DURHAM – SCARBOROUGH

Bus Rapid Transit

Appendix K4.1 – Review Agency Meetings and Correspondence

Prepared for Metrolinx
by IBI Group & Parsons

DURHAM – SCARBOROUGH

Bus Rapid Transit

Review Agencies Meetings and Correspondence (Pre TPAP)

Prepared for Metrolinx
by IBI Group & Parsons

DURHAM – SCARBOROUGH

Bus Rapid Transit

Ontario Ministry of Transportation (MTO)

Prepared for Metrolinx
by IBI Group & Parsons

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary – MTO

To/Attention	Notes to File	**Date**	April 15, 2020
From	Margaret Parkhill	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
April 6, 2020, 10:00 a.m. to 12:00 p.m.

Present Fahmi Choudhury, Martin Michalek, Raymond Ng, Michael Sit, MTO
[redacted], Ragavan Thuraisinganath, Parsons
Margaret Parkhill, Hailey McWilliam, IBI Group

Distribution Attendees and PWG members

Item Discussed	Action By
1. Introduction D. Hopper initiated introductions and provided an overview of the meeting agenda.	INFO
2. Project Overview D. Hopper provided a general overview of the Durham-Scarborough Bus Rapid Transit (DS BRT) project, including the study area, the purpose, proposed timelines, and a brief summary of work done to date. K. Demasi explained that the DS BRT project was announced as part of a group of projects that received funding in 2016. At the moment, the project does not have full capital funding for delivery. The delivery model has not yet been determined.	INFO
3. Kingston Road from Ellesmere Road to Port Union M. Parkhill presented an overview of the existing conditions in the area. It was noted that there is a proposed BRT stop at Kingston Road and Port Union Road. The City of Toronto requested that the project team protect for a BRT stop at the intersection of Kingston Road and Ellesmere Road. M. Parkhill presented the six design options developed for the area: 1. Mixed traffic 2. HOV	

Item Discussed	Action By
3. 2 queue jumps 4. 4 queue jumps 5. Centre-median (8-lanes) 6. Centre-median (6-lanes) Based on a preliminary evaluation, options 5 and 6 are technically preferred, but additional traffic analysis and engineering studies are required to confirm the feasibility of the options. Discussion included:	
• MTO to confirm Highway 2A ownership.	MTO
• The area south of Kingston Road is partially designated Mixed Use. According to the City of Toronto, this area is planned to intensify.	
• The consultant team is working on completing new EMME model runs for future with and without BRT scenarios. No detailed traffic analysis has started.	Consultant Team
• MTO requested that the project team share the results of the traffic analysis in this area, once complete.	
• Suggestion to add a new signal at the Highway 401 westbound on-ramp, west of Rylander Boulevard. Due to the proximity to the signal at Rylander (approximately 100 m), the new signal would likely be too close for the signals to operate independently.	
• The consultant team will consider completing a traffic analysis for the Meadowvale Road interchange if it has been determined that a volume of vehicles are diverting at Kingston Road.	Consultant Team
• 9 metres is the maximum amount of widening required for dedicated transit lanes (Two 3.5 metre transit lanes and a 2 metre raised median buffer, which could be narrowed somewhat if necessary).	
• In options 5 and 6, left-turns would be restricted to signalized intersections, which would change access to the MTO carpool lot and some Highway 401 on-ramps to right-in / right-out only. U-turns would be permitted at signalized intersections.	
• MTO requested information on impacts to MTO infrastructure, ramp geometry, taper lengths, access to Highway 401, off-ramp queues, and signal timing.	Consultant Team
• MTO understands that options 5 and 6 are technically preferred from a transit perspective.	
• The evaluation criteria ‘transportation system capacity’ takes into account traffic capacity, but considers the transportation network considered holistically since this is a transit project.	
• MTO has planned rehabilitation work in this location. MTO to confirm timing and extent of the rehabilitation works.	MTO

Item Discussed	Action By
4. Ramp Options M. Parkhill presented 4 potential ramp options for Kingston Road. Option 1: Connect the eastbound BRT parallel to the Highway 401 off-ramp. Option 2: Remove westbound left-turn from Kingston Road to Highway 2A. Option 3: Remove eastbound left from Kingston Road to Highway 401 WB ramp. Option 4: Relocate westbound off-ramp (3 potential relocation options). Discussion included: • A separate call is to be set up to discuss the ramp options with MTO traffic. • Consultant team to provide existing traffic numbers prior to the call.	K. Demasi Consultant Team
5. Highway 401 in Pickering and Whitby, Highway 412 in Whitby M. Parkhill identified potential / planned works in three other locations that are under MTO's jurisdiction within or near the study area: Highway 401 off-ramp at Church Street in Ajax, the Highway 412 overpass in Whitby, and the Highway 401 off-ramp at Garden Street in Whitby. Discussion included: **Highway 401 in Pickering** • MTO's position is that an off-ramp at Church Street would be too close to Westney. Traffic weaving is a concern. • MTO confirmed that there are no planning studies underway. **Highway 412 in Whitby** • MTO confirmed that there are no plans to signal the off-ramps. • When constructed, the bridge was built wide enough to accommodate BRT at the request of Durham Region. • There is a P3 contract for infrastructure maintenance. If changes are made to the infrastructure, the contract will have to be reviewed and the changes will have to be discussed with the consortium. • MTO noted that the Des Newman development is under construction and should be considered. **Highway 401 in Whitby** • MTO is not aware of any plans to shift the Brock Road ramps east to align with Garden Street. • M. Parkhill clarified that the off-ramp is not part of the DS BRT scope of work, but was raised by the Town as one potential mitigation measure to reduce traffic volumes on Brock Road.	

Item Discussed	Action By
6. Next Steps	
• MTO to review content and provide comments by April 27.	MTO
• Project team to set up call with MTO once the inventory of traffic existing conditions is complete.	K. Demasi

Durham-Scarborough Bus Rapid Transit

Metrolinx
MINISTRY OF TRANSPORTATION

Meeting Purpose

- Provide overview of planning to date for Durham-Scarborough BRT
- Review four locations:
  1. Kingston Road from Ellesmere Road to Port Union Road
  2. Highway 401 in Pickering
  3. Dundas Street West at Highway 412 Overpass
  4. Highway 401 in Whitby
- Discuss MTO's involvement and next steps

Study Area

What is Bus Rapid Transit?

Dedicated lanes for buses, where feasible, resulting in shorter travel times and more reliable transit service.

Frequent service with a bus every 5 minutes or less during peak hours.

Smart signals on Highway 2 are already installed and will adapt to support smoother traffic flow for all commuters.

Better connections: TTC, DRT and GO Transit routes can use the dedicated lanes and share the same stops, making it easier to travel throughout the region.

Reliable service with buses that are separated from general traffic in most areas.

Why Bus Rapid Transit?

The corridor is expected to support approximately 215,000 more residents and 66,000 more jobs by 2041.

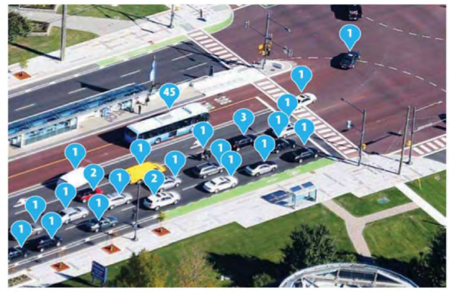
Higher capacity transit is needed to link communities and employment across the Toronto and Durham Boundary.

Investing in rapid transit will generate significant benefits to both residents of Durham Region and Scarborough.

The BRT will improve DRT and TTC service reliability, which increases ridership and attracts more transit-oriented development.

Key objective: Ensuring reliability of BRT service between Downtown Oshawa and Scarborough Centre.

VIVA Rapidway in York Region



Source: www.vivanext.com

Source: Durham Region Transit

Why Bus Rapid Transit?

The Initial Business Case identified the following benefits:

162 Kilotonnes of CO2 Reduced

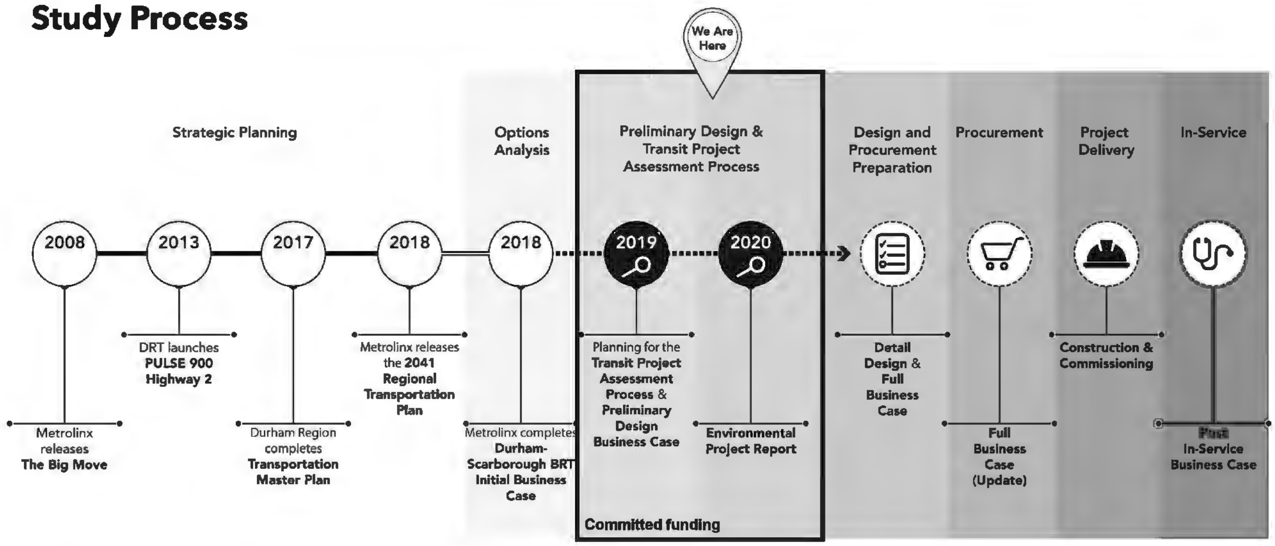
9.5 Minutes Saved Per Rider

208 Fewer Traffic Related Injuries or Deaths

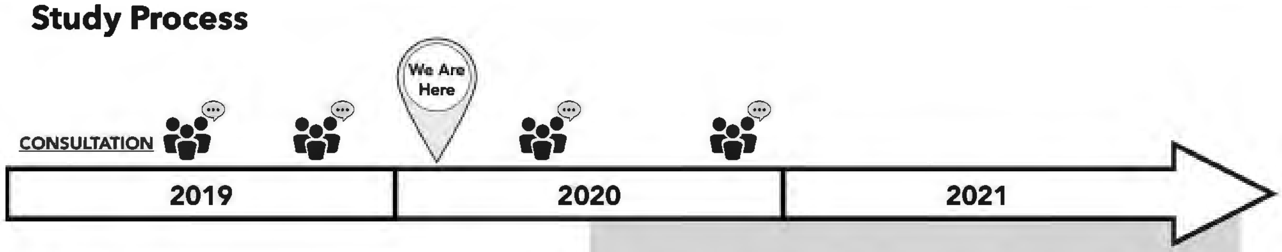
686 Millions of Dollars of Economic Benefits

1.29 Benefit to Cost Ratio

Study Process



Study Process



PRE-PLANNING

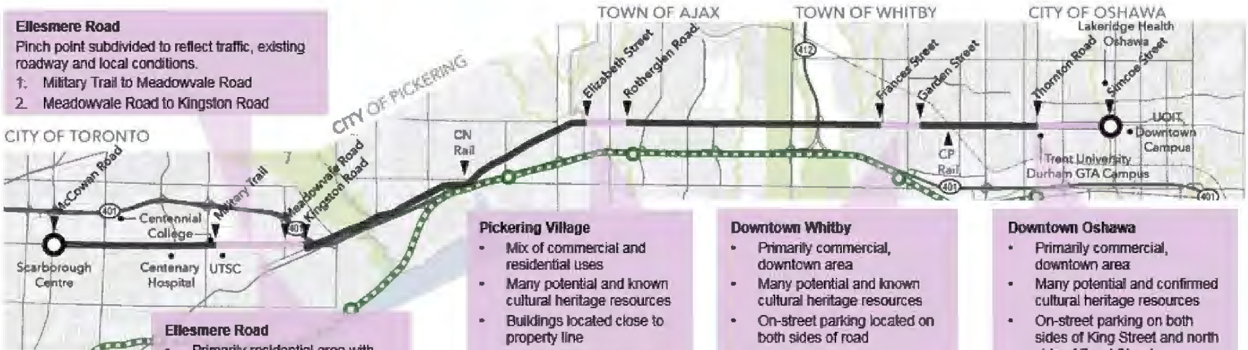
- Complete Environmental Studies
- Develop Alternative Designs
- Consult with agencies, Indigenous Communities, stakeholders and the public
- Assess Impacts and Mitigation
- Develop Preliminary Engineering Design
- Complete Preliminary Design Business Case
- Draft Environmental Project Report (EPR)

TRANSIT PROJECT ASSESSMENT PROCESS

- **Notice of Commencement**
  - 120 days
  - Consult with agencies, Indigenous communities, stakeholders and the public on Draft EPR and Preliminary Engineering Design
  - Document findings in Final EPR
- **Notice of Completion**
- Public Review of Final EPR and opportunity for objections and comments (30 days)
- Minister's Review & Decision (35 days)
- **Statement of Completion**

Pinch Points along the Corridor

There are a number of constrained locations on the corridor, which require more detailed design and analysis:



Ellesmere Road
Pinch point subdivided to reflect traffic, existing roadway and local conditions.
1. Military Trail to Meadowvale Road
2. Meadowvale Road to Kingston Road

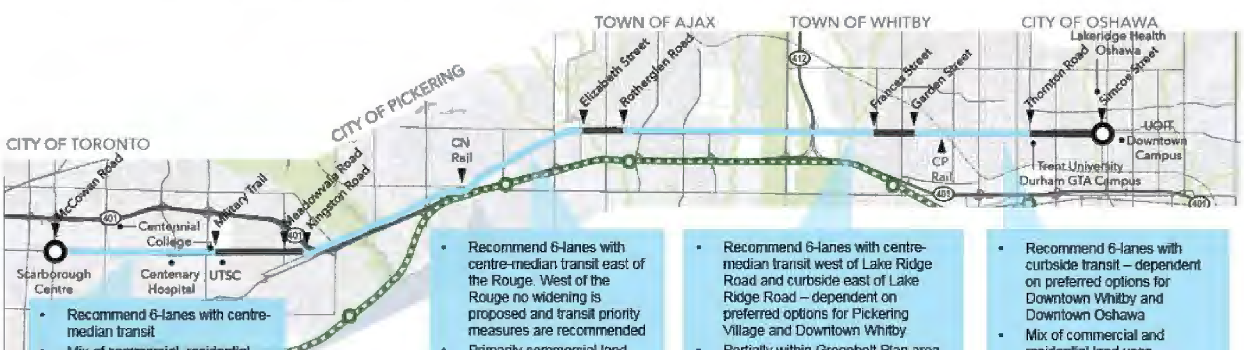
Ellesmere Road
- Primarily residential area with many driveways and side streets
- Limited commercial uses
- Surface utilities located on the north side of the road
- Buildings set back from the property line

Pickering Village
- Mix of commercial and residential uses
- Many potential and known cultural heritage resources
- Buildings located close to property line
- Surface utilities located on the north side of the road

Downtown Whitby
- Primarily commercial, downtown area
- Many potential and known cultural heritage resources
- On-street parking located on both sides of road
- Narrow sidewalks and buildings located close to property line

Downtown Oshawa
- Primarily commercial, downtown area
- Many potential and confirmed cultural heritage resources
- On-street parking on both sides of King Street and north side of Bond Street
- Buildings located close to property line

Between the Pinch Points



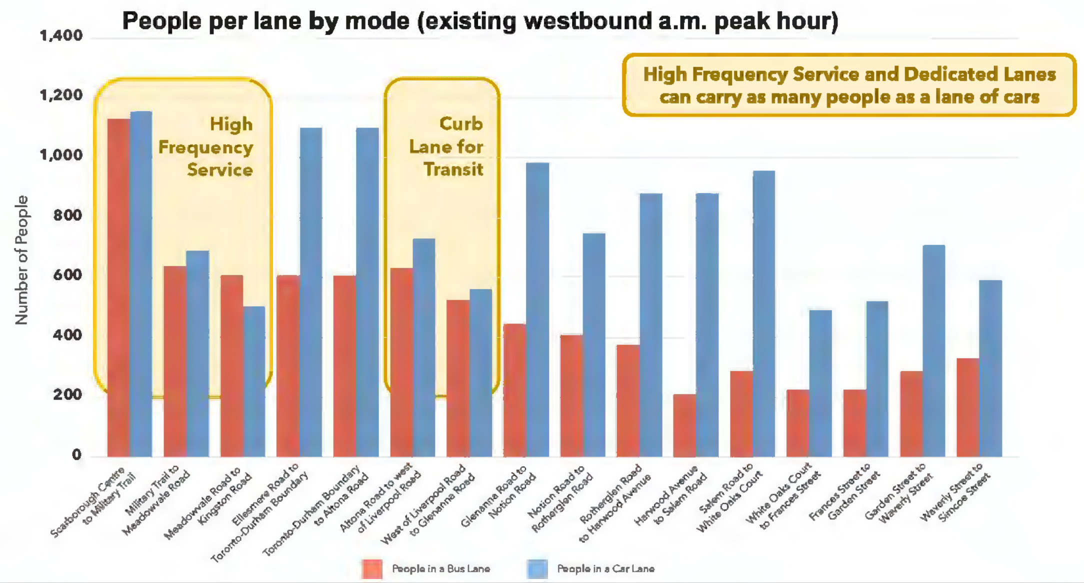
- Recommend 6-lanes with centre-median transit
- Mix of commercial, residential and institutional land uses
- Many driveways and side streets
- Contains an Area of Natural or Scientific Interest, and an Environmentally Sensitive Area

- Recommend 6-lanes with centre-median transit east of the Rouge. West of the Rouge no widening is proposed and transit priority measures are recommended
- Primarily commercial land uses with some backlotted residential uses
- Contains Rouge National Urban Park

- Recommend 6-lanes with centre-median transit west of Lake Ridge Road and curbside east of Lake Ridge Road – dependent on preferred options for Pickering Village and Downtown Whitby
- Partially within Greenbelt Plan area
- Development proposed east and west of Greenbelt Plan area
- Contains an Environmentally Sensitive Area (low risk)
- Includes interchange with Highway 412

- Recommend 6-lanes with curbside transit – dependent on preferred options for Downtown Whitby and Downtown Oshawa
- Mix of commercial and residential land uses
- Environmentally Sensitive Area (low risk) extends length of section

Moving People



Review four locations

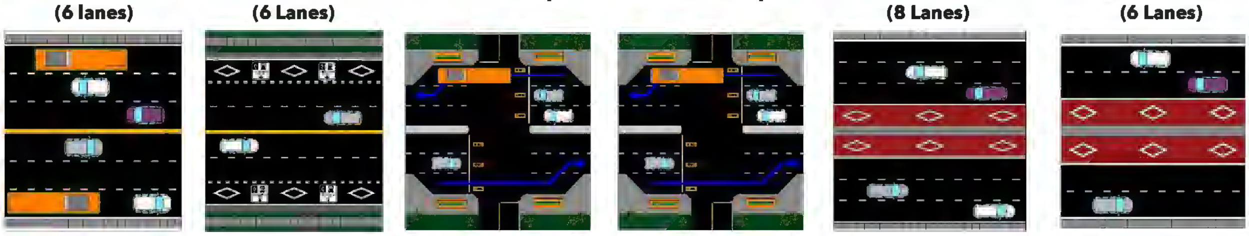
1 **Kingston Road under Highway 401** Ellesmere Road to Port Union Road

Existing signals: Ellesmere, 401 EB off, Rylander, Port Union, 401 WB off
Proposed BRT stop (opening day) at Port Union / Sheppard Avenue
Protect for future BRT stop (beyond 2041) at Ellesmere / Kingston Road

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Design options developed:

Option 1 Mixed Traffic (6 lanes)	Option 2 HOV (6 Lanes)	Option 3 2 Queue Jumps	Option 4 4 Queue Jumps	Option 5 Centre-median (8 Lanes)	Option 6 Centre-median (6 Lanes)



Transit Speed and Reliability Performance:

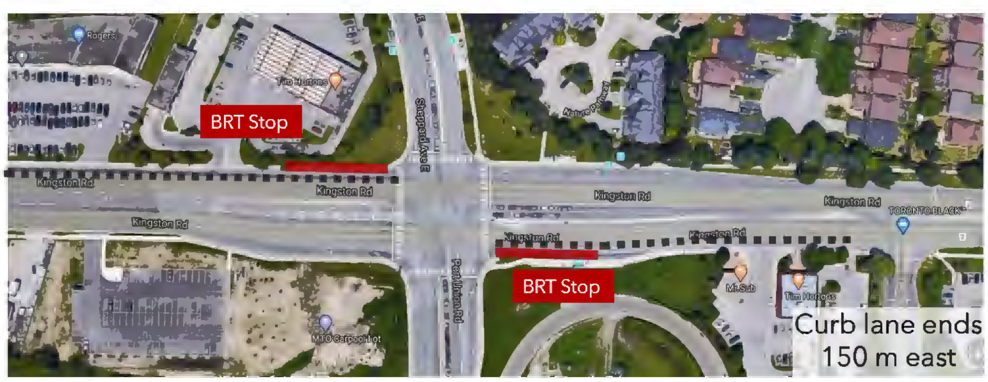
Poor	Fair	Good	Good	Excellent	Excellent

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 1 Mixed Traffic (6 lanes)

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 2 Curbside Transit / HOV lanes
Port Union Rd/ Sheppard Ave



Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 3 Two queue jumps (westbound)

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 3 Two queue jumps (eastbound)

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Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 4 Four queue jumps (westbound)

METROLINX

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 4 Four queue jumps (eastbound)

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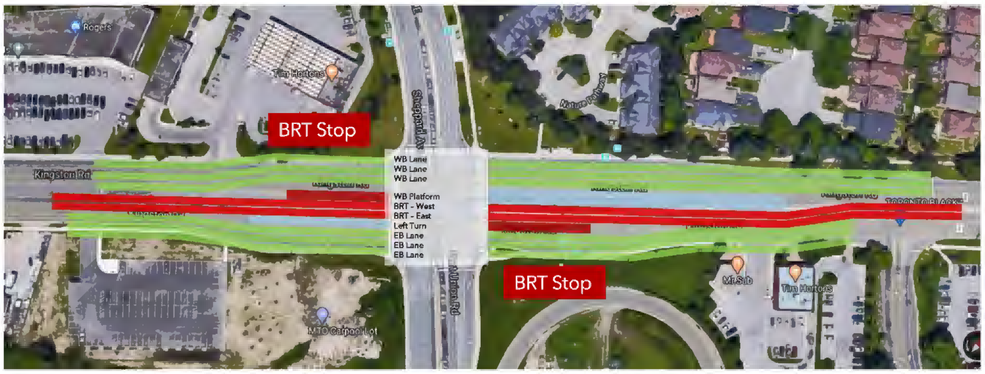
Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 5 Centre-median BRT (8-lanes)
Port Union Rd / Sheppard Ave



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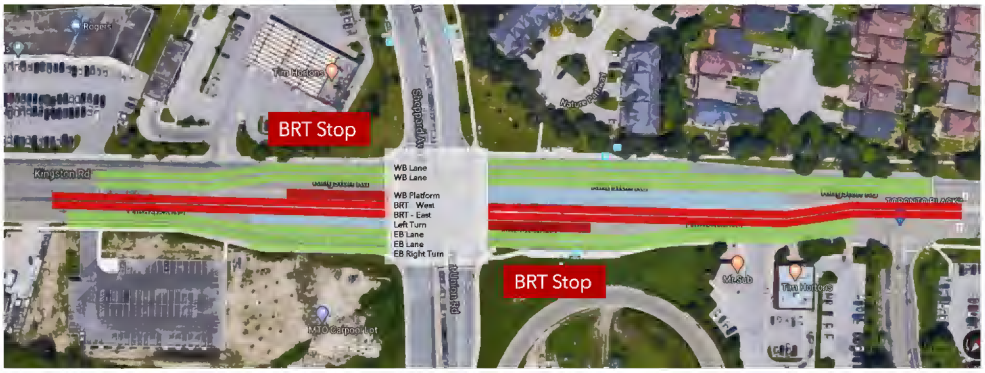
Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 5 Centre-median BRT (8-lanes)
Kingston Road under Highway 401, looking west

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 6 Centre-median BRT (6-lanes)
Port Union Rd / Sheppard Ave



Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Dedicated transit lane examples:

Sheppard Avenue East at Parkway Forest Drive

Jane Street at Highway 407 Subway Stn

Evaluation Criteria

Compatible with Adjacent Communities
- Noise, vibration and air quality
- Community character
- Area business viability
- Development incentives

Protect Historical, Cultural and Archaeological Resources
- Archaeological resources
- Cultural heritage resources
- Protection of public open spaces

Protect, Improve and Restore the Natural Environment
- Surface water and groundwater
- Aquatic and terrestrial habitat
- Flora and Fauna
- Ecological linkages

Increase Transit Ridership, Quality and Access
- Connectivity with other transit services
- Quality and reliability of transit service
- Accessibility to transit
- Safety and security

Support A Sustainable Transportation System
- Pedestrian and cycling networks
- Transportation system capacity
- Goods movement

Connect Major Facilities and Support Lands Designated for Development
- Catchment potential
- Transit-oriented development

Provide a Wise Investment
- Existing and future infrastructure investments
- Capital costs
- Operation and maintenance costs
- Land acquisition costs

Preliminary Evaluation for Discussion

Evaluation Criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
	Mixed Traffic 6-lanes	HOV 6-lanes	2 Queue Jumps	4 Queue Jumps	Centre-median 8-lanes	Centre-median 6-lanes
Compatible with Adjacent Communities			✓	✓		✓
Protect Historical, Cultural and Archaeological Resources	✓	✓				
Protect, Improve and Restore the Natural Environment	✓	✓	✓	✓	✓	✓
Increase Transit Ridership, Quality and Access			✓	✓	✓	✓
Support a Sustainable Transportation System			✓	✓	✓	✓
Connect Major Facilities and Support Lands Designated for Development					✓	✓
Provide a Wise Investment	✓	✓	✓	✓		

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Kingston Road under Highway 401 Ramp Options

Additional traffic analysis and engineering feasibility study required

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2 **Highway 401 in Pickering**

3 Highway 412 Overpass

Highway 412 Overpass

Initial Business Case recommended adding two dedicated transit lanes on Dundas Street West:

- Maintains reliability of transit service
- Protects for future development
- Limited natural and cultural heritage impacts
- Minimal impacts to traffic

4 Highway 401 in Whitby

Next Steps

- Develop preliminary design for preferred option (whole corridor)
  - o Check technical details and confirm feasibility
- Develop Preliminary Design Business Case
- Continue technical meetings with municipal and technical staff
- Present recommended preliminary design and Preliminary Design Business Case to stakeholders and public in fall 2020
- Initiate Transit Project Assessment Process in late 2020

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary – DRAFT – MTO

To/Attention	Notes to File	**Date**	November 26, 2020
From	Margaret Parkhill	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
October 9, 2020, 2:00 p.m. to 3:30 p.m.

Present Kevin Chan, Fahmi Choudhury, Les Dzbik, Eilee Li, Martin Michalek, Janice Munro, Prashanth Selvakumar, MTO
Renata Moraes, City of Toronto
Kristin Demasi, Matthew Coelho, Matthew Davis, Metrolinx
David Hopper, Ragavan Thuraisinganathan, Parsons
Margaret Parkhill, Scott Johnston, Mai-Linh Ho, Hailey McWilliam, IBI Group

Distribution Attendees and PWG members

Item Discussed	Action By
Introduction M. Parkhill welcomed attendees and provided an overview of the meeting agenda. A brief status update on the Durham-Scarborough BRT project was also provided. The purpose of the meeting was to review the technical package provided in support of the design options in the following areas: 1. Kingston Road from Ellesmere Road to Port Union Road 2. Highway 401 WB ramp terminal in Pickering 3. Dundas Street West at Highway 412 overpass A summary of the discussion is included below.	INFO
1. Kingston Road from Ellesmere Road to Port Union Road Six design options were developed for this segment. Two design options were carried forward for consideration: 1. Option 4 - Four queue jump lanes 2. Option 6 - Centre-median (6-lanes)	

Item Discussed	**Action By**
Discussion included:	
Option 6	
• Option includes improvements for pedestrians and cyclists. A multi-use path is included in the design.	
• Bridge abutment of Highway 401 over Kingston Road would be modified to widen the road bed slightly and provide a sidewalk on the north side and multi-use path on the south side.	
• MTO asked if 3 metres is sufficient for a lane width. The consultant team confirmed that curb lanes and dedicated transit lanes are proposed to be 3.5 metres wide. Through lanes for generally traffic are proposed to be 3 metres wide.	
• MTO noted the off-ramp intersection west of the bridge is planned to be reconfigured including removal of the southbound right-turn channel. MTO can provide design drawings.	F. Choudhury
• Consultant team to confirm source of traffic count data at the on-ramp east of the bridge. *[Post-meeting note: counts used attached to meeting minutes].*	
• MTO noted that the carpool lot has high utilization rates, with many drivers accessing the lot through a left-turn movement. Consultant team noted that drivers could access the lot by making a U-turn at Rylander to make a right-turn into the lot.	
• A queuing analysis was completed as documented in the memo dated August 18, 2020. Synchro outputs attached to that memo will be revised to include queuing and signal timing information.	Consultant Team
• MTO noted that there are segments along Kingston Road without centre-median BRT. The consultant team confirmed that there are constrained heritage and urban areas where the BRT will run curbside or in mixed traffic, however centre-median transit lanes are preferred to provide the highest form of transit priority and service reliability.	
Options to connect Ellesmere turning circle to Highway 401 Off-ramp intersection (west of bridge)	
• MTO advised that the option with 2 bus lanes connecting from the Ellesmere turning circle to create a 5-leg intersection is not acceptable.	
• Consultant team asked if option with one bus lane to connect eastbound buses would be acceptable? Such that buses would then approach the off-ramp intersection in the same direction as general traffic, reducing the potential for drivers to enter the ramp going the wrong way. Westbound buses would turn at Kingston and Ellesmere Road. MTO noted that they would review the concept. *[Post meeting note, see Option 6 design pdf for this revised concept.*]	MTO
• The consultant team showed Sheppard and Parkway (near Don Mills subway) as an example of an intersection with a dedicated	

Item Discussed	Action By
bus only lane. MTO noted there were geometric differences between the two.	
• MTO noted that this area is part of MTO's on-going construction contract. The construction will remove the channel, but keep space to facilitate right-turn movements. J. Munro to share design. Construction contract is in year 2 of 5.	J. Munro
Option 4	
• In this option, left-turns are not restricted and would be possible at all unsignalized entrances the same as today.	
• Option 4 does not perform as well for transit or traffic as Option 6, with higher delay and some v/c ratios are over 1.	
• MTO asked if westbound buses weaving between the curb lane at Rylander to the centre lane would be a concern. The consultant team noted that buses have sufficient distance to make the movement. There are no stops in-between. This would also allow buses to avoid queues at the on-ramp.	
• The traffic analysis for the queue jump lane option accounts for a 10 second "hold" to represent a transit-only phase which allows buses to move through while other traffic has all-red.	
• MTO noted that the report did not make it clear how many buses would be travelling through this section. The consultant team noted there is high bus frequency in this area. The BRT services is expected to be a bus every 4 or 5 minutes, plus TTC local service, would mean close to one bus per minute. Meaning Transit Signal Priority could be called every cycle, depending on the strategy employed.	
• MTO asked if TSP would be applied always or only when the bus is behind schedule. TSP specifics will be determined in detail design.	
• MTO asked if queues would clear when given green. Consultant team noted queues for both options are presented in the traffic memo.	
◦ Table 4 shows queue lengths in 2041 with existing lane configurations. Queues at Port Union intersection exceed existing storage.	
◦ Table 6 shows queues lengnths in 2041 for Option 4. Queues at Port Union Road continue to exceed existing storage.	
2. Highway 401 in Pickering	
M. Parkhill identified potential / planned works at the Highway 401 ramp terminal intersection in Pickering.	
Discussion included:	
• M. Parkhill to send traffic analysis of this intersection to MTO.	M. Parkhill

Item Discussed	Action By
3. Highway 412 interchange in Whitby	
• M. Parkhill noted that the project proposes median transit lanes, signalizing the on and off-ramps and a multi-use path on both sides.	INFO
• MTO requires cross-rides and bicycle signals. All infrastructure must be AODA compliant. The consultant team confirmed all infrastructure would be AODA compliant. OTM Book 18 and NACTO have been followed.	
• MTO noted that they have their own bikeways manual. P. Selvakumar to send to project team.	P. Selvakumar
• MTO asked if the team has checked to see if the rail heights need to be modified to accommodate the active transportation facilities. The consultant team noted that the team does not have general arrangement drawings. P. Selvakumar to provide tender or as-built drawings. OSIM reports would also be helpful.	P. Selvakumar
• MTO would like to know if any structure modifications would be required. Consultant team can advise after tender or as-built drawings provided.	
• The 407 east consortium is managing the structure. Consultant team noted it may make more sense for consortium to get involved in detail design. Add to EPR as commitment to future work.	Consultant team
• MTO will circulate preliminary design concept for review. Noted grading limits are missing.	MTO
• MTO requested that access to the access road on the east side of the bridge be maintained.	Consultant team
Next Steps	
• MTO to review content and provide comments to the project team.	MTO
• K. Demasi to schedule another meeting once MTO comments received.	K. Demasi

Please advise of any errors or omissions to M. Parkhill by December 11, 2020.

METROLINX

Durham-Scarborough Bus Rapid Transit

Metrolinx
MINISTRY OF TRANSPORTATION

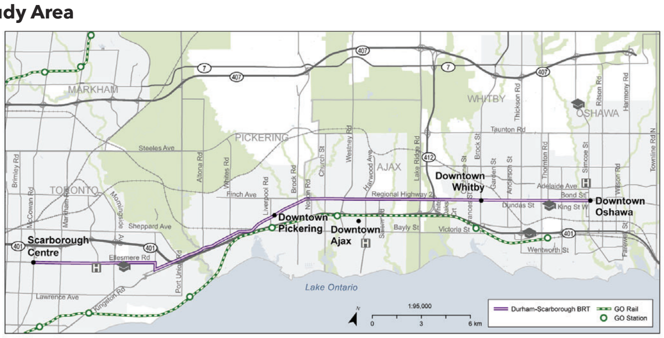
METROLINX

Meeting Purpose

- Provide update on Durham-Scarborough BRT
- Review three locations:
  1. Kingston Road from Ellesmere Road to Port Union Road
  2. Highway 401 WB ramp terminal in Pickering
  3. Dundas Street West at Highway 412 Overpass
- Discuss next steps

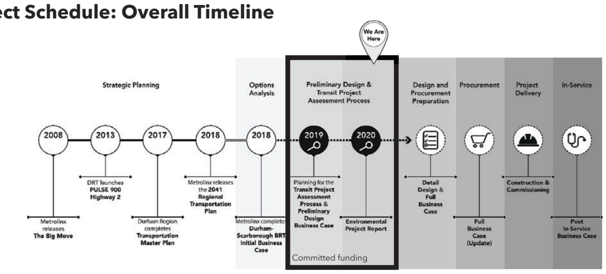
METROLINX

Study Area

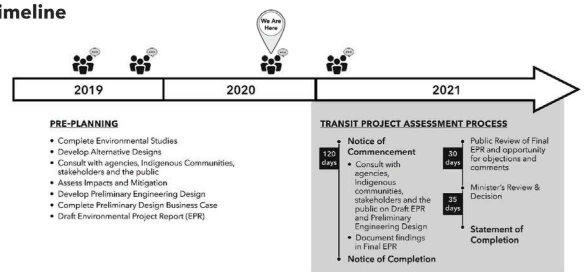


METROLINX

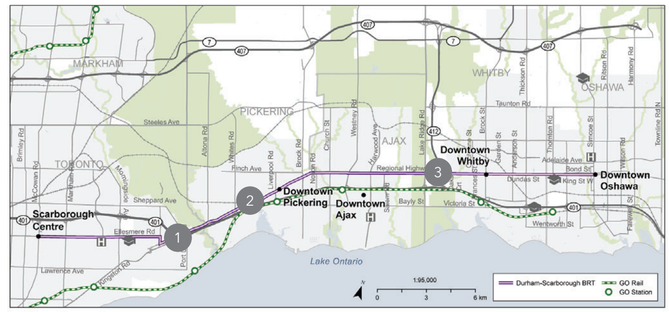
Project Schedule: Overall Timeline



TPAP Timeline



Review three locations

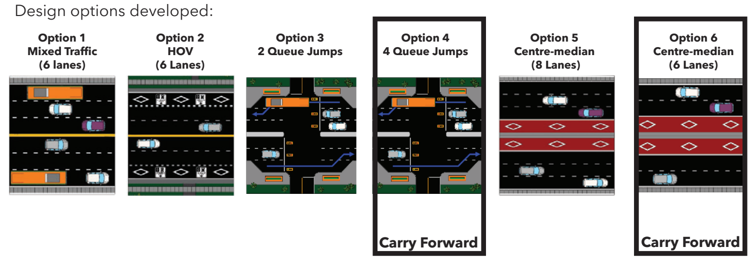


1 Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Existing signals: Ellesmere, 401 EB off, Rylander, Port Union, 401 WB off
Proposed BRT stop (opening day) at Port Union / Sheppard Avenue
Protect for future BRT stop (beyond 2041) at Ellesmere / Kingston Road

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Design options developed:



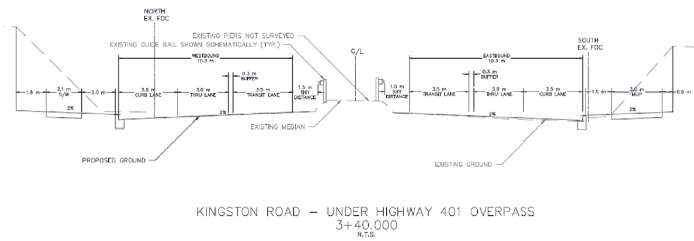
Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 4 Four queue jumps with Transit Signal Priority

Refer to preliminary design concept drawing.

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

Option 6 Centre-median (6 Lanes)



Refer to preliminary design concept drawing.

Kingston Road under Highway 401 Ellesmere Road to Port Union Road

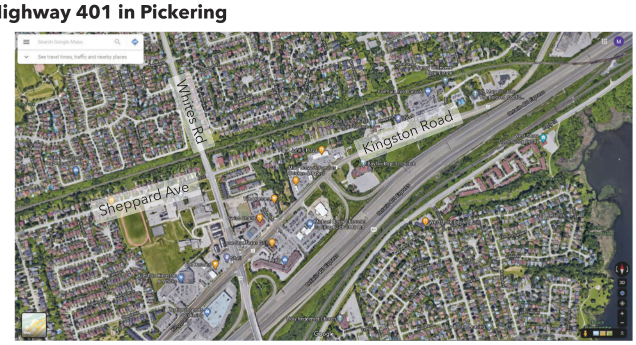
Traffic Analysis Results

	Option 4				**Option 6**			
	Future BRT with Transit Signal Priority (2041)				Future BRT with in median lanes (2041)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]
Kingston Road at Ellesmere Road	B (0.65)	-	C (0.88)	-	E (0.98)	WBT (E) [0.98] SBL (E) [0.81]	D (0.97)	SBL (E) [0.92]
Kingston Road at Highway 401 Eastbound Off-ramp	D (0.69)	SBL (F) [0.88] SBT (F) [0.85]	F (1.19)	WBL (F) [1.17] SBL (F) [1.19] SBT (F) [1.17]	C (0.77)	-	E (1.14)	EBT (F) [1.14] SBL (E) [1.04] SBT (E) [1.02]
Kingston Road at Rylander Boulevard	B (0.97)	EBL (F) [0.97]	C (1.12)	EBL (F) [1.12]	C (0.91)	EBL (F) [0.91] WBL (E) [0.18] SBL (E) [0.38] SBT (E) [0.38]	C (0.89)	EBL (F) [0.94] WBL (E) [0.19] NBT (E) [0.35] SBL (E) [0.53] SBT (E) [0.53]
Kingston Road at Sheppard Avenue/Port Union Road	D (1.23)	WBL (F) [1.23]	E (1.33)	EBR (F) [1.15] WBL (F) [1.33] NBR (C) [0.87]	E (1.09)	EBL (E) [0.20] WBL (F) [0.96] WBT (F) [1.09]	E (1.14)	EBL (E) [0.44] EBR (F) [1.14] WBL (F) [1.12] NBR (D) [0.85]
Kingston Road at Highway 401 Westbound Off-ramp	C (0.78)	-	C (0.61)	-	C (0.76)	-	D (0.73)	EBT (E) [0.99]

Refer to Table 7   Refer to Table 8

- Median lanes perform better
- TSP performs slightly better

2 **Highway 401 in Pickering**



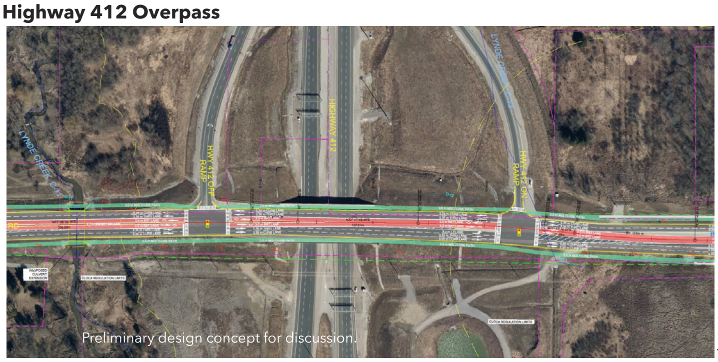
3 Highway 412 Overpass

Highway 412 Overpass

Initial Business Case recommended adding two dedicated transit lanes on Dundas Street West:

- Maintains reliability of transit service
- Protects for future development
- Limited natural and cultural heritage impacts
- Minimal impacts to traffic

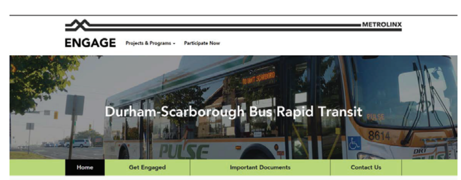
Highway 412 Overpass



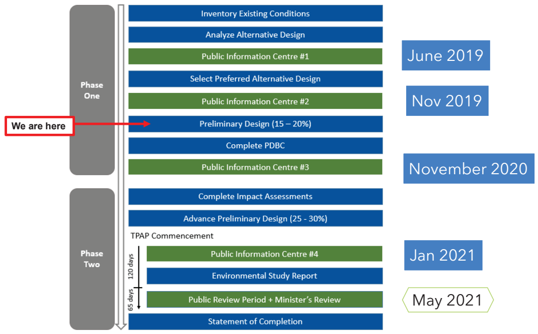
Preliminary design concept for discussion.

Public Information Centre #3

- Due to COVID-19, PIC #3 will be held on-line for 4 weeks.
- Information and videos will be posted on the project website: www.metrolinxengage.com/dsbrt
- An online survey will be used to obtain feedback.
- November 9 to December 7, 2020



Project Schedule Update



Next Steps

- Public Information Centre #3 scheduled for November 2020.
- Fall 2020 / Winter 2021 will be spent fine turning the design and preparing the draft Environmental Project Report.
- Early 2021, start the 120-day Transit Project Assessment Process. Notify stakeholders through a Notice of TPAP Commencement.
- PIC #4 planned for Early 2021.

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary – MTO

To/Attention	Notes to File	**Date**	June 17, 2021
From	Margaret Parkhill, David Hopper	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
May 13, 2021, 10:00 a.m. to 11:00 a.m.

Present Kristin Demasi, Darcy Wiltshire, Wilson Taveira, Matthew Coelho, Madelin Blacha, Metrolinx
Tim Apostolopoulos, Stanley Chan, Sandy De Lorenzi, Vlado Dimitrovski, Les Dzbik, Salia Kalali, Eileen Li, Janice Munro, Valerie Nantais, Prashanth Selvakumar, Michael Sit, MTO
Andrew Au, City of Toronto
Ragavan Thuraisinganathan, Parsons
Margaret Parkhill, Adrian Chiu, IBI Group

Distribution Meeting attendees

Item Discussed	Action By
Introduction	
M. Parkhill welcomed attendees and provided an update on the DSBRT project and status of the design for Kingston Road. Updated design plans of Kingston Road around the MTO right-of-way was shown.	INFO
Discussions included:	
• P. Selvakumar asked if a design criteria has been prepared. M. Parkhill confirmed that a design criteria has been prepared and will be circulated to meeting attendees.	M. Parkhill
• P. Selvakumar asked if any PHM-125 drawings have been prepared and expressed concerns that these drawings would be important when handing the project over to ProjectCo and are legal documents. M. Parkhill responded that the Project Team will discuss with Metrolinx about the preparation of these drawings. *[Post meeting note: A PHM-125 drawing is a legal drawing that is issued following detailed design, and is a requirement for a signal to be activated and go into operation. It would be premature to*	INFO

Item Discussed	Action By
develop PHM-125 based on the preliminary design. These drawings will be developed during detail design.]	
• P. Selvakumar asked if the PSOS has been prepared. M. Parkhill clarified that the project has not yet received funding and the procurement model has not been decided. An initial business case was completed that secured funding for this preliminary design project	INFO
• P. Selvakumar noted that once there is an agreement amongst the team, the proposed design should be presented to Metrolinx/MTO senior management. M. Parkhill asked about the logistics for this meeting. P. Selvakumar clarified that MTO can coordinate the booking of the meeting with senior management, while the Project Team would present key features of the project while highlighting areas where the design would deviate from MTO standards.	K. Demasi / P. Selvakumar
• V. Nantais noted there will be additional comments from MTO on the updated design plans. *[Post-meeting note: V. Nantais emailed MTO comments to M. Parkhill and K. Demasi on May 17, 2021.]*	INFO
• V. Nantais asked about the traffic impacts of not providing a westbound right-turn lane at the intersection of Ellesmere Road and Kingston Road. M. Parkhill responded that a right-turn lane was not proposed in order to avoid impacts to the properties on the northeast corner, including a cultural heritage property.	
• P. Selvakumar expressed concerns that based on MTO's understanding of the traffic report, there are some concerns about spillback at the Ellesmere/Kingston intersection. M. Parkhill responded that the team can review traffic impacts and potentially shifting the alignment south to accommodate a right-turn lane.	M. Parkhill
• V. Nantais wanted to confirm if compound curves would be used at MTO Highway Off-ramp intersections. M. Parkhill responded that the design will be updated to include compound curves at these intersections.	M. Parkhill
• V. Nantais asked if it's been confirmed that the ramp intersections will have acceptable traffic operations. M. Parkhill confirmed that this has been reviewed as part of the traffic report.	
• V. Nantais expressed concerns that the 3.3 m through lane widths do not meet MTO standards. M. Parkhill clarified that 3.3 m through lanes were provided based on previous direction from MTO that 3.3 m lanes would be acceptable based on what was done for the Highway 400 structures on the Finch West LRT project. P. Selvakumar further clarified that this would need to be approved by senior management.	K. Demasi / P. Selvakumar
• V. Dimitrovski expressed concerns that due to the shallow foundations of the Highway 401 structure, placing the multi-use path in the proposed location will undermine the foundation. V.	

