

APPENDIX

O STRUCTURAL ASSESSMENT





December 15, 2022

Soheil Nejatian, P.Eng.
Sr. Project Engineer – Capital Works
City of Brampton

Subject: Bridge Alternative Evaluation of Crossings A, C, D, E and H
Client ref.: Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47) – Part B

Dear Sir:

We have prepared conceptual General Arrangement drawings for bridge crossings A, C, D, E and H as part of this Municipal Class EA Area 47 Part B. A brief evaluation of the bridge structure types chosen is included below.

Crossing A, C, D, and E

Each of these structures is a single span vehicular bridge over a watercourse with spans varying from 35 to 40 m. As each of these crossings has similar constraints, we have evaluated two bridge superstructure alternatives, and used the chosen alternative for each of the conceptual designs.

Concrete slab on Steel Plate Girder Superstructure:

Steel plate girders are commonly used for vehicular bridges over water courses as they are constructable and economical. A main benefit of steel girders is that they can be designed to provide a shallow superstructure depth, which increases the clearance to the water. To prevent deterioration at the girder ends, joints at the ends should be eliminated by using either a fully integral or semi-integral configuration. The exterior girders could also be metallized or coated to improve durability. A steel plate girder bridge is generally about 20% more expensive than a comparable concrete girder bridge and is more subject to material price fluctuations, however fabricated steel girders are readily available and can be produced by several local companies.

Concrete slab on Concrete Prestressed NU Girder Superstructure:

Prestressed concrete NU girders are also commonly used for vehicular bridges over water courses and follow a similar construction method to steel plate girder bridge construction. Prestressed concrete girders for these span lengths would need to be deeper than a steel plate girder and would either reduce the hydraulic clearance or require a raise in road profile to accommodate the required clearances. To prevent deterioration at the girder ends, joints at the ends should be eliminated by using either a fully integral or semi-integral configuration. A concrete prestressed girder bridge is generally about 20% less expensive than a comparable steel plate girder bridge, however this does not consider indirect costs due to a potential profile raise of the road and the associated grading and property impacts. Our experience on recent projects has shown that very few companies can fabricate these girders to meet the most recent Ontario standards, and supply of the girders is unreliable and subject to a long lead time.

Chosen Conceptual Design Bridge Type:

Both structure types are viable options. The steel plate girder option was chosen for the conceptual design, especially considering the hydraulic clearance. During the detailed design process, the concrete girder option could be reviewed and implemented.

Crossing H:

Crossing H is a 17m single span vehicular structure over the Rainbow Creek Tributary.

Cast-in-Place Rigid Frame:

A rigid frame bridge structure is the most efficient and durable structure type and would convey the required channel width. The rigid frame configuration allows the top slab of the bridge to be shallow and provides more vertical clearance from underside of the structure to the watercourse below. The cost of this option is expected to be similar to the precast option, but construction duration is longer.

Precast Concrete Arch Units

A system with cast-in-place concrete footings and precast arch sections is also a feasible option but has some disadvantages for durability, especially with the joints between the precast units often leaking and causing localized defects. Construction is generally faster when compared to a cast-in-place rigid frame bridge

Chosen Conceptual Design Bridge Type:

We have chosen the cast-in-place rigid frame structure as it is the most efficient and durable structure type. During the detailed design process, the precast arch unit structure type can also be reviewed and implemented.

