# Appendix N.2 – Structural Design Report – Stouffville GO Rail Crossing at Clayton Drive

*Kennedy Road Environmental Assessment between Steeles Avenue and Major Mackenzie Drive*

# Go Transit Stouffville Railway Corridor

## Class EA Study for Improvements to Kennedy Road from Steeles Avenue to Major Mackenzie Drive

The Regional Municipality of York

January 26, 2021

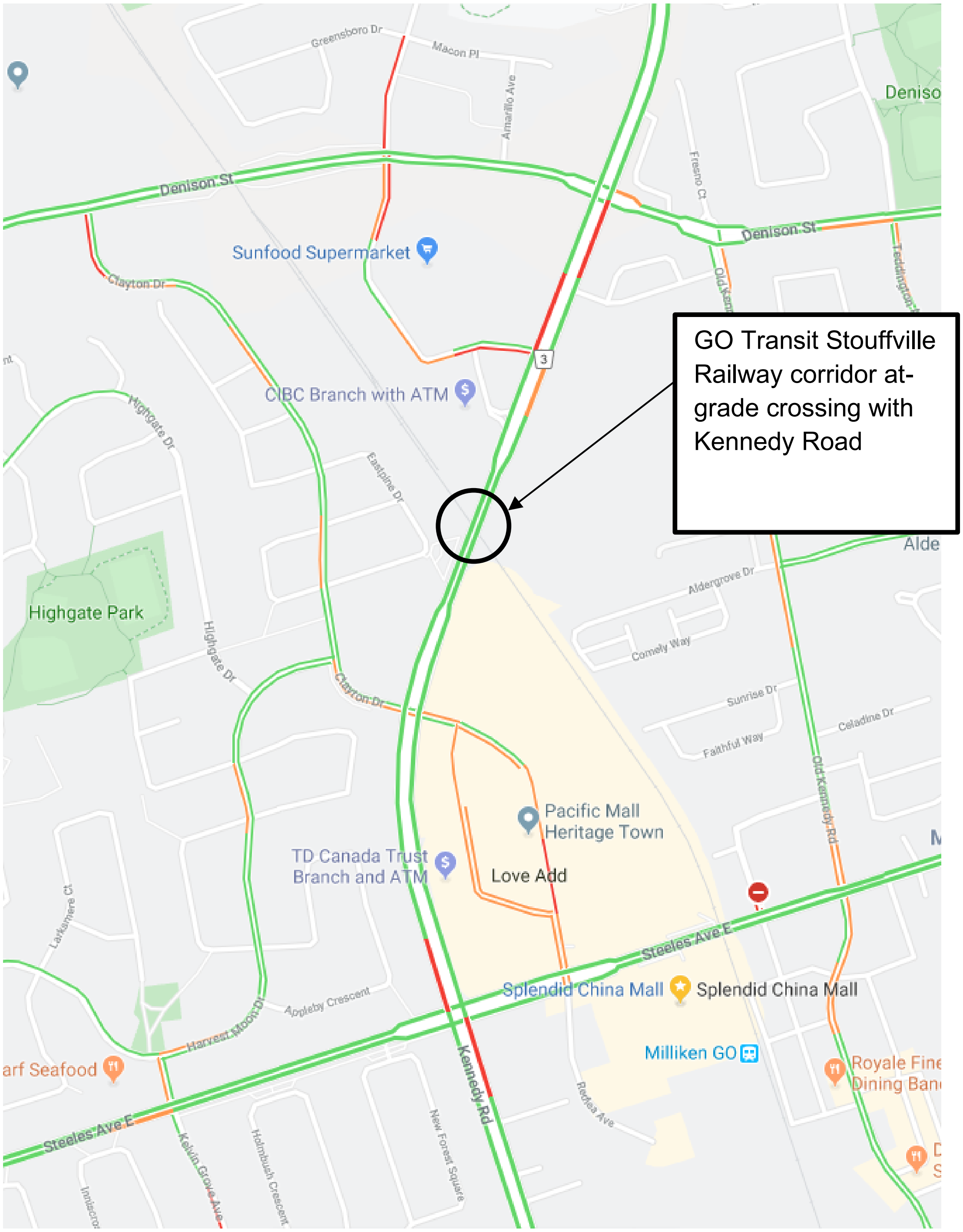
# Disclaimer

The material in this report reflects HDR's professional judgment considering the scope, schedule and other limitations stated in the document and in the contract between HDR and the client. The opinions in the document are based on conditions and information existing at the time the document was published and do not consider any subsequent changes. In preparing the document, HDR did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that HDR shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party resulting from decisions made or actions taken based on this document.

In preparing this report, HDR relied, in whole or in part, on data and information provided by the Client and third parties that was current at the time of such usage, which information has not been independently verified by HDR and which HDR has assumed to be accurate, complete, reliable, and current. Therefore, while HDR has utilized its best efforts in preparing this report, HDR does not warrant or guarantee the conclusions set forth in this report which are dependent or based upon data, information or statements supplied by third parties or the client, or that the data and information have not changed since being provided in the report. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that HDR shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party resulting from decisions made or actions taken based on this document.

# Contents

# KEY PLAN


GO Transit Stouffville Railway corridor at-grade crossing with Kennedy Road
Denison St
Sunfood Supermarket
CIBC Branch with ATM
Highgate Park
Pacific Mall Heritage Town
TD Canada Trust Branch and ATM
Love Add
Steeles Ave E
Splendid China Mall
Milliken GO
Kennedy Rd
Clayton Dr
Highgate Dr
Old Kennedy Rd

# 1.0 INTRODUCTION

HDR is undertaking the Municipal Class Environmental Assessment Study (Schedule 'C') and the Preliminary Design for improvement to Kennedy Road from Steeles Avenue to Major Mackenzie Drive for The Regional Municipality of York (York Region). The recently completed York Region Transportation Master Plan Update in 2016 designates this section of Kennedy Road for future widening to 6 lanes as part of the Frequent Transit Network.

It is HDR's mandate to provide bridge engineering services and preliminary design along the corridor to accommodate the road widening and improve transit.

An existing GO Rail at-grade crossing with Kennedy Road under the jurisdiction of Metrolinx is located along the corridor. HDR is mandated to analyze and develop design options to improve transit at this crossing.

This Structural Design Report provides a comparison of different alternatives for the at-grade GO Transit Stouffville Railway corridor crossing. Based on HDR's recommendation, comments from Metrolinx, and York Region's decision, HDR performed a Preliminary Design of the preferred alternative to a 30% design level.

# 2.0 LOCATION

The GO Transit Stouffville Railway corridor crossing with Kennedy Road is located approximately 280m north of Clayton Drive, in the City of Markham. The location of the at-grade crossing is indicated on the Key Plan.

# 3.0 EXISTING CONDITIONS

## 3.1 GENERAL CONDITIONS

Kennedy Road between Steeles Avenue and Major Mackenzie Drive is a four-lane, north-south Regional Arterial road located in the City of Markham. The road is crossing with the GO Transit Stouffville Railway corridor between Clayton Drive and Gorvette Road.

On the east side of Kennedy Road, a driveway for Pacific Mall is located 170 m south of the crossing and a residential road access is connecting with Kennedy 370 m north of the crossing. On the west side of Kennedy Road, a driveway for Milliken Wesleyan Methodist Church is located approximately 280 m south of the crossing and a driveway for Hollywood Square is located approximately 150 m north of the crossing.

The level crossing is two tracks of the GO Transit Stouffville Railway corridor, with crossing gates and signal lights, and is located approximately 860m from Milliken GO station. The track also crosses the sidewalks at this location, which are not gated.