Item Discussed	Action By
Nantais noted that structural drawings will be provided to the project team.	V. Nantais
• P. Selvakumar suggested placing the MUP on the existing path to avoid impacting the structure. M. Parkhill responded that the Project Team will forward drawings to their structural team to review.	M. Parkhill
• V. Nantais asked about bridge pier protection. M. Parkhill responded that details have not been reviewed, but there are no plans to impact the piers or existing guide rails. V. Dimitrovski noted that they will follow up with the Project Team on if the shy distance/clearance shown on the design plans are acceptable.	V. Dimitrovski
• V. Nantais advised that the MTO Bikeway Manual must be followed when providing the proposed multi-use path and to provide a Configuration A. P. Selvakumar requested that documentation of the 3-step process from the Bikeway Manual be provided. M. Parkhill responded that this 3-step process documentation will be reviewed.	M. Parkhill
• T. Apostolopoulos expressed concerns that a dual-left turn into the two-lanes shown on the design plans is not acceptable. Based on TAC Figure 9.17.13, additional width of receiving lanes will need to be provided for transport truck turning paths.	
• S. De Lorenzi asked if lane configuration has been done for the off-ramp intersection and if the dual-left turn is still necessary. M. Parkhill clarified that the left-turn volumes at this intersection would warrant maintaining the dual-left turn.	
• P. Selvakumar noted that the closure of the Highway 401 On-Ramp entrance and the conversion to right-in right-out at the MTO carpool lot needs to be approved by senior management.	
• S. De Lorenzi asked how traffic would access Highway 401 with the closure of the existing eastbound entrance to the On-Ramp. M. Parkhill responded that vehicles would access Highway 401 through Meadowvale as demand is typically low.	
• T. Apostolopoulos expressed concerns with the closure of the eastbound entrance to the Highway 401 On-Ramp. S. De Lorenzi noted that it is not expected that the closure of the entrance will be a great hindrance, due to it only serving a few houses.	
• T. Apostolopoulos requested that WB-20.5 be used for all swept paths with dual-left turns using MSU + WB-20.5 or I-Bus + WB-20.5	
• S. De Lorenzi expressed concerns based on their experience with vivaNext that many drivers accidentally enter the BRT lanes from ramp terminals. They recommended that signage be provided to make it clear that the BRT lane is meant of buses only.	Project Team

Item Discussed	Action By
• P. Selvakumar requested that when the PSOS is written, that MTO standards be taken as precedent. M. Parkhill responded that text can be added to the EPR to clarify this.	

Please advise of any errors or omissions to Margaret Parkhill by May 26, 2021.

Project Name	**Durham-Scarborough BRT**
IBI Project Number	**119887**
Client	**Metrolinx**
Project Manager	**Kristin Demasi**
Document Reviewed	**Toronto Kingston Road Design**
Date Received	**2021-02-24**
Last Updated	**2021-03-15**

No.	Comment Date	Commenter	Comment / Question	IBI / Parsons Response	Action by	Status
1	2021-02-24	A. Au	Can you confirm the curb locations for the bus lanes. The design suggests some portion have curbs between and outside of the bus lanes - which is not acceptable.	Between Ellesmere Rd and Rylander Blvd, a centre median is proposed between the BRT lanes to maintain existing bridge supports for the Highway 401 overpass. East of Rylander Blvd, raised islands are proposed to prevent general traffic from turning left into driveways. The island on the north side is a continuation of the platform at Port Union. At intersections the design includes either a concrete island or a painted area in order to maintain acceptable lane shifts through the intersection.	A. Chiu	Resolved
2	2021-02-24	A. Au	Please show local bus stops. Bus stop info from Open Data https://open.toronto.ca/dataset/ttc-routes-and-schedules/	Agreed, local bus stops will be shown on designs.	A. Chiu	Resolved
3	2021-02-24	A. Au	Protect for future EB TTC bus stop loop on Kingston Road to Sheppard and Rylander. Please see attached email about bus loop specifications.	As confirmed at March 17 meeting with Toronto and TTC, a new off-street bus loop will not be considered as part of the DSBRT project. The existing turnaround on Ellesmere Road will remain.	A. Chiu	Resolved
4	2021-02-24	A. Au	Please clarify how vehicles can access commercial properties west of Highway 2A ramp/Hwy 401 W-S ramp on Kingston Road.	The design of the Ellesmere Road / Kigston Road intersection will be revised to include a WB left-turn/U-turn lane without impacting the heritage property at 6540 Kingston Rd. Vehicles travelling WB may use the U-turn lane to access driveways on the south side of Kingston Road. The design already includes an EB left-turn/U-turn lane at Ellesmere Road. This is similar to the rest of the DSBRT corridor. Vehicles travelling EB on Kingston Road may access the commercial properties by turning right into the applicable driveways.	A. Chiu	Resolved

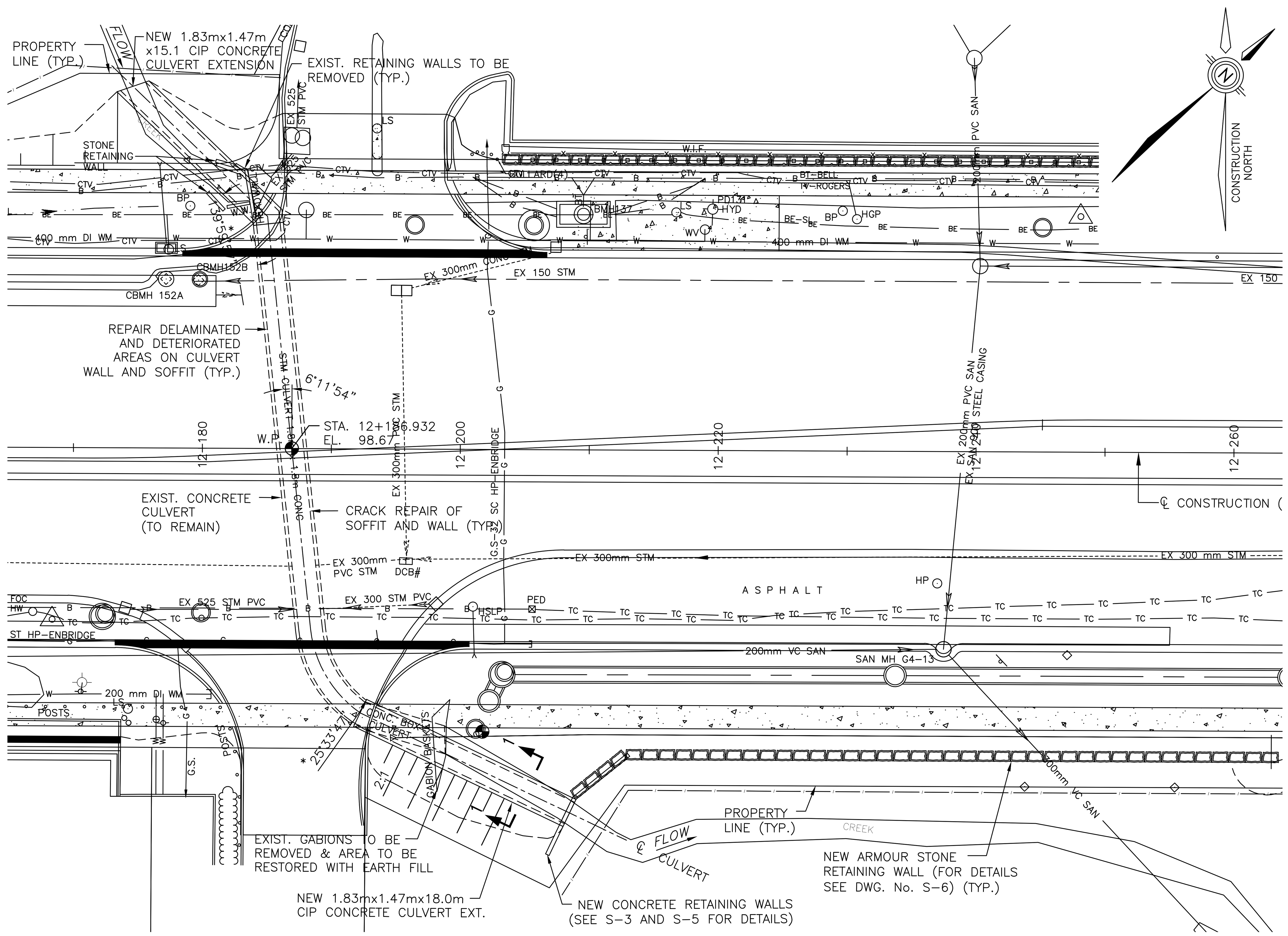
No.	Comment Date	Commenter	Comment / Question	IBI / Parsons Response	Action by	Status
5	2021-02-24	A. Au	Re: MTO Comment #2: "The other impacts related to the median BRT is the closure of the Kingston Rd EB left-turn to the WB Hwy 401 on-ramp and the WB left-turn movement to Hwy 2A. Although the closures will create some driver inconvenience, they are acceptable from a traffic operations perspective since there are alternate routes on City streets that detoured traffic can use. Local residential area which is likely the origin of most of the traffic using the on-ramp is west of the interchange. The WB onramp at Meadowvale is available and provides a more direct access to WB Hwy 401 by using the local street network i.e. no backtracking. It would be preferable to maintain the EB Kingston Rd on-ramp but we do not have a concern with closing it. Public may provide comments during the next PIC complaining about the proposed ramp closure and closure of left-turn to Hwy 2A." City needs to understand traffic impacts to City's streets; especially the impact to the intersection of Ellesmere/Meadowvale. For transparency, please explain recommendation for removing the WBLT to Hwy 2A and provide feasible alternatives. If information is provided already, please disregard comment. Please explore the potential impacts of closing the Hwy 2A ramp.	The updated traffic report was circulated to the City on March 2, 2021. Due to the Highway 401 bridge, there is limited available room for widening Kingston Road. The WBLT to the Hwy 2A on-ramp was removed in order to provide dedicated transit lanes without impacting either the overpass support columns or bridge abutments. The WBLT volumes is assumed to become WBT, continuing west on Ellesmere to the Highland Creek overpass to access Hwy 2A. Volumes are around 350 vehicles in the a.m. and 150 vehicles in the p.m. peak hour. Closing the Hwy 2A ramp is not proposed as part of the BRT project. Should the City wish to close the ramp entirely, SBT+EBR vehicles would also likely travel WB along Kingston Road to the Highland Creek Overpass in order to access Hwy 2A. Volumes are around 20 vehicles in the a.m. and 50 vehicles in the p.m. peak hour.	M. Parkhill	Discussed
6	2021-02-24	A. Au	Re: MTO Comment #5: "A dedicated WB right-turn lane at the Kingston Road & Ellesmere Road intersection should be considered as noted in the memo recommendations to mitigate queue spill back to the upstream intersection." This might create additional property impacts - please evaluate accordingly.	A dedicated WB right-turn lane is not recommended at this intersection based on the traffic analysis report. No action required.	A. Chiu	Resolved
7	2021-02-24	A. Au	Re: MTO Comment #6: "The proposed 3m through-lane width is not acceptable. A minimum 3.3m lane was deemed acceptable on Finch Ave under the Hwy 400 structure for the Finch West LRT as shown if the Figures below. There is a significant volume of traffic through Kingston Road and reducing lane width to 3m will only worsen level of service and safety." Please review accordingly with posted speed limits – 60km/h = 3.3m, 50km/h = 3.0m	Lane widths will be updated to 3.3m. It is expected that TTC buses will use the dedicated transit lanes on Kingston Road, not the curb lanes.	A. Chiu	Resolved
8	2021-02-24	A. Au	Re: MTO Comment #8: "A barrier is required to separate the MUP from the traffic lanes and should be taken into account in width requirement." Apply City's cycling design guidelines.	Configuration provided by MTO will be applied between the Hwy 401 Off-Ramp and Rylander Blvd to provide a barrier between the proposed MUP and traffic lanes. A 1.0 m separation buffer between the back of curb and MUP will be applied in all other areas based on MTO Book 18 standards. This is also consistent with previous direction provided by the City of Toronto.	A. Chiu	Resolved

Project Name	Durham-Scarborough BRT
IBI Project Number	119887
Client	Metrolinx
Project Manager	Lee Caragiale
Document Reviewed	MTO comments
Date Received	2021-01-25
Last Updated	2021-02-09

No.	Comment Date	Commenter	Comment / Question	IBI / Parsons Response	Action by	Status
1	2021-01-25	F. Choudhury	MTO cannot recommend BRT configurations shown in Options where the BRT goes through the EB off ramp terminal since this will degrade the intersection operation and potentially cause safety issues.	Noted. Since MTO is not supportive of the design, we will proceed with the design that includes centre-median BRT lanes along Kingston Road.	M-L. Ho	Resolved
2	2021-01-25	F. Choudhury	The other impacts related to the median BRT is the closure of the Kingston Rd EB left-turn to the WB Hwy 401 on-ramp and the WB left-turn movement to Hwy 2A. Although the closures will create some driver inconvenience, they are acceptable from a traffic operations perspective since there are alternate routes on City streets that detoured traffic can use. Local residential area which is likely the origin of most of the traffic using the on-ramp is west of the interchange. The WB onramp at Meadowvale is available and provides a more direct access to WB Hwy 401 by using the local street network i.e. no backtracking. It would be preferable to maintain the EB Kingston Rd on-ramp but we do not have a concern with closing it. Public may provide comments during the next PIC complaining about the proposed ramp closure and closure of left-turn to Hwy 2A.	Agreed, the design will include closing the WBL turn lane to Hwy 2A, and close the EBL turn to WB Hwy 401.	M-L. Ho	Resolved
3	2021-01-25	F. Choudhury	Regarding the closure of the EB Kingston Rd to WB Hwy 401 on-ramp, the Please see attached drawing with additional comments from MTO traffic regarding detail design.	Please refer to the attached drawing for response to the comments.	M-L. Ho	Resolved
4	2021-01-25	F. Choudhury	The median BRT will block direct access to the MTO Kingston Rd carpool. However, access is available by drivers U-turning at an adjacent signalized intersection which is inconvenient but still acceptable. Mx will need to work with MTO to install additional signs telling driver the u turn is available further west.	Noted. All signalized intersections will allow for U-turns. Detail design will further develop the signage plan to clearly indicate to drivers that this is an allowable movement.	No action	Resolved
5	2021-01-25	F. Choudhury	A dedicated WB right-turn lane at the Kingston Road & Ellesmere Road intersection should be considered as noted in the memo recommendations to mitigate queue spill back to the upstream intersection.	We do not recommend a dedicated WBR turn lane in this location due to the impacts it would have on the property at the NE corner and the adjacent property, which is a designated heritage building.	No action	Resolved
6	2021-01-25	F. Choudhury	The proposed 3m through-lane width is not acceptable. A minimum 3.3m lane was deemed acceptable on Finch Ave under the Hwy 400 structure for the Finch West LRT as shown if the Figures below. There is a significant volume of traffic through Kingston Road and reducing lane width to 3m will only worsen level of service and safety.	Agreed, 3.3 m wide thru lanes will be provided under the Hwy 401. Refer to the revised drawings. In accordance to City of Toronto guidance, 3 m thru lanes will be provided outside of the underpass.	M-L. Ho	Resolved
7	2021-01-25	F. Choudhury	The overall width required under the structure should also take into account the need for buffer/shy distances to the bridge piers and abutments. The existing condition shows a barrier curb and steel beam guide rail protecting the bridge piers.	Agreed, the design accounts for the horizontal clearance to the bridge piers and abutments. Refer to the attached cross sections.	No action	Resolved

No.	Comment Date	Commenter	Comment / Question	IBI / Parsons Response	Action by	Status
8	2021-01-25	F. Choudhury	A barrier is required to separate the MUP from the traffic lanes and should be taken into account in width requirement	Agreed, since this is a bi-directional facility, a barrier will be proposed between the curb lane and MUP. Refer to the updated cross section for additional details.	M-L. Ho	Resolved
9	2021-01-25	F. Choudhury	The design of the Hwy 401 EB-off and WB ramp-terminals double-left turn movements should accommodate the turning-paths for Wb-20 and medium SU design vehicles turning simultaneous. This requirement usually means widening of the truing vehicle receiving lanes (typically 2.5 lanes in width).	Noted, a swept path will be conducted to ensure the double left turn movements can accommodate a WB-20 and SU vehicle.	M-L. Ho	Resolved
10	2021-01-25	F. Choudhury	The MTO Bikeways manual requirements should be applied for the Multi Use Path design within ministry ROW	Agreed, the design will be updated to accommodate the MTO Bikeways manual within the ministry ROW.	M-L. Ho	Resolved
11	2021-01-25	F. Choudhury	A barrier is required to separate the MUP from the traffic lanes and should be taken into account in width requirement	See response to comment #8.	M-L. Ho	Resolved
12	2021-01-25	F. Choudhury	A bike cross-ride is required where the MUP crosses the ramp-terminal intersection which means a minimum 5m wide bike/ped crossing which will affect intersection design and perhaps property requirements.	See response to comment #10.	M-L. Ho	Resolved
13	2021-01-25	F. Choudhury	The proposed BRT operation and PDR designs affecting the other ramp terminals along the route such as the White's Road and Hwy 412 on and off ramp still needs to be presented and reviewed.	The designs are attached.	No action	Resolved
14	2021-01-25	F. Choudhury	The traffic PIC board (https://www.metrolinxengage.com/sites/default/files/pic3_boards_traffic_at_2020-11-12.pdf) says "Drivers will be able to make left-turns and U-turns during protected phases at signalized intersections. This configuration is expected to enhance safety."	Correct.	No action	Resolved
15	2021-01-25	F. Choudhury	On this board (https://www.metrolinxengage.com/sites/default/files/pic3_boards_traffic_at_2020-11-12.pdf) they show active transportation facilities through the Kingston Rd interchange area. How will cyclists/pedestrians get from one end to the other. It says design under review but we have not seen details yet from my understanding ? Also there a gap around Sheppard Ave. This can lead to active transportation usage along Sheppard Ave near the Port Union interchange. We should see how they plan to deal with this. Port Union is not designed for this.	Correct - active transportation facilities will be provided along Kingston Road. The facilities will be designed in accordance with the MTO Bikeways manual. They were not shown as part of the design drawings because this segment was withheld until a decision was made on the design in consultation with MTO. We understand that the City is installing bike lanes on Port Union south of the bridge and is working with MTO to provide cycling connections over the bridge.	M-L. Ho	Resolved
16	2021-01-25	F. Choudhury	Should discuss AT near Whites Road as well. Shown as one way. We should check crossing practicality and design	Yes, the proposed AT design along Kingston Road at Whites Road is a uni-directional cycle track. The crossing treatment is under review but will be provided in accordance to the Region's standard for cycling crossings.	M-L. Ho	Resolved
17	2021-01-25	F. Choudhury	Construction board (https://www.metrolinxengage.com/sites/default/files/pic3_boards_construction_2020-11-13.pdf) we need info on construction staging feasibility in our ROW.	A construction staging plan is still being developed. Additional details will be available in spring 2021. The plan will be refined during detail design.	D. Hopper	Resolved
18	2021-01-25	F. Choudhury	PIC shows proposed future traffic lanes and BRT as TBD for Kingston Rd. area which is good since we still have to work out the details (https://www.metrolinxengage.com/sites/default/files/prelimdesign_toronto_high.png)	Thank you, based on the feedback, we will now carry 4 lanes for traffic and 2 lanes for buses.	M-L. Ho	Resolved
19	2021-01-25	F. Choudhury	PIC talks about MTO ROW at Kingston Rd. being developed currently (https://www.youtube.com/watch?v=kjYsNT9NXc0) Please see 4:21 min.	That is correct.	No action	Resolved

No.	Comment Date	Commenter	Comment / Question	IBI / Parsons Response	Action by	Status
20	2021-01-25	F. Choudhury	PIC shows median BRT at Whites Road Ramp exit (https://www.metrolinxengage.com/sites/default/files/pickering_2020-11-12.pdf) There is a platform nearby. Please show autoturn movements with WB20.5 vehicles.	A swept path analysis can be conducted at this ramp. Please note, the design vehicle will be WB – 20 based on TAC guidance.	M-L. Ho	Resolved
21	2021-01-25	F. Choudhury	Metrolinx to check effect of BRT to Whites Rd. and Kingston Rd interchange. There is a stop/platform there as well. I know the current turning movements and sight lines there are odd due to the skewed intersection. Especially the one where traffic from EB Kingston Rd turn right to access highway. Not much info provided	Please clarify what impacts should be reviewed.	F. Choudhury	Open
22	2021-01-25	F. Choudhury	Liverpool Rd has a stop at Kingston Rd. Do they expect people to cross the interchange to access this stop? It is not designed for high pedestrian or cyclist volumes. I think other highway exists besides Kingston/Port Union, Whites Rd, and Liverpool are far away from highway.	A BRT stop is proposed at the intersection of Kingston and Liverpool. The intersection is signalized and pedestrians will access the stop by using a cross-walk. Note that the BRT buses will not cross highway interchanges on Liverpool.	No action	Resolved
23	2021-01-25	F. Choudhury	Are they installing bike signals in any of our ROW? Will there be separate phasing?	Yes bike signals will be installed at all signalized intersections, but details will be confirmed during detail design.	No action	Resolved
24	2021-01-25	F. Choudhury	They show 412 area (https://www.metrolinxengage.com/sites/default/files/whitby_2020-11-12.pdf). We should discuss this with MPO and 407	Let us know if you need more info to facilitate discussion.	No action	Resolved
25	2021-01-25	F. Choudhury	There looks like there is a water crossing near Whites Rd. We should get more details (https://www.metrolinxengage.com/sites/default/files/stormwaterstructures_high.png)	These structures will be modified to accommodate the proposed design. General arrangement drawings are attached. Construction will likely take place 2022-2023.	No action	Resolved



PLAN
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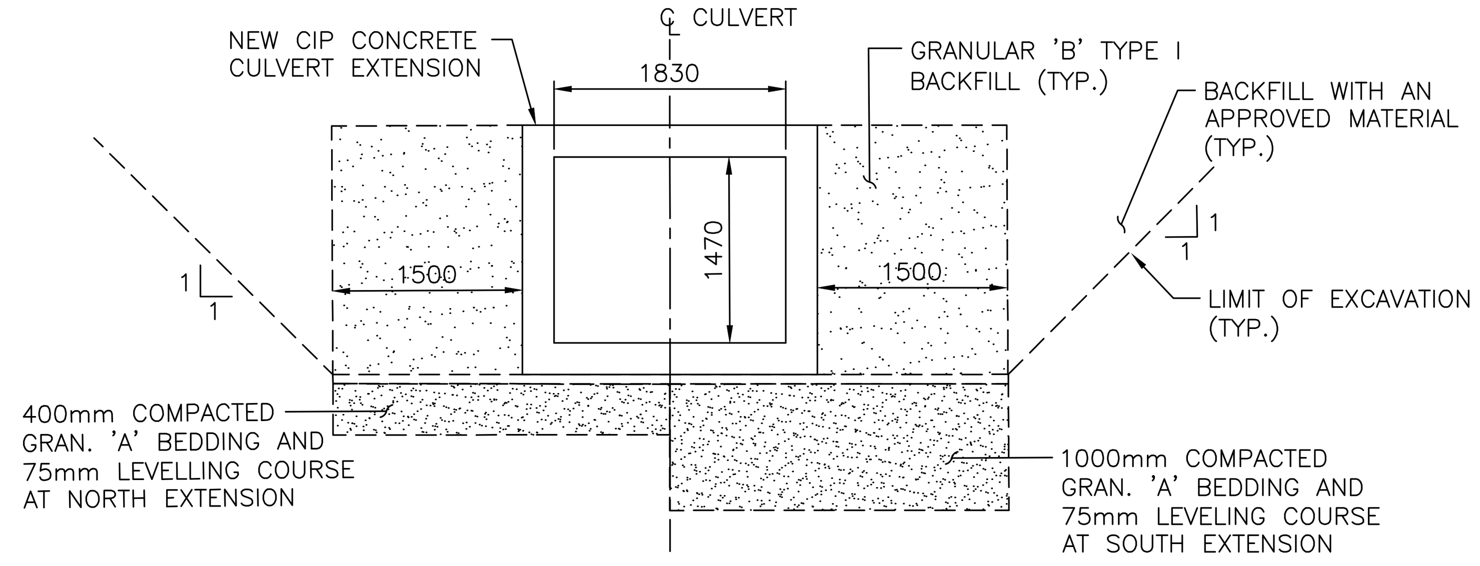
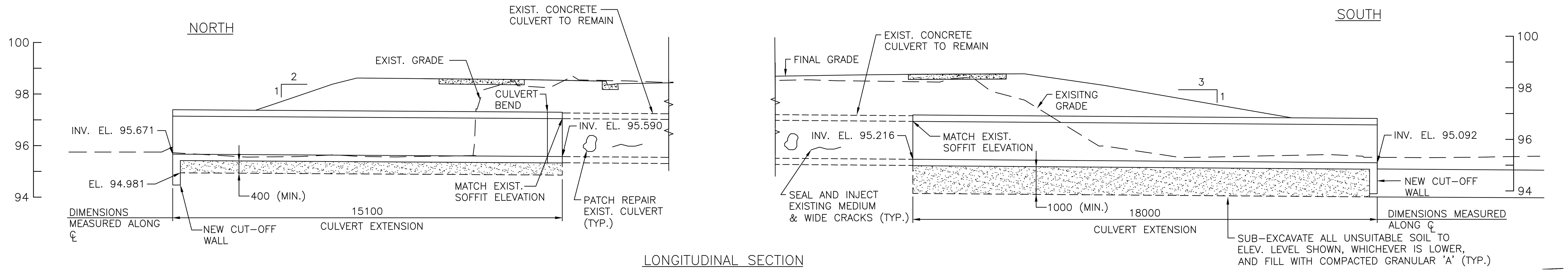


SECTION 1–1
TYPICAL SECTION AT NORTH & SOUTH
SCALE 1:50



LONGITUDINAL SECTION
SCALE 1:100

- GRANULAR 'A' SHALL NOT BE PLACE UNTIL THE DEPTH OF THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION SOIL HAVE BEEN APPROVED BY GHD GEOTECHNICAL ENGINEER. INSPECTION AND APPROVAL BY THE GEOTECHNICAL ENGINEER SHALL BE COORDINATED BY THE CONTRACT ADMINISTRATOR.
- THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF THE TEMPORARY FLOW PASSAGE SYSTEM FOR 2 YR. STORM ELEVATION.

APPLICABLE STANDARD DRAWINGS

OPSD 3090	FOUNDATION FROST PENETRATION DEPTH FOR SOUTHERN ONTARIO
OPSD 3121.150	WALLS, RETAINING, BACKFILLS, MINIMUM GRANULAR REQUIREMENT
OPSD 3950.100	JOINTS, CONCRETE EXPANSION AND CONSTRUCTION JOINT
OPSD 3329.100	DECK, REINFORCEMENT, SUPPORT FOR REINFORCING STEEL FOR SLAB DEPTHS 300mm OR LESS
OPSD 803.10	FROST TREATMENT FOR BOX CULVERT LESS THAN 3.0m

LIST OF DRAWINGS

S–1	GENERAL ARRANGEMENT
ESC–1	EROSION AND SEDIMENT CONTROL PLAN
S–2	REMOVALS
S–3	DETAILS
S–4	REINFORCEMENT DETAIL I
S–5	REINFORCEMENT DETAIL II
S–6	ARMOUR STONE RETAINING WALL DETAILS
S–7	MISCELLANEOUS DETAILS

NOTE:

* ANGLE TO BE VERIFIED IN FIELD BY CONTRACT ADMINISTRATOR.

LEGEND

GRANULAR 'A'

GRANULAR 'B'

GEOTECHNICAL RESISTANCE DATA

- SLS: 225 kPa
  ULS: 275 kPa
- THE FACTORED SOIL BEARING RESISTANCE SHALL BE INSPECTED AND APPROVED BY GHD GEOTECHNICAL ENGINEER ON SITE PRIOR TO THE PLACEMENT OF GRANULAR BEDDING OR FOUNDATIONS OF ANY KINDS.
- SOFT OR DISTURBED ZONE ENCOUNTERED IN THE SUBGRADE UNDER FOOTING OR UNDER GRANULAR BEDDING SHALL BE REMOVED AND FILLED WITH GRANULAR 'A'

SCOPE OF WORK

1. INSTALL EROSION AND SEDIMENT CONTROLS AND ENSURE THEY ARE MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION.
2. INSTALL ROADWAY PROTECTION AND ENVIRONMENTAL PROTECTION SYSTEMS FOR CONSTRUCTION.
3. REMOVE DEBRIS FROM WATERCOURSE.
4. INSTALL FLOW PASSAGE SYSTEM, DIVERT STREAM TO FLOW PASSAGE SYSTEM AND DEWATER THE WORK AREA. (REFER TO AND SEDIMENT CONTROL PLAN DWG. ESC–1).
5. REMOVE EXISTING HEADWALLS, RETAINING WALLS, AND PORTION OF THE EXISTING CULVERT FROM THE NORTH AND SOUTH ENDS.
6. EXCAVATE AND PLACE GRANULAR 'A' WORKING PAD FOR CULVERT EXTENSIONS AND RETAINING WALLS.
7. CONSTRUCT CULVERT EXTENSIONS AND ASSOCIATED HEADER WALLS AND RETAINING WALLS.
8. PLACE GRANULAR BACKFILL TO CULVERT EXTENSION AFTER THE CONCRETE HAD REACHED 25MPa.
9. PATCH REPAIR EXISTING CULVERT.
10. REMOVE FLOW PASSAGE SYSTEM AND REINSTATE NATURAL FLOW.
11. SEAL AND REPAIR MEDIUM AND WIDE CRACKS.
12. PAVE AND INSTALL STEEL BEAM GUIDERAILS.

CONSTRUCTION NOTES

- ALL EXPOSED EDGES TO BE CHAMFERED 25mm UNLESS NOTED.
- THE CONTRACTOR TO CHECK ALL RELEVANT EXISTING STRUCTURE DIMENSIONS AND ELEVATIONS SHOWN ON THE DRAWINGS AND ADJUST THE DIMENSIONS AND ELEVATIONS AS REQUIRED TO MATCH EXISTING STRUCTURE AS APPROVED BY THE CONTRACT ADMINISTRATOR.
- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.

GENERAL NOTES

SPECIFICATIONS

- ONTARIO PROVINCIAL STANDARD SPECIFICATIONS, MUNICIPAL–ORIENTED, LATEST REVISION.
- CANADIAN HIGHWAY BRIDGE DESIGN CODE, CAN/CSA–S6–14

CONCRETE

- CLASS OF CONCRETE 35MPa
- MAXIMUM AGGREGATE SIZE REPAIRS 13mm
- ALL OTHER CONCRETE 19mm

REINFORCING STEEL

- CLEAR COVER TO REINFORCING STEEL
  BOTTOM OF TOP SLAB 40 ± 10 FOR SLABS ≤ 300 THICK
  50 ± 10 FOR SLABS > 300 THICK
  BOTTOM OF BOTTOM SLAB 100 ± 25
  REMAINDER 60 ± 20 UNLESS OTHERWISE NOTED
- ALL REINFORCING STEEL SHALL BE IN ACCORDANCE WITH C.S.A. STANDARD CAN/CSA–G30.18–M92 (LATEST REVISION), GRADE 400W UNLESS NOTED OTHERWISE.
- UNLESS OTHERWISE SHOWN, TENSION LAP LENGTHS NOT INDICATED ON CONTRACT DRAWINGS SHALL BE CLASS 'B'.
- BAR HOOKS SHALL BE MINIMUM LENGTHS AND STIRRUPS SHALL HAVE MINIMUM HOOKS, UNLESS OTHERWISE INDICATED.
- ALL HOOKS SHALL BE IN ACCORDANCE WITH STANDARD DRAWING SS12–1 UNLESS INDICATED OTHERWISE.
- REINFORCING STEEL SHALL BE FIELD CUT AS DIRECTED BY THE CONTRACT ADMINISTRATOR AND AS A NON–PAY ITEM.

NOTES FOR CONTRACTOR

- THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF ALL UTILITIES, SERVICES, STRUCTURES, ROADWAYS ETC. DURING CONSTRUCTION.
- THE CONTRACTOR'S METHODS OF PROTECTION TO BE SUBMITTED TO THE CONTRACTOR ADMINISTRATOR.
- LOCATIONS OF EXISTING UTILITY DUCTS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND DETAILS OF EXISTING SITE CONDITIONS RELATIVE TO THE NEW CONSTRUCTION AND REPORT AND DISCREPANCIES TO THE CONTRACT ADMINISTRATOR BEFORE PROCEEDING.
- THE CONTRACTOR IS RESPONSIBLE FOR DESIGN, INSTALLATION, RELOCATION AND CONTINUOUS MONITORING TEMPORARY FLOW PASSAGE AND DEWATERING SYSTEM.

NO.	DATE	NAME	REVISIONS

UTILITIES VERIFIED

CABLE T.V.	XXXX XX XX	HYDRO	XXXX XX XX
BELL CANADA	XXXX XX XX	CITY OF XXXX	XXXX XX XX
ENBRIDGE GAS	XXXX XX XX		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

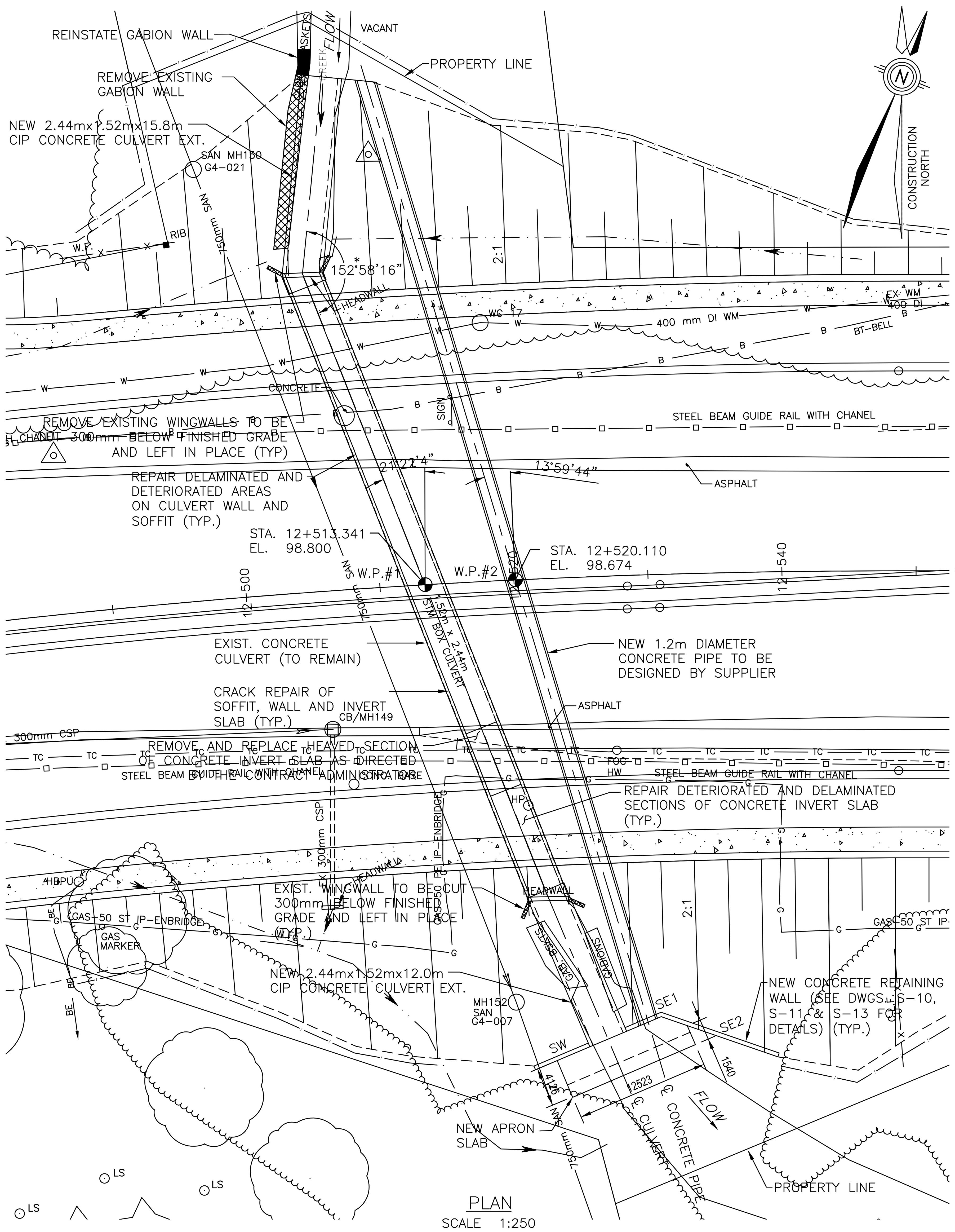
SURVEY DATA DATE: 2018 01
SCALE: AS NOTED

DRAWN: DATE:
DESIGN: DATE:
CHECKED: DATE:
APPROVED: DATE:

KINGSTON ROAD
AMBERLEA – WEST BRANCH CULVERT EXTENSION
GENERAL ARRANGEMENT

CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
–	2	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
S–1	—	3 OF 22



PLAN
SCALE 1:250

LIST OF DRAWINGS

S-8	GENERAL ARRANGEMENT
ESC-2	EROSION AND SEDIMENT CONTROL
S-9	REMOVALS
S-10	DETAILS I
S-11	DETAILS II
S-12	REINFORCEMENT DETAIL I
S-13	REINFORCEMENT DETAIL II
S-14	MISCELLANEOUS DETAILS

NOTE:

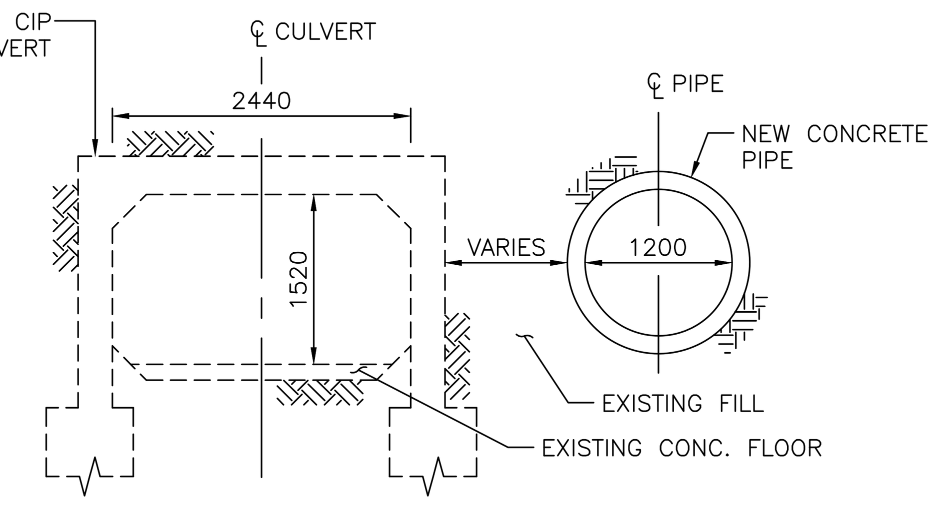
* ANGLE TO BE VERIFIED IN FIELD BY CONTRACT ADMINISTRATOR.

LEGEND

- GRANULAR 'A'
- GRANULAR 'B'
- REMOVAL

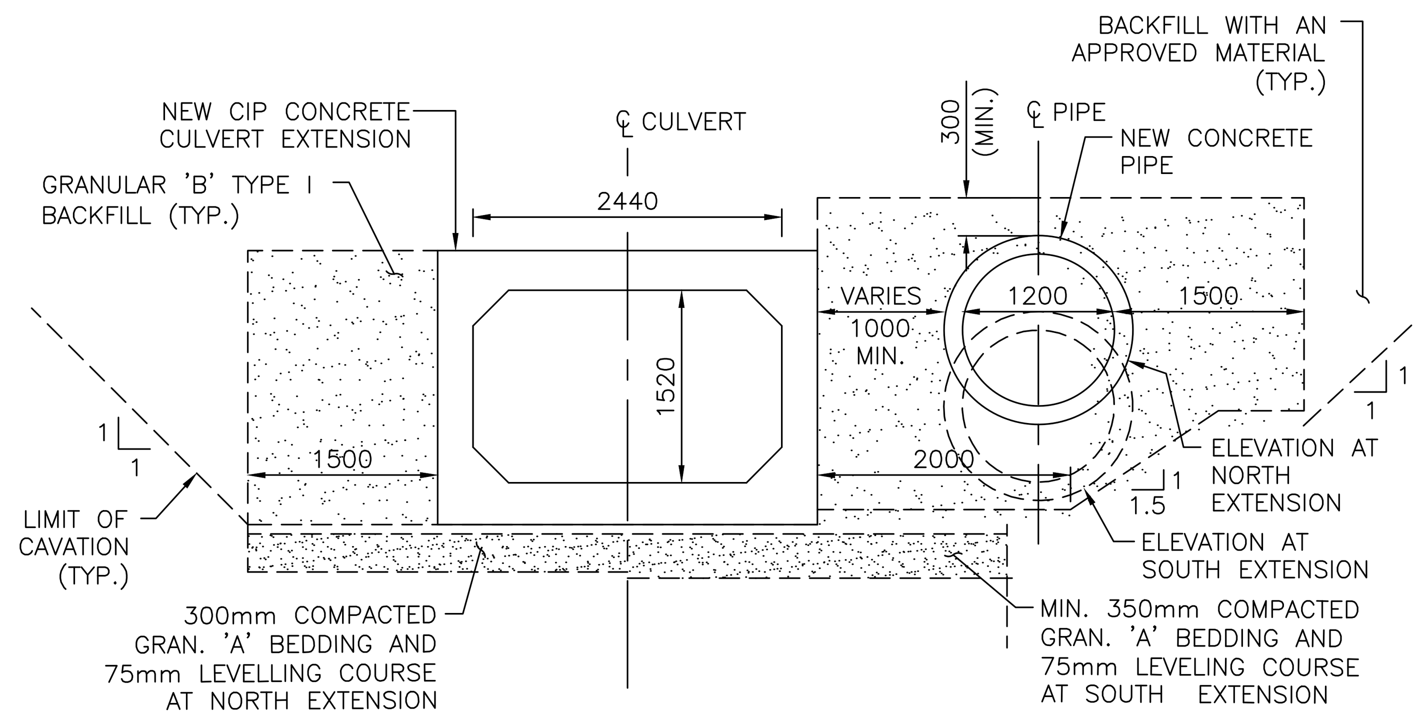
APPLICABLE STANDARD DRAWINGS

OPSD 3090	FOUNDATION FROST PENETRATION DEPTH FOR SOUTHERN ONTARIO
OPSD 3121.150	WALLS, RETAINING, BACKFILLS, MINIMUM GRANULAR REQUIREMENT
OPSD 3950.100	JOINTS, CONCRETE EXPANSION AND CONSTRUCTION JOINT
OPSD 3329.100	DECK, REINFORCEMENT, SUPPORT FOR REINFORCING STEEL FOR SLAB DEPTHS 300mm OR LESS
OPSD 3190.100	WALLS, RETAINING AND ABUTMENT WALL DRAIN
OPSD 803.10	FROST TREATMENT FOR BOX CULVERT LESS THAN 3.0m
OPSD 804.030	CONCRETE FOR PIPE LESS THAN 900 MM DIAMETER



TYPICAL SECTION (AT EXISTING)
SCALE 1:50

*NOTE: THE NEW CONCRETE PIPE UNDER EXISTING ROADWAY TO BE CONSTRUCTED USING JACK AND BORE METHOD. NO OPEN CUT IS ALLOWED.



