9	HU_EH_EHR_18_1b		2370.437	17.71	Low	26.24	Low	No Change	26.1	Coarse Gravel	34.6	Very Coarse Gravel	Increase in Grain Size	29.0	Coarse Gravel	37.0	Very Coarse Gravel	Increase in Grain Size
			2346.795	24.49	Low	12.08	Low	No Change	30.9	Coarse Gravel	18.8	Coarse Gravel	No Change	40.9	Very Coarse Gravel	25.7	Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_18_3_3	2344.79	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.705	47.77	Moderate	49.46	Moderate	No Change	49.2	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change	63.1	Very Coarse Gravel	65.2	Small Cobble	Increase in Grain Size
			2275.007	2.95	None	2.76	None	No Change	7.4	Fine Gravel	7.0	Fine Gravel	No Change	9.3	Medium Gravel	8.9	Medium Gravel	No Change
		HU_EH_EHT_18_3_4	2274	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2254.425	75.87	Moderate	72.29	Moderate	No Change	65.9	Small Cobble	63.8	Very Coarse Gravel	Decrease in Grain Size	91.7	Small Cobble	89.2	Small Cobble	No Change
			2242.197	30.76	Low	20.35	Low	No Change	36.0	Very Coarse Gravel	27.1	Coarse Gravel	Decrease in Grain Size	47.7	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
		HU_EH_EHT_18_3_5	2238.19	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2213.417	7.80	None	7.64	None	No Change	13.9	Medium Gravel	13.8	Medium Gravel	No Change	19.2	Coarse Gravel	18.7	Coarse Gravel	No Change
			2133.69	73.40	Moderate	68.49	Moderate	No Change	64.6	Small Cobble	61.6	Very Coarse Gravel	Decrease in Grain Size	89.2	Small Cobble	85.5	Small Cobble	No Change
9	HU_EH_EHR_18_1b		928.912	132.76	High	132.76	High	No Change	91.1	Small Cobble	91.1	Small Cobble	No Change	153.2	Large Cobble	153.2	Large Cobble	No Change
			893.029	28.61	Low	28.61	Low	No Change	31.3	Coarse Gravel	31.3	Coarse Gravel	No Change	55.1	Very Coarse Gravel	55.1	Very Coarse Gravel	No Change
		Kriby Road Culvert	881.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			854.967	20.18	Low	20.18	Low	No Change	24.5	Coarse Gravel	24.5	Coarse Gravel	No Change	44.3	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
			773.018	112.57	High	112.57	High	No Change	82.8	Small Cobble	82.8	Small Cobble	No Change	132.3	Large Cobble	132.3	Large Cobble	No Change
9	HU_EH_EHR_18_4		3924.49	24.84	Low	33.28	Low	No Change	34.5	Very Coarse Gravel	41.0	Very Coarse Gravel	No Change	33.2	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
		HU_EH_EHT_18_5_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3777.79	6.04	None	4.30	None	No Change	12.6	Medium Gravel	9.8	Medium Gravel	No Change	13.8	Medium Gravel	11.2	Medium Gravel	No Change
			3687.29	15.08	Low	37.39	Moderate	Increase	23.0	Coarse Gravel	43.4	Very Coarse Gravel	Increase in Grain Size	27.0	Coarse Gravel	48.6	Very Coarse Gravel	Increase in Grain Size
		HU_EH_EHT_18_5_2	3673.29	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3645.09	24.09	Low	34.83	Low	No Change	33.9	Very Coarse Gravel	41.7	Very Coarse Gravel	No Change	32.5	Very Coarse Gravel	46.0	Very Coarse Gravel	No Change
			3582.79	3.20	None	2.96	None	No Change	8.0	Fine Gravel	7.6	Fine Gravel	No Change	9.3	Medium Gravel	8.5	Medium Gravel	No Change
		Existing Hwy400 culvert	3544.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3717.174	0.12	None	0.21	None	No Change	0.9	Coarse Sand	1.4	Coarse Sand	No Change	0.7	Coarse Sand	1.1	Coarse Sand	No Change
9	HU_EH_EHR_18_5		3434.259	1.19	None	2.39	None	No Change	4.0	Very Coarse Sand	6.4	Fine Gravel	Increase in Grain Size	4.9	Very Coarse Sand	7.9	Fine Gravel	Increase in Grain Size
		HU_EH_EHT_18_3_6		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3359.886	0.02	None	0.38	None	No Change	0.2	Medium Sand	1.7	Coarse Sand	Increase in Grain Size	0.2	Medium Sand	2.5	Very Coarse Sand	Increase in Grain Size
			3349.546	0.00	None	0.00	None	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			3311.742	0.10	None	0.10	None	No Change	0.7	Coarse Sand	0.7	Coarse Sand	No Change	1.0	Coarse Sand	1.0	Coarse Sand	No Change
		Existing Private Culvert	3307	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3287.195	13.89	Low	15.84	Low	No Change	21.3	Coarse Gravel	23.3	Coarse Gravel	No Change	27.0	Coarse Gravel	29.0	Coarse Gravel	No Change
			3218.272	22.99	Low	17.51	Low	No Change	32.8	Very Coarse Gravel	27.1	Coarse Gravel	Decrease in Grain Size	31.1	Coarse Gravel	26.3	Coarse Gravel	No Change
			3717.174	0.12	None	0.21	None	No Change	0.9	Coarse Sand	1.4	Coarse Sand	No Change	0.7	Coarse Sand	1.1	Coarse Sand	No Change
		HU_EH_EHT_18_6_1	3670	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3630.589	1.97	None	3.74	None	No Change	6.2	Fine Gravel	9.3	Medium Gravel	Increase in Grain Size	5.4	Pebbles	9.3	Medium Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	25-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
9	HU_EH_EHR_18_5		3600.859	34.57	Low	26.16	Low	No Change	42.0	Very Coarse Gravel	35.7	Very Coarse Gravel	No Change	44.3	Very Coarse Gravel	34.7	Very Coarse Gravel	No Change
		HU_EH_EHT_18_6_2	3594	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3222.018	13.40	Low	37.99	Moderate	Increase	21.8	Coarse Gravel	44.3	Very Coarse Gravel	Increase in Grain Size	23.2	Coarse Gravel	48.6	Very Coarse Gravel	Increase in Grain Size
			3137.33	8.11	None	34.94	Low	Increase	16.8	Coarse Gravel	42.1	Very Coarse Gravel	Increase in Grain Size	13.8	Medium Gravel	45.1	Very Coarse Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
1	SIM_EB_SM_0_3		63.167	0.11	None	0.10	None	No Change	0.7	Coarse Sand	0.6	Coarse Sand	No Change	1.1	Coarse Sand	1.0	Coarse Sand	No Change
			63	0.07	None	0.06	None	No Change	0.5	Coarse Sand	0.5	Medium Sand	Decrease in Grain Size	0.8	Coarse Sand	0.7	Coarse Sand	No Change
	SIM_EB_SM_0_2	W-W4 (401 culvert extension)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			60.5	6.00	None	102.74	High	Increase	11.1	Medium Gravel	78.2	Small Cobble	Increase in Grain Size	17.6	Coarse Gravel	121.8	Small Cobble	Increase in Grain Size
			60	98.42	Moderate	13.75	Low	Decrease	76.3	Small Cobble	19.6	Coarse Gravel	Decrease in Grain Size	117.4	Small Cobble	31.1	Coarse Gravel	Decrease in Grain Size
1	SM_EL_SIM_1_2	SM_EL_SIM_1_WC1.1		Flow event not modelled					Flow event not modelled							45.1	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC1.2		Flow event not modelled					Flow event not modelled							34.7	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC1.5		Flow event not modelled					Flow event not modelled							88.0	Small Cobble	No Existing Velocity Provided
1	SM_EL_SIM_1_3	SM_EL_SIM_1_WC1		Flow event not modelled					Flow event not modelled					40.9	Very Coarse Gravel	253.1	Large Cobble	Increase in Grain Size
		SM_EL_SIM_1_WC1.6		Flow event not modelled					Flow event not modelled							40.1	Very Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_4	SM_EL_SIM_1_WC2.1		Flow event not modelled					Flow event not modelled							24.5	Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC2.2		Flow event not modelled					Flow event not modelled							22.0	Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_5	SM_EL_SIM_1_WC2.3		Flow event not modelled					Flow event not modelled					111.7	Small Cobble	111.7	Small Cobble	No Change
1	SM_EL_SIM_1_8	SM_EL_SIM_1_WC3.1		Flow event not modelled					Flow event not modelled							60.0	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC3.2		Flow event not modelled					Flow event not modelled					143.3	Large Cobble	73.9	Small Cobble	Decrease in Grain Size
		SM_EL_SIM_1_WC3.3		Flow event not modelled					Flow event not modelled							143.3	Large Cobble	No Existing Velocity Provided
		SM_EL_SIM_1_WC3.6		Flow event not modelled					Flow event not modelled							45.1	Very Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_10	SM_EL_SIM_1_WC4		Flow event not modelled					Flow event not modelled					43.4	Very Coarse Gravel	266.4	Small Boulder	Increase in Grain Size
2	CR_MC_MUL_8_3	CR-MC-MUL-8-WC1		Flow event not modelled					Flow event not modelled					60.0	Very Coarse Gravel	280.1	Small Boulder	Increase in Grain Size
2	CR_MC_MUL_8_4	CR-MC-MUL-8-WC3		Flow event not modelled					Flow event not modelled					3.0	Very Coarse Sand	113.1	Small Cobble	Increase in Grain Size
2	CR_MC_MUL_8_6	CR-MC-MUL-8-WC4		Flow event not modelled					Flow event not modelled					4.6	Very Coarse Sand	141.7	Large Cobble	Increase in Grain Size
2	CR_LC_LEV_1_2	CR_LC_LEV_1_WC2		Flow event not modelled					Flow event not modelled					25.1	Coarse Gravel	338.9	Small Boulder	Increase in Grain Size
2	CR_LC_LEV_0_1		55567	173.29	High	176.60	High	No Change	97.8	Small Cobble	99.0	Small Cobble	No Change	233.9	Large Cobble	238.1	Large Cobble	No Change
			55408	57.52	Moderate	56.65	Moderate	No Change	46.3	Very Coarse Gravel	45.8	Very Coarse Gravel	No Change	108.9	Small Cobble	107.6	Small Cobble	No Change
		W-W56		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	CR_LC_LEV_0_2		55270	87.98	Moderate	91.35	Moderate	No Change	65.0	Small Cobble	66.5	Small Cobble	No Change	130.8	Large Cobble	135.4	Large Cobble	No Change
			55202	113.82	High	115.22	High	No Change	75.7	Small Cobble	76.2	Small Cobble	No Change	163.3	Large Cobble	166.8	Large Cobble	No Change
			54959	20.18	Low	21.75	Low	No Change	21.7	Coarse Gravel	22.8	Coarse Gravel	No Change	58.0	Very Coarse Gravel	61.0	Very Coarse Gravel	No Change
			54949	7.60	None	8.09	None	No Change	11.3	Medium Gravel	11.7	Medium Gravel	No Change	29.0	Coarse Gravel	30.4	Coarse Gravel	No Change
		Embleton Road		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			54909	25.73	Low	25.89	Low	No Change	25.9	Coarse Gravel	25.9	Coarse Gravel	No Change	67.3	Small Cobble	67.3	Small Cobble	No Change
			54867	137.98	High	156.23	High	No Change	79.8	Small Cobble	86.7	Small Cobble	No Change	221.5	Large Cobble	242.3	Large Cobble	No Change
2	CR_LC_LEV_2_4		42344	60.22	Moderate	60.22	Moderate	No Change	52.9	Very Coarse Gravel	52.9	Very Coarse Gravel	No Change	89.2	Small Cobble	89.2	Small Cobble	No Change
		CR_LC_LEV_2_WC1.1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			42314	87.77	Moderate	87.77	Moderate	No Change	74.9	Small Cobble	74.9	Small Cobble	No Change	120.3	Small Cobble	120.3	Small Cobble	No Change
			42249	173.29	High	176.60	High	No Change	67.8	Small Cobble	67.8	Small Cobble	No Change	118.9	Small Cobble	118.9	Small Cobble	No Change
2	CR_LC_LEV_2_5	CR_LC_LEV_2_WC2.1		Flow event not modelled					Flow event not modelled					6.9	Fine Gravel	507.4	Small Boulder	Increase in Grain Size
		CR_LC_LEV_2_WC2.2		Flow event not modelled					Flow event not modelled					10.8	Medium Gravel	523.4	Medium Boulder	Increase in Grain Size
		CR_LC_LEV_2_WC2		Flow event not modelled					Flow event not modelled					6.3	Fine Gravel	338.4	Small Boulder	Increase in Grain Size
2	CR_LC_LEV_2_6	CR_LC_LEV_2_WC6		Flow event not modelled					Flow event not modelled					2.3	Very Coarse Sand	259.7	Small Boulder	Increase in Grain Size
2	CR_LC_LEV_10_1	CR_LC_LEV_10_WC1.1		Flow event not modelled					Flow event not modelled							416.8	Small Boulder	No Existing Velocity Provided
3	CR_NP_CRR_9_1	CR_NP_CRR_9_WC1		Flow event not modelled					Flow event not modelled					10.4	Medium Gravel	266.4	Small Boulder	Increase in Grain Size
		CR_NP_CRR_9_WC2		Flow event not modelled					Flow event not modelled					6.9	Fine Gravel	173.8	Large Cobble	Increase in Grain Size
3	CR_NP_CRR_3_2	CR_NP_CRR_3_WC1.1		Flow event not modelled					Flow event not modelled					3.9	Very Coarse Sand	284.7	Small Boulder	Increase in Grain Size
3	CR_NP_CRR_3_1	CR_NP_CRR_3_WC3.1		Flow event not modelled					Flow event not modelled					6.9	Fine Gravel	266.4	Small Boulder	Increase in Grain Size
		CR_NP_CRR_3_WC2		Flow event not modelled					Flow event not modelled							284.7	Small Boulder	No Existing Velocity Provided
		CR_NP_CRR_3_WC3		Flow event not modelled					Flow event not modelled					2.7	Very Coarse Sand	399.9	Small Boulder	Increase in Grain Size
3	CR_NP_CRR_3_3	CR_NP_CRR_3_WC4		Flow event not modelled					Flow event not modelled					7.2	Fine Gravel	308.5	Small Boulder	Increase in Grain Size
3	CR_NP_CRR_13_1	CR_NP_CRR_13_WC2		Flow event not modelled					Flow event not modelled							209.5	Large Cobble	No Existing Velocity Provided
3	CR_NP_CRR_13_MW (near)	CR_NP_CRR_13_WC3		Flow event not modelled					Flow event not modelled					3.0	Very Coarse Sand	188.4	Large Cobble	Increase in Grain Size
3	CR_HC_HUT_6_3	CR_HC_HUT_6_WC1		Flow event not modelled					Flow event not modelled							250.9	Large Cobble	No Existing Velocity Provided
4	EC_EH_ETW_12_3		2280	1.46	None	2.04	None	No Change	4.7	Very Coarse Sand	5.9	Pebbles	Increase in Grain Size	5.1	Pebbles	6.6	Fine Gravel	Increase in Grain Size
			2224	37.58	Moderate	7.04	None	Decrease	43.4	Very Coarse Gravel	13.4	Medium Gravel	Decrease in Grain Size	49.5	Very Coarse Gravel	16.6	Coarse Gravel	Decrease in Grain Size
		Post_ETW_12_WC1 (234.08)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2136	13.70	Low	14.04	Low	No Change	20.0	Coarse Gravel	20.2	Coarse Gravel	No Change	29.7	Coarse Gravel	30.4	Coarse Gravel	No Change
			2087	6.90	None	7.19	None	No Change	12.4	Medium Gravel	12.7	Medium Gravel	No Change	18.7	Coarse Gravel	19.8	Coarse Gravel	No Change
4	EC_EH_ETW_10_1 (Bridge)		1745	1.35	None	15.44	Low	Increase	4.9	Very Coarse Sand	26.3	Coarse Gravel	Increase in Grain Size	4.1	Very Coarse Sand	21.5	Coarse Gravel	Increase in Grain Size
			1673	14.24	Low	1.18	None	Decrease	22.9	Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size	23.8	Coarse Gravel	4.6	Very Coarse Sand	Decrease in Grain Size
		Post_ETW_10_W1 (234.06)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1610	1.45	None	3.20	None	No Change	5.1	Pebbles	8.2	Medium Gravel	Increase in Grain Size	4.4	Very Coarse Sand	8.5	Medium Gravel	Increase in Grain Size
			1578	0.59	None	0.59	None	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change	2.5	Very Coarse Sand	2.5	Very Coarse Sand	No Change
4	EC_EH_ETW_9_3		1549	8.21	None	8.60	None	No Change	14.3	Medium Gravel	14.6	Medium Gravel	No Change	20.3	Coarse Gravel	21.5	Coarse Gravel	No Change
			1526	6.77	None	7.19	None	No Change	12.6	Medium Gravel	13.0	Medium Gravel	No Change	17.6	Coarse Gravel	18.7	Coarse Gravel	No Change
		Post_ETW_9_WC2 (234.03)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1441	7.61	None	8.30	None	No Change	14.0	Medium Gravel	14.8	Medium Gravel	No Change	17.6	Coarse Gravel	19.2	Coarse Gravel	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			1373	0.21	None	0.22	None	No Change	1.2	Coarse Sand	1.3	Coarse Sand	No Change	1.4	Coarse Sand	1.5	Coarse Sand	No Change
4	EC_EH_ETW_7_2 (Bridge)		800	5.83	None	3.56	None	No Change	11.6	Medium Gravel	8.2	Medium Gravel	No Change	15.1	Medium Gravel	11.2	Medium Gravel	No Change
			791	45.20	Moderate	3.68	None	Decrease	49.4	Very Coarse Gravel	8.4	Medium Gravel	Decrease in Grain Size	56.1	Very Coarse Gravel	11.2	Medium Gravel	Decrease in Grain Size
		Post_Upper_Etobicoke_CH_IC (233.03)	750	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			723	3.79	None	4.34	None	No Change	8.4	Medium Gravel	9.2	Medium Gravel	No Change	12.0	Medium Gravel	13.3	Medium Gravel	No Change
			708	29.93	Low	44.31	Moderate	Increase	33.1	Very Coarse Gravel	43.1	Very Coarse Gravel	No Change	54.2	Very Coarse Gravel	71.6	Small Cobble	Increase in Grain Size
4	EC_EH_ETW_7_1		759	39.67	Moderate	44.14	Moderate	No Change	43.1	Very Coarse Gravel	46.1	Very Coarse Gravel	No Change	56.1	Very Coarse Gravel	62.1	Very Coarse Gravel	No Change
			745	28.45	Low	2.86	None	Decrease	35.9	Very Coarse Gravel	7.2	Fine Gravel	Decrease in Grain Size	40.9	Very Coarse Gravel	9.3	Medium Gravel	Decrease in Grain Size
		W-W108	TBD	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			639	1.06	None	1.12	None	No Change	3.9	Very Coarse Sand	4.0	Very Coarse Sand	No Change	4.1	Very Coarse Sand	4.4	Very Coarse Sand	No Change
			623	3.86	None	4.18	None	No Change	8.8	Medium Gravel	9.2	Medium Gravel	No Change	11.2	Medium Gravel	12.0	Medium Gravel	No Change
4	EC_EH_ETW_6_1 (Culvert)		848	21.94	Low	22.75	Low	No Change	26.0	Coarse Gravel	26.5	Coarse Gravel	No Change	46.9	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
			841	78.82	Moderate	84.99	Moderate	No Change	62.1	Very Coarse Gravel	65.1	Small Cobble	Increase in Grain Size	113.1	Small Cobble	120.3	Small Cobble	No Change
		EC_EH_ETW_6_WC1.1 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			816	82.13	Moderate	89.94	Moderate	No Change	66.2	Small Cobble	70.1	Small Cobble	No Change	108.9	Small Cobble	116.0	Small Cobble	No Change
		EC_EH_ETW_6_WC1.2, Existing (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			794	6.39	None	4.00	None	No Change	12.9	Medium Gravel	9.2	Medium Gravel	No Change	14.7	Medium Gravel	11.2	Medium Gravel	No Change
			723	0.96	None	0.90	None	No Change	3.1	Very Coarse Sand	3.0	Very Coarse Sand	No Change	5.1	Pebbles	4.9	Very Coarse Sand	Decrease in Grain Size
			708	85.02	Moderate	39.39	Moderate	No Change	65.5	Small Cobble	38.1	Very Coarse Gravel	Decrease in Grain Size	118.9	Small Cobble	72.7	Small Cobble	No Change
		EC_EH_ETW_6_WC1.4 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			616	84.98	Moderate	110.99	High	Increase	66.9	Small Cobble	79.2	Small Cobble	No Change	114.6	Small Cobble	141.7	Large Cobble	Increase in Grain Size
			606	15.21	Low	14.27	Low	No Change	21.6	Coarse Gravel	20.5	Coarse Gravel	No Change	31.8	Coarse Gravel	31.1	Coarse Gravel	No Change
		EC_EH_ETW_6_WC1.5 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			587	36.79	Moderate	39.77	Moderate	No Change	37.3	Very Coarse Gravel	39.0	Very Coarse Gravel	No Change	65.2	Small Cobble	70.5	Small Cobble	No Change
			568	129.62	High	127.23	High	No Change	87.9	Small Cobble	86.0	Small Cobble	No Change	158.2	Large Cobble	158.2	Large Cobble	No Change
4	EC_EH_ETW_6_4 (Bridge)		746	4.51	None	0.72	None	No Change	10.5	Medium Gravel	2.9	Very Coarse Sand	Decrease in Grain Size	10.8	Medium Gravel	3.3	Very Coarse Sand	Decrease in Grain Size
			737	4.18	None	1.79	None	No Change	10.2	Medium Gravel	5.3	Pebbles	Decrease in Grain Size	10.0	Medium Gravel	6.3	Fine Gravel	Decrease in Grain Size
		Post_ETW_6_WC3 -25m 232.02-Lower	700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			635	5.66	None	6.72	None	No Change	12.1	Medium Gravel	13.4	Medium Gravel	No Change	13.3	Medium Gravel	15.1	Medium Gravel	No Change
			629	4.85	None	5.42	None	No Change	10.9	Medium Gravel	11.7	Medium Gravel	No Change	11.6	Medium Gravel	12.9	Medium Gravel	No Change
4	Culvert (pre existing)		858	23.79	Low	55.83	Moderate	Increase	29.9	Coarse Gravel	53.5	Very Coarse Gravel	Increase in Grain Size	40.9	Very Coarse Gravel	73.9	Small Cobble	Increase in Grain Size
			833	65.38	Moderate	14.45	Low	Decrease	60.3	Very Coarse Gravel	21.1	Coarse Gravel	Decrease in Grain Size	80.8	Small Cobble	29.7	Coarse Gravel	Decrease in Grain Size
		Post_ETW_1_WC1 230.18	800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			768	7.59	None	4.59	None	No Change	14.0	Medium Gravel	9.7	Medium Gravel	No Change	18.2	Coarse Gravel	13.3	Medium Gravel	Decrease in Grain Size
			726	0.74	None	0.69	None	No Change	2.6	Very Coarse Sand	2.5	Very Coarse Sand	No Change	4.4	Very Coarse Sand	4.1	Very Coarse Sand	No Change
			703	0.83	None	0.79	None	No Change	2.7	Very Coarse Sand	2.6	Very Coarse Sand	No Change	5.1	Pebbles	4.9	Very Coarse Sand	Decrease in Grain Size
			671	0.83	None	0.79	None	No Change	2.7	Very Coarse Sand	2.6	Very Coarse Sand	No Change	5.1	Pebbles	4.9	Very Coarse Sand	Decrease in Grain Size
			663	0.83	None	0.79	None	No Change	2.7	Very Coarse Sand	2.6	Very Coarse Sand	No Change	5.1	Pebbles	4.9	Very Coarse Sand	Decrease in Grain Size
		Post_ETW_1_WC1 230.18	660	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	Culvert (pre existing)		637	3.19	None	3.53	None	No Change	6.8	Fine Gravel	7.2	Fine Gravel	No Change	12.9	Medium Gravel	14.2	Medium Gravel	No Change
			621	0.16	None	0.19	None	No Change	0.9	Coarse Sand	1.0	Coarse Sand	No Change	1.8	Coarse Sand	2.0	Coarse Sand	No Change
			588	0.01	None	0.01	None	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change	0.2	Fine Sand	0.2	Medium Sand	Increase in Grain Size
			551	0.02	None	0.02	None	No Change	0.2	Fine Sand	0.2	Medium Sand	Increase in Grain Size	0.3	Medium Sand	0.4	Medium Sand	No Change
			545	199.50	High	213.90	High	No Change	113.9	Small Cobble	118.5	Small Cobble	No Change	229.7	Large Cobble	244.5	Large Cobble	No Change
		Post_ETW_1_WC1 230.18	540	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			522	241.10	High	254.21	High	No Change	129.2	Large Cobble	133.1	Large Cobble	No Change	261.9	Small Boulder	275.5	Small Boulder	No Change
			510	26.35	Low	29.52	Low	No Change	31.0	Coarse Gravel	33.3	Very Coarse Gravel	Increase in Grain Size	47.7	Very Coarse Gravel	52.3	Very Coarse Gravel	No Change
4	EC_EH_ETW_1_5 (Bridge)		2746	2.45	None	2.70	None	No Change	6.0	Fine Gravel	6.4	Fine Gravel	No Change	9.6	Medium Gravel	10.4	Medium Gravel	No Change
			2660	24.04	Low	22.91	Low	No Change	29.3	Coarse Gravel	28.1	Coarse Gravel	No Change	44.3	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
		Post_ETW_1_WC3 230.12	1170	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	99.14	Moderate	112.39	High	Increase	72.1	Small Cobble	78.2	Small Cobble	No Change	135.4	Large Cobble	148.2	Large Cobble	No Change
			2401	7.56	None	8.13	None	No Change	12.8	Medium Gravel	13.4	Medium Gravel	No Change	21.5	Coarse Gravel	22.6	Coarse Gravel	No Change
5	EC_EH_ETW_1_7 (Bridge)		554	8.24	None	8.41	None	No Change	13.7	Medium Gravel	13.8	Medium Gravel	No Change	22.6	Coarse Gravel	23.2	Coarse Gravel	No Change
			523	83.23	Moderate	24.14	Low	Decrease	68.1	Small Cobble	28.5	Coarse Gravel	Decrease in Grain Size	104.8	Small Cobble	46.9	Very Coarse Gravel	Decrease in Grain Size
		Post_ETW_1_WC5 (230.07)	500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			413	15.94	Low	18.03	Low	No Change	21.3	Coarse Gravel	22.9	Coarse Gravel	No Change	36.2	Very Coarse Gravel	40.1	Very Coarse Gravel	No Change
			380	42.71	Moderate	45.59	Moderate	No Change	41.8	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change	70.5	Small Cobble	75.0	Small Cobble	No Change
5	EC_EH_ETW_1_8 (Culvert)		499	10.86	Low	12.30	Low	No Change	18.0	Coarse Gravel	19.6	Coarse Gravel	No Change	22.6	Coarse Gravel	24.5	Coarse Gravel	No Change
			456	38.95	Moderate	33.77	Low	Decrease	42.0	Very Coarse Gravel	37.8	Very Coarse Gravel	No Change	57.1	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
			439	39.65	Moderate	0.77	None	Decrease	45.4	Very Coarse Gravel	2.9	Very Coarse Sand	Decrease in Grain Size	50.4	Very Coarse Gravel	3.9	Very Coarse Sand	Decrease in Grain Size
		Post_ETW_1_WC6 230.05	400	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			358	19.94	Low	21.58	Low	No Change	28.9	Coarse Gravel	30.4	Coarse Gravel	No Change	30.4	Coarse Gravel	31.8	Coarse Gravel	No Change
			345	31.33	Low	32.10	Low	No Change	39.7	Very Coarse Gravel	40.2	Very Coarse Gravel	No Change	40.1	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
			1958	9.91	None	11.94	Low	Increase	17.2	Coarse Gravel	19.4	Coarse Gravel	No Change	20.3	Coarse Gravel	23.8	Coarse Gravel	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
5	EC_EH_ETW_1_11 (Bridge)		1920	13.86	Low	10.29	Low	No Change	21.2	Coarse Gravel	17.2	Coarse Gravel	No Change	27.0	Coarse Gravel	22.0	Coarse Gravel	No Change
		Post_ETW_1_WC8 229.07	1900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1568	44.89	Moderate	53.59	Moderate	No Change	48.5	Very Coarse Gravel	54.4	Very Coarse Gravel	No Change	57.1	Very Coarse Gravel	65.2	Small Cobble	Increase in Grain Size
5	EC_EH_ETW_1_12 (Bridge)		2746	2.45	None	2.70	None	No Change	6.0	Fine Gravel	6.4	Fine Gravel	No Change	9.6	Medium Gravel	10.4	Medium Gravel	No Change
			2660	24.04	Low	22.91	Low	No Change	29.3	Coarse Gravel	28.1	Coarse Gravel	No Change	44.3	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
		Post_ETW_1_WC10 229.01	2600	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	99.14	Moderate	112.39	High	Increase	72.1	Small Cobble	78.2	Small Cobble	No Change	135.4	Large Cobble	148.2	Large Cobble	No Change
			2401	7.56	None	8.13	None	No Change	12.8	Medium Gravel	13.4	Medium Gravel	No Change	21.5	Coarse Gravel	22.6	Coarse Gravel	No Change
5	HU_WH_CAC_01 (Bridge)		3401	0.97	None	0.53	None	No Change	4.3	Very Coarse Sand	2.8	Very Coarse Sand	No Change	2.7	Very Coarse Sand	1.8	Coarse Sand	Decrease in Grain Size
			3302	2.43	None	3.11	None	No Change	7.9	Fine Gravel	9.1	Medium Gravel	Increase in Grain Size	5.1	Pebbles	6.6	Fine Gravel	Increase in Grain Size
		West_WH_CAC	3000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2982	2.79	None	4.71	None	No Change	8.8	Medium Gravel	12.3	Medium Gravel	No Change	5.4	Pebbles	8.5	Medium Gravel	Increase in Grain Size
			2918	1.76	None	1.30	None	No Change	6.5	Fine Gravel	5.2	Pebbles	Decrease in Grain Size	3.9	Very Coarse Sand	3.3	Very Coarse Sand	No Change
			2842	9.35	None	6.69	None	No Change	19.8	Coarse Gravel	15.5	Medium Gravel	Decrease in Grain Size	13.3	Medium Gravel	10.8	Medium Gravel	No Change
		West_WH_CAC	2800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2762	14.17	Low	16.71	Low	No Change	26.5	Coarse Gravel	29.5	Coarse Gravel	No Change	17.1	Coarse Gravel	19.8	Coarse Gravel	No Change
			2657	122.89	High	147.77	High	No Change	124.8	Small Cobble	140.6	Large Cobble	Increase in Grain Size	65.2	Small Cobble	75.0	Small Cobble	No Change
5	Culvert (Existing)		513.703	0.29	None	0.29	None	No Change	1.3	Coarse Sand	1.3	Coarse Sand	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change
			513.696	4.16	None	4.16	None	No Change	7.6	Fine Gravel	7.6	Fine Gravel	No Change	18.2	Coarse Gravel	18.2	Coarse Gravel	No Change
		West_WH_CAC	513.682	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			513.664	60.80	Moderate	60.80	Moderate	No Change	49.0	Very Coarse Gravel	49.0	Very Coarse Gravel	No Change	108.9	Small Cobble	108.9	Small Cobble	No Change
			513.656	12.95	Low	12.95	Low	No Change	17.4	Coarse Gravel	17.4	Coarse Gravel	No Change	35.4	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
5	Culvert (Existing)		512.119	0.03	None	0.03	None	No Change	0.3	Medium Sand	0.3	Medium Sand	No Change	0.5	Coarse Sand	0.5	Coarse Sand	No Change
			512.109	1.72	None	1.72	None	No Change	4.1	Very Coarse Sand	4.1	Very Coarse Sand	No Change	10.0	Medium Gravel	10.0	Medium Gravel	No Change
		West_WH_CAC	512.088	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			512.06	84.67	Moderate	84.67	Moderate	No Change	62.5	Very Coarse Gravel	62.5	Very Coarse Gravel	No Change	130.8	Large Cobble	130.8	Large Cobble	No Change
			512.053	14.70	Low	14.70	Low	No Change	19.2	Coarse Gravel	19.2	Coarse Gravel	No Change	37.7	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
5	HU_WH_TWH_1_4 (Bridge Pre-existing)		5300	33.60	Low	25.41	Low	No Change	33.8	Very Coarse Gravel	27.7	Coarse Gravel	Decrease in Grain Size	67.3	Small Cobble	56.1	Very Coarse Gravel	Decrease in Grain Size
			5083	14.82	Low	12.17	Low	No Change	19.8	Coarse Gravel	17.0	Coarse Gravel	No Change	36.2	Very Coarse Gravel	32.5	Very Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.1	5000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4962	10.69	Low	36.68	Moderate	Increase	16.2	Coarse Gravel	35.4	Very Coarse Gravel	Increase in Grain Size	27.6	Coarse Gravel	72.7	Small Cobble	Increase in Grain Size
			4945	33.89	Low	20.35	Low	No Change	34.1	Very Coarse Gravel	23.9	Coarse Gravel	Decrease in Grain Size	67.3	Small Cobble	47.7	Very Coarse Gravel	Decrease in Grain Size
			4881	7.25	None	11.54	Low	Increase	12.3	Medium Gravel	16.5	Coarse Gravel	Increase in Grain Size	21.5	Coarse Gravel	31.1	Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.1	4700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4625	2.24	None	3.75	None	No Change	5.5	Pebbles	7.8	Fine Gravel	Increase in Grain Size	9.3	Medium Gravel	13.8	Medium Gravel	No Change
			4597	1.99	None	1.95	None	No Change	5.1	Pebbles	5.0	Pebbles	No Change	8.5	Medium Gravel	8.5	Medium Gravel	No Change
5	HU_WH_TWH_1_2 (Bridge)		4047	215.34	High	225.31	High	No Change	120.5	Small Cobble	123.2	Small Cobble	No Change	240.2	Large Cobble	250.9	Large Cobble	No Change
			4006	6.25	None	9.30	None	No Change	11.2	Medium Gravel	14.3	Medium Gravel	No Change	19.2	Coarse Gravel	26.3	Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.3	3900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3865	50.77	Moderate	95.71	Moderate	No Change	46.6	Very Coarse Gravel	70.9	Small Cobble	Increase in Grain Size	81.9	Small Cobble	129.3	Large Cobble	Increase in Grain Size
			3822	14.43	Low	15.09	Low	No Change	20.3	Coarse Gravel	20.8	Coarse Gravel	No Change	32.5	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
5	HU_WH_CAC_02a (Culvert)		511.957	25.01	Low	25.01	Low	No Change	27.6	Coarse Gravel	27.6	Coarse Gravel	No Change	54.2	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change
			511.762	2.31	None	2.31	None	No Change	5.7	Pebbles	5.7	Pebbles	No Change	9.6	Medium Gravel	9.6	Medium Gravel	No Change
		West_WH_CAC	511.615	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			511.563	6.25	None	6.25	None	No Change	10.7	Medium Gravel	10.7	Medium Gravel	No Change	20.9	Coarse Gravel	20.9	Coarse Gravel	No Change
			511.364	73.02	Moderate	73.02	Moderate	No Change	54.2	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change	129.3	Large Cobble	129.3	Large Cobble	No Change
6	HU_WH_TWH_2_1 (Bridge)		3541.743	9.33	None	9.33	None	No Change	15.0	Medium Gravel	15.0	Medium Gravel	No Change	23.8	Coarse Gravel	23.8	Coarse Gravel	No Change
			3520	4.57	None	4.57	None	No Change	9.1	Medium Gravel	9.1	Medium Gravel	No Change	15.1	Medium Gravel	15.1	Medium Gravel	No Change
		HU_WH_TWH_2_WC1	3500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3438	2.18	None	2.18	None	No Change	5.5	Pebbles	5.5	Pebbles	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change
			3420	1.44	None	1.44	None	No Change	4.0	Very Coarse Sand	4.0	Very Coarse Sand	No Change	7.5	Fine Gravel	7.5	Fine Gravel	No Change
6	HU_WH_TWH_2_1 Old School Culvert 5 m * 1.5m (to be confirmed)		2868.124	1.09	None	1.09	None	No Change	3.2	Very Coarse Sand	3.2	Very Coarse Sand	No Change	6.3	Fine Gravel	6.3	Fine Gravel	No Change
			2839.686	353.35	High	353.35	High	No Change	157.2	Large Cobble	157.2	Large Cobble	No Change	394.3	Small Boulder	394.3	Small Boulder	No Change
		HU_WH_TWH_2_WC1	2836	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2835.774	183.21	High	183.21	High	No Change	103.2	Small Cobble	103.2	Small Cobble	No Change	236.0	Large Cobble	236.0	Large Cobble	No Change
			2733.596	290.71	High	290.71	High	No Change	141.2	Large Cobble	141.2	Large Cobble	No Change	325.7	Small Boulder	325.7	Small Boulder	No Change
6	HU_WH_SAL_3_1 (Proposed Bridge)		1.698	12.48	Low	18.29	Low	No Change	20.2	Coarse Gravel	26.4	Coarse Gravel	No Change	23.8	Coarse Gravel	30.4	Coarse Gravel	No Change
			1.677	11.84	Low	5.12	None	Decrease	19.8	Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size	22.0	Coarse Gravel	13.3	Medium Gravel	Decrease in Grain Size
		HU_WH_SAL_3_1	1.637	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1.604	18.20	Low	53.22	Moderate	Increase	25.1	Coarse Gravel	52.8	Very Coarse Gravel	Increase in Grain Size	33.9	Very Coarse Gravel	69.4	Small Cobble	Increase in Grain Size
			1.562	56.62	Moderate	13.17	Low	Decrease	53.9	Very Coarse Gravel	19.5	Coarse Gravel	Decrease in Grain Size	75.0	Small Cobble	29.0	Coarse Gravel	Decrease in Grain Size
		HU_WH_SAL_3_2	1.55	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1.537	15.64	Low	16.34	Low	No Change	23.7	Coarse Gravel	24.2	Coarse Gravel	No Change	27.6	Coarse Gravel	29.0	Coarse Gravel	No Change
			1.475	6.58	None	6.58	None	No Change	13.3	Medium Gravel	13.3	Medium Gravel	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
6	HU_WH_SAL_5_1		1013.632	4.40	None	4.39	None	No Change	8.4	Medium Gravel	8.4	Medium Gravel	No Change	16.6	Coarse Gravel	16.6	Coarse Gravel	No Change
			1013.624	3.96	None	3.96	None	No Change	7.8	Fine Gravel	7.8	Fine Gravel	No Change	15.6	Medium Gravel	15.6	Medium Gravel	No Change
		HU_WH_SAL_5_1	1013	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
			1013.598	2.84	None	2.85	None	No Change	6.2	Fine Gravel	6.2	Fine Gravel	No Change	12.4	Medium Gravel	12.4	Medium Gravel	No Change
6	HU_WH_SAL_0_1		1013.741	176.53	High	175.99	High	No Change	100.4	Small Cobble	100.2	Small Cobble	No Change	229.7	Large Cobble	229.7	Large Cobble	No Change
			1013.064	75.13	Moderate	74.08	Moderate	No Change	54.8	Very Coarse Gravel	54.3	Very Coarse Gravel	No Change	133.9	Large Cobble	132.3	Large Cobble	No Change
			1013.048	74.99	Moderate	73.70	Moderate	No Change	54.8	Very Coarse Gravel	54.1	Very Coarse Gravel	No Change	133.9	Large Cobble	132.3	Large Cobble	No Change
6	HU_WH_SAL_0_2	E-W2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1012.967	74.62	Moderate	73.49	Moderate	No Change	54.6	Very Coarse Gravel	54.0	Very Coarse Gravel	No Change	133.9	Large Cobble	132.3	Large Cobble	No Change
			1012.924	73.00	Moderate	70.85	Moderate	No Change	53.8	Very Coarse Gravel	52.7	Very Coarse Gravel	No Change	132.3	Large Cobble	129.3	Large Cobble	No Change
			983.78	5.90	None	26.08	Low	Increase	11.5	Medium Gravel	32.4	Very Coarse Gravel	Increase in Grain Size	15.6	Medium Gravel	42.6	Very Coarse Gravel	Increase in Grain Size
			962.71	6.78	None	17.27	Low	Increase	12.8	Medium Gravel	23.3	Coarse Gravel	Increase in Grain Size	17.1	Coarse Gravel	35.4	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert WHR_1-5_1	961.2	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			857.44	198.18	High	183.09	High	No Change	131.9	Large Cobble	110.8	Small Cobble	Decrease in Grain Size	163.3	Large Cobble	201.7	Large Cobble	No Change
			802.03	1.92	None	9.37	None	No Change	5.5	Pebbles	15.1	Medium Gravel	Increase in Grain Size	6.9	Fine Gravel	23.8	Coarse Gravel	Increase in Grain Size
6	HU_WH_WHR_1_5	Proposed Culvert WHR_1-5_2	800.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			760.98	0.07	None	2.65	None	No Change	0.5	Coarse Sand	6.3	Fine Gravel	Increase in Grain Size	0.7	Coarse Sand	10.4	Medium Gravel	Increase in Grain Size
			658.28	0.14	None	0.14	None	No Change	0.9	Coarse Sand	0.9	Coarse Sand	No Change	1.4	Coarse Sand	1.4	Coarse Sand	No Change
		Culvert	643.98	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			615.92	128.21	High	128.21	High	No Change	88.4	Small Cobble	88.4	Small Cobble	No Change	151.5	Large Cobble	151.5	Large Cobble	No Change
			570.46	21.86	Low	21.86	Low	No Change	29.3	Coarse Gravel	29.3	Coarse Gravel	No Change	36.2	Very Coarse Gravel	36.2	Very Coarse Gravel	
			681.3	12.19	Low	34.02	Low	No Change	19.9	Coarse Gravel	40.6	Very Coarse Gravel	Increase in Grain Size	23.2	Coarse Gravel	46.0	Very Coarse Gravel	Increase in Grain Size
			659.93	3.29	None	3.36	None	No Change	8.2	Medium Gravel	7.7	Fine Gravel	Decrease in Grain Size	9.3	Medium Gravel	11.2	Medium Gravel	No Change
		GTAW		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_1_6		587.4	33.53	Low	61.73	Moderate	Increase	39.3	Very Coarse Gravel	58.5	Very Coarse Gravel	No Change	47.7	Very Coarse Gravel	76.1	Small Cobble	Increase in Grain Size
			548.14	28.43	Low	6.62	None	Decrease	34.5	Very Coarse Gravel	12.3	Medium Gravel	Decrease in Grain Size	44.3	Very Coarse Gravel	17.6	Coarse Gravel	Decrease in Grain Size
		Transitway		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			516.76	33.15	Low	62.81	Moderate	Increase	38.6	Very Coarse Gravel	57.8	Very Coarse Gravel	No Change	48.6	Very Coarse Gravel	80.8	Small Cobble	Increase in Grain Size
			453.57	20.72	Low	20.72	Low	No Change	28.4	Coarse Gravel	28.4	Coarse Gravel	No Change	33.9	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
			1353.908	85.64	Moderate	85.64	Moderate	No Change	55.9	Very Coarse Gravel	55.9	Very Coarse Gravel	No Change	170.3	Large Cobble	170.3	Large Cobble	No Change
			1353.896	50.84	Moderate	50.84	Moderate	No Change	39.1	Very Coarse Gravel	39.1	Very Coarse Gravel	No Change	118.9	Small Cobble	118.9	Small Cobble	No Change
6	HU_WH_WHR_0_2	HU_WH_WHR_0_1 (GTAW WBL + Ramp)	1353.855	51.43	Moderate	51.43	Moderate	No Change	40.3	Very Coarse Gravel	40.3	Very Coarse Gravel	No Change	114.6	Small Cobble	114.6	Small Cobble	No Change
			1353.844	182.04	High	182.04	High	No Change	94.9	Small Cobble	94.9	Small Cobble	No Change	277.8	Small Boulder	277.8	Small Boulder	No Change
			1352.611	27.82	Low	15.21	Low	No Change	28.8	Coarse Gravel	19.1	Coarse Gravel	No Change	63.1	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
			1352.576	104.25	High	75.11	Moderate	Decrease	67.7	Small Cobble	53.8	Very Coarse Gravel	Decrease in Grain Size	173.8	Large Cobble	140.1	Large Cobble	No Change
			1352.506	11.33	Low	14.25	Low	No Change	14.9	Medium Gravel	17.3	Coarse Gravel	Increase in Grain Size	37.7	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
		HU_WH_WHR_0_2 (GTAW EBL + Ramp)	1352.455	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_0_3		1352.49	20.03	Low	25.00	Low	No Change	22.1	Coarse Gravel	25.5	Coarse Gravel	No Change	55.1	Very Coarse Gravel	64.1	Small Cobble	Increase in Grain Size
			1352.414	17.71	Low	23.36	Low	No Change	20.1	Coarse Gravel	24.2	Coarse Gravel	No Change	51.4	Very Coarse Gravel	63.1	Very Coarse Gravel	No Change
			1352.37	28.96	Low	43.61	Moderate	Increase	27.8	Coarse Gravel	36.6	Very Coarse Gravel	Increase in Grain Size	73.9	Small Cobble	99.5	Small Cobble	No Change
		HU_WH_WHR_0_3 (Transit Bridge)	1352.355	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1352.347	16.57	Low	25.81	Low	No Change	19.2	Coarse Gravel	25.9	Coarse Gravel	No Change	48.6	Very Coarse Gravel	67.3	Small Cobble	Increase in Grain Size
			1352.293	11.62	Low	11.62	Low	No Change	14.9	Medium Gravel	14.9	Medium Gravel	No Change	39.3	Very Coarse Gravel	39.3	Very Coarse Gravel	No Change
			1415.673	202.28	High	201.17	High	No Change	112.7	Small Cobble	112.3	Small Cobble	No Change	240.2	Large Cobble	240.2	Large Cobble	No Change
			1415.625	20.30	Low	14.39	Low	No Change	25.7	Coarse Gravel	20.2	Coarse Gravel	No Change	40.9	Very Coarse Gravel	32.5	Very Coarse Gravel	No Change
		Proposed Bridge HU_WH_GRT_0_1	1415.602	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.577	23.01	Low	20.98	Low	No Change	27.7	Coarse Gravel	25.7	Coarse Gravel	No Change	45.1	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
			1415.564	45.48	Moderate	24.59	Low	Decrease	43.8	Very Coarse Gravel	28.3	Coarse Gravel	Decrease in Grain Size	73.9	Small Cobble	49.5	Very Coarse Gravel	Decrease in Grain Size
6	HU_WH_GRT_0_2	Proposed Bridge HU_WH_GRT_0_2	1415.547	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.505	9.46	None	14.13	Low	Increase	15.7	Medium Gravel	20.5	Coarse Gravel	Increase in Grain Size	22.6	Coarse Gravel	30.4	Coarse Gravel	No Change
			1415.406	18.89	Low	12.66	Low	No Change	25.1	Coarse Gravel	18.5	Coarse Gravel	No Change	37.0	Very Coarse Gravel	29.7	Coarse Gravel	Decrease in Grain Size
		Proposed Bridge HU_WH_GRT_0_3 (Transit)	1415.38	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.353	4.96	None	11.75	Low	Increase	9.7	Medium Gravel	17.2	Coarse Gravel	Increase in Grain Size	16.1	Coarse Gravel	29.7	Coarse Gravel	No Change
			1415.311	0.85	None	0.85	None	No Change	2.9	Very Coarse Sand	2.9	Very Coarse Sand	No Change	4.6	Very Coarse Sand	4.6	Very Coarse Sand	No Change
			1514.853	31.77	Low	25.65	Low	No Change	35.4	Very Coarse Gravel	30.4	Coarse Gravel	Decrease in Grain Size	53.2	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
			1514.841	64.00	Moderate	76.26	Moderate	No Change	57.6	Very Coarse Gravel	64.7	Small Cobble	Increase in Grain Size	85.5	Small Cobble	96.9	Small Cobble	No Change
		HU_WH_CDT_2_1	1514.818	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.795	43.88	Moderate	58.39	Moderate	No Change	47.4	Very Coarse Gravel	56.5	Very Coarse Gravel	No Change	57.1	Very Coarse Gravel	72.7	Small Cobble	Increase in Grain Size
			1514.773	4.82	None	13.37	Low	Increase	10.1	Medium Gravel	20.2	Coarse Gravel	Increase in Grain Size	13.3	Medium Gravel	27.6	Coarse Gravel	Increase in Grain Size
		HU_WH_CDT_2_2	1514.75	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.717	13.82	Low	3.99	None	Decrease	19.2	Coarse Gravel	17.5	Coarse Gravel	No Change	27.0	Coarse Gravel	25.7	Coarse Gravel	No Change
6	HU_WH_CDT_2_1		1514.687	202.28	High	201.17	High	No Change	20.9	Coarse Gravel	8.7	Medium Gravel	Decrease in Grain Size	27.6	Coarse Gravel	12.4	Medium Gravel	Decrease in Grain Size
		HU_WH_CDT_2_3 (Transit)	1514.671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.656	0.05	None	1.28	None	No Change	0.5	Medium Sand	4.0	Very Coarse Sand	Increase in Grain Size	0.5	Coarse Sand	5.7	Pebbles	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			1514.605	74.26	Moderate	74.26	Moderate	No Change	64.4	Small Cobble	64.4	Small Cobble	No Change	91.7	Small Cobble	91.7	Small Cobble	No Change
			1514.549	0.94	None	0.94	None	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change	5.4	Pebbles	5.4	Pebbles	No Change
			1514.507	0.10	None	0.10	None	No Change	0.6	Coarse Sand	0.6	Coarse Sand	No Change	1.3	Coarse Sand	1.3	Coarse Sand	No Change
		Culvert (Mayfield Road)	1514.475	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.447	37.64	Moderate	33.58	Low	Decrease	38.5	Very Coarse Gravel	35.5	Very Coarse Gravel	No Change	64.1	Small Cobble	60.0	Very Coarse Gravel	Decrease in Grain Size
6	HU_WH_CDT_0_2		1514.598	26.35	Low	20.54	Low	No Change	26.3	Coarse Gravel	22.1	Coarse Gravel	No Change	68.4	Small Cobble	57.1	Very Coarse Gravel	Decrease in Grain Size
			1514.575	8.57	None	6.81	None	No Change	12.4	Medium Gravel	10.6	Medium Gravel	No Change	30.4	Coarse Gravel	25.7	Coarse Gravel	No Change
		Proposed Bridge HU_WH_CDT_0_1	1514.573	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.501	106.55	High	90.99	Moderate	Decrease	66.5	Small Cobble	59.6	Very Coarse Gravel	Decrease in Grain Size	188.4	Large Cobble	170.3	Large Cobble	No Change
			1514.487	45.62	Moderate	41.72	Moderate	No Change	37.0	Very Coarse Gravel	34.8	Very Coarse Gravel	No Change	106.2	Small Cobble	100.8	Small Cobble	No Change
		Proposed Bridge HU_WH_CDT_0_2 Transit	1514.479	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.467	98.38	Moderate	92.61	Moderate	No Change	62.3	Very Coarse Gravel	59.7	Very Coarse Gravel	No Change	182.9	Large Cobble	175.6	Large Cobble	No Change
			1514.353	0.10	None	0.10	None	No Change	0.6	Coarse Sand	0.6	Coarse Sand	No Change	1.3	Coarse Sand	1.3	Coarse Sand	No Change
			1514.345	5.97	None	5.97	None	No Change	16.2	Coarse Gravel	16.2	Coarse Gravel	No Change	7.9	Fine Gravel	7.9	Fine Gravel	No Change
			1514.312	37.64	Moderate	33.58	Low	Decrease	38.5	Very Coarse Gravel	35.5	Very Coarse Gravel	No Change	64.1	Small Cobble	60.0	Very Coarse Gravel	Decrease in Grain Size
		Culvert	514.331 x-80 (43.04-03	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.306	37.64	Moderate	33.58	Low	Decrease	38.5	Very Coarse Gravel	35.5	Very Coarse Gravel	No Change	64.1	Small Cobble	60.0	Very Coarse Gravel	Decrease in Grain Size
		Culvert	514.331 x-80 (43.04-03	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.6	20.81	Low	54.14	Moderate	Increase	25.1	Coarse Gravel	48.6	Very Coarse Gravel	Increase in Grain Size	45.1	Very Coarse Gravel	85.5	Small Cobble	Increase in Grain Size
			24.59	106.94	High	15.56	Low	Decrease	76.2	Small Cobble	20.8	Coarse Gravel	Decrease in Grain Size	141.7	Large Cobble	36.2	Very Coarse Gravel	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_MH_RAI_1_3		24.55	115.23	High	35.13	Moderate	Decrease	18.3	Coarse Gravel	10.0	Medium Gravel	Decrease in Grain Size	33.2	Very Coarse Gravel	17.6	Coarse Gravel	Decrease in Grain Size
			24.54	12.19	Low	34.02	Low	No Change	80.4	Small Cobble	35.4	Very Coarse Gravel	Decrease in Grain Size	148.2	Large Cobble	66.2	Small Cobble	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.52	33.53	Low	61.73	Moderate	Increase	21.2	Coarse Gravel	29.0	Coarse Gravel	No Change	34.7	Very Coarse Gravel	49.5	Very Coarse Gravel	No Change
			24.51	28.43	Low	6.62	None	Decrease	47.0	Very Coarse Gravel	47.0	Very Coarse Gravel	No Change	83.1	Small Cobble	83.1	Small Cobble	No Change
			1739	4.64	None	35.70	Moderate	Increase	12.0	Medium Gravel	47.1	Very Coarse Gravel	Increase in Grain Size	8.5	Medium Gravel	37.0	Very Coarse Gravel	Increase in Grain Size
			1699	18.83	Low	9.35	None	Decrease	25.0	Coarse Gravel	15.3	Medium Gravel	Decrease in Grain Size	37.0	Very Coarse Gravel	23.2	Coarse Gravel	Decrease in Grain Size
7	HU_MH_ROB_3_5	Propsed Culvert_HU_MH_ROB_3_1 (3.3 x 2.1 m)	1697	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1655	71.64	Moderate	23.40	Low	Decrease	63.0	Very Coarse Gravel	29.2	Coarse Gravel	Decrease in Grain Size	89.2	Small Cobble	41.8	Very Coarse Gravel	Decrease in Grain Size
			1641	1.64	None	14.76	Low	Increase	5.3	Pebbles	22.4	Coarse Gravel	Increase in Grain Size	5.4	Pebbles	27.6	Coarse Gravel	Increase in Grain Size
			1750	123.73	High	123.73	High	No Change	75.3	Small Cobble	75.3	Small Cobble	No Change	199.8	Large Cobble	199.8	Large Cobble	No Change
			1739	65.56	Moderate	53.90	Moderate	No Change	49.5	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change	124.8	Small Cobble	108.9	Small Cobble	No Change
7	HU_MH_ROB_0_2	HU_MH_ROB_0_6 at Highway 427	1706	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1657	10.68	Low	10.17	Low	No Change	14.5	Medium Gravel	14.0	Medium Gravel	No Change	34.7	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
			1618	3.45	None	3.60	None	No Change	6.6	Fine Gravel	6.8	Fine Gravel	No Change	16.6	Coarse Gravel	17.1	Coarse Gravel	No Change
			825	54.71	Moderate	38.50	Moderate	No Change	52.5	Very Coarse Gravel	41.2	Very Coarse Gravel	No Change	73.9	Small Cobble	58.0	Very Coarse Gravel	Decrease in Grain Size
			822	155.46	High	80.66	Moderate	Decrease	94.4	Small Cobble	59.8	Very Coarse Gravel	Decrease in Grain Size	199.8	Large Cobble	129.3	Large Cobble	No Change
		HU_ROB-0-1	821	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			800	12.19	Low	3.43	None	Decrease	20.8	Coarse Gravel	8.7	Medium Gravel	Decrease in Grain Size	21.5	Coarse Gravel	8.9	Medium Gravel	Decrease in Grain Size
			782	107.40	High	75.15	Moderate	Decrease	92.3	Small Cobble	72.6	Small Cobble	No Change	94.3	Small Cobble	72.7	Small Cobble	No Change
			740	23.34	Low	22.53	Low	No Change	26.8	Coarse Gravel	25.9	Coarse Gravel	No Change	50.4	Very Coarse Gravel	49.5	Very Coarse Gravel	No Change
		HU_ROB-0-2	737	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			672	14.99	Low	19.44	Low	No Change	19.4	Coarse Gravel	23.0	Coarse Gravel	No Change	38.5	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
			653	9.52	None	12.65	Low	Increase	14.6	Medium Gravel	17.2	Coarse Gravel	Increase in Grain Size	26.3	Coarse Gravel	34.7	Very Coarse Gravel	Increase in Grain Size
7	HU_MH_ROB_0_5	HU_ROB-0-3 (Transit)	651	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			636	7.78	None	11.55	Low	Increase	12.4	Medium Gravel	16.1	Coarse Gravel	Increase in Grain Size	24.5	Coarse Gravel	32.5	Very Coarse Gravel	Increase in Grain Size
			616	168.05	High	168.05	High	No Change	95.0	Small Cobble	95.0	Small Cobble	No Change	233.9	Large Cobble	233.9	Large Cobble	No Change
			549	311.45	High	248.74	High	No Change	148.4	Large Cobble	127.0	Small Cobble	Decrease in Grain Size	338.4	Small Boulder	291.7	Small Boulder	No Change
			492	163.39	High	232.37	High	No Change	95.0	Small Cobble	120.9	Small Cobble	No Change	219.5	Large Cobble	280.1	Small Boulder	Increase in Grain Size
			429	108.80	High	33.49	Low	Decrease	99.1	Small Cobble	44.2	Very Coarse Gravel	Decrease in Grain Size	83.1	Small Cobble	37.0	Very Coarse Gravel	Decrease in Grain Size
			418	84.08	Moderate	83.52	Moderate	No Change	62.5	Very Coarse Gravel	61.2	Very Coarse Gravel	No Change	129.3	Large Cobble	132.3	Large Cobble	No Change
		HU_ROB-0-4	416	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			400	79.61	Moderate	136.71	High	Increase	62.7	Very Coarse Gravel	89.9	Small Cobble	Increase in Grain Size	113.1	Small Cobble	168.5	Large Cobble	Increase in Grain Size
			384	79.61	Moderate	136.71	High	Increase	62.7	Very Coarse Gravel	89.9	Small Cobble	Increase in Grain Size	113.1	Small Cobble	168.5	Large Cobble	Increase in Grain Size
			1825	1.08	None	1.08	None	No Change	3.0	Very Coarse Sand	3.0	Very Coarse Sand	No Change	7.5	Fine Gravel	7.5	Fine Gravel	No Change
7	HU_MH_ROB_0_6		1817.18	0.76	None	0.76	None	No Change	2.3	Very Coarse Sand	2.3	Very Coarse Sand	No Change	5.7	Pebbles	5.7	Pebbles	No Change
			1787.86	595.12	High	595.12	High	No Change	218.3	Large Cobble	218.3	Large Cobble	No Change	597.1	Medium Boulder	597.1	Medium Boulder	No Change
			1737.61	135.39	High	135.39	High	No Change	82.6	Small Cobble	82.6	Small Cobble	No Change	197.8	Large Cobble	197.8	Large Cobble	No Change
			791	175.89	High	175.89	High	No Change	105.1	Small Cobble	105.1	Small Cobble	No Change	207.5	Large Cobble	207.5	Large Cobble	No Change
			766	19.42	Low	15.28	Low	No Change	23.7	Coarse Gravel	20.0	Coarse Gravel	No Change	44.3	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
		HU_MH_ROB_7_1_1	763	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
7	HU_MH_ROB_7_1		739	9.18	None	12.16	Low	Increase	14.2	Medium Gravel	17.1	Coarse Gravel	Increase in Grain Size	26.3	Coarse Gravel	32.5	Very Coarse Gravel	Increase in Grain Size
			694	137.96	High	137.96	High	No Change	91.7	Small Cobble	91.7	Small Cobble	No Change	165.0	Large Cobble	165.0	Large Cobble	No Change
			666	201.79	High	88.83	Moderate	Decrease	113.0	Small Cobble	63.8	Very Coarse Gravel	Decrease in Grain Size	238.1	Large Cobble	138.6	Large Cobble	No Change
		HU_MH_ROB_7_1_2	664	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			600	34.55	Low	30.55	Low	No Change	34.6	Very Coarse Gravel	31.7	Coarse Gravel	Decrease in Grain Size	67.3	Small Cobble	62.1	Very Coarse Gravel	Decrease in Grain Size
			587	236.73	High	127.76	High	No Change	124.0	Small Cobble	81.2	Small Cobble	No Change	275.5	Small Boulder	181.0	Large Cobble	Decrease in Grain Size
		HU_MH_ROB_7_1_3	585	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			568	21.75	Low	24.14	Low	No Change	25.3	Coarse Gravel	27.1	Coarse Gravel	No Change	48.6	Very Coarse Gravel	52.3	Very Coarse Gravel	No Change
			529	42.33	Moderate	33.82	Low	Decrease	39.6	Very Coarse Gravel	34.0	Very Coarse Gravel	No Change	78.4	Small Cobble	67.3	Small Cobble	No Change
			444	59.60	Moderate	96.92	Moderate	No Change	50.7	Very Coarse Gravel	70.7	Small Cobble	Increase in Grain Size	96.9	Small Cobble	133.9	Large Cobble	Increase in Grain Size
			416	124.14	High	46.19	Moderate	Decrease	82.8	Small Cobble	42.0	Very Coarse Gravel	Decrease in Grain Size	163.3	Large Cobble	83.1	Small Cobble	Decrease in Grain Size
			390	12.19	Low	3.43	None	Decrease	20.8	Coarse Gravel	8.7	Medium Gravel	Decrease in Grain Size	21.5	Coarse Gravel	8.9	Medium Gravel	Decrease in Grain Size
		HU_MH_ROB_7_1_4	388	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			371	12.19	Low	3.43	None	Decrease	20.8	Coarse Gravel	8.7	Medium Gravel	Decrease in Grain Size	21.5	Coarse Gravel	8.9	Medium Gravel	Decrease in Grain Size
			355	12.40	Low	12.40	Low	No Change	17.6	Coarse Gravel	17.6	Coarse Gravel	No Change	31.8	Coarse Gravel	31.8	Coarse Gravel	No Change
7	HU_MH_ROB_7_2		477.94	4.46	None	4.39	None	No Change	10.2	Medium Gravel	10.1	Medium Gravel	No Change	11.2	Medium Gravel	11.2	Medium Gravel	No Change
			461.73	11.28	Low	3.05	None	Decrease	19.5	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size	20.3	Coarse Gravel	8.5	Medium Gravel	Decrease in Grain Size
		HU_HM_ROB_7_2_1	459.8	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			431.8	7.03	None	6.92	None	No Change	13.9	Medium Gravel	13.8	Medium Gravel	No Change	15.1	Medium Gravel	15.1	Medium Gravel	No Change
			389.94	36.61	Moderate	36.61	Moderate	No Change	43.3	Very Coarse Gravel	43.3	Very Coarse Gravel	No Change	46.9	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
			347.68	2.53	None	2.12	None	No Change	7.3	Fine Gravel	6.4	Fine Gravel	No Change	6.9	Fine Gravel	6.0	Pebbles	Decrease in Grain Size
		HU_HM_ROB_7_2_2	346.18	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			270.76	13.90	Low	53.46	Moderate	Increase	22.1	Coarse Gravel	54.1	Very Coarse Gravel	Increase in Grain Size	24.5	Coarse Gravel	66.2	Small Cobble	Increase in Grain Size
			205.88	11.86	Low	4.45	None	Decrease	20.9	Coarse Gravel	10.4	Medium Gravel	Decrease in Grain Size	19.8	Coarse Gravel	10.8	Medium Gravel	Decrease in Grain Size
		HU_HM_ROB_7_2_3 (Transit)	203.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			179.53	122.89	High	147.77	High	No Change	124.8	Small Cobble	140.6	Large Cobble	Increase in Grain Size	65.2	Small Cobble	75.0	Small Cobble	No Change
			1739	1.82	None	2.12	None	No Change	5.6	Pebbles	8.7	Medium Gravel	Increase in Grain Size	6.0	Pebbles	6.6	Fine Gravel	Increase in Grain Size
		HU_HM_ROB_7_2_4	138.45	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			100.22	3.38	None	4.27	None	No Change	8.8	Medium Gravel	28.2	Coarse Gravel	Increase in Grain Size	8.5	Medium Gravel	10.4	Medium Gravel	No Change
			82.64	17.90	Low	17.90	Low	No Change	28.2	Coarse Gravel	35.4	Very Coarse Gravel	Increase in Grain Size	25.1	Coarse Gravel	25.1	Coarse Gravel	No Change
7	HU_MH_ROB_4_1		1874	8.01	None	0.58	None	No Change	17.5	Coarse Gravel	2.9	Very Coarse Sand	Decrease in Grain Size	12.4	Medium Gravel	2.0	Coarse Sand	Decrease in Grain Size
			1859	0.90	None	20.59	Low	Increase	3.7	Very Coarse Sand	30.9	Coarse Gravel	Increase in Grain Size	3.0	Very Coarse Sand	27.6	Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_1	1840	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1823	7.81	None	29.84	Low	Increase	15.6	Medium Gravel	38.6	Very Coarse Gravel	Increase in Grain Size	15.1	Medium Gravel	38.5	Very Coarse Gravel	Increase in Grain Size
			1811	12.09	Low	2.38	None	Decrease	21.7	Coarse Gravel	7.1	Fine Gravel	Decrease in Grain Size	18.7	Coarse Gravel	6.3	Fine Gravel	Decrease in Grain Size
			1802	2.79	None	22.50	Low	Increase	8.0	Medium Gravel	32.7	Very Coarse Gravel	Increase in Grain Size	6.9	Fine Gravel	29.7	Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_2	1780	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1719	1.33	None	2.23	None	No Change	4.5	Very Coarse Sand	6.3	Fine Gravel	Increase in Grain Size	4.6	Very Coarse Sand	7.2	Fine Gravel	Increase in Grain Size
			1681	17.05	Low	14.52	Low	No Change	27.1	Coarse Gravel	23.3	Coarse Gravel	No Change	24.5	Coarse Gravel	24.5	Coarse Gravel	No Change
		HU_MH_ROB_4_3	1671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1646	11.82	Low	15.93	Low	No Change	19.3	Coarse Gravel	23.7	Coarse Gravel	No Change	23.2	Coarse Gravel	28.3	Coarse Gravel	No Change
			1588	0.00	None	11.11	Low	Increase	0.0	Very Fine Sand	18.8	Coarse Gravel	Increase in Grain Size	0.0	Very Fine Sand	21.5	Coarse Gravel	Increase in Grain Size
			1487	137.96	High	137.96	High	No Change	91.7	Small Cobble	91.7	Small Cobble	No Change	165.0	Large Cobble	165.0	Large Cobble	No Change
		HU_MH_ROB_4_4	1482	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1451	201.79	High	88.83	Moderate	Decrease	113.0	Small Cobble	63.8	Very Coarse Gravel	Decrease in Grain Size	238.1	Large Cobble	138.6	Large Cobble	No Change
			1353	34.55	Low	30.55	Low	No Change	34.6	Very Coarse Gravel	31.7	Coarse Gravel	Decrease in Grain Size	67.3	Small Cobble	62.1	Very Coarse Gravel	Decrease in Grain Size
			1252	236.73	High	127.76	High	No Change	124.0	Small Cobble	81.2	Small Cobble	No Change	275.5	Small Boulder	181.0	Large Cobble	Decrease in Grain Size
			1202	124.14	High	46.19	Moderate	Decrease	82.8	Small Cobble	42.0	Very Coarse Gravel	Decrease in Grain Size	163.3	Large Cobble	83.1	Small Cobble	Decrease in Grain Size
			1166	12.19	Low	3.43	None	Decrease	20.8	Coarse Gravel	8.7	Medium Gravel	Decrease in Grain Size	21.5	Coarse Gravel	8.9	Medium Gravel	Decrease in Grain Size
		HU_MH_ROB_4_5	1143	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1114	0.35	None	14.64	Low	Increase	1.8	Coarse Sand	22.5	Coarse Gravel	Increase in Grain Size	2.0	Coarse Sand	26.3	Coarse Gravel	Increase in Grain Size
			1062	0.04	None	27.75	Low	Increase	0.4	Medium Sand	35.5	Very Coarse Gravel	Increase in Grain Size	0.5	Medium Sand	39.3	Very Coarse Gravel	Increase in Grain Size
			1015	0.00	None	11.11	Low	Increase	0.0	Very Fine Sand	18.8	Coarse Gravel	Increase in Grain Size	0.0	Very Fine Sand	21.5	Coarse Gravel	Increase in Grain Size
			997	0.00	None	40.42	Moderate	Increase	0.0		45.8	Very Coarse Gravel		0.0	Silt	51.4	Very Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_6	979	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			965	78.31	Moderate	14.21	Low	Decrease	66.8	Small Cobble	22.0	Coarse Gravel	Decrease in Grain Size	95.6	Small Cobble	26.3	Coarse Gravel	Decrease in Grain Size
			948	16.86	Low	33.51	Low	No Change	24.4	Coarse Gravel	40.5	Very Coarse Gravel	Increase in Grain Size	30.4	Coarse Gravel	45.1	Very Coarse Gravel	Increase in Grain Size
8	HU_MH_MHR_0_1		23547	7.66	None	7.26	None	No Change	10.9	Medium Gravel	10.5	Medium Gravel	No Change	31.1	Coarse Gravel	30.4	Coarse Gravel	No Change
			23517	7.01	None	10.02	Low	Increase	10.3	Medium Gravel	13.1	Medium Gravel	No Change	29.0	Coarse Gravel	37.7	Very Coarse Gravel	Increase in Grain Size
		HU_MH_MHR_01	23516	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23493	6.34	None	8.64	None	No Change	9.6	Medium Gravel	11.8	Medium Gravel	No Change	27.6	Coarse Gravel	34.7	Very Coarse Gravel	Increase in Grain Size
			23474	4.92	None	7.17	None	No Change	8.2	Medium Gravel	10.5	Medium Gravel	No Change	22.0	Coarse Gravel	29.7	Coarse Gravel	No Change
		HU_MH_MHR_02	23473	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23421	3.18	None	3.13	None	No Change	6.1	Fine Gravel	6.0	Fine Gravel	No Change	16.6	Coarse Gravel	16.1	Coarse Gravel	No Change
			23307	14.23	Low	14.23	Low	No Change	16.3	Coarse Gravel	16.3	Coarse Gravel	No Change	50.4	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			1117.01	14.62	Low	11.66	Low	No Change	22.6	Coarse Gravel	19.3	Coarse Gravel	No Change	26.3	Coarse Gravel	22.6	Coarse Gravel	No Change
			1084.93	33.60	Low	53.15	Moderate	Increase	41.0	Very Coarse Gravel	53.4	Very Coarse Gravel	No Change	44.3	Very Coarse Gravel	67.3	Small Cobble	Increase in Grain Size