## 3.2 Transit Condition

The level crossing is an existing source of significant congestion and delays for all road users, causing northbound vehicles to back up on Kennedy Road to Clayton Drive and southbound vehicles to back up to Gorvette Road. The crossing gates come down when a GO train approaches the crossing. During the periods that northbound GO trains approach and stop at Milliken GO Station, the crossing gates come down for an extended period of time, worsening traffic congestion on Kennedy Road.

In addition, the delays result in unsafe behavior by pedestrians, cyclists, transit users, and motorists who try to avoid the crossing gates.

As Metrolinx implements the GO Expansion service on the GO Transit Stouffville Railway corridor, the above problems will worsen. GO Expansion service will gradually increase train service to 50-75 trains a day which will also require double or triple tracking.

Alternative solutions for the at-grade crossing at Kennedy Road will need to maintain GO train, vehicular, and pedestrian flows during construction.

# 4.0 Horizontal and Vertical Alignment

## 4.1 Horizontal Alignment

The horizontal alignment of the Kennedy Road remains unchanged after the construction.

## 4.2 Vertical Profile

The existing vertical profile of Kennedy Road has a crest vertical curve. The vertical profile of the proposed alternative for Kennedy Road will have a sag vertical curve that connects the descending grades

# 5.0 Cross-section

## 5.1 Existing Cross-Section

The existing Kennedy Road carries two (2) lanes of traffic in each direction. Sidewalks and splash pads are located on both sides of Kennedy Road.

## 5.2 Proposed Cross-Section

The proposed cross-section of Kennedy Road will consist of two (2) 3.3m wide traffic lanes and a 3.5m transit/HOV lane in each direction. Two (2) 3.5m wide multi-use paths (MUP) will be located on both sides of the roadway. The traffic lanes will be divided by a raised centre median.

# 6.0 PROPOSED STRUCTURE

The proposed bridge alternatives were influenced by a number of key constraints including but not limited to the following: traffic impact, aesthetics, social environment, cost, and construability.

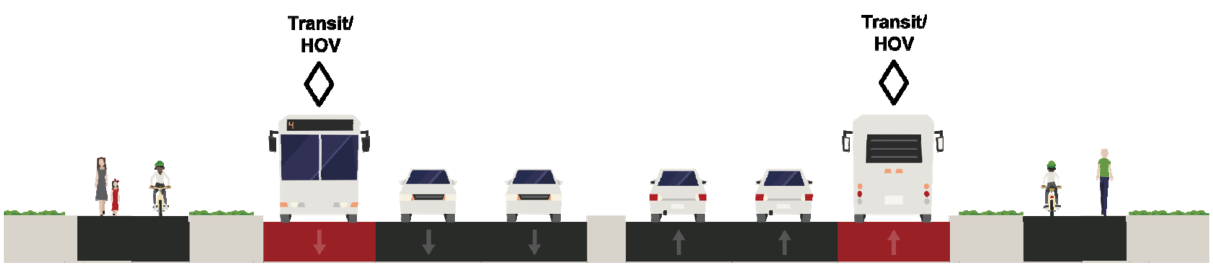
## 6.1 STRUCTURAL ALTERNATIVES

Three (3) alternatives were considered for the GO Transit Stouffville Railway corridor at-grade crossing at Kennedy Road. Descriptions of each alternative along with the estimated structure construction costs are listed below:

**Alternative 1: Modified Typical Section – At Grade Crossing with Active Transportation Improvements**

This alternative proposes to maintain the existing at grade railway crossing and widen Kennedy Road to accommodate the new Transit/HOV lanes and MUP. Alternative 1 increases the traffic congestion on Kennedy Road due to frequent gate closures from increased GO Train service. This decreases public access to businesses and surrounding developments. No changes to the visual aesthetics of the surrounding areas.

No structural cost is considered for this alternative, as there are no structural components.




**Alternative 2: Underpass – Modified Typical Section with Transportation Improvements**

This alternative proposes to construct a depressed corridor along the section of Kennedy Road under the railway track to by-pass the existing GO crossing. The roadway has a maximum of 5.00% grade and the MUP has a maximum of 3.1% grade, which complies with AODA standards. The depressed corridor consists of a concrete slab and retaining walls at both sides of the concrete slab forming a U shaped structure. Due to the high ground water level indicated in the geotechnical report, waterproofing around the structure is recommended. The design speed for Kennedy Road is 60km/hr.

A two (2) span concrete slab on steel girder bridge is recommended for the railway track. This structure incorporates a semi-integral connection between the superstructure and substructure to eliminate the need for costly maintenance prone expansion joints. This structure will be around 47.8m long and 15m wide. The foundation of the substructures will be determined during the detailed design, as three (3) different types of foundations were recommended in the geotechnical report. Vertical clearance between the bottom flange of the steel girder and the roadway shall not be less than 5 m.

The proposed bridge should be designed in accordance with the latest AREMA Manual and Metrolinx Guidelines, and capable to carry Cooper E-80 live loading plus diesel impact, with a service life of 100 years.

Per Metrolinx General Guidelines for Design of Railway Bridges and Structures (Metrolinx Guidelines), Part 1, Section 8, semi-integral and integral abutment bridges will not be permitted unless there is written approval from the Rail Corridor Infrastructure Senior Manager Track and Structures. Per Metrolinx Guidelines, Part 2A, Section 1.2, the superstructure of proposed railway bridge shall be simply-supported spans.

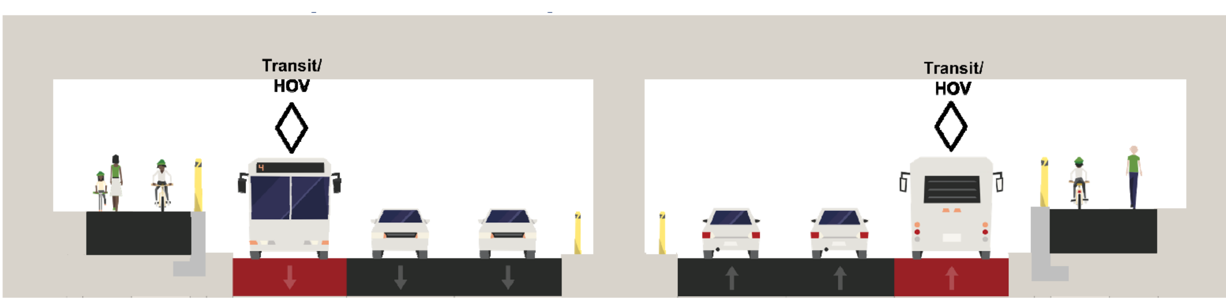
The grade separation has a moderate improvement to traffic congestion by reducing delays caused by at-grade train crossings and thus improve the access to businesses and surrounding developments. It is also expected that the grade separation has a minor impact to the visual aesthetics to the surrounding residences, as the road is under the railway bridge.

The constructability of this alternative is complex. This is due to the extensive coordination with Metrolinx, York Region, and the City of Markham. Vehicular lanes (2 in each direction) and train traffic must be maintained at all times. It is expected the construction could take multiple years to complete. A significant area around the railway crossing will be required for closure during the construction.

A temporary railway line is required for the construction of the railway's bridge, since it is proposed to construct the bridge in different stages. The temporary railway line could result in substantial project schedule risk due to rail operational coordination factors; i.e. rail traffic and operations must be substantially maintained daily as routine during construction.