TYPICAL SECTION (AT NORTH & SOUTH EXTENSION)
SCALE 1:50

GEOTECHNICAL RESISTANCE DATA

- SLS: 150 kPa
  ULS: 175 kPa
- THE FACTORED SOIL BEARING RESISTANCE SHALL BE INSPECTED AND APPROVED BY GHD GEOTECHNICAL ENGINEER ON SITE PRIOR TO THE PLACEMENT OF GRANULAR BEDDING OR FOUNDATIONS OF ANY KINDS.
- SOFT OR DISTURBED ZONE ENCOUNTERED IN THE SUBGRADE UNDER FOOTING OR UNDER GRANULAR BEDDING SHALL BE REMOVED AND FILLED WITH GRANULAR 'A'

SCOPE OF WORK

1. INSTALL EROSION AND SEDIMENT CONTROLS AND ENSURE THEY ARE MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION.
2. INSTALL ROADWAY PROTECTION AND ENVIRONMENTAL PROTECTION SYSTEMS FOR CONSTRUCTION.
3. REMOVE DEBRIS FROM WATERCOURSE.
4. INSTALL FLOW PASSAGE/DEWATERING SYSTEM, DIVERT STREAM TO FLOW PASSAGE SYSTEM AND DEWATER THE WORK AREA. (REFER TO AND SEDIMENT CONTROL PLAN DWG. ESC-2).
5. REMOVE EXISTING WINGWALLS, AND PORTION OF THE EXISTING CULVERT FROM THE NORTH AND SOUTH ENDS.
6. EXCAVATE AND PLACE GRANULAR 'A' WORKING PAD FOR CULVERT EXTENSIONS AND HEADWALLS.
7. CONSTRUCT CULVERT EXTENSIONS AND ASSOCIATED HEADWALLS AND RETAINING WALLS.
8. CONSTRUCT/INSTALL THE CONCRETE RELIEF PIPE AS INDICATED ON THE DRAWING. THE CONCRETE RELIEF PIPE UNDER THE EXISTING ROADWAY SHALL BE INSTALLED BY JACK AND BORE METHOD.
9. PLACE GRANULAR BACKFILL TO CULVERT, CONCRETE RELIEF PIPE, HEADWALLS AND RETAINING WALLS AFTER THE CONCRETE HAD REACHED 25MPa.
10. PATCH REPAIR EXISTING CULVERT.
11. SEAL AND REPAIR MEDIUM AND WIDE CRACKS.
12. REPAIR LEAKING JOINTS.
13. REMOVE FLOW PASSAGE/DEWATERING SYSTEM AND REINSTATE NATURAL FLOW.
14. PAVE AND INSTALL STEEL BEAM GUIDERAILS.

CONSTRUCTION NOTES

- ALL EXPOSED EDGES TO BE CHAMFERED 25mm UNLESS NOTED.
- THE CONTRACTOR TO CHECK ALL RELEVANT EXISTING STRUCTURE DIMENSIONS AND ELEVATIONS SHOWN ON THE DRAWINGS AND ADJUST THE DIMENSIONS AND ELEVATIONS AS REQUIRED TO MATCH EXISTING STRUCTURE AS APPROVED BY THE CONTRACT ADMINISTRATOR.
- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
- GRANULAR 'A' SHALL NOT BE PLACE UNTIL THE DEPTH OF EXCAVATION AND THE CHARACTER OF THE FOUNDATION SOIL HAVE BEEN APPROVED BY GHD GEOTECHNICAL ENGINEER. INSPECTION AND APPROVAL BY THE GEOTECHNICAL ENGINEER SHALL BE COORDINATED BY THE CONTRACT ADMINISTRATOR.
- CONCRETE RELIEF PIPE TO BE DESIGNED BY THE SUPPLIER AND SHALL BE INSTALLED AS INSTRUCTED BY THE SUPPLIER.
- THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF THE TEMPORARY FLOW PASSAGE/DEWATERING SYSTEM FOR 2 YR. STORM ELEVATION AS PER OPSS. PROV S17.
- NO STOCKPILING PERMIITTED.

GENERAL NOTES

SPECIFICATIONS

- ONTARIO PROVINCIAL STANDARD SPECIFICATIONS, MUNICIPAL-ORIENTED, LATEST REVISION.
- CANADIAN HIGHWAY BRIDGE DESIGN CODE, CAN/CSA-S6-14

CONCRETE

- CLASS OF CONCRETE 35MPa
- MAXIMUM AGGREGATE SIZE REPAIRS 13mm
- ALL OTHER CONCRETE 19mm

REINFORCING STEEL

- CLEAR COVER TO REINFORCING STEEL
  BOTTOM OF TOP SLAB 40 ± 10 FOR SLABS ≤ 300 THICK
  50 ± 10 FOR SLABS > 300 THICK
  BOTTOM OF BOTTOM SLAB 100 ± 25
  REMAINDER 60 ± 20 UNLESS OTHERWISE NOTED
- ALL REINFORCING STEEL SHALL BE IN ACCORDANCE WITH C.S.A. STANDARD CAN/CSA-G30.18-M92 (LATEST REVISION), GRADE 400W UNLESS NOTED OTHERWISE.
- UNLESS OTHERWISE SHOWN, TENSION LAP LENGTHS NOT INDICATED ON CONTRACT DRAWINGS SHALL BE CLASS 'B'.
- BAR HOOKS SHALL BE MINIMUM LENGTHS AND STIRRUPS SHALL HAVE MINIMUM HOOKS, UNLESS OTHERWISE INDICATED.
- ALL HOOKS SHALL BE IN ACCORDANCE WITH STANDARD DRAWING SS12-1 UNLESS INDICATED OTHERWISE.
- REINFORCING STEEL SHALL BE FIELD CUT AS DIRECTED BY THE CONTRACT ADMINISTRATOR AND AS A NON-PAY ITEM.

NOTES FOR CONTRACTOR

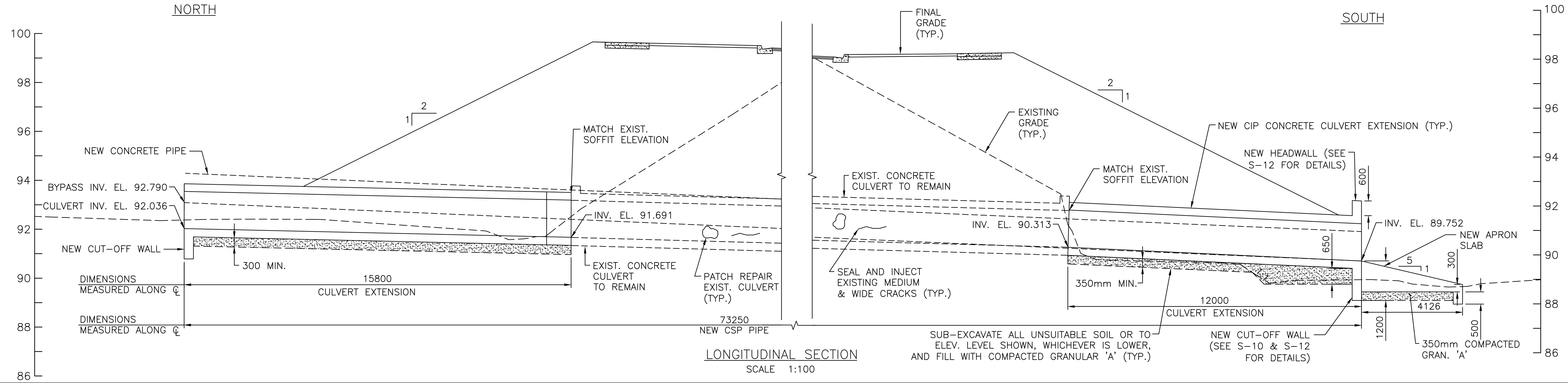
- THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF ALL UTILITIES, SERVICES, STRUCTURES, ROADWAYS ETC. DURING CONSTRUCTION.
- THE CONTRACTOR'S METHODS OF PROTECTION TO BE SUBMITTED TO THE CONTRACTOR ADMINISTRATOR.
- LOCATIONS OF EXISTING UTILITY DUCTS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND DETAILS OF EXISTING SITE CONDITIONS RELATIVE TO THE NEW CONSTRUCTION AND REPORT AND DISCREPANCIES TO THE CONTRACT ADMINISTRATOR BEFORE PROCEEDING.
- THE CONTRACTOR SHALL VERIFY LOCATION AND CONSTRUCTION THE OPENING OF CONCRETE PIPE CULVERT AT SOUTHEAST RETAINING WALL.

NO.	DATE	NAME	REVISIONS

UTILITIES VERIFIED

CABLE T.V.	XXXX XX XX	HYDRO	XXXX XX XX
BELL CANADA	XXXX XX XX	CITY OF XXXX	XXXX XX XX
ENBRIDGE GAS	XXXX XX XX		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.



LONGITUDINAL SECTION
SCALE 1:100

		SURVEY DATA DATE 2018 01
		SCALE AS NOTED

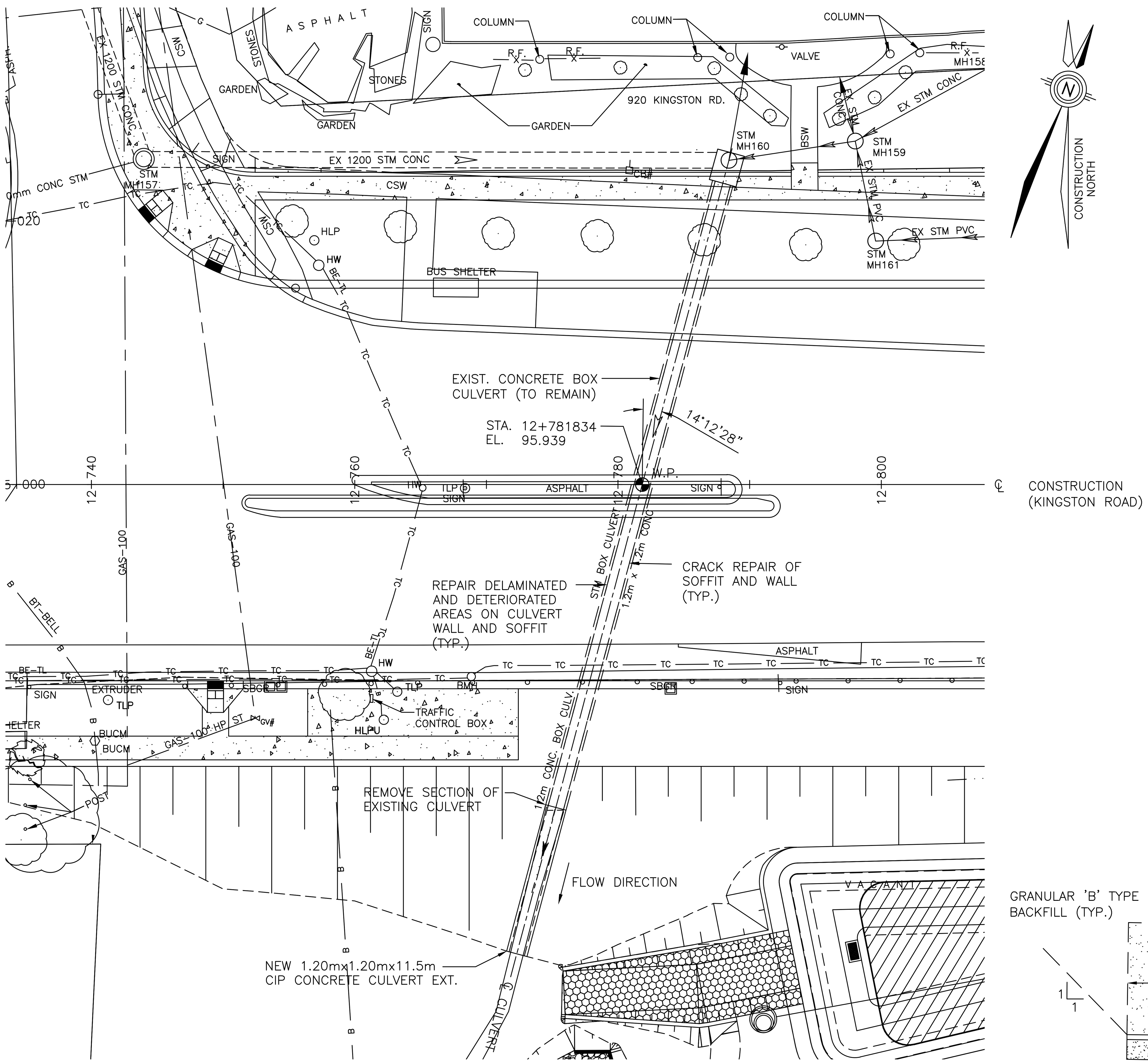
DRAWN:	DATE:
DESIGN:	DATE:
CHECKED:	DATE:
APPROVED:	DATE:

KINGSTON ROAD
AMBERLEA CULVERT EXTENSION GENERAL ARRANGEMENT

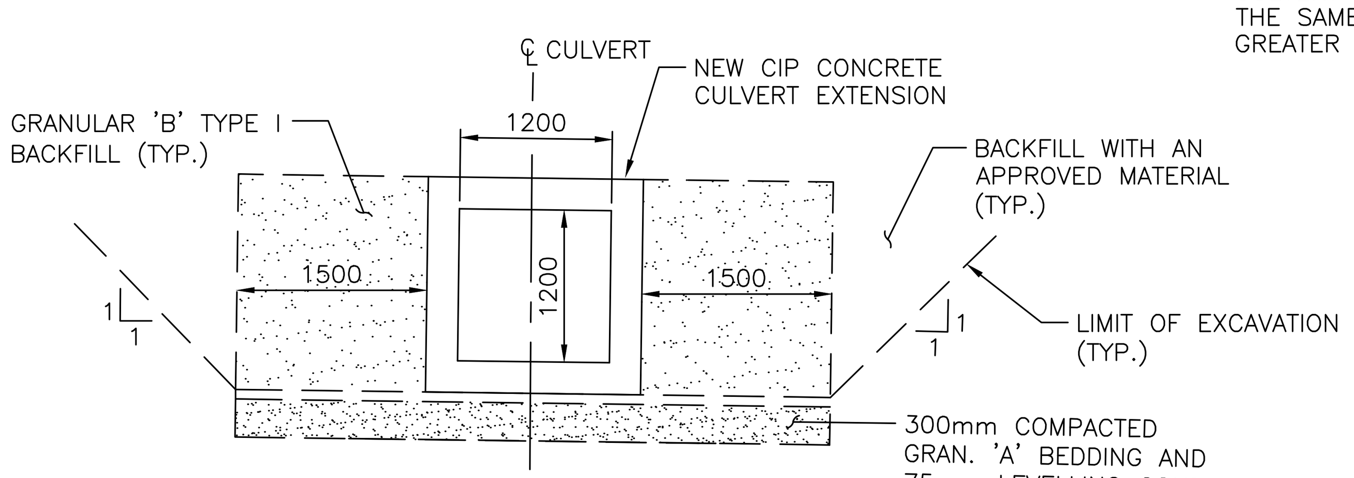
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
–	2	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
S-8	—	11 OF 22

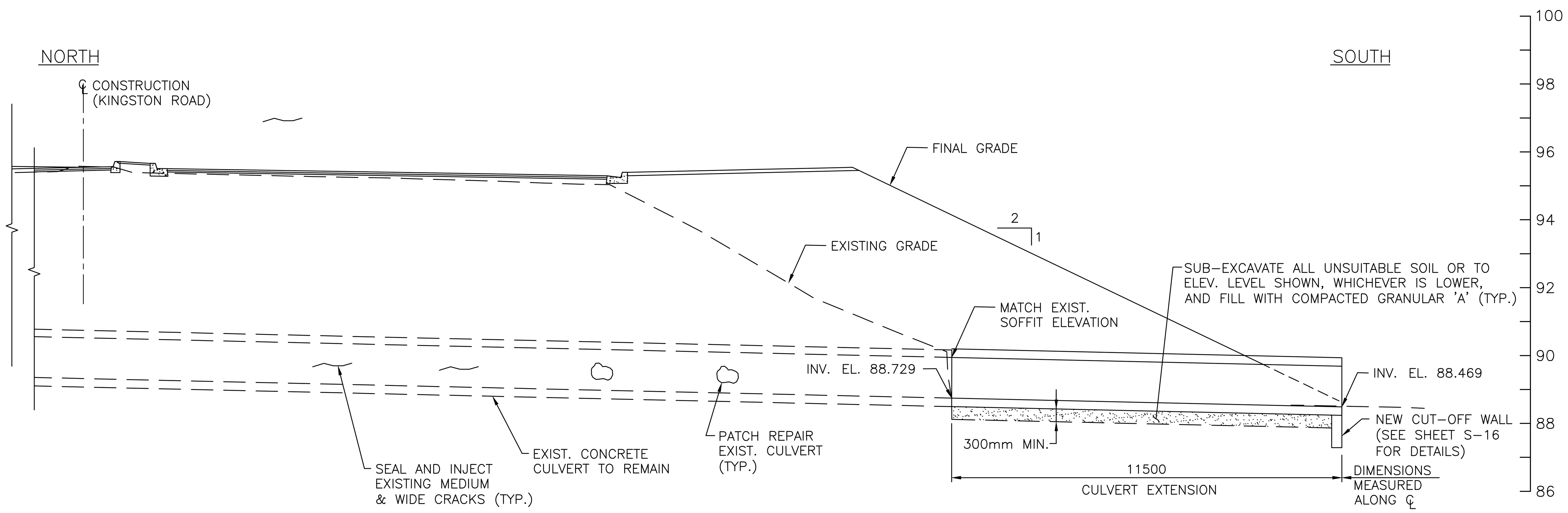
Plotted - February 8, 2021 File: J:\119887_Mx_DS_BRT\5.0 Design (Work) Phase\Structures\Structural GA's\11148853-STR_AMBERLEA CULVERTS-GA\11148853-STR_CULVERT-2_1_1_AMBERLEA-GA.dwg



PLAN
SCALE 1:250



TYPICAL SECTION
SCALE 1:50



LONGITUDINAL SECTION
SCALE 1:100

- GRANULAR 'A' SHALL NOT BE PLACE UNTIL THE DEPTH OF THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION SOIL HAVE BEEN APPROVED BY GHD GEOTECHNICAL ENGINEER. INSPECTION AND APPROVAL BY THE GEOTECHNICAL ENGINEER SHALL BE COORDINATED BY THE CONTRACT ADMINISTRATOR.
- THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF THE TEMPORARY FLOW PASSAGE/DEWATERING SYSTEM. IT IS ANTICIPATED THAT A 2 YR. STORM EVEN WILL FLOOD THE EXISTING CULVERT. CONSTRUCTION SHALL BE CARRIED DURING LOW FLOW SEASON. THE CONTRACTOR SHALL MONITOR ALL MAJOR STORM EVENTS AND THE WATER LEVEL CONSTANTLY.

APPLICABLE STANDARD DRAWINGS

OPSD 3090	FOUNDATION FROST PENETRATION DEPTH FOR SOUTHERN ONTARIO
OPSD 3950.100	JOINTS, CONCRETE EXPANSION AND CONSTRUCTION JOINT
OPSD 3329.100	DECK, REINFORCEMENT, SUPPORT FOR REINFORCING STEEL FOR SLAB DEPTHS 300mm OR LESS
OPSD 3190.100	WALLS, RETAINING AND ABUTMENT WALL DRAIN
OPSD 803.010	FROST TREATMENT FOR BOX CULVERT LESS THAN 3.0m

LIST OF DRAWINGS

S-15	GENERAL ARRANGEMENT
ESC-3	EROSION AND SEDIMENT CONTROL PLAN
S-16	REINFORCEMENT DETAIL I
S-17	MISCELLANEOUS DETAILS

LEGEND

- GRANULAR 'A'
- GRANULAR 'B'
- REMOVAL

GEOTECHNICAL RESISTANCE DATA

- SLS: 110 kPa
  ULS: 150 kPa
- THE FACTORED SOIL BEARING RESISTANCE SHALL BE INSPECTED AND APPROVED BY GHD GEOTECHNICAL ENGINEER ON SITE PRIOR TO THE PLACEMENT OF GRANULAR BEDDING OR FOUNDATIONS OF ANY KINDS.
- SOFT OR DISTURBED ZONE ENCOUNTERED IN THE SUBGRADE UNDER FOOTING OR UNDER GRANULAR BEDDING SHALL BE REMOVED AND FILLED WITH GRANULAR 'A'

SCOPE OF WORK

1. INSTALL EROSION AND SEDIMENT CONTROLS AND ENSURE THEY ARE MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION.
2. INSTALL ROADWAY PROTECTION AND ENVIRONMENTAL PROTECTION SYSTEMS FOR CONSTRUCTION.
3. REMOVE DEBRIS FROM WATERCOURSE.
4. INSTALL FLOW PASSAGE SYSTEM, DIVERT STREAM TO FLOW PASSAGE SYSTEM AND DEWATER THE WORK AREA. (REFER TO AND SEDIMENT CONTROL PLAN DWG. ESC-3).
5. REMOVE PORTION OF THE EXISTING CULVERT FROM THE SOUTH END.
6. PATCH REPAIR EXISTING CULVERT.
7. SEAL AND INJECT MEDIUM AND WIDE CRACKS
8. EXCAVATE AND PLACE GRANULAR 'A' WORKING PAD FOR CULVERT EXTENSIONS AND RETAINING WALLS.
9. CONSTRUCT CULVERT EXTENSION.
10. PLACE GRANULAR BACKFILL TO CULVERT EXTENSION AFTER THE CONCRETE HAD REACHED 25MPa.
11. REMOVE FLOW PASSAGE/DEWATERING SYSTEM AND REINSTATE NATURAL FLOW.
12. PAVE AND INSTALL STEEL BEAM GUIDERAILS.

CONSTRUCTION NOTES

- ALL EXPOSED EDGES TO BE CHAMFERED 25mm UNLESS NOTED.
- THE CONTRACTOR TO CHECK ALL RELEVANT EXISTING STRUCTURE DIMENSIONS AND ELEVATIONS SHOWN ON THE DRAWINGS AND ADJUST THE DIMENSIONS AND ELEVATIONS AS REQUIRED TO MATCH EXISTING STRUCTURE AS APPROVED BY THE CONTRACT ADMINISTRATOR.
- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.

LIST OF ABBREVIATIONS

W.P.	DENOTES WORKING POINT
T/A	DENOTES TOP OF ASPHALT

GENERAL NOTES

SPECIFICATIONS

- ONTARIO PROVINCIAL STANDARD SPECIFICATIONS, MUNICIPAL-ORIENTED, LATEST REVISION.
- CANADIAN HIGHWAY BRIDGE DESIGN CODE, CAN/CSA-S6-14

CONCRETE

- CLASS OF CONCRETE 35MPa
- MAXIMUM AGGREGATE SIZE REPAIRS 13mm
- ALL OTHER CONCRETE 19mm

REINFORCING STEEL

- CLEAR COVER TO REINFORCING STEEL
  BOTTOM OF TOP SLAB 40 ± 10 FOR SLABS ≤ 300 THICK
  50 ± 10 FOR SLABS > 300 THICK
  BOTTOM OF BOTTOM SLAB 100 ± 25
  REMAINDER 60 ± 20 UNLESS OTHERWISE NOTED
- ALL REINFORCING STEEL SHALL BE IN ACCORDANCE WITH C.S.A. STANDARD CAN/CSA-G30.18-M92 (LATEST REVISION), GRADE 400W UNLESS NOTED OTHERWISE.
- UNLESS OTHERWISE SHOWN, TENSION LAP LENGTHS NOT INDICATED ON CONTRACT DRAWINGS SHALL BE CLASS 'B'.
- BAR HOOKS SHALL BE MINIMUM LENGTHS AND STIRRUPS SHALL HAVE MINIMUM HOOKS, UNLESS OTHERWISE INDICATED.
- ALL HOOKS SHALL BE IN ACCORDANCE WITH STANDARD DRAWING SS12-1 UNLESS INDICATED OTHERWISE.
- REINFORCING STEEL SHALL BE FIELD CUT AS DIRECTED BY THE CONTRACT ADMINISTRATOR AND AS A NON-PAY ITEM.

NOTES FOR CONTRACTOR

- THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF ALL UTILITIES, SERVICES, STRUCTURES, ROADWAYS ETC. DURING CONSTRUCTION.
- THE CONTRACTOR'S METHODS OF PROTECTION TO BE SUBMITTED TO THE CONTRACTOR ADMINISTRATOR.
- LOCATIONS OF EXISTING UTILITY DUCTS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND DETAILS OF EXISTING SITE CONDITIONS RELATIVE TO THE NEW CONSTRUCTION AND REPORT AND DISCREPANCIES TO THE CONTRACT ADMINISTRATOR BEFORE PROCEEDING.
- THE CONTRACTOR IS RESPONSIBLE FOR DESIGN, INSTALLATION, RELOCATION AND CONTINUOUS MONITORING TEMPORARY FLOW PASSAGE AND DEWATERING SYSTEM.

NO.	DATE	NAME	REVISIONS

UTILITIES VERIFIED

CABLE T.V.	XXXX XX XX	HYDRO	XXXX XX XX
BELL CANADA	XXXX XX XX	CITY OF XXXX	XXXX XX XX
ENBRIDGE GAS	XXXX XX XX		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

SURVEY DATA DATE 2018 01
SCALE AS NOTED

DRAWN:	DATE:
DESIGN:	DATE:
CHECKED:	DATE:
APPROVED:	DATE:

KINGSTON ROAD
AMBERLEA – EAST BRANCH CULVERT EXTENSION
GENERAL ARRANGEMENT

CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
–	2	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
S-15	–	19 OF 22

Plotted – February 8, 2021 File: J:\11148853-STR_AMBERLEA CULVERTS-GA\11148853-STR_CULVERT-3_1_EAST BRANCH-GA.dwg

DSBRT - DURHAM REGION - CITY OF PICKERING - KINGSTON ROAD

GENERAL NOTES:
1. CYCLING AND PEDESTRIAN TREATMENTS AT INTERSECTIONS UNDER REVIEW

CONCEPTUAL DESIGN - DRAFT FOR COMMENT

PIK-002

REFERENCE DRAWINGS		ISSUE			REVISIONS		
DWG NO.	TITLE	NO.	DATE	ISSUED FOR	REV.	DATE	

DRAWN BY: | DESIGNED BY:
CHECKED BY: | APPROVED BY:
SCALE: 1:2000

IBI

METROLINX

METROLINX PROJECT NO.

DURHAM–SCARBOROUGH BUS RAPID TRANSIT ENVIRONMENTAL ASSESSMENT
OPTION AT HIGHWAY 401 / PORT UNION
STA.XX+XXX TO STA.XX+XXX

CONTRACT NO. | DWG. NO. | REV. | SHEET

July 13, 2020, 3:32 PM Login name: mai-linh.ho
Drawing Name: J:\119887_Mx_DS_BRT\5.9 Drawings\59civil\current\CPG_DSBRT_C1-004_XSEC.dwg

Centre – Median BRT (6 Lanes)

KINGSTON ROAD

Drawing Name: J:\119887_Mx_DS_BRT\5.9 Drawings\59civil\current\CPG_DSBRT_C1-004_XSEC.dwg
July 13, 2020, 3:32 PM Login name: mai-linh.ho

REFERENCE DRAWINGS		ISSUE			REVISIONS		
DWG NO.	TITLE	NO.	DATE	ISSUED FOR	REV.	DATE	

DRAWN BY: | DESIGNED BY:
CHECKED BY: | APPROVED BY:
SCALE: 1:2000

LEGEND

- BRT LANE
- PLATFORM/RAMP
- EX. PARCEL LINE
- TRAFFIC LANE CONFIGURATION
- EX. RIGHT-OF-WAY LINE
- PROPOSED SIDEWALK
- PROPOSED CYCLING FACILITY
- TRCA REGULATION LIMITS LINE
- PROPOSED CONCRETE ISLAND

IBI PARSONS

METROLINX

DURHAM – SCARBOROUGH Bus Rapid Transit

METRIC

ALL DIMENSIONS SHOWN ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE NOTED.

METROLINX PROJECT NO.

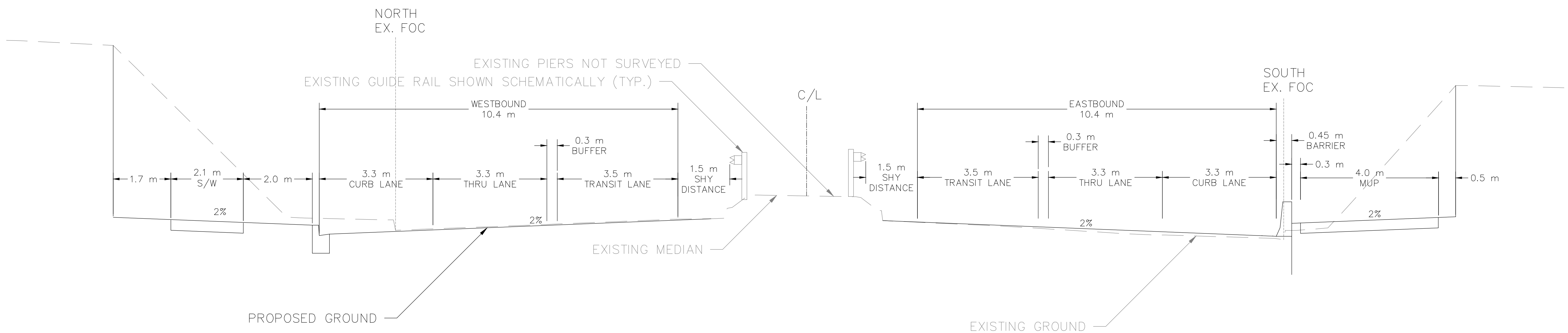
DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
OPTION AT HIGHWAY 401 / PORT UNION

STA.XX+XXX TO STA.XX+XXX

CONTRACT NO.	DWG. NO.	REV.	SHEET

METRIC

ALL DIMENSIONS SHOWN ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE NOTED.



KINGSTON ROAD – UNDER HIGHWAY 401 OVERPASS
3+40.000
N.T.S.

METROLINX PROJECT NO.

REFERENCE DRAWINGS		ISSUE			REVISIONS		
DWG NO.	TITLE	NO.	DATE	ISSUED FOR	REV.	DATE	

DRAWN BY: | DESIGNED BY:
CHECKED BY: | APPROVED BY:
SCALE:

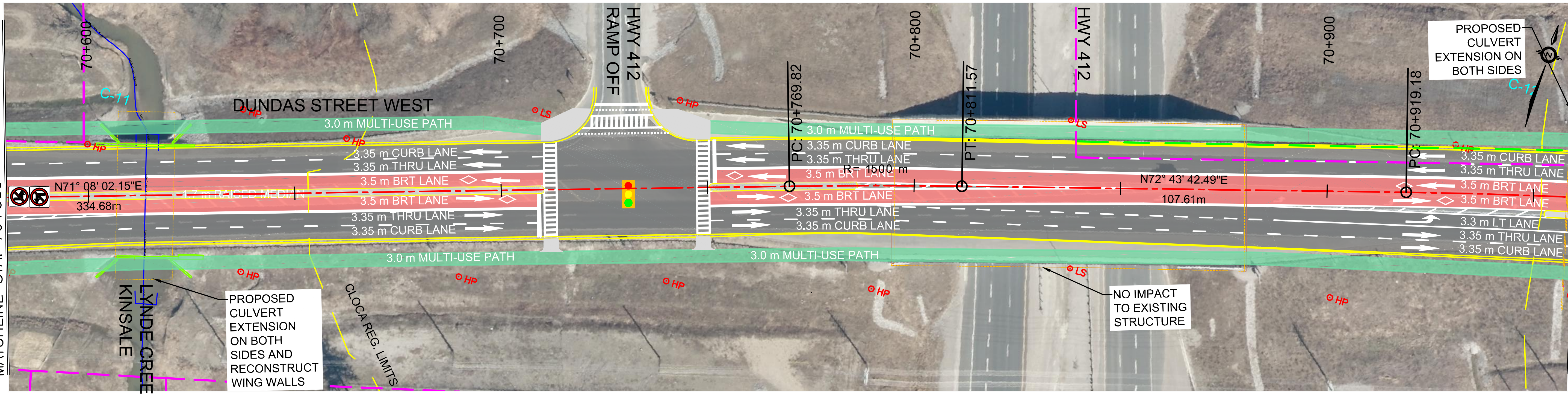
IBI

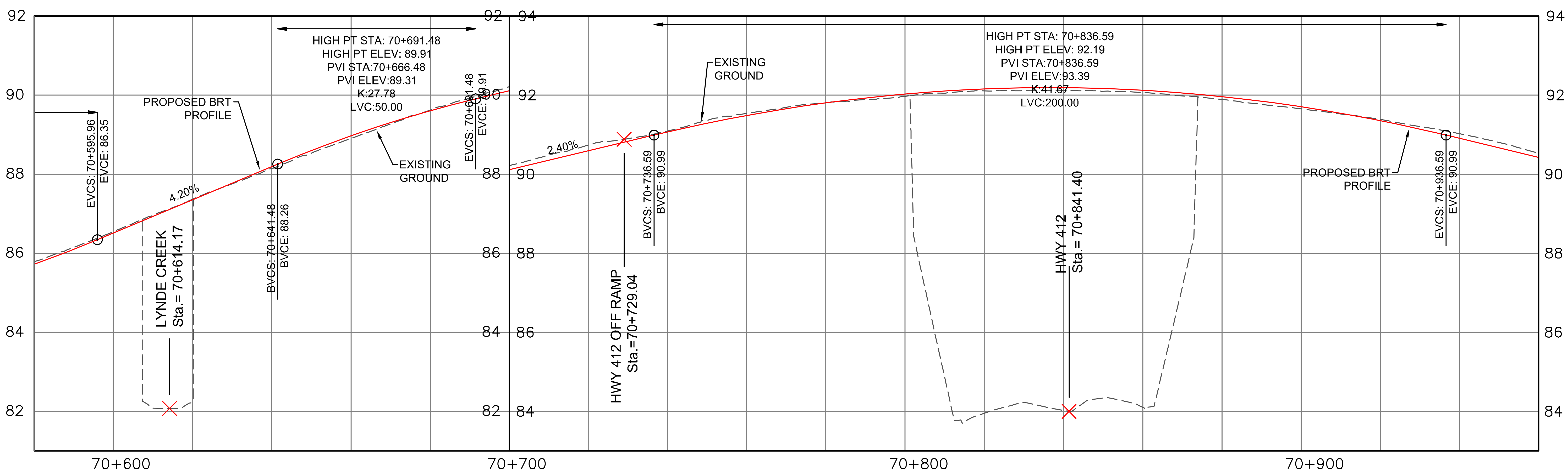
METROLINX

DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
SECTIONS

STA.XX+XXX TO STA.XX+XXX

CONTRACT NO. | DWG. NO. | REV. REVISION | SHEET SHEET





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DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 70+580 TO STA. 70+960

CONTRACT NO.	DWG. NO.	REV.	SHEET
RQQ-2018-PPDD-244	CPG_DSBRT_CO_000_PLAN&PROFILE_SHEET_WHT_02	00	WHT_02

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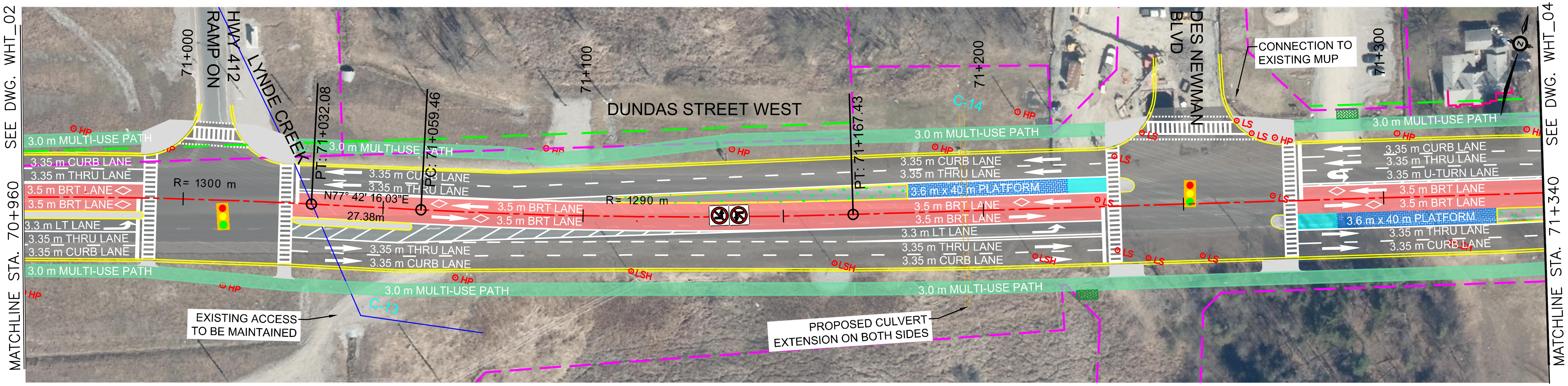

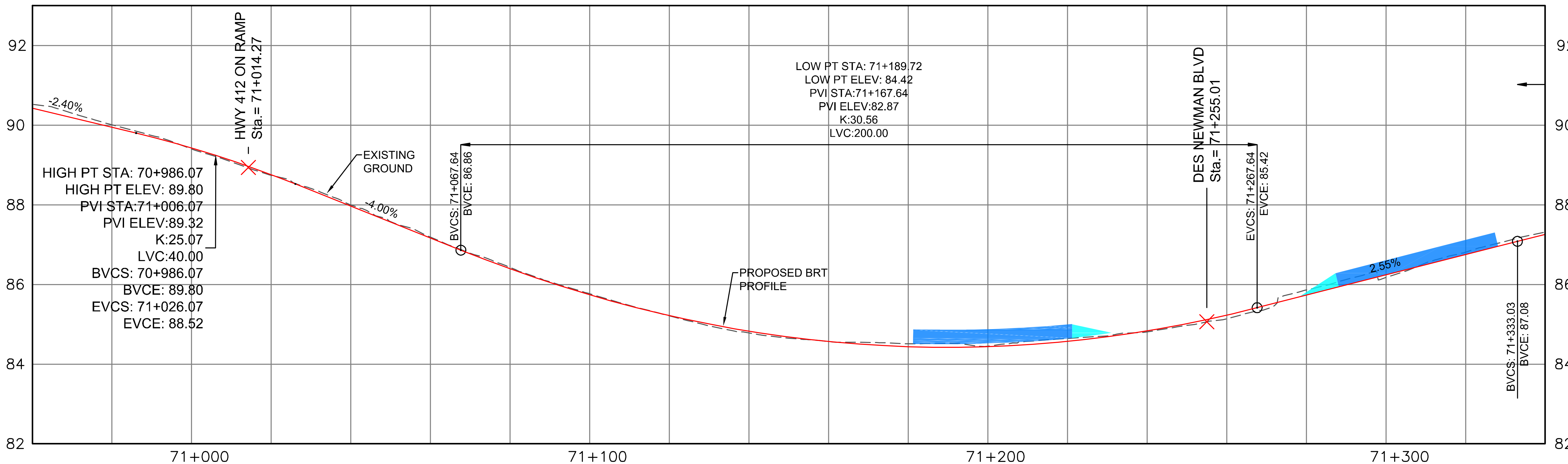

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DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 70+960 TO STA. 71+340

CONTRACT NO.	DWG. NO.	REV.	SHEET
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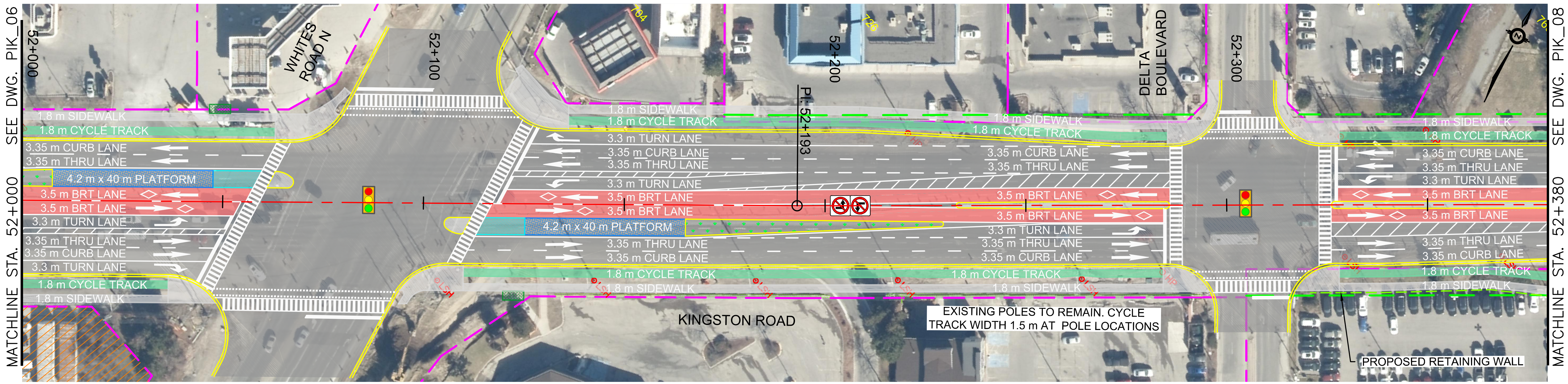

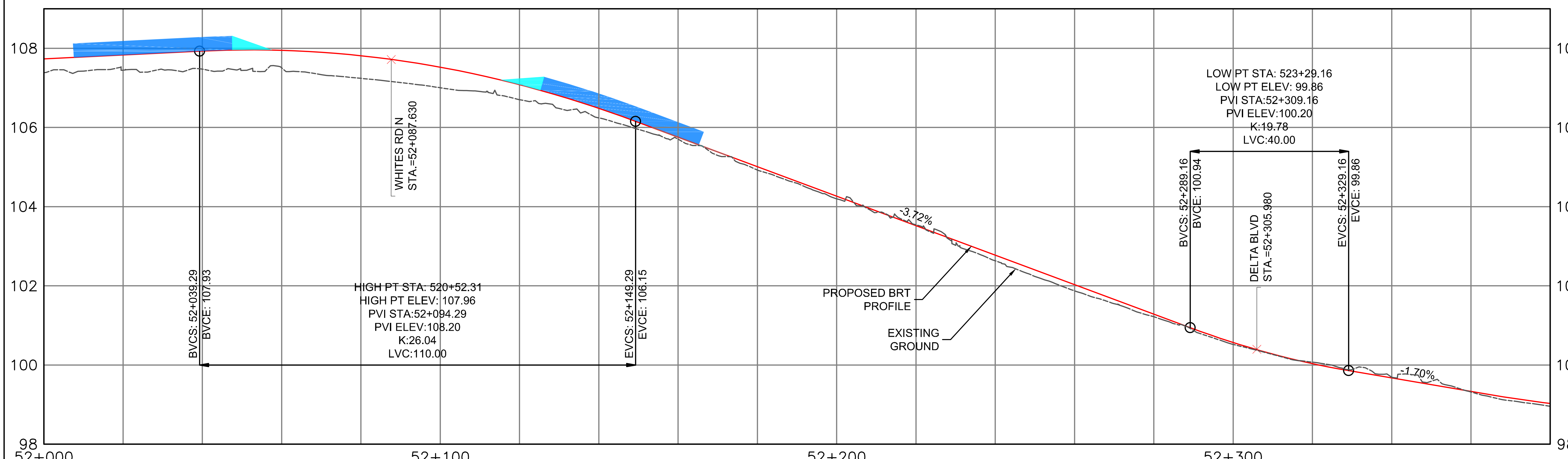

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DURHAM – SCARBOROUGH Bus Rapid Transit

DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 52+000 TO STA. 52+380

CONTRACT NO.	DWG. NO.	REV.	SHEET
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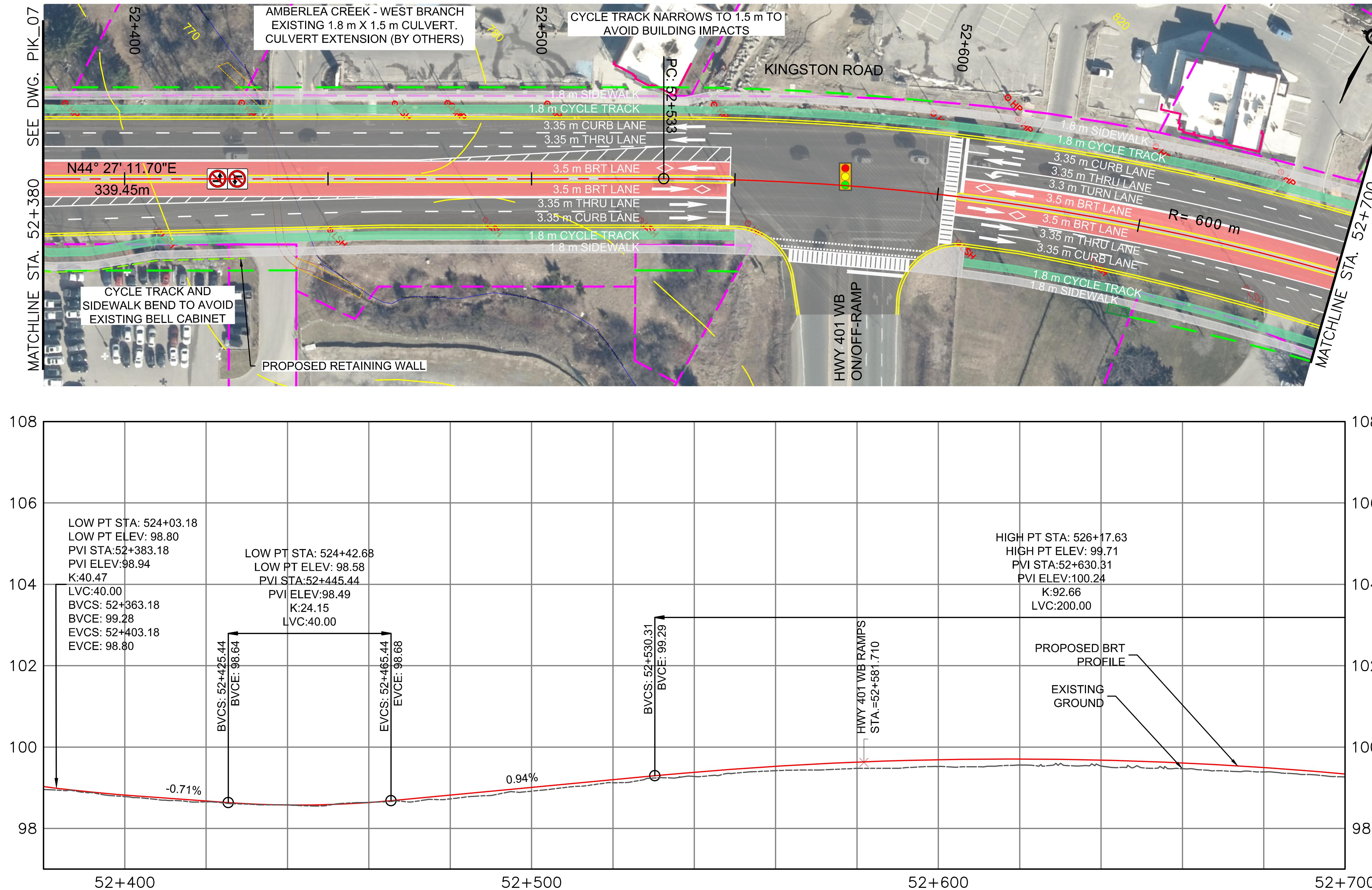

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DURHAM – SCARBOROUGH
Bus Rapid Transit

DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 52+380 TO STA. 52+700

CONTRACT NO.	DWG. NO.	REV.	SHEET
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7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
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Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	July 27, 2021
From	Margaret Parkhill, Ragavan Thuraisinganathan	**IBI Project No**	119887

Subject	Durham-Scarborough BRT and Highway 412 / Dundas Street Metrolinx July 27, 2021, 10:00 a.m. to 11:00 a.m.
Present	Kristin Demasi, Oscar Tapia, Wilson Taveira, Matthew Coelho, Metrolinx Frank Martins, Gustavo Rojas, Eileen Li, Valerie Nantais, Prashanth Selvakumar, Adrian Firmani, Lewis Lee, MTO Dave Dunn, Durham Region Ragavan Thuraisinganathan, Parsons Margaret Parkhill, IBI Group
Distribution	Meeting attendees and invitees

Item Discussed	Action By
Introduction K. Demasi welcomed attendees and provided an overview of the purpose of the meeting. M. Parkhill provided a brief overview of the DSBRT project. The following is a summary of the discussion: **Highway 412 interchange with Dundas Street in Whitby** • R. Thuraisinganathan provided an overview of the proposed preliminary design for the DSBRT on Dundas Street. • G. Rojas noted the 30-year contract (407 EDG) must meet MTO standards at all times, including all maintenance and rehab, including the ramp terminals. Before new infrastructure is added, the 407 EDG will need to be consulted to understand implications and any conditions. • F. Martins noted need to consider infrastructure capital costs as well as separate costs for additional maintenance costs for remaining 20+ years on the contract. Also noted that while MTO is self-insured, private company needs insurance and any exception to design standards may need acknowledgement of which agency is the responsible party should an incident occur. This will need to	INFO

Item Discussed	Action By
be considered going forward and may result in additional costs for the BRT project.	
• R. Thuraisinganathan asked if the change to 6-lanes was contemplated in the existing 3-year contract. G. Rojas noted the PDR sets out the ultimate design in consultation with Durham Region and Town of Whitby. MTO jurisdiction is the Highway 412 and 30-year contract is to maintain what is there now.	
• What are the maintenance limits of the 30-year contract? G. Rojas noted the two ramp terminals on Dundas are included. P. Selvakumar showed property drawings and Project Company lands and can circulate after the meeting. Then IBI/Parsons can delineate the capital cost associated with the proposed changes to Dundas Street.	P. Selvakumar
• G. Rojas noted a lower design speed doesn't necessarily mean drivers will follow the lower speed. R. Thuraisinganathan noted the posted speed would remain 60 km/h, similar to other rapid transit projects. P. Selvakumar noted MTO needs to review rationale for lower design speed, and what design speed can be met. Design team is working to document design criteria in MTO format.	R. Thuraisinganathan
• G. Rojas noted design exemption process may not be possible at this location. Not meeting design standards is a significant issue. 407 EDG is a stakeholder that needs to be consulted on the design.	
• G. Rojas noted adding cycling infrastructure may also change the insurance profile for the 407 EDG.	
• D. Dunn noted, in Town of Whitby, cyclists can legally use the sidewalks. Observed that not providing cycling infrastructure also has associated risks, as more cyclists are expected along Dundas Street.	
• M. Parkhill asked if there might be interim options to improve transit priority over Highway 412 during the 30-year contract, while keeping the 6-lane centre-running bus lanes as the ultimate configuration for the Environmental Assessment.	
• D. Dunn noted a consultant has been engaged to start detail design of this portion the BRT corridor (Des Newman to Lake Ridge Road). The project is planned to be implemented as traditional design-bid-build by Durham Region with support from ICIP funding for design and construction. Construction in Whitby is planned for 2024.	
• D. Dunn noted ICIP funding includes area around Highway 401 Whites Road off-ramp.	
• F. Martins noted there is a variation process for the EDG contract.	

