



# Spring Creek Tributary Crossing

## Structural Design Report

Clark Boulevard Extension and Eastern Avenue Improvements EA study ("Clark Boulevard / Eastern Avenue EA").

City of Brampton  
November 21, 2022



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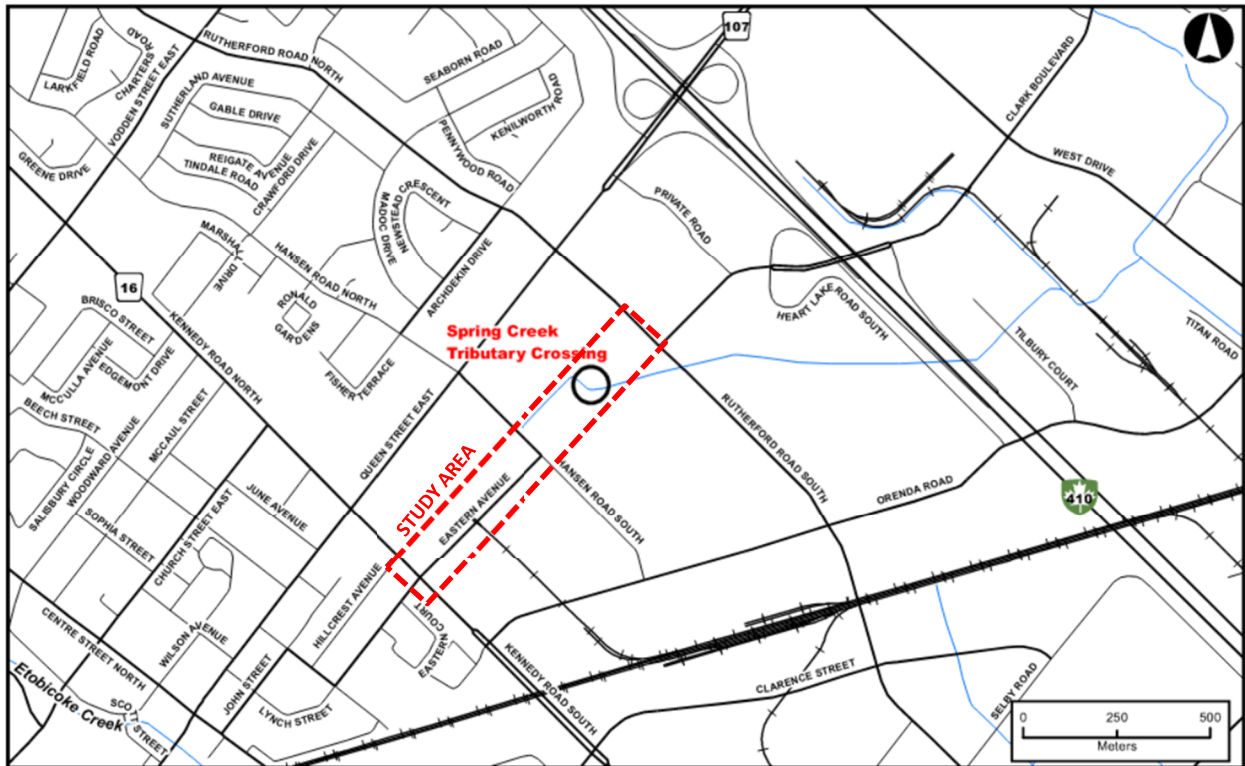


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### Appendix A: Proposed General Arrangement Drawing

