

Lower Don River West
Pedestrian Tunnel under Bala Subdivision

FUNCTIONAL DESIGN REPORT

URS

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Markham, ON L3T 7N9

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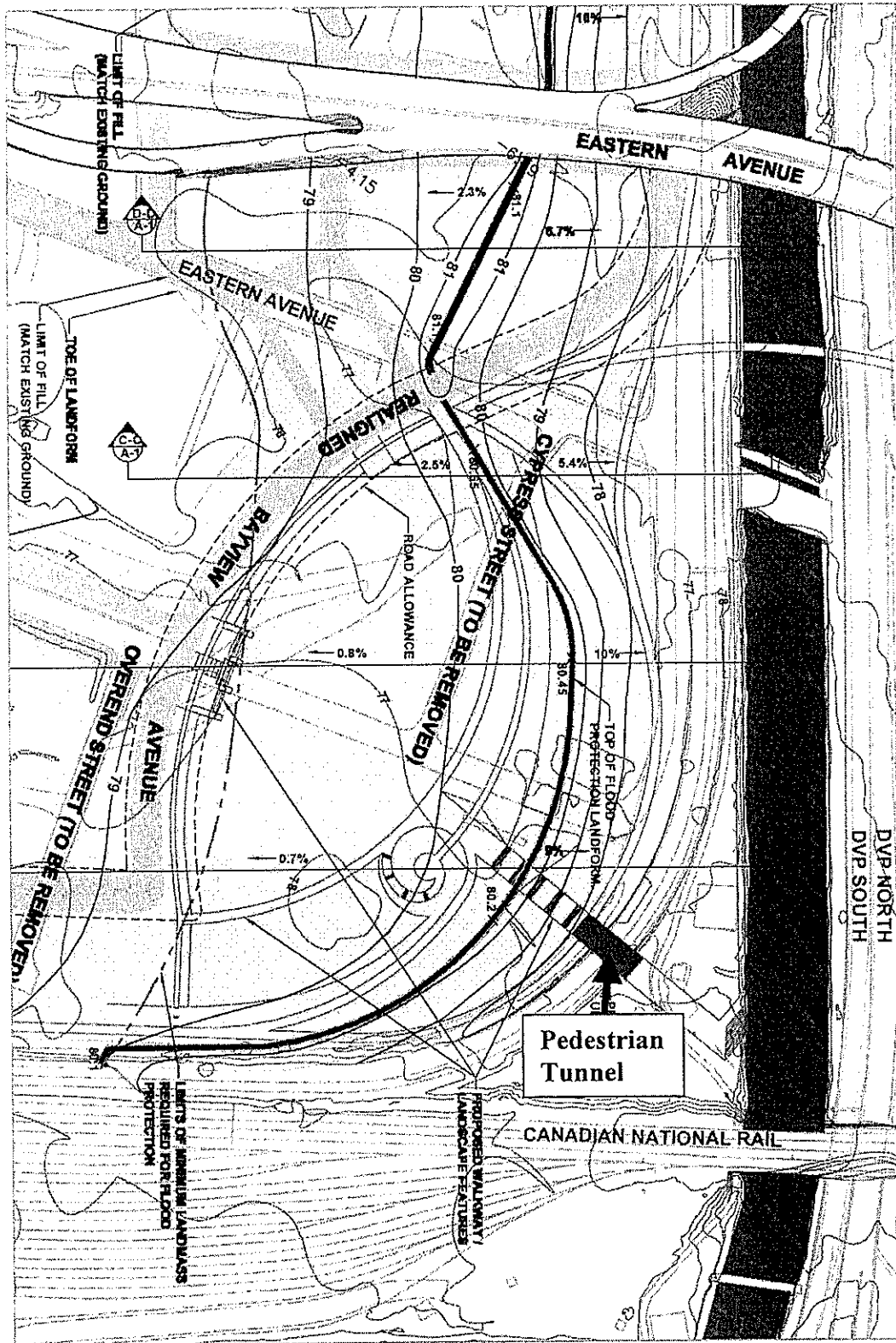
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Key Map



FUNCTIONAL DESIGN REPORT

Introduction

The Lower Don River West (LDRW) lands, located to the west of Don River and to the north of the CNR Bridge over the Don River, will be protected by the proposed "*Remedial Flood Protection Project*". To the west of the Don River, an existing walking/biking path runs parallel to the river bank. To the west of this path are the CNR's Bala Subdivision tracks, CPR's Bellville Subdivision tracks, and an abandoned track bed. These tracks are elevated relative to the adjacent ground, and are retained by a U-shaped concrete structure, which is about 2.4 m high. The thickness of the bottom concrete slab of the U-shaped concrete structure is about 750 mm and the concrete walls are about 450 mm thick.