Item Discussed	Action By
Next Steps	
• Project team to review if design standards can be met or what design speed is possible.	R. Thuraisinganathan
• Arrange meeting with 407 EDG to discuss detail design requirements. D. Dunn will confirm if detail design contract has been officially awarded. Meeting to be arranged via Metrolinx once confirmed.	D. Dunn
• Confirmed MTO provided design/contract drawings for Hwy 412. If available, can MTO share as-built drawings and recent inspection reports? Along with MTO design criteria and any documented design criteria exemptions A. Firmani will provide if available.	A. Firmani

Please advise of any errors or omissions to Margaret Parkhill by August 6, 2021.

Durham-Scarborough Bus Rapid Transit

MTO STAFF MEETING – July 27, 2021

Proposed Works around Highway 412 at Dundas Street West

Purpose

- Provide information on the Durham-Scarborough Bus Rapid Transit project around the Highway 412 interchange

- Review the DSBRT Preliminary Design for the EA/TPAP

- Discuss future construction and implementation strategies

METROLINX

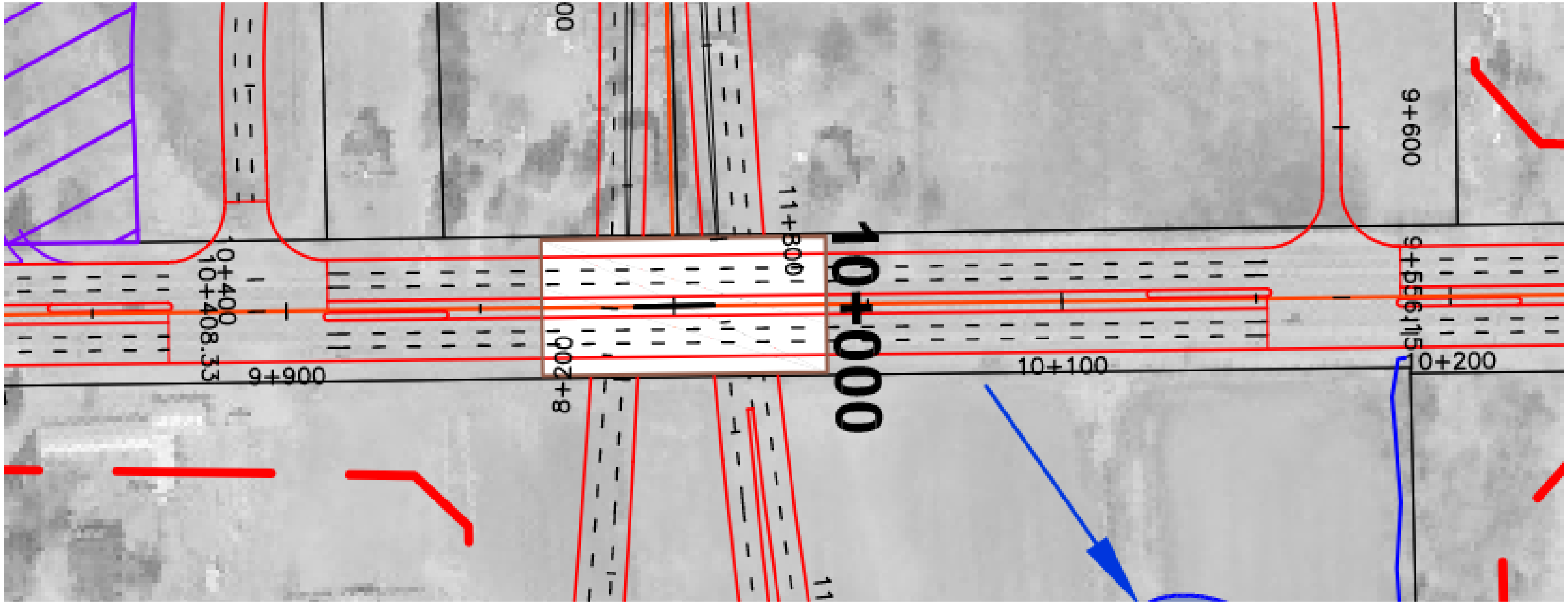
Study Area

Design Approach

- Improve multi-modal mobility along the corridor for automobiles, transit and active transportation
- Maintain the existing number of traffic lanes along Dundas Street and improve transit reliability along the corridor with the proposed median BRT configuration
- Accommodate the proposed cross-section over the existing Highway 412 bridge at Dundas Street W and avoid structural impacts.
- No impacts to traffic operations on Highway 412.

PDR: 407 East Extension – West Durham Link (Highway 412)

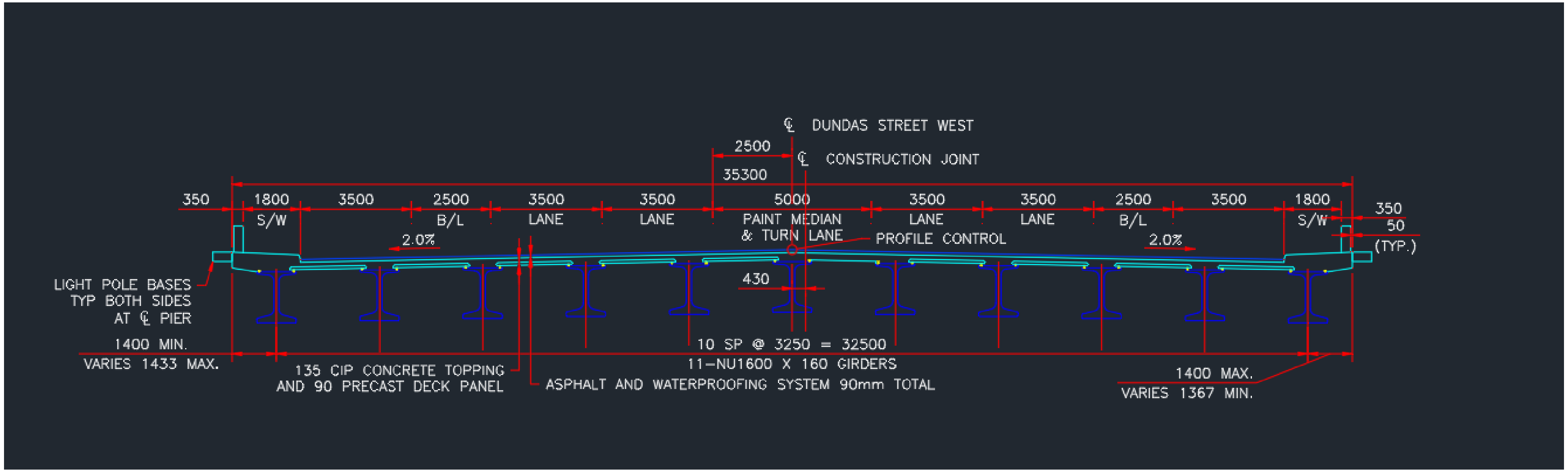
- Dundas Street was designed during the 407 East project to protect for a total of 6 lanes over the Highway 412 bridge, inclusive of planned BRT lanes.



407 EAST INDIVIDUAL ENVIRONMENTAL ASSESSMENT STUDY
RECOMMENDED PLAN WDL STA.10+000 TO STA.10+200
(SHEET 44)

Highway 412 Bridge Cross-Section

EXISTING



Highway 412 Interchange

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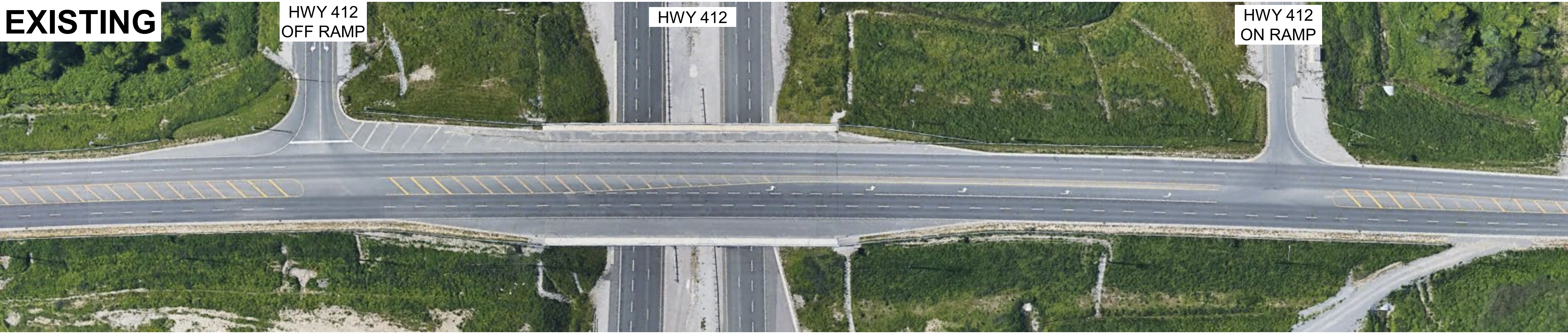

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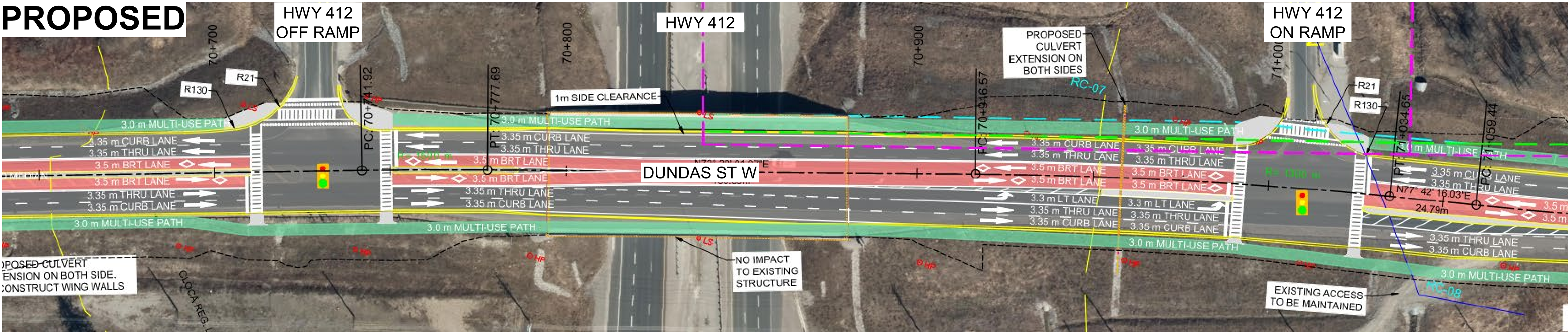


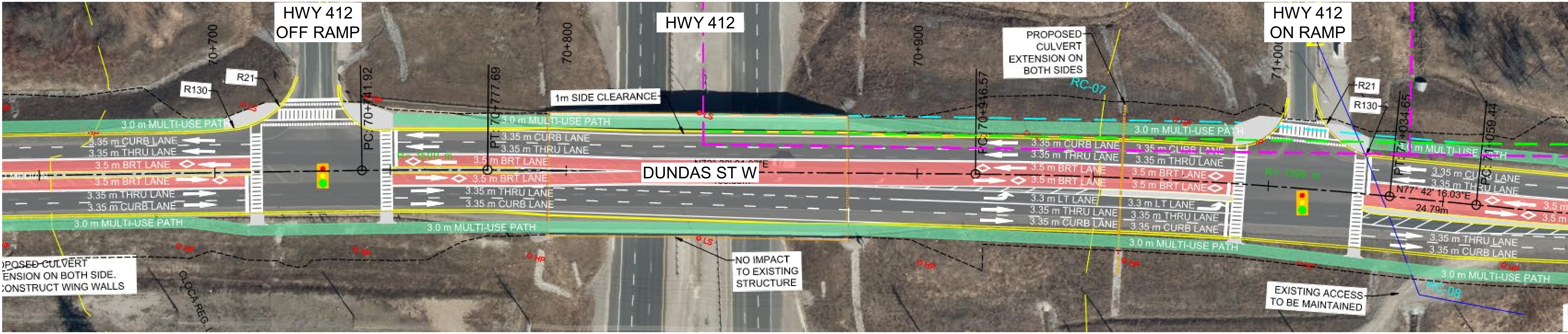
Highway 412 Interchange

Proposed Design along Dundas St W includes:

- Signalization of on/off ramp intersections to provide protected left turn movements. All existing traffic maneuvers to be maintained.

- No structural impacts to the Highway 412 bridge; proposed work is limited to asphalt pavement rehabilitation and sidewalk widening to construct MUP.

- Implementation of a continuous 3.0m MUP on both sides of Dundas St W with crossrides at intersections.



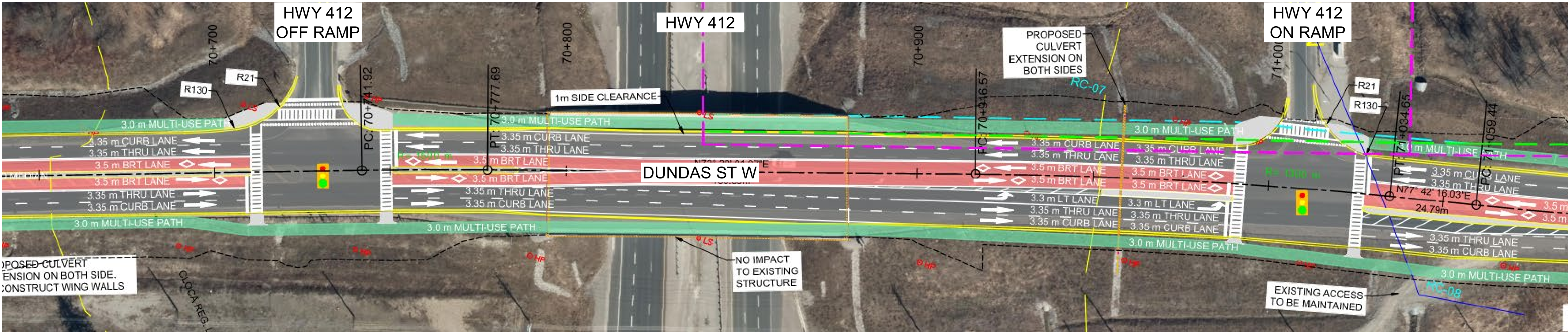
Highway 412 Interchange

Proposed Design along Dundas St W includes:

- Design speed reduction to 70 km/h to accommodate the proposed 3.35m lane widths along Dundas Street W.

- 1m side clearance maintained over bridge deck provides the opportunity in detailed design to reallocate pavement widths.

- Existing access road to SWM Pond will be maintained.



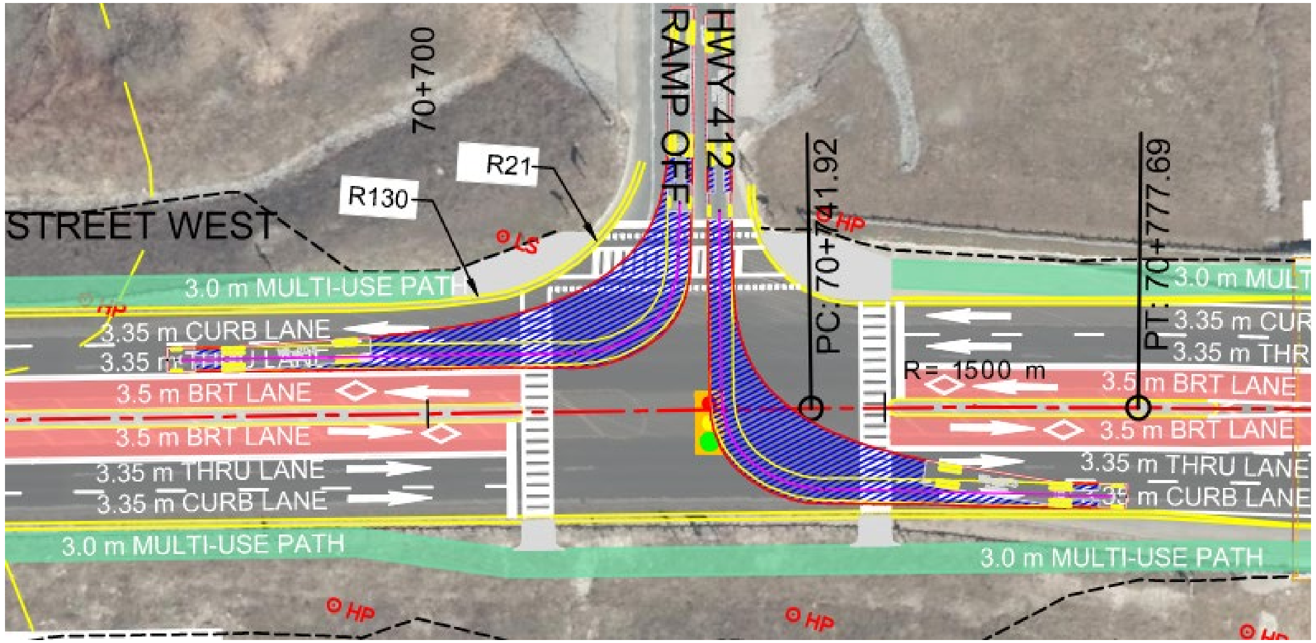
General Design Criteria – Dundas St at Hwy 412 Interchange (Whitby)

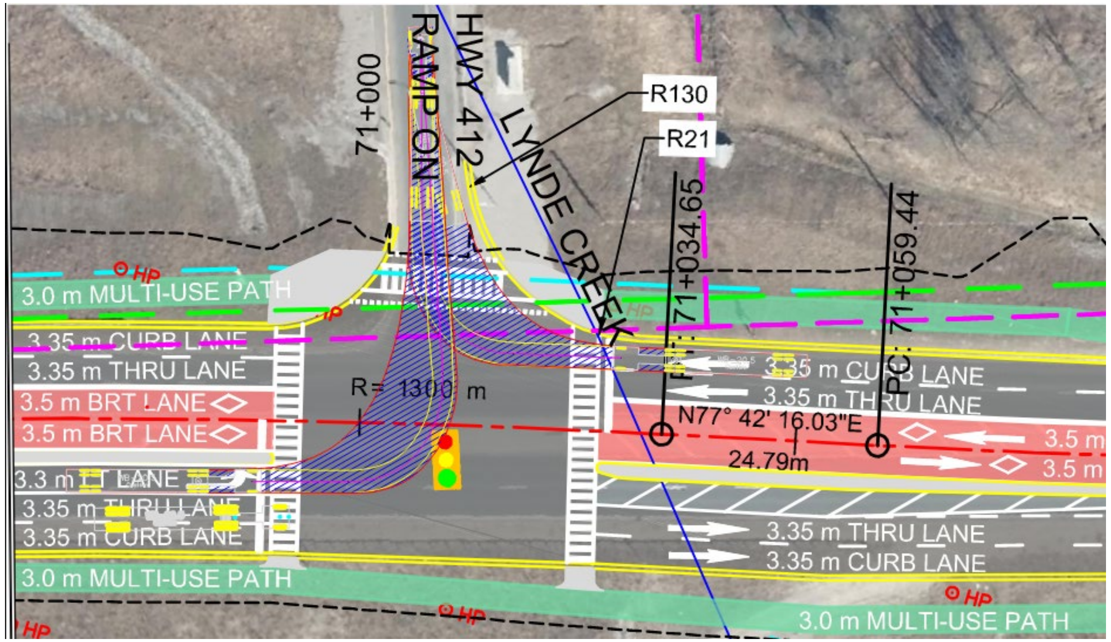
Criteria	Existing Condition	MTO Standard*	DSBRT Proposed
Posted Speed	70 km/h	-	60 km/h
Design Speed	90 km/h	90 km/h	70 km/h
Through Lane	3.5 m	3.5 m	3.35 m
Curb Lane	3.5 m	3.5 m	3.35 m
Left-Turn Lane	3.5 m	3.25 m	3.3 m
Left-Turn Taper	unknown	145 m	100 m
Left-Turn Deceleration Length	unknown	226 m	150 m
Side Clearance on Bridge Deck	varies	1.0 m	1.0 m

* - As per MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads (Apr 2020)

Vehicle Turn Movements

- Design Vehicle: WB-20.5
- Compound curb radii incorporated at ramp intersections





Traffic Operations at Highway 412 / Dundas Street Ramp Intersections

The table below summarizes Future (2041) with-BRT Traffic Conditions at the Highway 412 / Dundas St W ramps

Intersection	Overall Intersection LOS (v/c)	Critical Movements (LOS) [v/c]
Dundas Street at Highway 412 SB Off-Ramp (WHT)	A (0.74)	
Dundas Street at Highway 412 NB On-Ramp (WHT)	B (0.79)	EBT (B) [0.89]

Next Steps

- Refinement of MTO Design Criteria document
- Discuss future plans for construction and impact mitigation around the Highway 412 interchange
- Present the EA preliminary design within MTO jurisdiction areas to Senior Management

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7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
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Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	July 23, 2021
From	Margaret Parkhill, David Hopper	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
July 21, 2021, 10:00 a.m. to 12:00 p.m.

Present Kristin Demasi, Oscar Tapia, Madelin Blacha, Uton Samuels, Metrolinx
Stanley Chan, Vlado Dimitrovski, Les Dzbik, Eileen Li, Valerie Nantais, Selvakumar Prashanth, Christian Singh, Michael Sit, Marek Wiesek, MTO
Andrew Au, Andres Jarrin, Allan Abrogena, City of Toronto
David Hopper, Ragavan Thuraisinganathan, Parsons
Margaret Parkhill, Adrian Chiu, IBI Group

Distribution Meeting attendees

Item Discussed	Action By
Introduction	
M. Parkhill welcomed attendees and provided an update on the DSBRT project and status of the design at MTO jurisdiction areas. The following is a summary of the discussion:	INFO
Ellesmere Road and Kingston Road Intersection	
• M. Parkhill provided an update on the design at the Ellesmere Road and Kingston Road intersection, noting that an additional WBR lane was added due to traffic queues and highlighted impacts for an existing heritage property.	INFO
• P. Selvakumar asked if design drawings will be circulated to MTO. M. Parkhill confirmed that they will.	M. Parkhill
• V. Nantais asked if the multi-use path is impacted by the additional right-turn lane. M. Parkhill clarified that it is not.	
• P. Selvakumar noted MTO staff will provide feedback once drawings have been received.	

Item Discussed	Action By
• V. Nantais asked if the 3.5 m widened thru lanes is consistent along the rest of the Kingston Road section. M. Parkhill confirmed that they are.	
Kingston Road, under the Highway 401 Bridge	
• M. Parkhill provided an update on the design along Kingston Road under the existing Highway 401 bridges, noting that the proposed sidewalk and multi-use path have been revised to be placed at the top bench of the existing bridge slopes.	
• P. Selvakumar noted that MTO designs 20 km/h above posted speed and expressed concerns of reducing design speed along the corridor.	
• P. Selvakumar noted that 3.5 m wide lanes would not be sufficient for a design speed 20 km/h above posted. M. Parkhill noted that there is a pinch point at the existing bridge, where widening the road further may impact the existing bridge slopes and shallow foundations.	
• S. Chan asked if a retaining structure or toe wall has been reviewed to allow for further widening of the road. A. Chiu responded that during the previous meeting with MTO, staff expressed concerns that impacting the bridge slopes may undermine the footings of the existing bridge. V. Dimitrovski confirmed that the existing bridge footings are shallow and higher in elevation than the road, so impacting the slopes would require a full analysis by structural engineers to evaluate potential impacts.	
• P. Selvakumar noted that the circulated design criteria memo is not to MTO format, making it difficult to review. P. Selvakumar also noted that MTO staff needs to understand site conditions and what design speeds are possible. Design team will provide design criteria following MTO format.	R. Thuraisinganathan
• M. Parkhill asked if MTO could review the Design Exceptions memo circulated earlier, as it may provide more information. P. Selvakumar responded that based on an initial review, MTO might need more rationale to justify exceptions and will provide written comments.	P. Selvakumar
• L. Dzbik asked how wide the structure needs to be. V. Dimitrovski clarified that the structure already exists and impacts would require a full analysis. M. Parkhill responded that Metrolinx would need to make the decision on impacting the slope, as a full structural analysis was not anticipated as part of this project.	
• D. Hopper suggested reducing the shy distance from BRT lanes to centre guard rails as there is limited space to widen outwards. A. Au noted that City staff will want to review this and transit operators should be consulted. S. Chan responded that MTO will review and provide a response.	A. Au S. Chan

Item Discussed	Action By
Left-Turn Access at Highway 401 WB On-Ramp	
• M. Parkhill noted that as previously presented, the left-turn access to the Highway 401 WB On-Ramp is proposed to be closed.	
• V. Nantais noted that MTO staff cannot provide an endorsement of this closure until it has been presented to Senior Management and endorsed by them. M. Parkhill asked if there are any suggestions on getting senior management's endorsement. V. Nantais responded that a clear rationale should be presented, some examples already presented include low volumes and opportunities for detours. P. Selvakumar suggested presenting a map showing the network re-routing.	Project Team
• M. Sit asked what the difference in travel times is for drivers being re-routed by this closure. D. Hopper responded that travel time differences have not been reviewed due to the number of potential origin points. Suggested that drivers farthest from Meadowvale Road may instead U-turn at Rylander Boulevard to access the on-ramp.	
• M. Sit asked if signal timings have accounted for increased U-turn volumes. D. Hopper confirmed that they have.	
Highway 401 EB Off-Ramp and Municipal Highway 2 Intersection	
• M. Parkhill provided an update on the design at the Ellesmere Road and Highway 401 EB Off-Ramp / Municipal Highway 2 On-Ramp intersection.	
• P. Selvakumar noted that MTO requested PHM-125 drawings and asked if they will be receiving them. M. Parkhill responded that this project is for preliminary design which is to about 30% and that generally, PHM-125 drawings are prepared at about 60%. P. Selvakumar responded that the PHM-125 drawings don't need to be final but MTO would like to have them prepared. K. Demasi requested that this discussion be continued at a later time as this request is unusual.	K. Demasi / P. Selvakumar
MTO Carpool Lot Access	
• M. Parkhill provided an overview of the conversion to right-in, right-out access for the existing MTO Carpool Lot along Kingston Road.	
• V. Nantais suggested providing an analysis of volumes at Rylander to assess U-turn / right-turn conflicts.	Project Team
AutoTurn Figures	
• M. Parkhill provided an overview of updated AutoTurn figures at MTO ramp intersections.	
• P. Selvakumar requested that radii be shown for the compound corner radii on design plans.	

Item Discussed	Action By
• P. Selvakumar noted that MTO preference is for lanes to be widened to 3.75 m. R. Thuraisinganathan noted that the ability to widen lanes is limited by existing constraints such as utility poles and other features. P. Selvakumar noted that clearances for features such as utility poles be reviewed from the MTO Roadside Design Manual.	R. Thuraisinganathan
Dundas Street at Highway 412 Interchange	
• M. Parkhill provided an update on the design at the Highway 412 NB On-Ramp and SB Off-Ramp	
• P. Selvakumar noted that the Highway 412 is under a 30 year maintenance contract and requested that design exceptions be avoided. R. Thuraisinganath responded that lanes are designed to 3.35 m to provide width for all elements including BRT lanes and MUPs, suggesting that design speeds be reduced to 70 km/h. P. Selvakumar noted that due to existing concession, these exceptions may not be possible.	
• M. Wiesek noted that in addition to design geometry, costs will need to be incurred to change existing legal agreements. M. Parkhill responded that these concerns are valid and will discuss them with the MTO Highways Group next week.	Project Team
• P. Selvakumar requested to attend the meeting with MTO representatives re Highway 412. K. Demasi will send invitation.	K. Demasi
Design Criteria	
• M. Parkhill provided an overview of the proposed design criteria at the DSBRT corridor sections near MTO jurisdiction.	
• R. Thuraisinganath asked if MTO needs more justification or more elements of the design included in the design criteria memo. P. Selvakumar responded that MTO is looking for justification and what design speed can be met.	
• E. Li noted that pole clear zones may also need to be included. P. Selvakumar noted that the MTO Roadside Design Manual which defines obstacles and clear zones.	
Active Transportation	
• M. Parkhill provided an overview of Active Transportation facilities proposed within MTO jurisdiction.	
• V. Nantais asked if the MTO 3-Step Process has been done. M. Parkhill responded that a memo has been drafted and will be circulated after the meeting.	M. Parkhill
Traffic	
• M. Parkhill provided an overview of traffic operations at MTO ramp intersections and noted that the updated traffic memo will be circulated for comment after the meeting.	M. Parkhill

Item Discussed	Action By
Next Steps	
• M. Parkhill provided an overview of next steps to take following this meeting.	
• M. Parkhill asked if there are additional steps to take before presenting areas of concern to MTO Senior Management. P. Selvakumar responded that after MTO staff has time to review the design criteria, design plans and traffic analysis, another staff meeting would be useful before presenting to Senior Management.	
• P. Selvakumar requested that the design team look at landscape features for the design. M. Parkhill noted that specific landscaping elements will not be reviewed at this stage in the project, but commentary will be provided in the EPR.	
• A. Chiu requested if MTO could provide a copy of the 2017 Roadside Design Manual. P. Selvakumar responded that they will provide a link to MTO best practices.	P. Selvakumar
• V. Nantais requested that in Table 2 of the Design Criteria memo, that roads under MTO jurisdiction not be classified under a municipality. R. Thuraisinganath clarified that the headings with municipality names indicate geographic location of the segment and not jurisdiction.	
• M. Parkhill asked for clarification on the limits of MTO jurisdiction. V. Nantais noted that there is the MTO right-of-way and limits that extend beyond for permitting. P. Selvakumar noted that MTO can provide line work to clarify this.	P. Selvakumar

Please advise of any errors or omissions to Margaret Parkhill by August 3, 2021.

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Memorandum

To/Attention	Kristin Demasi, Metrolinx	**Date**	August 18, 2020
From	Yannis Stogios, Syed Imam	**Project No**	119887
cc	Scott Johnston, Margaret Parkhill		
Subject	Durham-Scarborough BRT: Analysis of Kingston Road at Highway 401 Traffic Operations in the City of Toronto		

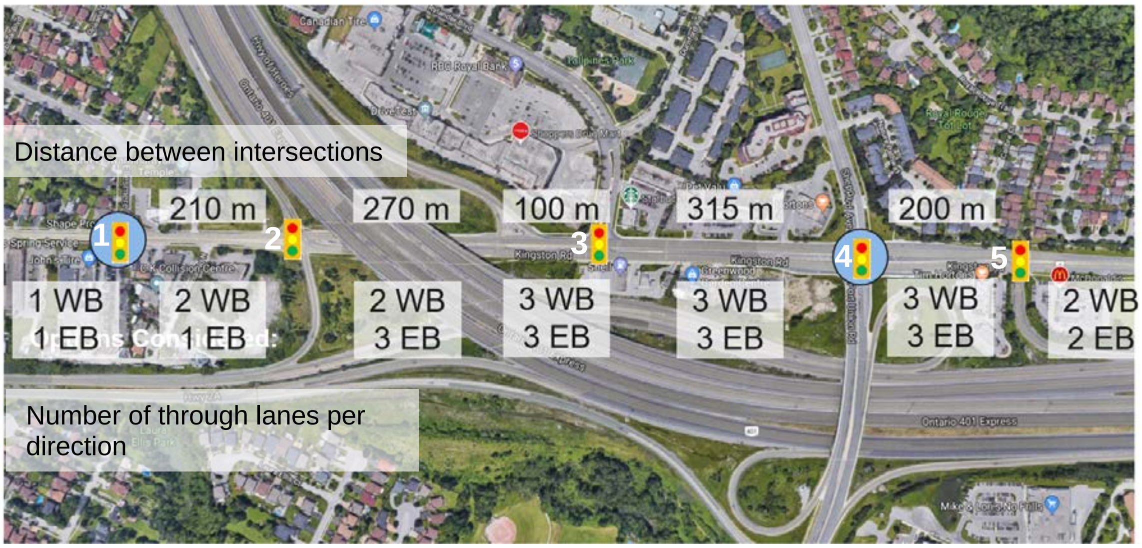
Converting two centre-lanes on Kingston Road to dedicated transit-only lanes, between Ellesmere Road and Port Union Road, is the preferred planning solution. This will transform the street into an urban corridor that supports future development, moves more people more efficiently, and accommodates active transportation infrastructure.

The traffic analysis presented in this memo compares three BRT scenarios in 2041: BRT in Mixed Traffic, BRT in Mixed Traffic with TSP, and BRT in Median Lanes. The analysis includes five signalized intersections on Kingston Road between Ellesmere Road and the Highway 401 westbound off-ramp, east of Port Union Road. The operational results are extracted from Synchro models and are presented for existing conditions (2019), future background conditions *without* the BRT (2041), and future BRT conditions (2041). Intersections included in the analysis:

1. Kingston Road at Ellesmere Road
2. Kingston Road at Highway 401 Eastbound off-ramp (and Highway 2A access)
3. Kingston Road at Rylander Boulevard
4. Kingston Road at Sheppard Avenue/Port Union Road
5. Kingston Road at Highway 401 Westbound off-ramp

The study area is shown in Exhibit 1, including the approximate number of through lanes and distance between intersections.

Exhibit 1: Signalized intersections, number of through lanes, and distance between intersections



Existing Conditions

Between Ellesmere Road and the Highway 401 eastbound off-ramp, east of Port Union Road, Kingston Road is a two- or three-lane per direction arterial. East of the Highway 401 eastbound off-ramp, Kingston Road operates with two lanes in each direction. The lane configuration at signalized intersections, which includes turning lanes, is presented at the end of this memo in **Attachment A**.

In the a.m. peak period, all of the intersections along Kingston Road operate with LOS C or better. In the p.m. peak period, Kingston Road at Sheppard Avenue/Port Union Road operates with LOS D, while the remaining intersections operate at LOS C or better. **Table 1** below lists overall intersection level of service and the individual critical movements for both the morning and afternoon peak periods. Critical movements are movements with LOS E or F, or having a v/c ratio above 0.85. **Table 2** identifies movements that are expected to have 50th or 95th percentile queues that exceed existing storage capacity in the a.m. or the p.m. peak period.

Table 1: Traffic Operational Results for Existing Conditions (2019)

Intersection	AM Peak Hour		PM Peak Hour	
	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]
Kingston Road & Ellesmere Road	A (0.49)	-	B (0.69)	-
Kingston Road & Highway 401 EB Off-Ramp	B (0.66)	-	D (1.00)	SBL (D) [0.93] SBT (D) [0.94] SBR (D) [0.94] WBL (F) [1.00]
Kingston Road & Rylander Boulevard	B (0.72)	-	B (0.73)	NBT (E) [0.36]
Kingston Road & Sheppard Avenue/Port Union Road	C (0.83)	WBL (E) [0.83]	D (0.99)	EBR (E) [0.99] WBL (F) [0.97]
Kingston Road & Highway 401 Westbound Off-Ramp	B (0.68)	-	B (0.85)	EBT (B) [0.85]

Table 2: Queue Lengths Exceeding Storage in Existing Conditions (2019)

Intersection	Mvmt	Current Storage (m)	AM Peak Period 50% Queues (m)	AM Peak Period 95% Queues (m)	PM Peak Period 50% Queues (m)	PM Peak Period 95% Queues (m)
Kingston Road & Sheppard Avenue/Port Union Road	EBR	57	14	35	**158**	**243**
	WBL	96	63	82	65	**98**
	NBR	34	0	9	**109**	**155**
	SBL	43	17	31	40	**59**

Future Background Conditions (2041 no BRT)

For future background conditions in 2041 without the BRT, the road configuration is assumed to remain the same as existing conditions, with increased vehicular volume from background traffic growth. The lane configurations shown in **Attachment A** were used for future background conditions analysis.

Traffic Growth Rates

Traffic growth for 2041 background conditions was estimated using Metrolinx's EMME model. Future background growth applied for this analysis includes:

- In the a.m. peak period:
  - *Eastbound* traffic is expected to increase by 150 vph between 2019 and 2041 (annual growth rate of 1.16%).
  - *Westbound* traffic is expected to increase by 200 vph (annual growth rate of 0.70%).
- In the p.m. peak period:
  - *Eastbound* traffic is expected to increase by 200 vph between 2019 and 2041 (annual growth rate of 0.55%).
  - *Westbound* traffic is expected to increase by 150 vph (annual growth rate of 0.84%).

These growth rates were taken from a corridor-level and converted into growth at a turning movement level at each intersection. The 2041 background traffic volumes are shown in **Attachment B**.

Traffic Operations

As expected, overall intersection operations are more congested in the future than existing conditions due to background traffic growth. This is most notable for the p.m. peak hour at the intersections that were problematic within existing conditions: Highway 401 eastbound off-ramp and Sheppard Avenue/Port Union Road. **Table 3** summarizes the overall intersection LOS and the critical movements for the a.m. and p.m. peak periods. Critical movements are movements with LOS E or F, or having a v/c ratio above 0.85. **Table 4** identifies movements that are expected to have 50^{th} or 95^{th} percentile queues that exceed existing storage capacity in the a.m. or the p.m. peak period.

Table 3: Traffic Operational Results for Future Background Conditions (2041)

Intersection	AM Peak Hour		PM Peak Hour	
	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]
Kingston Road & Ellesmere Road	B (0.68)	-	B (0.81)	-
Kingston Road & Highway 401 Eastbound Off-Ramp	C (0.93)	WBL (D) [0.93]	E (1.13)	WBL (F) [1.04] SBL (F) [1.13] SBT (F) [1.12]
Kingston Road & Rylander Boulevard	B (0.91)	EBL (E) [0.91] NBT (E) [0.21]	B (0.92)	EBL (E) [0.92] NBT (E) [0.55] SBL (E) [0.54] SBT (E) [0.54]
Kingston Road & Sheppard Avenue/Port Union Road	C (0.87)	WBL (E) [0.87]	E (1.15)	EBR (F) [1.15] WBL (F) [1.09] NBL (E) [0.76]
Kingston Road & Highway 401 Westbound Off-Ramp	B (0.74)	-	B (0.93)	EBT (C) [0.93]

Table 4: Queue Length Exceeding Storage for Future Background Conditions (2041)

Intersection	Mvmt	Current Storage	AM Peak Period		PM Peak Period	
			50% Queues	95% Queues	50% Queues	95% Queues
		(m)	(m)	(m)	(m)	(m)
Kingston Road & Rylander Boulevard	EBL	97	33	88	54	**128**
Kingston Road & Sheppard Avenue/Port Union Road	EBR	57	43	72	**249**	**327**
	WBL	96	74	**99**	87	**122**
	NBR	34	10	22	**145**	**203**
	SBL	43	22	39	**49**	**71**

Key observations include:

- At Kingston Road & Highway 401 Eastbound off-ramp, the southbound left and through movements operate poorly with LOS F and v/c ratio higher than 1.00. However, queues are adequately stored on the existing ramp which has approximately 445 m of storage. Operations may be improved by increasing the signal cycle length which is currently 70 seconds.
- At Rylander Boulevard, the eastbound left operates with high v/c ratio since it is served with a permitted-only phase. The north and southbound movements operate with LOS E due to the split phase operation and a long cycle length (140 seconds). However, the north and south v/c ratios are relatively low as shown in **Table 3**.
- At Kingston Road & Sheppard Avenue/Port Union Road the eastbound right and westbound left movements have high demand and provide access to the on-ramp for eastbound Highway 401. The eastbound right 50th percentile queue is expected to be 249 m during the p.m., extending nearly to the upstream Rylander signal. The westbound left 95th percentile queue is expected to be 122 m, which is less than the distance to the upstream Highway 401 westbound off-ramp signal.

Future BRT Conditions (2041 with BRT in Mixed Traffic)

For future conditions in 2041 with BRT, the road configuration is assumed to remain the same as existing conditions. Buses will operate in mixed traffic without any dedicated lanes. The lane configuration diagrams presented in **Attachment A** were used for the future with BRT scenario.

Traffic Growth Rates

Traffic growth for 2041 with BRT in mixed traffic was estimated using Metrolinx's EMME model. Future growth with BRT applied for this analysis includes:

- In the a.m. peak period
  - *Eastbound* traffic is expected to increase by 130 vph between 2019 and 2041 (annual growth rate of 1.02%)
  - *Westbound* traffic is expected to increase by 260 vph (annual growth rate of 0.90%).
- In the p.m. peak period
  - *Eastbound* traffic is expected to increase by 260 vph between 2019 and 2041 (annual growth rate of 0.70%)
  - *Westbound* traffic is expected to increase by 130 vph (annual growth rate of 0.74%)

As with the future background analysis, these growth rates were taken from a corridor-level and converted into growth at a turning movement level at each intersection. The 2041 with BRT traffic volumes are shown in **Attachment B**.

Traffic Operations

Intersections perform similar to the future background conditions with the bus operating in mixed traffic and expected future growth is a similar magnitude. **Table 5** summarizes the overall intersection LOS and the critical movements for the a.m. and p.m. peak periods. Critical movements are movements with LOS E or F, or having a v/c ratio above 0.85. **Table 6** identifies movements that are expected to have 50th or 95th percentile queues that exceed existing storage capacity in the a.m. or the p.m. peak period.

Note that with BRT, signal cycle lengths were increased to 120 seconds along the corridor, including at the Highway 401 EB off-ramp, which has an existing cycle length of 70 seconds.