# Key Plan

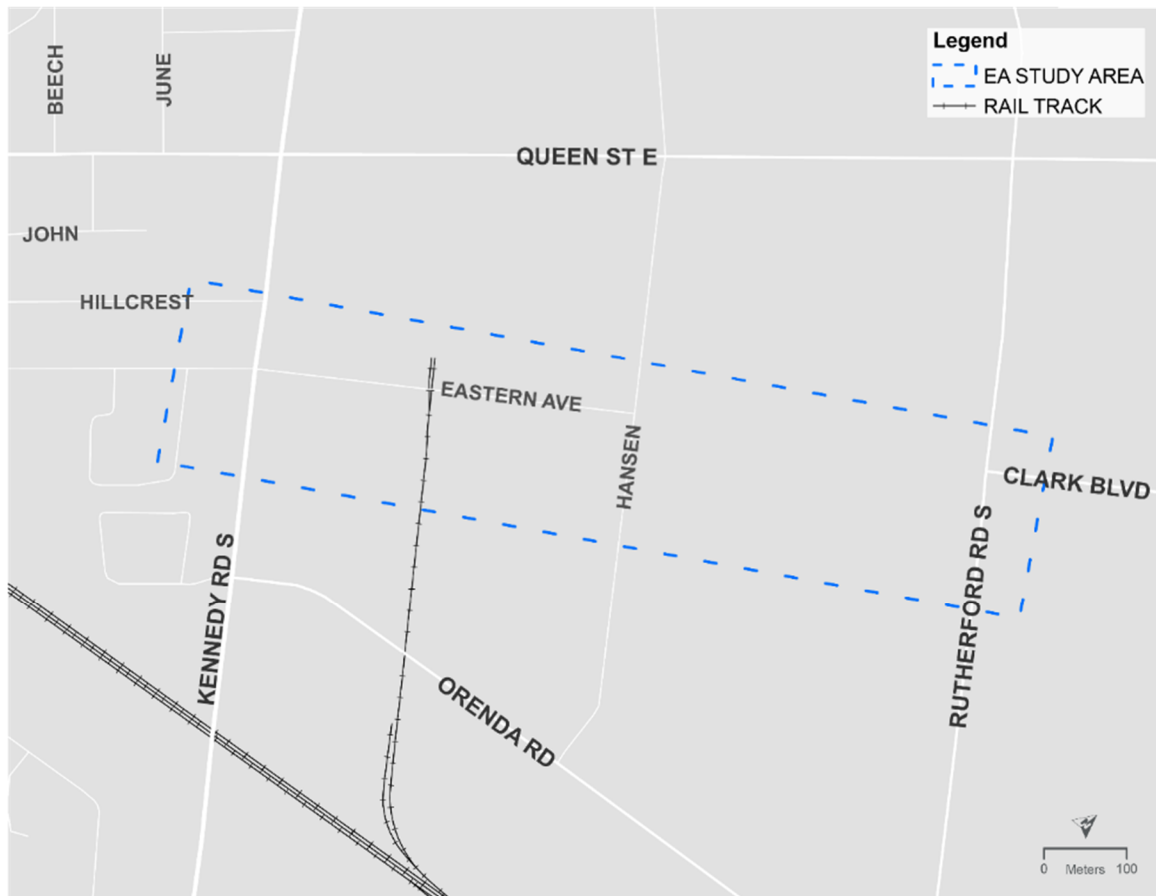


# 1. Introduction

HDR is undertaking a Schedule 'C' Municipal Class Environmental Assessment (EA) study for the extension of Clark Boulevard from Rutherford Road to Hansen Road South and widening of Eastern Avenue from Hansen Road South to Kennedy Road. The EA study is referred to as the Clark Boulevard Extension and Eastern Avenue Improvements EA study ("Clark Boulevard / Eastern Avenue EA"). The EA study is considering improvements to accommodate current and future transportation needs of pedestrians, cyclists, transit users and motorists. The study is being carried out in accordance with the Municipal Class Environmental Assessment planning and design process for Schedule 'C' projects, as outlined in the Municipal Engineers Association (MEA) guidelines (October 2000, as amended in 2007, 2011 and 2015).