Yours sincerely,



Nathan Kranendonk, P.Eng.
Intermediate Bridge Engineer



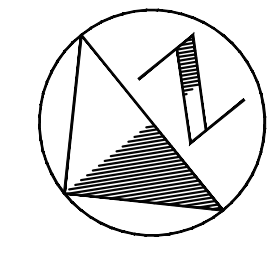
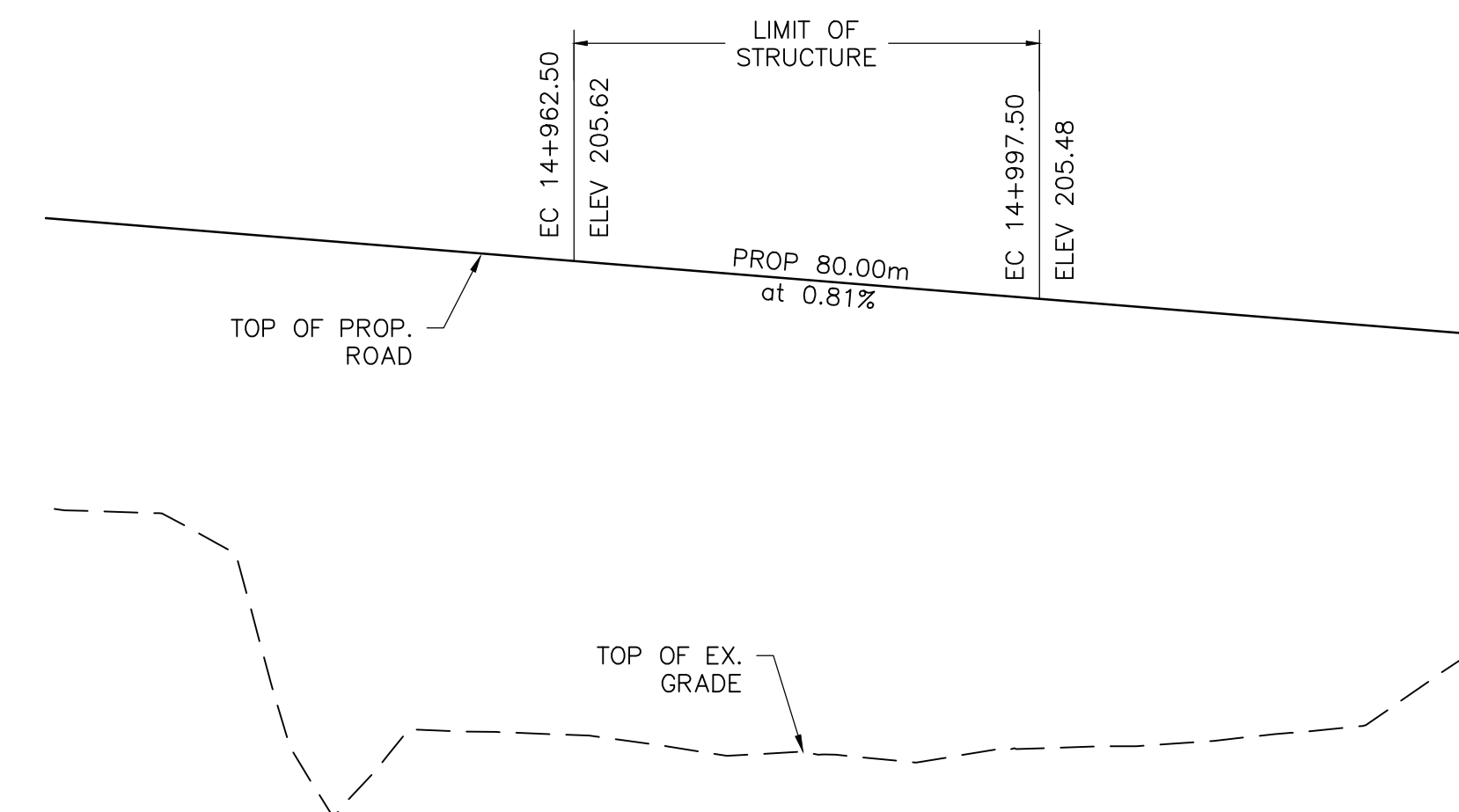
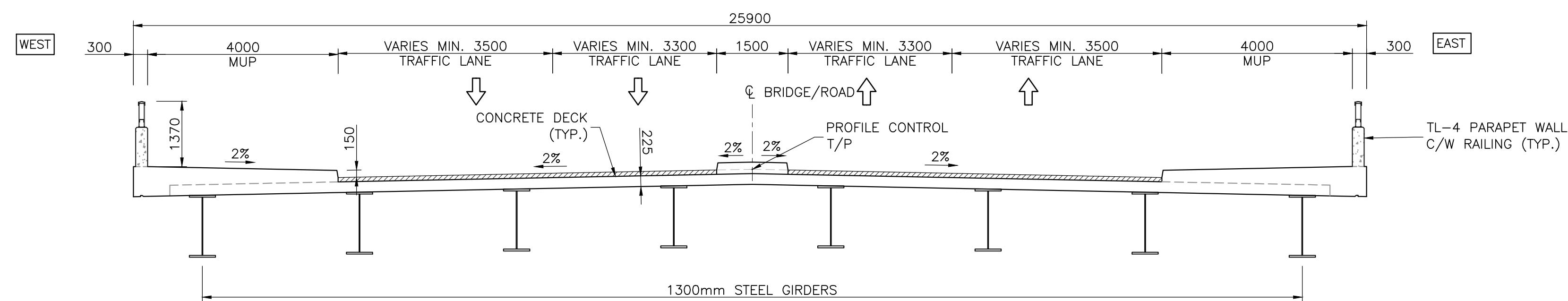
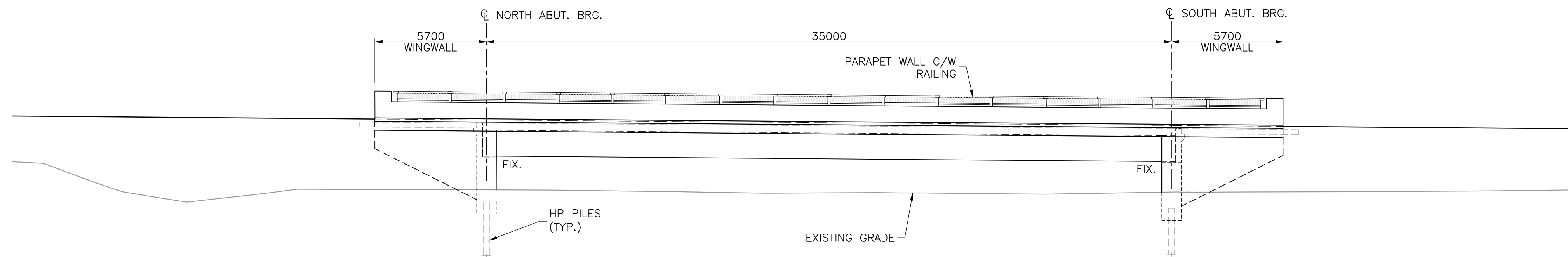
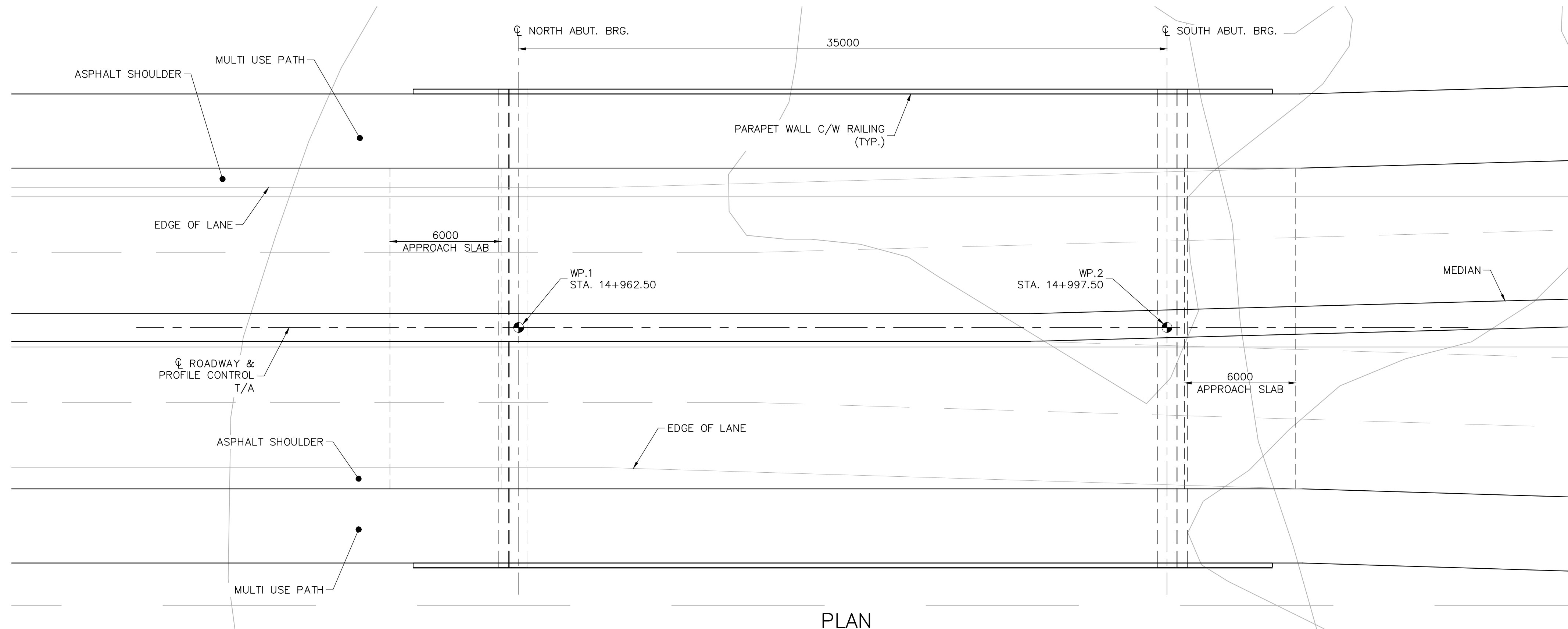
Karam Albazi, P.Eng.
Senior Bridge Lead Engineer

NK/KA

cc: Muhammad Khan, Aniq Shams

Encl. N/A

WSP ref.: TP115086



GENERAL NOTES:
CLASS OF CONCRETE:
 ALL CONCRETE 30 MPa
REINFORCING STEEL:
 1. REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.