Table 5: Traffic Operational Results for Future BRT in mixed traffic (2041)

Intersection	AM Peak Hour		PM Peak Hour	
	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]
Kingston Road at Ellesmere Road	B (0.72)	-	C (0.87)	SBL (D) [0.85]
Kingston Road at Highway 401 Eastbound Off-ramp	C (0.77)	-	E (1.06)	WBL (F) [1.06] SBL (E) [1.04] SBT (E) [1.02]
Kingston Road at Rylander Boulevard	C (0.97)	EBL (F) [0.97] NBT (E) [0.21]	B (0.89)	EBL (D) [0.89] NBT (E) [0.37] SBL (E) [0.54] SBT (E) [0.55]
Kingston Road at Sheppard Avenue/Port Union Road	C (0.88)	WBL (E) [0.88]	E (1.14)	EBR (F) [1.14] WBL (F) [1.12] NBR (D) [0.85]
Kingston Road at Highway 401 Westbound Off-ramp	B (0.76)	-	B (0.73)	-

Table 6: Queue Length Exceeding Storage for Future BRT in mixed traffic (2041)

Intersection	Mvmt	Current Storage (m)	AM Peak Period		PM Peak Period	
			50% Queues (m)	95% Queues (m)	50% Queues (m)	95% Queues (m)
Kingston Road & Rylander Boulevard	EBL	97	39	90	56	**121**
Kingston Road & Sheppard Avenue/Port Union Road	EBR	57	26	54	**243**	**327**
	WBL	96	76	**102**	86	**123**
	NBR	34	8	19	**152**	**213**
	SBL	43	21	37	**49**	**71**

Key observations include:

- At Kingston Road & Highway 401 Eastbound off-ramp, the southbound left and through movements perform better than 2041 background conditions, due the longer signal cycle length of 120 seconds.
- At Kingston Road & Rylander Boulevard, the eastbound left movement operates with high v/c ratio. The north and south movements operate with LOS E due to the split phase operation and long cycle length (140 seconds). However, the north and south v/c ratios are relatively low as shown in **Table 5**.
- At Kingston Road & Sheppard Avenue/Port Union Road, similar to the future background scenario, the eastbound right and westbound left movements have high demand. The high volumes associated with these movements is anticipated to interfere with BRT operations. Queue lengths are also similar to the future background scenario. The eastbound right queue during the p.m. is expected to extend to the upstream signal at Rylander signal. The westbound left queue is expected to be less than the distance to the upstream Highway 401 westbound off-ramp signal.

Future BRT Conditions (2041 with BRT in Mixed Traffic with TSP)

Transit signal priority (TSP) in the form of an advanced transit-only phase was modelled in Synchro. This approach is conservative, as the transit exclusive phase is assumed to occur every cycle. In practice, the transit-only phase could be called only in response to transit vehicle schedule adherence. The transit-only phase was assumed to be 10 seconds, to allow buses to jump ahead of general traffic during the all-red.

The operational results to traffic when the transit exclusive phase is included at every signalized intersection is presented in **Table 7** below.

Table 7: Traffic Operational Results for Future BRT Conditions (2041) with Transit Signal Priority

Intersection	AM Peak Hour		PM Peak Hour	
	Int LOS (v/c)	Critical Movements (LOS) [v/c]	Int LOS (v/c)	Critical Movements (LOS) [v/c]
Kingston Road & Ellesmere Road	B (0.65)	-	C (0.88)	-
Kingston Road & Highway 401 Eastbound Off-Ramp	D (0.69)	SBL (F) [0.88] SBT (F) [0.85]	F (1.19)	WBL (F) [1.17] SBL (F) [1.19] SBT (F) [1.17]
Kingston Road & Rylander Boulevard	B (0.97)	EBL (F) [0.97]	C (1.12)	EBL (F) [1.12]
Kingston Road & Sheppard Avenue/Port Union Road	D (1.23)	WBL (F) [1.23]	E (1.33)	EBR (F) [1.15] WBL (F) [1.33] NBR (C) [0.87]
Kingston Road & Highway 401 Westbound Off-Ramp	C (0.78)	-	C (0.61)	-

Overall traffic operations are expected to deteriorate with the implementation of a 10-second exclusive transit phase at all signalized intersections. This is expected, since transit phase provides additional green time to transit, and less green time to general traffic. This effect is most notable:

- At Kingston Road & Highway 401 Eastbound off-ramp, the southbound left and through movements and westbound left are all LOS F, an increase in delay compared to 2041 with BRT but not TSP.
- At Kingston Road & Sheppard Avenue/Port Union Road, the eastbound right and westbound left movements continue to operate LOS F.

Future BRT Conditions (2041 with BRT in Median Lanes)

Analysis of traffic operations with buses operating in dedicated median lanes was conducted to examine this option. This change includes the introduction of a curb median island, which restricts any unsignalized intersections or driveways to right-in/right-out only. The lane configuration diagram for 2041 with BRT in dedicated median lanes is presented in **Attachment B**. Note that the five signalized intersections have fewer through lanes for general traffic.

For the purpose of this analysis, traffic volumes were assumed to be the same as the 2041 with BRT in mixed traffic shown in **Attachment B**.

Traffic Operations

Intersections perform similar to the future BRT in mixed traffic scenario shown in **Table 5**. **Table 8** summarizes the overall intersection LOS and the critical movements for the a.m. and p.m.

peak periods. **Table 9** identifies movements that are expected to have 50th or 95th percentile queues that exceed existing storage capacity in the a.m. or the p.m. peak period.

Note that with BRT, signal cycle lengths were increased to 120 seconds along the corridor, including at the Highway 401 EB off-ramp, which has an existing cycle length of 70 seconds. All eastbound and westbound left-turns become protected-only. Other operational notes include:

- At the Kingston Road and Ellesmere Road intersection, a 10-second transit signal priority phase was included in every cycle. This is a conservative approach. In practice, the transit-only phase could be called only in response to transit vehicles. The transit-only phase allows buses to turn WBR and SBL. Buses would wait for this transit signal indication to make the turn, with all-red shown for all other moves. All general traffic movements are fully permissive. At this intersection, the existing dedicated westbound right turn lane is removed in this scenario.
- At both the Highway 401 eastbound and westbound off-ramps, one lane of Kingston Road in each direction is converted to transit-only for this scenario. Ramp lane configurations remain the same as today.
- At the Highway 401 eastbound off-ramp intersection, the westbound left-turn lane onto Highway 2A is removed and left-turning traffic would continue westbound through the Ellesmere Road intersection. Traffic could access Highway 2A at the Highland Creek overpass, approximately 1.75 km downstream.
- All unsignalized intersections and driveways become right-in/right-out only. Drivers wishing to turn left will either find a different path of travel, or make a U-turn at an adjacent signalized intersection during the protected-only left-turn phase.
- The Highway 401 westbound on-ramp, just west of Rylander, becomes right-in only. Using the traffic growth rates developed for this study, it is estimated that in 2041 approximately 40 vph and 280 vph would use the eastbound left-turn to the Highway 401 westbound on-ramp in the a.m. and p.m. periods, respectively. The most likely alternative is for these vehicles to use the Highway 401 westbound on-ramp to the collectors from Meadowvale Road using Kingston and Ellesmere Roads. Eastbound vehicles must originate to the west of this interchange, meaning the length of diversion to the Meadowvale interchange would be less than 1.5 km. Ellesmere Road has capacity to carry this traffic, which is opposite the peak direction of travel demand.
- At Rylander Boulevard, the eastbound and westbound left-turns change from fully-permissive to protected-only.

Table 8: Traffic Operational Results for Future BRT in dedicated median lanes (2041)

Intersection	AM Peak Hour Int LOS (v/c)	AM Peak Hour Critical Movements (LOS) [v/c]	PM Peak Hour Int LOS (v/c)	PM Peak Hour Critical Movements (LOS) [v/c]
Kingston Road at Ellesmere Road	E (0.98)	WBT (E) [0.98] SBL (E) [0.81]	D (0.97)	SBL (E) [0.92]
Kingston Road at Highway 401 Eastbound Off-ramp	C (0.77)	-	E (1.14)	EBT (F) [1.14] SBL (E) [1.04] SBT (E) [1.02]
Kingston Road at Rylander Boulevard	C (0.91)	EBL (F) [0.91] WBL (E) [0.18] SBL (E) [0.38] SBT (E) [0.38]	C (0.89)	EBL (F) [0.94] WBL (E) [0.19] NBT (E) [0.35] SBL (E) [0.53] SBT (E) [0.53]
Kingston Road at Sheppard Avenue/Port Union Road	E (1.09)	EBL (E) [0.20] WBL (F) [0.96] WBT (F) [1.09]	E (1.14)	EBL (E) [0.44] EBR (F) [1.14] WBL (F) [1.12] NBR (D) [0.85]
Kingston Road at Highway 401 Westbound Off-ramp	C (0.76)	-	D (0.73)	EBT (E) [0.99]

Table 9: Queue Length Exceeding Storage for Future BRT in dedicated median lanes (2041)

Intersection	Mvmt	Current Storage (m)	AM Peak Period 50% Queues (m)	AM Peak Period 95% Queues (m)	PM Peak Period 50% Queues (m)	PM Peak Period 95% Queues (m)
Kingston Road & Ellesmere Road	WBT	208	**222**	**346**	119	191
Kingston Road & Rylander Boulevard	EBL	97	30	84	74	**137**
Kingston Road & Sheppard Avenue/Port Union Road	EBR	57	24	50	**243**	**327**
	WBL	96	78	**113**	86	**123**
	WBT	177	**254**	**356**	113	147
	NBR	34	4	16	**152**	**213**
	SBL	43	21	37	**49**	**71**

Key observations:

- At Kingston Road & Ellesmere Road, the westbound through experiences more delay in the a.m. compared to other scenarios due to the combination of additional westbound through traffic from the closure of the westbound left-turn at Highway 2A and removal of the dedicated right-turn lane. The southbound left also experiences more delay in both a.m. and p.m. compared to other scenarios.
- At Kingston Road & Highway 401 EB off-ramp, overall LOS is improved compared to BRT with TSP, since the dedicated transit lanes provide transit priority without signal adjustments. Southbound left and through are LOS E. Eastbound through becomes a critical movement, but queue lengths can be accommodated.
- At Kingston Road & Rylander Boulevard, eastbound left-turns continue to experience LOS F as with other scenarios, and westbound lefts experience LOS F due to the change from permissive to protected-only left-turn phasing. Southbound movements experience higher delays in this scenario compared to other scenarios.
- At Kingston Road & Sheppard Avenue/Port Union Road, the eastbound right and westbound left movements continue to operate LOS F. Queue lengths are similar to

future BRT in mixed traffic scenario (see **Table 6**). The westbound through traffic experiences more delay in the a.m., which is due in part to the length of protected phase for the eastbound left, which reduces time for westbound through, and in part to the lane reallocation for transit.

- At Kingston Road & Highway 401 WB off-ramp, overall intersection delay is increased compared to BRT in mixed traffic, and about the same compared to BRT in mixed traffic with TSP. The delay is mainly attributed to the eastbound through movement, which is expected given the lane reallocation to transit.

Summary

Converting two centre-lanes on Kingston Road to dedicated transit-only lanes, between Ellesmere Road and Port Union Road, is the preferred planning solution. This will transform the street into an urban corridor that supports future development, moves more people more efficiently, and accommodates active transportation infrastructure.

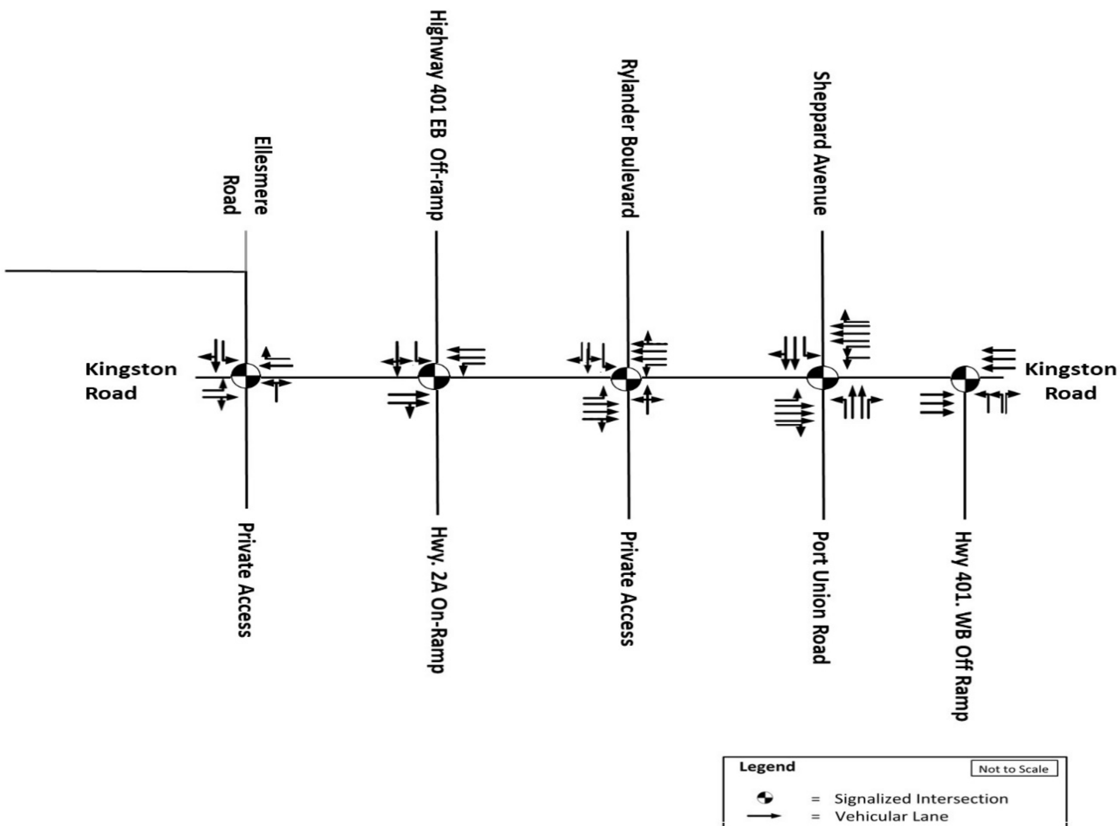
The traffic analysis presented in this memo compares three BRT scenarios in 2041: BRT in Mixed Traffic, BRT in Mixed Traffic with TSP, and BRT in Median Lanes. Key findings of the analysis are presented in **Table 10** and include:

- Kingston Road & Ellesmere Road intersection performs equally (LOS B/C) in the Mixed Traffic and TSP scenarios. In the Median Lanes scenario, the intersection accommodates more westbound traffic and requires a transit-only phase for buses to turn. In the Median Lanes scenario, intersection performance would be reviewed if a dedicated westbound right-turn lane could be added. This would also mitigate queue spill back to the upstream intersection.
- Kingston Road & Highway 401 EB off-ramp performs equally (LOS C) in the a.m. in the Mixed Traffic and Median Lanes scenarios. In the p.m., the intersection experiences LOS E in both the Mixed Traffic and Median Lanes scenarios, and LOS F in the BRT in mixed traffic with TSP scenario.
  - Traffic coming from Highway 401 is LOS E in both Mixed Traffic and Median Lanes scenarios, with the same v/c ratios. Queuing on the ramp is not an issue in either scenario.
- Kingston Road & Highway 401 WB on-ramp is currently unsignalized and was not included in the analysis. In the Median Lanes scenario, this ramp would become right-in only.
- Kingston Road & Rylander Boulevard performs best in the Mixed Traffic scenario (LOS C/B). With TSP, the p.m. intersection v/c ratio exceeds 1.0, mostly attributable to the eastbound left-turn with overall intersection LOS B/C. In the Median Lanes scenario, eastbound and westbound lefts become protected-only turns, which increases intersection delay (LOS E).
- Kingston Road & Sheppard Avenue/Port Union Road performs best in the Mixed Traffic scenario (LOS C/E). With TSP, the a.m. westbound left incurs more delay. With Median Lanes, queue lengths are similar to future BRT in mixed traffic scenario and westbound through traffic experiences more delay in the a.m., which is expected given the lane reallocation to transit.
- Kingston Road & Highway 401 WB off-ramp performs with LOS D or better in all scenarios.
  - Queuing on the ramp is not an issue in any scenario.

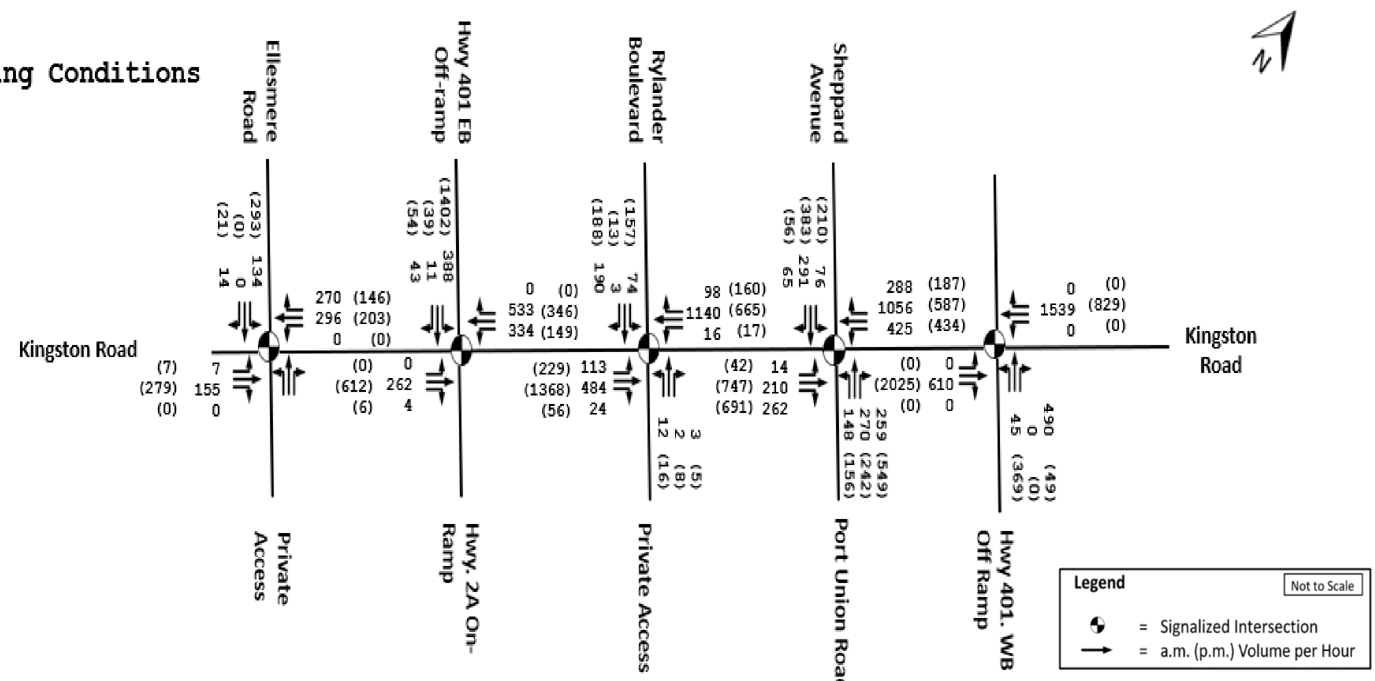
Table 10: Summary of Intersection LOS (v/c ratio) in 2041 BRT Scenarios

Intersection	AM Peak Hour			PM Peak Hour		
	BRT in mixed traffic	BRT with TSP	BRT in median lanes	BRT in mixed traffic	BRT with TSP	BRT in median lanes
Kingston Road at Ellesmere Road	B (0.72)	B (0.65)	E (0.98)	C (0.87)	C (0.88)	D (0.97)
Kingston Road at Highway 401 Eastbound Off-ramp	C (0.77)	D (0.69)	C (0.77)	E (1.06)	F (1.19)	E (1.14)
Kingston Road at Rylander Boulevard	C (0.97)	B (0.97)	C (0.91)	B (0.89)	C (1.12)	C (0.89)
Kingston Road at Sheppard Avenue/Port Union Road	C (0.88)	D (1.23)	E (1.09)	E (1.14)	E (1.33)	E (1.14)
Kingston Road at Highway 401 Westbound Off-ramp	B (0.76)	C (0.78)	C (0.76)	B (0.73)	C (0.61)	D (0.73)

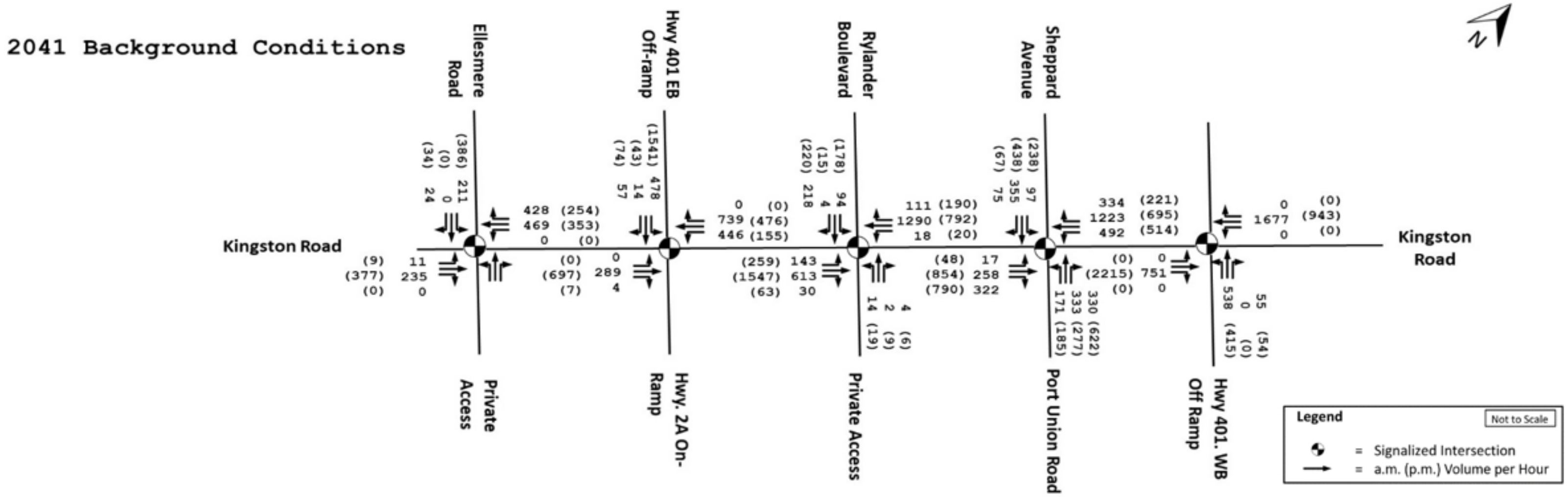
Attachment A: Existing Lane Configurations and Traffic Volumes

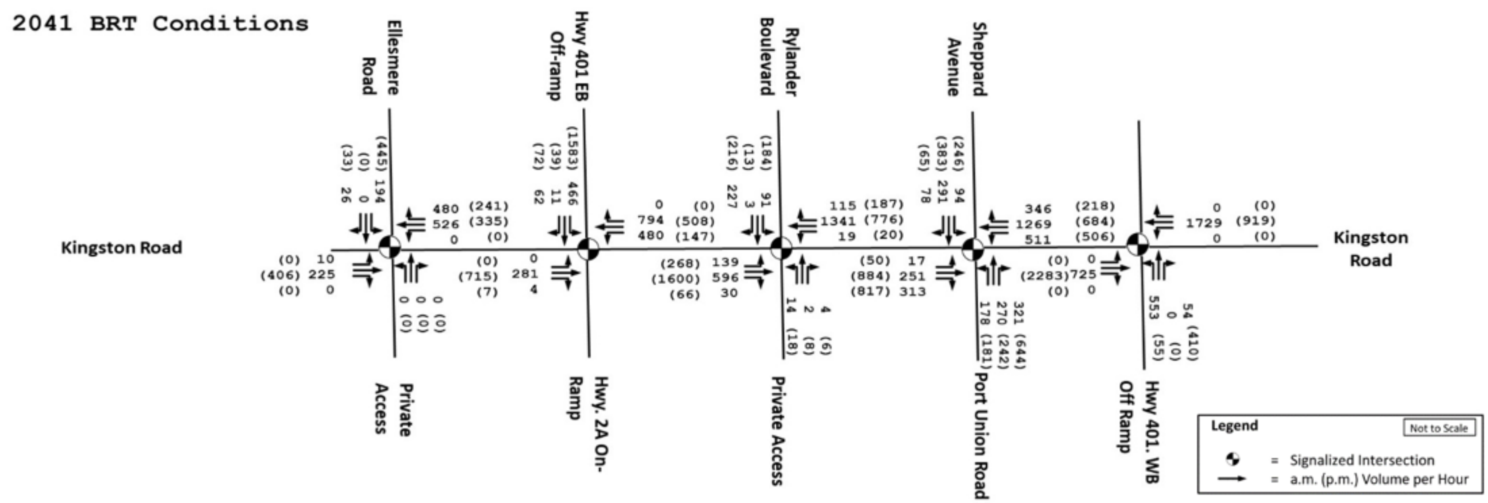


2019 Existing Conditions

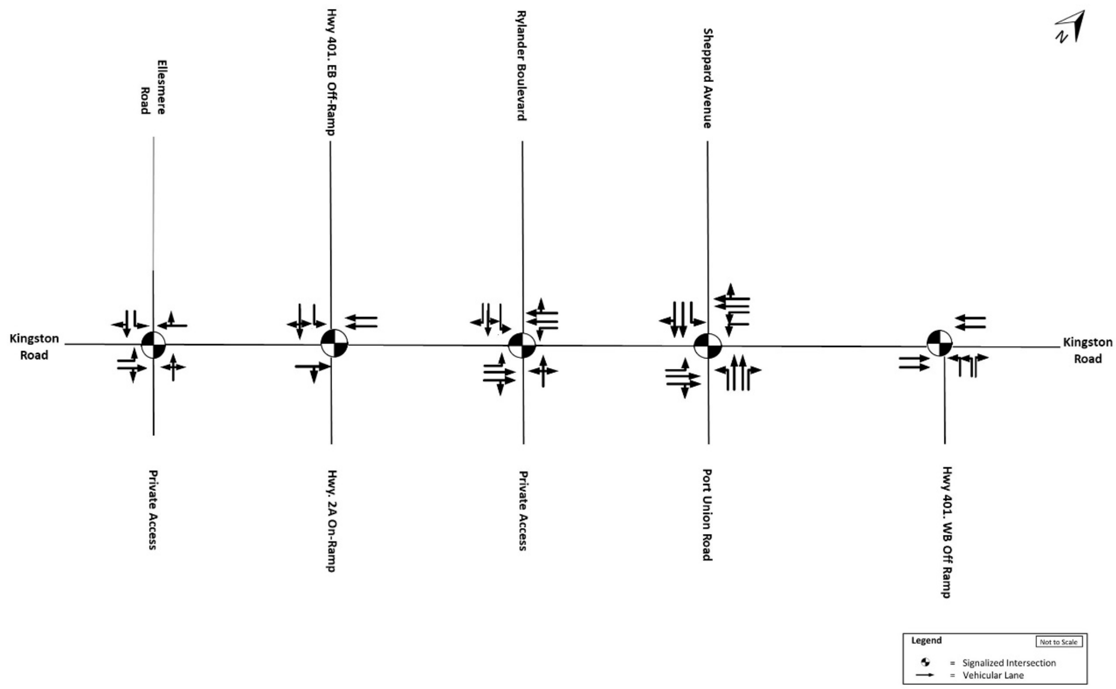


Attachment B: Future Traffic Volumes and Median BRT Lane Configuration





Lane configuration for 2041 with BRT in dedicated median lanes



Attachment C: Existing Conditions (2019) Synchro Report

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	155	0	0	296	270	0	0	0	134	0	14
Future Volume (vph)	7	155	0	0	296	270	0	0	0	134	0	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Flt Permitted	0.566									0.950		
Satd. Flow (perm)	1066	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						293						62
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			55.1			35.6			143.1	
Travel Time (s)		9.0			3.3			2.1			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	168	0	0	322	293	0	0	0	146	0	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	168	0	0	322	293	0	0	0	146	0	15
Turn Type	Perm	NA			NA	Perm				Prot		Perm
Protected Phases		2			6					8		
Permitted Phases	2					6						8
Detector Phase	2	2			6	6				8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0			23.0	23.0				7.0		7.0
Minimum Split (s)	30.0	30.0			30.0	30.0				25.0		25.0
Total Split (s)	44.0	44.0			44.0	44.0				26.0		26.0
Total Split (%)	62.9%	62.9%			62.9%	62.9%				37.1%		37.1%
Maximum Green (s)	37.0	37.0			37.0	37.0				20.0		20.0
Yellow Time (s)	4.0	4.0			4.0	4.0				4.0		4.0
All-Red Time (s)	3.0	3.0			3.0	3.0				2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0				0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0				6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0		3.0
Recall Mode	Max	Max			Max	Max				None		None
Walk Time (s)	7.0	7.0			7.0	7.0				7.0		7.0
Flash Dont Walk (s)	16.0	16.0			16.0	16.0				12.0		12.0
Pedestrian Calls (#/hr)	0	0			0	0				0		0
Act Effct Green (s)	44.3	44.3			44.3	44.3				10.5		10.5
Actuated g/C Ratio	0.70	0.70			0.70	0.70				0.17		0.17
v/c Ratio	0.01	0.13			0.25	0.24				0.49		0.05
Control Delay	5.6	5.6			6.1	1.5				29.4		0.3
Queue Delay	0.0	0.0			0.0	0.0				0.0		0.0
Total Delay	5.6	5.6			6.1	1.5				29.4		0.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A			A	A				C		A
Approach Delay		5.6			3.9						26.7	
Approach LOS		A			A						C	
Queue Length 50th (m)	0.3	6.7			14.2	0.0				15.5		0.0
Queue Length 95th (m)	1.8	15.7			29.7	8.1				29.1		0.0
Internal Link Dist (m)		126.4			31.1			11.6			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	743	1312			1312	1204				565		548
Starvation Cap Reductn	0	0			0	0				0		0
Spillback Cap Reductn	0	0			0	0				0		0
Storage Cap Reductn	0	0			0	0				0		0
Reduced v/c Ratio	0.01	0.13			0.25	0.24				0.26		0.03

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 63.5
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 8.1 Intersection LOS: A
Intersection Capacity Utilization 50.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 16: Kingston Rd. & Ellesmere Rd.

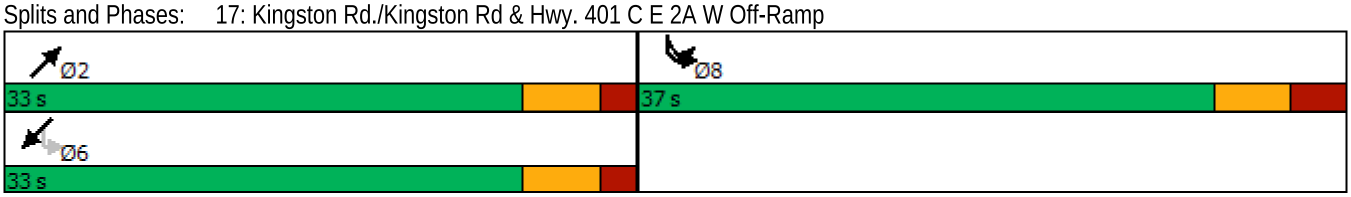
Lane Group	WBL	WBR	SBL2	SBL	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Traffic Volume (vph)	0	0	388	11	43	0	262	4	334	533	0
Future Volume (vph)	0	0	388	11	43	0	262	4	334	533	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0		0.0	0.0	0.0		0.0	32.0		0.0
Storage Lanes	0	0		2	0	0		0	1		0
Taper Length (m)	7.6			7.6		7.6			88.4		
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt				0.970			0.998				
Flt Protected			0.950	0.961					0.950		
Satd. Flow (prot)	0	0	1700	1668	0	0	3571	0	1789	3579	0
Flt Permitted			0.950	0.961					0.575		
Satd. Flow (perm)	0	0	1700	1668	0	0	3571	0	1083	3579	0
Right Turn on Red					Yes			Yes			Yes
Satd. Flow (RTOR)				47			2				
Link Speed (k/h)	19			80			60			60	
Link Distance (m)	60.6			169.8			91.2			246.8	
Travel Time (s)	11.5			7.6			5.5			14.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	422	12	47	0	285	4	363	579	0
Shared Lane Traffic (%)			42%								
Lane Group Flow (vph)	0	0	245	236	0	0	289	0	363	579	0
Turn Type			Prot	Prot			NA		Perm	NA	
Protected Phases			8	8			2			6	
Permitted Phases									6		
Detector Phase			8	8			2		6	6	
Switch Phase											
Minimum Initial (s)			7.0	7.0			18.0		18.0	18.0	
Minimum Split (s)			36.0	36.0			28.0		24.0	24.0	
Total Split (s)			37.0	37.0			33.0		33.0	33.0	
Total Split (%)			52.9%	52.9%			47.1%		47.1%	47.1%	
Maximum Green (s)			30.0	30.0			27.0		27.0	27.0	
Yellow Time (s)			4.0	4.0			4.0		4.0	4.0	
All-Red Time (s)			3.0	3.0			2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)			7.0	7.0			6.0		6.0	6.0	
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)			3.0	3.0			3.0		3.0	3.0	
Recall Mode			None	None			Max		Max	Max	
Walk Time (s)			7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)			22.0	22.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)			0	0			0		0	0	
Act Effct Green (s)			12.8	12.8			27.1		27.1	27.1	
Actuated g/C Ratio			0.24	0.24			0.51		0.51	0.51	
v/c Ratio			0.60	0.54			0.16		0.66	0.32	
Control Delay			24.0	18.4			7.9		18.9	8.9	
Queue Delay			0.0	0.0			0.0		0.0	0.0	
Total Delay			24.0	18.4			7.9		18.9	8.9	

Lane Group	WBL	WBR	SBL2	SBL	SBR	NEL	NET	NER	SWL	SWT	SWR
LOS			C	B			A		B	A	
Approach Delay				21.2			7.9			12.7	
Approach LOS				C			A			B	
Queue Length 50th (m)			21.6	16.1			6.7		22.7	15.1	
Queue Length 95th (m)			39.6	33.0			15.0		#69.8	29.8	
Internal Link Dist (m)	36.6			145.8			67.2			222.8	
Turn Bay Length (m)									32.0		
Base Capacity (vph)			966	968			1827		553	1830	
Starvation Cap Reductn			0	0			0		0	0	
Spillback Cap Reductn			0	0			0		0	0	
Storage Cap Reductn			0	0			0		0	0	
Reduced v/c Ratio			0.25	0.24			0.16		0.66	0.32	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 53
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 14.3 Intersection LOS: B
Intersection Capacity Utilization 61.7% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: Kingston Rd./Kingston Rd & Hwy. 401 C E 2A W Off-Ramp



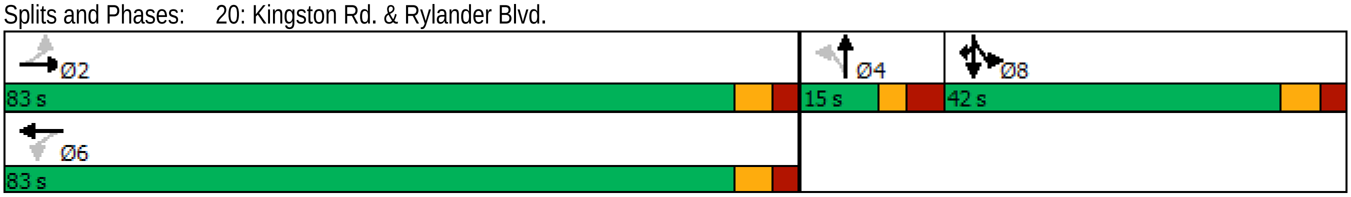
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	484	24	16	1140	98	12	2	3	74	3	190
Future Volume (vph)	113	484	24	16	1140	98	12	2	3	74	3	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.993			0.988			0.977				0.850
Flt Protected	0.950			0.950				0.965		0.950	0.956	
Satd. Flow (prot)	1789	5106	0	1789	5080	0	0	1776	0	1700	1711	1601
Flt Permitted	0.175			0.435						0.950	0.956	
Satd. Flow (perm)	330	5106	0	819	5080	0	0	1840	0	1700	1711	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			16			3				124
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			3.3			9.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	123	526	26	17	1239	107	13	2	3	80	3	207
Shared Lane Traffic (%)										48%		
Lane Group Flow (vph)	123	552	0	17	1346	0	0	18	0	42	41	207
Turn Type	Perm	NA		Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		2			6			4		8	8	8
Permitted Phases	2			6			4					
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	83.0	83.0		83.0	83.0		15.0	15.0		42.0	42.0	42.0
Total Split (%)	59.3%	59.3%		59.3%	59.3%		10.7%	10.7%		30.0%	30.0%	30.0%
Maximum Green (s)	76.0	76.0		76.0	76.0		8.0	8.0		35.0	35.0	35.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	76.9	76.9		76.9	76.9			7.5		12.0	12.0	12.0
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.07		0.11	0.11	0.11
v/c Ratio	0.53	0.15		0.03	0.37			0.14		0.22	0.22	0.72
Control Delay	21.8	6.5		8.1	7.9			48.6		48.0	47.8	34.7
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	21.8	6.5		8.1	7.9			48.6		48.0	47.8	34.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	A		A	A			D		D	D	C
Approach Delay		9.3			7.9			48.6			38.5	
Approach LOS		A			A			D			D	
Queue Length 50th (m)	7.9	8.9		0.7	26.5			2.8		8.0	7.8	15.6
Queue Length 95th (m)	45.7	25.9		4.6	70.3			11.3		20.7	20.4	43.6
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)				46.0						83.5		
Base Capacity (vph)	234	3626		581	3610			140		555	559	606
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.53	0.15		0.03	0.37			0.13		0.08	0.07	0.34

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 108.3
Natural Cycle: 110
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 12.4 Intersection LOS: B
Intersection Capacity Utilization 85.1% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 20: Kingston Rd. & Rylander Blvd.

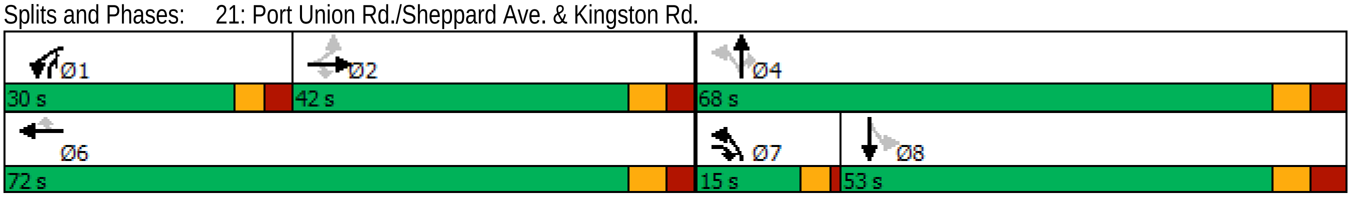


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	210	262	425	1056	288	148	270	259	76	291	65
Future Volume (vph)	14	210	262	425	1056	288	148	270	259	76	291	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		0	2		1	1		0	1		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.972	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1601	3471	5142	1601	1789	3579	1601	1789	3478	0
Flt Permitted	0.235			0.950			0.435			0.573		
Satd. Flow (perm)	443	5142	1601	3471	5142	1601	819	3579	1601	1079	3478	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			208			313			282		20	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			255.6			186.6	
Travel Time (s)		18.6			11.7			15.3			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	228	285	462	1148	313	161	293	282	83	316	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	15	228	285	462	1148	313	161	293	282	83	387	0
Turn Type	Perm	NA	pm+ov	Prot	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	
Protected Phases		2	7	1	6		7	4	1		8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	7	1	6	6	7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	6.0	6.0	34.0	34.0	6.0	44.0	6.0	44.0	44.0	
Minimum Split (s)	41.0	41.0	10.5	12.0	41.0	41.0	10.5	52.0	12.0	52.0	52.0	
Total Split (s)	42.0	42.0	15.0	30.0	72.0	72.0	15.0	68.0	30.0	53.0	53.0	
Total Split (%)	30.0%	30.0%	10.7%	21.4%	51.4%	51.4%	10.7%	48.6%	21.4%	37.9%	37.9%	
Maximum Green (s)	35.0	35.0	11.0	24.0	65.0	65.0	11.0	60.0	24.0	45.0	45.0	
Yellow Time (s)	4.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	3.0	3.0	1.0	3.0	3.0	3.0	1.0	4.0	3.0	4.0	4.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	6.0	7.0	7.0	4.0	8.0	6.0	8.0	8.0	
Lead/Lag	Lag	Lag	Lead	Lead			Lead		Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes		Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	None	None	Max	Max	None	None	None	None	None	
Walk Time (s)	7.0	7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	27.0	27.0			27.0	27.0		37.0		37.0	37.0	
Pedestrian Calls (#/hr)	0	0			0	0		0		0	0	
Act Effct Green (s)	36.7	36.7	54.4	22.3	65.0	65.0	62.7	58.7	89.0	44.0	44.0	
Actuated g/C Ratio	0.26	0.26	0.39	0.16	0.47	0.47	0.45	0.42	0.64	0.32	0.32	
v/c Ratio	0.13	0.17	0.38	0.83	0.48	0.34	0.36	0.19	0.25	0.24	0.35	
Control Delay	43.8	40.2	10.1	69.7	26.1	3.2	25.4	25.5	1.5	37.6	35.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	43.8	40.2	10.1	69.7	26.1	3.2	25.4	25.5	1.5	37.6	35.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	E	C	A	C	C	A	D	D	
Approach Delay		24.0			32.8			16.3			35.8	
Approach LOS		C			C			B			D	
Queue Length 50th (m)	3.2	18.0	13.7	63.2	77.7	0.0	26.2	26.2	0.0	16.9	40.6	
Queue Length 95th (m)	9.6	25.7	35.4	82.2	90.4	15.6	41.0	36.2	9.4	31.0	54.8	
Internal Link Dist (m)		285.6			171.1			231.6			162.6	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	117	1361	757	600	2409	916	446	1547	1144	350	1141	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.13	0.17	0.38	0.77	0.48	0.34	0.36	0.19	0.25	0.24	0.34	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 138.7	
Natural Cycle: 120	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 28.6	Intersection LOS: C
Intersection Capacity Utilization 155.0%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 21: Port Union Rd./Sheppard Ave. & Kingston Rd.



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑	↰↰	↱
Traffic Volume (vph)	610	0	0	1539	490	45
Future Volume (vph)	610	0	0	1539	490	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	5142	0	0	5142	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	5142	0	0	5142	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						49
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			262.6	155.3	
Travel Time (s)	11.7			15.8	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	663	0	0	1673	533	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	663	0	0	1673	533	49
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	31.0			31.0	39.0	39.0
Total Split (%)	44.3%			44.3%	55.7%	55.7%
Maximum Green (s)	24.0			24.0	33.0	33.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	24.1			24.1	12.8	12.8
Actuated g/C Ratio	0.48			0.48	0.26	0.26
v/c Ratio	0.27			0.68	0.60	0.11
Control Delay	8.5			12.1	19.2	5.7
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	8.5			12.1	19.2	5.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	279	0	0	203	146	0	0	0	293	0	21
Future Volume (vph)	7	279	0	0	203	146	0	0	0	293	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Flt Permitted	0.620									0.950		
Satd. Flow (perm)	1168	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						159						62
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			35.6			143.1	
Travel Time (s)		9.0			2.0			2.1			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	303	0	0	221	159	0	0	0	318	0	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	303	0	0	221	159	0	0	0	318	0	23
Turn Type	Perm	NA			NA	Perm				Prot		Perm
Protected Phases		2			6					8		
Permitted Phases	2					6						8
Detector Phase	2	2			6	6				8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0			23.0	23.0				7.0		7.0
Minimum Split (s)	30.0	30.0			30.0	30.0				25.0		25.0
Total Split (s)	40.0	40.0			40.0	40.0				30.0		30.0
Total Split (%)	57.1%	57.1%			57.1%	57.1%				42.9%		42.9%
Maximum Green (s)	33.0	33.0			33.0	33.0				24.0		24.0
Yellow Time (s)	4.0	4.0			4.0	4.0				4.0		4.0
All-Red Time (s)	3.0	3.0			3.0	3.0				2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0				0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0				6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0		3.0
Recall Mode	Max	Max			Max	Max				None		None
Walk Time (s)	7.0	7.0			7.0	7.0				7.0		7.0
Flash Dont Walk (s)	16.0	16.0			16.0	16.0				12.0		12.0
Pedestrian Calls (#/hr)	0	0			0	0				0		0
Act Effct Green (s)	33.7	33.7			33.7	33.7				16.1		16.1
Actuated g/C Ratio	0.54	0.54			0.54	0.54				0.26		0.26
v/c Ratio	0.01	0.30			0.22	0.17				0.69		0.05
Control Delay	8.9	10.1			9.5	2.4				29.3		0.8
Queue Delay	0.0	0.0			0.0	0.0				0.0		0.0
Total Delay	8.9	10.1			9.5	2.4				29.3		0.8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B			A	A				C		A
Approach Delay		10.1			6.5						27.4	
Approach LOS		B			A						C	
Queue Length 50th (m)	0.4	17.5			12.1	0.0				32.7		0.0
Queue Length 95th (m)	2.5	38.7			28.2	8.2				54.8		0.9
Internal Link Dist (m)		126.4			9.6			11.6			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	625	1009			1009	931				685		651
Starvation Cap Reductn	0	0			0	0				0		0
Spillback Cap Reductn	0	0			0	0				0		0
Storage Cap Reductn	0	0			0	0				0		0
Reduced v/c Ratio	0.01	0.30			0.22	0.17				0.46		0.04

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 62.9
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 14.5 — Intersection LOS: B
Intersection Capacity Utilization 50.0% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 16: Kingston Rd. & Ellesmere Rd.