The Clark Boulevard / Eastern Avenue EA study corridor is located in the City of Brampton and spans approximately 900m as is shown in **Exhibit 1**. The study corridor is comprised of two sections:

- Existing Eastern Avenue from Kennedy Road to Hansen Road South
- Clark Boulevard-Eastern Avenue Extension from Hansen Road South to Rutherford Road



**Exhibit 1: Study Area**

The existing Eastern Avenue from Kennedy Road to Hansen Avenue is an east-west arterial road under the jurisdiction of the City of Brampton and consists of a 2-lane rural road. The existing Clark Boulevard, east of Rutherford Road, is an east-west arterial road under the jurisdiction of the City of Brampton and consists of a 4-lane urban road. The proposed extension of Clark Boulevard is located at the westerly limit of Clark Boulevard and would extend to Hansen Road.

Spring Creek Tributary is located in the study corridor north of the existing Eastern Avenue corridor. It is proposed to be realigned and cross the proposed road extension of Clark Boulevard as part of the recommendations from this EA study.

This Structural Design Report provides a recommendation for the structure for the Spring Creek Tributary Crossing to accommodate the extension of Clark Boulevard at this crossing. The report also includes a Preliminary Design of the crossing structure to a 30% design level, as presented in the General Arrangement drawing in **Appendix A**.

## 2. Location

The proposed Spring Creek Tributary Crossing of the proposed extension of Clark Boulevard is located approximately 200m west of Rutherford Road South where the creek flows in an easterly direction. The location of the crossing is indicated on the Key plan.

## 3. Existing Conditions

The existing engineered drain (tributary) in the study area is characterized by a relatively shallow channel flowing through a heavily disturbed industrial area within the vicinity of Clark Boulevard and Eastern Avenue. The watercourse, which is a tributary to the Spring Creek, and its associated floodplain are regulated under the TRCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (Ontario Regulation 166/06).

A field survey of the Spring Creek engineered drain was carried out in June 2019. The existing engineered drain is lined with interlocking cement blocks and there was extensive debris present along the drain with glass and barbed wire scattered throughout. Aquatic vegetation was not observed and east of Rutherford Road it is perched. There was no fish or other aquatic organisms observed during the EA study's field survey. The watercourse was not found to support any fish species, although the channel is likely to provide indirect fish habitat as it provides flow to fish habitat downstream.

The area of the proposed extension of Clark Boulevard east of Spring Creek is currently occupied by a vacant parcel of industrial property owned by the City of Brampton at 25 Rutherford Road South which is the site of the future fire station. On the west side of Spring Creek, the area of the extension is occupied by a manufacturing plant for prefabricated concrete products at 35 Rutherford Road South. Areas surrounding the crossing mainly contain industrial properties along both sides of the proposed Clark Boulevard extension.

Based on the geotechnical investigation report prepared on January 20, 2022, the subsurface stratigraphy encountered in this area generally consists of mixed fill, generally underlain by native sands and silts soils

and sand and silt tills, over shale bedrock. The ground water levels within the area of the proposed creek crossing ranged between 212.7 m and 213.7 m.