50-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
8	HU_MH_MHR_3_1	Culvert # HU_MH_MHR_3_1	1054	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			936.63	115.23	High	35.13	Moderate	Decrease	11.2	Medium Gravel	19.7	Coarse Gravel	Increase in Grain Size	13.3	Medium Gravel	26.3	Coarse Gravel	Increase in Grain Size
			884.25	12.19	Low	34.02	Low	No Change	13.1	Medium Gravel	13.1	Medium Gravel	No Change	14.7	Medium Gravel	14.7	Medium Gravel	No Change
8	HU_MH_EHR_1_4		508.348	2.53	None	2.12	None	No Change	11.9	Medium Gravel	21.2	Coarse Gravel	Increase in Grain Size	18.2	Coarse Gravel	33.2	Very Coarse Gravel	Increase in Grain Size
			490.725	13.90	Low	53.46	Moderate	Increase	18.0	Coarse Gravel	16.6	Coarse Gravel	No Change	33.9	Very Coarse Gravel	22.0	Coarse Gravel	Decrease in Grain Size
		Existing Hwy 27 Culvert Proposed Replacement HU_EH_EHT_1_1 (16 m span)	460	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			425.936	139.15	High	139.44	High	No Change	94.5	Small Cobble	94.6	Small Cobble	No Change	156.5	Large Cobble	156.5	Large Cobble	No Change
			400.386	22.61	Low	22.61	Low	No Change	29.1	Coarse Gravel	29.1	Coarse Gravel	No Change	39.3	Very Coarse Gravel	39.3	Very Coarse Gravel	No Change
8	HU_MH_EHR_1_3		542.039	1.68	None	1.40	None	No Change	5.1	Pebbles	4.4	Very Coarse Sand	Decrease in Grain Size	6.3	Fine Gravel	5.4	Pebbles	Decrease in Grain Size
			531.454	77.93	Moderate	31.13	Low	Decrease	65.2	Small Cobble	34.4	Very Coarse Gravel	Decrease in Grain Size	99.5	Small Cobble	54.2	Very Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			515.797	32.13	Low	22.48	Low	No Change	37.4	Very Coarse Gravel	29.1	Coarse Gravel	Decrease in Grain Size	48.6	Very Coarse Gravel	38.5	Very Coarse Gravel	No Change
			507.016	90.29	Moderate	18.90	Low	Decrease	78.3	Small Cobble	25.8	Coarse Gravel	Decrease in Grain Size	91.7	Small Cobble	34.7	Very Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			421.237	67.65	Moderate	23.10	Low	Decrease	61.8	Very Coarse Gravel	29.4	Coarse Gravel	Decrease in Grain Size	81.9	Small Cobble	40.1	Very Coarse Gravel	Decrease in Grain Size
			418.126	25.55	Low	20.10	Low	No Change	32.0	Coarse Gravel	27.0	Coarse Gravel	No Change	41.8	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
		HU_EH_EHT_1_1_3		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			394.723	51.94	Moderate	57.70	Moderate	No Change	51.0	Very Coarse Gravel	54.5	Very Coarse Gravel	No Change	70.5	Small Cobble	76.1	Small Cobble	No Change
			390.543	56.93	Moderate	56.93	Moderate	No Change	54.9	Very Coarse Gravel	54.9	Very Coarse Gravel	No Change	72.7	Small Cobble	72.7	Small Cobble	No Change
		HU_EH_EHT_1_1_4 (Transit)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			367.965	11.28	Low	3.05	None	Decrease	19.5	Coarse Gravel	7.9	Fine Gravel	Decrease in Grain Size	20.3	Coarse Gravel	8.5	Medium Gravel	Decrease in Grain Size
			350.966	7.03	None	6.92	None	No Change	13.9	Medium Gravel	13.8	Medium Gravel	No Change	15.1	Medium Gravel	15.1	Medium Gravel	No Change
8	HU_MH_EHR_1_6		691.945	34.98	Low	51.62	Moderate	Increase	40.8	Very Coarse Gravel	51.1	Very Coarse Gravel	No Change	48.6	Very Coarse Gravel	69.4	Small Cobble	Increase in Grain Size
			643.653	56.99	Moderate	67.24	Moderate	No Change	55.9	Very Coarse Gravel	61.4	Very Coarse Gravel	No Change	70.5	Small Cobble	81.9	Small Cobble	No Change
		Proposed Culvert HU_EH_EHT_1_2_1 (Channel Realignment)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			533.859	42.49	Moderate	17.29	Low	Decrease	47.2	Very Coarse Gravel	24.7	Coarse Gravel	Decrease in Grain Size	54.2	Very Coarse Gravel	31.1	Coarse Gravel	Decrease in Grain Size
			496.432	56.36	Moderate	56.36	Moderate	No Change	55.6	Very Coarse Gravel	55.6	Very Coarse Gravel	No Change	69.4	Small Cobble	69.4	Small Cobble	No Change
8	HU_MH_EHR_1_6		295.252	64.98	Moderate	64.96	Moderate	No Change	59.2	Very Coarse Gravel	59.2	Very Coarse Gravel	No Change	83.1	Small Cobble	83.1	Small Cobble	No Change
			253.906	11.94	Low	56.26	Moderate	Increase	18.5	Coarse Gravel	55.4	Very Coarse Gravel	Increase in Grain Size	25.7	Coarse Gravel	69.4	Small Cobble	Increase in Grain Size
		Existing Hwy 27 culvert/Proposed Culvert HU_EH_EHT_1_2_2	243.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			188.519	20.05	Low	18.96	Low	No Change	26.1	Coarse Gravel	25.1	Coarse Gravel	No Change	37.7	Very Coarse Gravel	37.0	Very Coarse Gravel	No Change
			165.049	55.68	Moderate	55.72	Moderate	No Change	55.3	Very Coarse Gravel	55.4	Very Coarse Gravel	No Change	68.4	Small Cobble	68.4	Small Cobble	No Change
8	HU_MH_EHR_0_2		16040	39.21	Moderate	36.10	Moderate	No Change	33.1	Very Coarse Gravel	31.3	Coarse Gravel	Decrease in Grain Size	98.2	Small Cobble	93.0	Small Cobble	No Change
			16019	34.21	Low	31.50	Low	No Change	30.2	Coarse Gravel	28.6	Coarse Gravel	No Change	88.0	Small Cobble	83.1	Small Cobble	No Change
		HU_EH_EHR_01	16014	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15989	23.55	Low	21.87	Low	No Change	23.6	Coarse Gravel	22.4	Coarse Gravel	No Change	67.3	Small Cobble	64.1	Small Cobble	No Change
			15969	31.35	Low	28.62	Low	No Change	28.6	Coarse Gravel	26.9	Coarse Gravel	No Change	81.9	Small Cobble	77.3	Small Cobble	No Change
		HU_EH_EHR_02	15951	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15925	97.92	Moderate	96.33	Moderate	No Change	61.6	Very Coarse Gravel	60.9	Very Coarse Gravel	No Change	184.7	Large Cobble	182.9	Large Cobble	No Change
			15887	48.14	Moderate	48.14	Moderate	No Change	38.6	Very Coarse Gravel	38.6	Very Coarse Gravel	No Change	108.9	Small Cobble	108.9	Small Cobble	No Change
9	HU_EH_EHR_15_1		2607.261	25.65	Low	21.89	Low	No Change	33.0	Very Coarse Gravel	29.6	Coarse Gravel	Decrease in Grain Size	39.3	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
			2543.462	2543.46	2543.462	2543.46	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change
		Proposed Culvert HU_EH_EHT_15_2_1	2500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2474.157	22.51	Low	31.33	Low	No Change	32.0	Coarse Gravel	39.1	Very Coarse Gravel	Increase in Grain Size	31.8	Coarse Gravel	41.8	Very Coarse Gravel	Increase in Grain Size
			2424.009	34.80	Low	34.44	Low	No Change	42.2	Very Coarse Gravel	41.9	Very Coarse Gravel	No Change	44.3	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
			2390.711	2.47	None	3.36	None	No Change	6.9	Fine Gravel	8.2	Medium Gravel	Increase in Grain Size	7.2	Fine Gravel	9.6	Medium Gravel	Increase in Grain Size
9	HU_EH_EHR_15_1	Proposed Culvert HU_EH_EHT_15_2_2	2350	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.737	27.10	Low	45.68	Moderate	Increase	34.9	Very Coarse Gravel	49.4	Very Coarse Gravel	No Change	39.3	Very Coarse Gravel	57.1	Very Coarse Gravel	No Change
			2274.82	12.00	Low	4.34	None	Decrease	21.6	Coarse Gravel	9.8	Medium Gravel	Decrease in Grain Size	18.7	Coarse Gravel	11.6	Medium Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_15_2_3 (Transit)	2270.82	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2238.847	27.82	Low	36.65	Moderate	Increase	36.5	Very Coarse Gravel	43.0	Very Coarse Gravel	No Change	37.7	Very Coarse Gravel	47.7	Very Coarse Gravel	No Change
			2168.715	13.08	Low	13.08	Low	No Change	22.4	Coarse Gravel	22.4	Coarse Gravel	No Change	20.9	Coarse Gravel	20.9	Coarse Gravel	No Change
9	HU_EH_EHR_15_1		553.4597	0.31	None	0.3	None	No Change	1.483516484	Coarse Sand	1.497252747	Coarse Sand	No Change	2.301478017	Very Coarse Sand	2.301478017	Very Coarse Sand	No Change
			440.7852	1.91	None	1.68	None	No Change	4.903846154	Very Coarse Sand	4.903846154	Very Coarse Sand	No Change	8.891072251	Medium Gravel	8.891072251	Medium Gravel	No Change
		Existing Kriby Road Culvert	399.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			379.0983	71.61	Moderate	61.7	Moderate	No Change	63.4478022	Very Coarse Gravel	63.4478022	Very Coarse Gravel	No Change	87.99771532	Small Cobble	87.99771532	Small Cobble	No Change
			260.5125	6.97	None	5.08	None	No Change	13.46153846	Medium Gravel	12.10164835	Medium Gravel	No Change	16.11964301	Coarse Gravel	14.67559696	Medium Gravel	Decrease in Grain Size
			6169.405	1.79	None	3.70	None	No Change	5.8	Pebbles	9.7	Medium Gravel	Increase in Grain Size	5.1	Pebbles	8.5	Medium Gravel	Increase in Grain Size
			6131.176	1.95	None	1.77	None	No Change	6.4	Fine Gravel	5.7	Pebbles	Decrease in Grain Size	5.1	Pebbles	5.4	Pebbles	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
9	HU_EH_EHR_16_1	Proposed Bridge HU_EH_EHT_16_1	6126.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			6048.088	1.53	None	9.38	None	No Change	5.5	Pebbles	18.3	Coarse Gravel	Increase in Grain Size	4.1	Very Coarse Sand	16.1	Coarse Gravel	Increase in Grain Size
			6006.68	3.97	None	1.69	None	No Change	10.2	Medium Gravel	5.5	Pebbles	Decrease in Grain Size	8.5	Medium Gravel	5.1	Pebbles	Decrease in Grain Size
		Proposed Bridge HU_EH_EHT_16_2 (Transit)	6001	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			5969.339	2.51	None	3.93	None	No Change	7.6	Fine Gravel	10.0	Medium Gravel	Increase in Grain Size	6.3	Fine Gravel	8.9	Medium Gravel	Increase in Grain Size
			5932.436	1.65	None	1.69	None	No Change	5.9	Pebbles	5.9	Pebbles	No Change	4.1	Very Coarse Sand	4.4	Very Coarse Sand	No Change
9	HU_EH_EHR_16_1		3894.471	2.66	None	2.66	None	No Change	7.6	Fine Gravel	7.6	Fine Gravel	No Change	6.9	Fine Gravel	6.9	Fine Gravel	No Change
			3788.84	13.35	Low	13.35	Low	No Change	19.8	Coarse Gravel	19.8	Coarse Gravel	No Change	29.0	Coarse Gravel	29.0	Coarse Gravel	No Change
		Existing Kriby Road Culvert	3773.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3753.025	66.98	Moderate	66.98	Moderate	No Change	60.8	Very Coarse Gravel	60.8	Very Coarse Gravel	No Change	83.1	Small Cobble	83.1	Small Cobble	No Change
			3685.87	44.08	Moderate	44.08	Moderate	No Change	48.3	Very Coarse Gravel	48.3	Very Coarse Gravel	No Change	55.1	Very Coarse Gravel	55.1	Very Coarse Gravel	No Change
9	HU_EH_EHR_17_2		3222.018	14.67	Low	40.67	Moderate	Increase	23.0	Coarse Gravel	46.0	Very Coarse Gravel	Increase in Grain Size	25.1	Coarse Gravel	52.3	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_1	3218	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3137.33	9.08	None	38.98	Moderate	Increase	18.0	Coarse Gravel	44.6	Very Coarse Gravel	Increase in Grain Size	15.1	Medium Gravel	50.4	Very Coarse Gravel	Increase in Grain Size
			3076.886	24.09	Low	2.99	None	Decrease	34.1	Very Coarse Gravel	7.5	Fine Gravel	Decrease in Grain Size	31.8	Coarse Gravel	9.3	Medium Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_4	3068.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3032.119	3.74	None	3.13	None	No Change	8.7	Medium Gravel	7.7	Fine Gravel	Decrease in Grain Size	10.8	Medium Gravel	9.6	Medium Gravel	No Change
			2949.172	28.98	Low	37.58	Moderate	Increase	38.0	Very Coarse Gravel	43.8	Very Coarse Gravel	No Change	37.7	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
		Proposed Culvert HU_EH_EHT_17_3_5 (Transit)	2949.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2886.632	1.61	None	45.21	Moderate	Increase	5.9	Pebbles	48.4	Very Coarse Gravel	Increase in Grain Size	4.1	Very Coarse Sand	58.0	Very Coarse Gravel	Increase in Grain Size
			2788.101	2.44	None	2.44	None	No Change	6.5	Fine Gravel	6.5	Fine Gravel	No Change	7.9	Fine Gravel	7.9	Fine Gravel	No Change
9	HU_EH_EHR_17_2		1812.26	12.92	Low	10.40	Low	No Change	21.2	Coarse Gravel	18.2	Coarse Gravel	No Change	23.2	Coarse Gravel	19.8	Coarse Gravel	No Change
			1625.92	5.28	None	5.28	None	No Change	10.2	Medium Gravel	10.2	Medium Gravel	No Change	16.1	Coarse Gravel	16.1	Coarse Gravel	No Change
		Culvert	1568.03	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1530.3	8.80	None	8.77	None	No Change	14.4	Medium Gravel	14.3	Medium Gravel	No Change	23.2	Coarse Gravel	23.2	Coarse Gravel	No Change
			1415.195	36.39	Moderate	36.39	Moderate	No Change	43.3	Very Coarse Gravel	43.3	Very Coarse Gravel	No Change	46.0	Very Coarse Gravel	46.0	Very Coarse Gravel	No Change
9	HU_EH_EHR_18_1b		2370.437	18.07	Low	26.13	Low	No Change	26.1	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size	30.4	Coarse Gravel	38.5	Very Coarse Gravel	Increase in Grain Size
			2346.795	31.01	Low	14.40	Low	No Change	35.8	Very Coarse Gravel	21.0	Coarse Gravel	Decrease in Grain Size	49.5	Very Coarse Gravel	29.7	Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_18_3_3	2344.79	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.705	52.42	Moderate	58.44	Moderate	No Change	51.9	Very Coarse Gravel	55.8	Very Coarse Gravel	No Change	69.4	Small Cobble	75.0	Small Cobble	No Change
			2275.007	3.36	None	3.14	None	No Change	8.0	Fine Gravel	7.6	Fine Gravel	No Change	10.4	Medium Gravel	10.0	Medium Gravel	No Change
		HU_EH_EHT_18_3_4	2274	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2254.425	64.44	Moderate	70.75	Moderate	No Change	59.0	Very Coarse Gravel	62.7	Very Coarse Gravel	No Change	81.9	Small Cobble	88.0	Small Cobble	No Change
			2242.197	31.77	Low	22.31	Low	No Change	36.4	Very Coarse Gravel	28.6	Coarse Gravel	Decrease in Grain Size	50.4	Very Coarse Gravel	39.3	Very Coarse Gravel	No Change
		HU_EH_EHT_18_3_5	2238.19	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2213.417	9.00	None	8.56	None	No Change	15.2	Medium Gravel	14.7	Medium Gravel	No Change	21.5	Coarse Gravel	20.9	Coarse Gravel	No Change
			2133.69	81.58	Moderate	81.58	Moderate	No Change	68.7	Small Cobble	68.7	Small Cobble	No Change	98.2	Small Cobble	98.2	Small Cobble	No Change
9	HU_EH_EHR_18_1b		928.912	141.81	High	141.81	High	No Change	94.4	Small Cobble	94.4	Small Cobble	No Change	163.3	Large Cobble	163.3	Large Cobble	No Change
			893.029	26.00	Low	26.00	Low	No Change	28.8	Coarse Gravel	28.8	Coarse Gravel	No Change	54.2	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change
		Kriby Road Culvert	881.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			854.967	25.18	Low	25.18	Low	No Change	28.1	Coarse Gravel	28.1	Coarse Gravel	No Change	53.2	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
			773.018	123.86	High	123.86	High	No Change	87.4	Small Cobble	87.4	Small Cobble	No Change	144.9	Large Cobble	144.9	Large Cobble	No Change
9	HU_EH_EHR_18_4		3924.49	28.49	Low	37.07	Moderate	Increase	37.3	Very Coarse Gravel	43.5	Very Coarse Gravel	No Change	37.7	Very Coarse Gravel	47.7	Very Coarse Gravel	No Change
		HU_EH_EHT_18_5_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3777.79	6.69	None	7.15	None	No Change	13.3	Medium Gravel	13.8	Medium Gravel	No Change	15.1	Medium Gravel	16.1	Coarse Gravel	Increase in Grain Size
			3687.29	19.01	Low	20.84	Low	No Change	26.6	Coarse Gravel	28.4	Coarse Gravel	No Change	32.5	Very Coarse Gravel	34.7	Very Coarse Gravel	No Change
		HU_EH_EHT_18_5_2	3673.29	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3645.09	25.85	Low	38.35	Moderate	Increase	35.1	Very Coarse Gravel	43.9	Very Coarse Gravel	No Change	34.7	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			3582.79	3.29	None	3.04	None	No Change	8.0	Medium Gravel	7.6	Fine Gravel	Decrease in Grain Size	9.6	Medium Gravel	9.3	Medium Gravel	No Change
		Existing Hwy400 culvert	3544.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3717.174	0.14	None	0.20	None	No Change	1.0	Coarse Sand	1.3	Coarse Sand	No Change	0.9	Coarse Sand	1.1	Coarse Sand	No Change
9	HU_EH_EHR_18_5		3434.259	0.68	None	1.88	None	No Change	2.7	Very Coarse Sand	5.3	Pebbles	Increase in Grain Size	3.5	Very Coarse Sand	7.2	Fine Gravel	Increase in Grain Size
		HU_EH_EHT_18_3_6		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3359.886	0.01	None	0.38	None	No Change	0.2	Fine Sand	1.7	Coarse Sand	Increase in Grain Size	0.2	Medium Sand	2.5	Very Coarse Sand	Increase in Grain Size
			3349.546	0.00	None	0.00	None	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			3311.742	0.12	None	0.12	None	No Change	0.8	Coarse Sand	0.8	Coarse Sand	No Change	1.1	Coarse Sand	1.1	Coarse Sand	No Change
		Existing Private Culvert	3307	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3287.195	16.95	Low	19.16	Low	No Change	24.1	Coarse Gravel	26.2	Coarse Gravel	No Change	31.8	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
			3218.272	27.18	Low	20.82	Low	No Change	36.3	Very Coarse Gravel	30.1	Coarse Gravel	Decrease in Grain Size	36.2	Very Coarse Gravel	30.4	Coarse Gravel	Decrease in Grain Size
			3717.174	0.14	None	0.20	None	No Change	1.0	Coarse Sand	1.3	Coarse Sand	No Change	0.9	Coarse Sand	1.1	Coarse Sand	No Change
		HU_EH_EHT_18_6_1	3670	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3630.589	2.17	None	4.47	None	No Change	6.6	Fine Gravel	10.3	Medium Gravel	Increase in Grain Size	6.0	Pebbles	11.2	Medium Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	50-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
9	HU_EH_EHR_18_5		3600.859	37.47	Moderate	30.16	Low	Decrease	43.8	Very Coarse Gravel	38.8	Very Coarse Gravel	No Change	47.7	Very Coarse Gravel	39.3	Very Coarse Gravel	No Change
		HU_EH_EHT_18_6_2	3594	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3222.018	14.67	Low	40.67	Moderate	Increase	23.0	Coarse Gravel	46.0	Very Coarse Gravel	Increase in Grain Size	25.1	Coarse Gravel	52.3	Very Coarse Gravel	Increase in Grain Size
			3137.33	9.08	None	38.98	Moderate	Increase	18.0	Coarse Gravel	44.6	Very Coarse Gravel	Increase in Grain Size	15.1	Medium Gravel	50.4	Very Coarse Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
1	SIM_EB_SM_0_3		63.167	0.11	None	0.10	None	No Change	0.7	Coarse Sand	0.6	Coarse Sand	No Change	1.1	Coarse Sand	1.1	Coarse Sand	No Change
			63	0.07	None	0.06	None	No Change	0.5	Coarse Sand	0.5	Medium Sand	Decrease in Grain Size	0.8	Coarse Sand	0.8	Coarse Sand	No Change
	SIM_EB_SM_0_2	W-W4 (401 culvert extension)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			60.5	6.83	None	107.93	High	Increase	12.0	Medium Gravel	80.4	Small Cobble	Increase in Grain Size	19.8	Coarse Gravel	127.8	Small Cobble	Increase in Grain Size
			60	103.52	High	14.89	Low	Decrease	78.5	Small Cobble	20.6	Coarse Gravel	Decrease in Grain Size	123.3	Small Cobble	33.2	Very Coarse Gravel	Decrease in Grain Size
1	SM_EL_SIM_1_2	SM_EL_SIM_1_WC1.1		Flow event not modelled					Flow event not modelled							61.0	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC1.2		Flow event not modelled					Flow event not modelled							46.9	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC1.5		Flow event not modelled					Flow event not modelled							118.9	Small Cobble	No Existing Velocity Provided
1	SM_EL_SIM_1_3	SM_EL_SIM_1_WC1		Flow event not modelled					Flow event not modelled					59.04	Very Coarse Gravel	287.0	Small Boulder	Increase in Grain Size
		SM_EL_SIM_1_WC1.6		Flow event not modelled					Flow event not modelled							56.1	Very Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_4	SM_EL_SIM_1_WC2.1		Flow event not modelled					Flow event not modelled							33.2	Very Coarse Gravel	No Existing Velocity Provided
		SM_EL_SIM_1_WC2.2		Flow event not modelled					Flow event not modelled							30.4	Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_5	SM_EL_SIM_1_WC2.3		Flow event not modelled					Flow event not modelled					161.60	Large Cobble	161.6	Large Cobble	No Change
1	SM_EL_SIM_1_8	SM_EL_SIM_1_WC3.1		Flow event not modelled					Flow event not modelled							80.8	Small Cobble	No Existing Velocity Provided
		SM_EL_SIM_1_WC3.2		Flow event not modelled					Flow event not modelled					195.94	Large Cobble	100.8	Small Cobble	Decrease in Grain Size
		SM_EL_SIM_1_WC3.3		Flow event not modelled					Flow event not modelled							195.9	Large Cobble	No Existing Velocity Provided
		SM_EL_SIM_1_WC3.6		Flow event not modelled					Flow event not modelled							62.1	Very Coarse Gravel	No Existing Velocity Provided
1	SM_EL_SIM_1_10	SM_EL_SIM_1_WC4		Flow event not modelled					Flow event not modelled					58.05	Very Coarse Gravel	294.1	Small Boulder	Increase in Grain Size
2	CR_MC_MUL_8_3	CR-MC-MUL-8-WC1		Flow event not modelled					Flow event not modelled					65.17	Small Cobble	294.1	Small Boulder	Increase in Grain Size
2	CR_MC_MUL_8_4	CR-MC-MUL-8-WC3		Flow event not modelled					Flow event not modelled					3.05	Very Coarse Sand	118.9	Small Cobble	Increase in Grain Size
2	CR_MC_MUL_8_6	CR-MC-MUL-8-WC4		Flow event not modelled					Flow event not modelled					4.89	Very Coarse Sand	148.2	Large Cobble	Increase in Grain Size
2	CR_LC_LEV_1_2	CR_LC_LEV_1_WC2		Flow event not modelled					Flow event not modelled					27.65	Coarse Gravel	694.8	Medium Boulder	Increase in Grain Size
2	CR_LC_LEV_0_1		55567	187.34	High	190.42	High	No Change	102.2	Small Cobble	103.3	Small Cobble	No Change	253.1	Large Cobble	255.3	Large Cobble	No Change
			55408	64.94	Moderate	63.95	Moderate	No Change	49.8	Very Coarse Gravel	49.3	Very Coarse Gravel	No Change	120.3	Small Cobble	118.9	Small Cobble	No Change
		W-W56		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	CR_LC_LEV_0_2		55270	108.59	High	112.28	High	No Change	74.0	Small Cobble	75.5	Small Cobble	No Change	156.5	Large Cobble	159.9	Large Cobble	No Change
			55202	118.39	High	118.64	High	No Change	76.9	Small Cobble	76.9	Small Cobble	No Change	172.1	Large Cobble	173.8	Large Cobble	No Change
			54959	28.26	Low	29.80	Low	No Change	27.0	Coarse Gravel	28.0	Coarse Gravel	No Change	75.0	Small Cobble	77.3	Small Cobble	No Change
			54949	10.05	Low	10.48	Low	No Change	13.5	Medium Gravel	13.9	Medium Gravel	No Change	35.4	Very Coarse Gravel	37.0	Very Coarse Gravel	No Change
		Embleton Road		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			54909	26.94	Low	26.98	Low	No Change	26.5	Coarse Gravel	26.5	Coarse Gravel	No Change	70.5	Small Cobble	70.5	Small Cobble	No Change
			54867	217.83	High	236.09	High	No Change	108.0	Small Cobble	114.0	Small Cobble	No Change	310.9	Small Boulder	330.8	Small Boulder	No Change
2	CR_LC_LEV_2_4		42344	67.82	Moderate	67.82	Moderate	No Change	56.5	Very Coarse Gravel	56.5	Very Coarse Gravel	No Change	100.8	Small Cobble	100.8	Small Cobble	No Change
		CR_LC_LEV_2_WC1.1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			42314	101.06	High	101.06	High	No Change	82.1	Small Cobble	82.1	Small Cobble	No Change	137.0	Large Cobble	137.0	Large Cobble	No Change
			42249	187.34	High	190.42	High	No Change	74.1	Small Cobble	74.1	Small Cobble	No Change	132.3	Large Cobble	132.3	Large Cobble	No Change
2	CR_LC_LEV_2_5	CR_LC_LEV_2_WC2.1		Flow event not modelled					Flow event not modelled					7.20	Fine Gravel	552.9	Medium Boulder	Increase in Grain Size
		CR_LC_LEV_2_WC2.2		Flow event not modelled					Flow event not modelled					11.18	Medium Gravel	569.7	Medium Boulder	Increase in Grain Size
		CR_LC_LEV_2_WC2		Flow event not modelled					Flow event not modelled					6.57	Fine Gravel	375.1	Small Boulder	Increase in Grain Size
2	CR_LC_LEV_2_6	CR_LC_LEV_2_WC6		Flow event not modelled					Flow event not modelled					2.48	Very Coarse Sand	284.7	Small Boulder	Increase in Grain Size
2	CR_LC_LEV_10_1	CR_LC_LEV_10_WC1.1		Flow event not modelled					Flow event not modelled							440.0	Small Boulder	No Existing Velocity Provided
3	CR_NP_CRR_9_1	CR_NP_CRR_9_WC1		Flow event not modelled					Flow event not modelled					11.18	Medium Gravel	298.8	Small Boulder	Increase in Grain Size
		CR_NP_CRR_9_WC2		Flow event not modelled					Flow event not modelled					7.85	Fine Gravel	184.7	Large Cobble	Increase in Grain Size
3	CR_NP_CRR_3_2	CR_NP_CRR_3_WC1.1		Flow event not modelled					Flow event not modelled					4.14	Very Coarse Sand	323.2	Small Boulder	Increase in Grain Size
3	CR_NP_CRR_3_1	CR_NP_CRR_3_WC3.1		Flow event not modelled					Flow event not modelled					7.20	Fine Gravel	325.7	Small Boulder	Increase in Grain Size
		CR_NP_CRR_3_WC2		Flow event not modelled					Flow event not modelled							323.2	Small Boulder	No Existing Velocity Provided
		CR_NP_CRR_3_WC3		Flow event not modelled					Flow event not modelled					2.85	Very Coarse Sand	440.0	Small Boulder	Increase in Grain Size
3	CR_NP_CRR_3_3	CR_NP_CRR_3_WC4		Flow event not modelled					Flow event not modelled					7.85	Fine Gravel	343.5	Small Boulder	Increase in Grain Size
3	CR_NP_CRR_13_1	CR_NP_CRR_13_WC2		Flow event not modelled					Flow event not modelled							240.2	Large Cobble	No Existing Velocity Provided
3	CR_NP_CRR_13_MW (near)	CR_NP_CRR_13_WC3		Flow event not modelled					Flow event not modelled					3.25	Very Coarse Sand	211.5	Large Cobble	Increase in Grain Size
3	CR_HC_HUT_6_3	CR_HC_HUT_6_WC1		Flow event not modelled					Flow event not modelled							277.8	Small Boulder	No Existing Velocity Provided
4	EC_EH_ETW_12_3		2280	1.81	None	2.44	None	No Change	5.4	Pebbles	6.6	Fine Gravel	Increase in Grain Size	6.3	Fine Gravel	7.9	Fine Gravel	No Change
			2224	44.01	Moderate	8.43	None	Decrease	47.5	Very Coarse Gravel	14.9	Medium Gravel	Decrease in Grain Size	57.1	Very Coarse Gravel	19.8	Coarse Gravel	Decrease in Grain Size
		Post_ETW_12_WC1 (234.08)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2136	14.16	Low	14.28	Low	No Change	20.3	Coarse Gravel	20.3	Coarse Gravel	No Change	31.1	Coarse Gravel	31.8	Coarse Gravel	No Change
			2087	7.47	None	7.73	None	No Change	13.0	Medium Gravel	13.3	Medium Gravel	No Change	20.3	Coarse Gravel	20.9	Coarse Gravel	No Change
4	EC_EH_ETW_10_1 (Bridge)		1745	1.63	None	17.44	Low	Increase	5.5	Pebbles	28.3	Coarse Gravel	Increase in Grain Size	4.9	Very Coarse Sand	23.8	Coarse Gravel	Increase in Grain Size
			1673	16.29	Low	1.01	None	Decrease	24.8	Coarse Gravel	3.6	Very Coarse Sand	Decrease in Grain Size	27.0	Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size
		Post_ETW_10_W1 (234.06)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1610	1.64	None	4.20	None	No Change	5.5	Pebbles	9.8	Medium Gravel	Increase in Grain Size	4.9	Very Coarse Sand	10.8	Medium Gravel	Increase in Grain Size
			1578	0.72	None	0.72	None	No Change	3.1	Very Coarse Sand	3.1	Very Coarse Sand	No Change	2.9	Very Coarse Sand	2.9	Very Coarse Sand	No Change
			1549	9.09	None	9.26	None	No Change	15.1	Medium Gravel	15.1	Medium Gravel	No Change	22.6	Coarse Gravel	23.2	Coarse Gravel	No Change
			1526	6.80	None	7.67	None	No Change	12.4	Medium Gravel	13.3	Medium Gravel	No Change	18.2	Coarse Gravel	20.3	Coarse Gravel	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
4	EC_EH_ETW_9_3	Post_ETW_9_WC2 (234.03)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1441	9.29	None	10.21	Low	Increase	15.8	Medium Gravel	16.7	Coarse Gravel	Increase in Grain Size	21.5	Coarse Gravel	23.2	Coarse Gravel	No Change
			1373	0.25	None	0.27	None	No Change	1.4	Coarse Sand	1.5	Coarse Sand	No Change	1.7	Coarse Sand	1.8	Coarse Sand	No Change
4	EC_EH_ETW_7_2 (Bridge)		800	7.71	None	4.20	None	No Change	13.9	Medium Gravel	9.1	Medium Gravel	No Change	18.7	Coarse Gravel	12.4	Medium Gravel	Decrease in Grain Size
			791	45.36	Moderate	4.39	None	Decrease	48.7	Very Coarse Gravel	9.3	Medium Gravel	Decrease in Grain Size	58.0	Very Coarse Gravel	13.3	Medium Gravel	Decrease in Grain Size
		Post_Upper_Etobicoke_CH_IC (233.03)	750	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			723	4.55	None	4.90	None	No Change	9.4	Medium Gravel	9.8	Medium Gravel	No Change	13.8	Medium Gravel	15.1	Medium Gravel	No Change
			708	88.98	Moderate	97.10	Moderate	No Change	69.2	Small Cobble	73.0	Small Cobble	No Change	117.4	Small Cobble	126.3	Small Cobble	No Change
4	EC_EH_ETW_7_1		759	40.79	Moderate	41.93	Moderate	No Change	43.4	Very Coarse Gravel	43.9	Very Coarse Gravel	No Change	59.0	Very Coarse Gravel	61.0	Very Coarse Gravel	No Change
			745	38.49	Moderate	2.59	None	Decrease	43.6	Very Coarse Gravel	6.6	Fine Gravel	Decrease in Grain Size	51.4	Very Coarse Gravel	8.9	Medium Gravel	Decrease in Grain Size
		W-W108	TBD	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			639	1.19	None	1.28	None	No Change	4.1	Very Coarse Sand	4.3	Very Coarse Sand	No Change	4.6	Very Coarse Sand	4.9	Very Coarse Sand	No Change
			623	4.56	None	5.01	None	No Change	9.7	Medium Gravel	10.3	Medium Gravel	No Change	13.3	Medium Gravel	14.2	Medium Gravel	No Change
4	EC_EH_ETW_6_1 (Culvert)		848	23.23	Low	23.54	Low	No Change	26.8	Coarse Gravel	26.9	Coarse Gravel	No Change	49.5	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			841	92.60	Moderate	100.46	High	Increase	68.6	Small Cobble	72.2	Small Cobble	No Change	129.3	Large Cobble	138.6	Large Cobble	No Change
		EC_EH_ETW_6_WC1.1 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			816	94.15	Moderate	17.21	Low	Decrease	72.1	Small Cobble	22.3	Coarse Gravel	Decrease in Grain Size	120.3	Small Cobble	38.5	Very Coarse Gravel	Decrease in Grain Size
		EC_EH_ETW_6_WC1.2, Existing (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			794	5.36	None	1.08	None	No Change	11.1	Medium Gravel	3.6	Very Coarse Sand	Decrease in Grain Size	13.8	Medium Gravel	5.1	Pebbles	Decrease in Grain Size
			723	1.28	None	0.50	None	No Change	3.8	Very Coarse Sand	1.9	Coarse Sand	Decrease in Grain Size	6.6	Fine Gravel	3.5	Very Coarse Sand	Decrease in Grain Size
			708	99.54	Moderate	10.31	Low	Decrease	72.0	Small Cobble	14.9	Medium Gravel	Decrease in Grain Size	137.0	Large Cobble	30.4	Coarse Gravel	Decrease in Grain Size
		EC_EH_ETW_6_WC1.4 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			616	102.72	High	130.76	High	No Change	75.2	Small Cobble	87.3	Small Cobble	No Change	133.9	Large Cobble	163.3	Large Cobble	No Change
			606	13.95	Low	12.94	Low	No Change	20.0	Coarse Gravel	18.9	Coarse Gravel	No Change	31.1	Coarse Gravel	29.7	Coarse Gravel	No Change
		EC_EH_ETW_6_WC1.5 (232.07)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			587	46.38	Moderate	45.27	Moderate	No Change	43.0	Very Coarse Gravel	42.0	Very Coarse Gravel	No Change	79.6	Small Cobble	79.6	Small Cobble	No Change
			568	128.94	High	136.54	High	No Change	86.1	Small Cobble	88.8	Small Cobble	No Change	163.3	Large Cobble	172.1	Large Cobble	No Change
4	EC_EH_ETW_6_4 (Bridge)		746	5.64	None	0.86	None	No Change	12.0	Medium Gravel	3.2	Very Coarse Sand	Decrease in Grain Size	12.9	Medium Gravel	3.9	Very Coarse Sand	Decrease in Grain Size
			737	5.12	None	2.22	None	No Change	11.5	Medium Gravel	6.0	Fine Gravel	Decrease in Grain Size	11.6	Medium Gravel	7.5	Fine Gravel	Decrease in Grain Size
		Post_ETW_6_WC3 -25m 232.02-Lower	700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			635	6.86	None	8.24	None	No Change	13.5	Medium Gravel	15.2	Medium Gravel	No Change	15.6	Medium Gravel	18.2	Coarse Gravel	Increase in Grain Size
			629	5.73	None	6.34	None	No Change	12.0	Medium Gravel	12.8	Medium Gravel	No Change	13.3	Medium Gravel	14.7	Medium Gravel	No Change
4			858	28.96	Low	66.44	Moderate	Increase	33.7	Very Coarse Gravel	59.4	Very Coarse Gravel	No Change	48.6	Very Coarse Gravel	86.8	Small Cobble	Increase in Grain Size
			833	74.15	Moderate	16.75	Low	Decrease	64.8	Small Cobble	22.9	Coarse Gravel	Decrease in Grain Size	90.5	Small Cobble	34.7	Very Coarse Gravel	Decrease in Grain Size
		Post_ETW_1_WC1 230.18	800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			768	2.77	None	1.99	None	No Change	6.7	Fine Gravel	5.3	Pebbles	Decrease in Grain Size	9.6	Medium Gravel	7.9	Fine Gravel	Decrease in Grain Size
			726	0.62	None	0.58	None	No Change	2.3	Very Coarse Sand	2.1	Very Coarse Sand	No Change	4.1	Very Coarse Sand	3.9	Very Coarse Sand	No Change
			703	0.73	None	0.67	None	No Change	2.5	Very Coarse Sand	2.3	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.6	Very Coarse Sand	No Change
			671	0.73	None	0.67	None	No Change	2.5	Very Coarse Sand	2.3	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.6	Very Coarse Sand	No Change
			663	0.73	None	0.67	None	No Change	2.5	Very Coarse Sand	2.3	Very Coarse Sand	No Change	4.9	Very Coarse Sand	4.6	Very Coarse Sand	No Change
4	Culvert (pre existing)	Post_ETW_1_WC1 230.18	660	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
	Culvert (pre existing)		637	4.00	None	4.42	None	No Change	7.8	Fine Gravel	8.3	Medium Gravel	Increase in Grain Size	15.6	Medium Gravel	17.1	Coarse Gravel	Increase in Grain Size
			621	0.23	None	0.26	None	No Change	1.1	Coarse Sand	1.2	Coarse Sand	No Change	2.3	Very Coarse Sand	2.5	Very Coarse Sand	No Change
			588	0.01	None	0.01	None	No Change	0.1	Fine Sand	0.2	Fine Sand	No Change	0.2	Medium Sand	0.3	Medium Sand	No Change
			551	0.02	None	0.03	None	No Change	0.2	Medium Sand	0.3	Medium Sand	No Change	0.5	Medium Sand	0.5	Coarse Sand	Increase in Grain Size
			545	235.15	High	252.16	High	No Change	125.1	Small Cobble	130.2	Large Cobble	Increase in Grain Size	266.4	Small Boulder	284.7	Small Boulder	No Change
		Post_ETW_1_WC1 230.18	540	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			522	275.49	High	292.00	High	No Change	139.4	Large Cobble	144.1	Large Cobble	No Change	296.4	Small Boulder	313.3	Small Boulder	No Change
			510	32.64	Low	35.00	Moderate	Increase	35.4	Very Coarse Gravel	36.9	Very Coarse Gravel	No Change	57.1	Very Coarse Gravel	60.0	Very Coarse Gravel	No Change
4	EC_EH_ETW_1_5 (Bridge)		2746	3.11	None	3.56	None	No Change	7.0	Fine Gravel	7.6	Fine Gravel	No Change	11.6	Medium Gravel	12.9	Medium Gravel	No Change
			2660	22.78	Low	25.76	Low	No Change	27.8	Coarse Gravel	30.0	Coarse Gravel	No Change	44.3	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
		Post_ETW_1_WC3 230.12	1170	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	135.62	High	157.16	High	No Change	88.3	Small Cobble	97.1	Small Cobble	No Change	172.1	Large Cobble	192.2	Large Cobble	No Change
			2401	8.90	None	9.54	None	No Change	14.1	Medium Gravel	14.7	Medium Gravel	No Change	25.1	Coarse Gravel	26.3	Coarse Gravel	No Change
5	EC_EH_ETW_1_7 (Bridge)		554	9.91	None	9.49	None	No Change	15.3	Medium Gravel	14.8	Medium Gravel	No Change	26.3	Coarse Gravel	25.7	Coarse Gravel	No Change
			523	95.23	Moderate	30.41	Low	Decrease	73.3	Small Cobble	32.8	Very Coarse Gravel	Decrease in Grain Size	118.9	Small Cobble	57.1	Very Coarse Gravel	Decrease in Grain Size
		Post_ETW_1_WC5 (230.07)	500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			413	20.92	Low	23.65	Low	No Change	25.2	Coarse Gravel	27.2	Coarse Gravel	No Change	45.1	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			380	49.07	Moderate	52.12	Moderate	No Change	45.2	Very Coarse Gravel	46.8	Very Coarse Gravel	No Change	80.8	Small Cobble	85.5	Small Cobble	No Change
5	EC_EH_ETW_1_8 (Culvert)		499	10.57	Low	17.75	Low	No Change	17.7	Coarse Gravel	25.0	Coarse Gravel	No Change	22.0	Coarse Gravel	32.5	Very Coarse Gravel	Increase in Grain Size
			456	50.66	Moderate	23.99	Low	Decrease	49.6	Very Coarse Gravel	29.2	Coarse Gravel	Decrease in Grain Size	70.5	Small Cobble	44.3	Very Coarse Gravel	Decrease in Grain Size
			439	44.43	Moderate	0.81	None	Decrease	48.4	Very Coarse Gravel	3.0	Very Coarse Sand	Decrease in Grain Size	56.1	Very Coarse Gravel	4.1	Very Coarse Sand	Decrease in Grain Size
		Post_ETW_1_WC6 230.05	400	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