The proposed pedestrian tunnel will connect the LDRW lands to the existing biking/walking trail along the Don River, passing under the Bala Subdivision and Bellville Subdivision tracks, and through the U-shaped concrete retaining structure. About half of the tunnel would be above the adjacent ground as the tracks are elevated.

Train Traffic

The Bala Sub track is used by GO Transit for the Richmond Hill services on weekdays only, and possibly a daily freight train. Since GO Transit will take over the Don Yard from CNR, freight trains may use the Newmarket Sub instead, in the near future. CPR is expected to abandon this section of the Bellville Sub, or sell it to GO Transit as it may be used by GO Transit for a future service to Peterborough. Therefore, the possibility of shutting down both existing tracks over a weekend work-block is high.

Geotechnical Information

A preliminary geotechnical investigation was carried out at the location of the proposed pedestrian tunnel in 2004 by Terrapex. The soil quality outside of the U-shaped concrete structure is generally very poor. The fill material inside the U-shaped concrete structure is medium to fine sand with some gravel and traces of silt. Since the construction of the pedestrian tunnel will not increase the loading, no additional settlement is expected. The excavated material under the tracks may be found to be contaminated. In that case the excavated material may be suitable for backfilling, but the excess material would have to be exported to an appropriate dumpsite. The soils outside of the U-shaped concrete structure contain cinders and could be used as fill material at certain locations.

Structural Design

The plan and cross-sections of the proposed precast concrete pedestrian tunnel are shown in Figures 1, 2 and 3 respectively. GO Transit has used a similar standard pre-cast concrete section for pedestrian tunnels under GO Transit stations platforms in the past. Precast concrete units would be used under the tracks in order to limit the construction time to a weekend work-block. Reinforced concrete headwalls at each end of the tunnel would match the height of the existing retaining walls. Reinforced concrete retaining walls would be used along the approaches to the pedestrian tunnel for the length of the new path that is sloped from the existing ground to the bottom of tunnel. Drainage would be built in along the tunnel and would be connected to the drainage along the pedestrian path. Illumination would be added on the inside of the tunnel.

Construction Procedures

A number of utilities, including fiber-optic and signal/communication cables are buried underground along the tracks. All the utilities would have to be identified in advance, and plans for either decommissioning or relocating them during the construction of the proposed pedestrian tunnel would have to be developed.

Construction of the proposed pedestrian tunnel would be carried out in open-cut excavation during weekend work-blocks. Both tracks would be shut down at the start of the work-blocks and railway crews would un-stress the rails, and remove portions of the tracks that are within the limits of the excavation. Parts of the existing U-shaped concrete structure walls and bottom slab would be cut and removed. The excavation would have sloped sides from the track level to the concrete slab. Shoring would be required below the concrete slab and dewatering would be required during excavation below the adjacent ground.

The bedding for the precast units would be steel grillage injected with concrete. The precast units would be installed and tied together by post-tensioned high strength bars. The sides and the top of the tunnel would be waterproofed from the outside before backfilling.

After construction of the pedestrian tunnel under the railway tracks the railway crews would place the ballast bed and reinstate the tracks.

Retaining walls along the approaches and the cast-in-place concrete header walls would be constructed outside of the work-blocks.

Cost Estimate

The cost estimates for the pedestrian tunnel and approach retaining walls are provided in Table 1. This estimate is based on closure of both tracks during the work-block. The total cost for this project is estimated to be about \$830,000.

Detail Design Issues

The following issues would have to be addressed during the detailed design of the pedestrian tunnel:

- The availability of weekend work-blocks would have to be confirmed with CNR and Go Transit.
- The location of the utilities would have to be confirmed.
- As part of the preliminary geotechnical investigations only one bore hole was carried out in the vicinity of the pedestrian underpass. Additional geotechnical investigations on both sides of the pedestrian tunnel and directly below the U-shaped concrete structure slab would have to be carried out to provide recommendations for foundation capacity, dewatering and shoring; and develop remedial measures for contaminated soils, if present.
- Detailed structural, drainage, lighting and landscaping designs of the pedestrian tunnel and surrounding areas would have to be developed as part of the overall detailed design.