The depressed corridor also requires underground storage chambers to collect the stormwater and ground water to prevent from flooding. Water collected by the storage chambers must be pumped from the low point of the depressed corridor.

The preliminary cost estimate for Alternative 2 is $52.12M.



**Alternative 3: Overpass – Modified Typical Section with AT Improvements**

This alternative proposes to construct a single span bridge over the existing GO crossing. The proposed structure is a slab on CPCI girder bridge support on integral abutments. The bridge is approximately 20 m long and 35.1 m wide with a design speed of 60 km/hr.

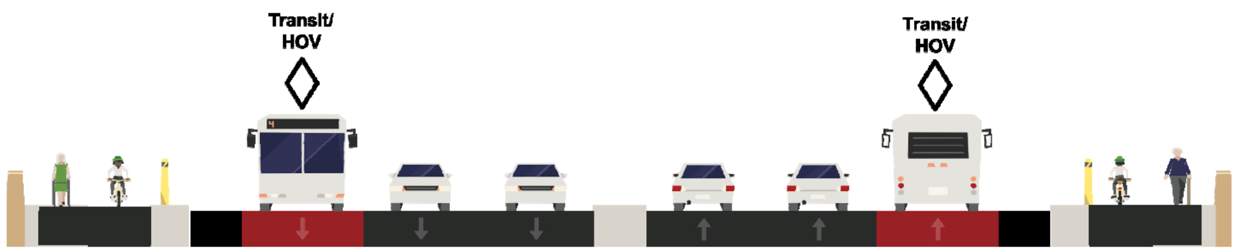
The substructure consists of reinforced concrete abutments and wingwalls supported on one (1) row of piles at each abutment.

The overpass bridge has a moderate improvement to traffic congestion by reducing delays caused by at-grade train crossings and thus improve the access to businesses and surrounding developments. Although the overpass has many benefits, the bridge is minimum 7.595 m above the top of the highest rail. Permanent closure of some direct accesses to Kennedy Road is required for the Overpass alternative due to the steep grades that result.. Thus, it has a significant visual aesthetic impacts to the surrounding residences.

The constructability of Alternative 3 is less complex in comparing to Alternative 2. It is expected all lanes on Kennedy Road can be maintained and has minimal impact to the daily rail operation throughout the construction. In addition, the construction of the overpass bridge can be completed within a single construction season. A moderate area around the railway crossing will be required for closure during the construction.

Excavation to the existing ground is minimal for this alternative, since it is proposed to have an integral abutment and no foundation excavation is required.  This will reduce the potential to contaminate the soil's ground water. The water table will likely not be disturbed and there is generally suitable areas to temporarily retain stormwater.

The preliminary cost estimate for Alternative 3 is $21.47M.




## 6.2 Discussion

A number of factors play a critical role in the development and evaluation of the alternatives. For the grade separation at Kennedy Road, these factors include constructability, vehicular and pedestrian impact, aesthetics, social environment impact, construction cost, and construction schedule. A comparison of the advantages and disadvantages of the three alternatives are summarized in the table below.

| Alternative | Advantages | Disadvantages |
|---|---|---|
| **1** | • No change to pedestrian environment.<br>• No changes to the visual aesthetics for the travelling public on Kennedy Road.<br>• Moderate capital costs to widen road.<br>• Shorter construction timing.<br>• Significant improvement to cyclist environment due to construction of dedicated cycling infrastructure.<br>• Minor Construction Complexity. | • Increased delay in traffic due to frequent gate closures from increased GO Train service.<br>• Reduction in access to employment areas and cross-streets due to increased traffic congestion with at-grade crossing and resultant delays for transit and vehicles. |
| **2** | • Moderate improvement to traffic operations by reducing delays caused by at-grade train crossings.<br>• Moderate impact to pedestrian environment due to increased travel distance for pedestrians traveling along moderate incline.<br>• Moderate reduction to visual aesthetics for the travelling public on Kennedy Road with all road users crossing under the rail.<br>• Significant improvement to access to employment areas and cross-streets due to reduced traffic congestion. | • Very significant capital costs to construct rail bridges, second rail track extension, retaining walls, grade separated and at-grade detour roads, raised AT facilities, underpass, and drawdown pumping system.<br>• Longest construction time due to complexity of the structure. |
| **3** | • Moderate improvement to traffic operations by reducing delays caused by at-grade train crossings.<br>• Significant improvement to access to employment areas and cross-streets due to reduced traffic congestion.<br>• Moderate construction complexity. | • Significant impact to pedestrian environment due to increased travel distance for pedestrian travelling along a substantial incline with wind exposure.<br>• Significant reduction to visual aesthetics for residences to the east and west of the crossing due to visual obstruction of new overpass structure.<br>• Significant capital costs to construct overpass structure, retaining walls, and grade separated and at-grade detour roads.<br>• Long construction time required to build overpass structure. |

## 6.3 STRUCTURAL RECOMMENDATION

As shown in table above, a comparison of alternatives reveals that Alternative 2 offers advantages over the other alternatives based on improvement in traffic congestion, minimized impact to pedestrians and cyclists, and significant improvement to access to employment areas and cross-streets.

Although Alternative 2 has the highest construction cost and the longest construction time, the benefits in the long term improvement of traffic congestion and public access to businesses and residences outweigh the total cost and construction time.

The **Recommended** design is Alternative 1, to maintain the crossing at-grade with AT improvements until GO Transit increases the frequency of train services. This Alternative does not require structural components.

Alternative 2 is recommended as the **Ultimate Vision** as this alternative will address vehicle queuing issues that will occur once the GO Train service increases.

# 7.0 CONSTRUCTION STAGING

The construction of the grade separation, Alternative 2, is proposed to be undertaken in multiple stages. During the construction, all four (4) lanes of road traffic and railway traffic will be maintained throughout the construction. A road detour and track detour will be required to carry out the construction while maintaining the road traffic as well as the railway traffic. The final design of the underpass and construction staging requirements will be subject to the findings and recommendations of the Metrolinx's GO Expansion program's Stouffville Grade Separations Transit Project Assessment Project (TPAP) which is underway as of February 2020 at time of writing of this report.

# 8.0 GEOTECHNICAL INVESTIGATION.

## 8.1 EXISTING CONDITIONS AND FOUNDATION RECOMMENDATION

Golder Associates Ltd. carried out a geotechnical investigation on November 19$^{th}$ and 21$^{st}$, 2018. The following summarizes the findings of the investigation and foundation recommendations from the Foundation Investigation and Preliminary Design Report dated October 29, 2019 prepared by Golder Associates Limited.

Cohesive and non-cohesive fill was encountered underlying the topsoil in Boreholes GO-1 and GO-2. The SPT "N" values measured within the non-cohesive fill layers range between 11 blows and 14 blows per 0.3m of penetration, indicating a compact level of compaction. The SPT "N" values measured within the cohesive fill layers range between 13 blows and 16 blows per 0.3m of penetration, indicating a stiff to very stiff consistency.

A till deposit varying in composition from silt and sand to clayey silt and sand was encountered underlying the fill in both boreholes. A 1.5m thick gravel seam was encountered within the till deposit in Borehole GO-1 at depth of 10.2m below ground surface. The till deposit was encountered at depths of 1.5m and 2.2m below ground surface in Boreholes GO-1 and GO-2, respectively. Both boreholes terminated within the till deposit at a depth of 15.9m below ground surface. The SPT "N" values measured within the silt and sand portion of the till deposit range between 17 blows to 67 blows per 0.3m of penetration, indicating a compact to very dense level of compactness.