100-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			358	23.98	Low	26.20	Low	No Change	32.4	Very Coarse Gravel	34.2	Very Coarse Gravel	No Change	35.4	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
			345	35.94	Moderate	39.06	Moderate	No Change	43.0	Very Coarse Gravel	45.2	Very Coarse Gravel	No Change	46.0	Very Coarse Gravel	49.5	Very Coarse Gravel	No Change
5	EC_EH_ETW_1_11 (Bridge)		1958	11.06	Low	13.92	Low	No Change	18.2	Coarse Gravel	21.2	Coarse Gravel	No Change	22.6	Coarse Gravel	27.0	Coarse Gravel	No Change
			1920	17.70	Low	12.19	Low	No Change	24.8	Coarse Gravel	18.9	Coarse Gravel	No Change	32.5	Very Coarse Gravel	25.7	Coarse Gravel	Decrease in Grain Size
		Post_ETW_1_WC8 229.07	1900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1568	56.73	Moderate	59.28	Moderate	No Change	56.0	Very Coarse Gravel	57.3	Very Coarse Gravel	No Change	69.4	Small Cobble	72.7	Small Cobble	No Change
			2746	3.11	None	3.56	None	No Change	7.0	Fine Gravel	7.6	Fine Gravel	No Change	11.6	Medium Gravel	12.9	Medium Gravel	No Change
5	EC_EH_ETW_1_12 (Bridge)		2660	22.78	Low	25.76	Low	No Change	27.8	Coarse Gravel	30.0	Coarse Gravel	No Change	44.3	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
		Post_ETW_1_WC10 229.01	2600	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2528	135.62	High	157.16	High	No Change	88.3	Small Cobble	97.1	Small Cobble	No Change	172.1	Large Cobble	192.2	Large Cobble	No Change
			2401	8.90	None	9.54	None	No Change	14.1	Medium Gravel	14.7	Medium Gravel	No Change	25.1	Coarse Gravel	26.3	Coarse Gravel	No Change
			3401	1.17	None	0.61	None	No Change	4.8	Very Coarse Sand	3.0	Very Coarse Sand	No Change	3.0	Very Coarse Sand	2.0	Coarse Sand	Decrease in Grain Size
			3302	2.85	None	3.73	None	No Change	8.8	Medium Gravel	10.2	Medium Gravel	No Change	6.0	Pebbles	7.5	Fine Gravel	Increase in Grain Size
		West_WH_CAC	3000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2982	3.33	None	5.63	None	No Change	9.8	Medium Gravel	13.7	Medium Gravel	No Change	6.6	Fine Gravel	10.0	Medium Gravel	Increase in Grain Size
5	HU_WH_CAC_01 (Bridge)		2918	2.11	None	1.52	None	No Change	7.3	Fine Gravel	5.7	Pebbles	Decrease in Grain Size	4.6	Very Coarse Sand	3.9	Very Coarse Sand	No Change
			2842	11.54	Low	8.01	None	Decrease	22.6	Coarse Gravel	17.4	Coarse Gravel	No Change	15.6	Medium Gravel	12.4	Medium Gravel	No Change
		West_WH_CAC	2800	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2762	17.40	Low	20.29	Low	No Change	30.2	Coarse Gravel	33.3	Very Coarse Gravel	Increase in Grain Size	20.3	Coarse Gravel	23.2	Coarse Gravel	No Change
			2657	152.18	High	162.81	High	No Change	142.8	Large Cobble	148.4	Large Cobble	No Change	77.3	Small Cobble	83.1	Small Cobble	No Change
			513.703	0.27	None	0.27	None	No Change	1.2	Coarse Sand	1.2	Coarse Sand	No Change	2.7	Very Coarse Sand	2.7	Very Coarse Sand	No Change
			513.696	4.61	None	4.61	None	No Change	8.0	Medium Gravel	8.0	Medium Gravel	No Change	20.3	Coarse Gravel	20.3	Coarse Gravel	No Change
5	Culvert (Existing)	West_WH_CAC	513.682	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			513.664	76.03	Moderate	76.03	Moderate	No Change	56.4	Very Coarse Gravel	56.4	Very Coarse Gravel	No Change	129.3	Large Cobble	129.3	Large Cobble	No Change
			513.656	13.98	Low	13.98	Low	No Change	18.1	Coarse Gravel	18.1	Coarse Gravel	No Change	38.5	Very Coarse Gravel	38.5	Very Coarse Gravel	No Change
			512.119	0.02	None	0.02	None	No Change	0.2	Medium Sand	0.2	Medium Sand	No Change	0.5	Medium Sand	0.5	Medium Sand	No Change
			512.109	1.80	None	1.80	None	No Change	4.2	Very Coarse Sand	4.2	Very Coarse Sand	No Change	10.8	Medium Gravel	10.8	Medium Gravel	No Change
5	Culvert (Existing)	West_WH_CAC	512.088	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			512.06	112.92	High	112.92	High	No Change	75.3	Small Cobble	75.3	Small Cobble	No Change	163.3	Large Cobble	163.3	Large Cobble	No Change
			512.053	16.06	Low	16.06	Low	No Change	20.2	Coarse Gravel	20.2	Coarse Gravel	No Change	40.9	Very Coarse Gravel	40.9	Very Coarse Gravel	No Change
			5300	37.24	Moderate	26.36	Low	Decrease	35.9	Very Coarse Gravel	28.2	Coarse Gravel	Decrease in Grain Size	72.7	Small Cobble	59.0	Very Coarse Gravel	Decrease in Grain Size
			5083	16.81	Low	13.43	Low	No Change	21.3	Coarse Gravel	18.0	Coarse Gravel	No Change	40.1	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.1	5000	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4962	11.39	Low	39.30	Moderate	Increase	16.7	Coarse Gravel	36.7	Very Coarse Gravel	Increase in Grain Size	29.0	Coarse Gravel	78.4	Small Cobble	Increase in Grain Size
5	HU_WH_TWH_1_4 (Bridge Pre-existing)		4945	33.03	Low	19.26	Low	No Change	33.2	Very Coarse Gravel	22.8	Coarse Gravel	Decrease in Grain Size	67.3	Small Cobble	46.9	Very Coarse Gravel	Decrease in Grain Size
			4881	6.91	None	12.59	Low	Increase	11.8	Medium Gravel	17.3	Coarse Gravel	Increase in Grain Size	21.5	Coarse Gravel	33.9	Very Coarse Gravel	Increase in Grain Size
		HU_WH_TWH_1_WC2.1	4700	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			4625	2.26	None	4.28	None	No Change	5.5	Pebbles	8.4	Medium Gravel	Increase in Grain Size	9.6	Medium Gravel	15.6	Medium Gravel	No Change
			4597	2.00	None	2.02	None	No Change	5.1	Pebbles	5.1	Pebbles	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change
			4047	236.35	High	248.84	High	No Change	126.9	Small Cobble	130.5	Large Cobble	Increase in Grain Size	261.9	Small Boulder	275.5	Small Boulder	No Change
5	HU_WH_TWH_1_2 (Bridge)		4006	7.17	None	10.85	Low	Increase	12.2	Medium Gravel	15.8	Medium Gravel	No Change	21.5	Coarse Gravel	30.4	Coarse Gravel	No Change
		HU_WH_TWH_1_WC2.3	3900	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3865	59.32	Moderate	115.57	High	Increase	51.3	Very Coarse Gravel	79.9	Small Cobble	Increase in Grain Size	93.0	Small Cobble	151.5	Large Cobble	Increase in Grain Size
			3822	15.40	Low	15.93	Low	No Change	21.0	Coarse Gravel	21.3	Coarse Gravel	No Change	34.7	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
			511.957	25.58	Low	25.58	Low	No Change	27.8	Coarse Gravel	27.8	Coarse Gravel	No Change	56.1	Very Coarse Gravel	56.1	Very Coarse Gravel	No Change
			511.762	2.39	None	2.39	None	No Change	5.7	Pebbles	5.7	Pebbles	No Change	10.0	Medium Gravel	10.0	Medium Gravel	No Change
5	HU_WH_CAC_02a (Culvert)	West_WH_CAC	511.615	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			511.563	7.12	None	7.12	None	No Change	11.6	Medium Gravel	11.6	Medium Gravel	No Change	23.8	Coarse Gravel	23.8	Coarse Gravel	No Change
			511.364	85.75	Moderate	85.75	Moderate	No Change	60.0	Very Coarse Gravel	60.0	Very Coarse Gravel	No Change	146.6	Large Cobble	146.6	Large Cobble	No Change
			3541.743	8.66	None	8.66	None	No Change	14.1	Medium Gravel	14.1	Medium Gravel	No Change	23.2	Coarse Gravel	23.2	Coarse Gravel	No Change
			3520	4.64	None	4.64	None	No Change	9.1	Medium Gravel	9.1	Medium Gravel	No Change	15.6	Medium Gravel	15.6	Medium Gravel	No Change
6	HU_WH_TWH_2_1 (Bridge)	HU_WH_TWH_2_WC1	3500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3438	2.28	None	2.28	None	No Change	5.6	Pebbles	5.6	Pebbles	No Change	9.6	Medium Gravel	9.6	Medium Gravel	No Change
			3420	1.43	None	1.43	None	No Change	3.9	Very Coarse Sand	3.9	Very Coarse Sand	No Change	7.5	Fine Gravel	7.5	Fine Gravel	No Change
			2868.124	1.04	None	1.04	None	No Change	3.1	Very Coarse Sand	3.1	Very Coarse Sand	No Change	6.3	Fine Gravel	6.3	Fine Gravel	No Change
	HU_WH_TWH_2_1 Old		2839.686	399.52	High	399.52	High	No Change	169.0	Large Cobble	169.0	Large Cobble	No Change	440.0	Small Boulder	440.0	Small Boulder	No Change
6	School Culvert 5 m * 1.5m (to be confirmed)	HU_WH_TWH_2_WC1	2836	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2835.774	219.43	High	219.43	High	No Change	115.4	Small Cobble	115.4	Small Cobble	No Change	273.2	Small Boulder	273.2	Small Boulder	No Change
			2733.596	336.26	High	336.26	High	No Change	154.6	Large Cobble	154.6	Large Cobble	No Change	367.1	Small Boulder	367.1	Small Boulder	No Change
			1.698	14.57	Low	19.05	Low	No Change	22.3	Coarse Gravel	26.9	Coarse Gravel	No Change	27.0	Coarse Gravel	31.8	Coarse Gravel	No Change
			1.677	12.89	Low	5.92	None	Decrease	20.8	Coarse Gravel	11.8	Medium Gravel	Decrease in Grain Size	23.8	Coarse Gravel	15.1	Medium Gravel	Decrease in Grain Size
		HU_WH_SAL_3_1	1.637	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_SAL_3_1 (Proposed Bridge)		1.604	20.84	Low	56.10	Moderate	Increase	27.3	Coarse Gravel	54.1	Very Coarse Gravel	Increase in Grain Size	37.7	Very Coarse Gravel	72.7	Small Cobble	Increase in Grain Size
			1.562	59.87	Moderate	14.98	Low	Decrease	55.3	Very Coarse Gravel	21.1	Coarse Gravel	Decrease in Grain Size	80.8	Small Cobble	31.8	Coarse Gravel	Decrease in Grain Size
		HU_WH_SAL_3_2	1.55	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			1.537	20.25	Low	21.40	Low	No Change	28.0	Coarse Gravel	28.9	Coarse Gravel	No Change	33.2	Very Coarse Gravel	35.4	Very Coarse Gravel	No Change
			1.475	6.41	None	6.41	None	No Change	12.8	Medium Gravel	12.8	Medium Gravel	No Change	15.1	Medium Gravel	15.1	Medium Gravel	No Change
			1013.632	4.58	None	4.57	None	No Change	8.6	Medium Gravel	8.5	Medium Gravel	No Change	17.6	Coarse Gravel	17.6	Coarse Gravel	No Change
6	HU_WH_SAL_5_1		1013.624	4.09	None	4.08	None	No Change	7.9	Fine Gravel	7.9	Fine Gravel	No Change	16.1	Coarse Gravel	16.1	Coarse Gravel	No Change
		HU_WH_SAL_5_1	1013	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1013.598	2.99	None	3.01	None	No Change	6.4	Fine Gravel	6.4	Fine Gravel	No Change	12.9	Medium Gravel	13.3	Medium Gravel	No Change
6	HU_WH_SAL_0_1		1013.741	210.88	High	210.28	High	No Change	112.6	Small Cobble	112.4	Small Cobble	No Change	264.2	Small Boulder	264.2	Small Boulder	No Change
			1013.064	82.35	Moderate	81.34	Moderate	No Change	57.9	Very Coarse Gravel	57.4	Very Coarse Gravel	No Change	144.9	Large Cobble	144.9	Large Cobble	No Change
6	HU_WH_SAL_0_2		1013.048	82.14	Moderate	80.90	Moderate	No Change	57.8	Very Coarse Gravel	57.2	Very Coarse Gravel	No Change	144.9	Large Cobble	143.3	Large Cobble	No Change
		E-W2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1012.967	80.90	Moderate	79.66	Moderate	No Change	57.2	Very Coarse Gravel	56.6	Very Coarse Gravel	No Change	143.3	Large Cobble	141.7	Large Cobble	No Change
			1012.924	78.08	Moderate	76.00	Moderate	No Change	55.8	Very Coarse Gravel	54.8	Very Coarse Gravel	No Change	140.1	Large Cobble	138.6	Large Cobble	No Change
			983.78	6.91	None	22.55	Low	Increase	12.7	Medium Gravel	29.0	Coarse Gravel	Increase in Grain Size	18.2	Coarse Gravel	39.3	Very Coarse Gravel	Increase in Grain Size
			962.71	7.66	None	17.51	Low	Increase	13.8	Medium Gravel	23.2	Coarse Gravel	Increase in Grain Size	18.7	Coarse Gravel	37.0	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert WHR_1-5_1	961.2	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			857.44	218.30	High	203.10	High	No Change	139.5	Large Cobble	117.8	Small Cobble	Decrease in Grain Size	179.2	Large Cobble	221.5	Large Cobble	No Change
6	HU_WH_WHR_1_5		802.03	2.46	None	10.02	Low	Increase	6.4	Fine Gravel	15.6	Medium Gravel	Increase in Grain Size	8.2	Medium Gravel	25.7	Coarse Gravel	Increase in Grain Size
		Proposed Culvert WHR_1-5_2	800.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			760.98	0.09	None	3.70	None	No Change	0.7	Coarse Sand	7.8	Fine Gravel	Increase in Grain Size	0.9	Coarse Sand	13.3	Medium Gravel	Increase in Grain Size
			658.28	0.20	None	0.20	None	No Change	1.1	Coarse Sand	1.1	Coarse Sand	No Change	1.8	Coarse Sand	1.8	Coarse Sand	No Change
		Culvert	643.98	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			615.92	142.01	High	142.01	High	No Change	93.7	Small Cobble	93.7	Small Cobble	No Change	166.8	Large Cobble	166.8	Large Cobble	No Change
			570.46	24.30	Low	24.30	Low	No Change	31.2	Coarse Gravel	31.2	Coarse Gravel	No Change	39.3	Very Coarse Gravel	39.3	Very Coarse Gravel	
			681.3	13.60	Low	38.05	Moderate	Increase	21.2	Coarse Gravel	43.4	Very Coarse Gravel	Increase in Grain Size	25.7	Coarse Gravel	50.4	Very Coarse Gravel	Increase in Grain Size
			659.93	3.72	None	3.79	None	No Change	8.9	Medium Gravel	8.2	Medium Gravel	No Change	10.4	Medium Gravel	12.4	Medium Gravel	No Change
		GTAW		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_1_6		587.4	35.11	Moderate	66.91	Moderate	No Change	40.1	Very Coarse Gravel	61.2	Very Coarse Gravel	No Change	50.4	Very Coarse Gravel	81.9	Small Cobble	Increase in Grain Size
			548.14	33.29	Low	7.13	None	Decrease	38.0	Very Coarse Gravel	12.8	Medium Gravel	Decrease in Grain Size	50.4	Very Coarse Gravel	19.2	Coarse Gravel	Decrease in Grain Size
		Transitway		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			516.76	36.38	Moderate	73.36	Moderate	No Change	40.8	Very Coarse Gravel	63.6	Very Coarse Gravel	No Change	53.2	Very Coarse Gravel	91.7	Small Cobble	Increase in Grain Size
			453.57	23.02	Low	23.02	Low	No Change	30.2	Coarse Gravel	30.2	Coarse Gravel	No Change	37.7	Very Coarse Gravel	37.7	Very Coarse Gravel	No Change
			1353.908	84.69	Moderate	84.69	Moderate	No Change	55.0	Very Coarse Gravel	55.0	Very Coarse Gravel	No Change	173.8	Large Cobble	173.8	Large Cobble	No Change
6	HU_WH_WHR_0_2		1353.896	55.99	Moderate	55.99	Moderate	No Change	41.4	Very Coarse Gravel	41.4	Very Coarse Gravel	No Change	130.8	Large Cobble	130.8	Large Cobble	No Change
		HU_WH_WHR_0_1 (GTAW WBL + Ramp)	1353.855	62.20	Moderate	62.20	Moderate	No Change	45.5	Very Coarse Gravel	45.5	Very Coarse Gravel	No Change	133.9	Large Cobble	133.9	Large Cobble	No Change
			1353.844	254.58	High	254.58	High	No Change	118.5	Small Cobble	118.5	Small Cobble	No Change	356.5	Small Boulder	356.5	Small Boulder	No Change
			1352.611	26.76	Low	16.10	Low	No Change	27.8	Coarse Gravel	19.6	Coarse Gravel	No Change	62.1	Very Coarse Gravel	44.3	Very Coarse Gravel	No Change
			1352.576	95.15	Moderate	71.90	Moderate	No Change	63.1	Very Coarse Gravel	51.9	Very Coarse Gravel	No Change	165.0	Large Cobble	137.0	Large Cobble	No Change
			1352.506	12.50	Low	15.86	Low	No Change	15.8	Medium Gravel	18.4	Coarse Gravel	Increase in Grain Size	40.9	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
		HU_WH_WHR_0_2 (GTAW EBL + Ramp)	1352.455	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_WH_WHR_0_3		1352.49	21.10	Low	27.53	Low	No Change	22.7	Coarse Gravel	27.1	Coarse Gravel	No Change	58.0	Very Coarse Gravel	70.5	Small Cobble	Increase in Grain Size
			1352.414	18.37	Low	24.67	Low	No Change	20.5	Coarse Gravel	24.9	Coarse Gravel	No Change	53.2	Very Coarse Gravel	66.2	Small Cobble	Increase in Grain Size
			1352.37	31.19	Low	47.56	Moderate	Increase	29.1	Coarse Gravel	38.6	Very Coarse Gravel	Increase in Grain Size	78.4	Small Cobble	106.2	Small Cobble	No Change
		HU_WH_WHR_0_3 (Transit Bridge)	1352.355	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1352.347	17.04	Low	26.83	Low	No Change	19.5	Coarse Gravel	26.4	Coarse Gravel	No Change	50.4	Very Coarse Gravel	69.4	Small Cobble	Increase in Grain Size
			1352.293	14.11	Low	14.11	Low	No Change	16.8	Coarse Gravel	16.8	Coarse Gravel	No Change	46.0	Very Coarse Gravel	46.0	Very Coarse Gravel	No Change
			1415.673	230.97	High	226.20	High	No Change	122.7	Small Cobble	121.0	Small Cobble	No Change	268.6	Small Boulder	264.2	Small Boulder	No Change
			1415.625	22.90	Low	16.18	Low	No Change	27.6	Coarse Gravel	21.6	Coarse Gravel	No Change	45.1	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
		Proposed Bridge HU_WH_GRT_0_1	1415.602	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.577	26.26	Low	23.91	Low	No Change	30.1	Coarse Gravel	27.8	Coarse Gravel	No Change	50.4	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
			1415.564	49.78	Moderate	28.34	Low	Decrease	46.2	Very Coarse Gravel	30.9	Coarse Gravel	Decrease in Grain Size	79.6	Small Cobble	56.1	Very Coarse Gravel	Decrease in Grain Size
6	HU_WH_GRT_0_2	Proposed Bridge HU_WH_GRT_0_2	1415.547	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.505	11.11	Low	15.53	Low	No Change	17.4	Coarse Gravel	21.6	Coarse Gravel	No Change	25.7	Coarse Gravel	33.2	Very Coarse Gravel	Increase in Grain Size
			1415.406	18.85	Low	14.37	Low	No Change	24.8	Coarse Gravel	20.0	Coarse Gravel	No Change	37.7	Very Coarse Gravel	33.2	Very Coarse Gravel	No Change
		Proposed Bridge HU_WH_GRT_0_3 (Transit)	1415.38	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1415.353	5.37	None	13.36	Low	Increase	10.1	Medium Gravel	18.6	Coarse Gravel	Increase in Grain Size	17.1	Coarse Gravel	33.2	Very Coarse Gravel	Increase in Grain Size
			1415.311	0.99	None	0.99	None	No Change	3.2	Very Coarse Sand	3.2	Very Coarse Sand	No Change	5.1	Pebbles	5.1	Pebbles	No Change
			1514.853	37.29	Moderate	24.99	Low	Decrease	39.2	Very Coarse Gravel	29.6	Coarse Gravel	Decrease in Grain Size	61.0	Very Coarse Gravel	46.9	Very Coarse Gravel	No Change
			1514.841	62.69	Moderate	85.51	Moderate	No Change	56.4	Very Coarse Gravel	69.4	Small Cobble	Increase in Grain Size	85.5	Small Cobble	106.2	Small Cobble	No Change
		HU_WH_CDT_2_1	1514.818	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.795	46.49	Moderate	64.68	Moderate	No Change	48.9	Very Coarse Gravel	60.0	Very Coarse Gravel	No Change	61.0	Very Coarse Gravel	79.6	Small Cobble	Increase in Grain Size

100-Year Flow Event

Section	Reach ID	Drainage Crossing ID	Station ID	Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
6	HU_WH_CDT_2_1		1514.773	5.18	None	13.59	Low	Increase	10.5	Medium Gravel	20.2	Coarse Gravel	Increase in Grain Size	14.2	Medium Gravel	28.3	Coarse Gravel	Increase in Grain Size
		HU_WH_CDT_2_2	1514.75	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.717	14.43	Low	4.40	None	Decrease	20.5	Coarse Gravel	18.3	Coarse Gravel	No Change	29.7	Coarse Gravel	27.6	Coarse Gravel	No Change
			1514.687	230.97	High	226.20	High	No Change	21.3	Coarse Gravel	9.2	Medium Gravel	Decrease in Grain Size	29.0	Coarse Gravel	13.3	Medium Gravel	Decrease in Grain Size
		HU_WH_CDT_2_3 (Transit)	1514.671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.656	0.06	None	1.53	None	No Change	0.5	Medium Sand	4.5	Very Coarse Sand	Increase in Grain Size	0.5	Coarse Sand	6.6	Fine Gravel	Increase in Grain Size
			1514.605	80.06	Moderate	80.06	Moderate	No Change	67.2	Small Cobble	67.2	Small Cobble	No Change	99.5	Small Cobble	99.5	Small Cobble	No Change
			1514.549	1.11	None	1.11	None	No Change	3.3	Very Coarse Sand	3.3	Very Coarse Sand	No Change	6.3	Fine Gravel	6.3	Fine Gravel	No Change
			1514.507	0.13	None	0.13	None	No Change	0.7	Coarse Sand	0.7	Coarse Sand	No Change	1.5	Coarse Sand	1.5	Coarse Sand	No Change
		Culvert (Mayfield Road)	1514.475	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.447	31.89	Low	29.00	Low	No Change	33.9	Very Coarse Gravel	31.7	Coarse Gravel	Decrease in Grain Size	59.0	Very Coarse Gravel	56.1	Very Coarse Gravel	No Change
6	HU_WH_CDT_0_2		1514.598	25.76	Low	20.25	Low	No Change	25.7	Coarse Gravel	21.8	Coarse Gravel	No Change	68.4	Small Cobble	58.0	Very Coarse Gravel	Decrease in Grain Size
			1514.575	9.44	None	7.35	None	No Change	13.1	Medium Gravel	11.0	Medium Gravel	No Change	33.2	Very Coarse Gravel	27.6	Coarse Gravel	Decrease in Grain Size
		Proposed Bridge HU_WH_CDT_0_1	1514.573	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.501	123.10	High	103.34	High	No Change	72.7	Small Cobble	64.4	Small Cobble	No Change	213.5	Large Cobble	188.4	Large Cobble	No Change
			1514.487	53.95	Moderate	48.93	Moderate	No Change	41.2	Very Coarse Gravel	38.5	Very Coarse Gravel	No Change	121.8	Small Cobble	114.6	Small Cobble	No Change
		Proposed Bridge HU_WH_CDT_0_2 Transit	1514.479	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.467	122.14	High	113.40	High	No Change	71.5	Small Cobble	67.9	Small Cobble	No Change	217.5	Large Cobble	205.6	Large Cobble	No Change
			1514.353	0.13	None	0.13	None	No Change	0.7	Coarse Sand	0.7	Coarse Sand	No Change	1.5	Coarse Sand	1.5	Coarse Sand	No Change
			1514.345	6.03	None	6.03	None	No Change	16.2	Coarse Gravel	16.2	Coarse Gravel	No Change	7.9	Fine Gravel	7.9	Fine Gravel	No Change
			1514.312	31.89	Low	29.00	Low	No Change	33.9	Very Coarse Gravel	31.7	Coarse Gravel	Decrease in Grain Size	59.0	Very Coarse Gravel	56.1	Very Coarse Gravel	No Change
		Culvert	14.331 x-80 (43.04-0	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1514.306	31.89	Low	29.00	Low	No Change	33.9	Very Coarse Gravel	31.7	Coarse Gravel	Decrease in Grain Size	59.0	Very Coarse Gravel	56.1	Very Coarse Gravel	No Change
		Culvert	14.331 x-80 (43.04-0	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
6	HU_MH_RAI_1_3		24.6	23.29	Low	57.00	Moderate	Increase	26.9	Coarse Gravel	49.9	Very Coarse Gravel	Increase in Grain Size	49.5	Very Coarse Gravel	90.5	Small Cobble	Increase in Grain Size
			24.59	117.45	High	16.96	Low	Decrease	80.7	Small Cobble	21.9	Coarse Gravel	Decrease in Grain Size	153.2	Large Cobble	39.3	Very Coarse Gravel	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.55	125.86	High	39.06	Moderate	Decrease	19.8	Coarse Gravel	10.9	Medium Gravel	Decrease in Grain Size	37.0	Very Coarse Gravel	19.8	Coarse Gravel	Decrease in Grain Size
			24.54	13.60	Low	38.05	Moderate	Increase	84.8	Small Cobble	37.9	Very Coarse Gravel	Decrease in Grain Size	159.9	Large Cobble	72.7	Small Cobble	Decrease in Grain Size
		Bridge_HU_MH_RAI_1_3_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			24.52	35.11	Moderate	66.91	Moderate	No Change	22.8	Coarse Gravel	31.9	Coarse Gravel	No Change	38.5	Very Coarse Gravel	56.1	Very Coarse Gravel	No Change
			24.51	33.29	Low	7.13	None	Decrease	48.8	Very Coarse Gravel	48.8	Very Coarse Gravel	No Change	86.8	Small Cobble	86.8	Small Cobble	No Change
7	HU_MH_ROB_3_5		1739	5.34	None	36.97	Moderate	Increase	13.1	Medium Gravel	49.1	Very Coarse Gravel	Increase in Grain Size	9.6	Medium Gravel	36.2	Very Coarse Gravel	Increase in Grain Size
			1699	22.31	Low	9.82	None	Decrease	27.7	Coarse Gravel	15.6	Medium Gravel	Decrease in Grain Size	41.8	Very Coarse Gravel	24.5	Coarse Gravel	Decrease in Grain Size
		Propsed Culvert_HU_MH_ROB_3_1 (3.3 x 2.1 m)	1697	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1655	83.06	Moderate	28.20	Low	Decrease	69.1	Small Cobble	32.7	Very Coarse Gravel	Decrease in Grain Size	100.8	Small Cobble	48.6	Very Coarse Gravel	Decrease in Grain Size
			1641	1.67	None	16.49	Low	Increase	5.3	Pebbles	23.9	Coarse Gravel	Increase in Grain Size	5.4	Pebbles	30.4	Coarse Gravel	Increase in Grain Size
7	HU_MH_ROB_0_2		1750	114.09	High	114.09	High	No Change	70.8	Small Cobble	70.8	Small Cobble	No Change	190.3	Large Cobble	190.3	Large Cobble	No Change
			1739	54.39	Moderate	47.65	Moderate	No Change	43.3	Very Coarse Gravel	39.6	Very Coarse Gravel	No Change	110.3	Small Cobble	100.8	Small Cobble	No Change
		HU_MH_ROB_0_6 at Highway 427	1706	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1657	12.01	Low	11.44	Low	No Change	15.5	Medium Gravel	15.0	Medium Gravel	No Change	38.5	Very Coarse Gravel	37.0	Very Coarse Gravel	No Change
			1618	4.47	None	4.67	None	No Change	7.8	Fine Gravel	8.0	Medium Gravel	Increase in Grain Size	19.8	Coarse Gravel	20.9	Coarse Gravel	No Change
7	HU_MH_ROB_0_5		825	58.97	Moderate	39.44	Moderate	No Change	54.9	Very Coarse Gravel	41.6	Very Coarse Gravel	No Change	78.4	Small Cobble	60.0	Very Coarse Gravel	Decrease in Grain Size
			822	170.33	High	89.13	Moderate	Decrease	99.8	Small Cobble	63.6	Very Coarse Gravel	Decrease in Grain Size	215.5	Large Cobble	140.1	Large Cobble	No Change
		HU_ROB-0-1	821	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			800	12.49	Low	4.02	None	Decrease	21.0	Coarse Gravel	9.6	Medium Gravel	Decrease in Grain Size	22.0	Coarse Gravel	10.4	Medium Gravel	Decrease in Grain Size
			782	113.63	High	75.13	Moderate	Decrease	95.7	Small Cobble	72.4	Small Cobble	No Change	98.2	Small Cobble	72.7	Small Cobble	No Change
			740	24.77	Low	25.26	Low	No Change	27.7	Coarse Gravel	27.8	Coarse Gravel	No Change	53.2	Very Coarse Gravel	55.1	Very Coarse Gravel	No Change
		HU_ROB-0-2	737	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			672	17.11	Low	22.83	Low	No Change	21.1	Coarse Gravel	25.4	Coarse Gravel	No Change	42.6	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
			653	11.04	Low	15.07	Low	No Change	16.1	Coarse Gravel	19.2	Coarse Gravel	No Change	29.7	Coarse Gravel	40.1	Very Coarse Gravel	Increase in Grain Size
		HU_ROB-0-3 (Transit)	651	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			636	8.99	None	14.03	Low	Increase	13.6	Medium Gravel	18.3	Coarse Gravel	Increase in Grain Size	27.6	Coarse Gravel	37.7	Very Coarse Gravel	Increase in Grain Size
			616	179.23	High	179.23	High	No Change	98.8	Small Cobble	98.8	Small Cobble	No Change	246.6	Large Cobble	246.6	Large Cobble	No Change
			549	340.39	High	281.79	High	No Change	156.5	Large Cobble	137.3	Large Cobble	No Change	367.1	Small Boulder	323.2	Small Boulder	No Change
			492	188.26	High	252.61	High	No Change	104.0	Small Cobble	127.2	Small Cobble	No Change	246.6	Large Cobble	301.2	Small Boulder	Increase in Grain Size
			429	106.96	High	33.58	Low	Decrease	97.3	Small Cobble	44.0	Very Coarse Gravel	Decrease in Grain Size	83.1	Small Cobble	37.7	Very Coarse Gravel	Decrease in Grain Size
			418	101.13	High	90.44	Moderate	Decrease	70.4	Small Cobble	64.1	Small Cobble	No Change	148.2	Large Cobble	143.3	Large Cobble	No Change
		HU_ROB-0-4	416	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			400	82.24	Moderate	143.93	High	Increase	63.6	Very Coarse Gravel	92.3	Small Cobble	Increase in Grain Size	118.9	Small Cobble	177.4	Large Cobble	Increase in Grain Size
			384	82.24	Moderate	143.93	High	Increase	63.6	Very Coarse Gravel	92.3	Small Cobble	Increase in Grain Size	118.9	Small Cobble	177.4	Large Cobble	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
7	HU_MH_ROB_0_6		1825	1.49	None	1.49	None	No Change	3.7	Very Coarse Sand	3.7	Very Coarse Sand	No Change	9.3	Medium Gravel	9.3	Medium Gravel	No Change
			1817.18	1.04	None	1.04	None	No Change	2.9	Very Coarse Sand	2.9	Very Coarse Sand	No Change	7.2	Fine Gravel	7.2	Fine Gravel	No Change
			1787.86	654.13	High	654.13	High	No Change	230.3	Large Cobble	230.3	Large Cobble	No Change	654.1	Medium Boulder	654.1	Medium Boulder	No Change
			1737.61	143.49	High	143.49	High	No Change	85.4	Small Cobble	85.4	Small Cobble	No Change	209.5	Large Cobble	209.5	Large Cobble	No Change
7	HU_MH_ROB_7_1		791	202.71	High	202.71	High	No Change	114.8	Small Cobble	114.8	Small Cobble	No Change	231.8	Large Cobble	231.8	Large Cobble	No Change
			766	22.03	Low	17.68	Low	No Change	25.6	Coarse Gravel	21.9	Coarse Gravel	No Change	48.6	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
		HU_MH_ROB_7_1_1	763	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			739	10.51	Low	14.43	Low	No Change	15.5	Medium Gravel	19.0	Coarse Gravel	Increase in Grain Size	29.0	Coarse Gravel	37.0	Very Coarse Gravel	Increase in Grain Size
			694	157.21	High	157.21	High	No Change	99.8	Small Cobble	99.8	Small Cobble	No Change	181.0	Large Cobble	181.0	Large Cobble	No Change
			666	193.17	High	97.48	Moderate	Decrease	108.4	Small Cobble	67.3	Small Cobble	No Change	238.1	Large Cobble	151.5	Large Cobble	No Change
		HU_MH_ROB_7_1_2	664	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			600	40.34	Moderate	35.02	Moderate	No Change	38.1	Very Coarse Gravel	34.5	Very Coarse Gravel	No Change	76.1	Small Cobble	70.5	Small Cobble	No Change
			587	246.12	High	141.17	High	No Change	126.5	Small Cobble	86.3	Small Cobble	No Change	287.0	Small Boulder	197.8	Large Cobble	Decrease in Grain Size
		HU_MH_ROB_7_1_3	585	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			568	25.38	Low	29.30	Low	No Change	27.9	Coarse Gravel	30.6	Coarse Gravel	No Change	55.1	Very Coarse Gravel	61.0	Very Coarse Gravel	No Change
			529	49.57	Moderate	41.61	Moderate	No Change	43.8	Very Coarse Gravel	38.9	Very Coarse Gravel	No Change	88.0	Small Cobble	78.4	Small Cobble	No Change
			444	61.12	Moderate	89.75	Moderate	No Change	51.2	Very Coarse Gravel	66.6	Small Cobble	Increase in Grain Size	99.5	Small Cobble	129.3	Large Cobble	Increase in Grain Size
			416	131.13	High	46.04	Moderate	Decrease	85.3	Small Cobble	41.5	Very Coarse Gravel	Decrease in Grain Size	172.1	Large Cobble	84.3	Small Cobble	Decrease in Grain Size
			390	12.49	Low	4.02	None	Decrease	21.0	Coarse Gravel	9.6	Medium Gravel	Decrease in Grain Size	22.0	Coarse Gravel	10.4	Medium Gravel	Decrease in Grain Size
		HU_MH_ROB_7_1_4	388	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			371	12.49	Low	4.02	None	Decrease	21.0	Coarse Gravel	9.6	Medium Gravel	Decrease in Grain Size	22.0	Coarse Gravel	10.4	Medium Gravel	Decrease in Grain Size
			355	13.61	Low	13.61	Low	No Change	18.6	Coarse Gravel	18.6	Coarse Gravel	No Change	33.9	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
7	HU_MH_ROB_7_2		477.94	5.28	None	5.27	None	No Change	11.3	Medium Gravel	11.3	Medium Gravel	No Change	12.9	Medium Gravel	12.9	Medium Gravel	No Change
			461.73	13.82	Low	3.64	None	Decrease	22.2	Coarse Gravel	8.8	Medium Gravel	Decrease in Grain Size	24.5	Coarse Gravel	10.0	Medium Gravel	Decrease in Grain Size
		HU_HM_ROB_7_2_1	459.8	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			431.8	7.95	None	7.93	None	No Change	15.0	Medium Gravel	14.9	Medium Gravel	No Change	17.1	Coarse Gravel	17.1	Coarse Gravel	No Change
			389.94	39.27	Moderate	39.27	Moderate	No Change	45.0	Very Coarse Gravel	45.0	Very Coarse Gravel	No Change	50.4	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			347.68	2.56	None	2.46	None	No Change	7.2	Fine Gravel	7.0	Fine Gravel	No Change	7.2	Fine Gravel	6.9	Fine Gravel	No Change
		HU_HM_ROB_7_2_2	346.18	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			270.76	17.52	Low	53.83	Moderate	Increase	25.9	Coarse Gravel	54.1	Very Coarse Gravel	Increase in Grain Size	29.0	Coarse Gravel	67.3	Small Cobble	Increase in Grain Size
			205.88	11.22	Low	5.44	None	Decrease	19.8	Coarse Gravel	11.8	Medium Gravel	Decrease in Grain Size	19.8	Coarse Gravel	12.4	Medium Gravel	Decrease in Grain Size
		HU_HM_ROB_7_2_3 (Transit)	203.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			179.53	152.18	High	162.81	High	No Change	142.8	Large Cobble	148.4	Large Cobble	No Change	77.3	Small Cobble	83.1	Small Cobble	No Change
			1739	4.63	None	2.52	None	No Change	6.4	Fine Gravel	9.6	Medium Gravel	Increase in Grain Size	6.9	Fine Gravel	7.9	Fine Gravel	No Change
		HU_HM_ROB_7_2_4	138.45	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			100.22	7.26	None	5.33	None	No Change	10.0	Medium Gravel	29.6	Coarse Gravel	Increase in Grain Size	10.0	Medium Gravel	12.4	Medium Gravel	No Change
			82.64	21.58	Low	19.67	Low	No Change	29.6	Coarse Gravel	34.7	Very Coarse Gravel	Increase in Grain Size	27.6	Coarse Gravel	27.6	Coarse Gravel	No Change
7	HU_MH_ROB_4_1		1874	7.11	None	0.59	None	No Change	16.0	Coarse Gravel	2.9	Very Coarse Sand	Decrease in Grain Size	11.6	Medium Gravel	2.1	Very Coarse Sand	Decrease in Grain Size
			1859	1.06	None	23.65	Low	Increase	4.1	Very Coarse Sand	33.6	Very Coarse Gravel	Increase in Grain Size	3.5	Very Coarse Sand	31.8	Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_1	1840	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1823	8.34	None	33.34	Low	Increase	16.2	Coarse Gravel	41.2	Very Coarse Gravel	Increase in Grain Size	16.1	Coarse Gravel	42.6	Very Coarse Gravel	Increase in Grain Size
			1811	13.50	Low	2.50	None	Decrease	23.2	Coarse Gravel	7.3	Fine Gravel	Decrease in Grain Size	20.9	Coarse Gravel	6.6	Fine Gravel	Decrease in Grain Size
			1802	2.82	None	24.72	Low	Increase	8.0	Fine Gravel	34.4	Very Coarse Gravel	Increase in Grain Size	6.9	Fine Gravel	33.2	Very Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_2	1780	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1719	1.57	None	2.73	None	No Change	5.0	Pebbles	7.1	Fine Gravel	Increase in Grain Size	5.4	Pebbles	8.2	Medium Gravel	Increase in Grain Size
			1681	18.17	Low	12.46	Low	No Change	28.0	Coarse Gravel	20.6	Coarse Gravel	No Change	26.3	Coarse Gravel	22.6	Coarse Gravel	No Change
		HU_MH_ROB_4_3	1671	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1646	12.60	Low	17.21	Low	No Change	20.1	Coarse Gravel	24.8	Coarse Gravel	No Change	24.5	Coarse Gravel	30.4	Coarse Gravel	No Change
			1588	0.00	None	12.56	Low	Increase	0.0	Very Fine Sand	20.3	Coarse Gravel	Increase in Grain Size	0.1	Fine Sand	23.8	Coarse Gravel	Increase in Grain Size
			1487	157.21	High	157.21	High	No Change	99.8	Small Cobble	99.8	Small Cobble	No Change	181.0	Large Cobble	181.0	Large Cobble	No Change
		HU_MH_ROB_4_4	1482	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1451	193.17	High	97.48	Moderate	Decrease	108.4	Small Cobble	67.3	Small Cobble	No Change	238.1	Large Cobble	151.5	Large Cobble	No Change
			1353	40.34	Moderate	35.02	Moderate	No Change	38.1	Very Coarse Gravel	34.5	Very Coarse Gravel	No Change	76.1	Small Cobble	70.5	Small Cobble	No Change
			1252	246.12	High	141.17	High	No Change	126.5	Small Cobble	86.3	Small Cobble	No Change	287.0	Small Boulder	197.8	Large Cobble	Decrease in Grain Size
			1202	131.13	High	46.04	Moderate	Decrease	85.3	Small Cobble	41.5	Very Coarse Gravel	Decrease in Grain Size	172.1	Large Cobble	84.3	Small Cobble	Decrease in Grain Size
			1166	12.49	Low	4.02	None	Decrease	21.0	Coarse Gravel	9.6	Medium Gravel	Decrease in Grain Size	22.0	Coarse Gravel	10.4	Medium Gravel	Decrease in Grain Size
		HU_MH_ROB_4_5	1143	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1114	0.47	None	17.00	Low	Increase	2.1	Very Coarse Sand	24.6	Coarse Gravel	Increase in Grain Size	2.5	Very Coarse Sand	30.4	Coarse Gravel	Increase in Grain Size
			1062	0.06	None	31.32	Low	Increase	0.5	Coarse Sand	38.2	Very Coarse Gravel	Increase in Grain Size	0.6	Coarse Sand	44.3	Very Coarse Gravel	Increase in Grain Size
			1015	0.00	None	12.56	Low	Increase	0.0	Very Fine Sand	20.3	Coarse Gravel	Increase in Grain Size	0.1	Fine Sand	23.8	Coarse Gravel	Increase in Grain Size
			997	0.00	None	45.25	Moderate	Increase	0.0		48.9	Very Coarse Gravel		0.0	Silt	57.1	Very Coarse Gravel	Increase in Grain Size
		HU_MH_ROB_4_6	979	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			965	87.72	Moderate	16.42	Low	Decrease	71.2	Small Cobble	24.0	Coarse Gravel	Decrease in Grain Size	106.2	Small Cobble	29.7	Coarse Gravel	Decrease in Grain Size
			948	19.28	Low	38.46	Moderate	Increase	26.5	Coarse Gravel	44.0	Very Coarse Gravel	Increase in Grain Size	33.9	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change
			23547	7.74	None	7.30	None	No Change	10.9	Medium Gravel	10.5	Medium Gravel	No Change	31.8	Coarse Gravel	31.1	Coarse Gravel	No Change
			23517	7.00	None	11.14	Low	Increase	10.2	Medium Gravel	14.0	Medium Gravel	No Change	29.7	Coarse Gravel	41.8	Very Coarse Gravel	Increase in Grain Size