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 modusz@rambert

No.	DATE	BY	REVISIONS	MAN	CAD

APPROVALS	
Municipal	Regional
Engineer	Engineer
Date	Date

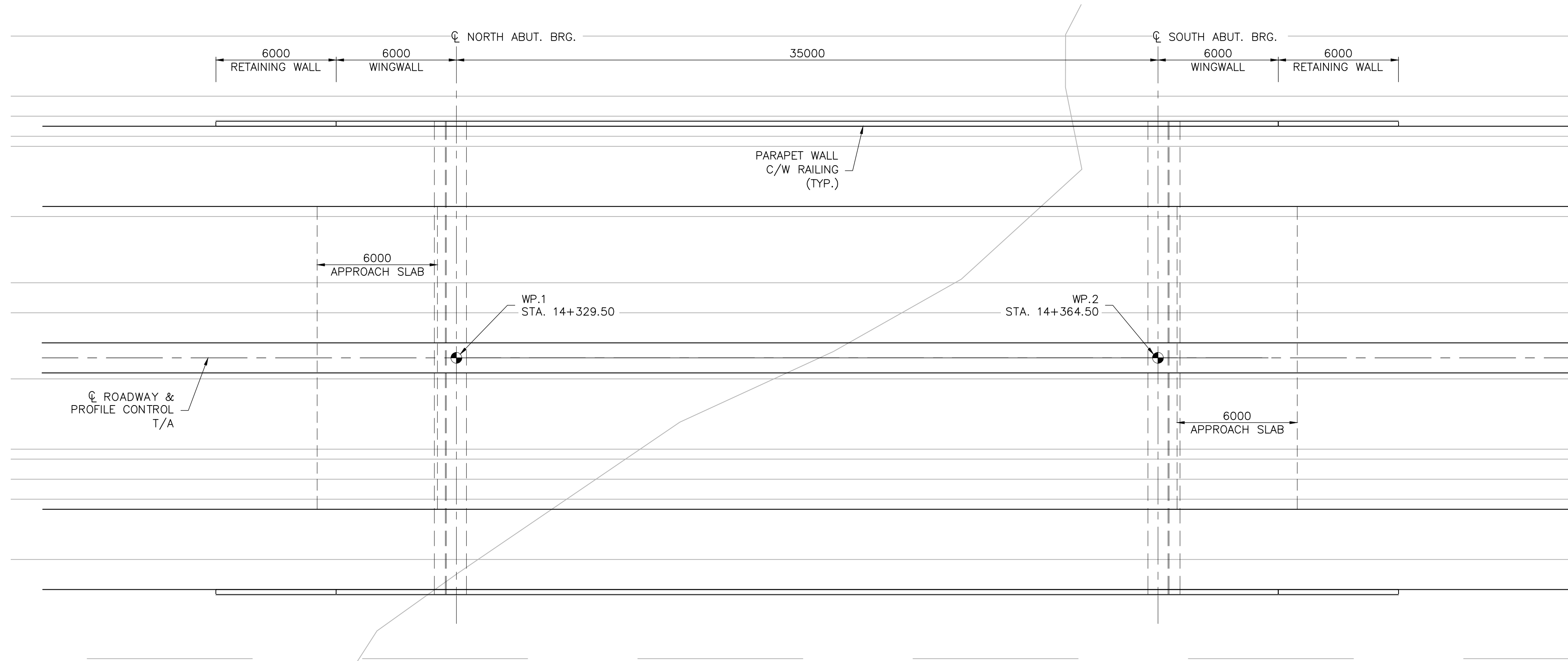
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CITY OF BRAMPTON
E-W ARTERIAL OVER GORE
TRIBUTARY

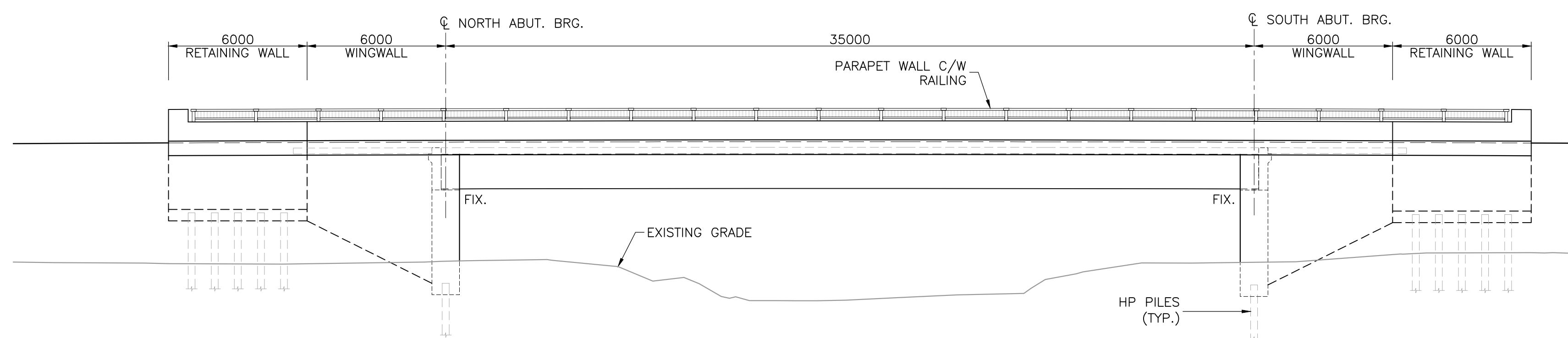
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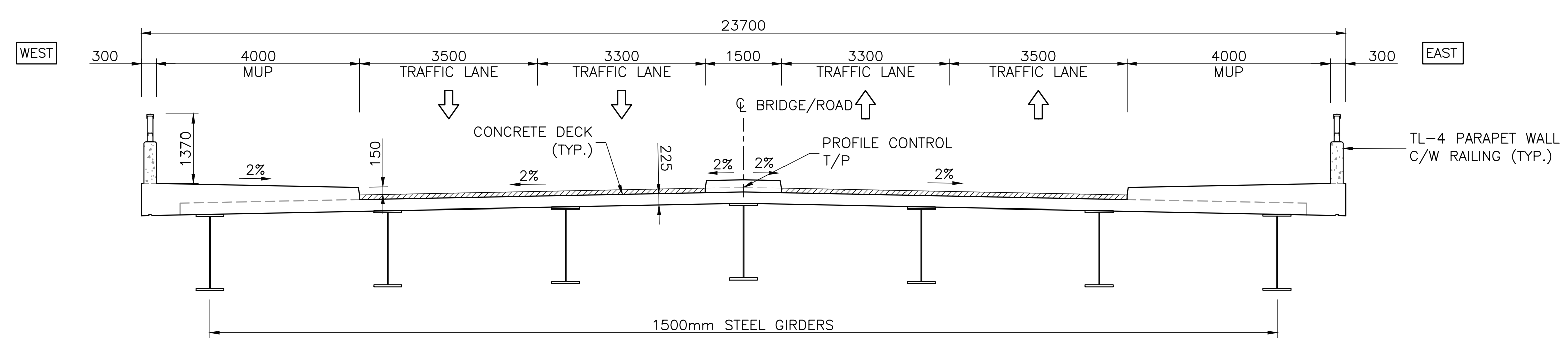
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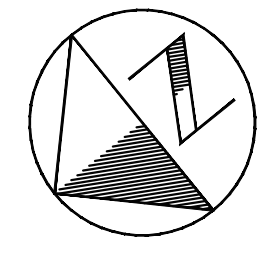
PLAN
SCALE 1:150