## 4. Cross Section

### 4.1. Existing Cross Section

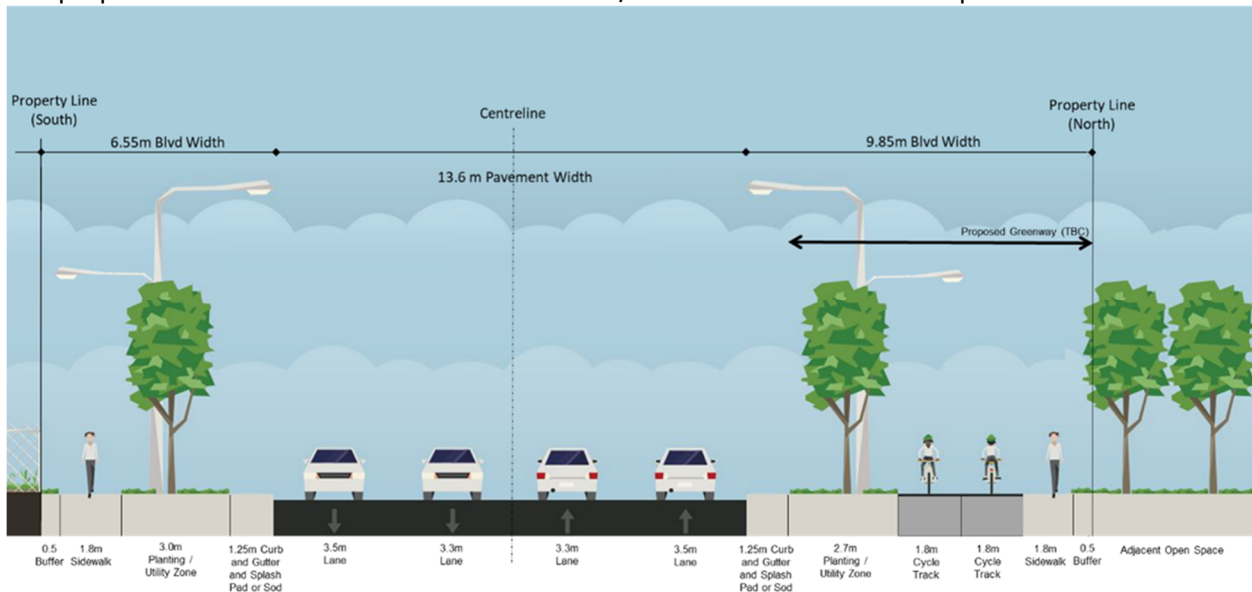
The existing cross-section of Eastern Avenue between Kennedy Road to Hansen Road is a rural two lane road (one lane of traffic in each direction), without dedicated cycling facilities and a discontinuous portion of sidewalk. Beyond the study corridor at its east limit, Clark Boulevard east of Rutherford Road South, carries two (2) lanes of traffic in each direction. On the north side of Clark Boulevard there is a sidewalk. Clark Boulevard does not have a raised centre median.

### 4.2. Proposed Cross Section

The proposed cross-section for the extension of Clark Boulevard from Rutherford Drive to Hansen Road will include four travel lanes (two in each direction), 1.8m east-bound and 1.8m west-bound boulevard cycle tracks on the north side of the road, and 1.8m sidewalks on both sides of the road, illumination and streetscaping.

The Spring Creek Tributary will be re-aligned to cross perpendicular to the proposed Clark Boulevard extension, and a new culvert is proposed approximately 200m west of Rutherford Road South.

The proposed cross section for the Eastern Avenue / Clark Boulevard corridor is provided in **Exhibit 2**.



**Exhibit 2 : Proposed Cross Section**

## 5. Proposed Spring Creek Tributary Crossing

### 5.1. Culvert Structure

The proposed extension of Clark Boulevard requires a new crossing of the Spring Creek Tributary. Crossing alternatives of the watercourse considered fluvial geomorphology, hydraulics, geotechnical recommendations, drainage and stormwater recommendations and opportunities to enhance the natural environment.

Based on the Channel Alignment Options for Proposed Clark Boulevard Extension Memo, prepared by Matrix Solutions Inc. in 2020, the Spring Creek Tributary watercourse was recommended to be realigned to accommodate the road extension and an 8.535m x 2.44 m Con/Span arch culvert was proposed for the Spring Creek Tributary crossing under the proposed Clark Boulevard extension. The proposed channel realignment is approximately 245m in length and includes a 90-degree bend in the channel downstream of the new perpendicular Clark Boulevard crossing and channel widening. This provides opportunities to replace a degraded section of the existing engineered channel with a hybrid natural/engineered solution, improved geomorphological conditions, improved conveyance and containment of flood events, provision of a functional floodplain in the overbank area, provide a perpendicular crossing of the future roadway which will reduce the crossing span and thus reducing construction cost and enhance the aesthetic appeal of the crossing.