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
8	HU_MH_MHR_0_1	HU_MH_MHR_01	23516	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23493	6.43	None	9.57	None	No Change	9.6	Medium Gravel	12.5	Medium Gravel	No Change	28.3	Coarse Gravel	37.7	Very Coarse Gravel	Increase in Grain Size
			23474	5.05	None	7.84	None	No Change	8.3	Medium Gravel	11.1	Medium Gravel	No Change	23.2	Coarse Gravel	31.8	Coarse Gravel	No Change
		HU_MH_MHR_02	23473	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			23421	3.66	None	3.61	None	No Change	6.6	Fine Gravel	6.6	Fine Gravel	No Change	18.7	Coarse Gravel	18.2	Coarse Gravel	No Change
			23307	16.63	Low	16.63	Low	No Change	17.9	Coarse Gravel	17.9	Coarse Gravel	No Change	57.1	Very Coarse Gravel	57.1	Very Coarse Gravel	No Change
8	HU_MH_MHR_3_1		1117.01	17.21	Low	13.16	Low	No Change	24.9	Coarse Gravel	20.6	Coarse Gravel	No Change	30.4	Coarse Gravel	25.7	Coarse Gravel	No Change
			1084.93	38.76	Moderate	60.77	Moderate	No Change	44.6	Very Coarse Gravel	57.7	Very Coarse Gravel	No Change	49.5	Very Coarse Gravel	76.1	Small Cobble	Increase in Grain Size
		Culvert # HU_MH_MHR_3_1	1054	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			936.63	125.86	High	39.06	Moderate	Decrease	12.6	Medium Gravel	23.1	Coarse Gravel	Increase in Grain Size	15.6	Medium Gravel	32.5	Very Coarse Gravel	Increase in Grain Size
			884.25	13.60	Low	38.05	Moderate	Increase	14.4	Medium Gravel	14.4	Medium Gravel	No Change	16.6	Coarse Gravel	16.6	Coarse Gravel	No Change
8	HU_MH_EHR_1_4		508.348	2.56	None	2.46	None	No Change	10.1	Medium Gravel	24.1	Coarse Gravel	Increase in Grain Size	15.1	Medium Gravel	38.5	Very Coarse Gravel	Increase in Grain Size
			490.725	17.52	Low	53.83	Moderate	Increase	17.8	Coarse Gravel	16.7	Coarse Gravel	No Change	34.7	Very Coarse Gravel	22.6	Coarse Gravel	Decrease in Grain Size
		Existing Hwy 27 Culvert Proposed Replacement HU_EH_EHT_1_1 (16 m span)	460	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			425.936	152.25	High	150.18	High	No Change	99.6	Small Cobble	98.7	Small Cobble	No Change	170.3	Large Cobble	168.5	Large Cobble	No Change
			400.386	24.34	Low	24.34	Low	No Change	30.3	Coarse Gravel	30.3	Coarse Gravel	No Change	41.8	Very Coarse Gravel	41.8	Very Coarse Gravel	No Change
8	HU_MH_EHR_1_3		542.039	1.82	None	1.50	None	No Change	5.2	Pebbles	4.6	Very Coarse Sand	Decrease in Grain Size	6.9	Fine Gravel	6.0	Pebbles	Decrease in Grain Size
			531.454	92.63	Moderate	30.80	Low	Decrease	72.5	Small Cobble	33.8	Very Coarse Gravel	Decrease in Grain Size	114.6	Small Cobble	55.1	Very Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			515.797	39.43	Moderate	25.55	Low	Decrease	42.6	Very Coarse Gravel	31.4	Coarse Gravel	Decrease in Grain Size	57.1	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
			507.016	99.97	Moderate	22.30	Low	Decrease	83.0	Small Cobble	28.6	Coarse Gravel	Decrease in Grain Size	102.1	Small Cobble	39.3	Very Coarse Gravel	Decrease in Grain Size
		HU_EH_EHT_1_1_2		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			421.237	72.36	Moderate	26.23	Low	Decrease	64.1	Small Cobble	31.7	Coarse Gravel	Decrease in Grain Size	88.0	Small Cobble	45.1	Very Coarse Gravel	Decrease in Grain Size
			418.126	31.01	Low	23.66	Low	No Change	36.1	Very Coarse Gravel	29.8	Coarse Gravel	Decrease in Grain Size	48.6	Very Coarse Gravel	40.9	Very Coarse Gravel	No Change
		HU_EH_EHT_1_1_3		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			394.723	49.56	Moderate	53.96	Moderate	No Change	48.8	Very Coarse Gravel	51.5	Very Coarse Gravel	No Change	69.4	Small Cobble	75.0	Small Cobble	No Change
			390.543	66.02	Moderate	66.02	Moderate	No Change	60.1	Very Coarse Gravel	60.1	Very Coarse Gravel	No Change	83.1	Small Cobble	83.1	Small Cobble	No Change
		HU_EH_EHT_1_1_4 (Transit)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			367.965	13.82	Low	3.64	None	Decrease	22.2	Coarse Gravel	8.8	Medium Gravel	Decrease in Grain Size	24.5	Coarse Gravel	10.0	Medium Gravel	Decrease in Grain Size
			350.966	7.95	None	7.93	None	No Change	15.0	Medium Gravel	14.9	Medium Gravel	No Change	17.1	Coarse Gravel	17.1	Coarse Gravel	No Change
8	HU_MH_EHR_1_6		691.945	40.88	Moderate	59.97	Moderate	No Change	44.9	Very Coarse Gravel	56.0	Very Coarse Gravel	No Change	55.1	Very Coarse Gravel	78.4	Small Cobble	Increase in Grain Size
			643.653	62.31	Moderate	58.92	Moderate	No Change	58.7	Very Coarse Gravel	55.3	Very Coarse Gravel	No Change	77.3	Small Cobble	77.3	Small Cobble	No Change
		Proposed Culvert HU_EH_EHT_1_2_1 (Channel Realignment)		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			533.859	47.10	Moderate	19.31	Low	Decrease	50.0	Very Coarse Gravel	26.4	Coarse Gravel	Decrease in Grain Size	59.0	Very Coarse Gravel	34.7	Very Coarse Gravel	No Change
			496.432	62.69	Moderate	62.69	Moderate	No Change	59.1	Very Coarse Gravel	59.1	Very Coarse Gravel	No Change	77.3	Small Cobble	77.3	Small Cobble	No Change
8	HU_MH_EHR_1_6		295.252	72.68	Moderate	72.68	Moderate	No Change	63.6	Very Coarse Gravel	63.6	Very Coarse Gravel	No Change	90.5	Small Cobble	90.5	Small Cobble	No Change
			253.906	11.08	Low	59.80	Moderate	Increase	17.3	Coarse Gravel	57.3	Very Coarse Gravel	Increase in Grain Size	25.7	Coarse Gravel	73.9	Small Cobble	Increase in Grain Size
		Existing Hwy 27 culvert/Proposed Culvert HU_EH_EHT_1_2_2	243.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			188.519	24.26	Low	23.13	Low	No Change	29.4	Coarse Gravel	28.5	Coarse Gravel	No Change	44.3	Very Coarse Gravel	43.4	Very Coarse Gravel	No Change
			165.049	58.88	Moderate	58.88	Moderate	No Change	57.1	Very Coarse Gravel	57.1	Very Coarse Gravel	No Change	72.7	Small Cobble	72.7	Small Cobble	No Change
8	HU_MH_EHR_0_2		16040	48.13	Moderate	45.60	Moderate	No Change	37.7	Very Coarse Gravel	36.3	Very Coarse Gravel	No Change	114.6	Small Cobble	111.7	Small Cobble	No Change
			16019	42.53	Moderate	40.29	Moderate	No Change	34.7	Very Coarse Gravel	33.5	Very Coarse Gravel	No Change	104.8	Small Cobble	100.8	Small Cobble	No Change
		HU_EH_EHR_01	16014	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15989	29.92	Low	29.91	Low	No Change	27.5	Coarse Gravel	27.4	Coarse Gravel	No Change	81.9	Small Cobble	81.9	Small Cobble	No Change
			15969	35.58	Moderate	33.36	Low	Decrease	30.9	Coarse Gravel	29.6	Coarse Gravel	No Change	91.7	Small Cobble	88.0	Small Cobble	No Change
		HU_EH_EHR_02	15951	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			15925	95.89	Moderate	91.42	Moderate	No Change	60.2	Very Coarse Gravel	58.3	Very Coarse Gravel	No Change	186.6	Large Cobble	179.2	Large Cobble	No Change
			15887	51.22	Moderate	51.22	Moderate	No Change	39.8	Very Coarse Gravel	39.8	Very Coarse Gravel	No Change	117.4	Small Cobble	117.4	Small Cobble	No Change
9	HU_EH_EHR_15_1		2607.261	29.60	Low	25.60	Low	No Change	36.0	Very Coarse Gravel	32.6	Very Coarse Gravel	No Change	44.3	Very Coarse Gravel	40.1	Very Coarse Gravel	No Change
			2543.462	2543.46	2543.462	2543.46	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change	2543.5	2543.462	2543.5	2543.462	No Change
		Proposed Culvert HU_EH_EHT_15_2_1	2500	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2474.157	25.40	Low	37.45	Moderate	Increase	34.4	Very Coarse Gravel	43.6	Very Coarse Gravel	No Change	34.7	Very Coarse Gravel	48.6	Very Coarse Gravel	No Change
			2424.009	37.40	Moderate	37.50	Moderate	No Change	43.9	Very Coarse Gravel	44.0	Very Coarse Gravel	No Change	47.7	Very Coarse Gravel	47.7	Very Coarse Gravel	No Change
			2390.711	2.96	None	3.63	None	No Change	7.7	Fine Gravel	8.5	Medium Gravel	Increase in Grain Size	8.5	Medium Gravel	10.8	Medium Gravel	No Change
		Proposed Culvert HU_EH_EHT_15_2_2	2350	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.737	24.10	Low	49.73	Moderate	Increase	32.3	Very Coarse Gravel	51.7	Very Coarse Gravel	No Change	35.4	Very Coarse Gravel	62.1	Very Coarse Gravel	No Change
			2274.82	13.49	Low	4.53	None	Decrease	23.3	Coarse Gravel	9.9	Medium Gravel	Decrease in Grain Size	20.9	Coarse Gravel	12.4	Medium Gravel	Decrease in Grain Size
		Proposed Culvert HU_EH_EHT_15_2_3 (Transit)	2270.82	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event														
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions			Pre-Existing Conditions		Proposed Conditions		
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate	Change	Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size	Change	Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	Change
			2238.847	28.67	Low	39.70	Moderate	Increase	37.0	Very Coarse Gravel	45.0	Very Coarse Gravel	No Change	38.5	Very Coarse Gravel	51.4	Very Coarse Gravel	No Change
			2168.715	15.12	Low	15.12	Low	No Change	24.5	Coarse Gravel	24.5	Coarse Gravel	No Change	23.8	Coarse Gravel	23.8	Coarse Gravel	No Change
			553.4597	0.33	None	0.33	None	No Change	1.524725275	Coarse Sand	1.524725275	Coarse Sand	No Change	2.477501414	Very Coarse Sand	2.477501414	Very Coarse Sand	No Change
			440.7852	2.16	None	2.16	None	No Change	5.260989011	Pebbles	5.260989011	Pebbles	No Change	9.622535077	Medium Gravel	9.622535077	Medium Gravel	No Change
9	HU_EH_EHR_15_1	Existing Kriby Road Culvert	399.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			379.0983	80.24	Moderate	80.24	Moderate	No Change	67.60989011	Small Cobble	67.60989011	Small Cobble	No Change	98.17123091	Small Cobble	98.17123091	Small Cobble	No Change
			260.5125	8.01	None	6.78	None	No Change	14.6978022	Medium Gravel	13.11813187	Medium Gravel	No Change	18.15937455	Coarse Gravel	16.11964301	Coarse Gravel	No Change
			6169.405	2.13	None	3.79	None	No Change	6.5	Fine Gravel	9.7	Medium Gravel	Increase in Grain Size	6.0	Pebbles	8.9	Medium Gravel	Increase in Grain Size
			6131.176	2.23	None	2.19	None	No Change	7.0	Fine Gravel	6.5	Fine Gravel	No Change	5.7	Pebbles	6.3	Fine Gravel	Increase in Grain Size
		Proposed Bridge HU_EH_EHT_16_1	6126.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
9	HU_EH_EHR_16_1		6048.088	1.81	None	9.88	None	No Change	6.1	Fine Gravel	18.7	Coarse Gravel	Increase in Grain Size	4.9	Very Coarse Sand	17.1	Coarse Gravel	Increase in Grain Size
			6006.68	4.40	None	2.04	None	No Change	10.8	Medium Gravel	6.2	Fine Gravel	Decrease in Grain Size	9.6	Medium Gravel	6.0	Pebbles	Decrease in Grain Size
		Proposed Bridge HU_EH_EHT_16_2 (Transit)	6001	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			5969.339	2.88	None	4.66	None	No Change	8.2	Medium Gravel	11.0	Medium Gravel	No Change	6.9	Fine Gravel	10.4	Medium Gravel	Increase in Grain Size
			5932.436	1.84	None	1.92	None	No Change	6.3	Fine Gravel	6.4	Fine Gravel	No Change	4.6	Very Coarse Sand	4.9	Very Coarse Sand	No Change
			3894.471	2.90	None	2.90	None	No Change	7.9	Fine Gravel	7.9	Fine Gravel	No Change	7.5	Fine Gravel	7.5	Fine Gravel	No Change
			3788.84	13.16	Low	13.16	Low	No Change	19.4	Coarse Gravel	19.4	Coarse Gravel	No Change	29.0	Coarse Gravel	29.0	Coarse Gravel	No Change
9	HU_EH_EHR_16_1	Existing Kriby Road Culvert	3773.9	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3753.025	72.15	Moderate	72.15	Moderate	No Change	63.5	Very Coarse Gravel	63.5	Very Coarse Gravel	No Change	89.2	Small Cobble	89.2	Small Cobble	No Change
			3685.87	47.47	Moderate	47.47	Moderate	No Change	50.4	Very Coarse Gravel	50.4	Very Coarse Gravel	No Change	59.0	Very Coarse Gravel	59.0	Very Coarse Gravel	No Change
			3222.018	16.24	Low	45.41	Moderate	Increase	24.5	Coarse Gravel	48.9	Very Coarse Gravel	Increase in Grain Size	27.6	Coarse Gravel	58.0	Very Coarse Gravel	Increase in Grain Size
		Proposed Culvert HU_EH_EHT_17_3_1	3218	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3137.33	10.00	Low	44.41	Moderate	Increase	19.1	Coarse Gravel	48.1	Very Coarse Gravel	Increase in Grain Size	16.6	Coarse Gravel	57.1	Very Coarse Gravel	Increase in Grain Size
			3076.886	26.26	Low	3.20	None	Decrease	35.9	Very Coarse Gravel	7.7	Fine Gravel	Decrease in Grain Size	34.7	Very Coarse Gravel	10.0	Medium Gravel	Decrease in Grain Size
9	HU_EH_EHR_17_2	Proposed Culvert HU_EH_EHT_17_3_4	3068.88	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3032.119	4.35	None	3.73	None	No Change	9.6	Medium Gravel	8.6	Medium Gravel	No Change	12.0	Medium Gravel	11.2	Medium Gravel	No Change
			2949.172	41.30	Moderate	43.03	Moderate	No Change	48.0	Very Coarse Gravel	47.4	Very Coarse Gravel	No Change	48.6	Very Coarse Gravel	55.1	Very Coarse Gravel	No Change
		Proposed Culvert HU_EH_EHT_17_3_5 (Transit)	2949.17	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2886.632	1.55	None	52.06	Moderate	Increase	5.7	Pebbles	52.7	Very Coarse Gravel	Increase in Grain Size	4.1	Very Coarse Sand	66.2	Small Cobble	Increase in Grain Size
			2788.101	2.73	None	2.73	None	No Change	7.0	Fine Gravel	7.0	Fine Gravel	No Change	8.9	Medium Gravel	8.9	Medium Gravel	No Change
			1812.26	12.28	Low	9.92	None	Decrease	20.2	Coarse Gravel	17.4	Coarse Gravel	No Change	22.6	Coarse Gravel	19.8	Coarse Gravel	No Change
			1625.92	5.88	None	5.88	None	No Change	10.8	Medium Gravel	10.8	Medium Gravel	No Change	18.2	Coarse Gravel	18.2	Coarse Gravel	No Change
9	HU_EH_EHR_17_2	Culvert	1568.03	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			1530.3	10.85	Low	10.81	Low	No Change	16.4	Coarse Gravel	16.3	Coarse Gravel	No Change	27.6	Coarse Gravel	27.6	Coarse Gravel	No Change
			1415.195	28.21	Low	28.21	Low	No Change	37.6	Very Coarse Gravel	37.6	Very Coarse Gravel	No Change	36.2	Very Coarse Gravel	36.2	Very Coarse Gravel	No Change
			2370.437	19.55	Low	25.14	Low	No Change	27.1	Coarse Gravel	32.5	Very Coarse Gravel	Increase in Grain Size	33.2	Very Coarse Gravel	38.5	Very Coarse Gravel	No Change
			2346.795	36.28	Moderate	16.63	Low	Decrease	39.3	Very Coarse Gravel	22.8	Coarse Gravel	Decrease in Grain Size	57.1	Very Coarse Gravel	33.9	Very Coarse Gravel	No Change
		HU_EH_EHT_18_3_3	2344.79	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2307.705	63.05	Moderate	67.60	Moderate	No Change	58.3	Very Coarse Gravel	61.0	Very Coarse Gravel	No Change	80.8	Small Cobble	84.3	Small Cobble	No Change
			2275.007	4.38	None	3.82	None	No Change	9.4	Medium Gravel	8.6	Medium Gravel	No Change	12.9	Medium Gravel	11.6	Medium Gravel	No Change
9	HU_EH_EHR_18_1b	HU_EH_EHT_18_3_4	2274	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2254.425	46.99	Moderate	59.30	Moderate	No Change	47.0	Very Coarse Gravel	55.1	Very Coarse Gravel	No Change	67.3	Small Cobble	79.6	Small Cobble	No Change
			2242.197	33.19	Low	23.79	Low	No Change	37.1	Very Coarse Gravel	29.5	Coarse Gravel	Decrease in Grain Size	53.2	Very Coarse Gravel	42.6	Very Coarse Gravel	No Change
		HU_EH_EHT_18_3_5	2238.19	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			2213.417	10.30	Low	9.74	None	Decrease	16.5	Coarse Gravel	15.9	Medium Gravel	Decrease in Grain Size	24.5	Coarse Gravel	23.2	Coarse Gravel	No Change
			2133.69	88.72	Moderate	88.72	Moderate	No Change	72.1	Small Cobble	72.1	Small Cobble	No Change	106.2	Small Cobble	106.2	Small Cobble	No Change
			928.912	123.08	High	123.08	High	No Change	84.9	Small Cobble	84.9	Small Cobble	No Change	151.5	Large Cobble	151.5	Large Cobble	No Change
			893.029	24.87	Low	24.87	Low	No Change	27.5	Coarse Gravel	27.5	Coarse Gravel	No Change	54.2	Very Coarse Gravel	54.2	Very Coarse Gravel	No Change
9	HU_EH_EHR_18_1b	Kriby Road Culvert	881.52	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			854.967	30.87	Low	30.87	Low	No Change	31.9	Coarse Gravel	31.9	Coarse Gravel	No Change	63.1	Very Coarse Gravel	63.1	Very Coarse Gravel	No Change
			773.018	135.41	High	135.41	High	No Change	92.0	Small Cobble	92.0	Small Cobble	No Change	156.5	Large Cobble	156.5	Large Cobble	No Change
			3924.49	31.88	Low	41.83	Moderate	Increase	39.8	Very Coarse Gravel	46.7	Very Coarse Gravel	No Change	41.8	Very Coarse Gravel	53.2	Very Coarse Gravel	No Change
		HU_EH_EHT_18_5_1		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3777.79	7.47	None	10.00	Low	Increase	14.2	Medium Gravel	17.2	Coarse Gravel	Increase in Grain Size	16.6	Coarse Gravel	20.9	Coarse Gravel	No Change
			3687.29	22.56	Low	17.65	Low	No Change	29.6	Coarse Gravel	24.9	Coarse Gravel	No Change	37.7	Very Coarse Gravel	31.8	Coarse Gravel	Decrease in Grain Size
9	HU_EH_EHR_18_4	HU_EH_EHT_18_5_2	3673.29	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3645.09	29.90	Low	42.32	Moderate	Increase	38.4	Very Coarse Gravel	46.3	Very Coarse Gravel	No Change	39.3	Very Coarse Gravel	55.1	Very Coarse Gravel	No Change
			3582.79	3.43	None	3.17	None	No Change	8.1	Medium Gravel	7.7	Fine Gravel	Decrease in Grain Size	10.4	Medium Gravel	9.6	Medium Gravel	No Change
		Existing Hwy400 culvert	3544.7	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3717.174	0.16	None	0.16	None	No Change	1.1	Coarse Sand	1.1	Coarse Sand	No Change	0.9	Coarse Sand	1.0	Coarse Sand	No Change

Section	Reach ID	Drainage Crossing ID	Station ID	100-Year Flow Event													
				Stream Power					Predicted Grain Size Entrained					Predicted Grain Size Transported				
				Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change	Pre-Existing Conditions		Proposed Conditions		Change
				Unit Stream Power (W/m^2)	Transport Rate	Unit Stream Power (W/m^2)	Transport Rate		Grain Entrained (mm)	Sediment Size	Grain Entrained (mm)	Sediment Size		Grain Size Transported (mm)	Sediment Size	Grain Size Transported (mm)	Sediment Size	
9	HU_EH_EHR_18_5		3434.259	0.29	None	1.56	None	No Change	1.5	Coarse Sand	4.6	Very Coarse Sand	Increase in Grain Size	2.0	Coarse Sand	6.6	Fine Gravel	Increase in Grain Size
		HU_EH_EHT_18_3_6		Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3359.886	0.01	None	0.39	None	No Change	0.2	Fine Sand	1.7	Coarse Sand	Increase in Grain Size	0.2	Fine Sand	2.7	Very Coarse Sand	Increase in Grain Size
			3349.546	0.00	None	0.00	None	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change	0.1	Fine Sand	0.1	Fine Sand	No Change
			3311.742	0.14	None	0.14	None	No Change	0.8	Coarse Sand	0.8	Coarse Sand	No Change	1.4	Coarse Sand	1.4	Coarse Sand	No Change
		Existing Private Culvert	3307	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3287.195	21.09	Low	24.00	Low	No Change	27.6	Coarse Gravel	30.2	Coarse Gravel	No Change	37.7	Very Coarse Gravel	40.9	Very Coarse Gravel	No Change
			3218.272	29.61	Low	22.81	Low	No Change	37.9	Very Coarse Gravel	31.6	Coarse Gravel	Decrease in Grain Size	39.3	Very Coarse Gravel	33.2	Very Coarse Gravel	No Change
9	HU_EH_EHR_18_5		3717.174	0.16	None	0.16	None	No Change	1.1	Coarse Sand	1.1	Coarse Sand	No Change	0.9	Coarse Sand	1.0	Coarse Sand	No Change
		HU_EH_EHT_18_6_1	3670	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3630.589	3.70	None	5.28	None	No Change	9.4	Medium Gravel	11.4	Medium Gravel	No Change	8.9	Medium Gravel	12.9	Medium Gravel	No Change
			3600.859	14.17	Low	32.86	Low	No Change	21.9	Coarse Gravel	40.6	Very Coarse Gravel	Increase in Grain Size	26.3	Coarse Gravel	42.6	Very Coarse Gravel	Increase in Grain Size
		HU_EH_EHT_18_6_2	3594	Flow not modelled through crossing					Flow not modelled through crossing					Flow not modelled through crossing				
			3222.018	16.24	Low	45.41	Moderate	Increase	24.5	Coarse Gravel	48.9	Very Coarse Gravel	Increase in Grain Size	27.6	Coarse Gravel	58.0	Very Coarse Gravel	Increase in Grain Size
			3137.33	10.00	Low	44.41	Moderate	Increase	19.1	Coarse Gravel	48.1	Very Coarse Gravel	Increase in Grain Size	16.6	Coarse Gravel	57.1	Very Coarse Gravel	Increase in Grain Size

F

Key Reach Details, Hazard Assessment, & Crossing-Specific Recommendations

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (CH, 2020)	Hazard Assessment
Section 1	Conservation Halton	Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_2_1**	SM_EB_SIM_2_DR2	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Sinuous	Unconfined	10.34	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**SM_EB_SIM_2_DR2** Crossing IDs ending with DR are considered micro drainage features by drainage. No modelling will be performed	**SM_EB_SIM_2_DR2** 900 mm Circular Culvert	Highway 401 roadside drainage, with future confirmation that a channel to East Sixteen Mile Creek exists (as shown on mapping). Likely no watercourse at this location No change to crossing is anticipated at this time however, there is the potential for in channel work depending on if there is road widening	**Assume no change** in structure is proposed	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen in field, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements as well as any fisheries/terrestrial limiting criteria.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is 10.34 ha= Low **SM_EB_SIM_2_DR2** Micro-drainage structure. Hydraulic assessment will not be completed
Section 1	Conservation Halton	Sixteen Mile	East Branch	Sixteen Mile Creek	**SM_EB_SIM_0_2**	SM_EB_SIM_0_WC1 EXTENSION	7.3	Transitional or Stressed	Permanent	Defined Channel	Present	Sinuous, straight through crossing	Confined	2105.8	NA	146	82.0 -140.0	Based on Mapping	5.0 -8.0 *6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	82.0 -140.0	Final = Preliminary MBW (82.0 -140.0 m) due to valley confinement	No	NA	7 m	**SM_EB_SIM_0_WC1** Slight change to the predicted grain size entrained and transported for the 2, 50, and 100 year flow events. Slight increase in grain size at the first station immediately downstream of the crossing and decrease at the next station. No change to predicted transport rate based on stream power for the two year flow event. Increase in predicted sediment transport immediately downstream of the crossing (first station) from no anticipated sediment transport to a high rate of transport. By the second station the predicted transport rate decreases to low rates of transport for the 50 and 100 year flow events.	**SM_EB_SIM_0_WC1** No. of Barrels: 2 Span: 6100 mm Rise: 4200 mm (Embed 400) Length: 160,300 mm Type: Concrete Box (Extension-South)	Watercourse has historically been altered due to the creation of Highway 401. Current Highway 401 Widening work consists of twin cell culvert replacement, channel modification (extension has already occurred, closed bottom). Historical Redside Dace habitat (not regulated under ESA). Bank erosion was considered to be typical for grass lined channels. The design include riffle-pool profile, low flow channel, mitigation of the steep ramps at the culvert outlet should be incorporated into the Detail Design if lowering of the culvert outlet is not feasible. - Further enclosure of the watercourse through an extended crossing will limit fluvial geomorphological adjustments of the channel - Upstream is urbanized - consider catchment wide channel adjustment In the 401 Corridor Integrated Planning Project report (Dillon Consulting, 2000) this reach is referred to as Reach D. The meander belt width calculated for the watercourse was 75m with a 15m erosion setback. Bankfull characteristics defined in the report agree with findings for this report. Channel realignment/ alteration may be required for culvert extension. Potential in channel work is required to satisfy culvert extension. Fluvial Geomorphology should be involved during Detail Design	Extension - **no change** in span (input will be required for channel as part of extension) Pre-existing inner culvert width of 6.1 m	Fluvial Geomorphology Assessment - Based on upstream assessment. This section likely will be a culvert extension. Potential channel realignment	Verify that the design has adequately allowed for natural channel migration (N/A due to channel extension), fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA - Transitional/Stressed = Moderate Defined Channel = High; Erosion present = Mod-High; Planform is sinuous to straight= Low; Confined = Low; Drainage Area is 2105.77 ha= Low-Mod **SM_EB_SIM_0_WC1** Culvert extension. Hydraulic assessment indicates a change in sediment transport and entrainment immediately downstream of the crossing under proposed conditions for a short section. This could result in erosion immediately downstream of the proposed culvert extension.
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_1**	Crossing SM_EL_SIM_1_DR1 removed from 90% design	Small undefined drainage feature based on air photo review. Assumed there is No Bankfull No permission to enter	RGA not applicable for undefined features No permission to enter	Ephemeral	No Defined Feature based on air photo review (likely vegetation, groundwater, or topography controlled)	Assumed no erosion due to lack of channel definition. Small drainage feature. No permission to enter	Straight, slightly sinuous	Unconfined	3.67	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity appears to be topography controlled	**SM_EL_SIM_1_DR1** Crossing IDs ending with DR are considered micro drainage features by drainage. No modelling will be performed	**SM_EL_SIM_1_DR1** No of Barrels: 1 Rise: 900 mm Type: Circular Culvert	Appears to be a small feature that begins at proposed 413 transportation route. Small drainage area indicates that Fluvial Geomorphology input is likely not required. Open bottom crossings preferred. Potential site of storm pond. Realignment may be required. Fluvial Geomorphology should be involved during Detail Design.	Drainage structure. No further plans for Fluvial Geomorphology investigation **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 3.67 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen in the air photo, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements as well as any fisheries/terrestrial limiting criteria.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is sinuous to straight (topography controlled)= Low; Unconfined = High; Drainage Area is 3.67 ha= Low **SM_EL_SIM_1_DR1** Micro-drainage structure. Hydraulic assessment will not be completed
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_2**	SM_EL_SIM_1_WC1.1, SM_EL_SIM_1_WC1.2, SM_EL_SIM_1_WC1.3, SM_EL_SIM_1_WC1.4, SM_EL_SIM_1_WC1.5	No Bankfull	RGA not applicable for undefined features	Ephemeral - Swale	Poorly defined (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	WC1.1: 39.5 WC1.2: 39.5 WC1.3: 47.0 WC1.4: 55.2 WC1.5: 69.3	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**SM_EL_SIM_1_WC1.1 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Very Coarse Gravel for the 50-year flow event and Very Coarse Gravel for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC1.2 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Very Coarse Gravel for the 50-year flow event and Very Coarse Gravel for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC1.3** No work is proposed for culvert. **SM_EL_SIM_1_WC1.4** No work is proposed for culvert. **SM_EL_SIM_1_WC1.5 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event. No stream power or shear stress modelled.	**SM_EL_SIM_1_WC1.1**: 2400 mm x 1500 mm **SM_EL_SIM_1_WC1.2**: 2400 mm x 1500 mm **SM_EL_SIM_1_WC1.3;** No work is proposed for culvert. **SM_EL_SIM_1_WC1.4**: No work is proposed for culvert. **SM_EL_SIM_1_WC1.5**: 4000 mm x 1800 mm	Multiple crossing structures exist in the area. Multiple existing storm pond downstream of Highway 401. Open bottom crossing preferred No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Majority of reach is located within the limits of grading. Potential for in channel work. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (swale type feature with small upstream drainage area 39.5-69.3 ha) No work is proposed for SM_EL_SIM_1_WC1.3. No recommendation provided.	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen from roadside, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements as well as any fisheries/terrestrial limiting criteria.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 46.97 ha= Low **SM_EL_SIM_1_WC1.1** **SM_EL_SIM_1_WC1.2** **SM_EL_SIM_1_WC1.5** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage **SM_EL_SIM_1_WC1.3** No work is proposed for culvert. **SM_EL_SIM_1_WC1.4** No work is proposed for culvert.
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_3**	SM_EL_SIM_1_WC1 EXTENSION, SM_EL_SIM_1_WC1.6	Small undefined drainage feature based on air photo review. Assumed there is No Bankfull No permission to enter	RGA not applicable for ephemeral features No permission to enter	Ephemeral	No Defined Feature based on air photo review (likely vegetation, groundwater, or topography controlled)	Assumed no erosion due to lack of channel definition. Small drainage feature. No permission to enter	Straight	Unconfined	WC1: 86.9 WC1.6: 91.2	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**SM_EL_SIM_1_WC1 (Existing Culvert)** Increase in grain size from Very Coarse Gravel to Large Cobble for the 50 year flow event and from Very Coarse Gravel to Small boulder for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC1.6 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Very Coarse Gravel for the 50-year flow event and Very Coarse Gravel for the 100-year flow event. No stream power or shear stress modelled.	**SM_EL_SIM_1_WC1:** 3000 mm x 1500 mm **SM_EL_SIM_1_WC1.6:** 4000 mm x 2000 mm	It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology may want to take a closer look at Detail Design stage No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Realigning existing storm pond. Realignment may be required. Fluvial Geomorphology should be involved during Detail Design.	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** **SM_EL_SIM_1_WC1:** Extension - no change in span (input will be required for channel as part of extension)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen in the air photo, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements as well as any fisheries/terrestrial limiting criteria.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; Assumed No Erosion (appears to be undefined) = Low; Planform is straight= Low; Unconfined = High; Drainage Area is <100 ha= Low **SM_EL_SIM_1_WC1** Culvert extension. It appears the feature is not defined however, the hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage **SM_EL_SIM_1_WC1.6** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_4**	SM_EL_SIM_1_WC2.1, RELOCATED, SM_EL_SIM_1_WC2.2	No Bankfull	RGA not applicable for undefined features Assessed at Steeles Ave upstream	Ephemeral - Swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	41.7	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**SM_EL_SIM_1_WC2.1 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Coarse Gravel for the 50-year flow event and Very Coarse Gravel for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC2.2 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Coarse Gravel for the 50-year flow event and Coarse Gravel for the 100-year flow event. No stream power or shear stress modelled.	**SM_EL_SIM_1_WC2.1:** 4500 mm x 1200 mm **SM_EL_SIM_1_WC2.2:** 8500 mm x 900 mm	Multiple crossing structures exist in the area. Open bottom crossing preferred. No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Majority of reach is located within the limits of grading. Potential for in channel work. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (swale type feature at Steeles Road, small upstream drainage area 41.74 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements as well as any fisheries/terrestrial limiting criteria.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 41.74 ha= Low **SM_EL_SIM_1_WC2.1** **SM_EL_SIM_1_WC2.2** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_5**	SM_EL_SIM_1_WC2.3 EXTENSION	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	72.4	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	– Straight Sinuosity is topography controlled	**SM_EL_SIM_1_WC2.3 (Existing Culvert)** No change in proposed grain size transported during 50 or 100-year flow events. No stream power or shear stress modelled.	**SM_EL_SIM_1_WC2.3:** 3500 mm x 1500 mm	Multiple Structures in the area Channel realignment/ alteration may be required for culvert extension. Potential in channel work is required to satisfy culvert extension. Fluvial Geomorphology should be involved during Detail Design	Extension - **no change** in span (input will be required for channel as part of extension)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 71.53 ha= Low **SM_EL_SIM_1_WC2.3** Culvert extension. Hydraulic assessment indicates no significant change in sediment transport/entrainment between existing and proposed conditions.

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (CH, 2020)	Hazard Assessment
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_8**	SM_EL_SIM_1_WC3.1, SM_EL_SIM_1_WC3.2 EXTENSION, SM_EL_SIM_1_WC3.3 SM_EL_SIM_1_WC3.6 RELOCATION,	No Bankfull	RGA not applicable for undefined features	Ephemeral - Swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	WC3.1: 69.9 WC3.2: 69.9 WC3.3: 69.9 WC3.6: 86.8	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**SM_EL_SIM_1_WC3.1 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Very Coarse Gravel for the 50-year flow event and Small Cobble for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC3.2 (Existing Culvert)** Decrease in predicted grain size transported from Large Cobble to Small Cobble for the 50 year flow event and from Large Cobble to Small Cobble for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC3.3 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Large Cobble for the 50-year flow event and Large Cobble for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC3.5 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Large boulder for the 50-year flow event and Large boulder for the 100-year flow event. No stream power or shear stress modelled. **SM_EL_SIM_1_WC3.6 (New Culvert)** New crossing structure. No pre-existing velocity provided. Proposed velocity predicts transport of Very Coarse Gravel for the 50-year flow event and Very Coarse Gravel for the 100-year flow event. No stream power or shear stress modelled.	**SM_EL_SIM_1_WC3.1:** 3500 mm x 1500 mm **SM_EL_SIM_1_WC3.2:** 3500 mm x 1500 mm **SM_EL_SIM_1_WC3.3:** 3500 mm x 1500 mm **SM_EL_SIM_1_WC3.5:** 3500 mm x 2100 mm **SM_EL_SIM_1_WC3.6:** 3500 mm x 2100 mm	Multiple Structures in the area It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology may want to take a closer look at Detail Design stage No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Channel realignment/ alteration may be required for culvert extension and relocation. Potential in channel work is required to satisfy culvert extension. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (swale type feature) small upstream drainage area 69.9-86.8 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology may want to take a closer look at Detail Design stage	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 89.93 ha= Low **SM_EL_SIM_1_WC3.1** **SM_EL_SIM_1_WC3.3** **SM_EL_SIM_1_WC3.5** **SM_EL_SIM_1_WC3.6** No pre-existing velocity provided. Hydraulic data assessment cannot be completed. **SM_EL_SIM_1_WC3.2** Culvert Extension. Feature is an undefined ephemeral swale but hydraulic assessment shows a slight decrease in predicted grain size transported from pre-existing to proposed conditions
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_9**	SM_EL_SIM_1_WC3.4 MODIFICATION, SM_EL_SIM_1_WC3.5,	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	85.3	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	~ Straight Sinuosity is topography controlled	**SM_EL_SIM_1_WC3.4 MODIFICATION** No Hydraulic Data at this time - modification to existing culvert only.	**SM_EL_SIM_1_WC3.4 MODIFICATION** Modification only.	Channel design may be required if channel is modified No velocity provided. Fluvial Geomorphology should be involved during Detail Design Channel realignment/ alteration may be required for channel modification. Potential in channel work required. Fluvial Geomorphology should be involved during Detail Design	Modified structure only. **Defer to hydraulic flow requitements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to size of upstream drainage area, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 105.49 ha= low-mod **SM_EL_SIM_1_WC3.4 MODIFICATION** Hydraulic assessment not included in Hazard assessment. Modification of pre-exiting structure only
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_10**	SM_EL_SIM_1_WC4 EXTENSION	No Bankfull	RGA not applicable for undefined features	Ephemeral - Swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	60.7	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	~ Straight Sinuosity is topography controlled	**SM_EL_SIM_1_WC4 (Existing Culvert)** Increase in grain size from Very Coarse Gravel to Small boulder for the 25, 50, and 100 year flow events. No stream power or shear stress modelled.	**SM_EL_SIM_1_WC4:** 3500 mm x 1500 mm	Multiple Structures in the area Channel realignment/ alteration may be required for culvert extension. Potential in channel work is required to satisfy culvert extension	Extension - **no change** in span (input may be required for channel as part of extension)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 59.61 ha= Low **SM_EL_SIM_1_WC4** Culvert extension. It appears the feature is not defined however, the hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 1	Conservation Halton	Sixteen Mile	East Branch Lisgar	Sixteen Mile Creek	**SM_EL_SIM_1_11**	SM_EL_SIM_1_WC4.1 EXTENSION	No Bankfull Assessed from Roadway	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	62.55	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	~ Straight Sinuosity is topography controlled	**No Hydraulic Data at this time**	**SM_EL_SIM_1_WC4.1** No of Barrels: 2 Span: 3.500 mm Rise: 1800 (Embed 300 mm) Length: NA Type: Concrete Box (Extension)	Multiple Structures in the area Channel realignment/ alteration may be required for culvert extension. Potential in channel work is required to satisfy culvert extension. Fluvial Geomorphology should be involved during Detail Design	**No change** in structure appears to be proposed	Fluvial Geomorphology Assessment - Due to size of upstream drainage area, it is likely that if a crossing is proposed for this reach it will be deferred to hydraulic flow requirements.	Verify that the design has adequately allowed for natural channel migration, fish/terrestrial passage, sediment transport, and minimizes the risk to infrastructure	**Hazard Assessment: Low** RGA = N/A No Defined Channel = Low; No Erosion = Low; Planform is straight= Low; Unconfined = High; Drainage Area is 62.55 ha= Low **SM_EL_SIM_1_WC4.1** Hydraulic assessment not included in hazard assessment. Extension of pre-exiting structure only

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (CVC, 2019)	Hazard Assessment
Section 2	Credit Valley Conservation Authority	Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_3**	CR-MC-MUL-8-WC1	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Relatively Straight	Unconfined	12.23	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. Crops are planted through the feature and therefore it has likely been modified by agricultural practices. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices.						No	NA	~ Straight Sinuosity is topography controlled	**CR-MC-MUL-8-WC1** Increase in predicted grain size transported from Very Coarse Gravel to Small boulder for the 50 year flow event and from Small Cobble to Small boulder for the 100 year flow event. No stream power or shear stress modelled.	**CR-MC-MUL-8-WC1** Rise: 900 mm Length: 100,000 mm Circular Culvert	Small feature with agricultural crops planted through it. Feature likely impacted by agricultural practices. In the 401 Corridor Integrated Planning Project report (Dillon Consulting, 2000) it states that the upper portions of the Mullett Creek are ephemeral and provide limited functional value for aquatic or terrestrial resources. Drainage would like to regrade the south end, west side to drain to culvert MUL-8-WC1 - watercourse identified as ephemeral but increase drainage may alter channel Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (no defined channel, small upstream drainage area 12.23 ha)	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR-MC-MUL-8-WC1** It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_4**	CR-MC-MUL-8-WC3	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Sinuous around driveway area to field	Unconfined	6.3	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. Crops are planted through the feature and therefore it has likely been modified by agricultural practices. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**CR-MC-MUL-8-WC3** Increase in predicted grain size transported from Very Coarse Sand to Small Cobble for the 50 year flow event and from Very Coarse Sand to Small Cobble for the 100 year flow event. No stream power or shear stress modelled.	**CR-MC-MUL-8-WC3** Rise: 900 mm Length: 100,000 mm Circular Culvert	Small feature with agricultural crops planted through it. In the 401 Corridor Integrated Planning Project report (Dillon Consulting, 2000) it states that the upper portions of the Mullett Creek are ephemeral and provide limited functional value for aquatic or terrestrial resources. Feature likely impacted by agricultural practices. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Some in-channel vegetation noted, may be vegetation controlled. Drainage area less than 100 Ha. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design Realignment work is unlikely however this will be confirmed during additional stages of the study. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (no defined channel, small upstream drainage area 6.3 ha)	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR-MC-MUL-8-WC3** It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Mullet Creek	Mullet Creek	**CR_MC_MUL_8_6**	CR-MC-MUL-8-WC4	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Slightly Sinuous	Unconfined	10.43	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. Crops are planted through the feature and therefore it has likely been modified by agricultural practices. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**CR-MC-MUL-8-WC4** Increase in predicted grain size transported from Very Coarse Sand to Large Cobble for the 50 year flow event and from Very Coarse Sand to Large Cobble for the 100 year flow event. No stream power or shear stress modelled.	**CR-MC-MUL-8-WC4** Rise: 900 mm Length: 110,000 mm Circular Culvert	Small feature with agricultural crops planted adjacent to it. In the 401 Corridor Integrated Planning Project report (Dillon Consulting, 2000) it states that the upper portions of the Mullett Creek are ephemeral and provide limited functional value for aquatic or terrestrial resources. Feature likely impacted by agricultural practices. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Some in-channel vegetation noted, may be vegetation controlled (drainage area less than 100 Ha) Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (no defined channel, small upstream drainage area 10.43 ha)	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR-MC-MUL-8-WC4** It appears the channel is not defined however, the hydraulic assessment is showing a large potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_1_1**	**Crossing removed from 90% design	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Slightly Sinuous	Unconfined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**No Hydraulic Data at this time - update during additional stages of study**	Unknown	Small feature with agricultural crops planted adjacent to it. Feature likely impacted by agricultural practices. Drainage - LEV-1-WC3 has a small drainage area and would like to direct to next culvert. The next crossing is reach CR-LC-LEV-1-2 which is an intermittent channel and contributing Redside dace habitat No velocity provided. Fluvial Geomorphology should be involved during Detail Design Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** **Crossing removed from 90% design	Fluvial Geomorphology Assessment Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_1_2**	CR_LC_LEV_1_WC2	1.3	In Regime	Intermittent	Defined Channel/ low flow channel	None identified, but the downstream section seems to be entrenched	Slighlty Sinuous	Unconfined - may be slighlty entrenched downstream	104.38	NA	26	9.6	Historically Altered – Used Empirical Method	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	17.6	Final = Preliminary MBW (9.6 m) + 2x Erosion Rate (2 x 4.0 m) = 17.6 m	No	NA	Straight	CR_LC_LEV_1_WC2 Increase in predicted grain size transported from Coarse Gravel to Small boulder for the 50 year flow event and from Coarse Gravel to Medium boulder for the 100 year flow event. No stream power or shear stress modelled. Hydraulic culvert size is 2100 mm; Fluvial Geomorphology recommendation of 4.5 m should improve sediment transport numbers	**CR_LC_LEV_1_WC2** Rise: 2,100 mm Length: 130,000 mm Circular Culvert	Existing watercourse is stable based on the results of the Rapid Geomorphic Assessment. Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Drainage - LEV-1-WC3 has a small drainage area and would like to direct to next culvert. The next crossing is reach CR-LC-LEV-1-2 which is an intermittent channel and contributing Redside dace habitat - will increased flows impact stability? Redside dace do not like turbid water Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**4.5 m:** For the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted. Based on field assessment the bankfull width is approximately 1.3 m wide resulting in a span approximately 4.5 m wide (1.5 x 3 m).	4.5 m: For the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted. Based on field assessment the bankfull width is approximately 1.3 m wide resulting in a span approximately 4.5 m wide (1.5 x 3 m).	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Low** RGA - In Regime = Low; Defined Channel = High; Erosion not present = Low; Planform is slighlty sinuous to straight = Low-Mod; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR_LC_LEV_1_WC2** Proposed 50-yr and 100-yr Return flow event results in an increase in the sediment size predicted to be transported. Hydraulic culvert size is 2100 mm; Fluvial Geomorphology recommendation of 4.5 m should improve sediment transport numbers
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_1**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. Crops are planted through the feature and therefore it has likely been modified by agricultural practices. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**No proposed crossing**	**No proposed crossing**	Small feature with agricultural crops in adjacent land. Feature likely impacted by agricultural practices. No velocity provided. Fluvial Geomorphology should be involved during Detail Design A portion of reach is located within the limits of grading. Potential for in channel work. Fluvial Geomorphology should be involved during Detail Design	**No proposed crossing**	No proposed crossing	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**N/A -** No proposed crossing
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_2**	No proposed crossing ID. Crossing will be located immediately downstream of reach break within reach CR_LC_LEV_2_4	3.0	In Regime	Intermittent	Defined	Present	Straight	Unconfined	Not modelled/ not calculated	NA	60	21.4	Historically Altered – Used Empirical Method	8.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	37.4	Final = Preliminary MBW (21.4 m) + 2 x Erosion Rate (2 x 8.0 m) = 37.4 m	No	NA	Straight. Has been artificialy straightened	**No proposed crossing**	**No proposed crossing**	Only a small portion of the downstream end within the proposed route. Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. No velocity provided. Fluvial Geomorphology should be involved during Detail Design A portion of reach is located within the limits of grading. Potential for in channel work. Fluvial Geomorphology should be involved during Detail Design	**No proposed crossing**	No proposed crossing	Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. The 100-year local erosion hazard will determine the extent at which the crossing infrastructure should be placed in order to avoid future channel realignment or unnecessary hardening of the channel or banks.	**N/A -** No proposed crossing
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_3**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Straight	Unconfined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	5 m Sinuosity is topography controlled	**No proposed crossing**	**No proposed crossing**	Located in potential Maintenance Yard Site	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No proposed crossing	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**N/A -** No proposed crossing

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (CVC, 2019)	Hazard Assessment
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5**	CR_LC_LEV_2_WC2.1 CR_LC_LEV_2_WC2.2 CR_LC_LEV_2_WC2	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled) Assessed from roadway - Upstream of Winston Churchill Boulevard Possibly has been modified	None	Straight based on aerial analysis (no clear defined feature observed in field)	Unconfined	WC2.1: 53.2 ha WC2.2: 62.5 ha WC3: 62.5 ha	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**CR_LC_LEV_2_WC2.1** Increase in predicted grain size transported from Fine Gravel to Small boulder for the 50 year flow event and from Fine Gravel to Medium boulder for the 100 year flow event. No stream power or shear stress modelled. **CR_LC_LEV_2_WC2.2** Increase in predicted grain size transported from Medium Gravel to Medium boulder for the 50 year flow event and from Medium Gravel to Medium boulder for the 100 year flow event. No stream power or shear stress modelled. **CR_LC_LEV_2_WC2** Increase in predicted grain size transported from Fine Gravel to Small boulder for the 50 year flow event and from Fine Gravel to Small boulder for the 100 year flow event. No stream power or shear stress modelled.	**CR_LC_LEV_2_WC2.1** Rise: 1,500 mm Length: 25,000 mm Circular Culvert **CR_LC_LEV_2_WC2.2** Rise: 1,650 mm Length: 25,000 mm Circular Culvert **CR_LC_LEV_2_WC2** Rise: 1,650 mm, Run: 100,000 mm. Circular Culvert	Watercourse likely crossed by both ramp and main highway. Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (not defined at proposed crossing location, small upstream drainage area 53.4 ha)	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (not defined at proposed crossing location, small upstream drainage area 53.4-62.5 ha)	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR_LC_LEV_2_WC2.1** **CR_LC_LEV_2_WC2.2** **CR_LC_LEV_2_WC2** It appears the channel is not defined however, the hydraulic assessment is showing a large potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5a**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral. Crops planted through feature based on aerial imagery	No Defined Feature (no water visible from ROW but an approximately 30 m stretch of Phragmites present).	None	Straight (likely straightened by agricultural activities) Assessed from aerial imagery	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	NA	NA	NA	Located in Potential Maintenance Yard Site	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No proposed crossing	No proposed crossing	NA
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5b**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral. Crops planted through feature based on aerial imagery	No Defined Feature (small patch of Phragmites and Cattails visible from the ROW)	None	Straight (likely straightened by agricultural activities) Assessed from aerial imagery	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	NA	NA	NA	Located in Potential Maintenance Yard Site	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No proposed crossing	No proposed crossing	NA
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5c**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral. Crops planted through feature based on aerial imagery	No Defined Feature (Stagnant water is present in the drainage feature parallel to roadway)	None	Straight (Assessed from aerial imagery)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	NA	NA	NA	Located in Potential Maintenance Yard Site	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No proposed crossing	No proposed crossing	NA
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5d**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral. Crops planted through feature based on aerial imagery	No Defined Feature (no flow visible from ROW and no defined flow path)	None	Straight (likely straightened by agricultural activities) Assessed from aerial imagery	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	NA	NA	NA	Located in Potential Maintenance Yard Site	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No proposed crossing	No proposed crossing	NA
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_5e**	No proposed crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral. Crops planted through feature based on aerial imagery	No Defined Feature (visible from ROW as topographic low within an agricultural field)	None	Straight (Assessed from aerial imagery)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	NA	NA	NA	Located in Potential Maintenance Yard Site	**No proposed crossing.** This reach is one of several undefined ephemeral watercourses that are currently in the footprint of a planned maintenance yard.	No proposed crossing	No proposed crossing	NA
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_4**	CR_LC_LEV_2_WC1, CR_LC_LEV_2_WC1.1	2.9	In Regime	Intermittent	Defined	None	Sinuous (likely straightened by agricultural activities)	Unconfined	131.49	NA	58	19.6	Historically Altered – Used Empirical Method	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	27.6	Final = Preliminary MBW (19.6m) + 2 x Erosion Rate (2 x 4.0 m) = 27.6 m	No	NA	Straight. Upstream appears to be a confluence and flow into crossing will need to consider planform of tributary channels.	**CR_LC_LEV_2_WC1.1** No change in predicted grain size transported for the 50 or 100 year flow events. No stream power or shear stress modelled.	**CR_LC_LEV_2_WC1.1** Span: 11,000 mm Rise: 2,440 mm Length: 95,000 mm Concrete Box	Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (surrounded by agriculture) Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Potential for in channel work depending on length and span of crossing of new structure. Fluvial Geomorphology should be involved during Detail Design	**9.0 m:** For the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted. Based on field assessment the bankfull width is approximately 2.9 m wide resulting in a span approximately 9.0 m wide (2.9 x 3.0 m).	**9m:** For the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted. Based on field assessment the bankfull width is approximately 2.9 m wide resulting in a span approximately 9 m wide (2.9 x 3 m).	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Low-Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion not present = Low; Planform is sinuous to straight= Mod; Unconfined=High; Drainage Area is between 100 and 2500 Ha= Low-Mod **CR_LC_LEV_2_WC1.1** No change in predicted grain size transported for the 50 year flow event and slight change for the 100 year flow event
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_2_6**	CR_LC_LEV_2_WC6	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight	Unconfined	17.1	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	Sinuosity is topography controlled	**CR_LC_LEV_2_WC6** Increase in predicted grain size transported from Very Coarse Sand to Small boulder for the 50 year flow event and from Very Coarse Sand to Small boulder for the 100 year flow event based on a crossing size of 1200 mm. No stream power or shear stress modelled.	**CR_LC_LEV_2_WC6** Run: 1,200 mm Length: 160,000 mm Circular Culvert	Small feature with small upstream drainage area. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of crossing of new structure. Fluvial Geomorphology should be involved during Detal Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (no defined channel, small upstream drainage area 17.1 ha)	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR_LC_LEV_2_WC6** It appears the channel is not defined however, the hydraulic assessment is showing a large potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_0_2**	CR_LC_LEV_0_WC2	4.2	Transitional or Stressed	Permanent	Defined	Present	Sinuous	Unconfined	733.35	NA	84	14.0	Based on Mapping	10.0 (+/-3)	Based on Mapping	34.0	Final = Preliminary MBW (14.0 m) + 2x Erosion Rate (2x10.0 m) = 34.0 m	Yes	Final = Preliminary MBW (14m) + 2x Erosion Rate (2x10m) + 2x 30m Riparian Buffer = 94 m	8 m	**CR_LC_LEV_0_WC2** No significant change in predicted grain size transported or entrained for the 2, 25, 50, or 100 year flow events. Stream power ranges from predicting no sediment transport to moderate sediment transport for the 2 year flow event. Overall no significant change in predicted transport rate under any of the flow events between existing and proposed conditions.	**CR_LC_LEV_0_WC2** Span: 65,000 mm Rise: 2,500 mm Length: 110,000 mm Bridge	Recovery Habitat for Redside Dace defines habitat as meander belt plus 30 m. Opportunities exist to improve habitat for Redside Dace Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Proposed crossing located in a sinuous portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Lateral migration likely in unconfined valleys (wide, flat floodplains) Based on the Rapid Geomorphic Assessment watercourse reach is in transition, with dominant process occurring being aggradation. Overtime, sediment deposition may initiate meander development. Moderate slope with some existing erosion noted. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 10.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30.0 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including Riparian Buffer 94.0 m**	94.0 m: Classified as Redside Dace Occupied Habitat Final meander belt is 34.0 m Erosion Rate is 10.0 (+/- 3m) Total meander belt is 34.0 m (+/- 3 m) based on meander belt and erosion rate, but also must add 30 m on either side (for Redside dace occupied habitat). Final width of 94m (this is based on Redside dace requirements, confirm with fisheries)	Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard (side note - due to the presence of Recovery Habitat for Redside Dace a meander belt assessment must be completed)	**Hazard Assessment: Moderate** RGA = Transitional Stressed = Moderate; Defined Channel = High; Erosion present = Mod-High; Planform is sinuous = Mod; Unconfined=High; Drainage Area is between 100 and 2500 Ha = Low-Mod **CR_LC_LEV_0_WC2** No significant change in predicted grain size transported or entrained or to predicted sediment transport for the range of flow events considered.