In the geotechnical report, different foundations were recommended for the different structures as described in the sections below.

### 8.1.1 DEPRESSED CORRIDOR

The geotechnical report recommended three (3) different types of foundations including shallow foundations, drill shafts, and driven steel H-piles.

**Shallow Foundations**

The retaining walls and the undercrossing bridge structure may be founded on conventional spread/strip foundations, depending on settlement tolerances and constructability considerations. All spread footings should be provided with a minimum of 1.4m of soil cover for frost protection. In addition, the footings should extend below any existing fill or surficial organic materials. The allowable bearing capacity, similar to the Serviceability Limit State (SLS) condition, for footings with a minimum width of 3m is 225kPa.

**Drill Shafts**

Drilled shafts maybe be considered for support of the underpass structure. Drilled shaft installed to the tip elevation of about 184.2m may be designed using the allowable bearing resistance of 1400kN, 2000kN and 2500kN for 0.9m, 1.2m and 1.5m caisson diameters, respectively.

**Steel H-Piles**

H-piles (HP 310x110) is recommended as an alternative for the shallow foundations. The H-piles driven to the tip elevation of about 177.2m may be designed using an allowable shaft bearing capacity of 650kN.

### 8.1.2 OVERPASS STRUCTURE

The geotechnical report recommended three (3) different types of foundations including shallow foundations, drill shafts, and driven steel H-piles.

**Shallow Foundations**

The overhead structure abutments can be supported on shallow foundations approximately 3m wide, founded on the stiff to hard clayey silt and sand or compact to dense silt and sand till deposits underlying the existing fill can be designed with an Ultimate Limit States Resistance of 300 kPa and factored Serviceability Limit States Resistance of 225 kPa.

**Drill Shafts**

Drilled shafts maybe be considered for support of the overpass structure. Drilled shaft installed to the tip elevation of about 192.2m may be designed using the factored axial resistance at ULS of 1600kN, 2200kN and 3600kN for 0.9m, 1.2m and 1.5m caisson diameters, respectively.

**Steel H-Piles**

H-piles (HP 310x110) is recommended as an alternative for the shallow foundations. The H-piles driven to the tip elevation of about 185.2m may be designed using a factored axial resistance at ULS of 1000kN.

## 8.2 Dewatering Structure Excavations

For an underpass configuration, permanent drainage of the roadway and pavements will be required to reduce the potential for hydraulic uplift. During subgrade preparation a subdrain system could be installed beneath the pavement granular materials at an appropriate depth and spacing and of proper size to collect groundwater and direct it to a dedicated outlet. Depending on the retaining structure type selected to construct the underpass, effective drainage behind the walls may also be required. It is expected that either a deep gravity sewer or a pumping station will be required to manage groundwater flows.

If permanent dewatering/drainage is prohibited, the structure should be designed to resist uplift pressure based on a design water level at Elevation 200.6m using either a thickened bottom slab or vertical anchors extending into the underlying till strata.

# 9.0 Metrolinx Constraints

All works on, above or below Metrolinx property will need to be coordinated with railway operations and comply with the following Metrolinx requirements:

- Rules, policies, standards and procedures for working within Metrolinx right-of-way;
- Liability insurance requirements for works performed on and/or in proximity to the railway or within railway right-of-way; and,
- Safety and related requirements and instructions for work on railway right-of-way by non-Metrolinx personnel.

All works during prearranged work blocks under railway flagging protection have to be planned and carried out in a manner to leave the work zone at the end of work block in safe condition for railway traffic and operations.

The Underpass design for the rail grade separation will be designed in accordance with the minimum vertical clearance of 5.3m from the proposed road profile to the underside of the rail structure as per page 1-3 of the Metrolinx – General Guidelines for Design of Railway Bridges and Structures, 2018. The final design of the underpass will be subject to the findings and recommendations of the Metrolinx' s GO Expansion program's Stouffville Grade Separations Transit Project Assessment Project (TPAP) which is underway as of February 2020 at time of writing of this report.

# 10.0 ENVIRONMENTAL CONSTRAINTS

The review of background information of existing conditions confirmed that there are limited environmental sensitivities at the subject location. These are limited to noise sensitive areas, some minor vegetation removal, and the potential for nesting birds in the trees. Thus, the contract documents will include standard mitigation measures and best construction management practices to address typical environmental concerns related to the structural works such as noise, migratory bird nesting, and vegetation removal.

A Noise By-law exemption will be required for the night time construction activities outside of the permitted hours for noise. Confirmation will be determined as the design progresses, and, if required, will be secured prior to the completion of the detailed design assignment.

A Permit to Take Water (PTTW) from the Ministry of Environment, Conservation and Parks will likely be required for the ground water prior to excavation. All construction shall be carried out in a dry area and prevent contamination to the ground water.

# 11.0 MISCELLANEOUS

The final design of the underpass will be subject to the findings and recommendations of the Metrolinx' s GO Expansion program's Stouffville Grade Separations Transit Project Assessment Project (TPAP) which is underway as of February 2020 at time of writing of this report.

## 11.1 DESIGN CODE

The design of the depressed corridor will be undertaken in accordance with the CAN/CSA-S6—19 Canadian Highway Bridge Design Code (CHBDC), Ministry of Transportation of Ontario's "Structural Manual", and all other current directives and standards.

The design of the railway bridge will be undertaken in accordance with the latest edition of American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering and Metrolinx General Guidelines for Design of Railway Bridges and Structures.

## 11.2 ACCESS TO THE SITE

The site is readily accessible from Kennedy Road. The number of lanes will be maintained on Kennedy Road throughout the construction. The construction is anticipated to be three (3) to four (4) years. A traffic staging plan will be developed during the detailed design in consultation with the City of Markham, Metrolinx and York Region.

## 11.3 Property

Property acquisition is anticipated on the east side of the Kennedy Road within the project limits to accommodate a wider cross-section. Extent of the property acquisition will be determined during detailed design.

## 11.4 Utilities

The proposed grade separation on Kennedy Road has a significant impact to the existing underground utilities. Relocation of existing sanitary sewer and gas line maybe required.

## 11.5 Drainage

The proposed grade separation on Kennedy Road has a sag vertical curve, with the road going under the railway. A surface drainage system must be installed along the road along the depressed corridor.

## 11.6 Concrete

All cast-in-place concrete will be class C—1 concrete as per CSA A23.I. Min. 28 days concrete compressive strength in railway bridges:
Precast prestressed elements fc' = 50 MPa; and
Conventional reinforced concrete elements, fc' = 35 MPa

## 11.7 Structural Steel

All main plate girder, web flanges, and bearing stiffeners shall be CSA G40.21 Grade 350 at category 5. Other non-fracture critical members including connecting angles, rolled section diaphragms and all secondary members shall be CAN3-G40.21 Grade 350A. The bearing plates shall be CAN3-G40.21 Grade 300W.

The type of structural steel and non-ferrous bearing components in the proposed railway bridge shall be in accordance with the Metrolinx Guidelines, Part 2A, Chapter 15.

## 11.8 Reinforcing Steel

Stainless steel reinforcement will be used in areas of the components where their surfaces are within the splash zone, including the front face of the retaining wall, front face of the abutment wall, and the centre pier.

For all other components, black steel (Grade 400W) will be used as specified in Section 12 of the MTO Structural Manual and the MTO Bridge Office Memorandum dated November 22, 2010 “Reinforcing Steel”.

For Alterative 2, rebar welding is not allowed in any components in railway bridges and structures.

Prepared by


Geffrey Huang
Bridge Engineer
HDR Inc.