ELEVATION
SCALE 1:150



SECTION
SCALE 1:75



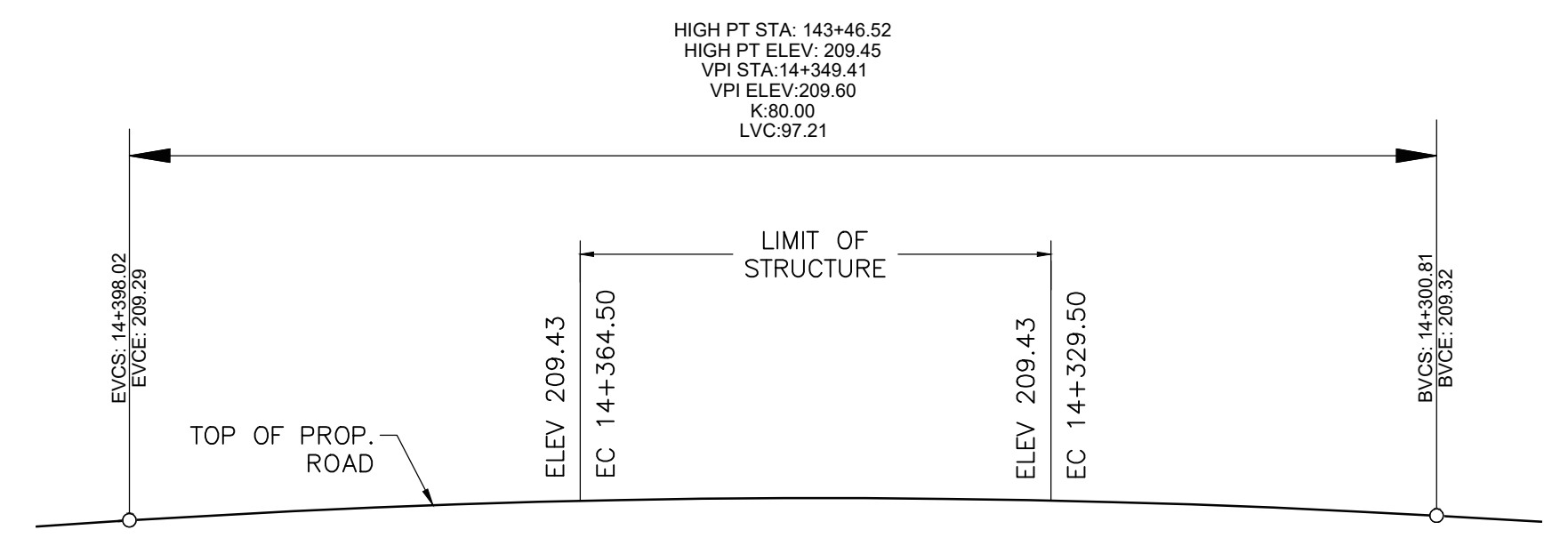
GENERAL NOTES:

CLASS OF CONCRETE:

ALL CONCRETE 30 MPa

REINFORCING STEEL:

1. REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.



E-W ARTERIAL PROFILE
N.T.S.

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APPROVALS	
Municipal Engineer Date	Regional Engineer Date

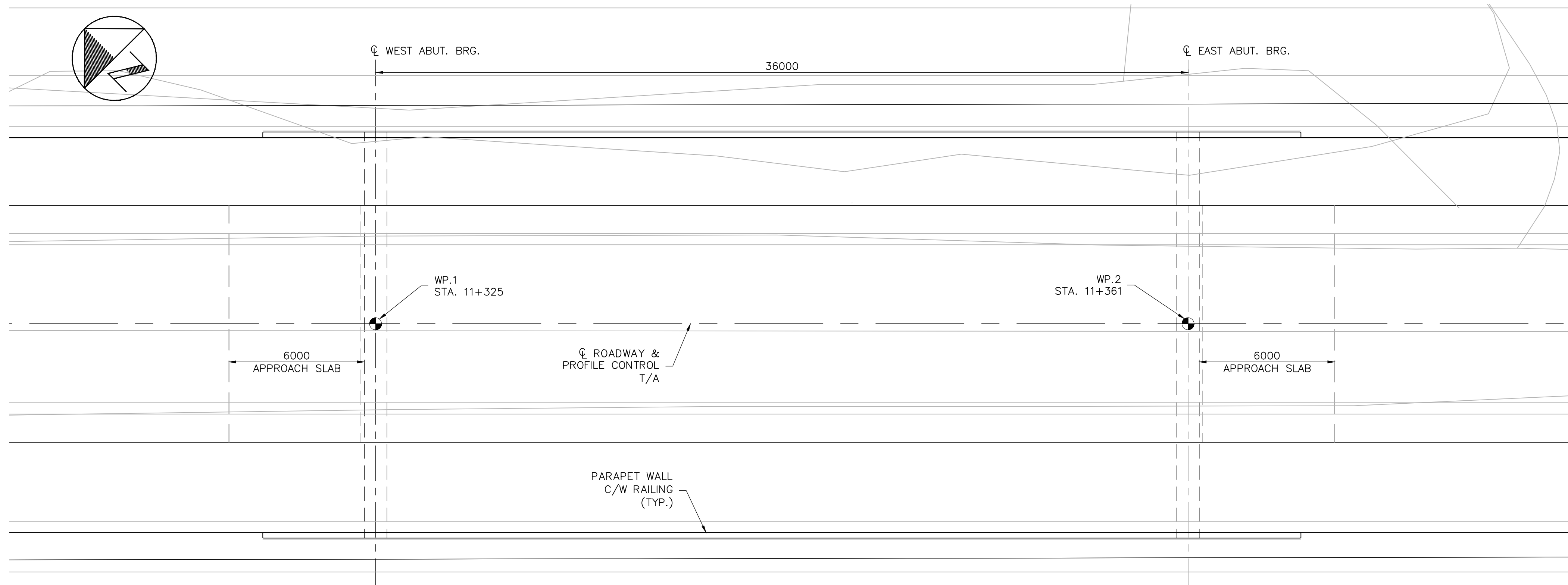
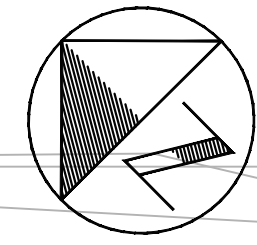
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**CITY OF BRAMPTON
E-W ARTERIAL OVER
CLARKWAY TRIBUTARY**