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (CVC, 2019)	Hazard Assessment
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_0_1**	CR_LC_LEV_0_WC2	4.1	In Regime (borders Transitional or Stressed)	Permanent	Defined	Present	Sinuous	Unconfined	733.35	NA	82	10.0	Based on Mapping	10.0 (+/-3)	Based on Mapping	30.0	Final = Preliminary MBW (10.0 m) + 2x Erosion Rate (2 x 10.0 m) = 30.0 m	Yes	Final = Preliminary MBW (10m) + 2x Erosion Rate (2x10m) + 2x 30m Riparian Buffer = 90 m	7.0 m	**CR_LC_LEV_0_WC2** No significant change in predicted grain size transported or entrained for the 2, 25, 50, or 100 year flow events. Stream power ranges from predicting no sediment transport to moderate sediment transport for the 2 year flow event. Overall no significant change in predicted transport rate under any of the flow events between existing and proposed conditions.	**CR_LC_LEV_0_WC2** Span: 65,000 mm Rise: 2,500 mm Length: 110,000 mm Bridge	Recovery Habitat for Redside Dace defines habitat as meander belt plus 30 m Opportunities exist to improve habitat for Redside Dace Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design.	Proposed bridge piers should be 10.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW including Riparian Buffer 90.0 m**	Fluvial Geomorphology Assessment Due to the presence of Recovery Habitat for Redside Dace, the proposed crossing is 30 m plus 30 m on either side of the meander belt leading to a total size recommendation of 90.0 m	Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard (side note - due to the presence of Recovery Habitat for Redside Dace a meander belt assessment must be completed)	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is sinuous = Mod; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_LC_LEV_0_WC2** No significant change in predicted grain size transported or entrained or to predicted sediment transport for the range of flow events considered.
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_9_1**	CR_LC_LEV_9_DR1 **Crossing removed from 90% design	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Sinuous	Unconfined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices					No	NA	Sinuosity is topography controlled	**CR_LC_LEV_9_DR1** Crossing IDs ending with DR are considered micro drainage features by drainage. No modelling will be performed	Crossing removed from proposed route	Appears to be an undefined feature with small upstream drainage area. Is classified as Contributing Habitat for Redside Dace. Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. No velocity provided as the crossing has been removed from the proposed route. Fluvial Geomorphology should be involved during Detail Design if crossing is required.	**Crossing removed from proposed route. No recommendations provided at this time.**	Crossing appears to have been removed from proposed route	Watercourses with small upstream drainage area. Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Unconfined=High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low **Crossing removed from 90% design
Section 2	Credit Valley Conservation Authority	Credit River	Levi Creek	Levi Creek	**CR_LC_LEV_10_1**	CR_LC_LEV_10_WC1.1	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	None	Sinuous	Unconfined	5.2	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices					No	NA	Sinuosity is topography controlled	**CR_LC_LEV_10_WC1.1** No pre-existing velocity provided. Proposed velocity predicts movement of Small boulder during the 50 year flow event and Small boulder for the 100-year flow event. No stream power or shear stress modelled.	Crossing removed from proposed route	Undefined feature with small upstream drainage area. Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (no defined channel, small upstream drainage area 17.1 ha)	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined=High; Drainage Area is less than 100 Ha= Low **CR_LC_LEV_10_WC1.1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_7_1**	CREDIT RIVER BRIDGE	No Bankfull. No defined feature at crossing. Further upstream the feature appears to be more defined and is 2.5 m to 3.0 m wide in short defined area where slope is steep	RGA not applicable for undefined features	Ephemeral	Largely undefined at crossing. Looks ephemeral at crossing. Defined in areas of steeper slope (site visit upstream of proposed route)	No erosion noted at crossing. Erosion present in steeper areas (site visit upstream of proposed route)	Sinuous	Partially confined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices					No	NA	Sinuosity is topography controlled	**Credit River Bridge** No Hydraulic Data at this time - update during additional stages of study	**Credit River Bridge** Span: 605,000 mm Rise: 19,000 mm Bridge	Fluvial Geomorphology Assessment - Watercourse will likely be spanned by proposed Credit River bridge crossing, Realignment may be required. Fluvial Geomorphology should be involved during Detail Design due to pier locations. The width of the channel upstream of the proposed route is less than 4 m, the general rule of 4 times bankfull width for the crossing span is proposed if separate crossing from the Credit River bridge required. Potential realignment due to bridge piers will require Fluvial Geomorphology input. Fluvial Geomorphology should be involved during Detail Design Potential for in-channel work due to pier placement	**Assumed to be crossed with the Credit River Bridge** Abutments, piers, and other bridge components should remain outside of the 100-year erosion rate. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time.	**Assumed to be crossed with the Credit River Bridge** Piers should remain outside of erosion rate	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Mod; Planform is sinuous (topography controlled) = Low; Partially Confined = Mod-High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low **Credit River Bridge** No velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_6_1**	CREDIT RIVER BRIDGE	No Bankfull. Limited permission to enter	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature	None	Straight	Unconfined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices					No	NA	Sinuosity is topography controlled	**Credit River Bridge** No Hydraulic Data at this time - update during additional stages of study	**Credit River Bridge** Span: 605,000 mm Rise: 19,000 mm Bridge	Fluvial Geomorphology Assessment - Watercourse will likely be spanned by proposed Credit River bridge crossing, Realignment may be required. Fluvial Geomorphology should be involved during Detail Design due to pier locations. The width of the channel upstream of the channel is less than 4 m, the general rule of 4 times bankfull width for the crossing span is proposed if separate crossing from the Credit River bridge required. Potential realignment due to bridge piers will require Fluvial Geomorphology input. Fluvial Geomorphology should be involved during Detail Design Potential for in-channel work due to pier placement	**Assumed to be crossed with the Credit River Bridge** Abutments, piers, and other bridge components should remain outside of the 100-year erosion rate. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time.	**Assumed to be crossed with the Credit River Bridge** Piers should remain outside of erosion rate	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is unknown but watercourse is ephemeral indicating small drainage area= Low **Credit River Bridge** No velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_0_1**	CREDIT RIVER BRIDGE	27.0	Transitional or Stressed (borders Stable)	Permanent	Defined	Present	Sinuous	Confined	Not modelled/ not calculated	NA	540	450.0 -640.0	Based on Mapping	20.0 (+/-3)	Based on Mapping	450.0 – 640.0	Final = Preliminary MBW = 450.0 – 640.0 m	No	NA	60 m (wide meander)	**Credit River Bridge** No Hydraulic Data at this time - update during additional stages of study	**Credit River Bridge** Span: 605,000 mm Rise: 19,000 mm Bridge	Location of tributary channels CR_NP_CRR_6_1 and CR_NP_CRR_7_1 should be considered for pier placement. Consideration to realignment of smaller tributary channels is recommended in order to avoid the need for larger bridge spans and avoidance of any in-channel work within the main Credit River Potential for in-channel work due to pier placement. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 20.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphic assessment based on 100 year erosion rate of 20.0 +/- 3 m plus bankfull width of 27.0 m. Width should be 27.0 + (2 x 20.0) = 67.0 m. **Fluvial Geomorphology recommendation: 67.0 m**	Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Moderate** RGA - Transitional = Moderate; Defined Channel = High; Erosion present = Mod-High; Planform is sinuous = Mod; Confined = Low; Drainage Area is Unknown **Credit River Bridge** No velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 2	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_0_2**	CREDIT RIVER BRIDGE	27.0	In Regime	Permanent	Defined	Present	Sinuous	Confined	Not modelled/ not calculated	NA	540	450.0 -640.0	Based on Mapping	20.0 (+/-3)	Based on Mapping	450.0 – 640.0	Final = Preliminary MBW = 450.0 – 640.0 m	No	NA	60 m (wide meander)	**Credit River Bridge** No Hydraulic Data at this time - update during additional stages of study	**Credit River Bridge** Span: 605,000 mm Rise: 19,000 mm Bridge	Location of tributary channels CR_NP_CRR_6_1 and CR_NP_CRR_7_1 should be considered for pier placement. Consideration to realignment of smaller tributary channels is recommended in order to avoid the need for larger bridge spans and avoidance of any in-channel work within the main Credit River Potential for in-channel work due to pier placement. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 20.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphic assessment based on 100 year erosion rate of 20.0 +/- 3 m plus bankfull width of 27.0 m. Width should be 27.0 + (2 x 20.0) = 67.0 m. **Fluvial Geomorphology recommendation: 67.0 m**	Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard	Generally, a geomorphic study is required to determine the crossing opening. However, for the watercourses that are less than 4 m wide, the crossing opening of three times the bankfull channel can be adopted without undertaking a geomorphic study.	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod; Planform is sinuous = Mod-High; Confined = Low; Drainage Area is Unknown **Credit River Bridge** No velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Documents (TRCA, 2015 and CVC, 2019)	Hazard Assessment
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_9_1**	CR_NP_CRR_9_WC1 CR_NP_CRR_9_WC2	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly defined channel (except in one area, which may not be natural); Channel splits into multiple channels throughout reach; Appears to be predominantly vegetation controlled	None	Sinuous; Multi-channel	Unconfined	9_WC1: 58.74 ha 9_WC2: 19.42 ha	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices Potential for in channel work depending on length and span of new structure						No	NA	Sinuosity is topography controlled	**CR_NP_CRR_9_WC1** Increase in predicted grain size transported from Medium Gravel to Small Boulder for the 50 year flow event and from Medium Gravel to Small Boulder for the 100 year flow event. No stream power or shear stress modelled. **CR_NP_CRR_9_WC2** Increase in predicted grain size transported from Fine Gravel to Large Cobble for the 50-year flow event and from Fine Gravel to Large Cobble for the 100 year flow event. No stream power or shear stress modelled.	**CR_NP_CRR_9_WC1** Span: 2,400 mm Rise: 900 mm Length: 55,000 mm Concrete Box **CR_NP_CRR_9_WC2** Span: 1,200 mm Rise: 900 mm Length: 30,000 mm Concrete Box	Removal of vegetation surrounding the feature could impact erosional processes. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (no defined channel, small upstream drainage area 58.74 ha for 9_WC1 and 19.42 ha for 9_WC2)	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (no defined channel, small upstream drainage area 58.74 ha for 9_WC1 and 19.42 ha for 9_WC2)	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low-Moderate** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous; multichannel = Mod; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_9_WC1** **CR_NP_CRR_9_WC2** It appears the channel is not defined however, the hydraulic assessment is showing a large potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_2**	CR_NP_CRR_3_WC1.1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Largely poorly defined. Appears to be slightly defined, but likely altered for agricultural purposes	Present. Erosion noted along Bovaird Dr W	Straight	Unconfined	73.83	NA	NA	Fluvial Geomorphology classified feature as ephemeral. The feature is only defined at the culvert outlet and is approximately 0.8 m wide. No defined channel boundaries are present therefore, meander belt delineation is not applicable. Overall, the feature has been likely subjected to alterations for agricultural purposes, has poorly defined banks and bed morphology. Bed substrate consists of fines (silt, clay, sand), gravel, and cobbles. The feature is unconfined with access to the floodplain. It is surrounded by scrubland, agricultural fields, and forest. Erosion and sediment deposition was noted along Bovaird Dr W on the day of the assessment. No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices						No	NA	~Straight. Watercourse Parallel with proposed route	**CR_NP_CRR_3_WC1** No hydraulics data provided at this time **CR_NP_CRR_3_WC2** No hydraulics data provided at this time	**CR_NP_CRR_3_WC1** Unknown **CR_NP_CRR_3_WC1.1** Span: 1,800 mm Rise: 1,200 mm Length: 32,000 mm Concrete Box	Removal of vegetation surrounding the feature could impact erosional processes. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of crossing of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (from roadway appears undefined, small upstream drainage area 73.83 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen from roadway, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low-Moderate** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Moderate; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_3_WC1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design **CR_NP_CRR_3_WC2** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_2a**	No proposed crossing	No Bankfull (Not visible from ROW, assessed from aerial imagery)	RGA could not be completed from ROW	Ephemeral to intermittent	May be slightly defined but difficult to tell from ROW. Small riparian buffer present around feature. Likely altered in the past for agricultural purposes based on aerial imagery	None visible from ROW	Straight to sinuous	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral to intermittent based on assessment from ROW and from Aerial Imagery. No defined channel boundaries were observed therefore, meander belt delineation is not applicable at this time. Should PTE become available, a more detailed investigation should be completed. . The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices	No	NA	Slightly sinuous feature	NA	NA	Feature may be impacted by planned stormwater pond	**It is anticipated that CR_NP_CRR_3_2a may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond. The feature was not visible from the ROW during the 2025 field investigation. Upstream reach is ephemeral in nature.**	No Proposed Crossing	No Proposed Crossing	NA
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_1**	CR_NP_CRR_3_WC3.1 CR_NP_CRR_3_WC3	No Bankfull Approximate feature wetted width: 1.6 m	No Permission to Enter within proposed route, field assessment occurred upstream. Feature has possibly been altered at this location. RGA not applicable for undefined features	Ephemeral	No permission to enter within proposed route, field assessment occurred upstream. Possible channel has been altered with in this location. Within agricultural area likely straightened. Largely poorly defined. Appears to be slightly defined but likely altered for agricultural purposes	None	No Permission to Enter within proposed route, field assessment occurred upstream. Possible channel has been altered with in this location. Sinuous upstream and then straight	Unconfined	WC3.1: 27.66 ha WC3: 65.99 ha	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location	No	NA	Has been manipulated. Sinuosity is topography controlled	**CR_NP_CRR_3_WC3.1** Increase in predicted grain size transported from Fine Gravel to Small boulder for the 50 year flow event and from Fine Gravel to Small boulder for the 100 year flow event. No stream power or shear stress modelled. **CR_NP_CRR_3_WC2** No pre-existing velocity provided. Proposed velocity predicts movement of Small boulder during the 50 year flow event and Small boulder for the 100-year flow event. No stream power or shear stress modelled. **CR_NP_CRR_3_WC3** Increase in predicted grain size transported from Very Coarse Sand to Small boulder for the 50 year flow event and from Very Coarse Sand to Small boulder for the 100 year flow event. No stream power or shear stress modelled.	**CR_NP_CRR_3_WC3.1** Rise: 900 mm Length: 80,000 mm Circular Culvert **CR_NP_CRR_3_WC2** Span: 1,800 mm Rise: 1,200 mm Length: 90,000 mm Concrete Box **CR_NP_CRR_3_WC3** Span: 1,500 mm Rise: 1,200 mm Length: 40,000 mm Concrete Box	Within proposed route, surrounding land is agricultural land Change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 65.99 ha)	Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous to straight (topography controlled) = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_3_WC3.1** **CR_NP_CRR_3_WC3** Proposed 50-yr and 100-yr Return flow event results in an increase in the sediment size predicted to be transported and therefore a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage **CR_NP_CRR_3_WC2** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_3**	CR_NP_CRR_3_WC3.2 CR_NP_CRR_3_WC4	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight	Unconfined	WC3.2: 22.83 ha WC4: 25.27 ha	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices	No	NA	Has been manipulated Sinuosity is topography controlled Parallel with proposed route	**CR_NP_CRR_3_WC4** Increase in predicted grain size transported from Fine Gravel to Small boulder for the 50 year flow event and from Fine Gravel to Small boulder for the 100 year flow event. No stream power or shear stress modelled.	**CR_NP_CRR_3_WC4** Span: 1,200 mm Rise: 900 mm Length: 48,000 mm Concrete Box	Within proposed route, surrounding land is agricultural land Multiple structures proposed Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of crossing of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (upstream no defined channel, small upstream drainage area 25.27 ha)	Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_3_WC4** It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_3a**	CR_NP_CRR_3_WC5	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight	Unconfined	17.75	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices	No	NA	Has been manipulated. Sinuosity is topography controlled.	**CR_NP_CRR_3_WC5** No hydraulics data provided at this time	**CR_NP_CRR_3_WC5.1** Unknown **CR_NP_CRR_3_WC5** Unknown	Removal of vegetation surrounding the feature could impact erosional processes.	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small drainage area 17.1 ha)	Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_3_WC5** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_3_3b**	CR_NP_CRR_3_WC5	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight	Unconfined	17.75	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices	No	NA	Has been manipulated. Sinuosity is topography controlled.	**CR_NP_CRR_3_WC5** No hydraulics data provided at this time	**CR_NP_CRR_3_WC5.1** Unknown **CR_NP_CRR_3_WC5** Unknown	Removal of vegetation surrounding the feature could impact erosional processes.	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small drainage area 17.1 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_3_WC5** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_13_1**	CR_NP_CRR_13_WC2	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight	Unconfined	32.41	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices	No	NA	~ Straight Sinuosity is topography controlled	**CR_NP_CRR_13_WC2** No pre-existing velocity provided. Proposed velocity predicts movement of Large Cobble during the 50 year flow event and Large Cobble for the 100-year flow event. No stream power or shear stress modelled.	**CR_NP_CRR_13_WC2** Rise: 1,200 mm Length: 85,000 mm Circular Culvert	Within proposed route, surrounding land is agricultural land No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 32.4 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen in aerial image, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA - In Regime = Low; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_NP_CRR_13_WC2** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 3	Credit Valley Conservation Authority	Credit River	Norval to Port Credit	Credit River	**CR_NP_CRR_13_MW**	CR_NP_CRR_13_WC3, CR_NP_CRR_13_WC5	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly defined	Erosion only noted along the right bank on the downstream end of the feature off of Walness Drive	Straight	Unconfined	WC3: 125.09 ha WC4.1: 112.52 ha WC5: 99.47	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices	No	NA	Sinuosity is topography controlled	**CR_NP_CRR_13_WC3** Increase in predicted grain size transported from Very Coarse Sand to Large Cobble for the 50 year flow event and from Very Coarse Sand to Large Cobble for the 100-year flow event. No stream power or shear stress modelled. **CR_NP_CRR_13_WC5** No hydraulics data provided at this time	**CR_NP_CRR_13_WC3** Span: 3,600 mm Rise: 1,200 mm Length: 40,000 mm Concrete Box Culvert	Proposed 50-yr and 100-yr Return flow event results in an increase in the sediment size predicted to be transported. Large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area <125.09 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Moderate; Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Low-Moderate **CR_NP_CRR_13_WC3** It appears the channel is not defined however, the hydraulic assessment is showing a large potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage **CR_NP_CRR_13_WC5** No hydraulics data provided at this time
Section 3	Credit Valley Conservation Authority	Credit River	Huttonville Creek	Huttonville Creek	**CR_HC_HUT_6_3**	CR_HC_HUT_6_WC1	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight	Unconfined	27.32	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. Crops are planted through the feature and therefore it has likely been modified by agricultural practices. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices In the 2004 report (Credit Valley Conservation Authority, 2004) this reach was grouped with CR_HC_HUT_6_2, CR_HC_HUT_6_1, CR_HC_HUT_0_1, CR_HC_HUT_0_2 and a portion of CR_HC_HUT_0_3, and a 10 m meander belt was defined for the entire reach	No	NA	~ Straight Sinuosity is topography controlled	**CR_HC_HUT_6_WC1** No pre-existing velocity provided. Proposed velocity predicts movement of Large Cobble during the 50 year flow event and Small boulder for the 100-year flow event. No stream power or shear stress modelled.	**CR_HC_HUT_6_WC1** Span: 1,200 mm Rise: 900 mm Length: 98,000 mm Concrete Box Culvert	Contributing Redside Dace Habitat must be considered in crossing design, but ephemeral nature of the watercourse dictates that the meander belt delimitation is not applicable. No pre-existing velocity provided. Fluvial Geomorphology should be involved during Detail Design Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 27.32 ha)	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition seen in aerial image, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.	Watercourses with small upstream drainage areas - Depending on the channel characteristics, a Fluvial Geomorphology Assessment may not be required. Contact CVC to receive further clarification and confirmation of these characteristics.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **CR_HC_HUT_6_WC1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Documents (TRCA, 2015 and CVC, 2019)	Hazard Assessment
Section 3	Credit Valley Conservation Authority	Credit River	Glen Williams to Norval	Credit River	**CR_GW_CRR_15a**	CR_GW_CRR_15_WC3	4.0 - 6.5 (Estimated, no cross-section survey completed; feature is artificially sized to serve as a roadside drainage feature)	In Regime (Straightened channel, interpret with caution)	Permanent	Defined Channel	None	Straight (channel has been straightened)	Confined	1.3 (feature is artificially sized to serve as a roadside drainage feature)	NA	80	9.3	Historically Altered – Used Empirical Method Due to the artificial nature of the channel (constructed drainage ditch), no reliable bankfull width or depth measurements were available. The Chitale (1973) method was applied, using the 2-year flow in place of bankfull discharge (see Table 5-1).	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	5.0 - 9.0	Final = Preliminary MBW (5.0 - 9.0 m) due to valley confinement	No	NA	Straight	**CR_GW_CRR_15_WC3** No Hydraulic Data at this time - update during additional stages of study	**CR_GW_CRR_15_WC3** Unknown	Site of a proposed maintenance facility. Facility should stay outside of the Meander Belt Width.	Feature is artificially defined and sized because it is a drainage ditch. **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 1.3 ha) Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (artificially defined channel, small upstream drainage area of 1.3 ha)	Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.	**Hazard Assessment: Low** RGA is In Regime = Low; Artificially defined Channel = Low; No Erosion present = Moderate; Planform is straight = Low; Confined = Low; Drainage Area is under 100 Ha= Low **CR_GW_CRR_15_WC3** No hydraulics data provided at this time, Update during additional stages of design.
Section 3	Credit Valley Conservation Authority	Credit River	Glen Williams to Norval	Credit River	**CR_GW_CRR_15b**	CR_GW_CRR_15_WC2.1	4.0 - 5.0 (Estimated, no cross-section survey completed; feature is artificially sized to serve as a roadside drainage feature)	RGA not completed due to no permission to enter.	Permanent	Defined Channel	None	Straight (channel has been straightened)	Confined	17.8 (feature is artificially sized to serve as a roadside drainage feature)	NA	80	9.3	Historically Altered – Used Empirical Method Due to the artificial nature of the channel (constructed drainage ditch), no reliable bankfull width or depth measurements were available. The Chitale (1973) method was applied, using the 2-year flow in place of bankfull discharge (see Table 5-1).	4.0	Based on CVC (2014) (Reach has been altered based on historical aerial imagery)	4.0 - 8.0	Final = Preliminary MBW (4.0 -8.0 m) due to valley confinement	No	NA	Straight	**CR_GW_CRR_15_WC2.1** No Hydraulic Data at this time - update during additional stages of study	**CR_GW_CRR_15_WC2.1** Unknown	Site of a proposed maintenance facility. Facility should stay outside of the Meander Belt Width.	Feature is artificially defined and sized because it is a drainage ditch. **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 17.8 ha) Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.	Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (artificially defined channel, small upstream drainage area of 17.8 ha)	Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.	**Hazard Assessment: Low** RGA not completed = NA; Artificially defined Channel = Low; No Erosion present = Moderate; Planform is straight = Low; Confined = Low; Drainage Area is under 100 Ha= Low **CR_GW_CRR_15_WC2.1** No hydraulics data provided at this time, Update during additional stages of design.
Section 3	Credit Valley Conservation Authority	Credit River	Glen Williams to Norval	Credit River	**CR_GW_CRR_15c**	No proposed crossing	No Bankfull (Not visible from ROW, assessed from aerial imagery)	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight (channel has been straightened)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. Crops are planted through the feature and therefore it has likely been modified by agricultural practices. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices					No	NA	Straight	NA	NA	Feature has likely been altered by adjacent agricultrual activities. Feature only assessed from aerial imagery. Could not be assessed from the ROW	**No proposed crossing**	No proposed Crossing	NA	NA
Section 3	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_13_1**	EC_EH_ETW_13_WC1	1.8	In Regime	Intermittent	Defined in one section that has a steep slope	Not Present	Straight	Unconfined (access to floodplain partially limited due to entrenchment)	36.8	28	36	12.6	Historically Altered – Used Empirical Method	1.0	Watercourse smaller than 3m. Mapping data not applicable. Used TRCA Table	14.6	Final = Preliminary MBW (12.6 m) + 2 x Erosion Rate (2 x 1.0 m) = 14.6 m Downstream on property Key ID 554 there was a Fluvial Geomorphology Assessment complete for this reach. They defined a wider bankfull (4.0 m) with a larger drainage area and MBW of 29 m. Based on the measurements provided, the previous assessment was likely completed after the confluence between EC_EH_ETW_13_1 and EC_EH_ETW_13_2 due to larger drainage area and wider bankfull width/depth	No	NA	Straight	**EC_EH_ETW_13_WC1** No Hydraulic Data at this time - update during additional stages of study	**EC_EH_ETW_13_WC1** Unknown	No velocity provided. Fluvial Geomorphology should be involved during Detail Design Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Fluvial Geomorphology recommendation based on 2x 100 year erosion rate of 1 m (TRCA Table) plus bankfull width of 1.8 m **Fluvial Geomorphology recommendation: 4.0 m**	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (36.8 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to In Regime RGA rating and lack of erosion observed in field and lack of a defined channel. Cannot measure erosion rate due to watercourse manipulation by human activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_13_WC1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 3	Credit Valley Conservation Authority	Credit River	Huttonville Creek	Huttonville Creek	**CR_HC_HUT_6_2**	CR_HC_HUT_6_WC1 CR_HC_HUT_6_WC1.1 – Note: this crossing is on the Transit Way and no Structural ID is assigned for this crossing	NA	RGA not applicable for undefined features	Ephemeral	Undefined	None	Straight	Unconfined	Small ephemeral feature. Flow not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices Potential for in channel work depending on length and span of new structure					No	NA	– Straight Sinuosity is topography controlled	**CR_HC_HUT_6_WC1.1** No Hydraulic Data at this time - update during additional stages of study	**CR_HC_HUT_6_WC1.1** Unknown	Majority of reach will be in grading limits. Within footprint of proposed stormwater pond	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area) It is anticipated that CR_HC_HUT_6_2 may need to be realigned slightly to bring it outside of the footprint of the proposed stormwater pond.	Fluvial Geomorphology Assessment - Due to size of upstream drainage area and lack of definition/altered definition, crossing sizing requirements for this reach will likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to ephemeral nature. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is unknown but is assumed to be less than 100 Ha due to lack of channel definition = Low **CR_HC_HUT_6_WC1.1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	Erosion Rate Approach	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review(based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_12_3**	EC_EH_ETW_12_WC1	2.5	RGA not applicable for undefined features Altered and poorly defined	Ephemeral to Intermittent	Poorly Defined. Only defined in one portion upstream of the preferred alignment. (likely not natural as the upstream watercourse is not defined and not seen during field work). Channel disappears to the north of the proposed 413 crossing location. Property owner mention that this is a tile drain and the upstream portion of the reach was backfilled when the drain was installed. Multiple tile drains were observed along the left bank of the feature.	Erosion noted at the toe of the banks within the defined section, likely due to steepness of bank slopes. Looks like the watercourse was dug out near the road for agricultural purposes *None	Straight	Unconfined	81.6	52	50	17.3	Historically Altered - Used Empirical Method	1.0	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	19.3	Final = Preliminary MBW (17.3 m) + 2x Erosion Rate (2x 1.0 m) = 19.3 m	No	NA	~ Straight. Crosses preferred alignment at oblique angle	**EC_EH_ETW_12_WC1:** Slight decrease in predicted grain size entrained and transported upstream of crossing for the 2, 50, and 100 year flowevents from very coarse sand to medium sand and decrease in the predicted transport rate from moderate transport to no predicted sediment transport for the same flowevents. The 25 flowevent was not modelled.	**EC_EH_ETW_12_WC1** No. Of Barrels: 1 Span: 8000 mm Rise: NA Length: 68,000 mm Bridge	Watercourse has been altered as there is no defined channel upstream of defined channel portion. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 1.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 4.1 m.**	Assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (81.6 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to no erosion observed in field and lack of a defined channel. Cannot measure erosion rate due to watercourse manipulation by human activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Poorly Defined and Altered Channel = Moderate; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_12_WC1** It appears the channel is poorly defined however, the hydraulic assessment is showing a small potential increase in erosion potential. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_11_1**	EC_EH_ETW_11_WC1	No Bankfull. Assessed from roadway	RGA not applicable for undefined features	Ephemeral - swale	No Defined Feature. Assessed from roadway	No erosion observed on day of assessment but feature was assessed from side of road	Sinuous	Unconfined	36.4	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features possition in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely followthe following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Sinuosity is topography controlled, has been manipulated.	**EC_EH_ETW_11_WC1** No Hydraulic Data at this time - update during additional stages of study	**EC_EH_ETW_11_WC1** No of Barrels: 1 Span: 2,100 mm Rise: 1,200 mm Length: 86,000 mm Type: Concrete box	Watercourse has been altered Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition	Assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (36.4 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = NA; Undefined Channel = Low; Erosion Not present = Low; Planform is sinuous = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_11_WC1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_10_1**	EC_EH_ETW_10_WC1	No Bankfull	RGA not applicable for undefined features	Ephemeral swale	Poorly Defined Feature.	None	Straight	Unconfined	91.7	No meander belt	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely followthe following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Sinuosity is topography controlled	**Post_ETW_10_W1:** Slight decrease in predicted grain size transported immediately upstream of the crossing for 2, 50, and 100 year flowevents from pebbles (2-year) or coarse gravel (50 and 100 year) to very coarse sand. Slight increase in grain size transported immediately downstream of the crossing from very coarse sand to medium gravel for the 50 and 100 year flowevents. Slight decrease in predicted grain size entrained immediately upstream of the crossing for 2, 50, and 100-year flowevents from medium gravel (2 year) or coarse gravel (50 year and 100 year) to very coarse sand. Slight increase in grain size entrained immediately downstream of the crossing from pebbles to medium gravel for the 50 and 100 year flowevents. No change to predicted transportation rate for the two year event. Decrease in predicted transportation rate immediately upstream of the crossing from lowss to no predicted transport for the 50 and 100 year events	**EC_EH_ETW_10_WC1** No of Barrels: 1 Span: 10,000 mm Rise: NA Length: 58,000 mm Bridge	Agricultural swale Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition	Assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse - Small watercourse drainage area (91.7 ha). - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuation and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **Post_ETW_10_W1** Slight changes to proposed grain size transported and entrained but overall, no large significant changes
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_9_3**	EC_EH_ETW_9_WC2	No Bankfull. Buried tile agricultural drain estimated to be 0.5 m wide.	No Defined Feature, Buried tile agricultural drain RGA not applicable for undefined features	Ephemeral/ buried agricultural drain	Modified. No Defined Feature/ buried agricultural drain	None	Buried tile agricultural drain	Unconfined	160.4	47	NA	Fluvial Geomorphology classified feature as being a buried tile drain feature. No defined channel boundaries are present and therefore, meander belt delineation is not applicable. Further assessment required at Detail Design No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as agricultural practices including agricultural drain infrastructure.	No	NA	~ Straight. Buried agricultural drain	**EC_EH_ETW_9_WC2:** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flowevents. No significant changes to predicted transportation rate.	**EC_EH_ETW_9_WC2** No of Barrels: 1 Span: 6,000 mm Rise: 1,350 mm Length: 74,000 mm Type: Concrete Box Culvert	N/A - buried agricultural drain Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Existing Buried agriculture drain - NA**	Assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (160.4 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to lack of a defined channel Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuation and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Low** RGA = NA; Undefined Channel = Low; Erosion Not present = Low; Planform is straight (Buried tile drain) = Low; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_9_WC2** No major change in predicted grain size transported/ entrained or predicted transport rate
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_7_3**	EC_EH_ETW_7_WC2	Small undefined drainage feature. Assumed there is No Bankfull. No permission to enter	RGA not applicable for undefined features No permission to enter	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	Assumed no erosion due to lack of channel definition. Small drainage feature. No permission to enter	Straight to sinuous (topography controlled and altered by human activities)	Unconfined	28.3	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present and feature is a buried tile agricultural drain therefore, meander belt delineation is not applicable. Further assessment required at Detail Design No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices including agricultural drain infrastructure. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely followthe following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Crosses preferred alignment at an oblique angle. Altered by human activities.	**EC_EH_ETW_7_WC2** No Hydraulic Data at this time - update during additional stages of study	**EC_EH_ETW_7_WC2** No of Barrels: 1 Span: 2,100 mm Rise: 900 mm Length: 94,000 mm Type: Concrete Box Culvert	Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria due to lack of channel definition** seen downstream and small upstream drainage area (28.3 ha)	Fluvial Geomorphology Assessment - If crossing required, it should at least span the bankfull width plus the 100 year erosion rate on either side of channel. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (28.3 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of channel definition Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuation and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Should be updated during later stages of study once permission to enter is available.	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = NA; Undefined Channel = Low; Erosion assumed not present due to lack of channel definition = Low; Planform has been altered by human activities = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_7_WC2** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW (m) Approach Used	100-Year Erosion Rate (m)	Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review(based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_7_2**	EC_EH_ETW_7_WC3	1.5	In Regime	Intermittent	Poorly defined. Barely defined in sections. If PTE becomes available in center of reach we should go back to assess	None. Assessed upstream & downstream of crossing location.	Straight	Unconfined	282.7	65	30	10.6	Historically Altered ... Used Empirical Method	1.0	Based on MNR Table 4 (TRCA, 2015) (Bankfull width of reach less than 3m)	12.6	Final = Preliminary MBW (10.6 m) + 2x Erosion Rate (2x 1.0 m) = 12.6 m	No	NA	Sinuosity is topography controlled	**EC_EH_ETW_7_WC3** No further changes to predicted grain size entrained and transported for 2, 50, and 100 year flowevents upstream of crossing. Decrease in predicted transport rate from low (2 year) to moderate (50 and 100 year) to no predicted transport immediately upstream of the crossing.	**EC_EH_ETW_7_WC3** No of Barrels: 1 Span: 20,000 mm Rise: NA Length: 238,000 mm Type: Bridge	Watercourse has been historically altered to be updated at a later time Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 1 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Recommendation based on 2x 100 year erosion rate of 1 m from Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003) plus bankfull width of 1.5 m **Fluvial Geomorphology recommendation is 3.5 m**	Based on upstream assessment, it should at least span the bankfull width plus the 100 year erosion rate m on either side of channel Assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (282.7 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans), - Unlikely to be rapidly eroding due to lack of erosion observed in the field and in Regime RGA rating. Unable to measure erosion rate due to bankfull width being less than 3 m Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Hazard Assessment: Low** RGA = In Regime = Low; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_7_WC3** Slight decrease in predicted grain size entrained and transported as well as sediment transport potential upstream of the crossing based on proposed span of 20 m
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_7_1**	EC_EH_ETW_7_WC4.1, EC_EH_ETW_7_WC4.2, EC_EH_ETW_7_WC4.3	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature	None	Straight	Unconfined	WC4.1: 95.2 WC4: 100.6 WC4.2: 100.6	35	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomophic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following role: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).								No	NA	- Straight Sinuosity is topography controlled	**EC_EH_ETW_7_WC4.1** **EC_EH_ETW_7_WC4.2** **EC_EH_ETW_7_WC4.3** No Hydraulic Data at this time - update during additional stages of study	**EC_EH_ETW_7_WC4.1** No of barrels: 1 Span: 6,000 mm Rise: 1,800 mm Length: 366,000 mm Type: Concrete Box Culvert **EC_EH_ETW_7_WC4.2** No of barrels: 1 Span: 6,000 mm Rise: 1,800 mm Length: 100,000 mm Type: Concrete Box Culvert **EC_EH_ETW_7_WC4.3** Unknown	No hydraulic data provided. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomophology should be involved during Detail Design	Channel realignment has been proposed for this reach. **The proposed crossing span based on the conceptual channel design work is 6.5 m.**	Based on upstream assessment, it should at least span the bankfull width plus the 100 year erosion rate on either side of channel Assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse (100.6 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = NA; Undefined Channel = Low; Erosion Not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_7_WC4.1** **EC_EH_ETW_7_WC4.2** **EC_EH_ETW_7_WC4.3** No hydraulic data provided. Model should be created and assessed with the proposed channel design conditions during the Detail Design stage
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_6_1**	EC_EH_ETW_6_WC1.4, EC_EH_ETW_6_WC1.5, EC_EH_ETW_6_WC1.6	3.5	In Regime	Intermittent	Defined	Present	Straight	Unconfined	WC1.4: 350.63 WC1.5: 350.63	70	70	23.6	Historically Altered – Used Empirical Method	5.0 -8.0 *5.0 selected as an appropriate erosion rate due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	33.6	Final = Preliminary MBW (23.6 m) + 2x Erosion Rate (2x 5.0 m) = 33.6 m	No	NA	8 m	**EC_EH_ETW_6_WC1.1** **EC_EH_ETW_6_WC1.2, Existing** **EC_EH_ETW_6_WC1.4** **EC_EH_ETW_6_WC1.5** No significant changes to predicted grain size entrained or transported or predicted transport rate for the 2-year return flowevent. Slight decrease in predicted grain size entrained and transported between EC_EH_ETW_6_WC1.1 and EC_EH_ETW_6_WC1.4 and decrease in predicted sediment transport immediately upstream of EC_EH_ETW_6_WC1.4 for the 100-year flowevent.	**EC_EH_ETW_6_WC1.1** N/A **EC_EH_ETW_6_WC1.2** Unknown **EC_EH_ETW_6_WC1.4** No of Barrels: 1 Span: 12,000 mm Rise: 1,800 mm Length: N/A Type: Bridge **EC_EH_ETW_6_WC1.5** No of Barrels: 1 Span: 12,000 mm Rise: 1,800 mm Length: N/A Type: Bridge	Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomophology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 14.0 m.**	Fluvial Geomorphology Assessment - Based on upstream assessment, it should at least span the bankfull width plus the 100 year erosion rate on either side of channel. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (350.637 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to only minor erosion observed in the field and in Regime RGA rating. Unable to measure erosion rate due to human alteration. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA = In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_6_WC1.1** **EC_EH_ETW_6_WC1.2** **EC_EH_ETW_6_WC1.4** **EC_EH_ETW_6_WC1.5** No major change in predicted grain size transported/ entrained/ predicted sediment transport rates for the 2-year return period flowevent. Slight decreases are present for the 100-year return period flowevent based on a span of 12 m. Fluvial Geomorphology has recommended channel design and a wider span of 14 m. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_6_4**	EC_EH_ETW_6_WC3	Poorly defined. Multichannel vegetated corridor. 2.0 m wide channels present at end of vegetated corridor.	Poorly defined. RGA not applicable for undefined features	Ephemeral to Intermittent	Mainly undefined. Poorly defined - multichannel at lower portion of corridor. Two poorly defined channels in the last 50 m to 60m of the vegetated corridor.	Last 50 m to 60 m. (beyond location of proposed crossing)	Straight to sinuous	Unconfined	199.25	59	40	16.0	Based on Mapping	5.0 -8.0 *5.0 selected as an appropriate erosion rate due to hazard assessment results	Based on MNR Table 4 (Reach less than 3 m wide)	26.0	Final = Preliminary MBW (16.0 m) + 2x Erosion Rate (2x 5.0 m) = 26.0 m	No	NA	Undefined feature	**Post_ETW_6_WC3-25m:** Decrease in the predicted grain size entrained and transported for the 2-, 50-, and 100- year return period events immediately upstream of the crossing. No change to predicted transport rate.	**EC_EH_ETW_6_WC3** No of Barrels: 1 Span: 25,000mm Rise: N/A Length: 90,000 mm Type: Bridge'	Potential for in channel work depending on length and span of new structure. Fluvial Geomophology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (2 m) = 12.0 m. **Fluvial Geomophology recommendation: 12.0 m**	Fluvial Geomophology Assessment -Based on mapping assessment, it should at least span the bankfull width plus the 100 year erosion rate on either side of channel. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse - Small watercourse drainage area (199.25 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Not rapidly eroding due to lack of a defined channel Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Low to Moderate** RGA = NA; Poorly Defined Channel = Low-Mod; Erosion only present downstream of proposed crossing location = Low to moderate Planform is straight = Low; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_6_WC3** Slight decrease in predicted grain size entrained and transported upstream of the crossing. Fluvial Geomorphology should take a closer look at Detail Design stage

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review(based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_4_1**	EC_EH_ETW_4_WC1	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined Feature	None	Sinuous	Unconfined	41.83	32	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely followthe following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Sinuosity is topography controlled	**EC_EH_ETW_4_WC1** No Hydraulic Data at this time - update during additional stages of study	**EC_EH_ETW_4_WC1** No of Barrels: 1 Span: 1,500 mm Rise: 900 mm Length: 129,000 mm Type: Concrete Box Culvert	Feature is poorly defined (swale type feature). The features position in the landscape and channel form is likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area and lack of channel definition downstream)	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Ephemeral nature and lack of channel definition of the watercourse dictates that the meander belt delimitation is not applicable. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (41.83 1 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Drainage Area is below 100 Ha= Low **EC_EH_ETW_4_WC1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_1**	EC_EH_ETW_1_WC1	3.8	In Regime	Permanent	Defined	Present (some but may not be Fluvial Geomorphology related)	Meandering	Unconfined	336.66	28	75.2	21.7	Historically Altered – Used Empirical Method	5.0 -8.0 *5.0 selected as an appropriate erosion rate due to hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	31.7	Final = Preliminary MBW (21.7 m) + 2x Erosion Rate (2x 5.0 m) = 31.7 m	No	NA	8 m	**EC_EH_ETW_1_WC1** No significant changes to predicted grain size entrained or transported or predicted transport rate for the 2-year or 100-year return flowevents. Slightly decrease in predicted grain size transported for the 50-year flowevent from pebbles to very coarse sand immediately upstream of the crossing. No significant changes to the predicted grain size entrained or predicted transport rate.	**EC_EH_ETW_1_WC1** No of Barrels: 1 Span: 20,000 mm Rise: NA Length: 58,000 mm Type: Bridge	Removal of vegetation surrounding the feature could impact erosional processes. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (3.8 m) = 14.0 m. **Fluvial Geomophology recommendation: 14.0 m**	Fluvial Geomorphology Assessment - Based on field assessment and MNR table 4, it should at least span the bankfull width plus the 100 year erosion rate on either side of channel. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (336.66 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to only minor erosion noted in the field and in Regime RGA rating. Unable to measure erosion rate due to human alteration. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime= Low; Defined Channel = High; Minor Erosion present = Mod; Planform is meandering = High; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_1_WC1** No major change in predicted grain size transported/ entrained or predicted transport rate
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_3**	EC_EH_ETW_1_WC2	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Undefined as viewed from roadway	None observed from roadway	NA	Unconfined	45.59	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely followthe following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Sinuosity is topography controlled	**EC_EH_ETW_1_WC2** No Hydraulic Data at this time - update during additional stages of study	**EC_EH_ETW_1_WC2** No of Barrels: 1 Span: 2,400 mm Rise: 1,200 mm Length: 98,000 mm Type: Concrete Box Culvert	Proposed crossing location is located in upper portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (agriculture). Drainage area less than 100 Ha (38.7 ha). Potential for in channel work depending on length and span of newstructure. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area and lack of channel definition downstream)	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Ephemeral nature and lack of channel definition of the watercourse dictates that the meander belt delimitation is not applicable. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (45.59 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion Not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Drainage Area is below 100 Ha= Low **EC_EH_ETW_1_WC1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 4	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_5**	EC_EH_ETW_1_WC3	4.2	Transitional or Stressed	Permanent	Defined - Multichannel within the larger valley	Present - Migrating knickpoint observed during 2024 assessment. Actively eroding channels.	Meandering	Confined	372.9	30	84	62.0 - 87.0	Based on Mapping	5.0 -8.0 8.0 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	62.0 - 87.0	Final = Preliminary MBW = 62.0 - 87.0 m	No	NA	6 m	**EC_EH_ETW_1_WC3:** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flowevents. Decrease in predicted transport rate immediately upstream of the crossing from moderate sediment transport to no sediment transport. No change to the predicted transport rate for the 50- or 100- year flow events.	**EC_EH_ETW_1_WC3** No of Barrels: 1 Span: 20,000 mm Rise: NA Length: 68,000 mm Type: Bridge	Removal of vegetation surrounding the feature could impact erosional processes. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Rapid Geomorphic Assessment (RGA) classifies reach as transitional (woody debris present and existing erosion present). Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of newstructure. Fluvial Geomorphology should be involved during Detail Design	Watercourse is actively eroding. Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If these structures are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomorphology recommendation is based on 2 x erosion rate (8.0 m erosion rate) + Bankfull Width (4.2 m) **Fluvial Geomophology recommendation 20.0 m**	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Fluvial Geomorphology Assessment - Crossing should at least span the bankfull width plus the 100 year erosion rate on either side of channel Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (372.9 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unable to determine if it's rapidly eroding. Unable to measure erosion rate due to human alteration. Reach has a Transitional/ Stressed RGA rating and has evidence of erosion in the field Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate - High** RGA - Transitional/Stressed = Moderate; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_1_WC3** No major change in predicted grain size transported/ entrained. Slight decrease in predicted transport rate.