Reviewed by

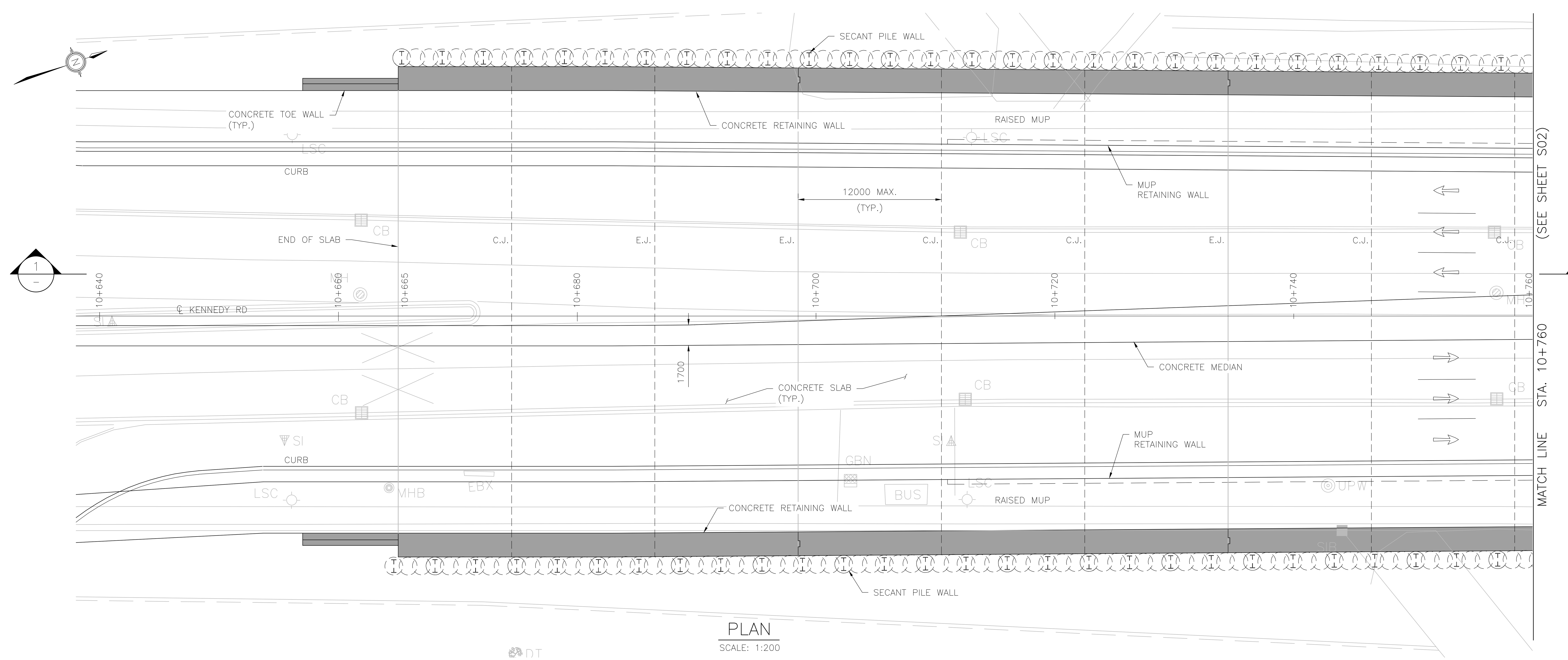

Jared Monkman, P.Eng
Bridges & Structures Lead Canada
HDR Inc.

# A

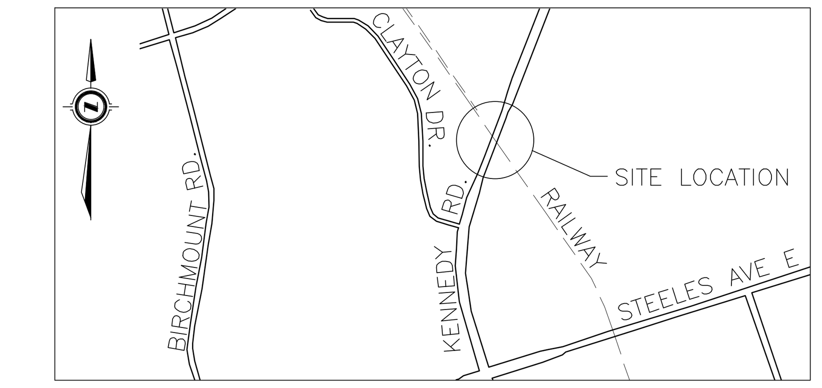
## Appendix

## Appendix A: Plan and Profile for Preferred Option

METRIC



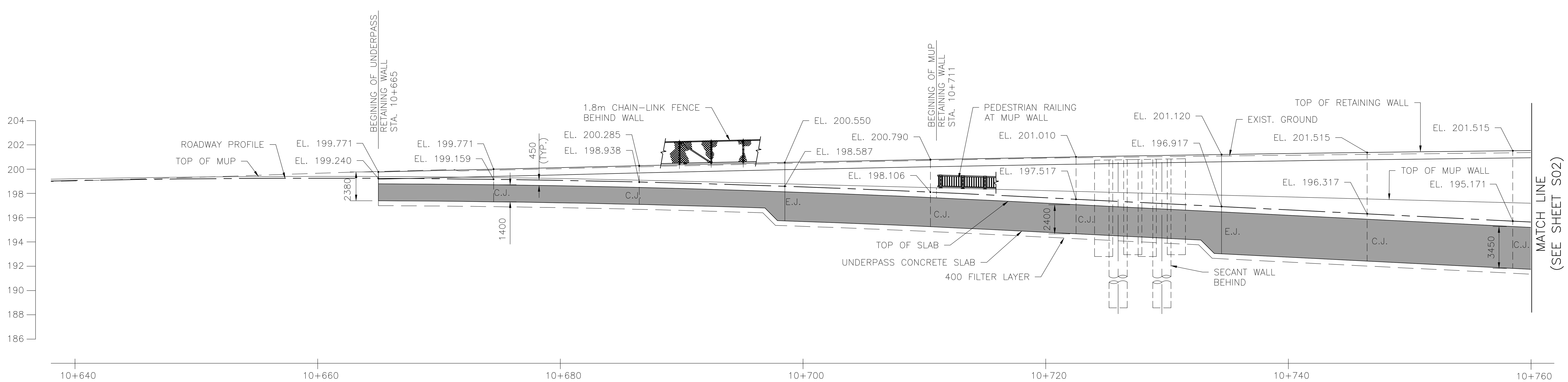

PLAN
SCALE: 1:200




KEY PLAN

## NOTES:

1. STRUCTURES SUBJECTED TO RAILWAY LOADING WILL BE DESIGNED IN ACCORDANCE WITH SCHEDULE 15 PART 3 DESIGN AND CONSTRUCTION REQUIREMENTS, AREMA MANUAL OF RAILWAY ENGINEERING, METROLINX DESIGN REQUIREMENT MANUAL AND CN GUIDELINES FOR THE DESIGN OF RAILWAY STRUCTURES.
   STRUCTURES NOT SUBJECTED TO RAILWAY LOADING WILL BE DESIGNED IN ACCORDANCE WITH SCHEDULE 15 PART 3 DESIGN AND CONSTRUCTION REQUIREMENTS, CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC).
2. LIVE LOAD: COOPER E90 PLUS DIESEL IMPACT AND ALTERNATE LOADING AS PER AREMA CLAUSE 1.3.3.