Summary and Recommendations

A precast concrete pedestrian tunnel would be designed and constructed under the existing CNR's Bala Subdivision tracks and the CPR's Bellville Subdivision tracks, connecting the Lower Don River West lands to the existing trail along the west bank of the Don River. The railway tracks are elevated at this location and retained by a U-shaped concrete structure. Parts of the retaining walls and the bottom slab of the U-shaped structure would be cut and removed for the construction of the pedestrian tunnel. The construction of the pedestrian tunnel would be carried out in a weekend work-block. The remaining construction for the approaches to the pedestrian tunnel would not require work-blocks.

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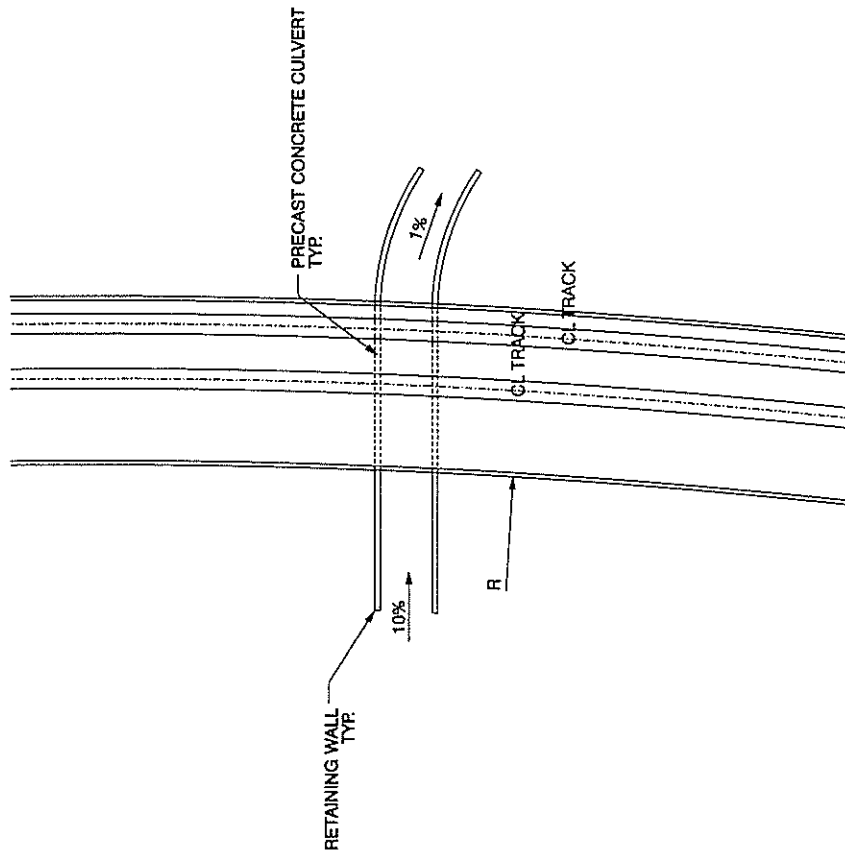
Reviewed by:



Ranjit Reel, P.Eng.
Chief Bridge Engineer

Table 1 – Pedestrian Tunnel Cost Estimate

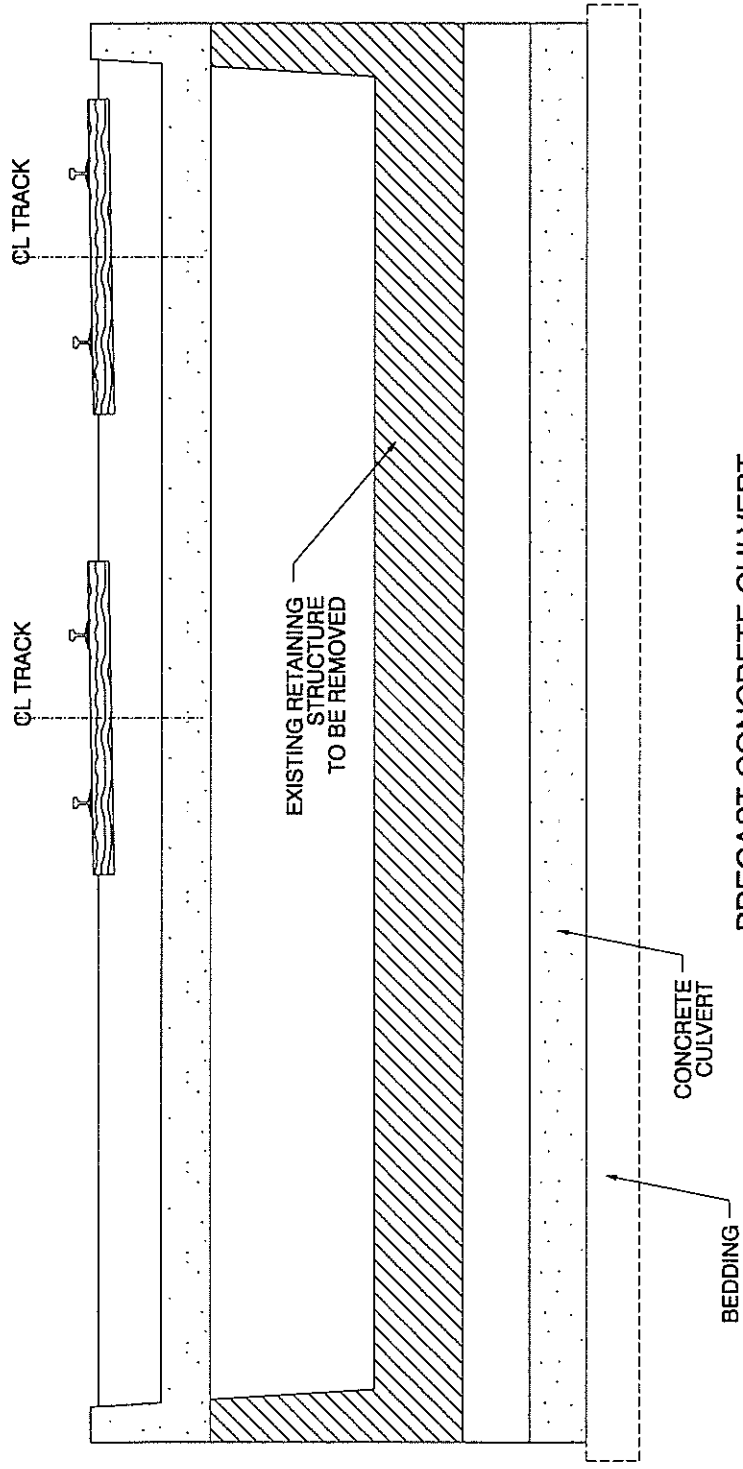
No.	ITEM	UNIT	QUANTITY	U/PRICE	COST
1	Temporary Shoring	l.s.	1	\$10,000.00	\$10,000.00
2	Relocation of utilities	l.s.	1	\$50,000.00	\$50,000.00
3	Dewatering	l.s.	1	\$10,000.00	\$10,000.00
4	Excavation	m ³	700	\$80.00	\$56,000.00
5	Concrete Removal	l.s.	1	\$50,000.00	\$50,000.00
6	Pre-Cast Culvert	m ³	130	\$1,200.00	\$156,000.00
7	Pre-Cast Culvert Erection	l.s.	1	\$25,000.00	\$25,000.00
8	Waterproofing	m ²	300	\$50.00	\$15,000.00
9	Bedding	m ²	100	\$500.00	\$50,000.00
10	Post-Tensioning	each	4	\$2,000.00	\$8,000.00
11	Cast-in-Place Concrete	m ³	40	\$1,200.00	\$48,000.00
12	Backfill	m ³	700	\$20.00	\$14,000.00
13	Illumination	l.s.	1	\$25,000.00	\$25,000.00
14	Drainage	l.s.	1	\$25,000.00	\$25,000.00
15	Retaining Walls	m ²	60	\$600.00	\$36,000.00
16	Anti Graffiti Paint	m ²	260	\$15.00	\$3,900.00
TOTAL =					\$581,900.00
15% Contingency =					\$87,285.00
10% Engineering =					\$58,190.00
Railway Costs =					\$100,000.00
GRAND TOTAL =					\$827,375.00