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Roadside Deck Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_6b**	EC_EH_ETW_1_WC4	Small undefined drainage feature based on air photo review. Assumed there is No Bankfull. No permission to enter	RGA not applicable for undefined features No permission to enter	Ephemeral	No Defined Feature based on air photo review (likely vegetation, groundwater, or topography controlled)	Assumed no erosion due to lack of channel definition. Small drainage feature. No permission to enter	Straight (based on mapping)	Confined	9.3	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomophic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	No permission to enter	**EC_EH_ETW_1_WC4** No Hydraulic Data at this time. update during additional stages of study	**EC_EH_ETW_1_WC4** No of Barrels: 1 Span: NA Rise: 900 mm Length: 95.000 mm Type: Circular Culvert	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	No permission to enter. Recommendation should be finalized during Detail Design **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria due to lack of channel definition and small upstream drainage area (9.3 ha)**	Fluvial Geomorphology Assessment based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - A small watercourse drainage area (9.3 ha), - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unable to classify whether rapidly eroding due to limited permission to enter. Assumed to not be rapidly eroding due to lack of channel definition observed from air photo review Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomophic Design or Realignment Note – Geomophic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel (based on air photo review) = Low; Assumed No Erosion present due to lack of channel definition and low drainage area (9.3 Ha) = low; Planform is straight = low; Confined = Low-Mod; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_1_WC4** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_7**	EC_EH_ETW_1_WC5	At Crossing: 5.0 Downstream of crossing: approximately 1.90 m	At Crossing: Transitional or stressed (borders stable) Downstream of Crossing: In Adjustment	Permanent	Defined	Present	Meandering	Confined	405	30	100	66.0 - 83.0	Based on Mapping	11.0 m (+/-3)	Based on Mapping	66.0 - 83.0	Final = Preliminary MBW = 66.0 - 83.0 m	No	NA	17 m	**Post_ETW_1_WC5** Decrease in predicted grain size entrained and transported immediately upstream of the crossing for the 2-, 50-, and 100-year flow events. Decrease in the predicted transport rate from moderate sediment transport to low sediment transport immediately upstream of the crossing.	**EC_EH_ETW_1_WC5** No of Barrels: 1 Span: 30.000 mm Rise: NA Length: 95.000 mm Type: Bridge	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 11.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 26.9 m.**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - A small watercourse drainage area (405 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Due to the annual erosion rate of 0.11 and a bankfull width of 5 m, the watercourse is not classified as rapidly eroding. TRCA guidelines state geomorphic design or realignment not recommended. TRCA preference for large watercourses is the 100 year erosion rate and does not recommend geomorphic design or realignment.	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomophic Design or Realignment	**Hazard Assessment: Moderate-High** RGA - In Adjustment to Stressed = High; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low-Moderate; Drainage Area is between 100 and 2500 Ha= low-Moderate **Post_ETW_1_WC5** There's generally a decrease in the predicted grain size entrained, transported, and in the predicted transport rate immediately upstream of the proposed crossing. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_8**	EC_EH_ETW_1_WC6	No defined feature (flow spreads across valley floor which is 30.0 m wide)	RGA not applicable for undefined features	Ephemeral	Poorly Defined	Erosion only noted close to Old School Road (away from proposed route) where flow is constricted through a culvert	Sinuous and multi-channel across valley floor	Unconfined and Confined	41.48	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomophic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Sinuosity is topography controlled	**EC_EH_ETW_1_WC6** Decrease in predicted grain size entrained and transported immediately upstream of the crossing for the 2-, 50-, and 100-year flow events. Decrease in the predicted transport rate from moderate sediment transport to low sediment transport immediately upstream of the crossing	**EC_EH_ETW_1_WC6** No of Barrels: 1 Span: 3,000 mm Rise: 1,200 mm Length: 70,000 mm Type: Concrete Box Culvert	Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition and small upstream drainage area (41.48 ha)	Fluvial Geomorphology Assessment based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - A small watercourse drainage area (41.48 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomophic Design or Realignment Note – Geomophic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Minor Erosion present = Mod; Planform is sinuous and multichannel = Moderate; Partially Confined = Mod-High; Drainage Area is less than 100 Ha= Low **EC_EH_ETW_1_WC6** There's generally a decrease in the predicted grain size entrained, transported, and in the predicted transport rate immediately upstream of the proposed crossing. Fluvial Geomorphology should take a closer look during Detail Design
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_10**	EC_EH_ETW_1_WC7	No defined feature	RGA not applicable for undefined features	Ephemeral	Poorly Defined	None	Sinuous	Unconfined	30	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable The upstream portion is in the proposed route (agricultural field and partially in the treed area based on aerial imagery). Due to likely alterations within the agricultural field, an erosion rate based on aerial imagery cannot be calculated. The features position in the landscape and channel form is likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. The section within the treed section does not appear to currently be affected by the proposed highway route. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Sinuosity is topography controlled	**EC_EH_ETW_1_WC7** No Hydraulic Data at this time. update during additional stages of study	**EC_EH_ETW_1_WC7** No of Barrels: 1 Span: 2,438 mm Rise: 1,829 mm Length: 109.000 mm Type: Concrete Box Culvert	Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition and small upstream drainage area (30 ha)	Fluvial Geomorphology Assessment - Due to the lack of channel definition (seen in aerial imagery) and the lack of upstream drainage area, sizing would likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following - Small watercourse drainage area (30 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomophic Design or Realignment Note – Geomophic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is sinuous (topography controlled) = Low; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_1_WC7** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Roadside Dock Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_11**	EC_EH_ETW_1_WC8	2.1	Transitional or Stressed	Permanent	Defined	Present	Meandering	Confined	154.2	30	42	48.0 - 96.0	Based on Mapping	5.0 - 8.0 8.0 m selected as an appropriate erosion rate due to transitional RGA rating and overall moderate-high hazard assessment	Watercourse smaller than 3m. Mapping data not applicable. Used TRCA Table	48.0 - 96.0	Final = Preliminary MBW = 48.0 - 96.0 m	No	NA	15 m	**EC_EH_ETW_1_WC8** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**EC_EH_ETW_1_WC8** No of Barrels: 1 Span: 25,000 mm Rise: NA Length: 220,000 mm Type: Bridge	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance. Removal of vegetation surrounding the feature could impact erosional processes. Watercourse is within confined valley. Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Rapid Geomorphic Assessment (RGA) classifies reach as transitional (woody debris present and existing erosion present) Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomophology should be involved during Detail Design	. Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomophology recommendation is based on 2 x erosion rate (8.0 m erosion rate) + Bankfull Width (2.1 m) = 18.0 m. **Fluvial geomorphic assessment provides a minimum recommended span of 18.0 m**	Fluvial Geomophology Assessment - Crossing should at least span the bankfull width plus the 100 year erosion rate on either side of channel Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (154.2 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unable to determine if it's rapidly eroding due to erosion observed in field and RGA classification of In Transition. Cannot measure erosion rate due to watercourse manipulation by agricultural activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate-High** RGA - Transitional/ Stressed= Mod; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 Ha= Moderate **EC_EH_ETW_1_WC8** No major change in predicted grain size transported/ entrained or sediment transport rate
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Etobicoke Creek Headwaters	Etobicoke Creek West Branch	**EC_EH_ETW_1_12**	EC_EH_ETW_1_WC10	2.6	In Regime	Permanent	Defined	Present	Slightly meandering	Confined	579.84	30	52	54 - 68	Based on Mapping	5.0 - 8.0 "5.0 selected as an appropriate erosion rate due to In Regime RGA rating and moderate hazard assessment	Watercourse smaller than 3m. Mapping data not applicable. Used TRCA Table	54.0 - 68.0	Final = Preliminary MBW = 54.0 - 68.0 m	No	NA	12.5 m	**Post_ETW_1_WC10** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate for the 50- or 100-year flow events. Decrease in predicted transport rate immediately upstream of the crossing from moderate to no anticipated transport for the 2-year flow event.	**EC_EH_ETW_1_WC10** No of Barrels: 1 Span: 30.000 mm Rise: NA Length: 112,000 mm Type: Bridge	Removal of vegetation surrounding the feature could impact erosional processes. Watercourse is within confined valley. Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Rapid Geomorphic Assessment (RGA) classifies reach as stable Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomophology should be involved during Detail Design	. Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomophology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (2.6 m) = 13.0 m. **Fluvial geomorphic assessment provides a minimum recommended span of 13.0 m**	Fluvial Geomophology Assessment - Crossing should span the bankfull width plus the 100 year erosion rate on either side of channel Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (579.84 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to minor amounts of erosion observed in field and RGA classification of In Regime. Cannot measure erosion rate due to watercourse manipulation by agricultural activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 Ha= Moderate **Post_ETW_1_WC10** No major change in predicted grain size transported/ entrained. Slight changes to predicted sediment transport rate
Section 5	Toronto and Region Conservation Authority	Humber River	West Humber River	Campbells Cross Creek	**HU_WH_CAC_0_1**	HU_WH_CAC_0_WC1	4.5	At Crossing Location: In Regime Upstream of Crossing: Transitional or Stressed	Permanent	Defined	Present	Slightly meandering	Confined	831.7	30	90	98.0 - 155.0	Based on Mapping	Erosion rate calculated based on historical mapping and 11.0 m (+/- 3 m). Upgraded to 16.0 (+/- 3)	Based on Mapping	98.0 - 155.0	Final = Preliminary MBW = 98.0 - 155.0	No	NA	13 m	**HU_WH_CAC_0_WC1** **HU_WH_CAC** No major changes to predicted grain size entrained or transported and no major changes to the predicted transport rate for the 2-, 25-, 50-, or 100- year flow events.	**HU_WH_CAC_0_WC1** No of Barrels: 1 Span: 30.000 mm Rise: NA Length: NA Type: Bridge	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance (based on downstream assessment) Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomophology should be involved during Detail Design	Proposed bridge piers should be 16.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 37.0 m.**	Fluvial Geomophology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (831.7 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Due to the annual erosion rate of 0.16 m/year and a bankfull width of 4.5m, the watercourse is not classified as rapidly eroding. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate-High** RGA - Regime to Transitional/Stressed = Low to Mod; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined = Low; Drainage Area is between 100 and 2500 Ha= Moderate **HU_WH_CAC_0_WC1** No major change in predicted grain size transported/ entrained or sediment transport rates. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 5	Toronto and Region Conservation Authority	Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_1**	HU_WH_TWH_1_WC1.2 HU_WH_TWH_1_WC1	No defined feature	RGA not applicable for undefined features	Ephemeral (Tile drained)	Undefined	None	Straight	Unconfined	35.87	32	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Tile drained. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Straight	**HU_WH_TWH_1_WC1.2** No Hydraulic Data at this time **HU_WH_TWH_1_WC1** No Hydraulic Data at this time	**HU_WH_TWH_1_WC1.2** No Hydraulic Data at this time **HU_WH_TWH_1_WC1** No Hydraulic Data at this time	Potential for in channel work depending on length and span of new structure. Majority of reach appears to be located within footprint of proposed route	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** due to lack of channel definition and small upstream drainage area (35.87 ha)	Fluvial Geomorphology Assessment - Sizing can be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria (tile drains present) Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (35.87 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to lack of erosion observed in field. Cannot measure erosion rate due to watercourse manipulation by agricultural activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; No Erosion present = Low; Planform is straight with one bend = low; Unconfined = High; Drainage Area is less than 100 Ha= Low **HU_WH_TWH_1_WC1.2** **HU_WH_TWH_1_WC1** No hydraulic data provided. Fluvial Geomophology should take a closer look during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined lowflow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Roadside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 5	Toronto and Region Conservation Authority	Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_2**	HU_WH_TWH_1_WC2.3	4.8	In Regime	Intermittent	Defined, but likely altered for agricultural practices	None	Straight, but some bends	Unconfined (entrenched)	699.3	30	100	34.7	Historically Altered – Used Empirical Method	5.0 - 8.0 m 5.0 m selected as an appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	44.7	Final = Preliminary MBW (34.7 m) + 2x Erosion Rate (2x 5m) = 44.7 m	No	NA	Straight. Has been manipulated by agricultural activities.	**HU_WH_TWH_1_WC2.3** No significant changes to predicted grain size transported or entrained for the 2- or 25- return period flow events. Increase in predicted grain size transported or entrained for the 50- and 100-year return period flowevents immediately downsteam of the crossing. No change to predicted transport rate for the 2-, 25-, or 50- year return period events. Increase in predicted transport rate immediately downsteam of the crossing for the 100-year return period events.	**HU_WH_TWH_1_WC2.3** No of Barrels: 1 Span: 40,000 mm Rise: UNK Length: UNK Type: Bridge	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of the proposed footprint. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. AECOM is proposing channel design work to be done in the vicinity of the proposed crossing. HU_WH_TWH_1_2 will be shortened slightly and will join with HU_WH_TWH_1_4 and will then cross under proposed route. Channel realignment has been proposed for this reach. **The proposed crossing span based on the conceptual channel design work is 13.3 m.**	Fluvial Geomorphology Assessment - The AECOM and WSP team have proposed conceptual channel design. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (699.3 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to lack of erosion observed in field and RGA classification of In Regime. Cannot measure erosion rate due to watercourse manipulation by agricultural activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined altered Channel = Mod-High; Erosion not present = Low; Planform is straight with some bends = Low-mod; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **HU_WH_TWH_1_WC2.3** No significant changes for lower frequency return period flow events. Increase in the predicted grain size transported or entrained for the 50- and 100-year return period flow events as well as to predicted sediment transport for the 100-year return period flowevent. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 5	Toronto and Region Conservation Authority	Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_4**	HU_WH_TWH_1_WC2 HU_WH_TWH_1_WC2.1	4.6	In Regime	Intermittent	Poorly defined	None	Slightly meandering	Unconfined	699.3	85	92.8	28.1	Historically Altered – Used Empirical Method	5.0 - 8.0 m 5.0 m selected as an appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	38.1	Final = Preliminary MBW (28.1 m) + 2 x Erosion Rate (2 x 5.0 m) = 38.1 m	No	NA	~ Straight	**HU_WH_TWH_1_WC2.1** Fluctuations in grain size between Station ID 5000 and 4700 including increases and decreases in predicted grain size entrained and transported for the 2-, 25-, 50-, and 100-year return period events. No change for the predicted transport rate for the 2-year return period event. Increase in predicted transport rate for the 25-, 50-, and 100-year return period events.	**HU_WH_TWH_1_WC2.1** No of Barrels: 1 Span: 40,000 mm Rise: NA Length: 75,000 mm Type: Bridge	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. The AECOM and WSP team have proposed conceptual channel design work done in the vicinity of the proposed crossing. HU_WH_TWH_1_2 will be shortened slightly and will join with HU_WH_TWH_1_4 and will then cross under proposed route. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 13.3 m.**	Fluvial Geomorphology Assessment - The AECOM and WSP team have proposed conceptual channel design. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (699.3 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to lack of erosion observed in field and RGA classification of In Regime. Cannot measure erosion rate due to watercourse manipulation by agricultural activities. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime = Low; Poorly Defined Channel = Mod; Erosion not present = Low; Planform is slightly meandering = Mod-High; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **HU_WH_TWH_1_WC2.1** Fluctuations in grain size transported and entrained but overall no major consistent changes predicted. Increase in predicted sediment transport rate for the 25-, 50-, and 100-year return period flowevents. Fluvial Geomorphology should take a closer look at Detail Design stage. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 5	Toronto and Region Conservation Authority	Humber River	West Humber River	Campbells Coss Creek	**HU_WH_CAC_0_2a**	HU_WH_CAC_0_WC2	5	In Regime	Permanent	Defined	Present	Meandering	Unconfined	1070.38	28	100	46.2	Based on empirical calculations	5.0 - 8.0 m 5.0 m selected as an appropriate width due to In Regime rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	56.2	Final = Preliminary MBW (46.2 m) + 2x Erosion Rate (2x 5.0 m) + 2x 30m Riparian Buffer = **116.2 m** Final = Preliminary MBW (46.2 m) + 2x Erosion Rate (2x 5.0 m) = 56.2 m	Yes	Final = Preliminary MBW (46.2 m) + 2x Erosion Rate (2x 5.0 m) + 2x 30m Riparian Buffer = **116.2 m** Final = Preliminary MBW (46.2 m) + 2x Erosion Rate (2x 5.0 m) = 56.2 m	6 m	**HU_WH_CAC_0_WC2** No major changes to predicted grain size entrained or transported and no major changes to the predicted transport rate for the 2-, 25-, 50-, or 100- year flowevents.	**HU_WH_CAC_0_WC2** No of Barrels: 1 Span: 30,000 mm Rise: NA Length: 82,000 mm Type: Bridge	Removal of surrounding vegetation could impact erosion rate due to the loss of shear stress resistance (based on road assessments) Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Small upstream drainage area (1062.4 ha) typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Based on the Rapid Geomorphic Assessment watercourse reach is in Regime, with dominant process occuring being planform adjustment. Existing erosion noted. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW including RSD Riparian Buffer 116.2 m**	Fluvial Geomorphology Assessment - The AECOM and WSP team have proposed conceptual channel design work. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (1070.38 ha). - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely rapidly eroding due to only minor erosion observed in field and RGA classification of In Regime. Cannot measure erosion rate due to watercourse manipulation by human activities. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime = Low; Defined Channel = High; Erosion present = Mod-High; Planform is meandering = High; Unconfined = High; Drainage Area is between 100 and 2500 Ha= Moderate **HU_WH_CAC_0_WC2** No major change in predicted grain size transported/ entrained or to the predicted transport rate
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_1a**	No Proposed Crossing	No defined feature (Not visible from ROW, assessed from aerial imagery)	RGA not applicable for undefined features	Ephemeral	No defined feature visible. Forest cover limits visibility of feature in aerial imagery.	None	Not visible in aerial imagery or from FOW	Unconfined based on topography	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller.	No	NA	Straight to sinuous	NA	NA	Feature may be impacted by planned stormwater pond	NA	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_1**	EC_SC_ETE_1_WC1.4 EC_SC_ETE_1_WC1.5	No defined feature	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined Channel	None	Straight	Unconfined	73.8	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Straight Sinuosity is topography controlled	**EC_SC_ETE_1_WC1.5** No Hydraulic Data at this time - update during additional stages of study	**EC_SC_ETE_1_WC1.5** No of Barrels: 1 Span: 6,000 mm Rise: 1,200 mm Length: NA Type: Concrete Box Culvert	Feature will need to be realigned to accommodate planned stormwater pond Removal of vegetation surrounding the feature could impact erosional processes Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design. Reach runs almost parallel to proposed roadway.	**Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** (small upstream drainage area 73.8 ha) It is anticipated that EC_SC_ETE_1_1 will need to be realigned during advanced stages of design to accommodate the proposed stormwater pond.	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (73.8 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A; Undefined Channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is below 100 Ha= Low **EC_SC_ETE_1_WC1.5** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Roadside Deck Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size (m)	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_1b**	Ne Proposed Crossing	No Bankfull - No defined feature (Not visible from ROW, assessed from aerial imagery)	RGA not applicable for undefined features	Ephemeral	Forest cover in upstream half of reach limits visibility in aerial imagery. Poorly defined discontinuous channel in downstream half of reach.	NA	Straight	Unconfined based on topography	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomophic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA		Straight	NA	NA	Feature may be impacted by planned stormwater pond	NA	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA
Section 5	Toronto and Region Conservation Authority	Etobicoke Creek	Spring Creek	Etobicoke Creek East Branch	**EC_SC_ETE_1_2**	EC_SC_ETE_1_WCL6, EC_SC_ETE_1_WCL7, EC_SC_ETE_1_WCL8.	No bankfull - No defined feature	Ponded water only, poorly defined in short sections. RGA not applicable for undefined features	Ephemeral	Poorly defined in sections but has likely been altered to create pond	None (banks protected by riprap)	Sinuous	Confined (due to highway ramps)	73.8	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable. No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomophic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	14 m Sinuosity is topography controlled	**EC_SC_ETE_1_WCL6** Unknown **EC_SC_ETE_1_WCL8** Unknown **EC_SC_ETE_1_WCL7** No of Barrels: NA Span: NA Rise: 1,500 mm Length: 149,000 mm Type: Concrete Box Culvert **EC_SC_ETE_1_WCL6** **EC_SC_ETE_1_WCL7** **EC_SC_ETE_1_WCL8** No Hydraulic Data at this time. update during additional stages of study	Removal of vegetation surrounding the feature could impact erosional processes Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Defer to hydraulic flow requirements as well as any fisheries/ terrestial limiting criteria** (small upstream drainage area 73.8 ha)	Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (73.8 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans). - Unlikely to be rapidly eroding due to lack of a defined channel. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Moderate** RGA = N/A; Defined and altered Channel = Moderate- High; Erosion not present = Low; Planform is sinuous = Mod; Confined = Low/Moderate; Drainage Area is below 100 Ha= Low **EC_SC_ETE_1_WCL6** **EC_SC_ETE_1_WCL7** **EC_SC_ETE_1_WCL8** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_1_5**	HU_WH_TWH_1_WCB.1	5.5 (Likely an over-estimate. Upstream of the proposed crossing the feature is an undefined/likely headwater feature that becomes more defined within the forested section where based on fieldwork water ponds during spring months. Downstream where the channel goes through the agricultural field is not defined. Downstream of the agricultural field a grate was noted on private property. It is assumed the feature likely flows into the grate. Additionally, further downstream at the Old School Road crossing the channel is also not defined. The 5.5 m bankfull width was collected closer to the residential properties at a section where the channel may have been altered).	In Regime	Intermittent	Defined, but likely altered due to presence of pond upstream of road multiple pipes present (piped through underground drainage infrastructure)	Not Present	Likely alteration due to presence of pond - Straight	Unconfined	52.38	30	110	34.6	Historically Altered – Used Empirical Method *Used bankfull width of 5.5 but this is likely not correct (5.5 is too large)	1.0	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	36.6	Final = Preliminary MBW (34.6 m) + 2 x Erosion Rate (2 x 1.0 m) = 36.6 m *Used bankfull width of 5.5 but this is likely not correct (5.5 is too large)	No	NA	None	**HU_WH_TWH_1_WCB.1** No Hydraulic Data at this time – update during additional stages of study	**HU_WH_TWH_1_WCB.1** Unknown	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Proposed crossing location is located is upper portion of watercourse (drainage area less than 100 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Lateral migration likely in unconfined valleys (wide, flat floodplains). Based on the Rapid Geomorphic Assessment watercourse reach is stable, with dominant process occurring being aggradation. Overtime, sediment deposition may initiate meander development. Low slope with no erosion noted. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**At a minimum, watercourse crossings should not be less than the bankfull width of the channel (Estimated to be 5.5 m however, field evidence suggests the estimated bankfull width is not natural). Recommend span bankfull width plus the 1 m erosion rate on either side of channel.** **Fluvial geomorphic assessment is based on a bankfull width of 5.5 m and a 1.0 m wide 100-year erosion rate = 7.5 m** **Fluvial Geomorphology recommends a 7.5 m span**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel. It's likely that the bankfull width of 5.5 m is not natural, as the channel is less defined at road crossing downstream. Additional assessments based on Table 3 in the TRCA (2015) crossing guidelines conclude it is a small, stable watercourse based on the following: - Small watercourse drainage area(upstream drainage is less than 100 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating and lack of erosion observed in the field. Cannot determine if watercourse is rapidly eroding due to human alteration (cannot measure erosion rate) Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA - In Regime = low Defined channel / Altered= Moderate; Erosion present = high-mod; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha=low **HU_WH_TWH_1_WCB.1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Tributaries of West Humber	**HU_WH_TWH_2_1**	HU_WH_TWH_2_WC1	Average - 3.0 Downstream at Old School Road 4.5 m	Transitional or Stressed (borders Stable)	Permanent	Defined	Downstream at Old School Road some present	Straight with small bend	Unconfined	757.7	30	60	24.8	Historically Altered – Used Empirical Method	8.0 - 15.0 12.0 m selected as an appropriate erosion rate due to transitional (borderline stable) RGA rating and moderate hazard assessment rating	Based on MNR Table 4 (Reach bankfull width 3m or less)	49.0	Final = Preliminary MBW (25.0 m) + 2x Erosion Rate (2x 12.0 m) = 49.0 m	No	Yes	Final = Preliminary MBW (25.0 m) + 2x Erosion Rate (2 x1 2.0 m) + 2 x 30.0 m Riparian Buffer = **109.0 m**	-5 m	**HU_WH_TWH_2_WC1** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_WH_TWH_2_WC1** No of Barrels: 1 Span: 60.000 mm Rise: NA Length: NA Type: Bridge	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Proposed crossing located in a relatively straight portion of watercourse (drainage area 757 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Lateral migration likely in unconfined valleys (wide, flat floodplains).Based on the Rapid Geomorphic Assessment watercourse reach is in Transition, with dominant process occurring being widening. Moderate slope with some existing erosion noted. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 12.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30.0 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including RSD Riparian Buffer 109.0 m**	Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (757.7 ha) - Not unstable (catchment area is greater than 5 km², but less than 25% urban land uses, either current or as proposed in municipal plans) - Cannot determine if watercourse is rapidly eroding due to human alteration (cannot measure erosion) however, the RGA rating is In Transition/ Stressed and evidence of erosion was noted in the field Based on TRCA's Table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - Transitional/Stressed = Mod Defined channel = High; Minor Erosion present = mod; Planform is straight with small bends = low Unconfined=high; Drainage Area is between 100 and 2500 Ha= Low-Mod **HU_WH_TWH_2_WC1** No major change in predicted grain size transported/ entrained or to the predicted transportation rate for the 60 m span proposed by the hydraulics team.
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Salt Creek	**HU_WH_SAL_2_1**	HU_WH_SAL_2_1	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined Channel	None	Straight	Unconfined	20.1	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).					No	NA	None	**HU_WH_SAL_2_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Large Cobble for the 50-year flow event and Large Cobble for the 100-year flow event	**HU_WH_SAL_2_1** 825 mm x 825 mm	Assessed from roadway. Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes, but area appears to agricultural. Potential for in channel work depending on length and span of new structure Based on hydraulic data, potential large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Ephemeral nature of the watercourse and lack of channel definition dictates that the meander belt delimitation is not applicable. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha and flows through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on TRCA's Table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 ha=low **HU_WH_SAL_2_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Salt Creek	**HU_WH_SAL_3_1**	HU_WH_SAL_3_1	2.7	In Regime	Intermittent	Poorly Defined, Has likely been altered	None	Straight	Unconfined	208.4	55	56	18.6	Historically Altered – Used Empirical Method	5.0 - 8.0 *5.0 selected as an appropriate erosion rate due to In Regime RGA rating and low hazard assessment results	Based on MNR Table 4 (Reach bankfull width 3m or less)	28.6	Final = Preliminary MBW (18.6 m) + 2x Erosion Rate (2x 5.0 m) = 28.6 m	No	No	N/A	In-channel vegetation forming a multi-channel; no amplitude	**HU_WH_SAL_3_1 (25 m span)** Decrease in grain size entrained and transported immediately upstream of the crossing for the 2-, 25-, 50-, and 100-year return period flow events. No change in predicted transport rate for the 2-year return period event. Decrease in predicted transport rate immediately upstream of the crossing for the 25-, 50-, and 100-year return period flow events.	**HU_WH_SAL_3_1** 25,000 mm span	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Proposed crossing located in a relatively straight portion of watercourse (drainage area 208.4 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Lateral migration likely in unconfined valleys (wide, flat floodplains). Based on the Rapid Geomorphic Assessment watercourse reach is in Regime, with dominant process occurring being aggradation. Moderate slope with no existing erosion noted. Overtime, sediment deposition may initiate meander development. Low slope with no erosion noted. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate based on Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (2.7 m) = 12.7 m. **Fluvial Geomorphology recommends a 12.7 m span**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel (due to poorly defined channel, no erosion present, In Regime RGA classification, and proposed crossing in relatively straight section of the watercourse) The small upstream drainage area lowers risk of movement, but dense in-channel vegetation and multi-channel nature of the channel could result in channel movement in vicinity of the proposed crossing. Crossing size can likely be reduced from the 100 year erosion rate while maintaining geomorphic form and function due to the low risk. Additional assessments based on TRCA (2015) Table 3 crossing guidelines concluded that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (208.4 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating and lack of erosion noted in the field Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Hazard Assessment: Low** RGA - In Regime = low Poorly defined channel = Mod; Erosion not present = Low; Planform is straight = low; Unconfined=high; Drainage Area is between 100 and 2500 ha= Low-Mod **HU_WH_SAL_3_1** Slight decrease in grain size entrained and transported as well as to transportation rate immediately upstream of the two crossings
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Gore Road Tributary	**HU_WH_SAL_5_1**	HU_WH_SAL_0_1	1.7	RGA not applicable for undefined features. Feature only poorly defined in sections.	Intermittent	Poorly defined in sections	Yes, downstream of perched culverts	Straight	Unconfined	201	32	34	6.1	Historically Altered – Used Empirical Method based on discharge values only due to channel design	5.0 -8.0 5.0 m selected as an appropriate erosion rate due to small channel size.	Based on MNR Table 4 (Reach has been altered based on historical aerial image; bankfull less than 3 m)	16.1	Final = Preliminary MBW (6.1 m) + 2 x Erosion Rate (2 x 5.0) = 16.1 m	No	No	N/A	Channel design watercourse	**HU_WH_SAL_0_1 (25 m span)** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_WH_SAL_0_1** 25,000 mm span	Contributing habitat for Redside Dace. Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Watercourse realignment required for this channel	**The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.** **A recommended crossing size of 6.1 m has been provided based on the two year flow from the HEC-RAS model**	**This watercourse will be realigned as part of the proposed works. A recommended crossing size of 6.1 m has been provided based on the two year flow from the HEC-RAS model**	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Hazard Assessment: Moderate** RGA = Not collected Defined channel = High; Minor Erosion present = Mod; Planform is Multi-channel and sinuous = Mod High; Unconfined = High; Drainage Area is between 100 and 2500 Ha = Low-Mod **HU_WH_SAL_0_1** No major change in predicted grain size transported/ entrained or to predicted transportation rate for a 25-m span. However, a channel realignment is proposed and therefore the model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Salt Creek	**HU_WH_SAL_0_3**	Realignment has negated need for crossing	7.3 Feature is two-staged with an upper bankfull of 6 m - 8 m and a lower bankfull of 1.5 - 2m	In regime	Permanent	Defined	Present	Sinuous	Unconfined	1313	30	145.2	49.0	Based on Mapping	6.5 (+/-3)	Based on Mapping	62.0	Final = Preliminary MBW (49.0 m) + 2x Erosion Rate (2 x 6.5 m) + 2x 30 m Riparian Buffer = **122.0 m**	Yes	Final = Preliminary MBW (49.0 m) + 2 x Erosion Rate (2 x 6.5 m) = 62.0 m	~10.5 m	**Realignment has negated need for crossing**	**Realignment has negated need for crossing**	Recovery habitat for Redside dace Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Meander amplitude approximately 10 m in vicinity of proposed crossing. Small upstream drainage area (1313 ha) typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Based on the Rapid Geomorphic Assessment watercourse reach is in Regime, with dominant process occurring being planform adjustment. Moderate slope with existing erosion noted. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 6.5 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30.0 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including RSD Riparian Buffer 122.0** **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	Fluvial Geomorphology Assessment the AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Additional assessments based on Table 3 in the TRCA (2015) crossing guidelines it is a small, stable watercourse based on the following: - Small watercourse drainage area (13.13 km²) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not rapidly eroding due to the annual erosion rate of 6 m and a bankfull width of 7.26 m Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Due to the presence of Recovery Habitat for Redside Dace, aquatic requirements must be considered. This likely requires the crossing to span the 62 m (meander belt) plus 30 m on either side of the meander belt. "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: High** RGA - In Regime = low Defined channel = High; Erosion present = high-mod; Planform is sinuous = Mod; Unconfined=High; Drainage Area is between 100 and 2500 Ha = Low-Mod **Realignment has negated need for crossing**

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Salt Creek	**HU_WH_SAL_4_1**	Realignment has negated need for crossing	No bankfull Largely undefined, short sections measure 0.8-1.2 m wide where defined	RGA not applicable for undefined features	Ephemeral	Poorly defined for most of the reach until 100 m from DS reach break where it's defined due to the steep slope	Evidence of bank erosion through entrenched portion. May be altered due to past agricultural activities	Straight	Confined in entrenched sections	100.8	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).								No	NA	Appears relatively straight	**Realignment has negated need for crossing**	**Realignment has negated need for crossing**	Proposed crossing location is located with an upstream drainage area of 100.8 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Field assessment should confirm whether vegetation controlled watercourse. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	Fluvial Geomorphology Assessment - the AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Additional assessments based on Table 3 in the TRCA (2015) crossing guidelines it is a small, stable watercourse based on the following: - Small watercourse drainage area (100.8 ha, small upstream drain area) that flows through an agricultural field - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of a defined channel. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Moderate** RGA = N/A: Undefined channel = Low; Minor Erosion present = Low; Planform is straight = low; Partially Confined-Moderate-High; Drainage Area is between 100 and 2500 Ha = Low-Mod **Realignment has negated need for crossing**
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Salt Creek	**HU_WH_SAL_0_2**	HU_WH_SAL_0_2	3.5 (average) ~2.3 m in area not affected by backwater at lower bank; upper bank closer to 6.4 m	Transitional or Stressed (borders Stable) Airport Road Widening Project identified this reach as transitional.	Intermittent	Defined	Present	Multi-channel ; slightly sinuous	Unconfined	1212	30	70	26.0	Historically Altered – Used Empirical Method (Larger value taken for calculations for HU_WH_SAL_0_1)	Parish Geomorphic (2014) calculated an erosion rate of 3.2 m based on 10% of meander belt, stated to do channel alterations and poor imagery TRCA has recently updated their protocol for erosion rate, therefore will need to consider updated method. Watercourse has been historically altered and therefore erosion rate calculated using bends that appear more natural within the subject area (as per TRCA (2015) guidelines. 7.0 (+/- 3)	Based on Mapping	40.0	Final = Preliminary MBW (26.0 m) + 2 x Erosion Rate (2 x 7.0 m) = 40.0 m	Yes	Final = Preliminary MBW (26.0 m) + 2 x Erosion Rate (2 x 7.0m) + 2 x 30 m Riparian Buffer = **100.0 m**	~20 m	**HU_WH_SAL_0_2 (35 m span)** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate. **HU_WH_SAL_0_3 (35 m span)** No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate. **HU_WH_SAL_0_4** No hydraulics data at this time	**HU_WH_SAL_0_2** 35,000 mm span **HU_WH_SAL_0_3** 35,000 mm span **HU_WH_SAL_0_4** No hydraulics data at this time	Recovery habitat for Redside dace Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Field work identified a multi-channel planform and aerial imagery shows sinuosity, ensure crossing with maintains sinuosity in order to prevent loss of channel length. Watercourse and proposed crossing not perpendicular, opportunity for realignment. Small upstream drainage area (1212 ha) typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Based on the Rapid Geomorphic Assessment watercourse reach is Transitional, with dominant process occurring being aggradation. Overtime, sediment deposition may initiate meander development. Low slope with no erosion noted. Moderate slope with existing erosion noted. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of new structure. Need for realignment identified. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 7.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW including RSD Riparian Buffer 100.0 m** **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	Fluvial Geomorphology Assessment - the AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Additional assessments based on Table 3 in the TRCA (2015) crossing guidelines it is a small, stable watercourse based on the following: - Small watercourse drainage area (1212 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.07 and a bankfull width of 3.5 m Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: High** RGA - Transitional/Stressed = Mod Defined channel = High; Erosion present = Mod-High; Planform is Multi-channel and sinuous = Mod-High; Unconfined = High; Drainage Area is between 100 and 2500 Ha = Low-Mod **HU_WH_SAL_0_2** **HU_WH_SAL_0_3** No major change in predicted grain size transported entrained for a 35 m span. However, a channel realignment is proposed and therefore the model should be re-run with the proposed channel design conditions during the Detail Design stage **HU_WH_SAL_0_4** No hydraulics data at this time. Fluvial Geomorphology should take a closer look during Detail Design
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Salt Creek	**HU_WH_SAL_0_1**	Realignment has negated need for crossing	3.4 (average) Feature is two-staged with a lower bank width of 1.4 m, and an upper bankfull width of 3.4 m	In Regime Airport Road Widening Project identified this reach as low end transitional	Permanent	Defined	Minor erosion downstream of Airport Road	Sinuous/ multi-channel	Unconfined	52.38	30	68	26.0	Historically Altered – Used Empirical Method	Parish Geomorphic (2014) calculated an erosion rate of 3.2 m based on 10% of meander belt, stated to do channel alterations and poor imagery TRCA has recently updated their protocol for erosion rate, therefore will need to consider updated method. Watercourse has been historically altered and therefore erosion rate calculated using bends that appear more natural within the subject area (as per TRCA (2015) guidelines). 7.0 (+/- 3)	Based on Mapping	40.0	Final = Preliminary MBW (27.2 m) + 2x Erosion Rate (2x 7.0 m) = 40.0 m	Yes	Final = Preliminary MBW (26.0 m) + 2 x Erosion Rate (2 x 7.0 m) + 2x 30 m Riparian Buffer = **100.0 m**	Appears relatively straight	Realignment has negated need for crossing	Realignment has negated need for crossing	Recovery habitat for Redside dace Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Field work identified a multi-channel planform and aerial imagery shows sinuosity, ensure crossing with maintains sinuosity in order to prevent loss of channel length. Watercourse and proposed crossing not perpendicular, opportunity for realignment. Small upstream drainage area (990.6 ha) typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Based on the Rapid Geomorphic Assessment watercourse reach is In Regime, with dominant process occurring being aggradation. Overtime, sediment deposition may initiate meander development. Low slope with no erosion noted. Low to moderate slope with some existing erosion noted. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 7.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW including RSD Riparian Buffer 100.0 m** **The AECOM and WSP team have proposed channel realignment to accommodate the proposed route. Refer to the Salt Creek Realignment Conceptual Channel Design Memo.**	Fluvial Geomorphology Assessment - channel realignment to accommodate the proposed route Additional assessments based on Table 3 in the TRCA (2015) crossing guidelines it is a small, stable watercourse based on the following: - Small watercourse drainage area (52.38 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.07 and a bankfull width of 3.4 m Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Moderate** RGA - In Regime = Low Defined channel = High; Minor Erosion present = Mod; Planform is Multi-channel and sinuous = Mod-High; Unconfined = High; Drainage Area is below 100 Ha = Low-Mod Realignment has negated need for crossing
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_1**	HU_WH_WHT_1_1_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature	None	Straight	Unconfined	7.7	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	N/A	**HU_WH_WHT_1_1_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small boulder for the 50-year flow event and Small boulder for the 100-year flow event	**HU_WH_WHT_1_1_1** 1830 mm x 910 mm	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha at 7.7 ha). Watercourse is surrounded by agriculture. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design Based on hydraulic data, potential large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (7.7 ha) and flows through an agricultural field), - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WH_WHT_1_1_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_3**	HU_WH_WHT_1_2_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature	None	Straight	Unconfined	7.13	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Sinuosity appears to be controlled by topography	**HU_WH_WHT_1_2_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Large Cobble for the 50-year flow event and Large Cobble for the 100-year flow event	**HU_WH_WHT_1_2_1** 825 mm x 825 mm	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha at 7.13 ha). Watercourse is surrounded by agriculture. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design Based on hydraulic data, potential large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (7.13 ha) and flows through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WH_WHT_1_2_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_4**	HU_WH_WHT_1_3_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature	None	Straight	Unconfined	14.8	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Sinuosity appears to be controlled by topography	**HU_WH_WHT_1_3_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small boulder for the 50-year flow event and Small boulder for the 100-year flow event	**HU_WH_WHT_1_3_1** 1050 mm x 1050 mm	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha at 14.8 ha). Watercourse is surrounded by agriculture. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design Based on hydraulic data, potential large change in predicted grain size transported. Further Fluvial Geomorphology input should be provided during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (14.8 ha) and flows through an agricultural field), - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WH_WHT_1_3_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_5**	HU_WH_WHT_1_5_1	No Bankfull	RGA not applicable for undefined features. To the West there is a large pool but otherwise the feature is very poorly defined to undefined	Ephemeral - swale	Poorly defined channel. Upstream the channel becomes defined but likely altered as part of agricultural activities.	None, some portions are poorly vegetated	Straight, sinuous, multichannel	Unconfined	52.38	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Sinuosity appears to be controlled by topography	**HU_WHR_1_5_1 (4.8 m span x 2.4 m rise, 0.30 m embedment)** No significant changes to the predicted grain size transported or entrained or the predicted transport rate for the 2-year return period event. Increase in predicted grain size transported and predicted transport rate immediately upstream of the main transportation corridor crossing and decrease in predicted grain size transported and predicted transport rate immediately upstream of the transitway crossing for the 25-, 50-, and 100-year return period events. No changes to predicted grain size entrained.	**HU_WHR_1_5_1** 4800 mm span x 2400 mm rise, 300 mm embedment	Appears to be an online pond in proposed location of crossing Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha at 52.38 ha). Watercourse is surrounded by agriculture. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Assessed at Healey Road where there is dense in-channel herbaceous vegetation. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (52.38 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low-Moderate** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous and multi-channel = mod-high; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WHR_1_5_1** No major change in predicted grain size transported entrained or sediment transport for the 2-year return period event but increases observed for the 25-, 50-, and 100- year return period events for a 4.8 m span. Fluvial Geomorphology should take a closer look during Detail Design.

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_1_6**	HU_WH_WHT_1_6_1	No channel seen from side of road (Healy Road), potentially dug out further downstream	No defined Feature seen at road crossing. RGA not applicable for undefined features	Ephemeral	No defined channel seen at road crossing (field has been tilled)	None observed from road crossing	Straight (sinuosity likely due to topography)	Unconfined	34.92	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).					No	NA	Sinuosity appears to be controlled by topography	**HU_WHR_1_6_1** No Hydraulic Data at this time - update during additional stages of study	**HU_WHR_1_6_1** Unknown	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha at 34.92 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse (less than 100 ha (34.92 ha). - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled)= Low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WHR_1_6_1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_3_1**	HU_WH_WHT_1_7_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature	None	Straight (sinuosity likely due to topography)	Unconfined	47.87	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).					No	NA	Sinuosity appears to be controlled by topography	**HU_WH_WHT_1_7_1** No Hydraulic Data at this time - update during additional stages of study	**HU_WH_WHT_1_7_1** Unknown	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha at 47.87 ha). Watercourse is surrounded by agriculture. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition seen at road crossing, sizing would likely be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (47.87 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight to sinuous (topography controlled)= Low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WH_WHT_1_7_1** No hydraulic data provided. Fluvial Geomorphology should take a closer look during Detail Design
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_3_1a**	No Proposed Crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	No defined channel visible on aerial imagery	None	Straight	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).					No	NA	Straight	NA	NA	Potential Maintenance Yard Site	**The edge of the reach is within the maintenance yard footprint. At a minimum, infrastructure should stay outside of the meander belt (if applicable) of the watercourse.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_3_1b**	No Proposed Crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	No defined channel visible on aerial imagery	None	Straight	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).					No	NA	Straight	NA	NA	Potential Maintenance Yard Site	**It is anticipated that reach HU_WH_WHR_3_1b will need to be realigned to accommodate the proposed carpool lot.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_0_2**	HU_WH_WHR_0_2	8.5 (Possible two staged channel)	In Regime (borders Transitional	Permanent	Defined	Present	Meandering	Confined	2712	30	170.8	118.0 - 186.0	Based on Mapping	18.0 (+/- 3)	Based on Mapping	186.0	Final = Preliminary MBW (186.0 m)	Yes	Final = Preliminary MBW (186.0 m) + 2x 30 m Riparian Buffer = **246.0 m**	~20	**HU_WH_WHR_0_1** (120 m span) No significant changes to predicted grain size entrained or transported for the 2-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_WH_WHR_0_1** 120,000 mm span	Multiple crossing structures appear to be proposed here as part of the proposed highway. Bridge abutments and piers constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a sinuous channel upstream and downstream of existing structure, but perpendicular. Large upstream drainage area (2712 ha) - erosive forces of larger watercourses tend to exceed stabilizing properties of vegetation, therefore increased potential for migration. Confluence upstream. Removal of vegetation surrounding the feature could impact erosional processes. Based on the Rapid Geomorphic Assessment watercourse reach is in Regime, with dominant process occurring being widening. Moderate slope with existing erosion noted. Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt. Proposed bridge piers should be 18.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Crossing size of (120.0 m span) from hydraulics indicates no change to sediment size transported/entrained In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW including RSD Riparian Buffer 246.0 m**	Fluvial Geomorphology Assessment - final MBW + RSD riparian buffer Due to the high risk the 100 year erosion rate of 18 m +/- 3 m should be considered. This can be further assessed when proposed hydraulic model velocity data is available. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a large watercourse, stable watercourse based on the following: - Large watercourse (drainage area greater than 25 km²) - Not unstable (catchment area is greater than 5 km² but less than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.18 and a bankfull width of 8.54 m Based on TRCA's Table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and geomorphic design or realignment is not recommended. Based on the fact that it is a large watercourse, TRCA guidelines recommends the crossing span the meander belt or 100 year erosion rate.	**Considered a Large, Unstable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Not Recommended - Geomorphic Design or Realignment	**Hazard Assessment: High** RGA - In Regime= Low Defined channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined= Low; Drainage Area is between 2500 Ha= High **HU_WH_WHR_0_1** No major change in predicted grain size transported/ entrained
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	West Humber River	**HU_WH_WHR_0_3**	HU_WH_WHR_0_3	7.5	Upstream of crossing: In Regime At Crossing Location: In Adjustment	Permanent	Defined	Present	Meandering; downstream there appears to be a beaver dam causing a temporary multi-channel, meandering.	Confined	2712	30	100 - 200	100.0 - 294.0	Based on Mapping	23.0 (+/- 3)	Based on Mapping	294.0	Final = Preliminary MBW (294.0 m) + 2x 30 m Riparian Buffer = **354.0 m**	Yes	Final = Preliminary MBW (294.0 m) + 2x 30 m Riparian Buffer = **354.0 m**	~20	**HH_WH_WHR_0_3 (120 m span)** Slight increases in grain size but overall no significant changes to predicted grain size entrained or transported for the 2-, 25-, 50-, or 100-year flow events. No significant changes to predicted transportation rate for the 2-year return period event. Increase in predicted transport rate from low to moderate sediment transport immediately upstream of the HU_WH_WHR_0_3 crossing for the 25-, 50-, and 100-year return period events.	**HU_WH_WHR_0_3** 120,000 mm span	Aerial imagery shows a sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Meander amplitude approximately 20 m in vicinity of proposed crossing. Large upstream drainage area (2712 ha) - erosive forces of larger watercourses tend to exceed stabilizing properties of vegetation, therefore increased potential for migration. Angle into proposed crossing not ideal Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt. Proposed bridge piers should be 23.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Crossing size of (120.0 m span) from hydraulics indicates no change to sediment size transported/entrained In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW including RSD Riparian Buffer 354.0 m**	Fluvial Geomorphology Assessment - final MBW + RSD riparian buffer In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~20 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a large watercourse, stable watercourse based on the following: - Large watercourse (drainage area greater than 25 km²) - Not unstable (catchment area is greater than 5 km² but less than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.23 and a bankfull width of 7.5 m Based on TRCA's Table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and geomorphic design or realignment is not recommended. Based on the fact that it is a large watercourse, TRCA guidelines recommends the crossing span the meander belt or 100 year erosion rate.	**Considered a Large, Unstable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Not Recommended - Geomorphic Design or Realignment	**Hazard Assessment: High** RGA - Unstable at crossing= High Defined channel = High; Erosion present = Mod-High; Planform is meandering = High; Confined= Low; Drainage Area is greater than 2500 Ha= High **HU_WH_WHR_0_3** No major change in predicted grain size transported/ entrained
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Gore Road Tributary	**HU_WH_GRT_0_2**	HU_WH_WHR_0_1, HU_WH_GRT_0_2	4.0 Downstream seems to be less defined	Transitional or Stressed (poorly defined)	Intermittent	Poorly defined	Present	Sinuous, multi channel in some locations	Unconfined	562.2	90	80	32.9	Empirical (Not enough resolution on historical data)	5.0 - 8.0 *6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	46.0	Final = Preliminary MBW (33.0 m) + 2 x Erosion Rate (2 x 6.5 m) = 46.0 m	No	NA	Sinuosity may be controlled by topography	**HU_WH_GRT_0_1 (40 m span)** **HU_WH_GRT_0_2 (40 m span)** Slight decrease in anticipated grain size entrained and transported and decrease in predicted transport rate immediately upstream of HU_WH_GRT_0_2 for the 2-, 25-, 50-, and 100- year return period events. Otherwise there are slight increases and decreases to anticipated grain size entrained and transported between the crossings but overall no significant changes	**HU_WH_GRT_0_1** 40,000 m span **HU_WH_GRT_0_2** 40,000 m span	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Proposed crossing located in a slightly sinuous and multi-channel portion of watercourse (drainage area 562.2 ha). Small-upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 6.5 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial Geomorphology recommendation is based on 2 x erosion rate (6.5 m erosion rate) + Bankfull Width (4.0 m) = 17.0 m. **Fluvial Geomorphology recommends a minimum span of 17.0 m**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel. Due to the fact that upstream of the proposed crossing area is more defined than downstream, it's likely that the channel has been altered and therefore the 100 year erosion rate of 22 m (+/- 3 m) is likely an artificial measurement. Decided to use 100-year erosion rate based on empirical measurements. The predicted sediment size transported based on hydraulic analysis shows that a crossing spanned for the 50-yr flow event results in a smaller sediment size for the HU_WH_GRT_0_2 crossing. Therefore, the 100 year erosion rate can likely be reduced but they should be sized larger than the proposed span for the 50-yr flow event to not impact sediment transport potential. Additional assessments based on TRCA (2015) Table 3 crossing guidelines concluded that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (5.62 km²) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unable to determine if it's rapidly eroding due to transitional/stressed RGA rating and evidence of existing erosion. Unable to measure erosion rate due to human alteration. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - Transitional/Stressed = Moderate Poorly defined channel = Moderate; Erosion present = Mod-High; Planform is multi-channel and sinuous=Mod-high; Unconfined= High; Drainage Area is between 100 and 2500 Ha= Low-Mod **HU_WH_GRT_0_1** **HU_WH_GRT_0_2** Slight decrease in the anticipated grain size entrained and transported and sediment transport upstream of HU_WH_GRT_0_2 which could indicate potential erosional concerns but otherwise no significant changes. Fluvial Geomorphology should be involved during Detail Design

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_2_1**	HU_WH_CDT_2_1-HU_WH_CDT_2_2	1.5	RGA not applicable for undefined features	Ephemeral	Poorly defined. Defined only in short sections	None	Straight	Unconfined	63.11	30	NA	9.8	Empirical (historically altered and is less than 3 m wide)	1.0	Based on MNR Table 4 (Reach bankfull width 3m or less)	11.8	Final = Preliminary MBW (9.8 m) + 2 x Erosion Rate (2 x 1.0 m) = 11.8 m	No	NA	Sinuosity likely controled by topography	**HU_WH_CDT_2_1 (5.4 m span culvert with 0.30 m embedment. Length 45 m)** **HU_WH_CDT_2_2 (5.4 m span culvert with 0.30 m embedment. Length 54 m)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate between the crossings but overall no significant changes	**HU_WH_CDT_2_1** 5400 mm span culvert with 300 mm embedment. Length 45,000 mm **HU_WH_CDT_2_2** 5400 mm span culvert with 300 mm embedment. Length 54,000 mm	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha - 63.11 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Online pond located downstream of proposed crossings. Outside of limits of grading but within the Study Area. Realignment work is unlikely however this will be confirmed during additional stages of the study. Fluvial Geomorphology should be involved during Detail Design	Hydraulic span of 5.4 m results in no major change to sediment size entrained/ transported. Fluvial Geomorphology recommendation is based on 2 x erosion rate (1.0 m erosion rate) + Bankfull Width (1.5 m) = 3.5 m. **Fluvial Geomorphology recommends a minimum span of 3.5 m**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel Low Risk. It's likely that the channel has been historically altered and therefore the 100 year erosion rate of 12 m (+/- 3 m) is likely an artificial measurement. The predicted sediment size transported based on hydraulic analysis shows that a crossing spanned for the 50-yr and 100-yr flow event results in larger sediment size for the HU_WH_CDT_2_2 crossing. Therefore, the 100 year erosion rate can likely be reduced but size should not increase flow velocities impacting sediment transport potential. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (13.1 ha) - Small watercourse drainage area (less than 100 ha (63.11 ha) and appears to flow through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing.	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Poorly defined channel = High; Erosion not present = Low; Planform is straight = Low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_WH_CDT_2_1** **HU_WH_CDT_2_2** No major change in predicted grain size transported/ entrained or to predicted transportation rate
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_2_1a**	No Proposed Crossing	No bankfull	RGA not applicable for undefined features	Ephemeral	Poorly defined channel based on aerial imagery	None	Sinuous	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).										No	NA	NA	NA	NA	Feature may be impacted by the carpool lot.	**It is anticipated that reach HU_WH_CDT_2_1a will need to be realigned to accommodate the proposed carpool lot.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_2_1b**	No Proposed Crossing	1 .0- 2.5	In Regime	Permanent	Defined	Present	Sinuous	Unconfined	Not modelled/ not calculated	NA	NA	16.9	Historically Altered – Used Empirical Method (Bankfull width of 2.5 m and Bankfull depth of 0.5 m was used in the assessment) The Chitale (1973) method was also applied (MBW = 11.7), using the 2-year flow in place of bankfull discharge (see Table 5-1).	5.0 - 8.0 5.0 selected as an appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	26.9	Final = Preliminary MBW (16.9 m + 2x Erosion Rate (2x 5 m) = 26.9 m	No	NA	Sinuous	NA	NA	Feature may be impacted by the carpool lot. Must stay outside of meander belt width	**It is anticipated that reach HU_WH_CDT_2_1b will need to be realigned to accommodate the proposed carpool lot.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA
Section 6	Toronto and Region Conservation Authority	Humber River	West Humber River	Clarkway Drive Tributary	**HU_WH_CDT_0_2**	HU_WH_CDT_0_1	4.2	In Regime (limited permission to enter)	Permanent	Defined	Present	Sinuous	Confined	645.8	30	50	39.0 - 83.0	Based on Mapping	5.0 – 8.0 8.0 selected as an appropriate erosion rate due to high meander amplitude	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	39.0 - 83.0	Final = Preliminary MBW = 39.0 - 83.0 m	No	NA	~10 m	**HU_WH_CDT_0_1 (60 m span x 6.0 m Rise)** No significant changes to predicted grain size entrained or transported for the 2-, 25-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_WH_CDT_0_1** 60,000 mm span x 6,000 mm Rise	Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing platform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomo<AD22>AC25	Proposed bridge piers should be 8 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Hydraulic sizing of 60 m results in no major changes to grain size transported/ entrained. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~10 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Fluvial Geomorphology recommendation is based on 2 x erosion rate (8 m erosion rate) + Bankfull Width (4.2 m) = 20.2 m. **Fluvial Geomorphology recommends a minimum crossing span of 20.2 m**	Due to the fact that the proposed 50-yr and 100-yr Return flow event does not alter sediment size predicted to be transported based on hydraulic assessment, the crossing span can likely be reduced from the 100 year erosion rate. The meander amplitude in vicinity of the crossing should be considered. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (6.46 km²) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating and minor evidence of existing erosion. Unable to measure erosion rate due to human alteration. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing.	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime= Low Defined channel = High; Erosion present = Mod-High; Planform is sinuous = High; Confined= Low; Drainage Area is between 100 and 2500 Ha= High **HU_WH_CDT_0_1** No major change in predicted grain size transported/ entrained or to predicted transport rate
Section 6	Toronto and Region Conservation Authority	Humber River	Main Humber River	Rainbow Creek	**HU_MH_RAI_1_1**	HU_MH_RAI_1_1_1	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly defined channel	None	Sinuous	Unconfined	13.1	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).										No	NA	Sinuosity likely controled by topography	**HU_MH_RAI_1_1_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_MH_RAI_1_1_1** 825 mm x 825 mm	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha - 13.1 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (13.1 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing.	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined=high; Drainage Area is less than 100 Ha= Low **HU_MH_RAI_1_1_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	Main Humber River	Rainbow Creek	**HU_MH_RAI_1_2**	HU_MH_RAI_1_2_1	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly defined channel	None	Straight	Unconfined	8.7	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).										No	NA	Sinuosity likely controled by topography	**HU_MH_RAI_1_2_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_MH_RAI_1_2_1** 825 mm x 825 mm	Proposed crossing location is located in upper portion of watercourse (drainage area less than 100 ha - 8.7 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (8.7 ha). - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing.	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = high; Drainage Area is less than 100 Ha= Low **HU_MH_RAI_1_2_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 6	Toronto and Region Conservation Authority	Humber River	Main Humber River	Rainbow Creek	**HU_MH_RAI_1_3**	HU_MH_RAI_1_3_1	4.4	In Regime	Intermittent	Poorly defined swale-type feature -upstream/ modified. Becomes more defined downstream	Present	Sinuous	Unconfined	105.8	160	88	29.0	Historically Altered – Used Empirical Method	5.0 -8.0 5.0 m selected as an appropriate erosion rate due to In Regime RGA rating and moderate hazard assessment results	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	39.0	Final = Preliminary MBW (29.0 m) + 2x Erosion Rate (2x 5.0 m) = 39.0 m	No	NA	Sinuosity likely controled by topography	**HU_MH_RAI_1_3_1** **(20 m span - Channel Modified in Option 7 to make Low Flow** Decrease in predicted grain size entrained and transported as well as predicted transport rate beginning immediately upstream of first bridge and between the two bridges.	**HU_MH_RAI_1_3_1** 20,000 m span	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Proposed crossing located in a sinuous portion of watercourse (drainage area 105.8 ha). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Removal of vegetation surrounding the feature could impact erosional processes. Lateral migration likely in unconfined valleys (wide, flat floodplains).Based on the Rapid Geomorphic Assessment watercourse reach is in Regime, with dominant process occurring being aggradation. Overtime, sediment deposition may initiate meander development. Low to moderate slope with some existing erosion noted. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	**Fluvial Geomorphology recommendation is based on 2 x erosion rate (5.0 m erosion rate) + Bankfull Width (4.4 m) = 14.4 m.** **Fluvial Geomorphology recommends a minimum span of 14.4 m**	Crossing should span bankfull width plus the 100 year erosion rate of 8 m to 15 m on either side of channel. Due to the moderate risk, the 100 year erosion rate is likely on the lower end of the range. The lack of channel definition, In Regime RGA, and small upstream drainage area indicate that crossing size can likely be reduced from the 100 year erosion rate while maintaining geomorphic form and function. Crossing should not alter sediment transport potential based on hydraulic analysis. Additional assessments based on TRCA (2015) Table 3 crossing guidelines concluded that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (105.8 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is the geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse.** **Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Moderate** RGA - In Regime = Low Poorly Defined channel = Mod; Erosion present = Mod-High; Planform is sinuous (topography controlled) = Low; Unconfined = high; Drainage Area is between 100 and 2500 Ha= Low-Moderate **HU_MH_RAI_1_3_1** Decrease in predicted grain size entrained and transported and in predicted transport rate. May be influenced to channel modifications considered in hydraulic assessment