SECTION 1
SCALE: 1:200

NOTES:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. CONSULT THE RESPECTIVE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES TO DETERMINE THE EXACT LOCATION OF THEIR UTILITIES. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UTILITIES AND SHALL ADEQUATELY PROTECT AND SUPPORT THEM DURING CONSTRUCTION.

NOT FOR CONSTRUCTION


HDR
100 York Blvd., Suite 300,
Richmond Hill, ON, L4B 1J8
Phone (289) 695-4600
Fax (289) 695-4601


| No. | DATE | REVISIONS | BY |
|---|---|---|---|
| 1 | JULY 27,2020 | PRELIMINARY | S.M.B. |

York Region Transportation Services

| | |
|---|---|
| DESIGN | A.T. |
| DRAWN | M.V. |
| CHECKED | S.M.B. |

KENNEDY ROAD
STOUFFVILLE GO GRADE SEPARATION

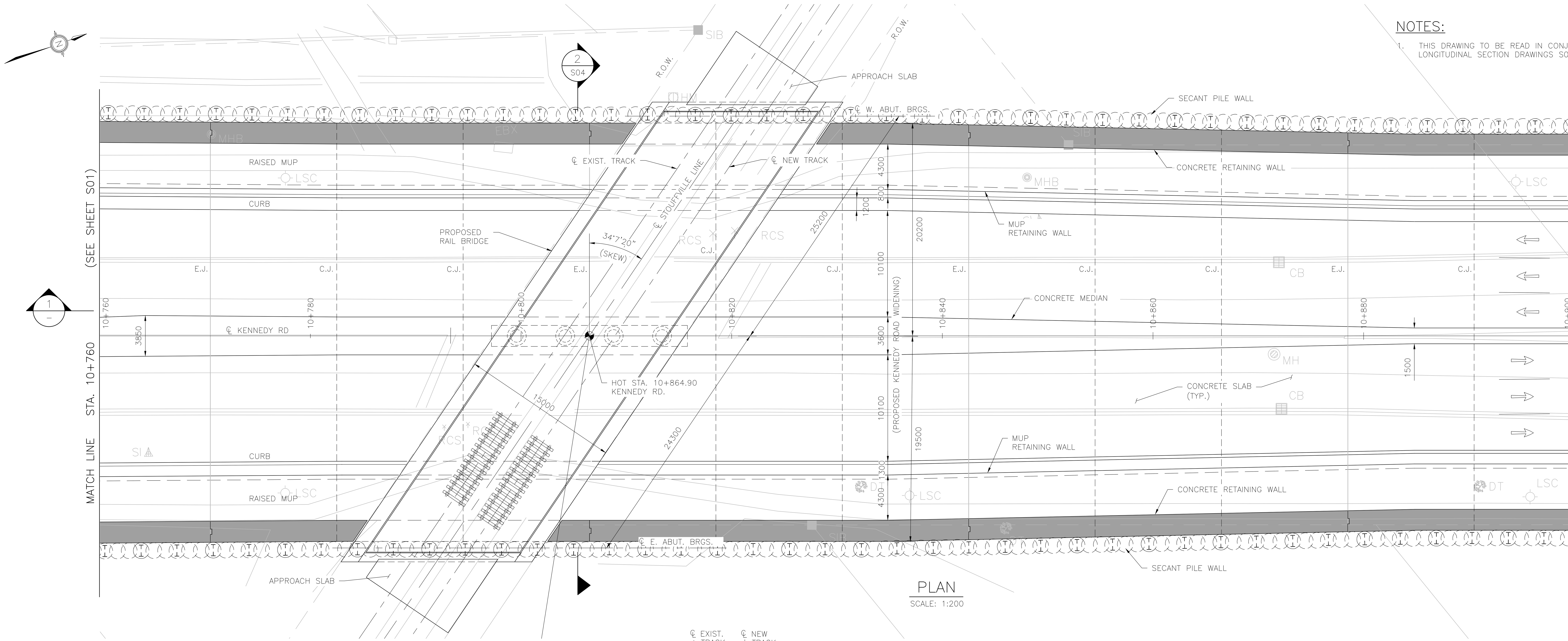
PLAN AND LONGITUDINAL SECTION
STA. 10+640 TO STA. 10+760

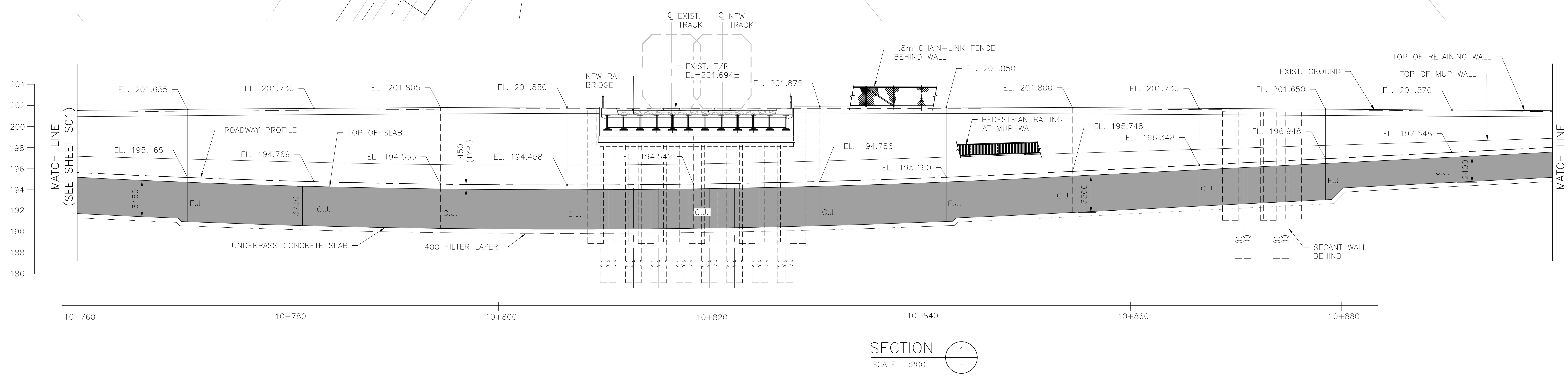
DWG. NO.
CONT. NO.
SHEET NO.
S-01

METRIC

NOTES:

1. THIS DRAWING TO BE READ IN CONJUCTION WITH PLAN AND LONGITUDINAL SECTION DRAWINGS S01 AND S03.




NOTES:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. CONSULT THE RESPECTIVE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES TO DETERMINE THE EXACT LOCATION OF THEIR UTILITIES. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UTILITIES AND SHALL ADEQUATELY PROTECT AND SUPPORT THEM DURING CONSTRUCTION.

NOT FOR CONSTRUCTION


HDR
100 York Blvd., Suite 300,
Richmond Hill, ON, L4B 1J8
Phone (289) 695-4600
Fax (289) 695-4601


| No. | DATE | REVISIONS | BY |
|---|---|---|---|
| 1 | JULY 27,2020 | PRELIMINARY | S.M.B. |

York Region Transportation Services

| | |
|---|---|
| DESIGN | A.T. |
| DRAWN | M.V. |
| CHECKED | S.M.B. |

KENNEDY ROAD
STOUFFVILLE GO GRADE SEPARATION

PLAN AND LONGITUDINAL SECTION
STA. 10+760 TO STA. 10+900

DWG. NO.