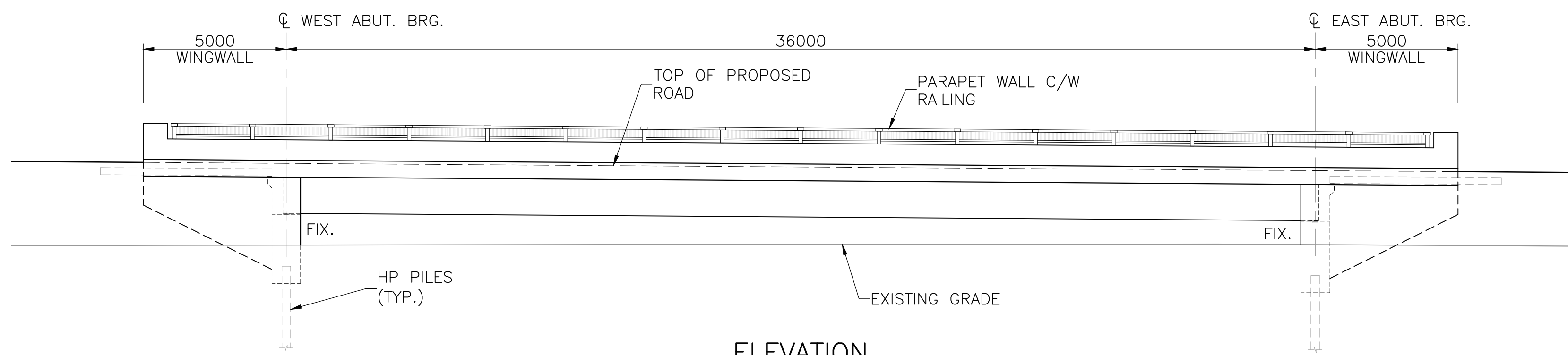
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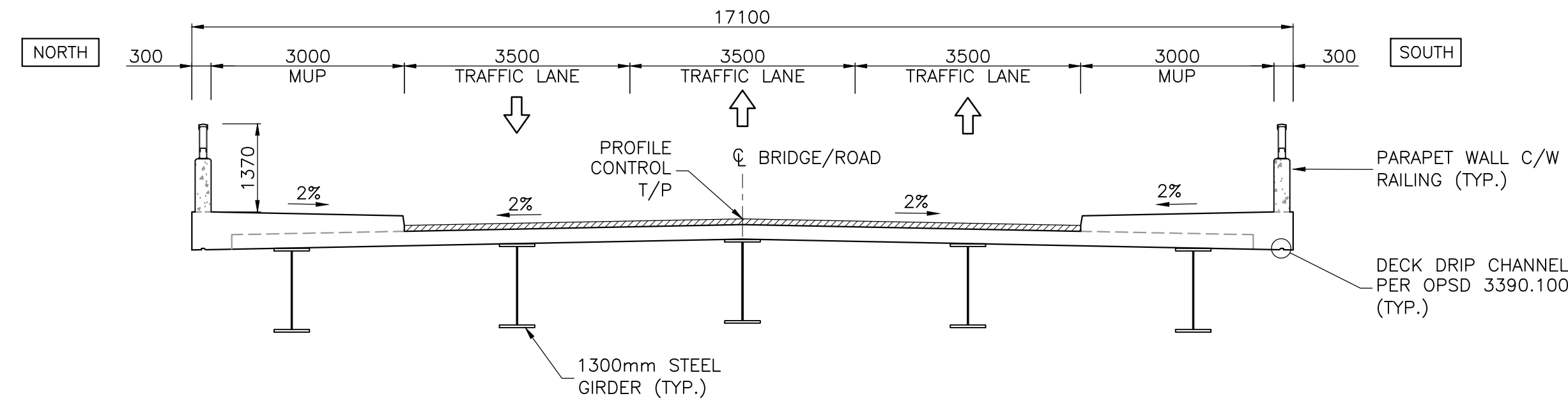
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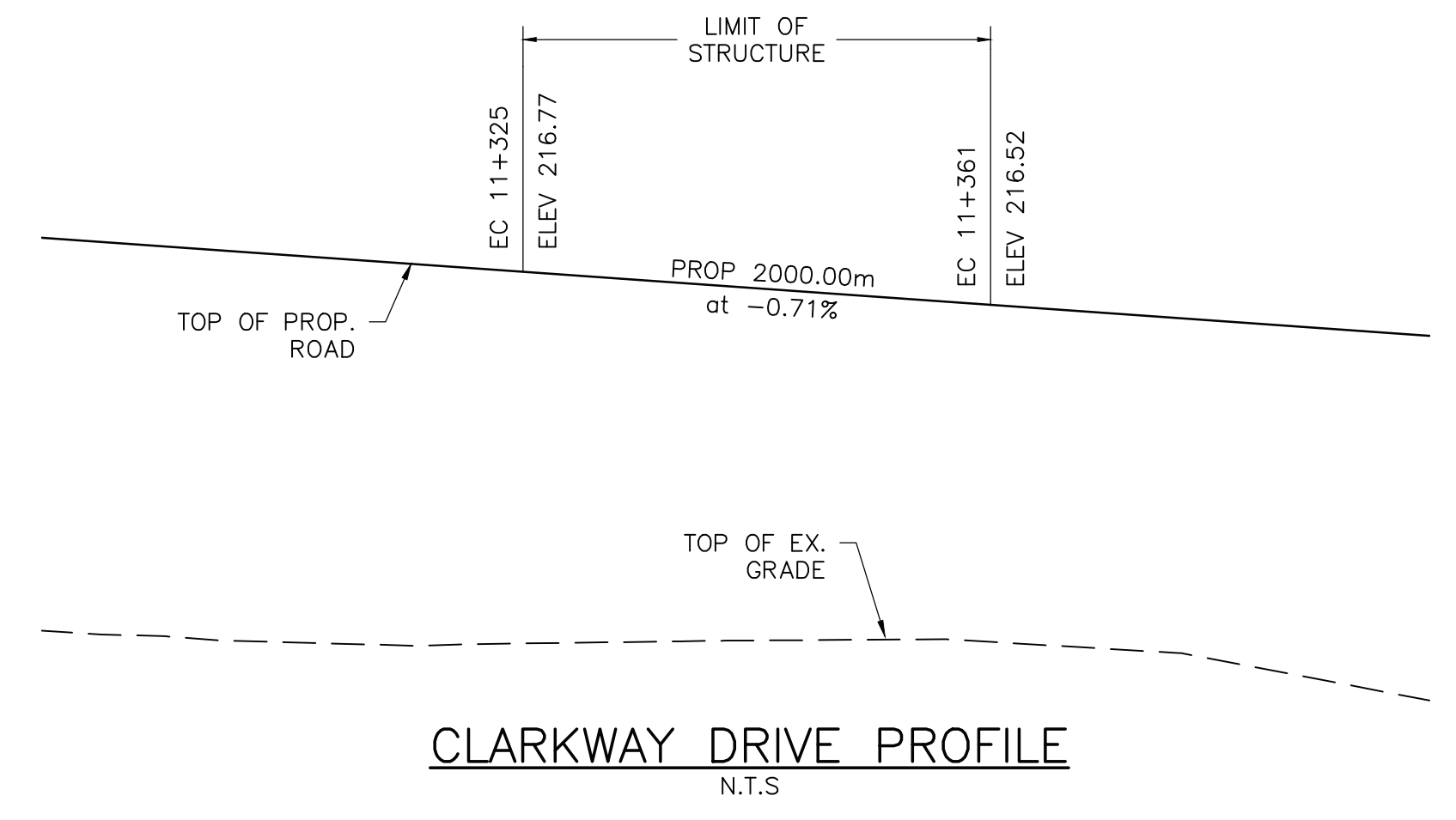
PLAN
SCALE 1:125



ELEVATION
SCALE 1:125



SECTION
SCALE 1:75



CLARKWAY DRIVE PROFILE
N.T.S

GENERAL NOTES:

- CLASS OF CONCRETE:**
ALL CONCRETE 30 MPa
- REINFORCING STEEL:**
1. REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.

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Municipal	Regional
Engineer	Engineer
Date	Date