PRECAST CONCRETE CULVERT
UNDER BALA SUBDIVISION
FIGURE 1 - PLAN VIEW
NTS

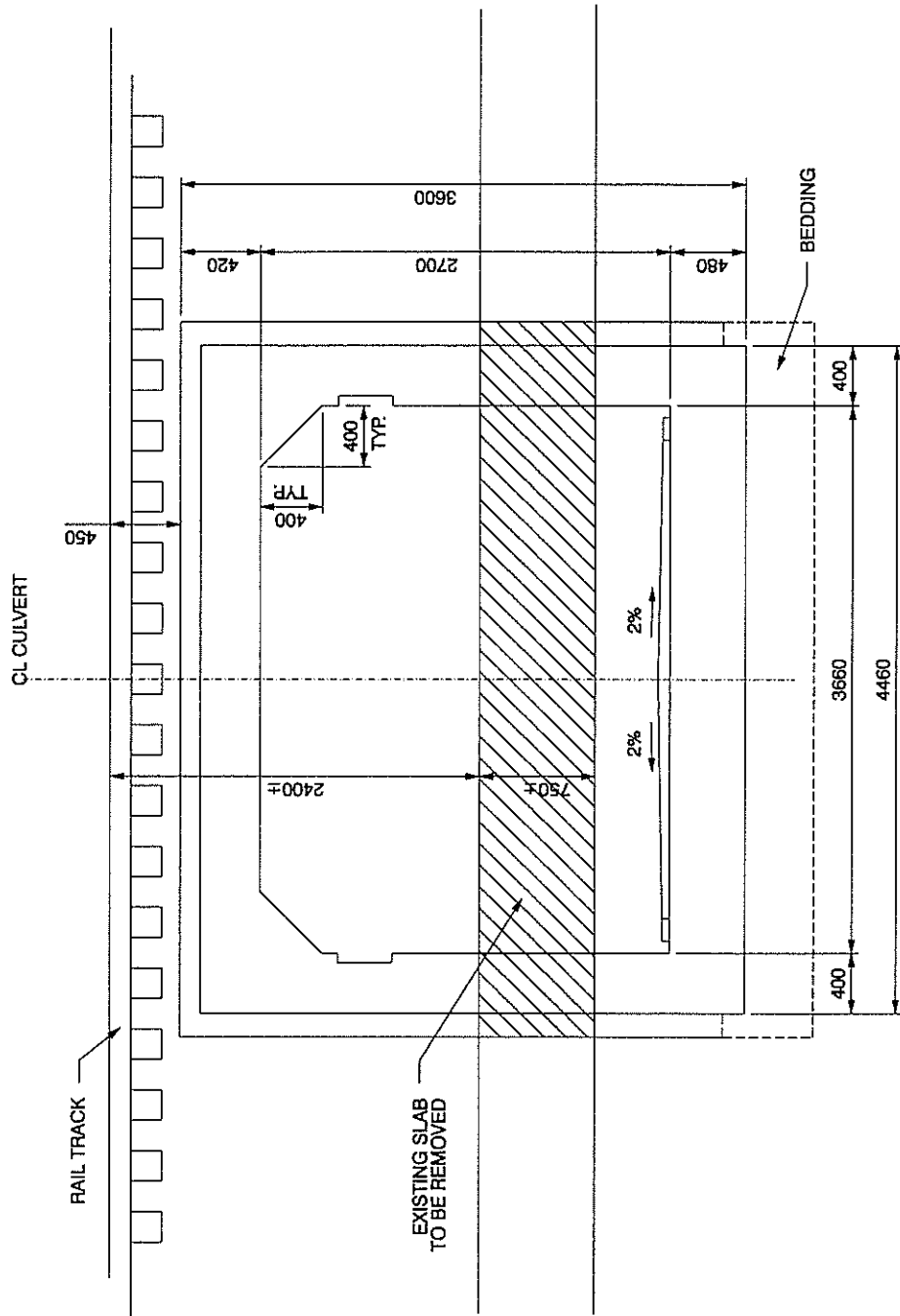
WEST

EAST



PRECAST CONCRETE CULVERT
UNDER BALA SUBDIVISION

FIGURE 2 - SECTION PERPENDICULAR TO TRACKS
NTS



PRECAST CONCRETE CULVERT
UNDER BALA SUBDIVISION

FIGURE 3 - SECTION PARALLEL TO TRACKS
NTS

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