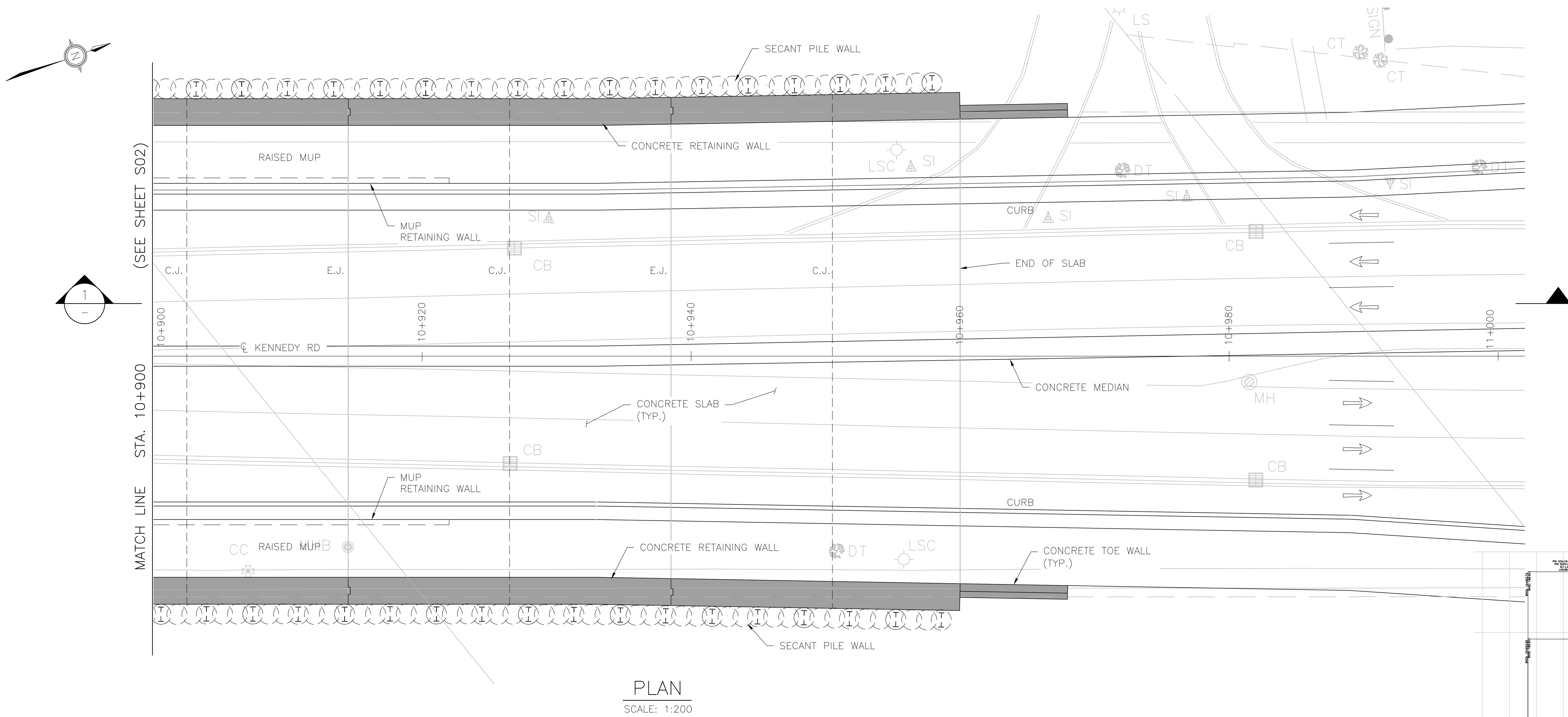
CONT. NO.

SHEET NO. S-02

METRIC

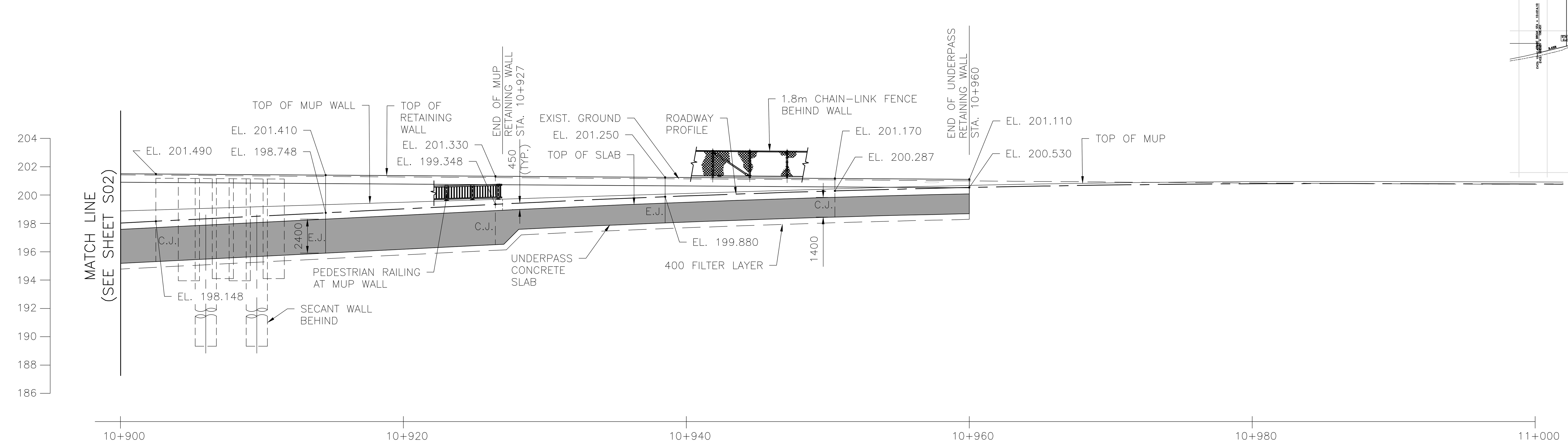
NOTES:

1. THIS DRAWING TO BE READ IN CONJUCTION WITH PLAN AND LONGITUDINAL SECTION DRAWING S02.



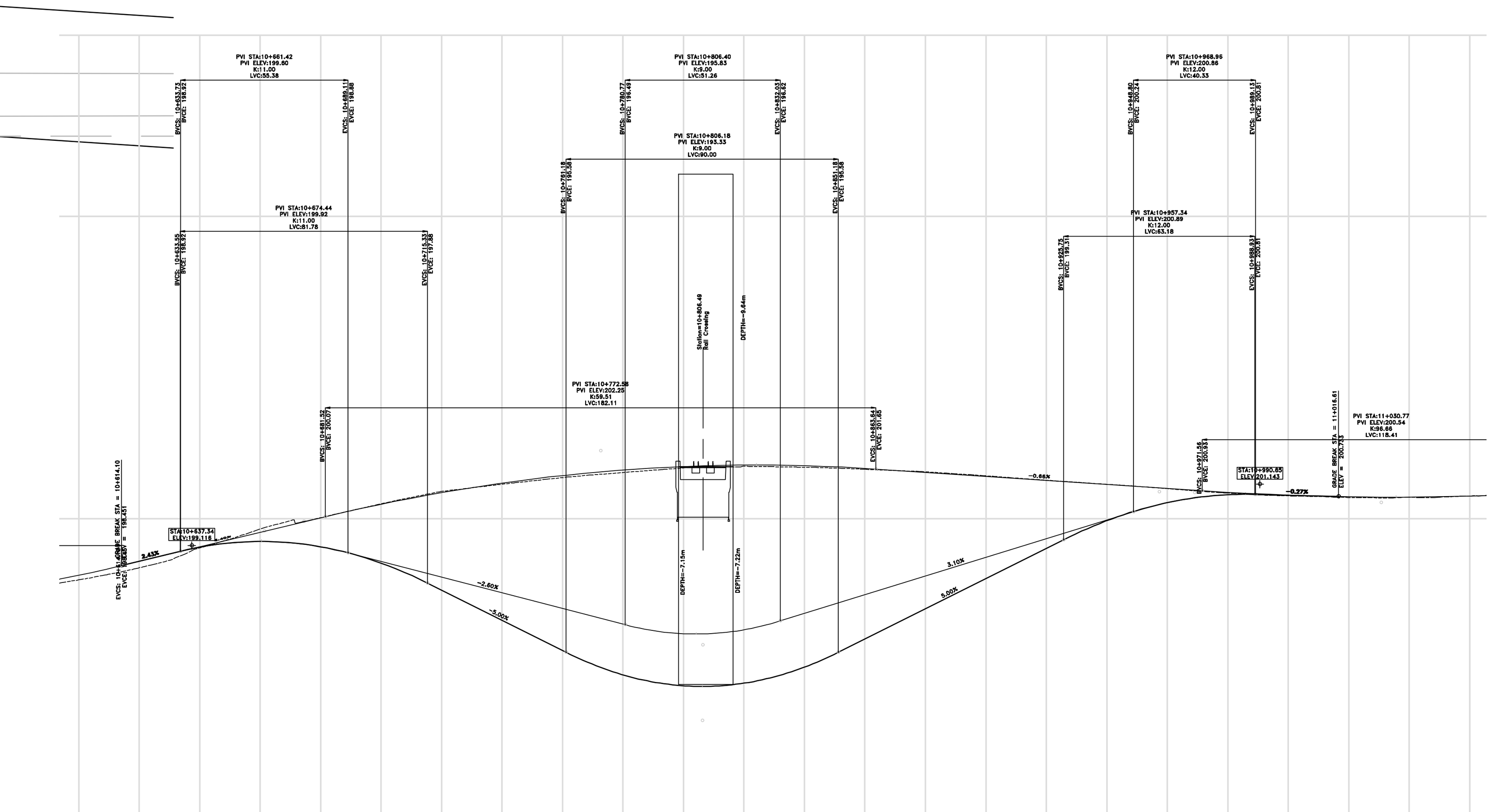

PLAN

SCALE: 1:200




SECTION 1

SCALE: 1:200



NOTES:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. CONSULT THE RESPECTIVE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES TO DETERMINE THE EXACT LOCATION OF THEIR UTILITIES. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UTILITIES AND SHALL ADEQUATELY PROTECT AND SUPPORT THEM DURING CONSTRUCTION.

NOT FOR CONSTRUCTION


HDR
100 York Blvd., Suite 300, Richmond Hill, ON, L4B 1J8
Phone (289) 695-4600
Fax (289) 695-4601


| No. | DATE | REVISIONS | BY |
|---|---|---|---|
| 1 | JULY 27,2020 | PRELIMINARY | S.M.B. |

York Region Transportation Services

| | |
|---|---|
| DESIGN | A.T. |
| DRAWN | M.V. |
| CHECKED | S.M.B. |

KENNEDY ROAD
STOUFFVILLE GO GRADE SEPARATION

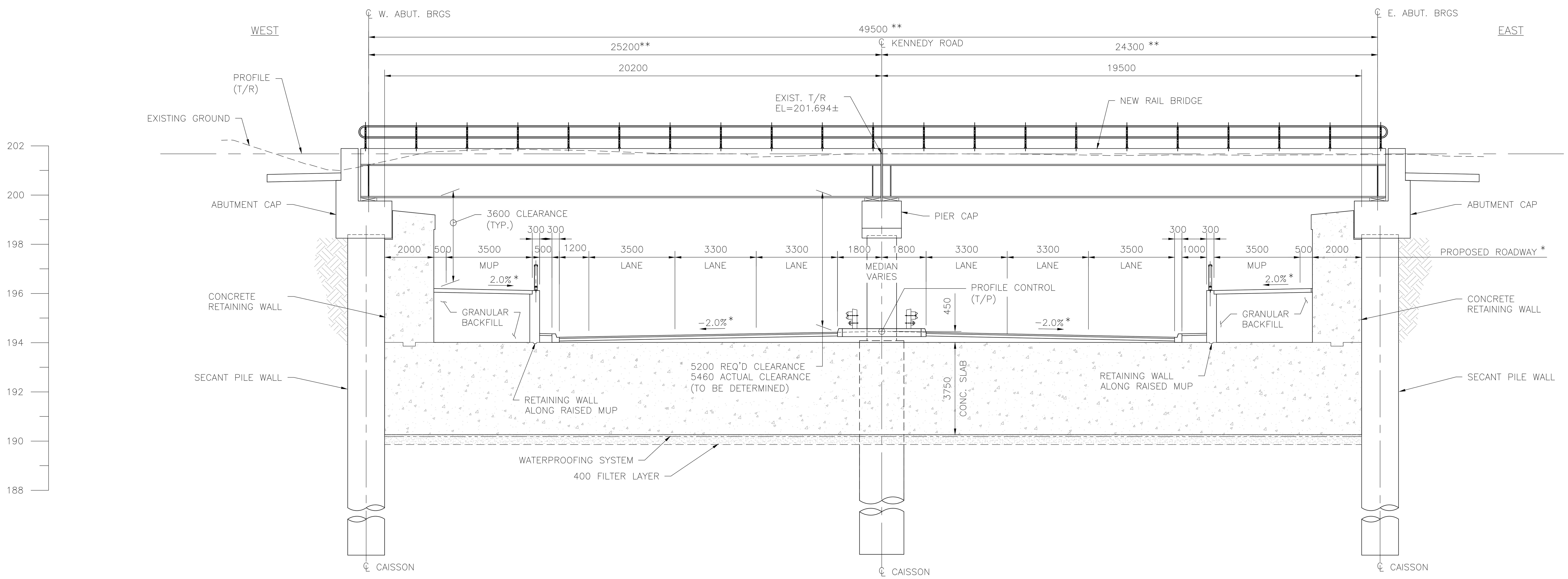
PLAN AND LONGITUDINAL SECTION
STA. 10+900 TO STA. 11+000

DWG. NO.

CONT. NO.

SHEET NO. S-03

METRIC




SECTION 2
SCALE: 1:100

NOTE:
(*) DENOTES DIMENSIONS AND CROSS-FALL MEASURED PERPENDICULAR TO ℄ OF KENNDY ROAD

(**) DENOTES DIMENSIONS MEASURED SKEW TO ℄ OF KENNDY ROAD

NOTES:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. CONSULT THE RESPECTIVE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES TO DETERMINE THE EXACT LOCATION OF THEIR UTILITIES. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UTILITIES AND SHALL ADEQUATELY PROTECT AND SUPPORT THEM DURING CONSTRUCTION.

NOT FOR CONSTRUCTION


HDR
100 York Blvd., Suite 300, Richmond Hill, ON, L4B 1J8
Phone (289) 695-4600
Fax (289) 695-4601


| No. | DATE | REVISIONS | BY |
|---|---|---|---|
| 1 | JULY 27,2020 | PRELIMINARY | S.M.B. |

York Region Transportation Services

| | |
|---|---|
| DESIGN | A.T. |
| DRAWN | M.V. |
| CHECKED | S.M.B. |

KENNEDY ROAD
STOUFFVILLE GO GRADE SEPARATION

CROSS SECTION

DWG. NO.
CONT. NO.
SHEET NO. S-04