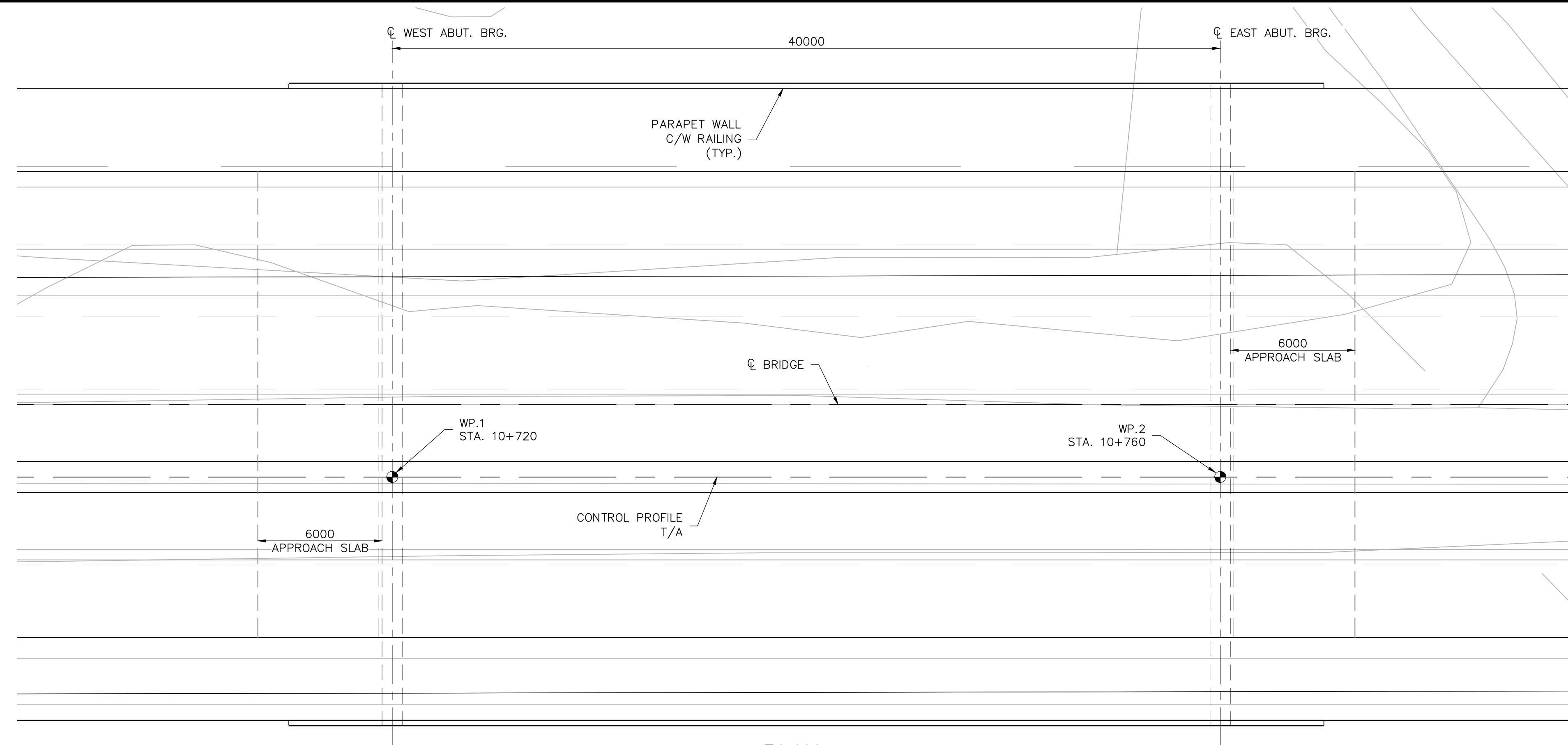
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Date	OCTOBER 2022		

CITY OF BRAMPTON
CLARKWAY DRIVE OVER
CLARKWAY TRIBUTARY

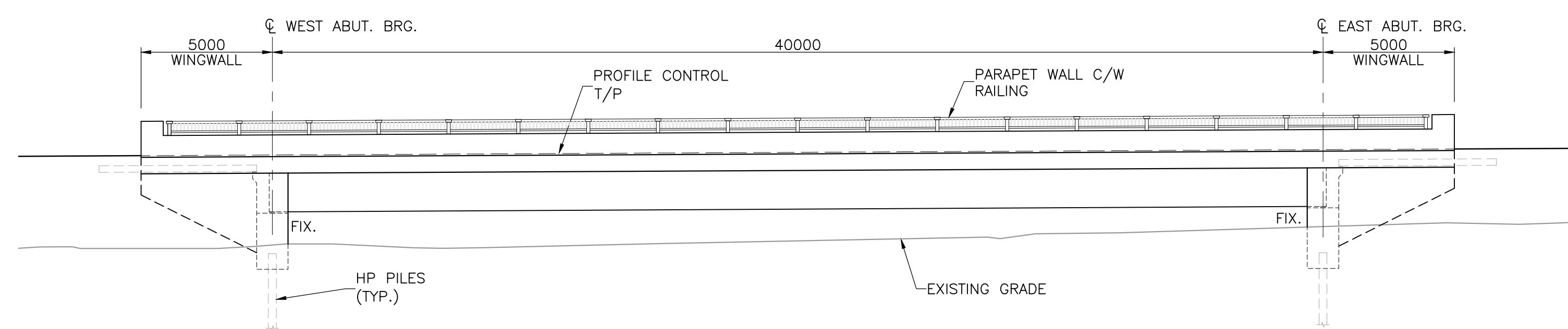
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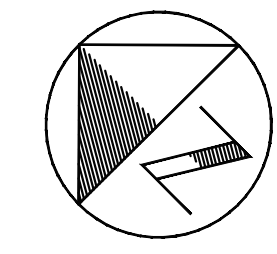
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PLAN
SCALE 1:150



ELEVATION
SCALE 1:150



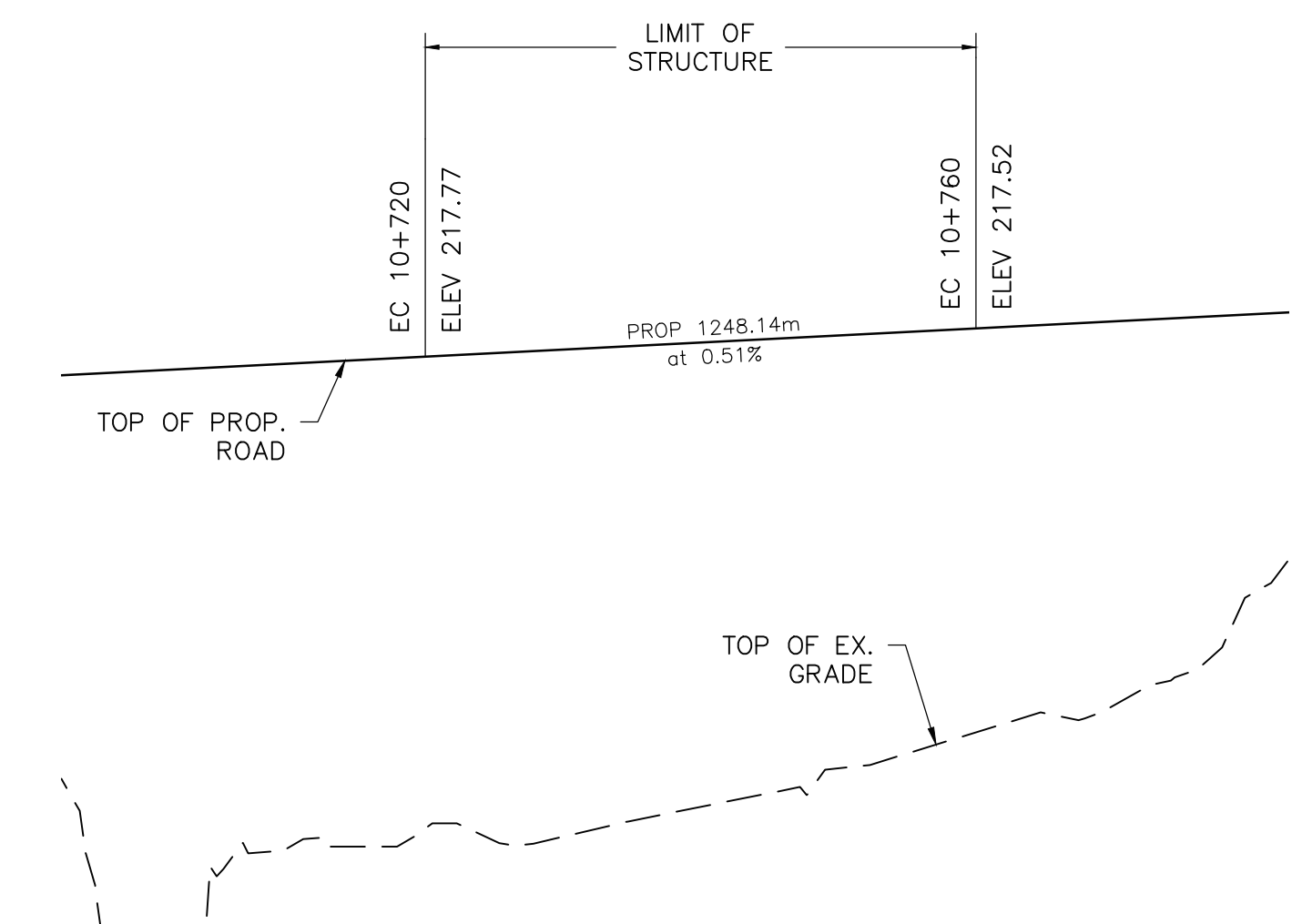
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CLASS OF CONCRETE:

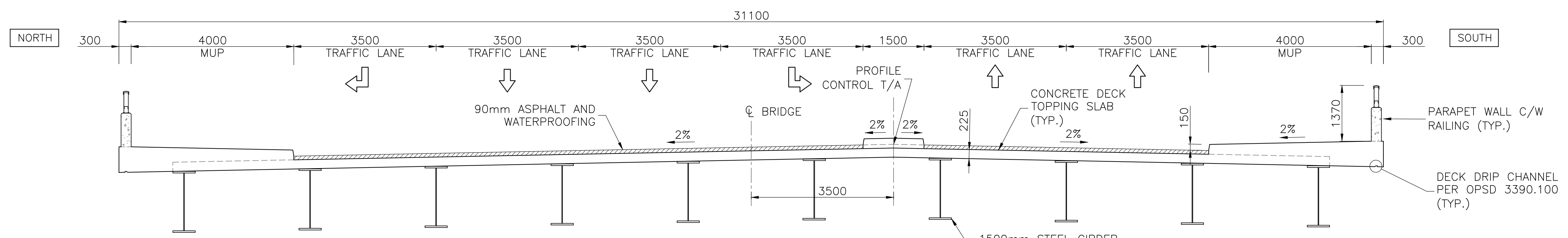
ALL CONCRETE 30 MPa

REINFORCING STEEL:

1. REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.



COUNTRYSIDE DRIVE PROFILE
N.T.S.



SECTION
SCALE 1:75

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Engineer	Engineer
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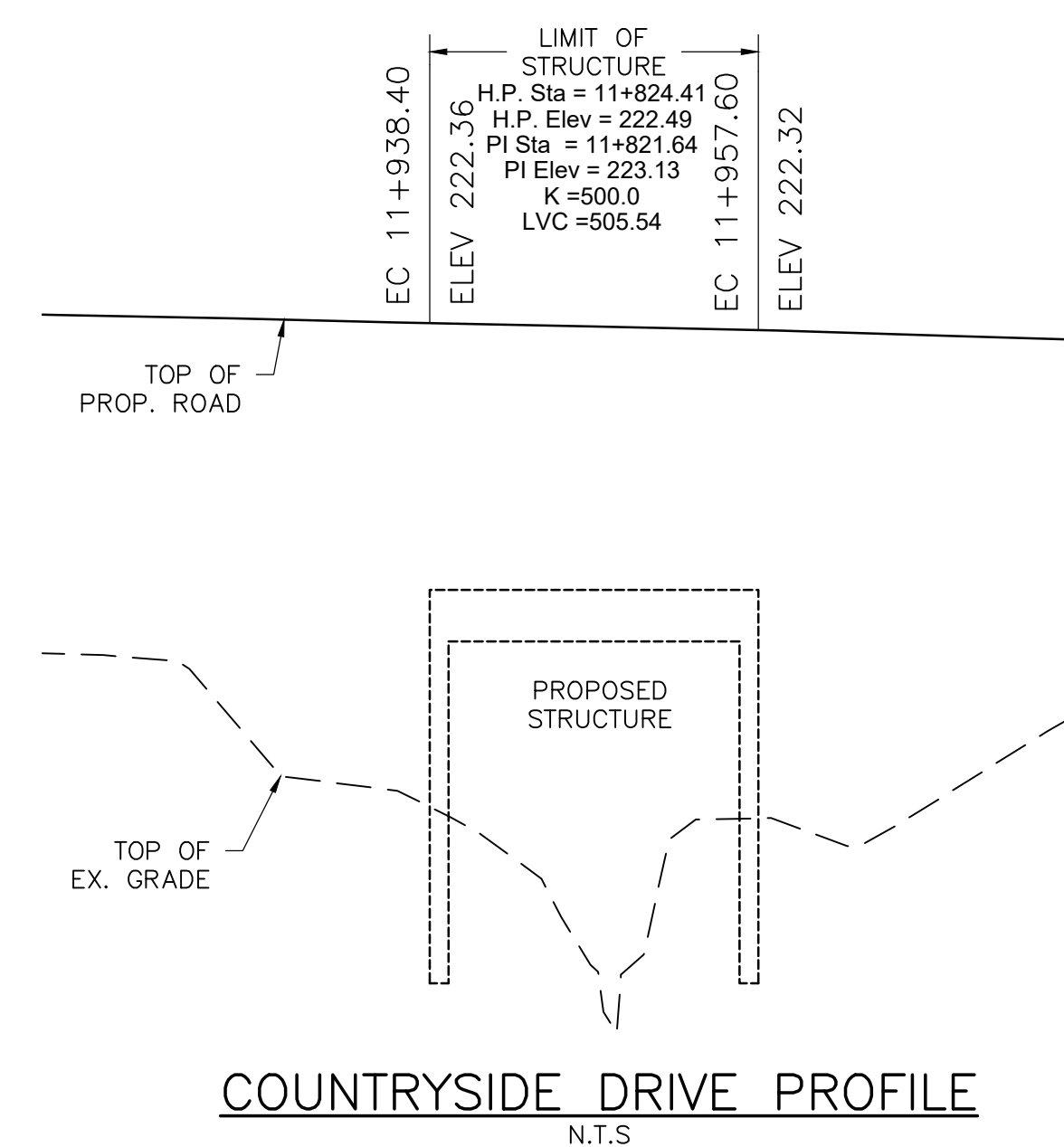
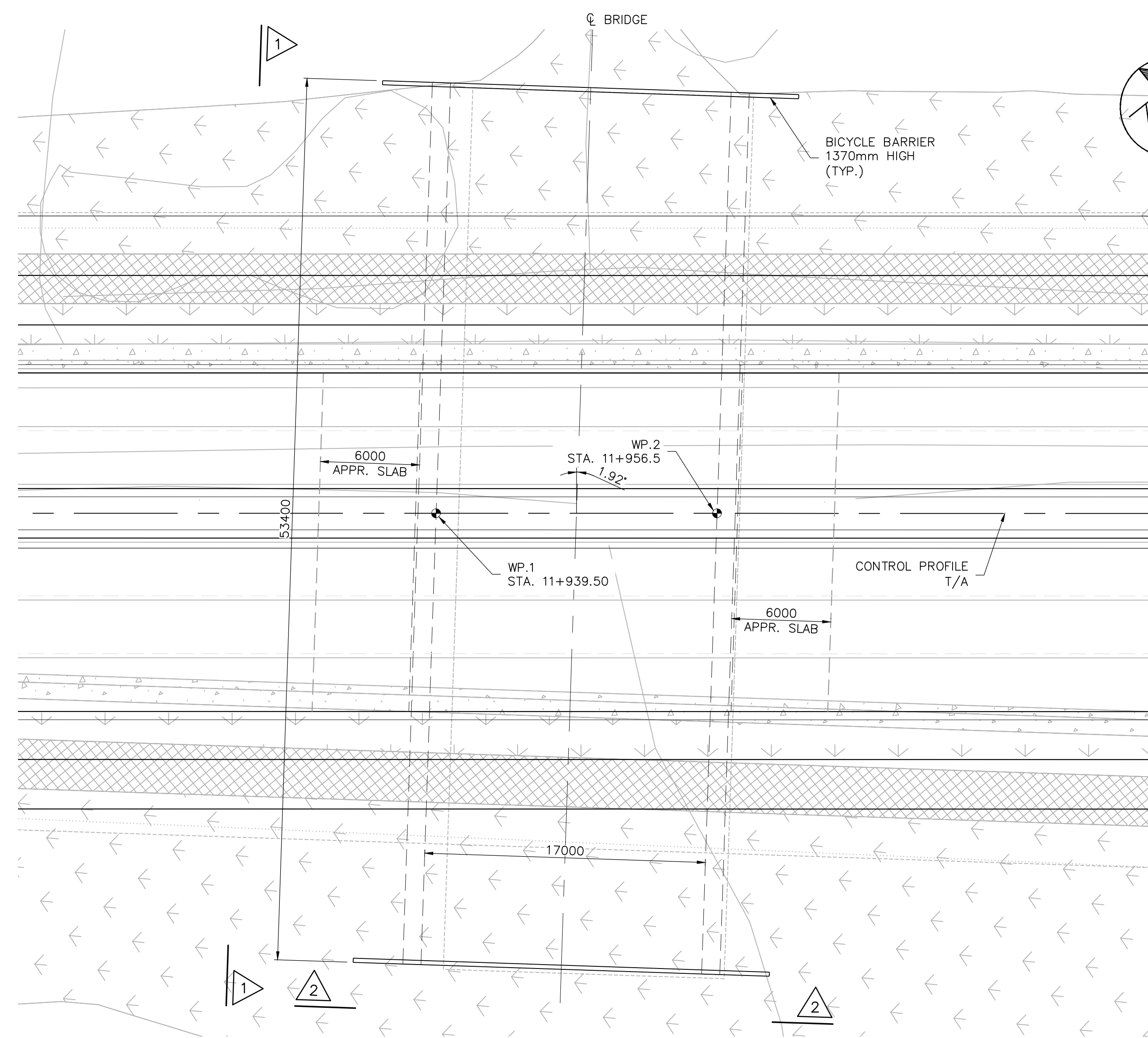
CITY OF BRAMPTON
COUNTRYSIDE DRIVE OVER
CLARKWAY TRIBUTARY