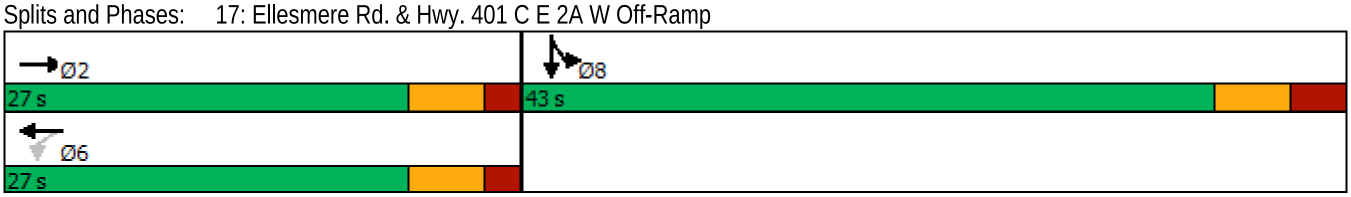
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	612	6	149	346	0	0	0	0	1402	39	54
Future Volume (vph)	0	612	6	149	346	0	0	0	0	1402	39	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.989	
Flt Protected				0.950						0.950	0.958	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1695	0
Flt Permitted				0.286						0.950	0.958	
Satd. Flow (perm)	0	3571	0	539	3579	0	0	0	0	1700	1695	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1									8	
Link Speed (k/h)		60			60			20			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			10.9			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	665	7	162	376	0	0	0	0	1524	42	59
Shared Lane Traffic (%)										47%		
Lane Group Flow (vph)	0	672	0	162	376	0	0	0	0	808	817	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		24.0		24.0	24.0					36.0	36.0	
Total Split (s)		27.0		27.0	27.0					43.0	43.0	
Total Split (%)		38.6%		38.6%	38.6%					61.4%	61.4%	
Maximum Green (s)		21.0		21.0	21.0					36.0	36.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					22.0	22.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		21.0		21.0	21.0					35.4	35.4	
Actuated g/C Ratio		0.30		0.30	0.30					0.51	0.51	
v/c Ratio		0.62		1.00	0.35					0.93	0.94	
Control Delay		23.9		101.1	20.1					36.1	37.5	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		23.9		101.1	20.1					36.1	37.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C		F	C					D	D	
Approach Delay		23.9			44.5						36.8	
Approach LOS		C			D						D	
Queue Length 50th (m)		39.4		~21.1	20.0					96.0	97.1	
Queue Length 95th (m)		55.8		#55.8	30.7					#173.7	#177.3	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		1081		162	1083					882	883	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.62		1.00	0.35					0.92	0.93	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 69.4
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 35.2 Intersection LOS: D
Intersection Capacity Utilization 82.3% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: Ellesmere Rd. & Hwy. 401 C E 2A W Off-Ramp



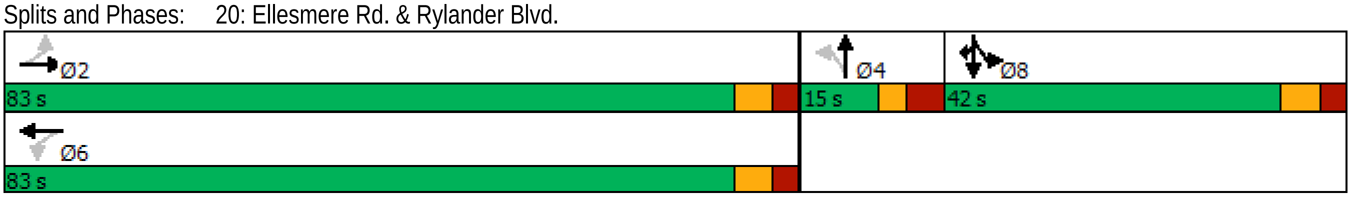
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	229	1368	56	17	665	160	16	8	5	157	13	188
Future Volume (vph)	229	1368	56	17	665	160	16	8	5	157	13	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.994			0.971			0.978				0.850
Flt Protected	0.950			0.950				0.973		0.950	0.959	
Satd. Flow (prot)	1789	5111	0	1789	4993	0	0	1792	0	1700	1716	1601
Flt Permitted	0.297			0.126				0.525		0.950	0.959	
Satd. Flow (perm)	559	5111	0	237	4993	0	0	967	0	1700	1716	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			63			5				204
Link Speed (k/h)		60			60			30			50	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			6.5			9.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	249	1487	61	18	723	174	17	9	5	171	14	204
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	249	1548	0	18	897	0	0	31	0	92	93	204
Turn Type	Perm	NA		Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		2			6			4		8	8	8
Permitted Phases	2			6			4					
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	83.0	83.0		83.0	83.0		15.0	15.0		42.0	42.0	42.0
Total Split (%)	59.3%	59.3%		59.3%	59.3%		10.7%	10.7%		30.0%	30.0%	30.0%
Maximum Green (s)	76.0	76.0		76.0	76.0		8.0	8.0		35.0	35.0	35.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	59.5	59.5		59.5	59.5			8.3		11.8	11.8	11.8
Actuated g/C Ratio	0.61	0.61		0.61	0.61			0.09		0.12	0.12	0.12
v/c Ratio	0.73	0.50		0.12	0.29			0.36		0.45	0.45	0.55
Control Delay	30.0	11.6		11.6	9.0			57.6		53.2	53.1	12.7
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	30.0	11.6		11.6	9.0			57.6		53.2	53.1	12.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	B		B	A			E		D	D	B
Approach Delay		14.1			9.0			57.6			31.9	
Approach LOS		B			A			E			C	
Queue Length 50th (m)	32.8	59.0		1.4	26.8			5.0		18.5	18.7	0.0
Queue Length 95th (m)	#82.2	79.5		5.4	38.3			#18.3		38.9	39.0	21.3
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	433	3967		183	3888			90		659	665	746
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.58	0.39		0.10	0.23			0.34		0.14	0.14	0.27

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 97.6
Natural Cycle: 120
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 15.3 Intersection LOS: B
Intersection Capacity Utilization 85.8% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: Ellesmere Rd. & Rylander Blvd.



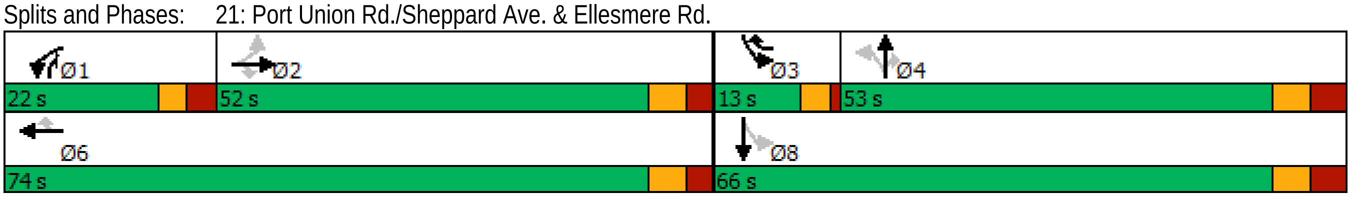
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	747	691	434	587	187	156	242	549	210	383	56
Future Volume (vph)	42	747	691	434	587	187	156	242	549	210	383	56
Ideal Flow (vphpl)	1900	1900	2100	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		0	2		1	1		2	1		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	*1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.981	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1769	3579	5142	1601	1789	3579	1601	1789	3511	0
Flt Permitted	0.399			0.950			0.479			0.540		
Satd. Flow (perm)	751	5142	1769	3579	5142	1601	902	3579	1601	1017	3511	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			230			203			93		14	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			255.6			186.3	
Travel Time (s)		18.6			11.7			15.3			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	812	751	472	638	203	170	263	597	228	416	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	812	751	472	638	203	170	263	597	228	477	0
Turn Type	Perm	NA	Perm	Prot	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		2		1	6	3		4	1	3	8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	2	1	6	3	4	4	1	3	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	34.0	6.0	34.0	6.0	44.0	44.0	6.0	6.0	44.0	
Minimum Split (s)	41.0	41.0	41.0	12.0	41.0	10.0	52.0	52.0	12.0	10.0	52.0	
Total Split (s)	52.0	52.0	52.0	22.0	74.0	13.0	53.0	53.0	22.0	13.0	66.0	
Total Split (%)	37.1%	37.1%	37.1%	15.7%	52.9%	9.3%	37.9%	37.9%	15.7%	9.3%	47.1%	
Maximum Green (s)	45.0	45.0	45.0	16.0	67.0	9.0	45.0	45.0	16.0	9.0	58.0	
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	1.0	4.0	4.0	3.0	1.0	4.0	
Lost Time Adjust (s)	0.0	0.0	-3.0	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	3.0	7.0	4.0	8.0	8.0	6.0	4.0	8.0	
Lead/Lag	Lag	Lag	Lag	Lead		Lead	Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	Max	None	Max	None	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0		7.0		7.0	7.0			7.0	
Flash Dont Walk (s)	27.0	27.0	27.0		27.0		37.0	37.0			37.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0			0	
Act Effct Green (s)	45.0	45.0	48.0	19.0	67.0	83.0	44.0	44.0	68.0	61.0	57.0	
Actuated g/C Ratio	0.32	0.32	0.35	0.14	0.48	0.60	0.32	0.32	0.49	0.44	0.41	
v/c Ratio	0.19	0.49	0.99	0.97	0.26	0.20	0.60	0.23	0.72	0.46	0.33	
Control Delay	36.6	39.0	60.9	92.2	21.6	2.0	50.2	35.7	29.1	29.0	27.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	36.6	39.0	60.9	92.2	21.6	2.0	50.2	35.7	29.1	29.0	27.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	E	F	C	A	D	D	C	C	C	
Approach Delay		49.1			43.9			34.3			28.2	
Approach LOS		D			D			C			C	
Queue Length 50th (m)	9.1	65.6	157.6	65.4	37.1	0.0	39.4	28.0	108.5	39.8	45.2	
Queue Length 95th (m)	19.7	78.9	#242.7	#98.2	45.8	9.7	65.4	39.4	155.2	59.0	58.8	
Internal Link Dist (m)		285.6			171.1			231.6			162.3	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	243	1664	761	489	2478	1037	292	1158	830	496	1473	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.19	0.49	0.99	0.97	0.26	0.20	0.58	0.23	0.72	0.46	0.32	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 139
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 41.2 Intersection LOS: D
Intersection Capacity Utilization 155.0% ICU Level of Service H
Analysis Period (min) 15
* User Entered Value
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 21: Port Union Rd./Sheppard Ave. & Ellesmere Rd.



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑	↰↰	↱
Traffic Volume (vph)	2025	0	0	829	369	49
Future Volume (vph)	2025	0	0	829	369	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	5142	0	0	5142	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	5142	0	0	5142	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			226.2	155.3	
Travel Time (s)	11.7			13.6	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2201	0	0	901	401	53
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2201	0	0	901	401	53
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	31.0			31.0	39.0	39.0
Total Split (%)	44.3%			44.3%	55.7%	55.7%
Maximum Green (s)	24.0			24.0	33.0	33.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	24.0			24.0	10.6	10.6
Actuated g/C Ratio	0.50			0.50	0.22	0.22
v/c Ratio	0.85			0.35	0.52	0.15
Control Delay	15.5			7.9	18.8	15.7
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	15.5			7.9	18.8	15.7

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	B			A	B	B
Approach Delay	15.5			7.9	18.4	
Approach LOS	B			A	B	
Queue Length 50th (m)	52.4			14.8	15.3	3.6
Queue Length 95th (m)	#96.9			24.4	25.0	10.0
Internal Link Dist (m)	171.1			202.2	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	2592			2592	2406	1109
Starvation Cap Reductn	0			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.85			0.35	0.17	0.05

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 47.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 13.9 Intersection LOS: B
Intersection Capacity Utilization 60.5% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Hwy 401 Off-Ramp & Ellesmere Rd.

Attachment D: Future Background (2041) Conditions Synchro Report

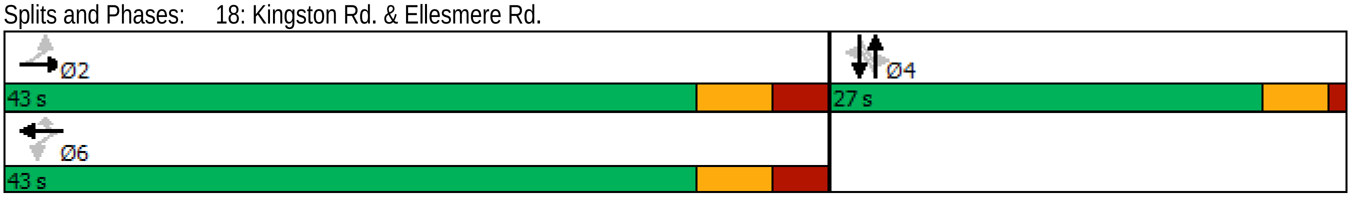
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	235	0	0	469	428	0	0	0	211	0	24
Future Volume (vph)	11	235	0	0	469	428	0	0	0	211	0	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		0
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850					0.850	
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	1601	0
Flt Permitted	0.431									0.757		
Satd. Flow (perm)	812	1883	0	0	1883	1601	0	1883	0	1426	1601	0
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						465					301	
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			35.6			143.1	
Travel Time (s)		9.0			2.0			2.1			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	255	0	0	510	465	0	0	0	229	0	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	255	0	0	510	465	0	0	0	229	26	0
Turn Type	Perm	NA			NA	Perm				Perm	NA	
Protected Phases		2			6			4			4	
Permitted Phases	2			6		6	4			4		
Detector Phase	2	2		6	6	6	4	4		4	4	
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0	23.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	22.5	22.5		22.5	22.5	
Total Split (s)	43.0	43.0		43.0	43.0	43.0	27.0	27.0		27.0	27.0	
Total Split (%)	61.4%	61.4%		61.4%	61.4%	61.4%	38.6%	38.6%		38.6%	38.6%	
Maximum Green (s)	36.0	36.0		36.0	36.0	36.0	22.5	22.5		22.5	22.5	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.5	3.5		3.5	3.5	
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0			7.0	7.0		4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	39.3	39.3			39.3	39.3				15.6	15.6	
Actuated g/C Ratio	0.59	0.59			0.59	0.59				0.23	0.23	
v/c Ratio	0.03	0.23			0.46	0.41				0.68	0.04	
Control Delay	7.8	8.1			10.4	2.2				33.1	0.1	
Queue Delay	0.0	0.0			0.0	0.0				0.0	0.0	
Total Delay	7.8	8.1			10.4	2.2				33.1	0.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A			B	A				C	A	
Approach Delay		8.1			6.5						29.8	
Approach LOS		A			A						C	
Queue Length 50th (m)	0.5	12.8			30.3	0.0				23.9	0.0	
Queue Length 95th (m)	3.0	29.9			65.7	12.2				43.3	0.0	
Internal Link Dist (m)		126.4			9.6			11.6			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	480	1113			1113	1136				484	742	
Starvation Cap Reductn	0	0			0	0				0	0	
Spillback Cap Reductn	0	0			0	0				0	0	
Storage Cap Reductn	0	0			0	0				0	0	
Reduced v/c Ratio	0.03	0.23			0.46	0.41				0.47	0.04	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 66.5
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 10.7 Intersection LOS: B
Intersection Capacity Utilization 57.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 18: Kingston Rd. & Ellesmere Rd.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	289	4	446	739	0	0	0	0	478	14	57
Future Volume (vph)	0	289	4	446	739	0	0	0	0	478	14	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.968	
Flt Protected				0.950						0.950	0.964	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1670	0
Flt Permitted				0.559						0.950	0.964	
Satd. Flow (perm)	0	3571	0	1053	3579	0	0	0	0	1700	1670	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2									23	
Link Speed (k/h)		60			60			19			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			11.5			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	314	4	485	803	0	0	0	0	520	15	62
Shared Lane Traffic (%)										42%		
Lane Group Flow (vph)	0	318	0	485	803	0	0	0	0	302	295	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		28.0		24.0	24.0					36.0	36.0	
Total Split (s)		34.0		34.0	34.0					36.0	36.0	
Total Split (%)		48.6%		48.6%	48.6%					51.4%	51.4%	
Maximum Green (s)		28.0		28.0	28.0					29.0	29.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					22.0	22.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		28.2		28.2	28.2					15.7	15.7	
Actuated g/C Ratio		0.49		0.49	0.49					0.28	0.28	
v/c Ratio		0.18		0.93	0.45					0.65	0.62	
Control Delay		9.3		45.2	11.3					24.8	22.3	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		9.3		45.2	11.3					24.8	22.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A		D	B					C	C	
Approach Delay		9.3			24.1						23.6	
Approach LOS		A			C						C	
Queue Length 50th (m)		8.7		43.3	26.2					28.5	25.3	
Queue Length 95th (m)		19.0		#116.0	49.7					49.6	45.7	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		1769		521	1772					871	867	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.18		0.93	0.45					0.35	0.34	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 57

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.93

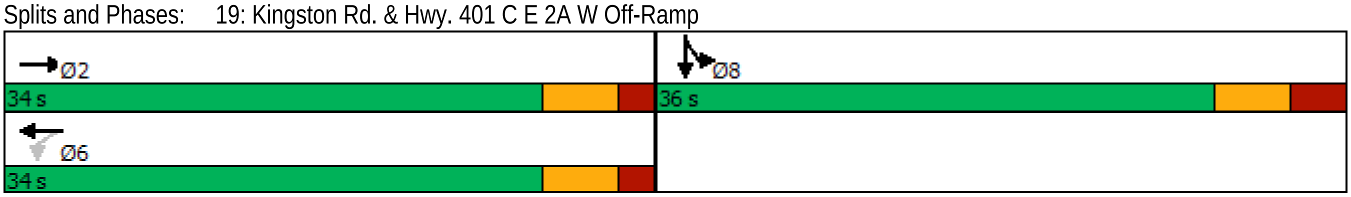
Intersection Signal Delay: 21.8 Intersection LOS: C

Intersection Capacity Utilization 64.8% ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp



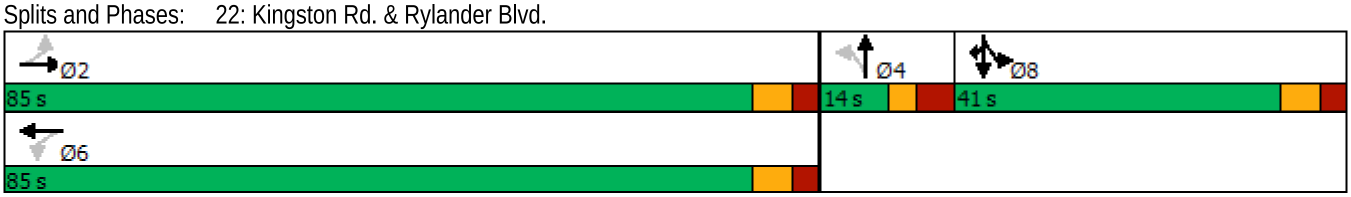
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	613	30	18	1290	111	14	2	4	94	4	218
Future Volume (vph)	143	613	30	18	1290	111	14	2	4	94	4	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.993			0.988			0.974				0.850
Flt Protected	0.950			0.950				0.966		0.950	0.956	
Satd. Flow (prot)	1789	5106	0	1789	5080	0	0	1772	0	1700	1711	1601
Flt Permitted	0.135			0.374				0.879		0.950	0.956	
Satd. Flow (perm)	254	5106	0	704	5080	0	0	1613	0	1700	1711	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			16			4				95
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		79.8			309.6			54.4			124.6	
Travel Time (s)		4.8			18.6			4.9			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	155	666	33	20	1402	121	15	2	4	102	4	237
Shared Lane Traffic (%)										48%		
Lane Group Flow (vph)	155	699	0	20	1523	0	0	21	0	53	53	237
Turn Type	Perm	NA		Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		2			6			4		8	8	8
Permitted Phases	2			6			4					
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	85.0	85.0		85.0	85.0		14.0	14.0		41.0	41.0	41.0
Total Split (%)	60.7%	60.7%		60.7%	60.7%		10.0%	10.0%		29.3%	29.3%	29.3%
Maximum Green (s)	78.0	78.0		78.0	78.0		7.0	7.0		34.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	79.0	79.0		79.0	79.0			7.1		16.5	16.5	16.5
Actuated g/C Ratio	0.67	0.67		0.67	0.67			0.06		0.14	0.14	0.14
v/c Ratio	0.91	0.20		0.04	0.45			0.21		0.22	0.22	0.77
Control Delay	74.3	8.9		10.5	11.1			55.2		47.5	47.4	46.3
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	74.3	8.9		10.5	11.1			55.2		47.5	47.4	46.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	A		B	B			E		D	D	D
Approach Delay		20.8			11.1			55.2			46.6	
Approach LOS		C			B			E			D	
Queue Length 50th (m)	32.6	23.9		1.7	64.3			4.0		12.2	12.2	33.8
Queue Length 95th (m)	#87.8	37.5		5.9	93.9			13.1		24.6	24.6	61.6
Internal Link Dist (m)		55.8			285.6			30.4			100.6	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	170	3437		473	3422			101		498	501	536
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.91	0.20		0.04	0.45			0.21		0.11	0.11	0.44

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 117.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 18.9 Intersection LOS: B
Intersection Capacity Utilization 85.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Kingston Rd. & Rylander Blvd.



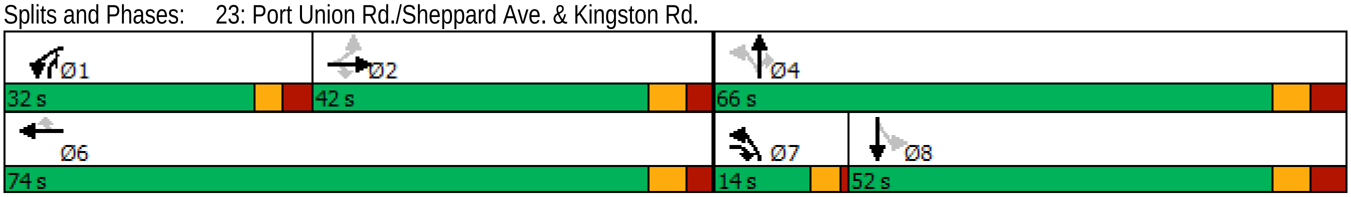
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	258	322	492	1223	334	171	333	330	97	355	75
Future Volume (vph)	17	258	322	492	1223	334	171	333	330	97	355	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		1	1		1	1		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.974	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1601	3471	5142	1601	1789	3579	1601	1789	3485	0
Flt Permitted	0.194			0.950			0.370			0.536		
Satd. Flow (perm)	365	5142	1601	3471	5142	1601	697	3579	1601	1010	3485	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			146			352			254		19	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			255.6			186.3	
Travel Time (s)		18.6			11.7			15.3			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	280	350	535	1329	363	186	362	359	105	386	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	280	350	535	1329	363	186	362	359	105	468	0
Turn Type	Perm	NA	pm+ov	Prot	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	
Protected Phases		2	7	1	6		7	4	1		8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	7	1	6	6	7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	6.0	6.0	34.0	34.0	6.0	44.0	6.0	44.0	44.0	
Minimum Split (s)	41.0	41.0	10.5	12.0	41.0	41.0	10.5	52.0	12.0	52.0	52.0	
Total Split (s)	42.0	42.0	14.0	32.0	74.0	74.0	14.0	66.0	32.0	52.0	52.0	
Total Split (%)	30.0%	30.0%	10.0%	22.9%	52.9%	52.9%	10.0%	47.1%	22.9%	37.1%	37.1%	
Maximum Green (s)	35.0	35.0	10.0	26.0	67.0	67.0	10.0	58.0	26.0	44.0	44.0	
Yellow Time (s)	4.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	3.0	3.0	1.0	3.0	3.0	3.0	1.0	4.0	3.0	4.0	4.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	6.0	7.0	7.0	4.0	8.0	6.0	8.0	8.0	
Lead/Lag	Lag	Lag	Lead	Lead			Lead		Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes		Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	None	None	Max	Max	None	None	None	None	None	
Walk Time (s)	7.0	7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	27.0	27.0			27.0	27.0		37.0		37.0	37.0	
Pedestrian Calls (#/hr)	0	0			0	0		0		0	0	
Act Effct Green (s)	36.1	36.1	53.1	24.9	67.0	67.0	62.0	58.0	90.9	44.0	44.0	
Actuated g/C Ratio	0.26	0.26	0.38	0.18	0.48	0.48	0.44	0.41	0.65	0.31	0.31	
v/c Ratio	0.19	0.21	0.50	0.87	0.54	0.38	0.48	0.24	0.32	0.33	0.42	
Control Delay	47.8	41.6	21.7	71.1	26.7	3.6	29.1	27.3	3.6	40.4	37.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	47.8	41.6	21.7	71.1	26.7	3.6	29.1	27.3	3.6	40.4	37.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	C	E	C	A	C	C	A	D	D	
Approach Delay		31.1			33.6			18.3			38.2	
Approach LOS		C			C			B			D	
Queue Length 50th (m)	4.0	22.6	42.8	74.3	92.8	1.6	31.6	34.0	10.0	22.3	51.7	
Queue Length 95th (m)	11.6	31.2	72.3	#98.5	106.7	18.0	48.4	45.5	21.9	39.1	67.5	
Internal Link Dist (m)		285.6			171.1			231.6			162.3	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	94	1325	697	644	2460	949	386	1482	1139	317	1108	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.19	0.21	0.50	0.83	0.54	0.38	0.48	0.24	0.32	0.33	0.42	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Natural Cycle: 120
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 30.6 Intersection LOS: C
Intersection Capacity Utilization 155.0% ICU Level of Service H
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 23: Port Union Rd./Sheppard Ave. & Kingston Rd.



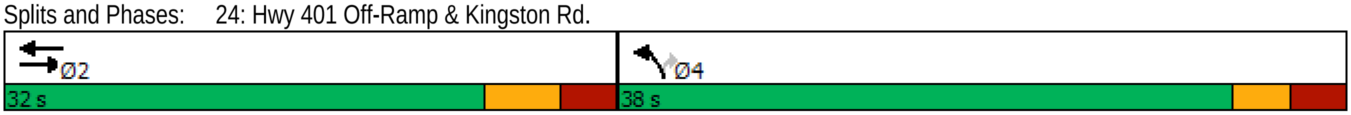
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	751	0	0	1677	538	55
Future Volume (vph)	751	0	0	1677	538	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	5142	0	0	5142	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	5142	0	0	5142	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						51
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			262.6	155.3	
Travel Time (s)	11.7			15.8	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	816	0	0	1823	585	60
Shared Lane Traffic (%)						
Lane Group Flow (vph)	816	0	0	1823	585	60
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	32.0			32.0	38.0	38.0
Total Split (%)	45.7%			45.7%	54.3%	54.3%
Maximum Green (s)	25.0			25.0	32.0	32.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	25.1			25.1	14.1	14.1
Actuated g/C Ratio	0.48			0.48	0.27	0.27
v/c Ratio	0.33			0.74	0.63	0.13
Control Delay	9.3			13.7	19.8	6.5
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.3			13.7	19.8	6.5

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A			B	B	A
Approach Delay	9.3			13.7	18.6	
Approach LOS	A			B	B	
Queue Length 50th (m)	15.5			45.2	24.5	0.6
Queue Length 95th (m)	26.9			73.2	36.9	6.8
Internal Link Dist (m)	171.1			238.6	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	2470			2470	2134	1004
Starvation Cap Reductn	0			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.33			0.74	0.27	0.06

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 52.2
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 58.6% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 24: Hwy 401 Off-Ramp & Kingston Rd.

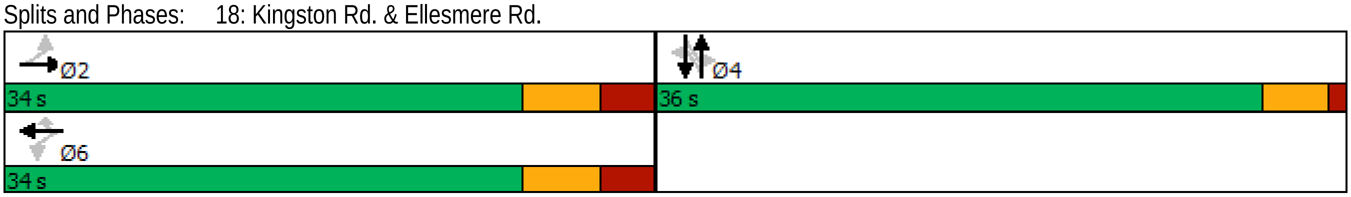


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	377	0	0	353	254	0	0	0	386	0	34
Future Volume (vph)	9	377	0	0	353	254	0	0	0	386	0	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		0
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850					0.850	
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	1601	0
Flt Permitted	0.492									0.757		
Satd. Flow (perm)	927	1883	0	0	1883	1601	0	1883	0	1426	1601	0
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						276					299	
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			35.6			143.1	
Travel Time (s)		9.0			2.0			2.1			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	410	0	0	384	276	0	0	0	420	0	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	410	0	0	384	276	0	0	0	420	37	0
Turn Type	Perm	NA			NA	Perm				Perm	NA	
Protected Phases		2			6			4			4	
Permitted Phases	2			6		6	4			4		
Detector Phase	2	2		6	6	6	4	4		4	4	
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0	23.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	22.5	22.5		22.5	22.5	
Total Split (s)	34.0	34.0		34.0	34.0	34.0	36.0	36.0		36.0	36.0	
Total Split (%)	48.6%	48.6%		48.6%	48.6%	48.6%	51.4%	51.4%		51.4%	51.4%	
Maximum Green (s)	27.0	27.0		27.0	27.0	27.0	31.5	31.5		31.5	31.5	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.5	3.5		3.5	3.5	
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0			7.0	7.0		4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	27.3	27.3			27.3	27.3				22.2	22.2	
Actuated g/C Ratio	0.45	0.45			0.45	0.45				0.36	0.36	
v/c Ratio	0.02	0.49			0.46	0.32				0.81	0.05	
Control Delay	12.7	16.1			15.7	3.2				30.4	0.1	
Queue Delay	0.0	0.0			0.0	0.0				0.0	0.0	
Total Delay	12.7	16.1			15.7	3.2				30.4	0.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	B			B	A				C	A	
Approach Delay		16.1			10.5						28.0	
Approach LOS		B			B						C	
Queue Length 50th (m)	0.6	31.1			28.7	0.0				40.8	0.0	
Queue Length 95th (m)	3.4	66.1			61.3	12.9				70.4	0.0	
Internal Link Dist (m)		126.4			9.6			11.6			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	413	840			840	867				742	977	
Starvation Cap Reductn	0	0			0	0				0	0	
Spillback Cap Reductn	0	0			0	0				0	0	
Storage Cap Reductn	0	0			0	0				0	0	
Reduced v/c Ratio	0.02	0.49			0.46	0.32				0.57	0.04	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 61.2	
Natural Cycle: 55	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 17.2	Intersection LOS: B
Intersection Capacity Utilization 50.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 18: Kingston Rd. & Ellesmere Rd.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	697	7	155	526	0	0	0	0	1541	43	74
Future Volume (vph)	0	697	7	155	526	0	0	0	0	1541	43	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.987	
Flt Protected				0.950						0.950	0.959	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1694	0
Flt Permitted				0.252						0.950	0.959	
Satd. Flow (perm)	0	3571	0	475	3579	0	0	0	0	1700	1694	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2									10	
Link Speed (k/h)		60			60			20			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			10.9			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	758	8	168	572	0	0	0	0	1675	47	80
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	0	766	0	168	572	0	0	0	0	904	898	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		24.0		24.0	24.0					36.0	36.0	
Total Split (s)		30.0		30.0	30.0					40.0	40.0	
Total Split (%)		42.9%		42.9%	42.9%					57.1%	57.1%	
Maximum Green (s)		24.0		24.0	24.0					33.0	33.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					22.0	22.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		24.0		24.0	24.0					33.0	33.0	
Actuated g/C Ratio		0.34		0.34	0.34					0.47	0.47	
v/c Ratio		0.63		1.04	0.47					1.13	1.12	
Control Delay		21.9		110.1	19.5					95.1	90.9	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		21.9		110.1	19.5					95.1	90.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C		F	B					F	F	
Approach Delay		21.9			40.1						93.0	
Approach LOS		C			D						F	
Queue Length 50th (m)		43.2		~23.1	30.2					~147.7	~145.6	
Queue Length 95th (m)		60.1		#57.9	43.5					#214.9	#214.8	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		1225		162	1227					801	803	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.63		1.04	0.47					1.13	1.12	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Natural Cycle: 120

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 64.7 Intersection LOS: E

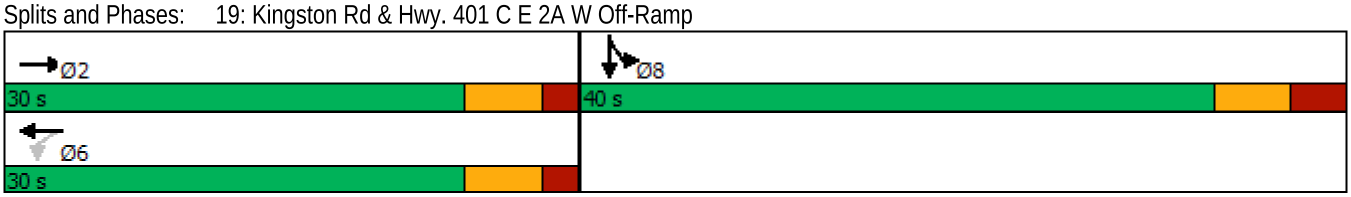
Intersection Capacity Utilization 92.4% ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Kingston Rd & Hwy. 401 C E 2A W Off-Ramp



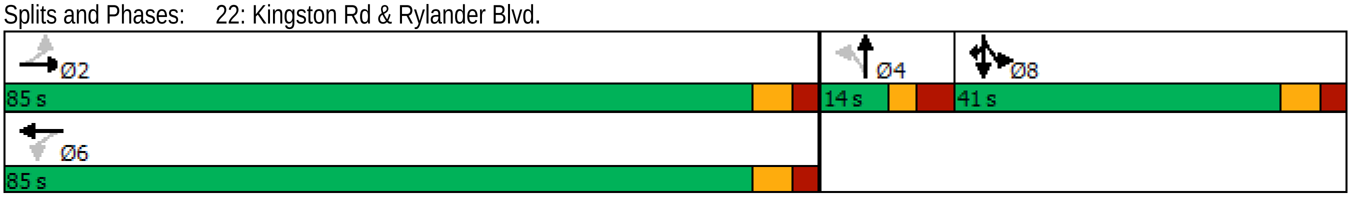
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	259	1547	63	20	792	190	19	9	6	178	15	220
Future Volume (vph)	259	1547	63	20	792	190	19	9	6	178	15	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.994			0.971			0.975				0.850
Flt Protected	0.950			0.950				0.973		0.950	0.959	
Satd. Flow (prot)	1789	5111	0	1789	4993	0	0	1787	0	1700	1716	1601
Flt Permitted	0.242			0.100				0.575		0.950	0.959	
Satd. Flow (perm)	456	5111	0	188	4993	0	0	1056	0	1700	1716	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			65			6				183
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			4.9			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	282	1682	68	22	861	207	21	10	7	193	16	239
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	282	1750	0	22	1068	0	0	38	0	104	105	239
Turn Type	Perm	NA		Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		2			6			4		8	8	8
Permitted Phases	2			6			4					
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	85.0	85.0		85.0	85.0		14.0	14.0		41.0	41.0	41.0
Total Split (%)	60.7%	60.7%		60.7%	60.7%		10.0%	10.0%		29.3%	29.3%	29.3%
Maximum Green (s)	78.0	78.0		78.0	78.0		7.0	7.0		34.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	78.5	78.5		78.5	78.5			7.0		13.4	13.4	13.4
Actuated g/C Ratio	0.67	0.67		0.67	0.67			0.06		0.11	0.11	0.11
v/c Ratio	0.92	0.51		0.17	0.32			0.55		0.54	0.54	0.69
Control Delay	57.2	11.3		13.8	8.7			78.5		59.7	59.6	24.7
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	57.2	11.3		13.8	8.7			78.5		59.7	59.6	24.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	B		B	A			E		E	E	C
Approach Delay		17.6			8.8			78.5			41.0	
Approach LOS		B			A			E			D	
Queue Length 50th (m)	55.5	72.7		1.9	34.7			7.4		24.6	24.8	12.3
Queue Length 95th (m)	#127.8	100.5		7.4	50.3			#25.2		43.0	43.5	38.3
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	306	3437		126	3377			69		498	502	598
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.92	0.51		0.17	0.32			0.55		0.21	0.21	0.40

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 116.8
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 87.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Kingston Rd & Rylander Blvd.



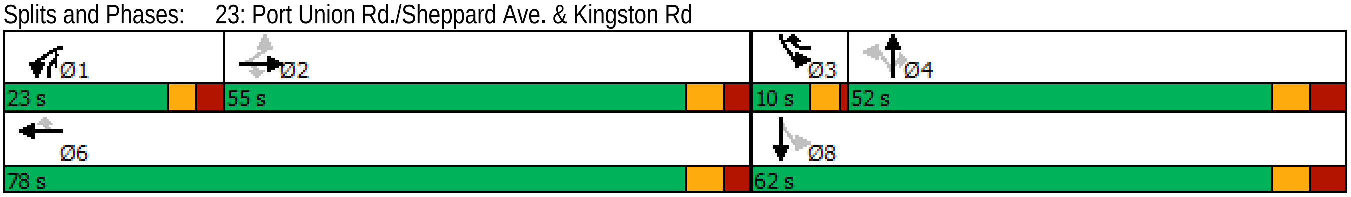
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	854	790	514	695	221	185	277	622	238	438	67
Future Volume (vph)	48	854	790	514	695	221	185	277	622	238	438	67
Ideal Flow (vphpl)	1900	1900	2100	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	1		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	*1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1769	3579	5142	1601	1789	3579	1601	1789	3507	0
Flt Permitted	0.353			0.950			0.447			0.506		
Satd. Flow (perm)	665	5142	1769	3579	5142	1601	842	3579	1601	953	3507	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			163			240			62		14	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			255.6			185.9	
Travel Time (s)		18.6			11.7			15.3			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	928	859	559	755	240	201	301	676	259	476	73
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	928	859	559	755	240	201	301	676	259	549	0
Turn Type	Perm	NA	Perm	Prot	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		2		1	6	3		4	1	3	8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	2	1	6	3	4	4	1	3	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	34.0	6.0	34.0	6.0	44.0	44.0	6.0	6.0	44.0	
Minimum Split (s)	41.0	41.0	41.0	12.0	41.0	10.0	52.0	52.0	12.0	10.0	52.0	
Total Split (s)	55.0	55.0	55.0	23.0	78.0	10.0	52.0	52.0	23.0	10.0	62.0	
Total Split (%)	39.3%	39.3%	39.3%	16.4%	55.7%	7.1%	37.1%	37.1%	16.4%	7.1%	44.3%	
Maximum Green (s)	48.0	48.0	48.0	17.0	71.0	6.0	44.0	44.0	17.0	6.0	54.0	
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	1.0	4.0	4.0	3.0	1.0	4.0	
Lost Time Adjust (s)	0.0	0.0	-3.0	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	3.0	7.0	4.0	8.0	8.0	6.0	4.0	8.0	
Lead/Lag	Lag	Lag	Lag	Lead		Lead	Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	Max	None	Max	None	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0		7.0		7.0	7.0			7.0	
Flash Dont Walk (s)	27.0	27.0	27.0		27.0		37.0	37.0			37.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0			0	
Act Effct Green (s)	48.0	48.0	51.0	20.0	71.0	84.0	44.0	44.0	69.0	58.0	54.0	
Actuated g/C Ratio	0.34	0.34	0.36	0.14	0.51	0.60	0.31	0.31	0.49	0.41	0.39	
v/c Ratio	0.23	0.53	1.15	1.09	0.29	0.23	0.76	0.27	0.82	0.60	0.40	
Control Delay	36.2	38.2	115.0	122.3	20.3	1.9	63.2	36.7	37.4	36.9	31.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	36.2	38.2	115.0	122.3	20.3	1.9	63.2	36.7	37.4	36.9	31.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	F	F	C	A	E	D	D	D	C	
Approach Delay		74.0			54.2			41.6			33.3	
Approach LOS		E			D			D			C	
Queue Length 50th (m)	10.3	75.3	~248.9	~87.1	43.1	0.0	50.2	32.8	144.6	48.6	56.2	
Queue Length 95th (m)	21.6	89.2	#327.0	#121.9	52.1	10.3	#88.9	45.1	203.1	70.8	71.9	
Internal Link Dist (m)		285.6			171.1			231.6			161.9	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	228	1762	748	511	2607	1056	264	1124	820	430	1361	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.23	0.53	1.15	1.09	0.29	0.23	0.76	0.27	0.82	0.60	0.40	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Natural Cycle: 145
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 55.1 Intersection LOS: E
Intersection Capacity Utilization 155.0% ICU Level of Service H
Analysis Period (min) 15
* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 23: Port Union Rd./Sheppard Ave. & Kingston Rd



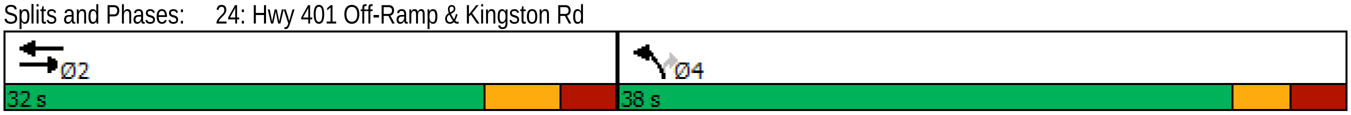
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2215	0	0	943	415	54
Future Volume (vph)	2215	0	0	943	415	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	5142	0	0	5142	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	5142	0	0	5142	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			226.2	155.3	
Travel Time (s)	11.7			13.6	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2408	0	0	1025	451	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2408	0	0	1025	451	59
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	32.0			32.0	38.0	38.0
Total Split (%)	45.7%			45.7%	54.3%	54.3%
Maximum Green (s)	25.0			25.0	32.0	32.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	25.1			25.1	11.7	11.7
Actuated g/C Ratio	0.50			0.50	0.23	0.23
v/c Ratio	0.93			0.40	0.55	0.16
Control Delay	21.5			8.6	19.4	15.8
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	21.5			8.6	19.4	15.8

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	C			A	B	B
Approach Delay	21.5			8.6	19.0	
Approach LOS	C			A	B	
Queue Length 50th (m)	64.9			18.2	18.0	4.1
Queue Length 95th (m)	#120.4			30.9	28.5	10.9
Internal Link Dist (m)	171.1			202.2	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	2586			2586	2235	1031
Starvation Cap Reductn	0			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.93			0.40	0.20	0.06

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 49.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 17.8 Intersection LOS: B
Intersection Capacity Utilization 65.5% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 24: Hwy 401 Off-Ramp & Kingston Rd



Attachment E: Future BRT (2041) Conditions Synchro Report

1) BRT in Mixed Traffic
2) BRT in Mixed Traffic with TSP
3) BRT in Median Lanes

1) BRT in Mixed Traffic

Lanes, Volumes, Timings
18: Kingston Rd. & Ellesmere Rd. 11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	225	0	0	526	480	0	0	0	194	0	26
Future Volume (vph)	10	225	0	0	526	480	0	0	0	194	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Flt Permitted	0.390									0.757		
Satd. Flow (perm)	735	1883	0	0	1883	1601	0	1883	0	1426	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						522						36
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			53.2			143.1	
Travel Time (s)		9.0			2.0			3.2			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	245	0	0	572	522	0	0	0	211	0	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	245	0	0	572	522	0	0	0	211	0	28
Turn Type	Perm	NA			NA	Perm				Perm		Perm
Protected Phases		2			6			4				
Permitted Phases	2			6		6	4			8		8
Detector Phase	2	2		6	6	6	4	4		8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0	23.0	7.0	7.0		7.0		7.0
Minimum Split (s)	32.0	32.0		32.0	32.0	32.0	32.0	32.0		32.0		32.0
Total Split (s)	60.0	60.0		60.0	60.0	60.0	60.0	60.0		60.0		60.0
Total Split (%)	50.0%	50.0%		50.0%	50.0%	50.0%	50.0%	50.0%		50.0%		50.0%
Maximum Green (s)	53.0	53.0		53.0	53.0	53.0	54.0	54.0		54.0		54.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0		4.0
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0		6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Max	Max		Max	Max	Max	None	None		None		None
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0		7.0
Flash Dont Walk (s)	18.0	18.0		18.0	18.0	18.0	19.0	19.0		19.0		19.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0		0
Act Effct Green (s)	55.0	55.0			55.0	55.0				17.7		17.7
Actuated g/C Ratio	0.64	0.64			0.64	0.64				0.21		0.21
v/c Ratio	0.02	0.20			0.47	0.43				0.72		0.08
Control Delay	7.4	7.6			10.4	2.0				45.2		7.7
Queue Delay	0.0	0.0			0.1	0.0				0.0		0.0
Total Delay	7.4	7.6			10.5	2.0				45.2		7.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A			B	A				D		A
Approach Delay		7.6			6.4						40.8	
Approach LOS		A			A						D	
Queue Length 50th (m)	0.6	14.5			42.2	0.0				31.4		0.0
Queue Length 95th (m)	2.9	30.4			81.3	12.0				53.6		5.1
Internal Link Dist (m)		126.4			9.6			29.2			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	471	1208			1208	1214				900		1024
Starvation Cap Reductn	0	0			76	0				0		0
Spillback Cap Reductn	0	0			0	0				0		0
Storage Cap Reductn	0	0			0	0				0		0
Reduced v/c Ratio	0.02	0.20			0.51	0.43				0.23		0.03

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 85.7

Natural Cycle: 65

Control Type: Semi Act-Uncoord

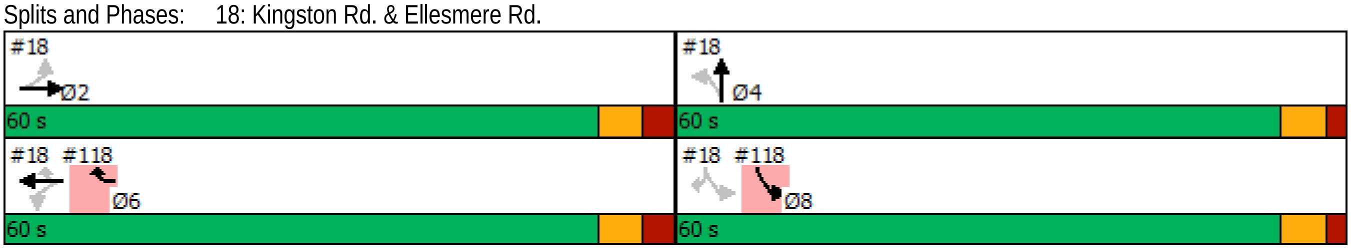
Maximum v/c Ratio: Err

Intersection Signal Delay: 11.8 Intersection LOS: B

Intersection Capacity Utilization 60.6% ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 18: Kingston Rd. & Ellesmere Rd.