HDR conducted a preliminary hydraulic assessment to confirm the sizing of the proposed culvert crossing and summarized the findings in the Drainage and Stormwater Management Report prepared in July 2022. The hydraulic assessment confirmed that with the proposed 8.535m x 2.44m Con/Span arch culvert, there would be no increase in upstream flood levels and the proposed crossing meets the MTO Drainage Design freeboard criteria. The culvert is estimated to be 36.1m in length.

Preliminary geotechnical and pavement investigations were conducted by Thurber Engineering Ltd. in August and September 2021. A geotechnical investigation report was prepared by Thurber as part of this geotechnical investigation. Based on the January 2022 geotechnical investigation report recommendations, shallow spread footing foundations is the preferred foundation option for the proposed crossing structure due to the relatively dense till soils encountered at expected footing levels at approximate frost depth at 1.3m. This recommendation supports the proposed 8.535m x 2.44m x 36.1m Con-Span arch culvert.

The 8.535m x 2.44m x 36.1m Con/Span pre-cast arch culvert is an appropriate solution for the Spring Creek Tributary Crossing due to it relatively thin top of slab thickness since there is limited height spacing between the roadway and channel invert elevation. This pre-cast arch culvert requires less concrete per open area than other precast bridge and culvert structures and is an ideal combination of hydraulic efficiency and structural capacity. The clear span and clear distance between footings is maximized with this arch culvert structure. Installation of the Con/Span arch culvert is rapid, compared to conventional cast in place culverts, consequently the Clark Boulevard extension can be opened to traffic sooner. Installation cost is also reduced by way of reduced forming and grouting, a shorter construction window, less construction complications, a more fixed construction scheduling and higher quality control of the pre-cast concrete components. Cost to maintain the Con/Span arch culvert is lower due to higher concrete quality and better-quality control of precast factory produced products. The three-sided structure provides a natural bottom for environmental applications. The arch culvert panels can be manufactured



well in advance and installed within environmental windows if required. In addition, the Con/Span arch culvert is aesthetically pleasing.

During the detailed design of the Spring Creek Tributary Crossing, a detailed structural analysis and structural design will need to be performed to confirm the suitability of the Con/Span arch culvert for this crossing, culvert size, culvert location and the need for wing walls for soil retention as necessary.

## 5.2. Cost Estimate

The estimated construction cost of the proposed culvert is \$1,200,400.

## 5.3. Design Code

The design of the culvert will be undertaken in accordance with the latest Canadian Highway Bridge Design Code (CHBDC), Ministry of Transportation of Ontario's "Structural Manual", Ministry of Transportation of Ontario's "Concrete Culvert Design and Detailing Manual" and all other current directives and standards.

## 5.4. Access to the Site

The future road corridor will be under the jurisdiction of the City of Brampton and accessible from Rutherford Road South and Hansen Road South.

## 5.5. Property

The re-aligned tributary and new crossing will be located on the existing manufacturing plant at 35 Rutherford Road South. Property acquisition is required of this site to construct the road extension, tributary re-alignment and new watercourse crossing.

## 5.6. Utilities

Based on the Utility Composite and Conflict Plan prepared by HDR dated September 15, 2021, there are no existing utilities in the vicinity of the proposed Spring Creek Tributary Crossing. A detailed utility investigation should be carried out during detailed design to confirm that there are no existing utilities that will be in conflict with the proposed culvert structure.

## 5.7. Concrete

All cast-in-place concrete will be Class C-1 concrete as per CSA A23.1.

All pre-cast concrete will be as per CSA A23.4 Precast Concrete – Materials and Construction.

## 5.8. Reinforcing Steel


Reinforcing steel shall be Grade 400W or 500W.

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# A

## Appendix

### GENERAL ARRANGEMENT