CROSSING E

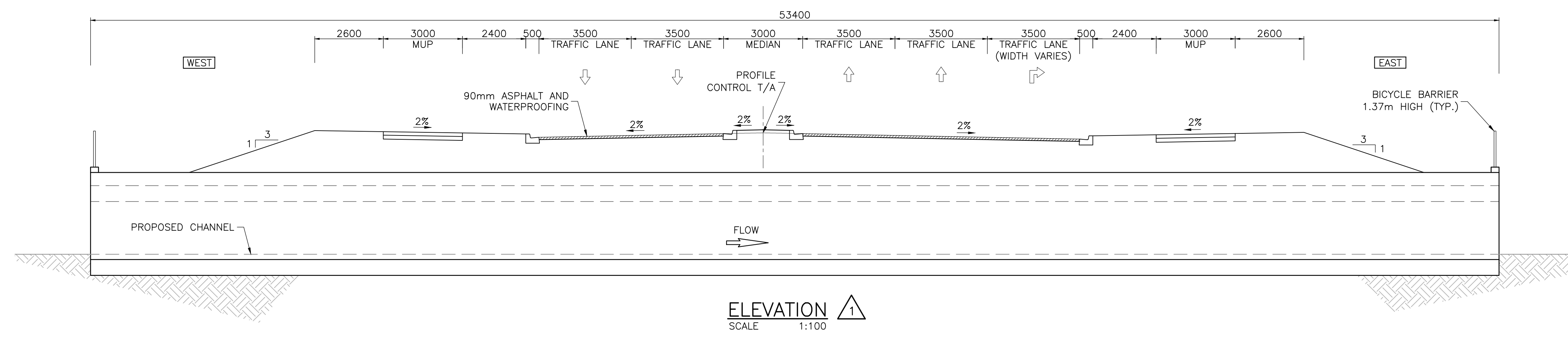
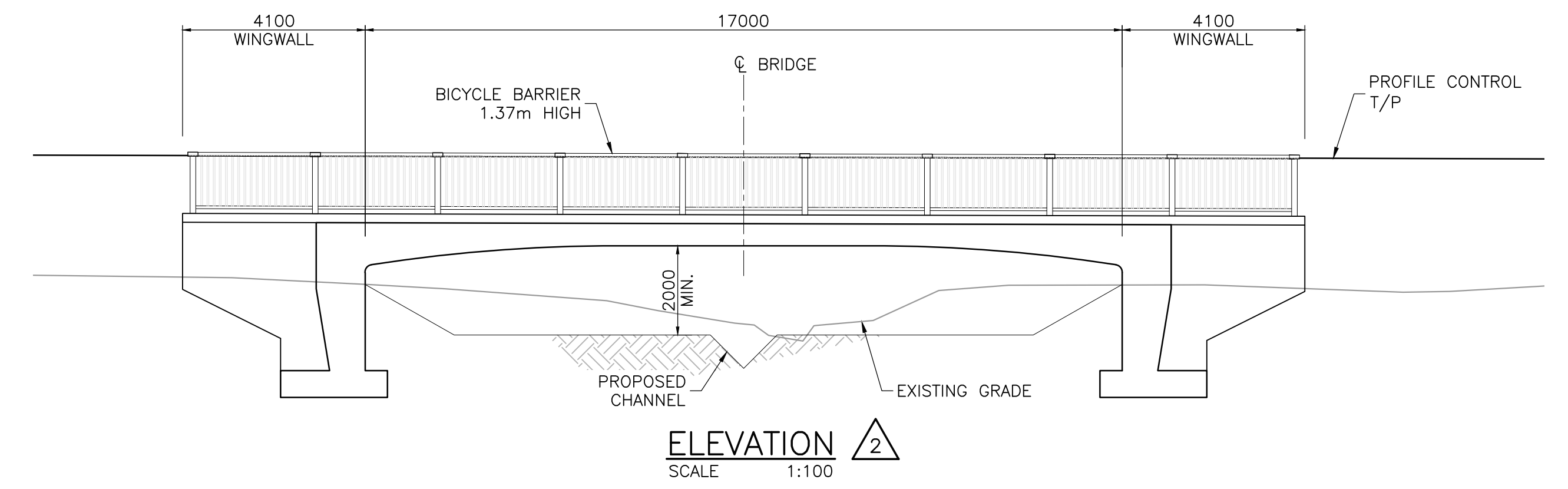
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- GENERAL NOTES:**
- CLASS OF CONCRETE**
- ALL CONCRETE UNLESS OTHERWISE SPECIFIED 30MPa
- REINFORCING STEEL**
- REINFORCING STEEL SHALL BE GRADE 400W UNLESS OTHERWISE SPECIFIED. BARS MARKED WITH SUFFIX 'C' DENOTES COATED BARS.
- CONSTRUCTION NOTES**
- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm



No.	DATE	BY	REVISIONS	MAN	CAD

APPROVALS	
Municipal	Regional
Engineer	Engineer
Date	Date

Design	N.K.	Checked	K.A.
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Scale	AS SHOWN		
Date	OCTOBER 2022		

CITY OF BRAMPTON
COUNTRYSIDE DRIVE OVER
RAINBOW CREEK TRIBUTARY

CROSSING H

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