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100 Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2013)	Hazard Assessment
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_2**	HU_MH_ROB_3_0	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Straight (based on air photos)	Unconfined	UNK	30	N/A	Floxial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).											No	NA	Sinuosity appears to be controlled by topography	**HU_MH_ROB_3_0** No Hydraulic Data at this time - update during additional stages of study	**HU_MH_ROB_3_0** No Hydraulic Data at this time - update during additional stages of study	Proposed crossing location is located in upper portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. In-channel vegetation noted, likely vegetation controlled. Removal of vegetation surrounding the feature could impact erosional processes. It is anticipated that HU_MH_ROB_3_2 may will need to be realigned to accommodate the proposed transit station.	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria** **It is anticipated that HU_MH_ROB_3_2 may will need to be realigned to accommodate the proposed transit station.**	Floxial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Further assessment can be completed when hydraulic velocity input available. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (assumed to be under 100 ha based on mapping and field assessment) and flows through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Not Recommended - Geomorphic Design or Realignment	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high. Drainage Area is assumed to be less than 100 ha=low **HU_MH_ROB_3_0** No Hydraulic Data at this time - update during additional stages of study
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_3**	HU_MH_ROB_3_3_1 HU_MH_ROB_3_3_2	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	No Defined Feature	None	Straight (based on air photos)	Unconfined	13.91	30	N/A	Floxial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).											No	NA	Sinuosity appears to be controlled by topography	**HU_MH_ROB_3_3_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_MH_ROB_3_3** 825 mm x 825 mm	Proposed crossing location is located in upper portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. In-channel vegetation noted, likely vegetation controlled. Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design. It is anticipated that reach HU_MH_ROB_3_3 will need to be realigned to accommodate the proposed 50m water pond.	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Floxial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Further assessment can be completed when hydraulic velocity input available. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (13.91 ha) and flows through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high. Drainage Area is less than 100 ha=low **HU_MH_ROB_3_3_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_4**	HU_MH_ROB_3_4_1 HU_MH_ROB_3_4_2	No Bankfull Channel likely altered to have a width of 1.5 in short sections	RGA not applicable for undefined features	Ephemeral - swale	Poorly defined - Manmade/ manipulated	None	Straight	Unconfined	10.2	30	N/A	Floxial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).											No	NA	Sinuosity appears to be controlled by topography	**HU_MH_ROB_3_4_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event **HU_MH_ROB_3_4_2** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_MH_ROB_3_4_1** 825 mm x 825 mm **HU_MH_ROB_3_4_2** 825 mm x 825 mm	Proposed crossing location is located in upper portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. In-channel vegetation noted, likely vegetation controlled (drainage area less than 100 ha (10.2 ha). Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Floxial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Further assessment can be completed when hydraulic velocity input available. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (10.2 ha) and flows through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Poorly defined/manipulated channel= moderate; Erosion not present = low; Planform is straight = low; Unconfined=high. Drainage Area is less than 100 ha=low **HU_MH_ROB_3_4_1** **HU_MH_ROB_3_4_2** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_3_5**	HU_MH_ROB_3_1 HU_MH_ROB_3_5	No bankfull 1.6 m approximate width of short altered sections (limited permission to enter; location downstream of Highway 50 appears to have been altered)	In Regime (limited permission to enter)	Ephemeral - swale	Largely poorly defined/ modified. Defined downstream of Highway 50 but may not be natural	None	Straight	Unconfined	70.23	30	32.6	Floxial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).											No	NA	Straight	**HU_MH_ROB_3_1 (3.3 x 2.1 m)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing but overall no significant changes for the 2- or 25-year return period flow event. Decrease in predicted grain size entrained and transported as well as decrease in the predicted transport rate immediately upstream and downstream of the crossing for the 50- and 100- year return period flow events.	**HU_MH_ROB_3_3** 3,300 x 2,100 mm	Proposed crossing location is located in upper portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. In-channel vegetation noted, likely vegetation controlled (drainage area less than 100 ha (70.23 ha). Removal of vegetation surrounding the feature could impact erosional processes. Watercourse also appears to have altered in agricultural field and downstream of Highway 50. Proposed crossing alignment based on existing watercourse planform not cloud Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Floxial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Likely vegetation controlled Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (70.23 ha) and flows through an agricultural field and vegetative area) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA - In Regime = low Poorly defined/manipulated channel= moderate; Erosion not present = low; Planform is straight = low; Unconfined=high. Drainage Area is less than 100 ha=low **HU_MH_ROB_3_1** It appears the channel is not defined however, the hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_2**	HU_MH_ROB_0_5	4.8 (limited permission to enter)	Transitional or Stressed	Intermittent	Defined	Present	Meandering	Confined	1188	100	96	80.0 - 97.0	Based on Mapping	7.0 (+/- 3)	Based on Mapping	80.0 - 97.0	Final = Preliminary MBW = 80.0 - 97.0 m	No	NA	~20 m	**HU_MH_ROB_0_6** No significant changes to predicted grain size entrained or transported for the 2-, 25-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_MH_ROB_0_6** Unknown	There is a small tributary creating a confluence where the proposed crossing will be. Watercourse is within confined valley. Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Rapid Geomorphic Assessment (RGA) classifies reach as transitional (woody debris present and existing erosion present) Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Sting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Meander amplitude approximately 12.0 m. Watercourse crossing location appears to be at confluence; confluences are dynamic locations which must be considered for crossing design; potential for channel realignment at this location due to confluence Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 7 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Assessment is based on 2x erosion rate (7 m erosion rate) + Bankfull Width (4.8 m) = 19 m however, this is smaller than meander amplitude so crossing size of at least 30m is recommended to account for this. It is recommended that HU_MH_ROB_0_3 be contained in the crossing envelope of HU_MH_ROB_0_2 **Fluvial Geomorphology recommendation: At least 30 m**	Crossing should span bankfull width plus the 100 year erosion rate on either side of channel, but due to no permission to enter upstream, further assessment required when permission to enter granted during additional phases of the study Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: Small watercourse (drainage area less than 25 km²) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.07 and a bankfull width of 4.8 m Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - Transitional/ Stressed = Moderate Defined channel= high; Erosion present = high-moderate; Planform is meandering = high; Confined= low-mod Drainage Area is 1188 ha = Mod **HU_MH_ROB_0_6** No major change in predicted grain size transported/ entrained or to the predicted transportation rate.
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_3**	HU_MH_ROB_0_5	4.5	In Regime	Intermittent	Defined	None	Meandering	Unconfined	1188	within another meander belt	90	32.0 - 63.0	Channel used to be a compound meander belt (see HU_MH_ROB_0_3_3 but valley infilling cut off the meander. The meander belt for this feature is part of ROB_0_2	14.0 (+/- 3)	Based on Mapping	60.0 - 91.0	Final = Preliminary MBW (32.0 -63.0 m) + 2 x Erosion Rate (2 x 14.0 m) = 60.0 -91.0 m	No	NA	~13	**HU_MH_ROB_0_5** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing but overall no significant changes for the 2-, 25-, 50- , or 100- year return period flow event.	**HU_MH_ROB_0_5** Unknown	Channel used to be a compound meander belt part of ROB_0_3 - but valley infilling cut off the meander. The meander belt for this feature is part of ROB_0_2 Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**This small channel will need to be looked at during Detail Design. Channel used to be a compound meander bend of HU_MH_ROB_0_2, but it appears that historic valley infilling cut off the meander. It is recommended that HU_MH_ROB_0_3 be contained in the crossing envelope of HU_MH_ROB_0_2**	Crossing should span bankfull width plus the 100 year erosion rate on either side of channel Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: Small watercourse (drainage area less than 25 km²) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.07 and a bankfull width of 4.8 m Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate-High** RGA - In Regime = low Defined channel= high; Erosion present = high; Planform is meandering = High; Unconfined=high. Drainage Area is 1188 ha=mod **HU_MH_ROB_0_5** No major change in predicted grain size transported/ entrained or to the predicted transportation rate.
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_2_1**	HU_MH_ROB_8_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Sinuous. Feature has likely been straightened	Unconfined	36.4	30	N/A	Floxial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).											No	NA	Sinuosity may be topographic controlled.	**HU_MH_ROB_8_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Large Cobble for the 50-year flow event and Large Cobble for the 100-year flow event	**HU_MH_ROB_8_1** 825 mm x 825 mm	Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (field work to verify vegetation control). Drainage area less than 100 ha (36.4 ha) Lateral migration likely in unconfined valleys (wide, flat floodplains). Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (36.4 ha) and flows through an agricultural field) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Therefore the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= Low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high. Drainage Area is less than 100 ha= Low **HU_MH_ROB_2_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_0_5**	HU_MH_ROB_0_1 HU_MH_ROB_0_2 HU_MH_ROB_0_4	3.5	Transitional or stressed (based on downstream assessment)	Permanent	Defined	Present	Sinuous	Unconfined	290	50	70	10.0	Based on Mapping	10.0 (+/- 3)	Based on Mapping	39.0	Final = Preliminary MBW (10.0 m) + 2 x Erosion Rate (2 x 10.0 m) = 39.0 m	No	NA	~ 15 m	**HU_MH_ROB_0_1 (26 m span)** **HU_MH_ROB_0_2 (26 m span)** **HU_MH_ROB_0_4 (26 m span)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing. Generally, there seems to be a decrease in predicted grain size entrained and transported and for the predicted transport rate immediately upstream and downstream of HU_MH_ROB_0_1 and increase in predicted grain size entrained and transported and predicted transport rate downstream of HU_MH_ROB_0_4.	**HU_MH_ROB_0_1** 26,000 mm span **HU_MH_ROB_0_2** 26,000 mm span **HU_MH_ROB_0_4** 26,000 mm span	Removal of vegetation surrounding the feature could impact erosional processes. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Sting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Rapid Geomorphic Assessment (RGA) classifies reach as transitional (woody debris present and existing erosion present) Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Meander amplitude approximately 7 m. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 10 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~15 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). Assessment is based on 2 x erosion rate (10.0 m erosion rate) + Bankfull Width (3.5 m) = 24.0 m. **Fluvial Geomorphology recommendation: At least 24.0 m**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate of 10 m on either side of channel Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse - Small watercourse drainage area(290 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.10 and a bankfull width of 3.5 m Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate-High** RGA - Transitional = Mod Defined channel= High; Erosion present = mod-high; Planform is sinuous (topography controlled) = High; Unconfined=High Drainage Area is between 100 and 2500 ha= Low-Mod **HU_MH_ROB_0_1** **HU_MH_ROB_0_2** **HU_MH_ROB_0_4** The hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100 Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2013)	Hazard Assessment
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_1**	HU_MH_ROB_7_1_1, HU_MH_ROB_7_1_2, HU_MH_ROB_7_1_3, HU_MH_ROB_7_1_4,	3	In Regime	Permanent	Defined	Present	Sinuous	Unconfined	506.0	75	60	35.4	Based on Mapping	5.0 -8.0 8.0 selected as an appropriate erosion rate due to increase in upstream urbanization (unstable)	Based on MNR Table 4 (Reach bankfull width 3m or less)	51.4	Final = Preliminary MBW (35.4 m) + 2 x Erosion Rate (2 x 8.0 m) = 51.4 m	No	NA	~ 5 m	**HU_MH_ROB_7_1_1 (30 m span x 4.0 m Rise structure)** **HU_MH_ROB_7_1_2 (30 m span x 4.0 m Rise structure)** **HU_MH_ROB_7_1_3 (30 m span x 4.0 m Rise structure)** **HU_MH_ROB_7_1_4 (32 m span x 4.0 m Rise structure)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing. Generally, there seems to be a decrease in predicted grain size entrained and transported and for the predicted transport rate immediately upstream and downstream of HU_MH_ROB_7_1_4.	**HU_MH_ROB_7_1_1** 30.000 mm span x 4.000 mm Rise structure **HU_MH_ROB_7_1_2** 30.000 mm span x 4.000 mm Rise structure **HU_MH_ROB_7_1_3** 30.000 mm span x 4.000 mm Rise structure **HU_MH_ROB_7_1_4** 32.000 mm span x 4.000 mm Rise structure	Removal of vegetation surrounding the feature could impact erosional processes. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Rapid Geomorphic Assessment (RGA) classifies reach as In Regime (some existing erosion present) Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. The proposed crossing is located within a sinuous planform location with an amplitude of ~5 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). **Based on the fact that the watercourse is considered unstable according to TRCA, 2015, it is recommended that the crossing span the hydraulics recommendation of 30.0 m for HU_MH_ROB_7_1_2 and HU_MH_ROB_7_1_3 and 32.0 m for HU_MH_ROB_7_1_4.**	Fluvial Geomorphology geomorphic assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel Based on TRCA (2015) Table 3, the watercourse is classified as a small, unstable watercourse based on the following: - Small watercourse drainage area (506 ha) - Unstable (greater than 5km² with more than 25% urban land use) - Unlikely to be rapidly eroding due to In Regime RGA rating. Unable to measure erosion rate due to human alteration. Geomorphic Design or realignment not recommended in TRCA guidelines. Limited permission to enter.	**Considered a Large, Unstable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Not Recommended - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime = Low Defined channel= High; Erosion present = mod-high; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is between 100 and 2500 ha= Low-Mod **HU_MH_ROB_7_1_1** **HU_MH_ROB_7_1_2** **HU_MH_ROB_7_1_3** **HU_MH_ROB_7_1_4** The hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_2**	HU_MH_ROB_7_2_2, HU_MH_ROB_7_2_4	2	In Regime	Intermittent	Defined	None	Meandering	Unconfined	78.5	30	40	31.0	Based on Mapping	5.0 - 8.0 *5.0 selected as an appropriate erosion rate due to In Regime RGA	Based on MNR Table 4 (Reach bankfull width 3m or less)	41.0	Final = Preliminary MBW (31.0 m) + 2 x Erosion Rate (2 x 5.0 m) = 41.0 m	No	NA	~ 5 m Sinuosity may be topographic controlled.	**HU_MH_ROB_7_2_2 (18m span x 4.0 m Rise)** **HU_MH_ROB_7_2_4 (18m span x 4.0 m Rise)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing. Generally, there seems to be an increase in predicted grain size entrained and transported and predicted transport rate between HU_MH_ROB_7_2_2 and HU_ROB_7_2_4.	**HU_MH_ROB_7_2_2** 18.000 mm span x 4.000 mm Rise **HU_MH_ROB_7_2_4** 18.000 mm span x 4.000 mm Rise	Proposed crossing location is located in upper portion of watercourse. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. In-channel vegetation noted, likely vegetation controlled (drainage area less than 100 Ha (24.8 ha)). Removal of vegetation surrounding the feature could impact erosional processes. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Reach is nearly parallel with road alignment. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 5.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. There has been channel design work done in the vicinity of the proposed crossing. The watercourse has been modified where the proposed road is going. **Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 12.0 m.**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (78.5 ha)) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating and lack of erosion noted in the field Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects. Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low-Moderate** RGA - In Regime = Low Defined channel= High; Erosion not present = low; Planform is Meandering = High; Unconfined=high; Drainage Area is less than 100 ha= Low **HU_MH_ROB_7_2_2** **HU_MH_ROB_7_2_4** The hydraulic assessment is showing a slight potential increase in erosion potential. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_7_5a**	HU_MH_ROB_7_2_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	None	Straight	Unconfined	78.5	30	NA	Fluvial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).										No	NA	N/A	**HU_MH_ROB_7_2_1 (18m span x 4.0 m Rise)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing. Generally, there seems to be a decrease in predicted grain size entrained and transported immediately upstream of HU_MH_ROB_7_2_1	**HU_MH_ROB_7_2_1** 18.000 mm span x 4.000 mm Rise	Removal of vegetation surrounding the feature could impact erosional processes. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Rapid Geomorphic Assessment (RGA) classifies reach as In Regime (some existing erosion present) Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	**Due to small drainage area and lack of a defined feature- Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria.**	Fluvial Geomorphology Assessment - Due to the lack of channel definition, sizing would be deferred to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria. Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (less than 100 ha (78.5 ha)) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating and lack of erosion noted in the field Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects. Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = NA Undefined to Poorly defined feature = Low; Erosion not present = Low; Planform is straight = Low; Unconfined = High; Drainage Area is less than 100 ha= Low **HU_MH_ROB_7_2_1** It appears the channel is not defined however, the hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_4_1**	HU_MH_ROB_4_2, HU_MH_ROB_4_4, HU_MH_ROB_4_5, HU_MH_ROB_4_6	2.9	Transitional or Stressed	Intermittent	It is defined in agricultural field, but directly downstream from property the channel is not defined (this property has likely been altered for agricultural practices)	Present	Sinuous (may be manipulated)	Unconfined	46.1	30	58	26.5	Based on Mapping	5.0 - 8.0 6.5 m selected as an appropriate erosion rate due to low-moderate hazard assessment results	Based on MNR Table 4 (Reach bankfull width 3m or less)	39.5	Final = Preliminary MBW (26.5 m) + 2x Erosion Rate (2x 6.5 m) = 39.5 m	No	NA	~ 25 m Parallel to proposed roadway Sinuous - may be manipulated. Does not appear to have meanders	**Assessment based on 60% design** **HU_MH_ROB_4_4 (Culvert 4.2 x 2.1 m), 33 m** **HU_MH_ROB_4_5 (Culvert 4.2 x 2.1 m), 34 m** **HU_MH_ROB_4_6 (Culvert 3.6 x 1.2 m), 48 m long** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate around the crossing. Generally, there seems to be a decrease in predicted grain size entrained and transported and predicted transport rate between HU_MH_ROB_4_4 and HU_MH_ROB_4_5 and an increase in predicted grain size entrained and transported and predicted transport rate between HU_MH_ROB_4_5 and HU_MH_ROB_4_6. There was also a decrease in the predicted grain size entrained and transported and predicted transport rate downstream of HU_MH_ROB_4_6.	**Assessment based on 60% design** **HU_MH_ROB_4_4** Culvert 4,200 mm x 2,300 mm, 33,000 mm long **HU_MH_ROB_4_5** Culvert 4,200 mm x 2,100 mm, 34,000 mm long **HU_MH_ROB_4_6** Culvert 3,600 x 1,200 mm, 48,000 mm long	Removal of vegetation surrounding the feature could impact erosional processes. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Rapid Geomorphic Assessment (RGA) classifies reach as transitional (woody debris present and existing erosion present) Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (field work to verify vegetation control). Drainage area less than 100 ha. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design.Reach is roughly parallel with proposed roadway.	Fluvial Geomorphology Assessment -Conceptual channel design work Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse due to the following: - Small watercourse drainage area (less than 100 ha (46.1 ha)) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unable to determine if rapidly eroding due to Transitional RGA rating Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low-Moderate** RGA - Transitional = Moderate Poorly defined channel= Moderate; Erosion present = Mod-High; Planform is sinuous (topography controlled & manipulated) = Low-mod; Unconfined=High; Drainage Area is less than 100 ha= Low Assessment based on 60% design **HU_MH_ROB_4_4** **HU_MH_ROB_4_5** **HU_MH_ROB_4_6** There are fluctuations in the anticipated grain size entrained/transported and in the transport rate based on crossing spans of 4.2 and 3.6 m. A wider crossing may help mitigate these issues. Additionally, a channel design has been proposed. The hydraulics should be further investigated during Detail Design. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 7	Toronto and Region Conservation Authority	Humber River	Main Humber River	Robinson Creek	**HU_MH_ROB_6_1**	No Proposed Crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined Feature (slight depression in an agricultural field)	None	Straight (based on air photos)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	NA	NA	NA	Feature may be impacted by the carport lot.	**It is anticipated that HU_MH_ROB_6_1 will need to be realigned to accommodate the proposed transit station.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	NA

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 8	Toronto and Region Conservation Authority	Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_0_1**	HU_MH_MHR_0_1, HU_MH_MHR_0_2	15.8 m	Transitional or stressed	Permanent	Defined channel	Present	Meandering	Confined	28,510	30	316.2	320.0 - 516.0	Based on Mapping	12.0 (+/-3)	Based on Mapping	320.0 - 516.0	Final = Preliminary MBW = 320.0 - 516.0 m	No	NA	– 150 m	**HU_MH_MHR_0_1** **HU_MH_MHR_0_2** No significant changes to predicted grain size entrained or transported for the 2-, 25-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_MH_MHR_0_1** Span: 160,000 mm Rise: 10,000 mm Lenth: 20,000 mm **HU_MH_MHR_0_2** Span: 160,000 mm Rise: 10,000 mm Lenth: 20,000 mm	Watercourse is adjacent to valley slope where proposed crossing is located (confined valley). Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Large watercourse - erosive forces of larger watercourses tend to exceed stabilizing properties of vegetation, therefore increased potential for migration. Rapid Geomorphic Assessment (RGA) classifies reach as transitional. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 12.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. **This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA. 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt.**	Fluvial Geomorphology Assessment - Piers should aim to remain outside of the erosion rate 12 m (+/- 3m) Based on TRCA (2015) Table 3, the watercourse is classified as a large watercourse, based on the following: - Large watercourse drainage area (28,510 ha) - Not rapidly eroding (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not Rapidly Eroding based on an erosion rate of 0.12 and a bankfull width of 15.81 m TRCA guidelines state geomorphic design or realignment not recommended. TRCA preference for large watercourses is the 100 year erosion rate and does not recommend geomorphic design or realignment.	**Considered a Large, Unstable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Not Recommended - Geomorphic Design or Realignment	**Hazard Assessment: Moderate-High** RGA Transitional/stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is meandering = high; Confined/low-mod; Drainage Area is greater than 2500 Ha=high **HU_MH_MHR_0_1** **HU_MH_MHR_0_2** No major change in predicted grain size transported/ entrained or to the predicted transportation rate.
Section 8	Toronto and Region Conservation Authority	Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_1**	HU_MH_HRT_3_1	No Bankfull Short sections are altered and have an approximate width of 3.5 (e.g., at Kirby Road, poorly defined further upstream)	RGA not applicable for undefined features	Ephemeral	Poorly defined. Only defined at Kirby Road crossing (downstream of proposed route)	None	Sinuous to straight (topography controlled)	Confined	67.8	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).												No	NA	Proposed crossing location at online pond and confluence area, planform into proposed crossing not ideal. Channel is poorly defined	**HU_MH_MHR_3_1 (Opening 5.4 X 2.4 m. With 0.30 embedded)** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate, In general, there appears to be an increase in predicted sediment transport immediately upstream of the crossing and a decrease immediately downstream of the crossing for the 2-, 25-, 50-, and 100-year return period events.	**HU_MH_MHR_3_1** Opening 5.400 X 2.400 mm. With 300 mm embedded	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows proposed crossing location at confluence and online pond, ensure prevention of loss of channel length. Within a confined valley which can impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Some in-channel vegetation noted, may be vegetation controlled (drainage area less than 100 Ha) Watercourse crossing location appears to be at confluence with reaches HU_MH_MHR_3_4 and HU_MH_MHR_3_5; confluences are dynamic locations which must be considered for crossing design; potential for channel realignment at this location due to confluence Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Platform at proposed crossing includes a confluence and a pond, which will need to be considered during Detail Design. Further discussion on channel realignment should be held during Detail Design. Assessment due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Additional assessments based on TRCA (2015) Table 3 crossing guidelines conclude that the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (67.8 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. TRCA preference for small watercourses is the 100 year erosion rate and least recommended is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low (channel is only defined at Kirby Road crossing); Erosion not present = low; Planform is sinuous to straight (topography controlled)= low; Confined=low-mod; Drainage Area is less than 100 Ha=low **HU_MH_MHR_3_1** It appears the channel is not defined however, the hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 8	Toronto and Region Conservation Authority	Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_4**	No Proposed Crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	NA	Straight (topography controlled)	Unconfined	NA	30	NA	Fluvial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).												No	NA	Sinuosity controlled by topography	NA	NA	No crossing is anticipated at this time however, a portion of the reach is located within the limits of grading. Potential for in channel work.	**No Proposed Crossing.** Assessment performed since watercourse is close to the proposed route and may be impacted by grading	Not Applicable	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight (topography controlled)= low; Unconfined= high; Drainage Area is assumed to be less than 100 Ha =low **No review of hydraulic data**
Section 8	Toronto and Region Conservation Authority	Humber River	Main Humber River	Main Humber River	**HU_MH_MHR_3_5**	No Proposed Crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	NA	Sinuous (topography controlled)	Unconfined	NA	36	NA	Fluvial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).												No	NA	Sinuosity controlled by topography	NA	NA	Outside of limits of grading but within the Study Area. Realignment work is unlikely however this will be confirmed during additional stages of the study	**No Proposed Crossing.** Assessment performed since watercourse is close to the proposed route and may be impacted by grading	Not Applicable	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled)= low; Unconfined= high; Drainage Area is assumed to be less than 100 Ha =low **No review of hydraulic data**
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_4**	HU_EH_EHT_1_1	2.7	Transitional or stressed	Permanent	Defined, meandering channel	Yes, actively incising	Meandering	Confined	240.47	30	54	30.0	Based on Mapping 30.0 m max width of confining valley. Measured mid way up-slope	5.0 - 8.0 8.0 selected as an appropriate erosion rate due to Transitional or stressed RGA and active erosion	Based on MNR Table 4 (Reach bankfull width 3m or less)	30.0	Final = Preliminary MBW = 30.0 m	No	NA	Confluence located upstream and downstream of proposed crossing. Watercourse relatively straight upstream and downstream of existing roadway.	**HU_MH_EHR_1_4** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate. In general, there seems to be an increase in predicted transport immediately upstream of the crossing and a decrease in the predicted grain size transported immediately upstream of the crossing for the 2-, 25-, 50-, and 100-year return period events.	**HU_MH_EHR_1_4** Unknown	Contributing Habitat for Redside Dace Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Watercourse within a confined valley which can impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Fluvial geomorphic assessment is 2x erosion rate (8.0 m erosion rate based on Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (2.7 m) = 19.0 m. **Fluvial geomorphic recommendation is a minimum width of 19.0 m.**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse (240.47 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unable to determine if it's rapidly eroding watercourse is actively incising and has a transitional RGA rating but watercourse is less than 3 m wide and therefore cannot measure erosion rate from aerial imagery Based on TRCA's Table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA transitional/stressed = Mod Confined = Low-mod; Erosion = Mod-high Planform is meandering = high Confined = low Drainage Area is between 100 and 2500 Ha = low-Mod **HU_MH_EHR_1_4** The hydraulic assessment is showing a slight potential increase in erosion potential. Fluvial Geomorphology should take a closer look during Detail Design
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_3**	HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_3, HU_EH_EHT_1_1_4	S.1 (downstream of driveway access)	In Adjustment	Intermittent	Poorly defined./ modified. Only defined at Kirby Road crossing	Present	Sinuous to meandering	Confined	75.03 (HU_EH_EHT_1_1_2, HU_EH_EHT_1_1_1, HU_EH_EHT_1_1_3)	45	102	33.0 - 92.0	Based on Mapping 8.0 selected as an appropriate erosion rate due to RGA rating of In Adjustment	5.0 - 8.0 8.0 selected as an appropriate erosion rate due to RGA rating of In Adjustment	Based on MNR Table 4 (Reach has been altered based on historical aerial imagery)	33.0 - 92.0	Final = Preliminary MBW = 33.0 - 92.0 m	No	NA	– 18 m; confluence located directly upstream of proposed crossing	**HU_EH_EHR_1_1_1 (16 m x 4.0 m span)** **HU_EH_EHR_1_1_2 (16 m x 4.0 m span)** **HU_EH_EHR_1_1_3 (16 m x 4.0 m span)** **HU_EH_EHR_1_1_4 (16 m x 4.0 m span)** Decrease to predicted grain size entrained and transported and in predicted transport rate beginning upstream of HU_EH_EHT_1_1_1 and extending to immediately downstream of HU_EH_EHT_1_1_2 for the 2-, 25-, 50-, and 100-year return period events.	**HU_EH_EHR_1_1_1** 16,000 mm x 4,000 mm span **HU_EH_EHR_1_1_2** 16,000 mm x 4,000 mm span **HU_EH_EHR_1_1_3** 16,000 mm x 4,000 mm span **HU_EH_EHR_1_1_4** 16,000 mm x 4,000 mm span	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Watercourse within a confined valley which can impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length (sinuous at proposed crossing itself, therefore may require realignment) Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (likely not vegetation controlled, but verify during field assessment) Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 8.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. In addition, the proposed crossing is located within a sinuous planform location with an amplitude of ~18 m which should be considered in the proposed span (reduction is channel length will result in a steeper bed slope). As well, there is a confluence located directly upstream of the proposed crossing. Assessment is 2 x erosion rate (8.0 m erosion rate based on Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (5.1 m) = 21.0 m. While hydraulics proposed crossing size of 16.0 does not result in significant changes to sediment transport/ entrainment, the sinuous planform must be taken into account. **A crossing width of 21.0 m is a more appropriate width.**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (75.03 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Cannot determine if it's rapidly eroding RGA rating of In Adjustment. Cannot measure erosion since reach has been altered by human activities Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: High** RGA = In Adjustment = High Defined channel= High ; Erosion present = Mod-High; Planform is sinuous to meandering= High; Confined=low-mod; Drainage Area is less than 100 Ha=low **HU_EH_EHR_1_1_1** **HU_EH_EHR_1_1_2** **HU_EH_EHR_1_1_3** **HU_EH_EHR_1_1_4** The hydraulic assessment is showing a slight potential increase in erosion potential for a 16 m span however, Fluvial Geomorphology is recommending a minimum width of 21 m which should help alleviate the flow constriction and erosion issues. Fluvial Geomorphology should take a closer look during Detail Design
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_3a**	No Proposed Crossing	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	None	Straight (based on air photos)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).												No	NA	NA	NA	NA	Feature may be impacted by the carpool lot.	**It is anticipated that HU_MH_EHR_1_3a will need to be realigned to accommodate the proposed carpool lot.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	**NA**

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	East Humber River	**HU_MH_EHR_1_6**	HU_EH_EHT_1_2_1	3.3	In Regime (borders Transitional)	Intermittent	Defined	Present	Straight, sinuous	Confined	154.50 (HU_EH_EHT_1_2_2), 149.10 (HU_EH_EHT_1_2_1)	50	20	32.0 - 58.0	Based on Mapping	7.3 (+/-3)	Based on Mapping	32.0 - 58.0	Final = Preliminary MBW = 32.0 - 58.0 m	No	NA	Multi-channel feature that meandered through floodplain (limited permission to enter)	**Assessment based on 60% design HU_EH_EHT_1_2_1 - span: 4.8** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate. In general, there appears to be a decrease in the predicted sediment transport immediately downstream of HU_EH_EHT_1_2_1	**Assessment based on 60% design HU_EH_EHT_1_2_1** Span: 4,800 mm	Channel Realignment is likely required as crossings are located along channel bends, if no channel realignment is occurring the span will be larger Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Watercourse within a confined valley which can impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length (sinuous at proposed crossing itself, therefore may require realignment) Potential for in channel work depending on length and span of new structure. Need for realignment identified. Fluvial Geomorphology should be involved during Detail Design	**Channel realignment has been proposed for this reach. The proposed crossing span based on the conceptual channel design work is 6.0 m.**	Fluvial Geomorphology Assessment - Crossing should span bankfull width plus the 100 year erosion rate on either side of channel Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (149.10-154.50 ha) - Not Unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating. Unable to measure erosion rate due to human alteration. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Moderate** RGA - In Regime = Low Defined channel= High ; Erosion present = Mod-High; Planform is sinuous to straight and multi-channelled = High; Confined=low-mod; Drainage Area is between 100 and 2500 Ha=low-mod Assessment based on 60% design **HU_EH_EHT_1_2_1** The hydraulic assessment is showing a slight potential increase in erosion potential. Model should be re-run with the proposed channel design conditions during the Detail Design stage
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	East Humber River	**HU_MH_EHR_0_2**	HU_EH_EHR_0_1, HU_EH_EHR_0_2	11.1	Transitional or Stressed	Permanent	Defined	Present	Meandering	Confined	13,613	30	336	186.0 - 278.0	Based on Mapping	18.0 (+/-3)	Based on Mapping	278.0	Final = Preliminary MBW (278.0 m)	Yes	Final = Preliminary MBW (278.0 m) + 2 x 30m Riparian Buffer **=338.0 m**	Shape controlled by topography (confined valley)	**HU_MH_EHR_0_1** **HU_MH_EHR_0_2** No significant changes to predicted grain size entrained or transported for the 2-, 25-, 50-, or 100-year flow events. No significant changes to predicted transportation rate.	**HU_EH_EHR_0_1** Unknown **HU_EH_EHR_0_2** Unknown	Recovery Habitat for Redside Dace Watercourse is adjacent to valley slope where proposed crossing is located (confined valley). Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Large watercourse - erosive forces of larger watercourses tend to exceed stabilizing properties of vegetation, therefore increased potential for migration. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Aerial imagery shows a slightly sinuous channel Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Proposed bridge piers should be 18.0 m away from top of bank on either side. Abutments, piers and other bridge components should be located outside of the 100-year local erosion hazard (18.0 m). Due to width it is likely that the piers will be placed within the meander belt. If piers are necessary within the meander belt of the watercourse, their foundations should be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time. Crossing size of (120 m span) from hydraulics indicates no change to sediment size transported/entrained This is a large watercourse (i.e., drainage area greater than 25 km²). According to TRCA, 2015 the most preferred solution for a new crossing over a large watercourse is to span the meander belt. Red Side Dace recovery habitat - Crossing must span meander belt + 30 m buffer on either side due to Regulatory requirements for species at risk **Final MBW Including RSD Riparian Buffer 338.0 m**	Fluvial Geomorphology Assessment - Due to the presence of Recovery Habitat for Redside Dace, the proposed crossing must consider the final meander belt (222 m to 314 m) plus 30 m on either side of the meander belt Additional assessments based on TRCA (2015) Table 3, the watercourse is classified as a large, stable watercourse due to the following: - Large watercourse drainage area (13,613 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Not rapidly eroding based on an erosion rate of 0.18 and a bankfull width of 11.1 m Based on the fact that it is a large watercourse, TRCA guidelines recommend the crossing span the meander belt or 100 year erosion rate.	**Considered a Large, Unstable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Not Recommended - Geomorphic Design or Realignment	**Hazard Assessment: High-Moderate** RGA Transitional/stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is Meandering = high; Confined=low-mod; Drainage Area is between 100 and 2500 Ha=high **HU_EH_EHR_0_1** **HU_EH_EHR_0_2** No major change in predicted grain size transported/ entrained or to the predicted transportation rate.
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_3**	HU_EH_EHT_12_1_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	None	Sinuous	Unconfined	17.0 (HU_EH_EHT_12_1_1),	30	NA	Fluvial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	No defined channel seen from road	**HU_EH_EHT_12_1_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Medium Gravel for the 50-year flow event and Medium Gravel for the 100-year flow event	**HU_EH_EHT_12_1_1** 1220 mm x 910 mm	Small upstream drainage area (17 ha) typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (likely vegetation controlled, field work shows dense in-channel vegetation) Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Fluvial Geomorphology Assessment - Due to small drainage area and lack of a defined feature- Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (17.0 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_12_1_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_4**	HU_EH_EHT_12_2_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined	A small amount of erosion around culvert likely due to constrained flow	Sinuous	Unconfined	10.93 (HU_EH_EHT_12_2_1)	30	NA	Fluvial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Appears to be slightly sinuous, may be topography controlled. Verify during field work.	**HU_EH_EHT_12_2_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_EH_EHT_12_2_1** 825 mm x 825 mm	Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (field work required to verify in-channel vegetation) Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (10.93 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Minor Erosion present = moderate; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_12_2_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 8	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_12_5**	HU_EH_EHT_12_3_3 HU_EH_EHT_12_3_4	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined	None	Sinuous	Unconfined	16.38 (HU_EH_EHT_12_3_3)	30	NA	Fluvial Geomorphology classified feature as ephemeral (swale type). No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	No	NA	Appears to be slightly sinuous where proposed crossing going, may be topography controlled. Verify during field work.	**HU_EH_EHT_12_3_3** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_EH_EHT_12_3_3** 825 mm x 825 mm	Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation (field work required to verify in-channel vegetation) Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (16.38 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Due to the presence of Redside Dace, this option needs to be discussed with the Fisheries team	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_12_3_3** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_15_1**	HU_EH_EHT_15_2_1, HU_EH_EHR_15_2_2	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined	None	Sinuous	Unconfined	30.54 (HU_EH_EHT_15_2_1), 30.54 (HU_EH_EHR_15_2_2),	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Sinuosity is topography controlled	**Assessment based on 60%design** **HU_EH_EHT_15_2_1** **HU_EH_EHT_15_2_2** **HU_EH_EHT_15_2_3** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate. In general, there is a decrease in predicted grain size entrained and transported as well as the predicted transport rate immediately upstream of HU_EH_EHT_15_2_3 for the 25-, 50-, and 100-year return period events.	**Assessment based on 60% design** **HU_EH_EHT_15_2_1** Span: 3,600 mm Rise: 2,100 mm Length: 35,000 mm **HU_EH_EHR_15_2_2** Span: 3,600 mm Rise: 2,100 mm Length: 80,000 mm **HU_EH_EHR_15_2_3** Span: 4,800 mm	Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Lateral migration likely in unconfined valleys (wide, flat floodplains). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Potential for in channel work depending on length and span of crossing due to sinuosity of channel at crossing location. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (30.54 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **Assessment based on 60%design** **HU_EH_EHT_15_2_1** **HU_EH_EHR_15_2_2** **HU_EH_EHR_15_2_3** No major change in predicted grain size transported/ entrained or to predicted transport rate
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_15_4**	HU_EH_EHT_15_3_1	No Bankfull	RGA not applicable for undefined features	Ephemeral - swale	Poorly Defined	Present	Sinuous	Unconfined	28.13 (HU_EH_EHT_15_3_1)	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Sinuosity is topography controlled	**HU_EH_EHT_15_3_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Large Cobble for the 50-year flow event and Large Cobble for the 100-year flow event	**HU_EH_EHT_15_3_1** 1830 mm x 910 mm	Multiple crossing structures appear to be proposed here. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Lateral migration likely in unconfined valleys (wide, flat floodplains). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (28.13 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion present = Moderate; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_15_3_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_16_1**	HU_EH_EHT_16_1	No Bankfull	RGA not applicable for undefined features	Ephemeral	No Defined Feature	None	Sinuous	Unconfined	106.30 (HU_EH_EHT_16_1)	60	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	sinuosity is topography controlled	**Assessment based on 60%design** **HU_EH_EHR_16_1** **HU_EH_EHR_16_2** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate. In general, there is an increase in the predicted grain size entrained and transported upstream and downstream of HU_EH_EHT_16_1 and a decrease in predicted grain size entrained and transported immediately upstream of HU_EH_EHT_16_2 followed by an anticipated increase immediately downstream of the crossing for the 2-, 25-, 50-, and 100- year return period events.	**Assessment based on 60% design** **HU_EH_EHR_16_1** Span: 14,000 mm Rise: 1,800 mm Length: 58,000 mm **HU_EH_EHR_16_2** Unknown	Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for in channel work depending on length and span of new structure It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology may want to take a closer look at Detail Design stage	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (106.3 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is between 100 and 2500 Ha=low-mod Assessment based on 60% design **HU_EH_EHR_16_1** **HU_EH_EHR_16_2** It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_16_2**	HU_EH_EHT_17_3_2	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	None	Straight	Unconfined	25.54	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	– 4m (topography controlled)	**HU_EH_EHT_17_3_2** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_EH_EHT_17_3_2** 825 mm x 825 mm	Contributing habitat for Redside dace Multiple crossing structures appear to be proposed here as part of the proposed highway (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Lateral migration likely in unconfined valleys (wide, flat floodplains). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (25.54 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_17_3_2** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_17_2**	HU_EH_EHT_17_3_1, HU_EH_EHT_17_3_4	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined	None	Straight	Unconfined	59.98 (HU_EH_EHT_17_3_4)	60	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Straight	**Assessment based on 60%design** **HU_EH_EHT_17_3_1** **HU_EH_EHT_17_3_4** **HU_EH_EHT_17_3_5** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate. In general, there is an increase in the predicted grain size transported and entrained immediately upstream and downstream of HU_EH_EHT_17_3_1, followed by a decrease immediately upstream of HU_EH_EHT_17_3_4. There is also an increase in predicted grain size entrained and transported and an increase in the predicted transport rate immediately downstream of HU_EH_EHT_17_3_5.	**Assessment based on 60% design** **HU_EH_EHT_17_3_1** Span: 3,600 mm Rise: 1,800 mm Length: 7,500 mm **HU_EH_EHT_17_3_4** Span: 3,600 mm Rise: 1,800 mm Length: 38,000 mm **HU_EH_EHT_17_3_5** Unknown	Multiple crossing structures appear to be proposed here as part of the proposed highway. Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Lateral migration likely in unconfined valleys (wide, flat floodplains). Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Potential for in channel work depending on length and span of new structure. Majority of reach is located within the limits of grading. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (59.98 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on TRCA's table 3 in the guidelines, the TRCA preferred method is the 100 year erosion rate and the least preferred is geomorphic design or realignment. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 Ha=low Assessment based on 60% design **HU_EH_EHT_17_3_1** **HU_EH_EHT_17_3_4** **HU_EH_EHT_17_3_5** It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_17_1**	HU_EH_EHT_17_3_3	No Bankfull	RGA not applicable for undefined features	Ephemeral	Poorly Defined	None	Sinuous (topography controlled)	Unconfined	24.38	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller. If required, it would likely follow the following rule: For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using the criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).						No	NA	Straight	**HU_EH_EHT_17_3_3** No pre-existing velocity data provided. Proposed velocity predicts transport of Small Cobble for the 50-year flow event and Large Cobble for the 100-year flow event	**HU_EH_EHT_17_3_3** 825 mm x 825 mm	Multiple crossing structures appear to be proposed here as part of the proposed highway (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (24.38 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_17_3_3** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1a**	No Proposed Crossing	4.5	In Regime	Permanent	Defined	Present	Meandering	Confined	Not modelled/ not calculated	NA	90	35.0 - 75.0	Used Empirical Method (Modern and Historical imagery obscured by dense tree cover)	5.0 -8.0 *5.0 was selected as an appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Channel less than 5 m wide)	35.0 - 75.0	Final = Preliminary MBW = 35.0 - 75.0 m. Due to valley confinement	No	NA	N/A	N/A	N/A	**Feature may be impacted by the proposed maintenance yard. Any infrastructure will need to stay outside of the features meander belt or a realignment may be necessary**	**No Proposed Crossing.** Fluvial Reach located at the edge of a planned maintenance yard location. Any infrastructure associated with the maintenance yard will need to stay outside of the watercourses meander belt or a realignment may be necessary.	**No Proposed Crossing.**	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	**NA**

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1b**	HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4, HU_EH_EHT_18_3_5	1.8	In Regime	Permanent	Defined	Present	Straight	Unconfined	190.20 (HU_EH_EHT_18_3_3, HU_EH_EHT_18_3_4), 192.20 (HU_EH_EHT_18_3_5)	65	36	13.4	Based on Empirical	5.0 -8.0 *5.0 was selected as an appropriate erosion rate due to In Regime RGA rating	Based on MNR Table 4 (Reach less than 3m wide)	23.4	Final = Preliminary MBW (13.4 m) + 2x Erosion Rate (2x 5.0 m) = 23.4 m	No	NA	Watercourse appears to be straight (straightened) in vicinity of proposed crossing	**HU_EH_EHT_18_3_3** **HU_EH_EHT_18_3_4** **HU_EH_EHT_18_3_5** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate but overall no significant changes.	**HU_EH_EHT_18_3_3** Span: 12,000 mm Rise: 3,000 mm Length: 27,000 mm **HU_EH_EHT_18_3_4** Span: 12,000 mm Rise: 3,000 mm Length: 15,000 mm **HU_EH_EHT_18_3_5** Span: 12,000 mm Rise: 3,000 mm Length: 26,000 mm	Multiple crossing structures appear to be proposed here as part of the proposed highway (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). No field data collected due to No Permission to Enter, therefore constraints and opportunities will be further assessed when permission to enter granted during additional phases of the study (downstream RGA classified as In Regime/Stable). Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for catchment wide channel adjustment due to do existing impacts from Highway 400. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design	Watercourse crossings should not be less than the bankfull width of the channel (1.8 m) plus 2 x erosion rate (5.0 m) (Using Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)). Hydraulic data does not show a change in sediment entrainment/ transport with a crossing width of 12.0 m **Fluvial geomorphic assessment 12.0 m**	Based on downstream assessment crossing should span bankfull width plus the 100 year erosion rate of 5 m to 8 m on either side of channel according to TRCA protocol. Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (190.20-192.20 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to In Regime RGA rating . Unable to measure erosion rate due to human alteration. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003).	**Hazard Assessment: Moderate** RGA In Regime = low Defined channel= high; Erosion present = mod-high; Planform is slightly sinuous = mod; Unconfined=high; Drainage Area is between 100 and 2500 Ha=low-mod **HU_EH_EHT_18_3_3** **HU_EH_EHT_18_3_4** **HU_EH_EHT_18_3_5** No major change in predicted grain size transported/ entrained or to predicted transport rate
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1c**	N/A	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	None	Straight (based on aerial imagery)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller.					No	NA	NA	NA	NA	Feature may be impacted by the proposed transit station.	**It is anticipated that HU_EH_EHR_18c will need to be realigned to accommodate the proposed transit station.**	NA	NA	**NA**
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_1d**	N/A	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined	None	Straight (based on aerial imagery)	Unconfined	Not modelled/ not calculated	NA	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller.					No	NA	NA	NA	NA	Feature may be impacted by the proposed transit station.	**It is anticipated that HU_EH_EHR_18d will need to be realigned to accommodate the proposed transit station.**	NA	**Any planned infrastructure should be located outside of the meander belt to protect it from future erosion and damage.**	**NA**
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_2**	HU_EH_EHT_18_7_1	Limited permission to enter Swale feature - with no defined boundaries seen Bank slope is gradual and erosion is low.	RGA not applicable for undefined features	Ephemeral - swale	Undefined	None	Straight	Unconfined	7.66 (HU_EH_EHT_18_7_1)	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller.					No	NA	Sinuosity may be topography controlled	**HU_EH_EHT_18_7_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Large Cobble for the 50-year flow event and Large Cobble for the 100-year flow event	**HU_EH_EHT_18_7_1** 825 mm x 825 mm	Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). Potential for in channel work depending on length and span of new structure	Due to small drainage area and lack of a defined feature- **Defer to hydraulics and ecology**	Vegetation noted within the channel and therefore potentially is a vegetation dominated channel with a small drainage area, sizing could be deferred to hydraulic and ecology requirements. Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (7.66 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight = low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_18_7_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_6**	HU_EH_EHT_18_4_1	2.5	Transitional or Stressed	Permanent	Defined	Present	Sinuous	Unconfined	57.0 (HU_EH_EHT_18_4_1, HU_EH_EHT_18_4_2)	30	50	19.1	Partially confined.	5.0 -8.0 *6.5 selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 (Reach less than 3m wide)	32.1	Final = Preliminary MBW (19.1 m) + 2x Erosion Rate (2x 6.5 m) = 32.1 m	No	NA	Appears to be straight	**HU_EH_EHT_18_4_1** No pre-existing velocity data provided. Proposed velocity predicts transport of Very Coarse Gravel for the 50-year flow event and Small Cobble for the 100-year flow event	**HU_EH_EHT_18_4_1** 2440 mm x 1220 mm	Contributing habitat for Redside dace Multiple crossing structures appear to be proposed here as part of the Highway 413 Route (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. No field data collected due to Limited Permission to Enter, therefore constraints and opportunities will be further assessed when permission to enter granted during additional phases of the study. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for catchment wide channel adjustment due to do existing impacts from Highway 400. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Meander belt may be close to proposed route. May be impacted by grading. Previous reporting for crossings at Highway 400 that were part of the Highway 400 Widening (Major Mackenzie Drive to King Road) project will be referenced. Specifically, the AquaLogic Meander Belt Memo Report (Geomorphic Characterization for Redside Dace Habitat East Humber River and Tributary C, Purpleview Creek and Tributaries A-C Highway 400 Study Area, Teston Road to King Road) references the following watercourses that are also part of the Highway 413 project: Purpleville Creek Tributary A (Highway 400 Culvert C18) corresponds to watercourse reach HU_EH_EHR_18_6	**Crossing likely to be an extension and not a new culvert.** If replacement is required, Fluvial Geomorphology's assessment is 2 x erosion rate (6.5 m erosion rate Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003)) + Bankfull Width (2.5 m) = 15.5 m.	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (57 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unable to determine if it's rapidly eroding due to Transitional/stressed RGA rating . Unable to measure erosion rate due to human alteration. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Moderate** RGA transitional/ stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is sinuous = mod; Confined=low-mod; Drainage Area is less than 100 Ha=low **HU_EH_EHT_18_4_1** No pre-existing velocity provided. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_6b**	No Proposed Crossing	2.5	RGA not collected in field	Permanent	Defined	Present	Sinuous	Confined	57.0 (HU_EH_EHT_18_4_1, HU_EH_EHT_18_4_2)	30	50	6.5 - 15	Partially confined	5.0 -8.0 *6.5 selected as an appropriate erosion rate	Based on MNR Table 4 (Reach less than 3m wide)	6.5 - 15.0	Final = preliminary MBW (6.5 - 15.0 m)	No	NA	Appears to be straight	N/A	NA	Multiple crossing structures appear to be proposed here as part of the proposed highway (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. No field data collected due to Limited Permission to Enter, therefore constraints and opportunities will be further assessed when permission to enter granted during additional phases of the study. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for catchment wide channel adjustment due to do existing impacts from Highway 400. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Valley slope will impact erosion rate by limiting lateral erosion (can be more susceptible to down-cutting and/or channel widening). Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design Previous reporting for crossings at Highway 400 that were part of the Highway 400 Widening (Major Mackenzie Drive to King Road) project will be referenced. Specifically, the AquaLogic Meander Belt Memo Report (Geomorphic Characterization for Redside Dace Habitat East Humber River and Tributary C, Purpleview Creek and Tributaries A-C Highway 400 Study Area, Teston Road to King Road) references the following watercourses that are also part of the Highway 413 project: Purpleville Creek Tributary A (Highway 400 Culvert C18) corresponds to watercourse reach HU_EH_EHR_18_6	**No proposed Crossing**	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (57 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unable to determine if it's rapidly eroding due to Transitional/stressed RGA rating . Unable to measure erosion rate due to human alteration. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing." For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment For watercourses with channel width less than three (3) meters, it is expected that in many cases the scale of historic aerial photographs will not permit accurate delineation of the historic channel plan form. In such instances only, 100-year erosion rates in both lateral and downstream directions can be estimated using criteria outlined in Table 4 from the Ontario Ministry of Natural Resources Natural Hazards Training Manual (2003). Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Moderate** RGA transitional/ stressed = Mod Defined channel= high; Erosion present = mod-high; Planform is sinuous = mod; Confined=low-mod; Drainage Area is less than 100 Ha=low

Section	Conservation Authority	Watershed	Sub-watershed	Watercourse Name	Reach	Crossing ID	Bankfull Width from Cross Section (m)	Rapid Geomorphic Assessment Results	Hydraulic Regime	Defined Channel (or defined low flow channel)	Existing Erosion Present	Planform of Existing Channel	Channel Confinement	Drainage Area (Ha)	TRCA Mapping Meander Belt Width Online Tool	20 x Bankfull Width as per MNR, 2002 (m)	Preliminary MBW (m)	Preliminary MBW Approach Used	100-Year Erosion Rate (m)	100-Year Erosion Rate Approach Used	Final MBW (m)	Justification	Redside Dace Occupied Habitat?	RSD Regulatory Limit (m)	Meander Amplitude (upstream)	High Level Hydraulics Review (based on 60% designs)	Crossing Size from Hydraulics (based on 60% designs)	Constraints and Opportunities	Recommended Crossing Size	Recommended Crossing Size Justification	Conservation Authority Recommendations for New Crossings based on Guidance Document (TRCA, 2015)	Hazard Assessment
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_4**	HU_EH_EHT_18_5_1, HU_EH_EHT_18_5_3	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined/ modified. Altered previously as part of HWY 400 works	None	Sinuous	Unconfined	62.54 (HU_EH_EHT_18_5_2, HU_EH_EHT_18_5_1)	30	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller.						No	NA	Sinuosity may be topography controlled	**Assessment based on 60% design** **HU_EH_EHT_18_5_1** Span: 2,700 mm Rise: 1,500 mm Length: 120,000 mm **HU_EH_EHT_18_5_2** Span: 2,700 mm Rise:1,500 mm Length: 40,000 mm	Multiple crossing structures appear to be proposed here as part of the proposed highway (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). No field data collected due to Limited Permission to Enter, therefore constraints and opportunities will be further assessed when permission to enter granted during additional phases of the study. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for catchment wide channel adjustment due to do existing impacts from Highway 400. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design Previous reporting for crossings at Highway 400 that were part of the Highway 400 Widening (Major Mackenzie Drive to King Road) project will be referenced. Specifically, the AquaLogic Meander Belt Memo Report (Geomorphic Characterization for Redside Dace Habitat East Humber River and Tributary C, Purpleview Creek and Tributaries A-C Highway 400 Study Area, Teston Road to King Road) references the following watercourses that are also part of the Highway 413 project: Purpleville Creek (Highway 400 Culvert C19) corresponds to watercourse reach HU_EH_EHR_18_4	Likely to be a culvert extension Hydraulic assessment shows that the proposed 50-yr and 100-yr flow event crossing sizes do not alter the sediment size predicted to be transported. Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**.	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (62.54 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is sinuous (topography controlled) = low; Unconfined=high; Drainage Area is less than 100 Ha=low **Assessment based on 60%design** **HU_EH_EHT_18_5_1** **HU_EH_EHT_18_5_2** No major change in predicted grain size transported/ entrained or to predicted transport rate
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_5**	HU_EH_EHT_18_6_1, HU_EH_EHT_18_6_2, HU_EH_EHT_18_3_0	No Bankfull	RGA not applicable for undefined features	Ephemeral	Undefined/ modified. Altered previously as part of HWY 400 works	None	Straight (Likely straightened due to agricultural activities)	Unconfined	48.96 (HU_EH_EHT_18_6_1, HU_EH_EHT_18_6_2)	45	NA	Fluvial Geomorphology classified feature as ephemeral. No defined channel boundaries are present therefore, meander belt delineation is not applicable No defined channel observed. The features position in the landscape and channel form are likely determined by other factors such as vegetation, groundwater, topography, and/or agricultural practices. Geomorphic studies are not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 1 km² (100 ha) or smaller.						No	NA	Sinuosity may be topography controlled	**HU_EH_EHT_18_6_1** **HU_EH_EHT_18_6_2** **HU_EH_EHT_18_3_0** Slight increases and decreases to anticipated grain size entrained and transported and to predicted transport rate. In general there is an increase in the predicted grain size entrained and transported and the predicted transport rate immediately downstream of HU_EH_EHT_18_6_1 and HU_EH_EHT_18_6_2	Crossing HU-EH-EHT-18-3-6 is at a confluence (dynamic location). Multiple crossing structures appear to be proposed here as part of the proposed highway (downstream). Culverts constrain channel function by preventing planform adjustment and disrupting longitudinal connectivity. Open bottom crossings are preferred to maintain geomorphological processes as closed bottom culverts reduce bed roughness and act as grade controls. Significance of these controls is accentuated where the channel is adjusting through downcutting and widening. Siting of crossings should be perpendicular to valley and stream corridors. Lateral migration likely in unconfined valleys (wide, flat floodplains). No field data collected due to Limited Permission to Enter, therefore constraints and opportunities will be further assessed when permission to enter granted during additional phases of the study. Aerial imagery shows a slightly sinuous channel, ensure crossing width maintains sinuosity in order to prevent loss of channel length. Potential for catchment wide channel adjustment due to do existing impacts from Highway 400. Small upstream drainage area typically lowers the potential for lateral channel movement and erosion due to stabilization provided by vegetation. Potential for in channel work depending on length and span of new structure. Fluvial Geomorphology should be involved during Detail Design **HU_EH_EHT_18_6_1** Span: 2,700 mm Rise: 1,500 mm Length: 56,000 mm **HU_EH_EHT_18_6_2** Span: 2,700 mm Rise: 1,500 mm Length: 78,000 mm **HU_EH_EHT_18_3_0** TBD	Likely to be a culvert extension Hydraulic assessment shows that the proposed 50-yr and 100-yr flow event crossing sizes do not alter the sediment size predicted to be transported. Due to small drainage area and lack of a defined feature- **Defer to hydraulic flow requirements as well as any fisheries/ terrestrial limiting criteria**.	Based on TRCA (2015) Table 3, the watercourse is classified as a small, stable watercourse based on the following: - Small watercourse drainage area (48.96 - 111.50 ha) - Not unstable (catchment area is not greater than 5 km² with more than 25% urban land uses, either current or as proposed in municipal plans) - Unlikely to be rapidly eroding due to lack of channel definition. Based on this, "For small and stable watercourses, other alternatives exist for proponents to manage these risks including a combination of crossing opening configuration and erosion protection in anticipation of channel migration. Alternatively, the channel could be realigned to create a stable, naturalized alignment that will not result in contact between the channel and road infrastructure over the life of the crossing."	**Considered a Small, Stable Watercourse. Recommendations for existing and new crossings:** Most Preferred - Meander Belt Preferred - 100 year erosion rate Least Preferred - Geomorphic Design or Realignment Note – Geomorphic assessments are typically not required for very small, rural, vegetation-dominated watercourses with drainage area approximately 100 ha or smaller for early to late stage projects.	**Hazard Assessment: Low** RGA = N/A Undefined channel= low; Erosion not present = low; Planform is straight to sinuous (topography controlled)=low; Unconfined=high; Drainage Area is less than 100 Ha=low **HU_EH_EHT_18_6_1** **HU_EH_EHT_18_6_2** **HU_EH_EHT_18_3_0** It appears the channel is not defined however, the hydraulic assessment is showing a potential increase in erosion potential. Fluvial Geomorphology should take a closer look at Detail Design stage
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_8**	No Proposed Crossing	4.0	Transitional or Stressed	Permanent	Defined	Present	Linearized. Likely altered by adjacent agricultural activities. Valley infilling detected in historical assessment.	Confined	368.7	75	80	29.0 to 38.0	Mapping	5.0 - 8.0 *6.5 Selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.	29.0 to 38.0	Final = Preliminary MBW (29.0 - 38.0 m) + 2x RSD Buffer (2 x 30 m)= **89.0 - 98.0 m**	Yes	Final = Preliminary MBW (28.0 - 66.0 m) + 2x RSD Buffer (2 x 30 m)= **89.0 - 98.0 m**	Relatively straight. Does not cross preferred alignment.	No Proposed Crossing	No Proposed Crossing	Outside of limits of grading but within the Study Area. Realignment work is unlikely however this will be confirmed during additional stages of the study. Redside Race habitat. Meander belt must be defined to delineate RSD habitat	**No Proposed Crossing. MBW calculated due to presence of Redside Dace**	No Proposed Crossing	N/A	N/A
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_8b**	No Proposed Crossing	3.9	Transitional or Stressed	Permanent	Defined	Present and active	Linearized. Likely altered by adjacent activities. Valley infilling detected in historical assessment.	Confined and incising	387.7	75	80	28 to 68 (irregular valley width)	Mapping	5.0 - 8.0 *6.5 Selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Likely altered by valley infill and agricultural activities.	28.0 to 66.0	Final = Preliminary MBW (30.0 - 40.0 m) = 30.0 - 40.0	Yes	Final = Preliminary MBW (28.0 - 66.0 m) + 2x RSD Buffer (2 x 30 m)= **86.0 - 126.0 m**	Relatively straight. Does not cross preferred alignment.	No Proposed Crossing	No Proposed Crossing	Outside of limits of grading but within the Study Area. Realignment work is unlikely however this will be confirmed during additional stages of the study. Redside Race habitat. Meander belt must be defined to delineate RSD habitat	**No Proposed Crossing. MBW calculated due to presence of Redside Dace**	No Proposed Crossing	N/A	N/A
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_18_8c**	No Proposed Crossing	4.6	Transitional or Stressed (borderline In Regime)	Permanent	Defined	Minor	Meandering	Partially confined	409.1	75	92	53	Mapping	5.0 - 8.0 *6.5 Selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Watercourse less than 5 m in width	66.0	Final = Preliminary MBW (53.0 m) + 2x Erosion Rate (2 x 6.5 m) = 66.0 m	Yes	Final = Preliminary MBW (66.0 m) + 2x RSD Buffer (2 x 30 m)= **126.0 m**	Relatively straight. Does not cross preferred alignment.	No Proposed Crossing	No Proposed Crossing	Outside of limits of grading but within the Study Area. Realignment work is unlikely however this will be confirmed during additional stages of the study. Redside Race habitat. Meander belt must be defined to delineate RSD habitat	**No Proposed Crossing. MBW calculated due to presence of Redside Dace**	No Proposed Crossing	N/A	N/A
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_19_1**	No Drainage ID. Culverts will be widened based on existing opening	8.4	In Regime	Permanent	Defined	Minor	Meandering	Partially confined	6783.4	30	168	86 (max. meander amplitude at surrogate reach downstream)	Mapping - Surrogate reach downstream	9.3	Mapping - Surrogate reach downstream	94.6	Final = Preliminary MBW (86.0 m) + safety factor (1.1 x Preliminary MBW) = 94.6 m	Yes	154.6	Straight through proposed crossing location (pre-existing crossing)	No Proposed Crossing	Not part of the hydraulic model at this time	Potential crossing currently outside of project limits	**Potential crossing currently outside of project limits**	Potential crossing currently outside of project limits	Potential crossing currently outside of project limits	**Hazard Assessment: Mod - High** RGA in Regime = low Defined channel= High; Minor erosion present = low; Planform is meandering= High; Partially confined=Mod; Drainage Area = High
Section 9	Toronto and Region Conservation Authority	Humber River	East Humber River	Purpleville Creek	**HU_EH_EHR_19_7**	No Drainage ID. Culverts will be widened based on existing opening	3.1	Transitional or Stressed	Permanent	Defined	Actively Eroding	Meandering	Partially confined	379.2	30	62	50	Mapping	5.0 - 8.0 *6.5 Selected as an appropriate erosion rate due to transitional RGA rating	Based on MNR Table 4 - Watercourse less than 5 m in width	50.0	Final = Preliminary MBW (50.0 m) = 50.0 m	No (Contributing)	NA	Straight through proposed crossing location (pre-existing crossing)	No Proposed Crossing	Not part of the hydraulic model at this time	Potential crossing currently outside of project limits	**Potential crossing currently outside of project limits**	Potential crossing currently outside of project limits	Potential crossing currently outside of project limits	**Hazard Assessment: Mod-High** RGA transitional/stressed = Mod Defined channel= High; Erosion present = High; Planform is straight= low; Partially confined=Mod; Drainage Area is less than 500 Ha= Mod