Lanes, Volumes, Timings
19: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp

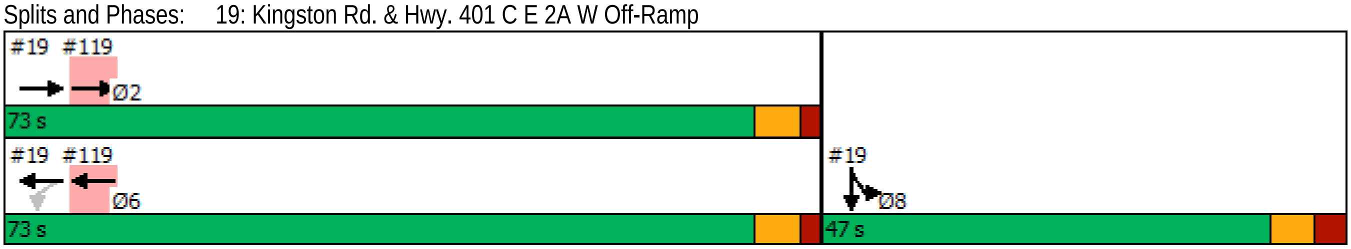
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	281	4	480	794	0	0	0	0	466	11	62
Future Volume (vph)	0	281	4	480	794	0	0	0	0	466	11	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.965	
Flt Protected				0.950						0.950	0.965	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1666	0
Flt Permitted				0.564						0.950	0.965	
Satd. Flow (perm)	0	3571	0	1062	3579	0	0	0	0	1700	1666	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2									14	
Link Speed (k/h)		60			60			19			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			11.5			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	305	4	522	863	0	0	0	0	507	12	67
Shared Lane Traffic (%)										41%		
Lane Group Flow (vph)	0	309	0	522	863	0	0	0	0	299	287	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		28.0		24.0	24.0					36.0	36.0	
Total Split (s)		73.0		73.0	73.0					47.0	47.0	
Total Split (%)		60.8%		60.8%	60.8%					39.2%	39.2%	
Maximum Green (s)		67.0		67.0	67.0					40.0	40.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					21.0	21.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		67.3		67.3	67.3					23.9	23.9	
Actuated g/C Ratio		0.65		0.65	0.65					0.23	0.23	
v/c Ratio		0.13		0.76	0.37					0.77	0.73	
Control Delay		8.2		24.0	10.0					50.9	46.4	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		8.2		24.0	10.0					50.9	46.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A		C	B					D	D	
Approach Delay		8.2			15.3						48.7	
Approach LOS		A			B						D	
Queue Length 50th (m)		11.6		67.5	39.2					59.6	54.1	
Queue Length 95th (m)		22.0		#163.1	65.8					89.3	83.0	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		2305		685	2310					655	650	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.13		0.76	0.37					0.46	0.44	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 104.2
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 72.5% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	139	596	30	19	1341	115	14	2	4	91	3	227
Future Volume (vph)	139	596	30	19	1341	115	14	2	4	91	3	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.993			0.988			0.974				0.850
Flt Protected	0.950			0.950				0.966		0.950	0.955	
Satd. Flow (prot)	1789	5106	0	1789	5080	0	0	1772	0	1700	1709	1601
Flt Permitted	0.124			0.381				0.879		0.714	0.726	
Satd. Flow (perm)	234	5106	0	718	5080	0	0	1613	0	1278	1299	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			16			4				90
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		79.8			309.6			54.4			124.7	
Travel Time (s)		4.8			18.6			4.9			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	151	648	33	21	1458	125	15	2	4	99	3	247
Shared Lane Traffic (%)										49%		
Lane Group Flow (vph)	151	681	0	21	1583	0	0	21	0	50	52	247
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			9			4	
Permitted Phases	2			6			9			4		4
Detector Phase	2	2		6	6		9	9		4	4	4
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	85.0	85.0		85.0	85.0		14.0	14.0		41.0	41.0	41.0
Total Split (%)	60.7%	60.7%		60.7%	60.7%		10.0%	10.0%		29.3%	29.3%	29.3%
Maximum Green (s)	78.0	78.0		78.0	78.0		7.0	7.0		34.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	79.0	79.0		79.0	79.0			7.1		17.7	17.7	17.7
Actuated g/C Ratio	0.67	0.67		0.67	0.67			0.06		0.15	0.15	0.15
v/c Ratio	0.97	0.20		0.04	0.47			0.21		0.26	0.27	0.78
Control Delay	92.6	9.3		10.9	11.9			55.7		48.8	48.9	48.6
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	92.6	9.3		10.9	11.9			55.7		48.8	48.9	48.6

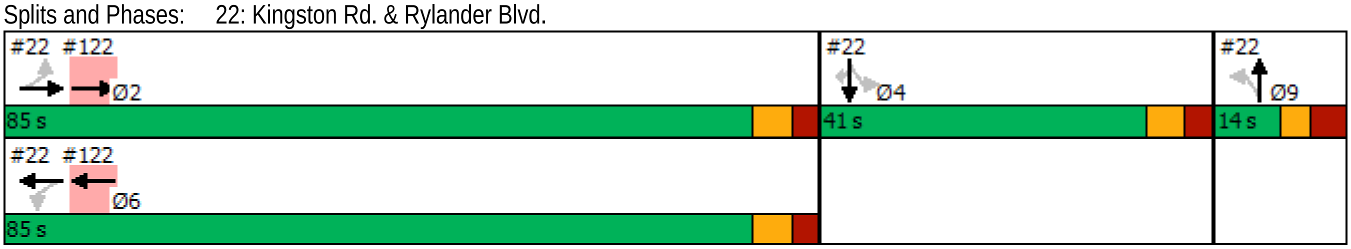
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	A		B	B			E		D	D	D
Approach Delay		24.4			11.9			55.7			48.7	
Approach LOS		C			B			E			D	
Queue Length 50th (m)	~39.2	23.9		1.8	70.3			4.0		11.5	12.1	37.8
Queue Length 95th (m)	#89.8	37.6		6.3	102.0			13.3		23.8	24.6	66.6
Internal Link Dist (m)		55.8			285.6			30.4			100.7	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	155	3404		478	3389			100		371	377	528
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.97	0.20		0.04	0.47			0.21		0.13	0.14	0.47

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 118.6	
Natural Cycle: 150	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 20.5	Intersection LOS: C
Intersection Capacity Utilization 85.3%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Kingston Rd. & Rylander Blvd.



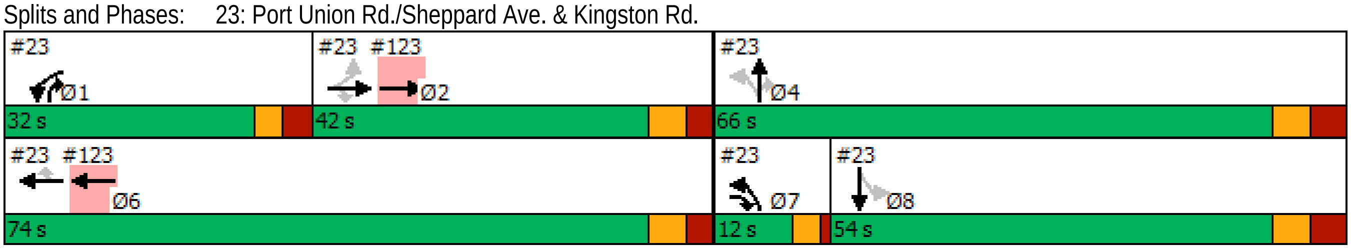
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	251	313	511	1269	346	178	270	321	94	291	78
Future Volume (vph)	17	251	313	511	1269	346	178	270	321	94	291	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	2		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.968	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1601	3471	5142	1601	1789	3579	1601	1789	3464	0
Flt Permitted	0.184			0.950			0.425			0.573		
Satd. Flow (perm)	347	5142	1601	3471	5142	1601	800	3579	1601	1079	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			207			376			263		26	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			176.1			186.3	
Travel Time (s)		18.6			11.7			10.6			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	273	340	555	1379	376	193	293	349	102	316	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	273	340	555	1379	376	193	293	349	102	401	0
Turn Type	Perm	NA	pm+ov	Prot	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	
Protected Phases		2	7	1	6		7	4	1		8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	7	1	6	6	7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	6.0	6.0	34.0	34.0	6.0	44.0	6.0	44.0	44.0	
Minimum Split (s)	41.0	41.0	10.5	12.0	41.0	41.0	10.5	54.0	12.0	54.0	54.0	
Total Split (s)	42.0	42.0	12.0	32.0	74.0	74.0	12.0	66.0	32.0	54.0	54.0	
Total Split (%)	30.0%	30.0%	8.6%	22.9%	52.9%	52.9%	8.6%	47.1%	22.9%	38.6%	38.6%	
Maximum Green (s)	35.0	35.0	8.0	26.0	67.0	67.0	8.0	58.0	26.0	46.0	46.0	
Yellow Time (s)	4.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	3.0	3.0	1.0	3.0	3.0	3.0	1.0	4.0	3.0	4.0	4.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	6.0	7.0	7.0	4.0	8.0	6.0	8.0	8.0	
Lead/Lag	Lag	Lag	Lead	Lead			Lead		Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes		Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	None	None	Max	Max	None	None	None	None	None	
Walk Time (s)	7.0	7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	27.0	27.0			27.0	27.0		39.0		39.0	39.0	
Pedestrian Calls (#/hr)	0	0			0	0		0		0	0	
Act Effct Green (s)	35.8	35.8	50.8	25.2	67.0	67.0	60.0	56.0	89.2	44.0	44.0	
Actuated g/C Ratio	0.26	0.26	0.37	0.18	0.49	0.49	0.43	0.41	0.65	0.32	0.32	
v/c Ratio	0.20	0.20	0.47	0.88	0.55	0.39	0.48	0.20	0.31	0.30	0.36	
Control Delay	47.5	40.7	14.9	70.8	26.0	3.1	29.7	27.0	3.2	38.3	34.7	
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	47.5	40.7	14.9	70.8	26.4	3.1	29.7	27.0	3.2	38.3	34.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	E	C	A	C	C	A	D	C	
Approach Delay		27.0			33.3			17.7			35.5	
Approach LOS		C			C			B			D	
Queue Length 50th (m)	3.9	21.6	25.9	76.2	94.7	0.0	32.9	27.0	8.1	21.0	41.3	
Queue Length 95th (m)	11.7	30.0	53.8	#102.4	108.6	16.1	50.3	37.3	19.4	37.0	55.5	
Internal Link Dist (m)		285.6			171.1			152.1			162.3	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	90	1335	720	653	2496	970	405	1504	1135	359	1172	
Starvation Cap Reductn	0	0	0	0	555	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.20	0.20	0.47	0.85	0.71	0.39	0.48	0.19	0.31	0.28	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 138
Natural Cycle: 130
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 29.6 Intersection LOS: C
Intersection Capacity Utilization 155.0% ICU Level of Service H
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 23: Port Union Rd./Sheppard Ave. & Kingston Rd.

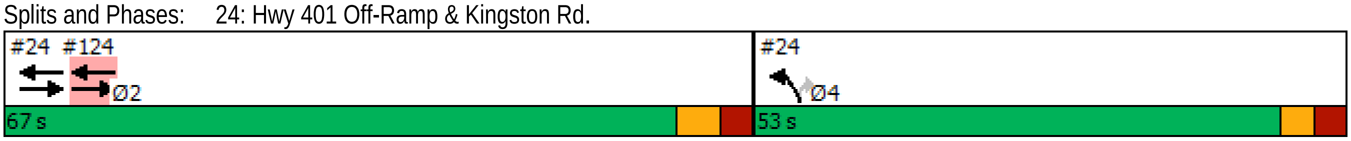


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	725	0	0	1729	553	54
Future Volume (vph)	725	0	0	1729	553	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	5142	0	0	5142	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	5142	0	0	5142	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						59
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			522.3	155.3	
Travel Time (s)	11.7			31.3	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	788	0	0	1879	601	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	788	0	0	1879	601	59
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	67.0			67.0	53.0	53.0
Total Split (%)	55.8%			55.8%	44.2%	44.2%
Maximum Green (s)	60.0			60.0	47.0	47.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	60.1			60.1	21.7	21.7
Actuated g/C Ratio	0.63			0.63	0.23	0.23
v/c Ratio	0.24			0.58	0.76	0.14
Control Delay	8.2			11.4	40.7	8.6
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	8.2			11.4	40.7	8.6

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A			B	D	A
Approach Delay	8.2			11.4	37.8	
Approach LOS	A			B	D	
Queue Length 50th (m)	20.4			64.8	52.9	0.0
Queue Length 95th (m)	31.9			94.5	70.6	9.1
Internal Link Dist (m)	171.1			498.3	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	3259			3259	1723	824
Starvation Cap Reductn	0			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.24			0.58	0.35	0.07

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 94.8	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 60.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 24: Hwy 401 Off-Ramp & Kingston Rd.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	406	0	0	335	241	0	0	0	445	0	33
Future Volume (vph)	10	406	0	0	335	241	0	0	0	445	0	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Flt Permitted	0.477									0.757		
Satd. Flow (perm)	898	1883	0	0	1883	1601	0	1883	0	1426	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						262						36
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			35.6			143.1	
Travel Time (s)		9.0			2.0			2.1			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	441	0	0	364	262	0	0	0	484	0	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	441	0	0	364	262	0	0	0	484	0	36
Turn Type	Perm	NA			NA	Perm				Perm		Perm
Protected Phases		2			6			4				
Permitted Phases	2			6		6	4			8		8
Detector Phase	2	2		6	6	6	4	4		8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0	23.0	7.0	7.0		7.0		7.0
Minimum Split (s)	32.0	32.0		32.0	32.0	32.0	32.0	32.0		32.0		32.0
Total Split (s)	49.0	49.0		49.0	49.0	49.0	71.0	71.0		71.0		71.0
Total Split (%)	40.8%	40.8%		40.8%	40.8%	40.8%	59.2%	59.2%		59.2%		59.2%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	65.0	65.0		65.0		65.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0		4.0
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0		6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Max	Max		Max	Max	Max	None	None		None		None
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0		7.0
Flash Dont Walk (s)	18.0	18.0		18.0	18.0	18.0	19.0	19.0		19.0		19.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0		0
Act Effct Green (s)	42.5	42.5			42.5	42.5				35.4		35.4
Actuated g/C Ratio	0.47	0.47			0.47	0.47				0.39		0.39
v/c Ratio	0.03	0.50			0.41	0.30				0.87		0.06
Control Delay	17.9	21.6			20.1	3.5				42.6		5.3
Queue Delay	0.0	0.0			0.0	0.0				0.0		0.0
Total Delay	17.9	21.6			20.1	3.5				42.6		5.3

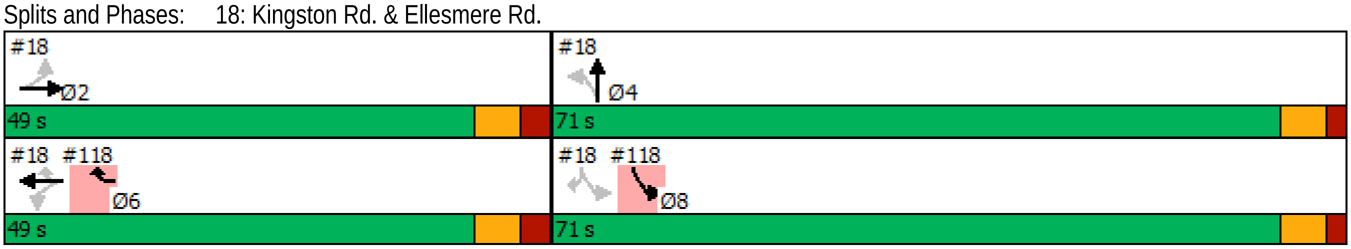
Lanes, Volumes, Timings
18: Kingston Rd. & Ellesmere Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C			C	A				D		A
Approach Delay		21.6			13.2						40.1	
Approach LOS		C			B						D	
Queue Length 50th (m)	1.0	51.1			40.1	0.0				75.9		0.0
Queue Length 95th (m)	5.1	103.7			82.8	15.0				115.3		5.1
Internal Link Dist (m)		126.4			9.6			11.6			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	419	878			878	886				1029		1165
Starvation Cap Reductn	0	0			0	0				0		0
Spillback Cap Reductn	0	0			0	0				0		0
Storage Cap Reductn	0	0			0	0				0		0
Reduced v/c Ratio	0.03	0.50			0.41	0.30				0.47		0.03

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 91.1
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 24.3 — Intersection LOS: C
Intersection Capacity Utilization 55.2% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 18: Kingston Rd. & Ellesmere Rd.



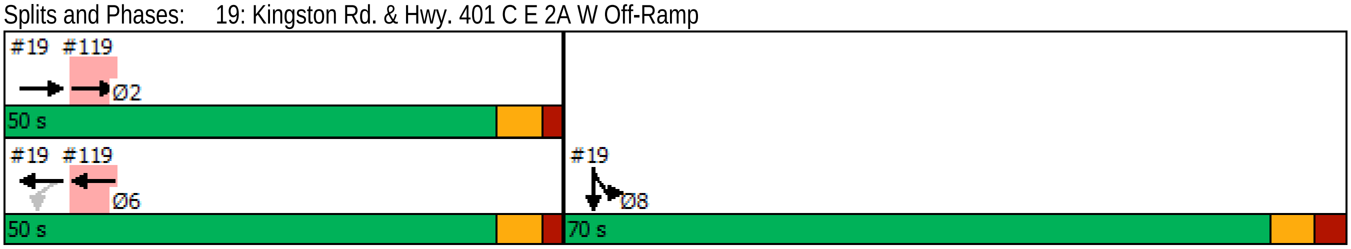
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	715	7	147	508	0	0	0	0	1583	39	72
Future Volume (vph)	0	715	7	147	508	0	0	0	0	1583	39	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.987	
Flt Protected				0.950						0.950	0.958	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1692	0
Flt Permitted				0.220						0.950	0.958	
Satd. Flow (perm)	0	3571	0	414	3579	0	0	0	0	1700	1692	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1									6	
Link Speed (k/h)		60			60			20			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			10.9			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	777	8	160	552	0	0	0	0	1721	42	78
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	0	785	0	160	552	0	0	0	0	929	912	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		24.0		24.0	24.0					36.0	36.0	
Total Split (s)		50.0		50.0	50.0					70.0	70.0	
Total Split (%)		41.7%		41.7%	41.7%					58.3%	58.3%	
Maximum Green (s)		44.0		44.0	44.0					63.0	63.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					21.0	21.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		44.0		44.0	44.0					63.0	63.0	
Actuated g/C Ratio		0.37		0.37	0.37					0.52	0.52	
v/c Ratio		0.60		1.06	0.42					1.04	1.02	
Control Delay		33.1		128.4	29.7					70.5	65.2	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		33.1		128.4	29.7					70.5	65.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C		F	C					E	E	
Approach Delay		33.1			51.9						67.8	
Approach LOS		C			D						E	
Queue Length 50th (m)		78.1		~41.2	50.7					~249.0	~240.0	
Queue Length 95th (m)		98.1		#83.8	66.2					#328.9	#320.7	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		1310		151	1312					892	891	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.60		1.06	0.42					1.04	1.02	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 110
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 56.3 Intersection LOS: E
Intersection Capacity Utilization 97.9% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	268	1600	66	20	776	187	18	8	6	184	13	216
Future Volume (vph)	268	1600	66	20	776	187	18	8	6	184	13	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.994			0.971			0.974				0.850
Flt Protected	0.950			0.950				0.973		0.950	0.958	
Satd. Flow (prot)	1789	5111	0	1789	4993	0	0	1785	0	1700	1714	1601
Flt Permitted	0.250			0.094				0.798		0.950	0.958	
Satd. Flow (perm)	471	5111	0	177	4993	0	0	1464	0	1700	1714	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			65			7				190
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			4.9			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	291	1739	72	22	843	203	20	9	7	200	14	235
Shared Lane Traffic (%)										47%		
Lane Group Flow (vph)	291	1811	0	22	1046	0	0	36	0	106	108	235
Turn Type	Perm	NA		Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		2			6			9		4	4	4
Permitted Phases	2			6			9					
Detector Phase	2	2		6	6		9	9		4	4	4
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	85.0	85.0		85.0	85.0		14.0	14.0		41.0	41.0	41.0
Total Split (%)	60.7%	60.7%		60.7%	60.7%		10.0%	10.0%		29.3%	29.3%	29.3%
Maximum Green (s)	78.0	78.0		78.0	78.0		7.0	7.0		34.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	78.7	78.7		78.7	78.7			7.1		13.3	13.3	13.3
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.06		0.12	0.12	0.12
v/c Ratio	0.90	0.51		0.18	0.30			0.37		0.54	0.54	0.66
Control Delay	50.6	10.4		13.8	7.8			58.2		58.6	58.7	21.5
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	50.6	10.4		13.8	7.8			58.2		58.6	58.7	21.5

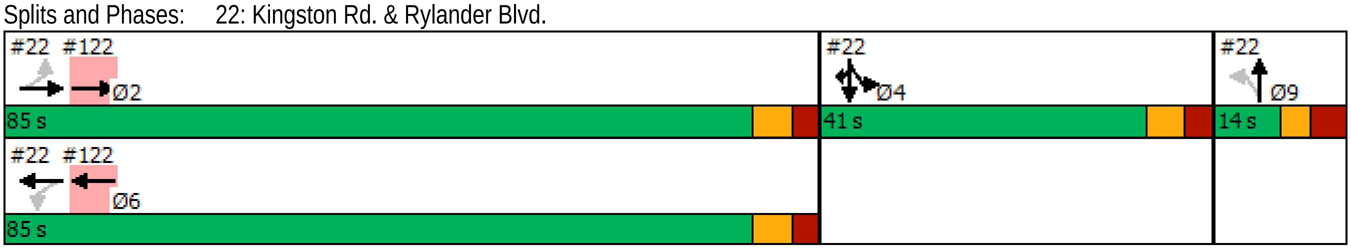
22: Kingston Rd. & Rylander Blvd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		B	A			E		E	E	C
Approach Delay		16.0			7.9			58.2			39.2	
Approach LOS		B			A			E			D	
Queue Length 50th (m)	57.4	77.1		1.9	33.8			6.7		25.1	25.5	9.8
Queue Length 95th (m)	#129.3	103.2		7.5	47.8			18.3		43.8	44.4	35.1
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	325	3531		122	3468			97		511	515	614
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.90	0.51		0.18	0.30			0.37		0.21	0.21	0.38

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 114
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 16.9 — Intersection LOS: B
Intersection Capacity Utilization 88.3% — ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Kingston Rd. & Rylander Blvd.



Lanes, Volumes, Timings
23: Port Union Rd./Sheppard Ave. & Kingston Rd.

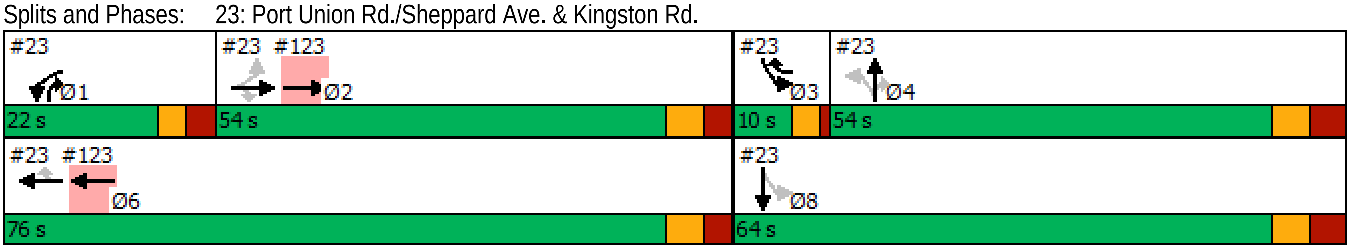
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	884	817	506	684	218	181	242	644	246	383	65
Future Volume (vph)	50	884	817	506	684	218	181	242	644	246	383	65
Ideal Flow (vphpl)	1900	1900	2100	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	2		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	*1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1769	3579	5142	1601	1789	3579	1601	1789	3500	0
Flt Permitted	0.358			0.950			0.475			0.541		
Satd. Flow (perm)	674	5142	1769	3579	5142	1601	895	3579	1601	1019	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217			237			62		16	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			207.1			186.3	
Travel Time (s)		18.6			11.7			12.4			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	961	888	550	743	237	197	263	700	267	416	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	961	888	550	743	237	197	263	700	267	487	0
Turn Type	Perm	NA	Perm	Prot	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		2		1	6	3		4	1	3	8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	2	1	6	3	4	4	1	3	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	34.0	6.0	34.0	6.0	44.0	44.0	6.0	6.0	44.0	
Minimum Split (s)	41.0	41.0	41.0	12.0	41.0	10.0	54.0	54.0	12.0	10.0	54.0	
Total Split (s)	54.0	54.0	54.0	22.0	76.0	10.0	54.0	54.0	22.0	10.0	64.0	
Total Split (%)	38.6%	38.6%	38.6%	15.7%	54.3%	7.1%	38.6%	38.6%	15.7%	7.1%	45.7%	
Maximum Green (s)	47.0	47.0	47.0	16.0	69.0	6.0	46.0	46.0	16.0	6.0	56.0	
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	1.0	4.0	4.0	3.0	1.0	4.0	
Lost Time Adjust (s)	0.0	0.0	-3.0	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	3.0	7.0	4.0	8.0	8.0	6.0	4.0	8.0	
Lead/Lag	Lag	Lag	Lag	Lead		Lead	Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	Max	None	Max	None	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0		7.0		7.0	7.0			7.0	
Flash Dont Walk (s)	27.0	27.0	27.0		27.0		39.0	39.0			39.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0			0	
Act Effct Green (s)	47.0	47.0	50.0	19.0	69.0	82.0	44.4	44.4	68.4	58.4	54.4	
Actuated g/C Ratio	0.34	0.34	0.36	0.14	0.50	0.59	0.32	0.32	0.49	0.42	0.39	
v/c Ratio	0.24	0.55	1.14	1.12	0.29	0.23	0.69	0.23	0.85	0.58	0.35	
Control Delay	36.6	38.6	110.0	131.2	20.8	2.0	55.0	35.1	39.3	34.7	29.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	36.6	38.6	110.0	131.2	20.8	2.0	55.0	35.1	39.3	34.7	29.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	F	F	C	A	D	D	D	C	C	
Approach Delay		71.9			57.6			41.0			31.3	
Approach LOS		E			E			D			C	
Queue Length 50th (m)	10.6	77.6	~242.7	~85.9	42.3	0.0	46.9	27.7	151.9	49.1	47.3	
Queue Length 95th (m)	22.6	93.9	#327.0	#122.9	52.8	10.7	76.9	38.8	213.4	71.2	61.4	
Internal Link Dist (m)		285.6			171.1			183.1			162.3	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	228	1746	777	491	2564	1045	297	1189	822	463	1425	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.24	0.55	1.14	1.12	0.29	0.23	0.66	0.22	0.85	0.58	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 138.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 55.3 Intersection LOS: E
Intersection Capacity Utilization 155.0% ICU Level of Service H
Analysis Period (min) 15
* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 23: Port Union Rd./Sheppard Ave. & Kingston Rd.

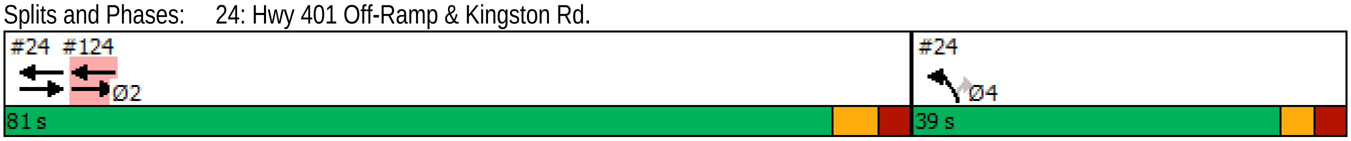


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2283	0	0	919	410	55
Future Volume (vph)	2283	0	0	919	410	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	5142	0	0	5142	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	5142	0	0	5142	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						4
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			419.5	155.3	
Travel Time (s)	11.7			25.2	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2482	0	0	999	446	60
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2482	0	0	999	446	60
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	81.0			81.0	39.0	39.0
Total Split (%)	67.5%			67.5%	32.5%	32.5%
Maximum Green (s)	74.0			74.0	33.0	33.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	74.1			74.1	18.7	18.7
Actuated g/C Ratio	0.70			0.70	0.18	0.18
v/c Ratio	0.69			0.28	0.73	0.21
Control Delay	10.9			6.4	48.5	36.5
Queue Delay	0.6			0.0	0.0	0.0
Total Delay	11.5			6.4	48.5	36.5

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	B			A	D	D
Approach Delay	11.5			6.4	47.1	
Approach LOS	B			A	D	
Queue Length 50th (m)	94.9			24.6	45.1	9.9
Queue Length 95th (m)	131.2			36.1	61.3	21.4
Internal Link Dist (m)	171.1			395.5	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	3601			3601	1084	502
Starvation Cap Reductn	658			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.84			0.28	0.41	0.12

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 105.8	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 14.7	Intersection LOS: B
Intersection Capacity Utilization 66.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 24: Hwy 401 Off-Ramp & Kingston Rd.



Lanes, Volumes, Timings
16: Kingston Rd. & Ellesmere Rd.
11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	225	0	0	526	480	0	0	0	194	0	26
Future Volume (vph)	10	225	0	0	526	480	0	0	0	194	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Flt Permitted	0.382									0.757		
Satd. Flow (perm)	719	1883	0	0	1883	1601	0	1883	0	1426	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						522						55
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			53.2			143.1	
Travel Time (s)		9.0			2.0			3.2			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	245	0	0	572	522	0	0	0	211	0	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	245	0	0	572	522	0	0	0	211	0	28
Turn Type	Perm	NA			NA	Perm				Perm		Perm
Protected Phases		2			6			4				
Permitted Phases	2			6		6	4			8		8
Detector Phase	2	2		6	6	6	4	4		8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0	23.0	7.0	7.0		7.0		7.0
Minimum Split (s)	32.0	32.0		32.0	32.0	32.0	32.0	32.0		32.0		32.0
Total Split (s)	70.0	70.0		70.0	70.0	70.0	40.0	40.0		40.0		40.0
Total Split (%)	58.3%	58.3%		58.3%	58.3%	58.3%	33.3%	33.3%		33.3%		33.3%
Maximum Green (s)	63.0	63.0		63.0	63.0	63.0	34.0	34.0		34.0		34.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0		4.0
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0		6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Max	Max		Max	Max	Max	None	None		None		None
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0		7.0
Flash Dont Walk (s)	18.0	18.0		18.0	18.0	18.0	19.0	19.0		19.0		19.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0		0
Act Effct Green (s)	65.4	65.4			65.4	65.4				19.8		19.8
Actuated g/C Ratio	0.65	0.65			0.65	0.65				0.20		0.20
v/c Ratio	0.02	0.20			0.47	0.43				0.75		0.08
Control Delay	9.7	9.1			12.0	2.2				54.1		2.8
Queue Delay	0.0	0.0			0.2	0.0				0.0		0.0
Total Delay	9.7	9.1			12.2	2.2				54.1		2.8

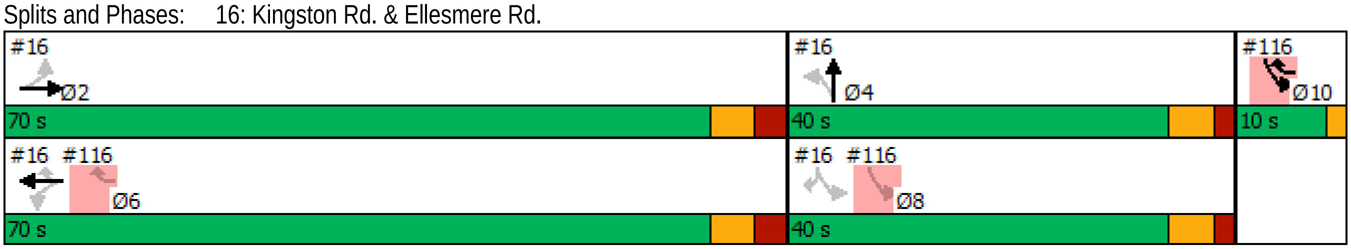
Lanes, Volumes, Timings
16: Kingston Rd. & Ellesmere Rd.

11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A			B	A				D		A
Approach Delay		9.1			7.4						48.0	
Approach LOS		A			A						D	
Queue Length 50th (m)	0.6	15.6			45.3	0.0				36.6		0.0
Queue Length 95th (m)	3.9	42.8			114.5	14.9				66.9		2.2
Internal Link Dist (m)		126.4			9.6			29.2			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	469	1230			1230	1227				487		584
Starvation Cap Reductn	0	0			189	0				0		0
Spillback Cap Reductn	0	0			0	0				0		0
Storage Cap Reductn	0	0			0	0				0		0
Reduced v/c Ratio	0.02	0.20			0.55	0.43				0.43		0.05

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 100	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 13.8	Intersection LOS: B
Intersection Capacity Utilization 60.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 16: Kingston Rd. & Ellesmere Rd.



2) BRT in Mixed Traffic with TSP

Lanes, Volumes, Timings
17: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp 11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	281	4	480	794	0	0	0	0	466	11	62
Future Volume (vph)	0	281	4	480	794	0	0	0	0	466	11	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.965	
Flt Protected				0.950						0.950	0.965	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1666	0
Flt Permitted				0.562						0.950	0.965	
Satd. Flow (perm)	0	3571	0	1058	3579	0	0	0	0	1700	1666	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1									6	
Link Speed (k/h)		60			60			19			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			11.5			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	305	4	522	863	0	0	0	0	507	12	67
Shared Lane Traffic (%)										41%		
Lane Group Flow (vph)	0	309	0	522	863	0	0	0	0	299	287	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		28.0		24.0	24.0					36.0	36.0	
Total Split (s)		157.0		157.0	157.0					63.0	63.0	
Total Split (%)		68.3%		68.3%	68.3%					27.4%	27.4%	
Maximum Green (s)		151.0		151.0	151.0					56.0	56.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					21.0	21.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		151.2		151.2	151.2					43.3	43.3	
Actuated g/C Ratio		0.69		0.69	0.69					0.20	0.20	
v/c Ratio		0.12		0.71	0.35					0.88	0.85	
Control Delay		11.9		28.4	14.5					111.4	105.2	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		11.9		28.4	14.5					111.4	105.2	

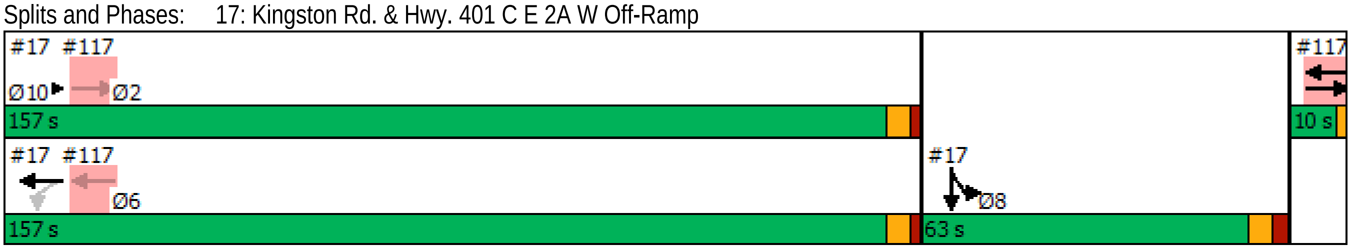
Lanes, Volumes, Timings
17: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp

11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B		C	B					F	F	
Approach Delay		11.9			19.7						108.4	
Approach LOS		B			B						F	
Queue Length 50th (m)		22.8		133.0	77.2					135.4	126.6	
Queue Length 95th (m)		34.5		217.1	104.8					177.1	166.7	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		2482		735	2487					438	433	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.12		0.71	0.35					0.68	0.66	

Intersection Summary	
Area Type: Other	
Cycle Length: 230	
Actuated Cycle Length: 217.6	
Natural Cycle: 100	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 41.5	Intersection LOS: D
Intersection Capacity Utilization 72.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 17: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	139	596	30	19	1341	115	14	2	4	91	3	227
Future Volume (vph)	139	596	30	19	1341	115	14	2	4	91	3	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.993			0.988			0.974				0.850
Flt Protected	0.950			0.950				0.966		0.950	0.955	
Satd. Flow (prot)	1789	5106	0	1789	5080	0	0	1772	0	1700	1709	1601
Flt Permitted	0.123			0.381						0.715	0.727	
Satd. Flow (perm)	232	5106	0	718	5080	0	0	1834	0	1279	1301	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			14			4				183
Link Speed (k/h)		60			60			60			40	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			3.3			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	151	648	33	21	1458	125	15	2	4	99	3	247
Shared Lane Traffic (%)										49%		
Lane Group Flow (vph)	151	681	0	21	1583	0	0	21	0	50	52	247
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			9			4	
Permitted Phases	2			6			9			4		4
Detector Phase	2	2		6	6		9	9		4	4	4
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	75.0	75.0		75.0	75.0		14.0	14.0		41.0	41.0	41.0
Total Split (%)	53.6%	53.6%		53.6%	53.6%		10.0%	10.0%		29.3%	29.3%	29.3%
Maximum Green (s)	68.0	68.0		68.0	68.0		7.0	7.0		34.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag							Lead	Lead				
Lead-Lag Optimize?							Yes	Yes				
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	69.6	69.6		69.6	69.6			7.2		11.6	11.6	11.6
Actuated g/C Ratio	0.67	0.67		0.67	0.67			0.07		0.11	0.11	0.11
v/c Ratio	0.97	0.20		0.04	0.46			0.16		0.35	0.36	0.72
Control Delay	90.8	8.9		11.3	11.2			48.4		51.9	52.1	26.6
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	90.8	8.9		11.3	11.2			48.4		51.9	52.1	26.6

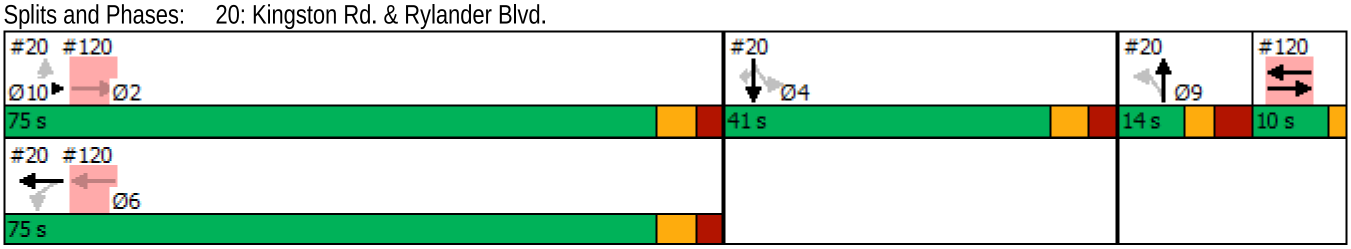
Lanes, Volumes, Timings
20: Kingston Rd. & Rylander Blvd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	A		B	B			D		D	D	C
Approach Delay		23.7			11.2			48.4			34.0	
Approach LOS		C			B			D			C	
Queue Length 50th (m)	17.1	11.1		0.9	32.7			2.9		8.8	9.1	10.7
Queue Length 95th (m)	#58.1	39.4		6.6	107.0			12.6		24.3	25.1	41.3
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	156	3433		482	3417			130		429	437	659
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.97	0.20		0.04	0.46			0.16		0.12	0.12	0.37

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 103.6	
Natural Cycle: 150	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 18.1	Intersection LOS: B
Intersection Capacity Utilization 85.3%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: Kingston Rd. & Rylander Blvd.



Lanes, Volumes, Timings
21: Port Union Rd./Sheppard Ave. & Kingston Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	251	313	511	1269	346	178	270	321	94	291	78
Future Volume (vph)	17	251	313	511	1269	346	178	270	321	94	291	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	2		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.968	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1601	3471	5142	1601	1789	3579	1601	1789	3464	0
Flt Permitted	0.184			0.950			0.425			0.573		
Satd. Flow (perm)	347	5142	1601	3471	5142	1601	800	3579	1601	1079	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			322			362			349		26	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			176.1			186.3	
Travel Time (s)		18.6			11.7			10.6			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	273	340	555	1379	376	193	293	349	102	316	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	273	340	555	1379	376	193	293	349	102	401	0
Turn Type	Perm	NA	pm+ov	Prot	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	
Protected Phases		2	7	1	6		7	4	1		8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	7	1	6	6	7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	6.0	6.0	34.0	34.0	6.0	44.0	6.0	44.0	44.0	
Minimum Split (s)	41.0	41.0	10.5	12.0	41.0	41.0	10.5	54.0	12.0	54.0	54.0	
Total Split (s)	41.5	41.5	10.5	24.0	65.5	65.5	10.5	64.5	24.0	54.0	54.0	
Total Split (%)	29.6%	29.6%	7.5%	17.1%	46.8%	46.8%	7.5%	46.1%	17.1%	38.6%	38.6%	
Maximum Green (s)	34.5	34.5	6.5	18.0	58.5	58.5	6.5	56.5	18.0	46.0	46.0	
Yellow Time (s)	4.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	3.0	3.0	1.0	3.0	3.0	3.0	1.0	4.0	3.0	4.0	4.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	6.0	7.0	7.0	4.0	8.0	6.0	8.0	8.0	
Lead/Lag	Lag	Lag	Lead	Lead			Lead		Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes		Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	None	None	Max	Max	None	None	None	None	None	
Walk Time (s)	7.0	7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	27.0	27.0			27.0	27.0		39.0		39.0	39.0	
Pedestrian Calls (#/hr)	0	0			0	0		0		0	0	
Act Effct Green (s)	34.5	34.5	48.0	18.0	58.5	58.5	58.5	54.5	74.5	44.0	44.0	
Actuated g/C Ratio	0.25	0.25	0.35	0.13	0.42	0.42	0.42	0.39	0.54	0.32	0.32	
v/c Ratio	0.21	0.21	0.44	1.23	0.63	0.42	0.50	0.21	0.34	0.30	0.36	
Control Delay	48.5	41.5	6.1	169.5	32.9	4.4	31.8	28.0	1.9	38.3	34.7	
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	48.5	41.5	6.1	169.5	33.3	4.4	31.8	28.0	1.9	38.3	34.7	

Lanes, Volumes, Timings
21: Port Union Rd./Sheppard Ave. & Kingston Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	A	F	C	A	C	C	A	D	C	
Approach Delay		22.6			61.3			18.0			35.5	
Approach LOS		C			E			B			D	
Queue Length 50th (m)	3.9	21.7	3.2	~95.8	107.1	2.2	33.6	27.5	0.0	21.0	41.3	
Queue Length 95th (m)	11.7	30.1	24.8	#131.7	122.9	20.9	51.3	38.0	10.0	37.0	55.5	
Internal Link Dist (m)		285.6			171.1			152.1			162.3	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	86	1285	766	452	2179	887	385	1465	1024	359	1172	
Starvation Cap Reductn	0	0	0	0	328	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.21	0.21	0.44	1.23	0.75	0.42	0.50	0.20	0.34	0.28	0.34	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 138

Natural Cycle: 140

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: Err

Intersection Signal Delay: 44.1 Intersection LOS: D

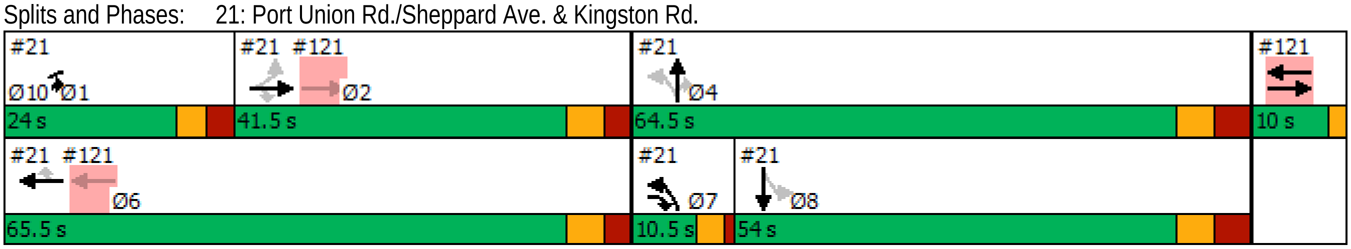
Intersection Capacity Utilization 155.0% ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 21: Port Union Rd./Sheppard Ave. & Kingston Rd.