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Channel Realignment Figures

G1. Proposed and Completed Channel Realignments
G2. High-Level Proposed Channel Realignments

G1. Proposed and Completed Channel Realignments

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Legend

- Completed Conceptual Channel Realignments
- Potential Future Channel Realignments
- Watercourse
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Figure X-1
26 Feb, 2026

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Metres

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Layout: 60315006_Hwy413_Fluvial_Realignment Locations Author: Last Saved by: michael.w.collins

Legend

- Completed Conceptual Channel Realignments
- Potential Future Channel Realignments
- Watercourse
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Figure X-2
26 Feb, 2026

0 560 1,120 1,680 2,240
Metres

AECOM WSP Ontario

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Layout: 60315006_Hwy413_Fluvial_Realignment Locations Author: Last Saved by: michael.w.collins

Legend

- Completed Conceptual Channel Realignments
- Potential Future Channel Realignments
- Watercourse
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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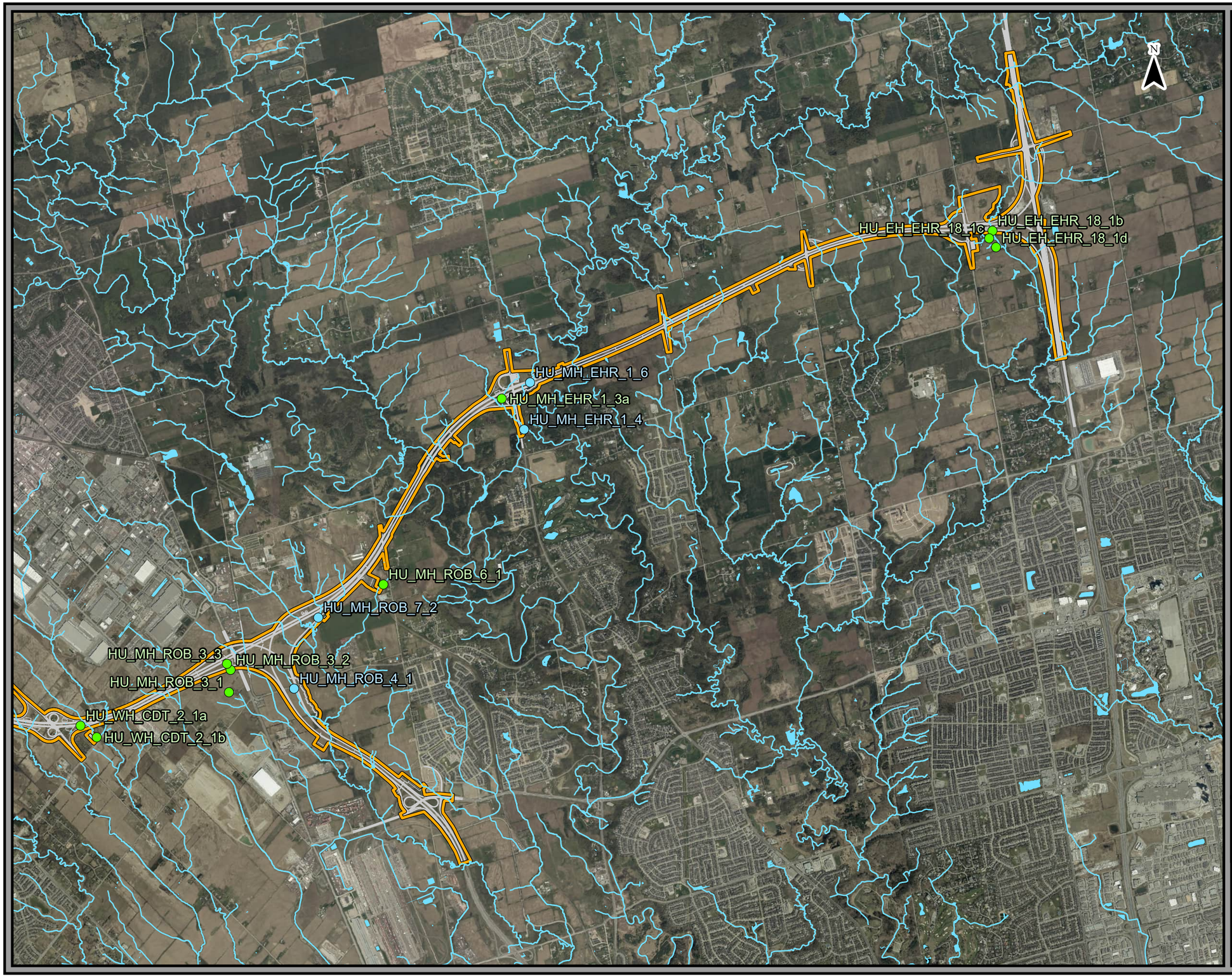
Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Figure X-3
26 Feb, 2026

0 560 1,120 1,680 2,240
Metres

AECOM WSP Ontario

AECOM Z:\Kitchener-CAKCN1\DCS\GIS\Projects\60347240\900-CAD_GIS\920-929 (GIS-Graphics)\920-ENV\Design\01_Reports\FLUV\60315006 FLUV Memo 2025.aprx
Layout: 60315006_Hwy413_Fluvial_Realignment Locations Author: Last Saved by: michael.w.collins



Legend

- Completed Conceptual Channel Realignments
- Potential Future Channel Realignments
- Watercourse
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Figure X-4
26 Feb, 2026

0 560 1,120 1,680 2,240
Metres

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G2. High-Level Proposed Channel Realignments

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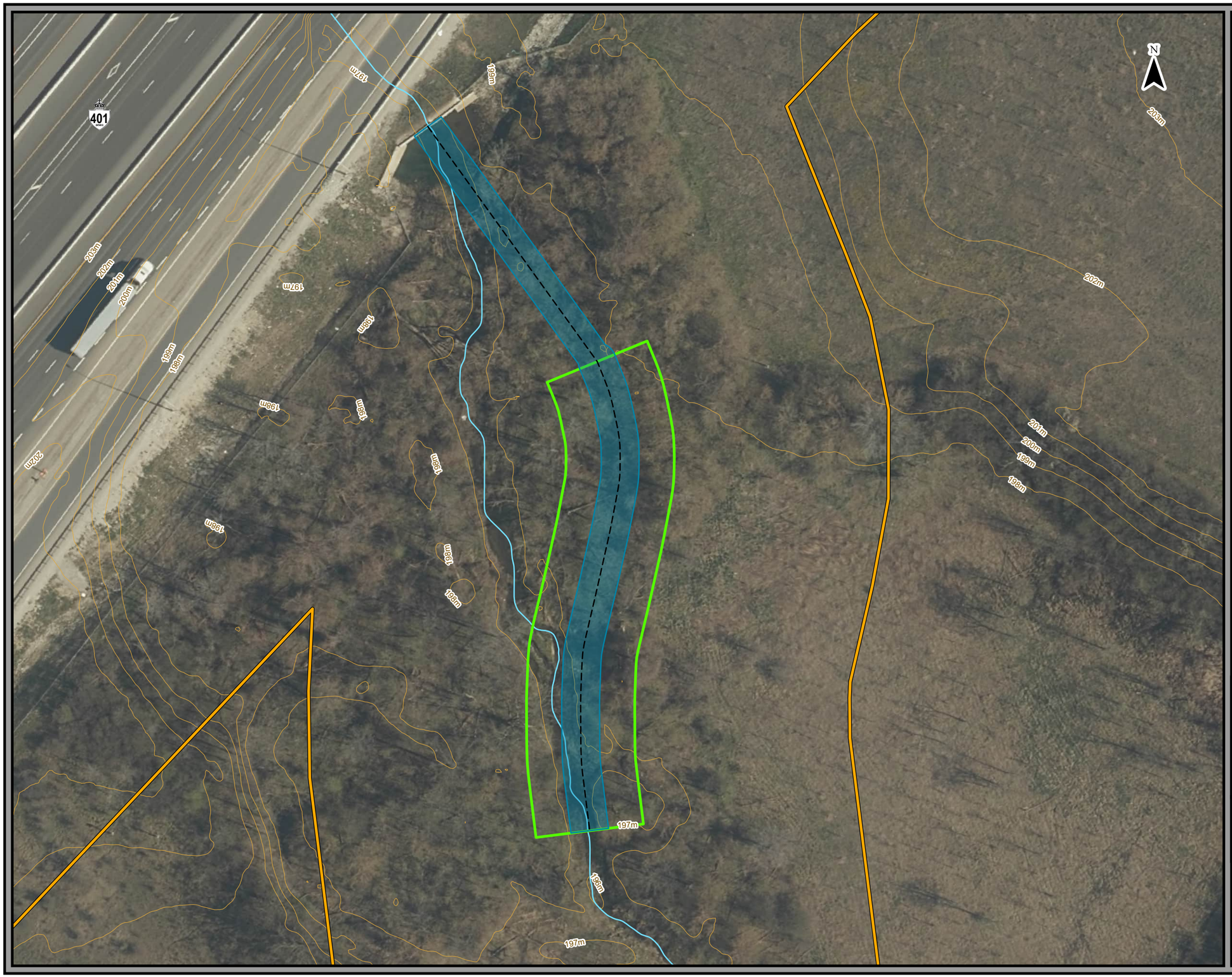

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Conceptual Channel Realignment SM_EB_SIM_0_2

07 Oct, 2025

0 8 16 24 32
Metres

AECOM WSP Ontario

Layout: 60315006_Hwy413_Fluvial_Realignments Author: Last Saved by: michael.w.collins

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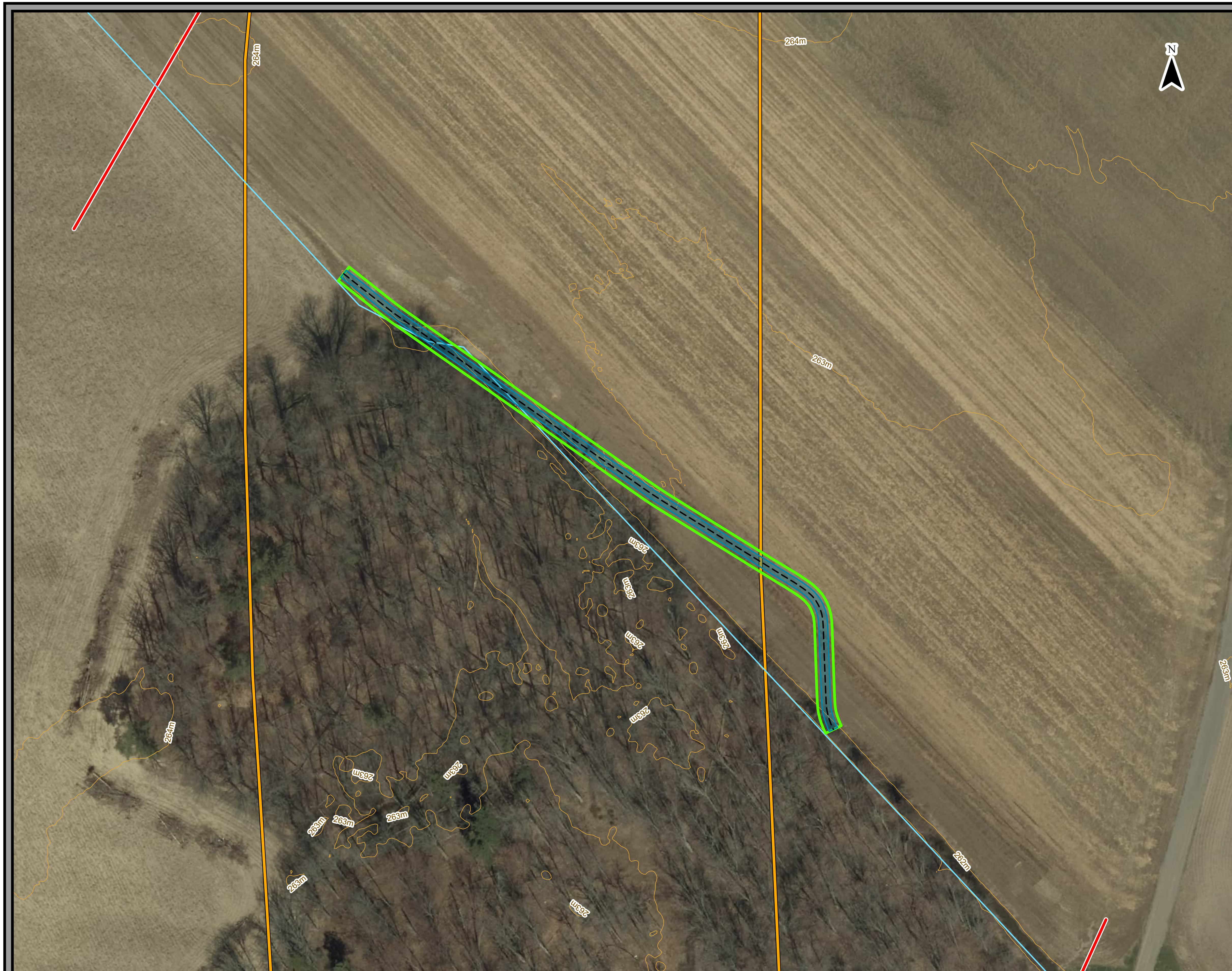

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Reach Break
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Conceptual Channel Realignment
EC_EH_ETW_12_3
07 Oct, 2025

0 10 20 30 40
Metres

AECOM Z:\Kitchener-CAKCN1\DCS\GIS\Projects\60347240\900-CAD_GIS\920-929 (GIS-Graphics)\920-ENV\Design\01_Reports\FLUV\60315006 FLUV Memo 2025.aprx
Layout: 60315006_Hwy413_Fluvial_Realignments Author: Last Saved by: michael.w.collins

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Conceptual Channel Realignment EC_EH_ETW_7_1

07 Oct, 2025

0 20 40 60 80

Metres

AECOM WSP Ontario

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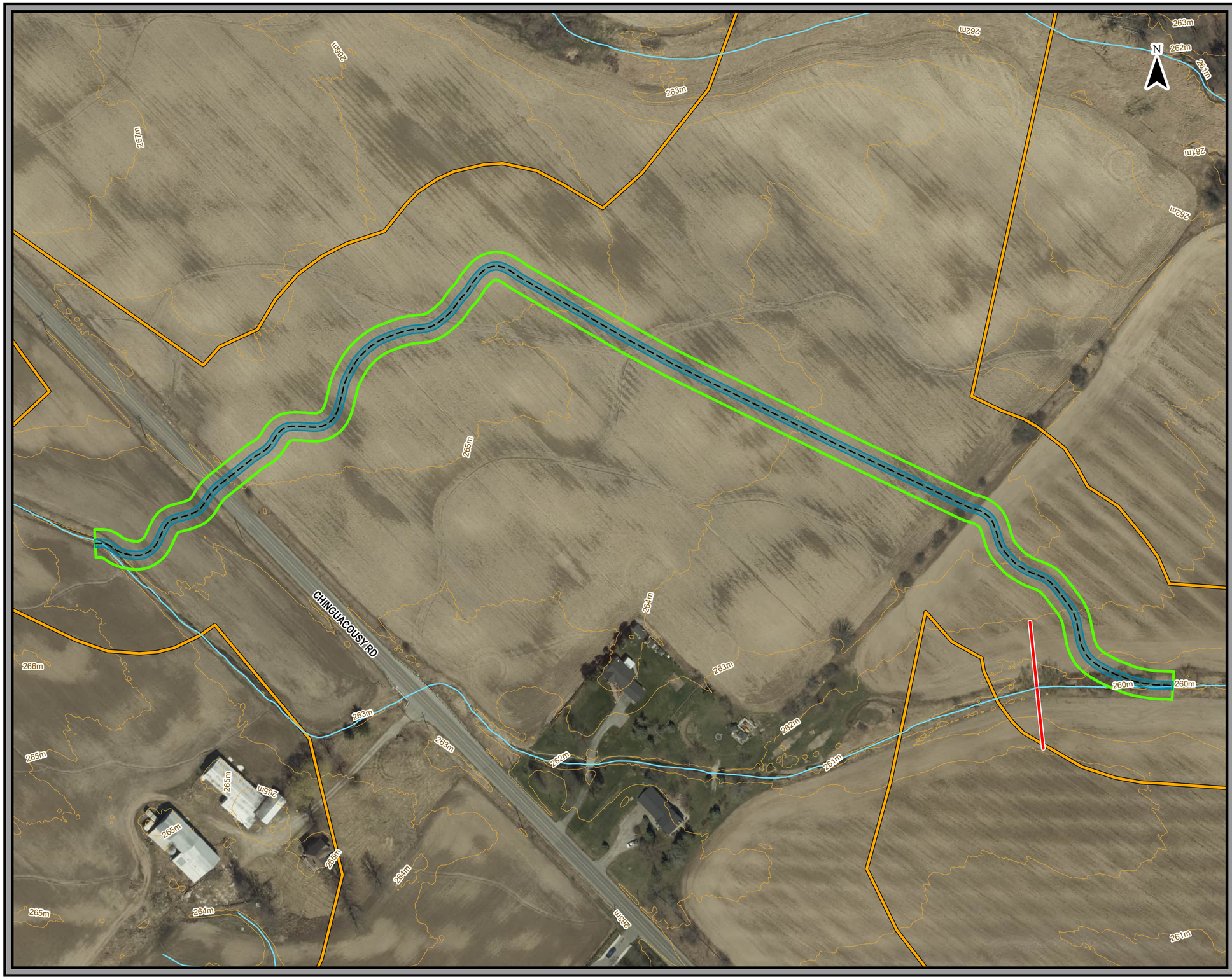

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Reach Break
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Conceptual Channel Realignment EC_EH_ETW_6_1

07 Oct, 2025

0 20 40 60 80
Metres

AECOM WSP Ontario

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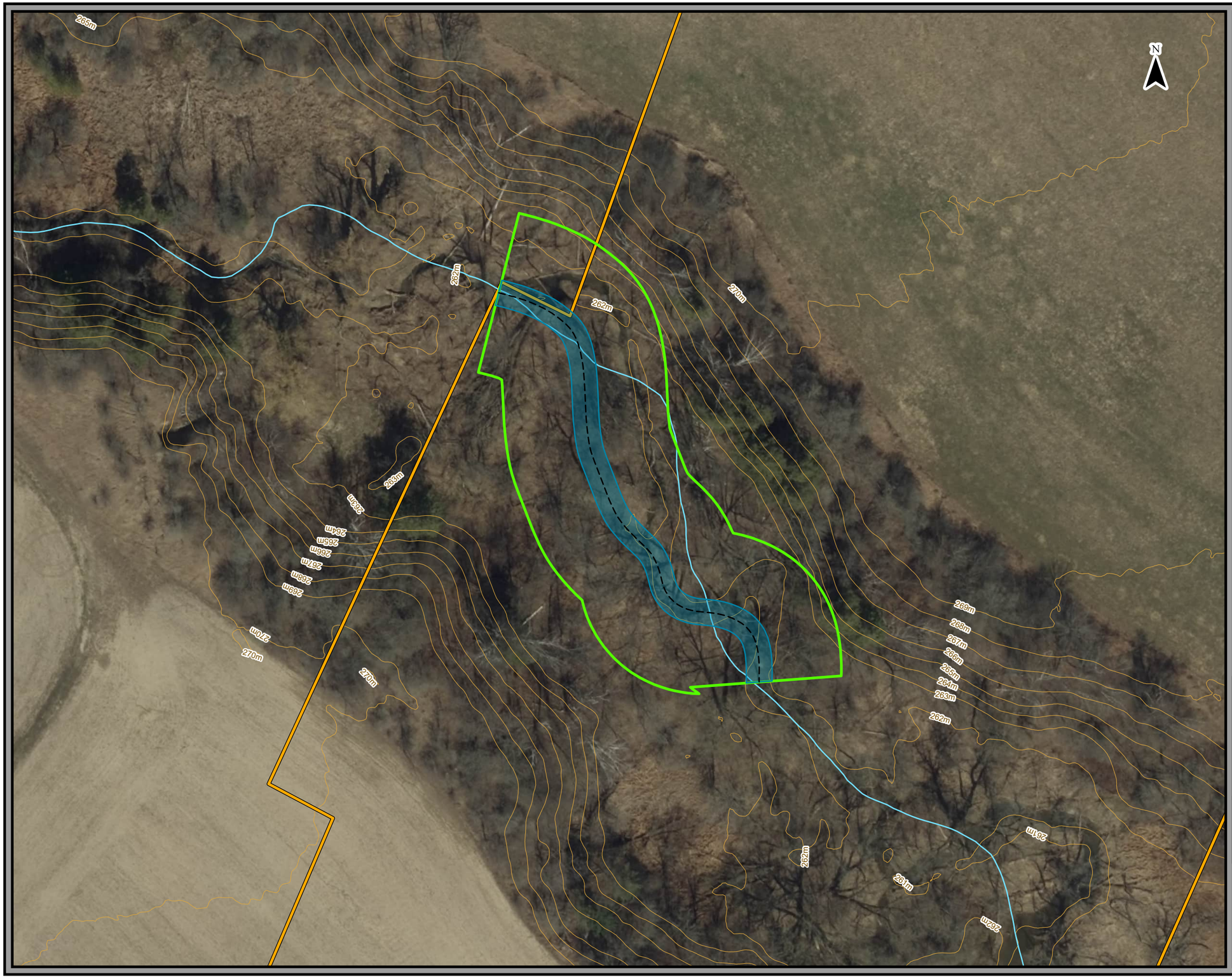

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Conceptual Channel Realignment EC_EH_ETW_1_7

07 Oct, 2025

0 7 14 21 28
Metres

AECOM WSP Ontario

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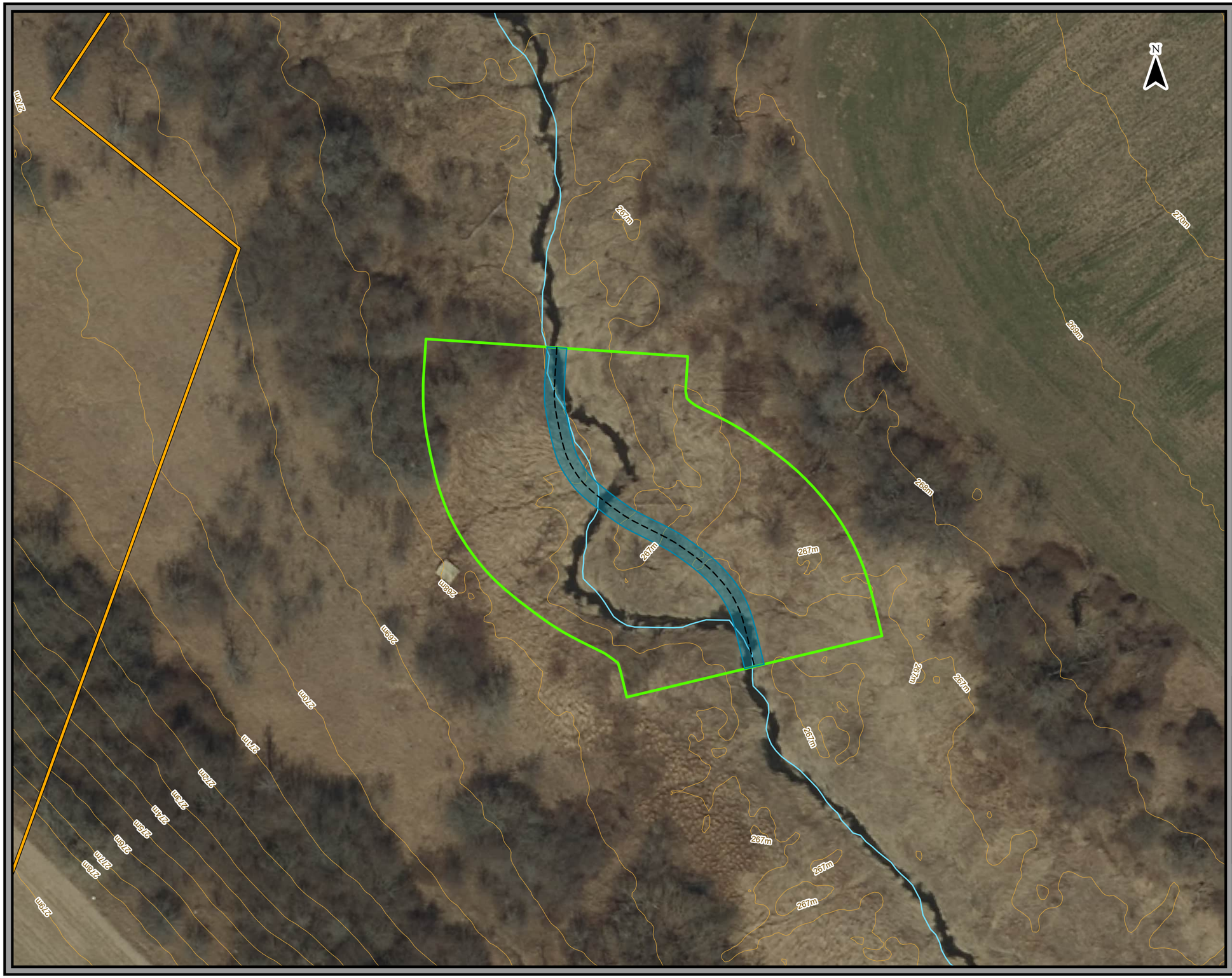

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Conceptual Channel Realignment HU_WH_CAC_0_1

07 Oct, 2025

0 5.5 11 16.5 22
Metres

AECOM WSP Ontario

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Layout: 60315006_Hwy413_Fluvial_Realignments Author: Last Saved by: michael.w.collins

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Redside Dace 30m Limit
- Preliminary Design Right-of-Way

Sources:
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Conceptual Channel Realignment HU_WH_CAC_0_2a

07 Oct, 2025

0 4.5 9 13.5 18
Metres

AECOM WSP Ontario

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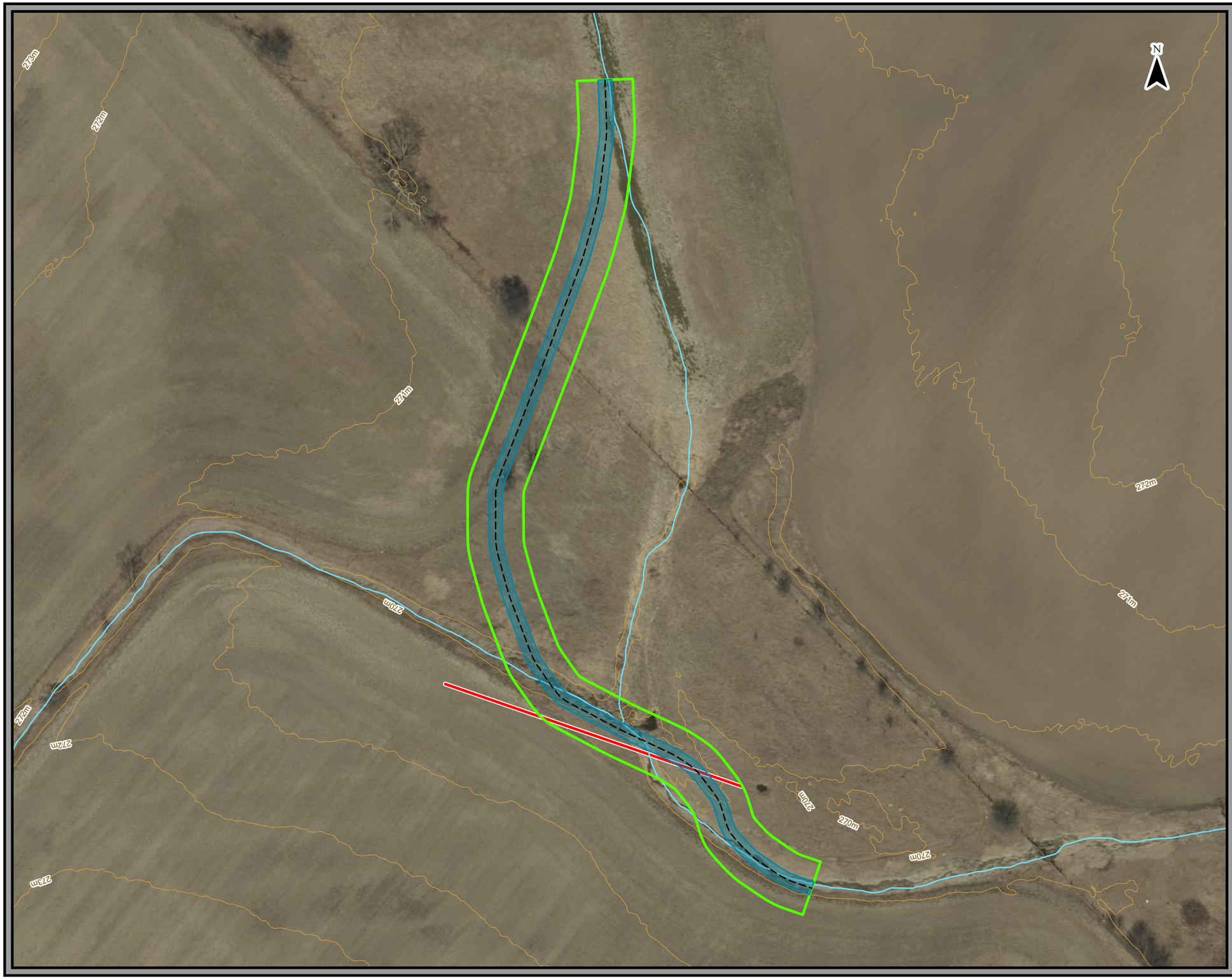

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Reach Break
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Conceptual Channel Realignment HU_WH_TWH_1_4

07 Oct, 2025

0 10 20 30 40
Metres

AECOM WSP Ontario

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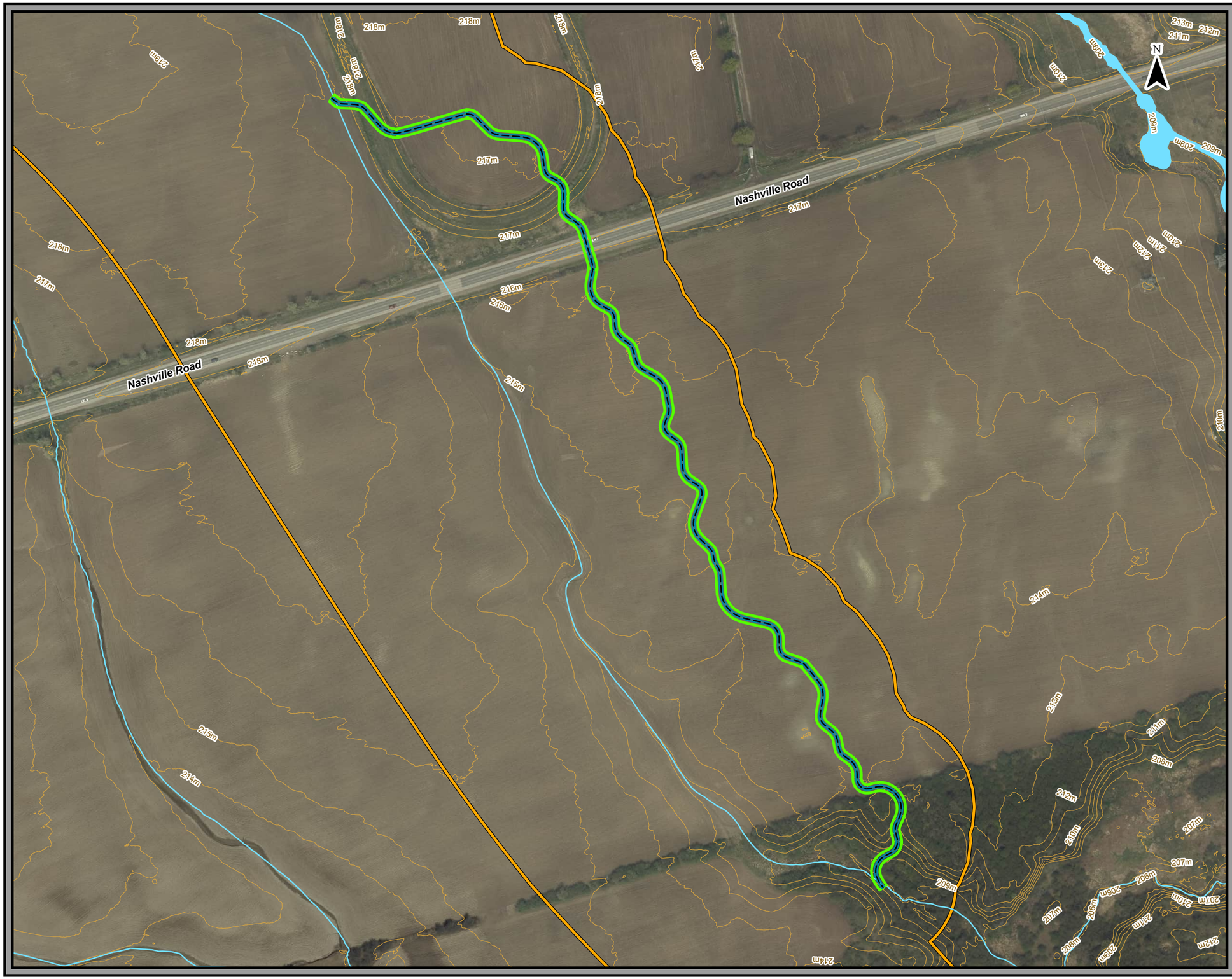

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Reach Break
- Waterbody
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Conceptual Channel Realignment HU_MH_ROB_4_1

07 Oct, 2025

0 25 50 75 100

Metres

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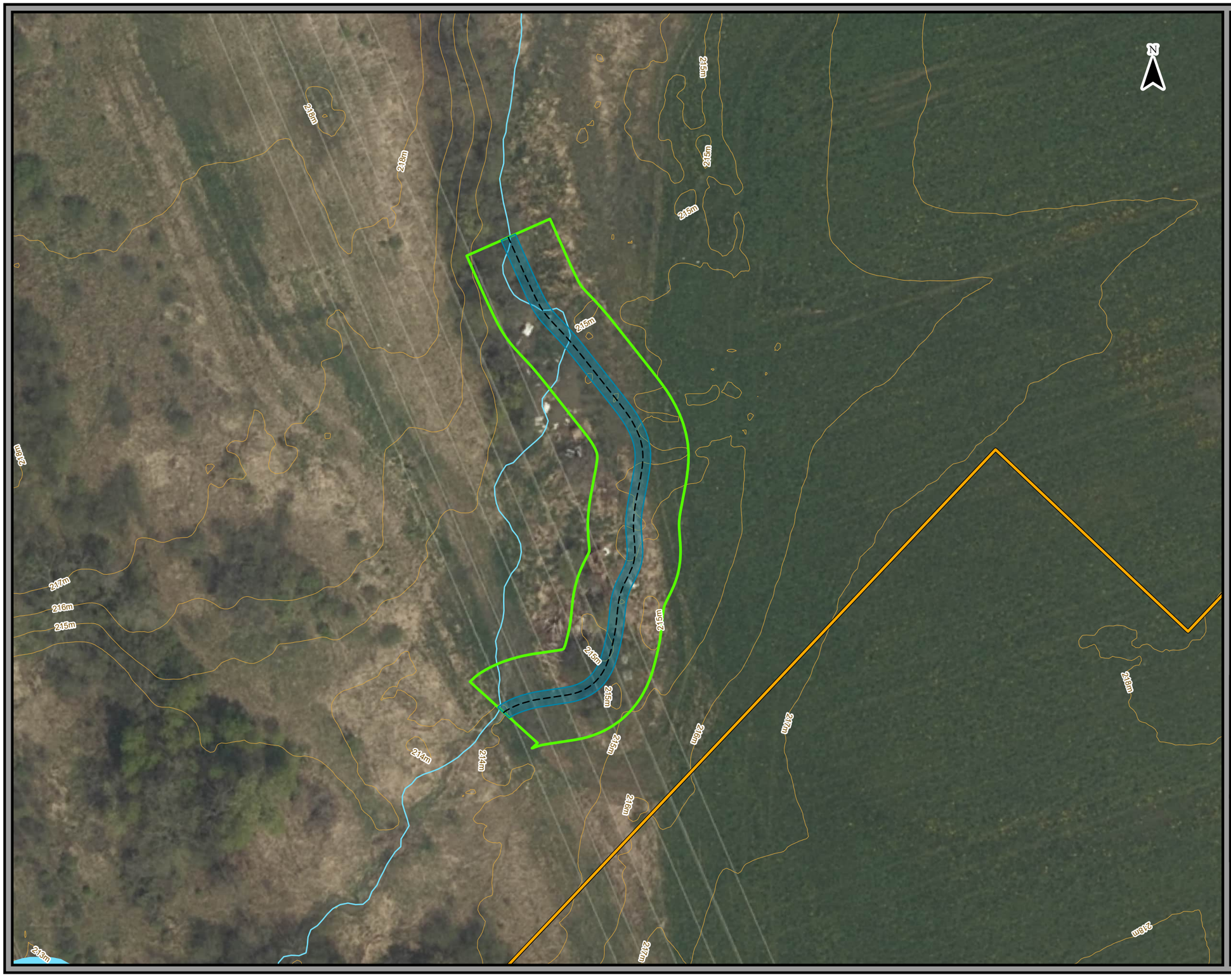

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Waterbody
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Conceptual Channel Realignment HU_MH_ROB_7_2

07 Oct, 2025

0 5.5 11 16.5 22

Metres

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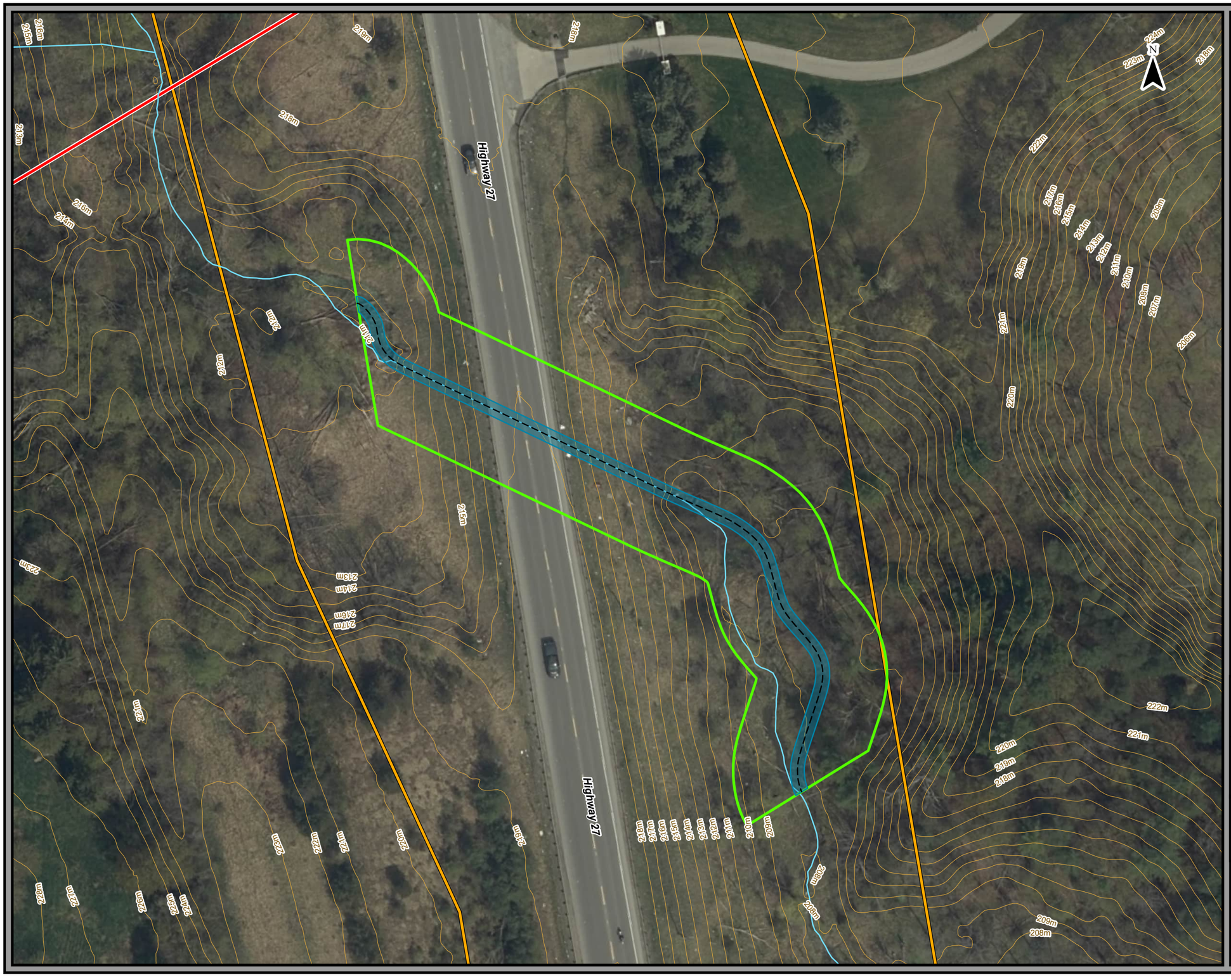

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Reach Break
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Conceptual Channel Realignment HU_MH_EHR_1_4

07 Oct, 2025

0 7 14 21 28

Metres

AECOM WSP

Ontario

Layout: 60315006_Hwy413_Fluvial_Realignments Author: Last Saved by: michael.w.collins
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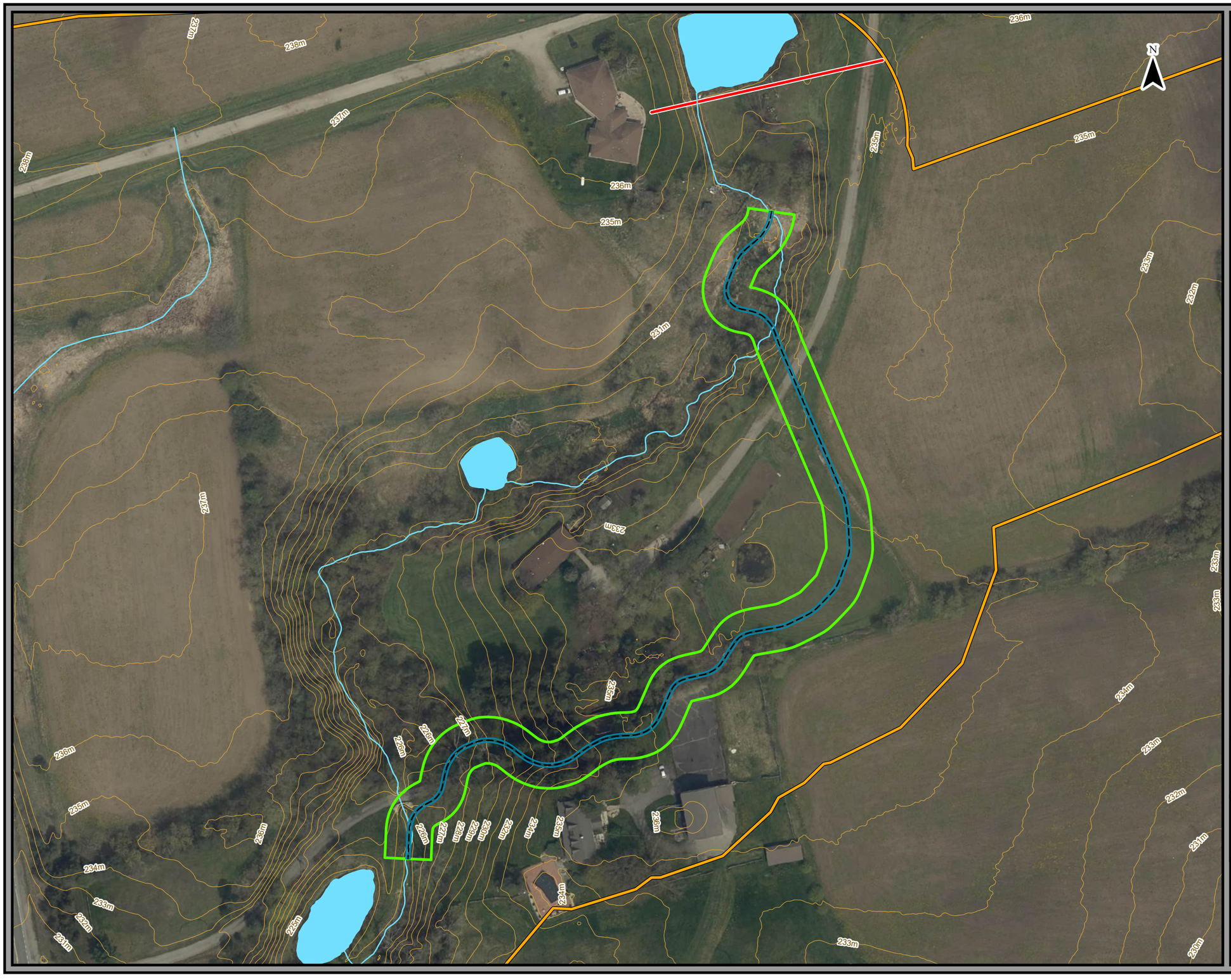

Legend

- Watercourse
- Contour (1m)
- Realignment Centreline
- 100 Year Erosion
- Channel
- Reach Break
- Waterbody
- Preliminary Design Right-of-Way

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Highway 413 Preliminary Design and Assessment of Environmental Impacts - Fluvial Geomorphological Assessment

Conceptual Channel Realignment HU_MH_EHR_1_6

07 Oct, 2025

0 10 20 30 40
Metres

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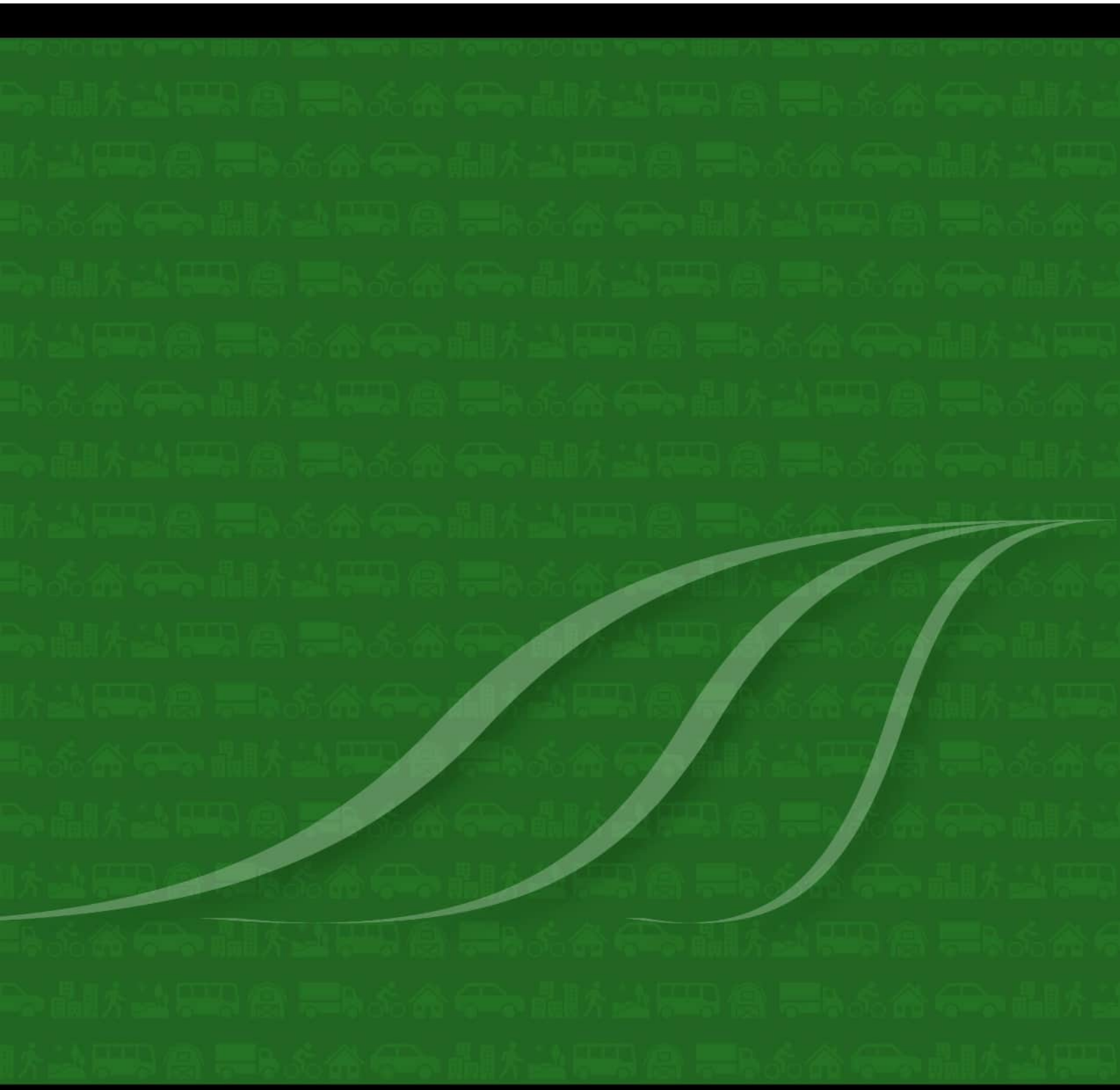

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