Lanes, Volumes, Timings
22: Hwy 401 Off-Ramp & Kingston Rd. 11/23/2020

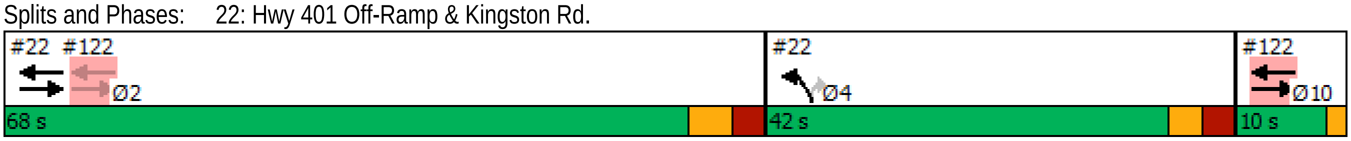
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø10
Lane Configurations							
Traffic Volume (vph)	725	0	0	1729	553	54	
Future Volume (vph)	725	0	0	1729	553	54	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)		0.0	0.0		149.4	35.1	
Storage Lanes		0	0		2	0	
Taper Length (m)			7.6		39.6		
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00	
Frt						0.850	
Flt Protected					0.950		
Satd. Flow (prot)	5142	0	0	5142	3471	1601	
Flt Permitted					0.950		
Satd. Flow (perm)	5142	0	0	5142	3471	1601	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)						59	
Link Speed (k/h)	60			60	60		
Link Distance (m)	195.1			522.3	155.3		
Travel Time (s)	11.7			31.3	9.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	788	0	0	1879	601	59	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	788	0	0	1879	601	59	
Turn Type	NA			NA	Prot	Perm	
Protected Phases	2			2	4		10
Permitted Phases	2			2		4	
Detector Phase	2			2	4	4	
Switch Phase							
Minimum Initial (s)	23.0			23.0	7.0	7.0	8.0
Minimum Split (s)	30.0			30.0	38.0	38.0	10.0
Total Split (s)	68.0			68.0	42.0	42.0	10.0
Total Split (%)	56.7%			56.7%	35.0%	35.0%	8%
Maximum Green (s)	61.0			61.0	36.0	36.0	8.0
Yellow Time (s)	4.0			4.0	3.0	3.0	2.0
All-Red Time (s)	3.0			3.0	3.0	3.0	0.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0	
Total Lost Time (s)	7.0			7.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0
Recall Mode	Max			Max	None	None	Max
Walk Time (s)	7.0			7.0	7.0	7.0	
Flash Dont Walk (s)	16.0			16.0	25.0	25.0	
Pedestrian Calls (#/hr)	0			0	0	0	
Act Effct Green (s)	61.1			61.1	24.0	24.0	
Actuated g/C Ratio	0.57			0.57	0.22	0.22	
v/c Ratio	0.27			0.65	0.78	0.15	
Control Delay	12.9			18.0	47.2	9.4	
Queue Delay	0.0			0.0	0.0	0.0	
Total Delay	12.9			18.0	47.2	9.4	

Lanes, Volumes, Timings
22: Hwy 401 Off-Ramp & Kingston Rd.   11/23/2020

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø10
LOS	B			B	D	A	
Approach Delay	12.9			18.0	43.8		
Approach LOS	B			B	D		
Queue Length 50th (m)	29.2			93.0	61.7	0.0	
Queue Length 95th (m)	42.9			127.2	80.2	9.9	
Internal Link Dist (m)	171.1			498.3	131.3		
Turn Bay Length (m)					149.4	35.1	
Base Capacity (vph)	2906			2906	1157	573	
Starvation Cap Reductn	0			0	0	0	
Spillback Cap Reductn	0			0	0	0	
Storage Cap Reductn	0			0	0	0	
Reduced v/c Ratio	0.27			0.65	0.52	0.10	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 108.1	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 21.9	Intersection LOS: C
Intersection Capacity Utilization 60.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 22: Hwy 401 Off-Ramp & Kingston Rd.



Lanes, Volumes, Timings
31: Kingston Rd. & Ellesmere Rd. 11/23/2020

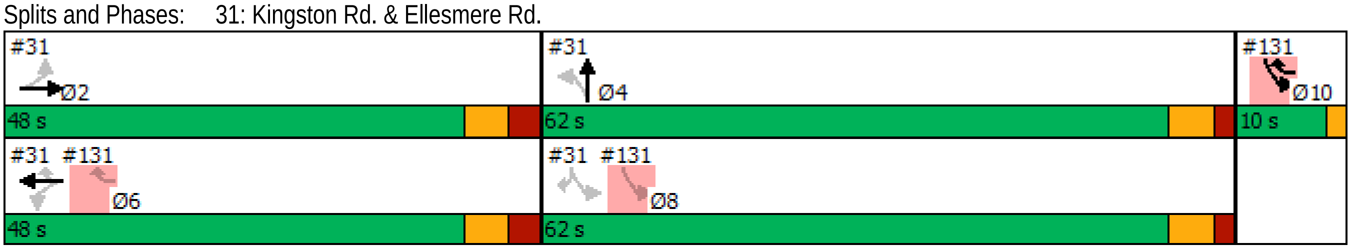
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	406	0	0	335	241	0	0	0	445	0	33
Future Volume (vph)	10	406	0	0	335	241	0	0	0	445	0	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		1	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1883	1601	0	1883	0	1789	0	1601
Flt Permitted	0.464									0.757		
Satd. Flow (perm)	874	1883	0	0	1883	1601	0	1883	0	1426	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)						262						55
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			35.6			143.1	
Travel Time (s)		9.0			2.0			2.1			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	441	0	0	364	262	0	0	0	484	0	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	441	0	0	364	262	0	0	0	484	0	36
Turn Type	Perm	NA			NA	Perm				Perm		Perm
Protected Phases		2			6			4				
Permitted Phases	2			6		6	4			8		8
Detector Phase	2	2		6	6	6	4	4		8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0	23.0	7.0	7.0		7.0		7.0
Minimum Split (s)	32.0	32.0		32.0	32.0	32.0	32.0	32.0		32.0		32.0
Total Split (s)	48.0	48.0		48.0	48.0	48.0	62.0	62.0		62.0		62.0
Total Split (%)	40.0%	40.0%		40.0%	40.0%	40.0%	51.7%	51.7%		51.7%		51.7%
Maximum Green (s)	41.0	41.0		41.0	41.0	41.0	56.0	56.0		56.0		56.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0		4.0
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0		6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Max	Max		Max	Max	Max	None	None		None		None
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0		7.0
Flash Dont Walk (s)	18.0	18.0		18.0	18.0	18.0	19.0	19.0		19.0		19.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0		0
Act Effct Green (s)	42.0	42.0			42.0	42.0				35.7		35.7
Actuated g/C Ratio	0.45	0.45			0.45	0.45				0.39		0.39
v/c Ratio	0.03	0.52			0.43	0.30				0.88		0.06
Control Delay	21.1	24.2			22.5	4.1				44.4		2.3
Queue Delay	0.0	0.0			0.0	0.0				0.0		0.0
Total Delay	21.1	24.2			22.5	4.1				44.4		2.3

Lanes, Volumes, Timings
31: Kingston Rd. & Ellesmere Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C			C	A				D		A
Approach Delay		24.1			14.8						41.5	
Approach LOS		C			B						D	
Queue Length 50th (m)	1.0	50.5			39.5	0.0				74.3		0.0
Queue Length 95th (m)	5.9	125.1			99.9	17.3				132.0		3.2
Internal Link Dist (m)		126.4			9.6			11.6			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	396	854			854	869				883		1012
Starvation Cap Reductn	0	0			0	0				0		0
Spillback Cap Reductn	0	0			0	0				0		0
Storage Cap Reductn	0	0			0	0				0		0
Reduced v/c Ratio	0.03	0.52			0.43	0.30				0.55		0.04

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 92.5	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 26.1	Intersection LOS: C
Intersection Capacity Utilization 55.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 31: Kingston Rd. & Ellesmere Rd.



Lanes, Volumes, Timings
32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp 11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	715	7	147	508	0	0	0	0	1583	39	72
Future Volume (vph)	0	715	7	147	508	0	0	0	0	1583	39	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.998									0.987	
Flt Protected				0.950						0.950	0.958	
Satd. Flow (prot)	0	3571	0	1789	3579	0	0	0	0	1700	1692	0
Flt Permitted				0.209						0.950	0.958	
Satd. Flow (perm)	0	3571	0	394	3579	0	0	0	0	1700	1692	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1									5	
Link Speed (k/h)		60			60			20			80	
Link Distance (m)		91.2			246.8			60.6			169.8	
Travel Time (s)		5.5			14.8			10.9			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	777	8	160	552	0	0	0	0	1721	42	78
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	0	785	0	160	552	0	0	0	0	929	912	0
Turn Type		NA		Perm	NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases				6								
Detector Phase		2		6	6					8	8	
Switch Phase												
Minimum Initial (s)		18.0		18.0	18.0					7.0	7.0	
Minimum Split (s)		24.0		24.0	24.0					36.0	36.0	
Total Split (s)		48.0		48.0	48.0					62.0	62.0	
Total Split (%)		40.0%		40.0%	40.0%					51.7%	51.7%	
Maximum Green (s)		42.0		42.0	42.0					55.0	55.0	
Yellow Time (s)		4.0		4.0	4.0					4.0	4.0	
All-Red Time (s)		2.0		2.0	2.0					3.0	3.0	
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	
Total Lost Time (s)		6.0		6.0	6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		Max		Max	Max					None	None	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0					21.0	21.0	
Pedestrian Calls (#/hr)		0		0	0					0	0	
Act Effct Green (s)		42.0		42.0	42.0					55.0	55.0	
Actuated g/C Ratio		0.35		0.35	0.35					0.46	0.46	
v/c Ratio		0.63		1.17	0.44					1.19	1.17	
Control Delay		35.2		165.9	31.4					130.2	122.0	
Queue Delay		0.0		0.0	0.0					0.0	0.0	
Total Delay		35.2		165.9	31.4					130.2	122.0	

Lanes, Volumes, Timings
32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp

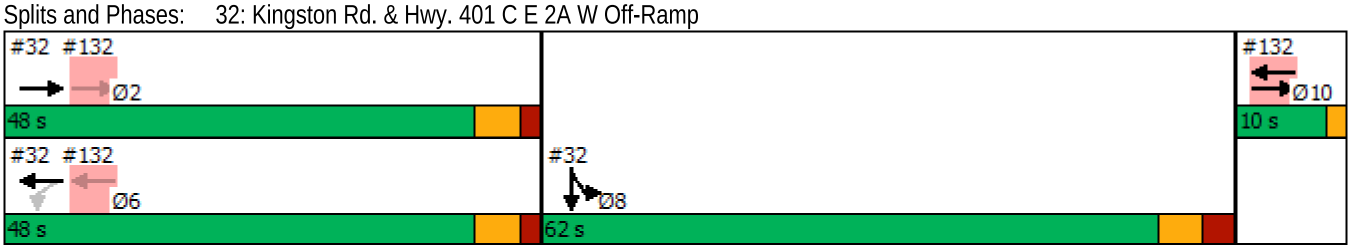
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		D		F	C					F	F	
Approach Delay		35.2			61.6						126.1	
Approach LOS		D			E						F	
Queue Length 50th (m)		80.3		~44.6	52.2					~278.2	~270.1	
Queue Length 95th (m)		100.9		#87.3	68.1					#358.2	#350.9	
Internal Link Dist (m)		67.2			222.8			36.6			145.8	
Turn Bay Length (m)				32.0								
Base Capacity (vph)		1250		137	1252					779	778	
Starvation Cap Reductn		0		0	0					0	0	
Spillback Cap Reductn		0		0	0					0	0	
Storage Cap Reductn		0		0	0					0	0	
Reduced v/c Ratio		0.63		1.17	0.44					1.19	1.17	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Natural Cycle: 150	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 91.0	Intersection LOS: F
Intersection Capacity Utilization 97.9%	ICU Level of Service F
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp



Lanes, Volumes, Timings
35: Kingston Rd. & Rylander Blvd. 11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	268	1600	66	20	776	187	18	8	6	184	13	216
Future Volume (vph)	268	1600	66	20	776	187	18	8	6	184	13	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	1		1
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.994			0.971			0.974				0.850
Flt Protected	0.950			0.950				0.973		0.950	0.958	
Satd. Flow (prot)	1789	5111	0	1789	4993	0	0	1785	0	1700	1714	1601
Flt Permitted	0.240			0.081				0.841		0.950	0.958	
Satd. Flow (perm)	452	5111	0	153	4993	0	0	1543	0	1700	1714	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			56			7				235
Link Speed (k/h)		60			60			30			40	
Link Distance (m)		79.8			309.6			54.4			124.6	
Travel Time (s)		4.8			18.6			6.5			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	291	1739	72	22	843	203	20	9	7	200	14	235
Shared Lane Traffic (%)										47%		
Lane Group Flow (vph)	291	1811	0	22	1046	0	0	36	0	106	108	235
Turn Type	Perm	NA		Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		2			6			9		4	4	4
Permitted Phases	2			6			9					
Detector Phase	2	2		6	6		9	9		4	4	4
Switch Phase												
Minimum Initial (s)	36.0	36.0		36.0	36.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	43.0	43.0		43.0	43.0		14.0	14.0		41.0	41.0	41.0
Total Split (s)	55.0	55.0		55.0	55.0		14.0	14.0		41.0	41.0	41.0
Total Split (%)	45.8%	45.8%		45.8%	45.8%		11.7%	11.7%		34.2%	34.2%	34.2%
Maximum Green (s)	48.0	48.0		48.0	48.0		7.0	7.0		34.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		4.0	4.0	4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	7.0
Lead/Lag							Lead	Lead				
Lead-Lag Optimize?							Yes	Yes				
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	7.0	7.0		7.0	7.0					7.0	7.0	7.0
Flash Dont Walk (s)	29.0	29.0		29.0	29.0					27.0	27.0	27.0
Pedestrian Calls (#/hr)	0	0		0	0					0	0	0
Act Effct Green (s)	49.4	49.4		49.4	49.4			7.2		11.7	11.7	11.7
Actuated g/C Ratio	0.57	0.57		0.57	0.57			0.08		0.14	0.14	0.14
v/c Ratio	1.13	0.62		0.25	0.36			0.27		0.46	0.47	0.56
Control Delay	121.1	16.4		25.9	12.3			42.3		43.7	43.8	10.9
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	121.1	16.4		25.9	12.3			42.3		43.7	43.8	10.9

Lanes, Volumes, Timings
35: Kingston Rd. & Rylander Blvd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	B		C	B			D		D	D	B
Approach Delay		30.9			12.6			42.3			26.5	
Approach LOS		C			B			D			C	
Queue Length 50th (m)	~60.0	74.3		1.9	33.0			4.7		17.5	18.0	0.0
Queue Length 95th (m)	#129.0	126.5		10.4	59.3			15.8		36.9	37.5	20.0
Internal Link Dist (m)		55.8			285.6			30.4			100.6	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	258	2926		87	2880			135		688	694	788
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	1.13	0.62		0.25	0.36			0.27		0.15	0.16	0.30

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 86.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: Err

Intersection Signal Delay: 25.1 Intersection LOS: C

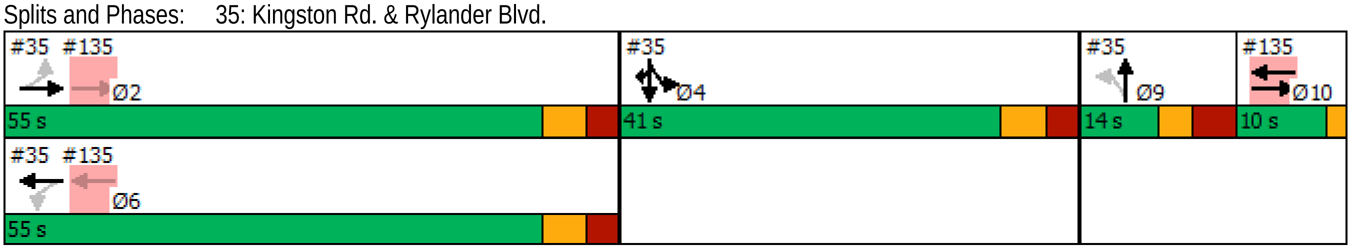
Intersection Capacity Utilization 88.3% ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 35: Kingston Rd. & Rylander Blvd.



Lanes, Volumes, Timings
36: Port Union Rd./Sheppard Ave. & Kingston Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	884	817	506	684	218	181	242	644	246	383	65
Future Volume (vph)	50	884	817	506	684	218	181	242	644	246	383	65
Ideal Flow (vphpl)	1900	1900	2100	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	2		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.91	1.00	*1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	5142	1769	3579	5142	1601	1789	3579	1601	1789	3500	0
Flt Permitted	0.358			0.950			0.475			0.541		
Satd. Flow (perm)	674	5142	1769	3579	5142	1601	895	3579	1601	1019	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			321			237			202		16	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			207.1			186.3	
Travel Time (s)		18.6			11.7			12.4			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	961	888	550	743	237	197	263	700	267	416	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	961	888	550	743	237	197	263	700	267	487	0
Turn Type	Perm	NA	Perm	Prot	NA	pm+ov	Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		2		1	6	3		4	1	3	8	
Permitted Phases	2		2			6	4		4	8		
Detector Phase	2	2	2	1	6	3	4	4	1	3	8	
Switch Phase												
Minimum Initial (s)	34.0	34.0	34.0	6.0	34.0	6.0	44.0	44.0	6.0	6.0	44.0	
Minimum Split (s)	41.0	41.0	41.0	12.0	41.0	10.0	54.0	54.0	12.0	10.0	54.0	
Total Split (s)	47.0	47.0	47.0	19.0	66.0	10.0	54.0	54.0	19.0	10.0	64.0	
Total Split (%)	33.6%	33.6%	33.6%	13.6%	47.1%	7.1%	38.6%	38.6%	13.6%	7.1%	45.7%	
Maximum Green (s)	40.0	40.0	40.0	13.0	59.0	6.0	46.0	46.0	13.0	6.0	56.0	
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	1.0	4.0	4.0	3.0	1.0	4.0	
Lost Time Adjust (s)	0.0	0.0	-3.0	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.0	7.0	4.0	3.0	7.0	4.0	8.0	8.0	6.0	4.0	8.0	
Lead/Lag	Lag	Lag	Lag	Lead		Lead	Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	Max	None	Max	None	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0		7.0		7.0	7.0			7.0	
Flash Dont Walk (s)	27.0	27.0	27.0		27.0		39.0	39.0			39.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0			0	
Act Effct Green (s)	40.0	40.0	43.0	16.0	59.0	72.0	44.4	44.4	59.4	58.4	54.4	
Actuated g/C Ratio	0.29	0.29	0.31	0.12	0.43	0.52	0.32	0.32	0.43	0.42	0.39	
v/c Ratio	0.28	0.65	1.15	1.33	0.34	0.25	0.69	0.23	0.87	0.58	0.35	
Control Delay	43.1	45.5	110.9	210.8	27.2	2.7	55.0	35.1	30.4	34.7	29.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	43.1	45.5	110.9	210.8	27.2	2.7	55.0	35.1	30.4	34.7	29.4	

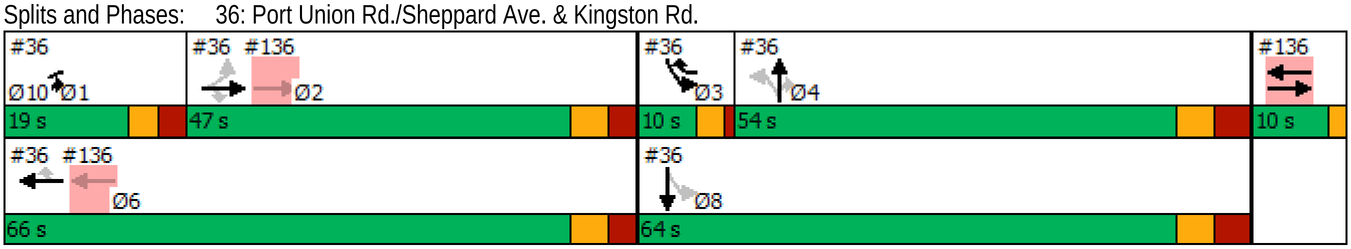
Lanes, Volumes, Timings
36: Port Union Rd./Sheppard Ave. & Kingston Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	F	F	C	A	D	D	C	C	C	
Approach Delay		75.9			89.4			35.7			31.3	
Approach LOS		E			F			D			C	
Queue Length 50th (m)	11.4	84.1	~220.7	~96.9	49.0	0.0	46.9	27.7	102.1	49.1	47.3	
Queue Length 95th (m)	24.4	101.5	#304.1	#134.0	60.9	12.8	76.9	38.8	#165.6	71.2	61.4	
Internal Link Dist (m)		285.6			171.1			183.1			162.3	
Turn Bay Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		
Base Capacity (vph)	194	1486	771	413	2192	946	297	1189	802	463	1425	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.28	0.65	1.15	1.33	0.34	0.25	0.66	0.22	0.87	0.58	0.34	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 138.4	
Natural Cycle: 150	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 64.8	Intersection LOS: E
Intersection Capacity Utilization 155.0%	ICU Level of Service H
Analysis Period (min) 15	

* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 36: Port Union Rd./Sheppard Ave. & Kingston Rd.



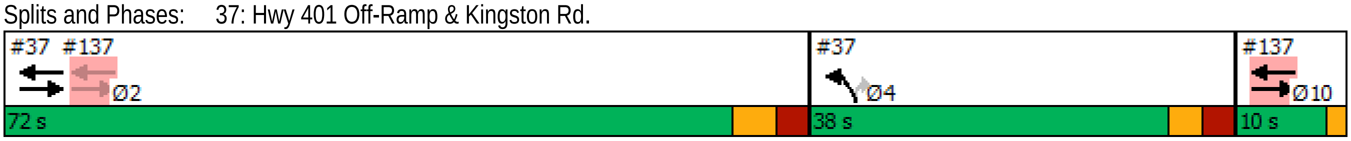
Lanes, Volumes, Timings
37: Hwy 401 Off-Ramp & Kingston Rd.

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø10
Lane Configurations							
Traffic Volume (vph)	2283	0	0	919	410	55	
Future Volume (vph)	2283	0	0	919	410	55	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)		0.0	0.0		149.4	35.1	
Storage Lanes		0	0		2	0	
Taper Length (m)			7.6		39.6		
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00	
Frt						0.850	
Flt Protected					0.950		
Satd. Flow (prot)	5142	0	0	5142	3471	1601	
Flt Permitted					0.950		
Satd. Flow (perm)	5142	0	0	5142	3471	1601	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)						60	
Link Speed (k/h)	60			60	60		
Link Distance (m)	195.1			419.5	155.3		
Travel Time (s)	11.7			25.2	9.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	2482	0	0	999	446	60	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	2482	0	0	999	446	60	
Turn Type	NA			NA	Prot	Perm	
Protected Phases	2			2	4		10
Permitted Phases	2			2		4	
Detector Phase	2			2	4	4	
Switch Phase							
Minimum Initial (s)	23.0			23.0	7.0	7.0	8.0
Minimum Split (s)	30.0			30.0	38.0	38.0	10.0
Total Split (s)	72.0			72.0	38.0	38.0	10.0
Total Split (%)	60.0%			60.0%	31.7%	31.7%	8%
Maximum Green (s)	65.0			65.0	32.0	32.0	8.0
Yellow Time (s)	4.0			4.0	3.0	3.0	2.0
All-Red Time (s)	3.0			3.0	3.0	3.0	0.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0	
Total Lost Time (s)	7.0			7.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0
Recall Mode	Max			Max	None	None	Max
Walk Time (s)	7.0			7.0	7.0	7.0	
Flash Dont Walk (s)	16.0			16.0	25.0	25.0	
Pedestrian Calls (#/hr)	0			0	0	0	
Act Effct Green (s)	65.1			65.1	18.8	18.8	
Actuated g/C Ratio	0.61			0.61	0.18	0.18	
v/c Ratio	0.79			0.32	0.73	0.18	
Control Delay	18.7			10.8	49.2	10.8	
Queue Delay	1.6			0.0	0.0	0.0	
Total Delay	20.4			10.8	49.2	10.8	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø10
LOS	C			B	D	B	
Approach Delay	20.4			10.8	44.6		
Approach LOS	C			B	D		
Queue Length 50th (m)	132.9			34.3	45.6	0.0	
Queue Length 95th (m)	174.1			47.8	62.0	10.6	
Internal Link Dist (m)	171.1			395.5	131.3		
Turn Bay Length (m)					149.4	35.1	
Base Capacity (vph)	3130			3130	1040	521	
Starvation Cap Reductn	441			0	0	0	
Spillback Cap Reductn	0			0	0	0	
Storage Cap Reductn	0			0	0	0	
Reduced v/c Ratio	0.92			0.32	0.43	0.12	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 106.9	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 21.0	Intersection LOS: C
Intersection Capacity Utilization 66.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 37: Hwy 401 Off-Ramp & Kingston Rd.



Lanes, Volumes, Timings
31: Kingston Rd. & Ellesmere Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	225	0	0	526	480	0	0	0	194	0	26
Future Volume (vph)	10	225	0	0	526	480	0	0	0	194	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.936							0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1763	0	0	1883	0	1789	0	1601
Flt Permitted	0.056									0.757		
Satd. Flow (perm)	105	1883	0	0	1763	0	0	1883	0	1426	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)					67							55
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			53.2			143.1	
Travel Time (s)		9.0			2.0			3.2			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	245	0	0	572	522	0	0	0	211	0	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	245	0	0	1094	0	0	0	0	211	0	28
Turn Type	Perm	NA			NA					Perm		Perm
Protected Phases		2			6			4				
Permitted Phases	2						4			8		8
Detector Phase	2	2			6		4	4		8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0			23.0		7.0	7.0		7.0		7.0
Minimum Split (s)	32.0	32.0			32.0		32.0	32.0		32.0		32.0
Total Split (s)	78.0	78.0			78.0		32.0	32.0		32.0		32.0
Total Split (%)	65.0%	65.0%			65.0%		26.7%	26.7%		26.7%		26.7%
Maximum Green (s)	71.0	71.0			71.0		26.0	26.0		26.0		26.0
Yellow Time (s)	4.0	4.0			4.0		4.0	4.0		4.0		4.0
All-Red Time (s)	3.0	3.0			3.0		2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0		0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0			6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0		3.0
Recall Mode	Max	Max			Max		None	None		None		None
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0		7.0
Flash Dont Walk (s)	18.0	18.0			18.0		19.0	19.0		19.0		19.0
Pedestrian Calls (#/hr)	0	0			0		0	0		0		0
Act Effct Green (s)	71.1	71.1			71.1					21.1		21.1
Actuated g/C Ratio	0.62	0.62			0.62					0.18		0.18
v/c Ratio	0.17	0.21			0.98					0.81		0.08
Control Delay	18.8	11.0			45.1					68.5		3.0
Queue Delay	0.0	0.0			31.3					0.0		0.0
Total Delay	18.8	11.0			76.3					68.5		3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	B			E					E		A
Approach Delay		11.3			76.3						60.8	
Approach LOS		B			E						E	
Queue Length 50th (m)	1.0	23.4			222.4					46.0		0.0
Queue Length 95th (m)	5.2	38.7			#346.3					73.0		2.4
Internal Link Dist (m)		126.4			9.6			29.2			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	65	1161			1113					321		404
Starvation Cap Reductn	0	0			101					0		0
Spillback Cap Reductn	0	0			0					0		0
Storage Cap Reductn	0	0			0					0		0
Reduced v/c Ratio	0.17	0.21			1.08					0.66		0.07

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 115.3

Natural Cycle: 120

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: Err

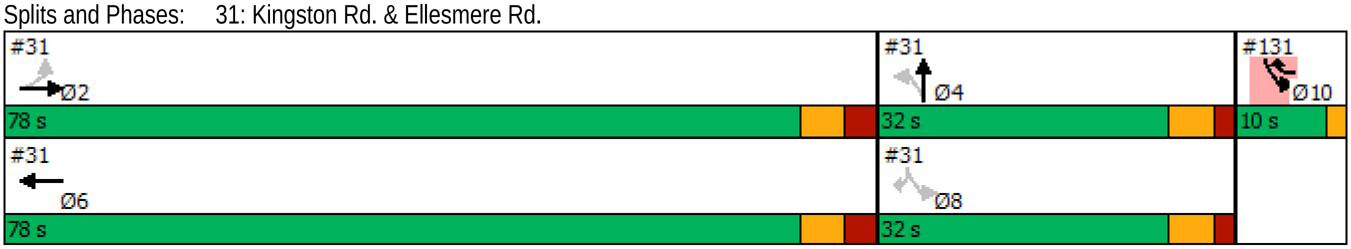
Intersection Signal Delay: 63.5 Intersection LOS: E

Intersection Capacity Utilization 76.9% ICU Level of Service D

Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 31: Kingston Rd. & Ellesmere Rd.



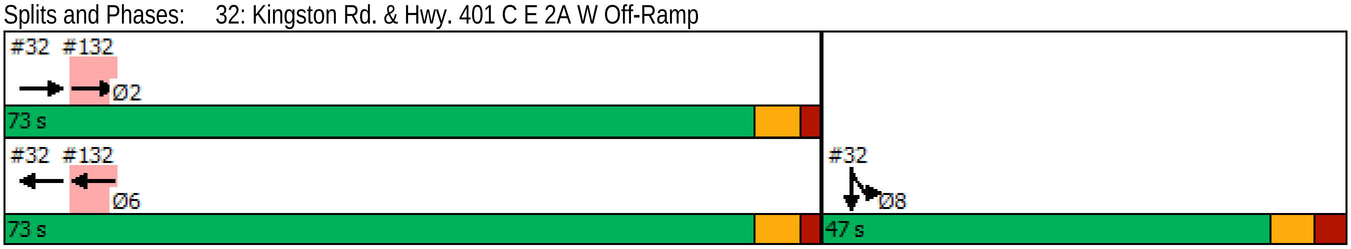
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	281	4	0	1274	0	0	0	0	466	11	62
Future Volume (vph)	0	281	4	0	1274	0	0	0	0	466	11	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998									0.873	
Flt Protected										0.950		
Satd. Flow (prot)	0	1880	0	0	3579	0	0	0	0	1789	1644	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	1880	0	0	3579	0	0	0	0	1789	1644	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1									39	
Link Speed (k/h)		60			60			19			80	
Link Distance (m)		91.2			296.9			60.6			169.8	
Travel Time (s)		5.5			17.8			11.5			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	305	4	0	1385	0	0	0	0	507	12	67
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	309	0	0	1385	0	0	0	0	507	79	0
Turn Type		NA			NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases												
Detector Phase		2			6					8	8	
Switch Phase												
Minimum Initial (s)		18.0			18.0					7.0	7.0	
Minimum Split (s)		28.0			24.0					36.0	36.0	
Total Split (s)		73.0			73.0					47.0	47.0	
Total Split (%)		60.8%			60.8%					39.2%	39.2%	
Maximum Green (s)		67.0			67.0					40.0	40.0	
Yellow Time (s)		4.0			4.0					4.0	4.0	
All-Red Time (s)		2.0			2.0					3.0	3.0	
Lost Time Adjust (s)		0.0			0.0					0.0	0.0	
Total Lost Time (s)		6.0			6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Recall Mode		Max			Max					None	None	
Walk Time (s)		7.0			7.0					7.0	7.0	
Flash Dont Walk (s)		11.0			11.0					21.0	21.0	
Pedestrian Calls (#/hr)		0			0					0	0	
Act Effct Green (s)		67.1			67.1					36.0	36.0	
Actuated g/C Ratio		0.58			0.58					0.31	0.31	
v/c Ratio		0.28			0.67					0.92	0.15	
Control Delay		13.9			19.6					61.0	16.5	
Queue Delay		0.0			0.0					0.0	0.0	
Total Delay		13.9			19.6					61.0	16.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B			B					E	B	
Approach Delay		13.9			19.6						55.0	
Approach LOS		B			B						D	
Queue Length 50th (m)		36.5			118.1					110.6	6.4	
Queue Length 95th (m)		53.6			142.5					#167.0	17.4	
Internal Link Dist (m)		67.2			272.9			36.6			145.8	
Turn Bay Length (m)												
Base Capacity (vph)		1086			2068					617	592	
Starvation Cap Reductn		0			0					0	0	
Spillback Cap Reductn		0			0					0	0	
Storage Cap Reductn		0			0					0	0	
Reduced v/c Ratio		0.28			0.67					0.82	0.13	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 116.2
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 27.9 Intersection LOS: C
Intersection Capacity Utilization 71.9% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	139	596	30	19	1341	115	14	2	4	91	3	227
Future Volume (vph)	139	596	30	19	1341	115	14	2	4	91	3	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	2		0
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.993			0.988			0.974			0.852	
Flt Protected	0.950			0.950				0.966		0.950		
Satd. Flow (prot)	1789	3553	0	1789	3536	0	0	1772	0	3471	1605	0
Flt Permitted	0.950			0.950						0.715		
Satd. Flow (perm)	1789	3553	0	1789	3536	0	0	1834	0	2613	1605	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			8			4			204	
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			3.3			9.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	151	648	33	21	1458	125	15	2	4	99	3	247
Shared Lane Traffic (%)												
Lane Group Flow (vph)	151	681	0	21	1583	0	0	21	0	99	250	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			9			4	
Permitted Phases							9			4		
Detector Phase	5	2		1	6		9	9		4	4	
Switch Phase												
Minimum Initial (s)	5.0	36.0		5.0	36.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	9.5	43.0		9.5	43.0		14.0	14.0		41.0	41.0	
Total Split (s)	14.0	71.0		14.0	71.0		14.0	14.0		41.0	41.0	
Total Split (%)	10.0%	50.7%		10.0%	50.7%		10.0%	10.0%		29.3%	29.3%	
Maximum Green (s)	9.5	64.0		9.5	64.0		7.0	7.0		34.0	34.0	
Yellow Time (s)	3.5	4.0		3.5	4.0		3.0	3.0		4.0	4.0	
All-Red Time (s)	1.0	3.0		1.0	3.0		4.0	4.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.5	7.0		4.5	7.0			7.0		7.0	7.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)		7.0			7.0					7.0	7.0	
Flash Dont Walk (s)		29.0			29.0					27.0	27.0	
Pedestrian Calls (#/hr)		0			0					0	0	
Act Effct Green (s)	9.8	70.1		6.9	60.1			7.2		11.1	11.1	
Actuated g/C Ratio	0.09	0.67		0.07	0.57			0.07		0.11	0.11	
v/c Ratio	0.91	0.29		0.18	0.78			0.16		0.36	0.71	
Control Delay	100.1	10.2		55.5	22.2			48.7		50.0	23.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	100.1	10.2		55.5	22.2			48.7		50.0	23.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	B		E	C			D		D	C	
Approach Delay		26.6			22.6			48.7			31.0	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	30.0	16.4		4.0	100.5			3.2		9.6	8.6	
Queue Length 95th (m)	#84.7	64.4		13.2	210.0			12.5		19.5	36.2	
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	166	2444		166	2223			129		871	671	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.91	0.28		0.13	0.71			0.16		0.11	0.37	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 104.8

Natural Cycle: 140

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: Err

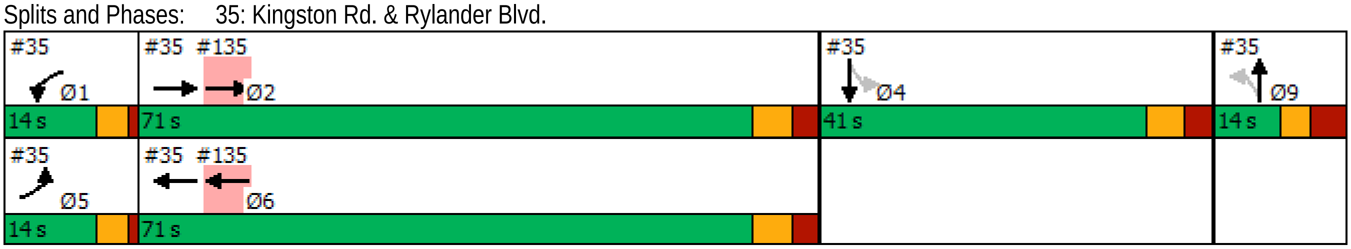
Intersection Signal Delay: 25.0 Intersection LOS: C

Intersection Capacity Utilization 78.1% ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 35: Kingston Rd. & Rylander Blvd.



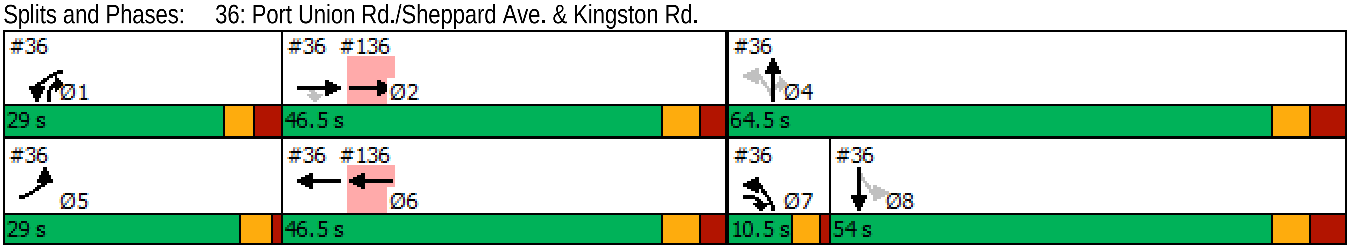
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	251	313	511	1269	346	178	270	321	94	291	78
Future Volume (vph)	17	251	313	511	1269	346	178	270	321	94	291	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	2		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.968				0.850		0.968	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3579	1601	3471	3464	0	1789	3579	1601	1789	3464	0
Flt Permitted	0.950			0.950			0.421			0.573		
Satd. Flow (perm)	1789	3579	1601	3471	3464	0	793	3579	1601	1079	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			212		25				311		26	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			176.1			186.3	
Travel Time (s)		18.6			11.7			10.6			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	273	340	555	1379	376	193	293	349	102	316	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	273	340	555	1755	0	193	293	349	102	401	0
Turn Type	Prot	NA	pm+ov	Prot	NA		pm+pt	NA	pm+ov	Perm	NA	
Protected Phases	5	2	7	1	6		7	4	1		8	
Permitted Phases			2				4		4	8		
Detector Phase	5	2	7	1	6		7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	34.0	6.0	6.0	34.0		6.0	44.0	6.0	44.0	44.0	
Minimum Split (s)	9.5	41.0	10.5	12.0	41.0		10.5	54.0	12.0	54.0	54.0	
Total Split (s)	29.0	46.5	10.5	29.0	46.5		10.5	64.5	29.0	54.0	54.0	
Total Split (%)	20.7%	33.2%	7.5%	20.7%	33.2%		7.5%	46.1%	20.7%	38.6%	38.6%	
Maximum Green (s)	24.5	39.5	6.5	23.0	39.5		6.5	56.5	23.0	46.0	46.0	
Yellow Time (s)	3.5	4.0	3.0	3.0	4.0		3.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0		1.0	4.0	3.0	4.0	4.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	7.0	4.0	6.0	7.0		4.0	8.0	6.0	8.0	8.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead		Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max	None	None	Max		None	None	None	None	None	
Walk Time (s)		7.0			7.0			7.0		7.0	7.0	
Flash Dont Walk (s)		27.0			27.0			39.0		39.0	39.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	7.0	39.5	53.0	23.0	63.4		58.5	54.5	85.5	44.0	44.0	
Actuated g/C Ratio	0.05	0.29	0.38	0.17	0.46		0.42	0.39	0.62	0.32	0.32	
v/c Ratio	0.20	0.27	0.46	0.96	1.09		0.50	0.21	0.31	0.30	0.36	
Control Delay	67.4	38.9	13.4	85.6	87.7		31.9	28.0	2.6	38.3	34.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	67.4	38.9	13.4	85.6	87.7		31.9	28.0	2.6	38.3	34.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	D	B	F	F		C	C	A	D	C	
Approach Delay		26.0			87.2			18.3			35.5	
Approach LOS		C			F			B			D	
Queue Length 50th (m)	4.8	30.3	23.7	78.3	~254.4		33.6	27.5	3.8	21.0	41.3	
Queue Length 95th (m)	13.1	42.5	50.4	#113.4	#356.4		51.3	38.0	15.5	37.0	55.5	
Internal Link Dist (m)		285.6			171.1			152.1			162.3	
Turn Bay Length (m)	93.9		56.7	95.7			153.6		34.1	42.7		
Base Capacity (vph)	317	1024	745	578	1605		383	1465	1110	359	1172	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.06	0.27	0.46	0.96	1.09		0.50	0.20	0.31	0.28	0.34	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 138	
Natural Cycle: 150	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 58.6	Intersection LOS: E
Intersection Capacity Utilization 146.5%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 36: Port Union Rd./Sheppard Ave. & Kingston Rd.



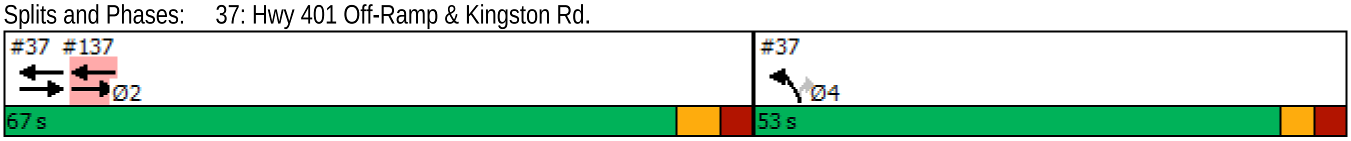
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	725	0	0	1729	553	54
Future Volume (vph)	725	0	0	1729	553	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	3579	0	0	3579	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	3579	0	0	3579	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						59
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			522.3	155.3	
Travel Time (s)	11.7			31.3	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	788	0	0	1879	601	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	788	0	0	1879	601	59
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	67.0			67.0	53.0	53.0
Total Split (%)	55.8%			55.8%	44.2%	44.2%
Maximum Green (s)	60.0			60.0	47.0	47.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	60.1			60.1	21.7	21.7
Actuated g/C Ratio	0.63			0.63	0.23	0.23
v/c Ratio	0.35			0.83	0.76	0.14
Control Delay	9.2			18.4	40.7	8.6
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.2			18.4	40.7	8.6

Lanes, Volumes, Timings
37: Hwy 401 Off-Ramp & Kingston Rd.

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A			B	D	A
Approach Delay	9.2			18.4	37.8	
Approach LOS	A			B	D	
Queue Length 50th (m)	31.7			124.7	52.9	0.0
Queue Length 95th (m)	51.0			192.8	70.6	9.1
Internal Link Dist (m)	171.1			498.3	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	2269			2269	1723	824
Starvation Cap Reductn	0			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.35			0.83	0.35	0.07

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 94.8	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 20.1	Intersection LOS: C
Intersection Capacity Utilization 74.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 37: Hwy 401 Off-Ramp & Kingston Rd.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	406	0	0	335	241	0	0	0	445	0	33
Future Volume (vph)	10	406	0	0	335	241	0	0	0	445	0	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	36.3		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	1		1
Taper Length (m)	28.7			7.6			7.6			0.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.943							0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1789	1883	0	0	1776	0	0	1883	0	1789	0	1601
Flt Permitted	0.184									0.757		
Satd. Flow (perm)	347	1883	0	0	1776	0	0	1883	0	1426	0	1601
Right Turn on Red			Yes			Yes			No			Yes
Satd. Flow (RTOR)					36							55
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		150.4			33.6			53.7			143.1	
Travel Time (s)		9.0			2.0			3.2			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	441	0	0	364	262	0	0	0	484	0	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	441	0	0	626	0	0	0	0	484	0	36
Turn Type	Perm	NA			NA					Perm		Perm
Protected Phases		2			6			4				
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8		8
Switch Phase												
Minimum Initial (s)	23.0	23.0		23.0	23.0		7.0	7.0		7.0		7.0
Minimum Split (s)	32.0	32.0		32.0	32.0		32.0	32.0		32.0		32.0
Total Split (s)	55.0	55.0		55.0	55.0		55.0	55.0		55.0		55.0
Total Split (%)	45.8%	45.8%		45.8%	45.8%		45.8%	45.8%		45.8%		45.8%
Maximum Green (s)	48.0	48.0		48.0	48.0		49.0	49.0		49.0		49.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
All-Red Time (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0		0.0		0.0
Total Lost Time (s)	7.0	7.0			7.0			6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Recall Mode	Max	Max		Max	Max		None	None		None		None
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0		7.0
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		19.0	19.0		19.0		19.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0		0
Act Effct Green (s)	48.2	48.2			48.2					41.7		41.7
Actuated g/C Ratio	0.43	0.43			0.43					0.37		0.37
v/c Ratio	0.07	0.55			0.80					0.92		0.06
Control Delay	24.0	28.8			37.4					58.2		2.8
Queue Delay	0.0	0.0			0.0					0.0		0.0
Total Delay	24.0	28.8			37.4					58.2		2.8

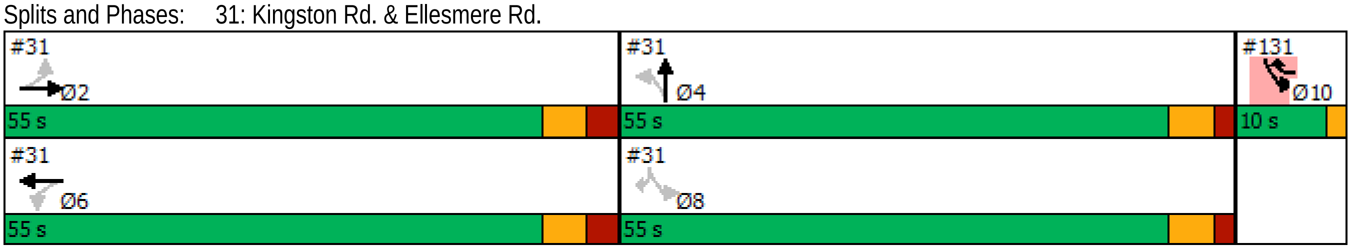
Lanes, Volumes, Timings
31: Kingston Rd. & Ellesmere Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C			D					E		A
Approach Delay		28.7			37.4						54.4	
Approach LOS		C			D						D	
Queue Length 50th (m)	1.5	75.4			118.6					100.6		0.0
Queue Length 95th (m)	5.8	113.2			#190.8					#158.2		3.6
Internal Link Dist (m)		126.4			9.6			29.7			119.1	
Turn Bay Length (m)	36.3											
Base Capacity (vph)	147	803			778					621		728
Starvation Cap Reductn	0	0			0					0		0
Spillback Cap Reductn	0	0			0					0		0
Storage Cap Reductn	0	0			0					0		0
Reduced v/c Ratio	0.07	0.55			0.80					0.78		0.05

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 113
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 40.5 Intersection LOS: D
Intersection Capacity Utilization 66.2% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 31: Kingston Rd. & Ellesmere Rd.



Lanes, Volumes, Timings
32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	715	7	0	655	0	0	0	0	1583	39	72
Future Volume (vph)	0	715	7	0	655	0	0	0	0	1583	39	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	32.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	7.6			88.4			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.999									0.987	
Flt Protected										0.950	0.958	
Satd. Flow (prot)	0	1882	0	0	3579	0	0	0	0	1700	1692	0
Flt Permitted										0.950	0.958	
Satd. Flow (perm)	0	1882	0	0	3579	0	0	0	0	1700	1692	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											6	
Link Speed (k/h)		60			60			20			80	
Link Distance (m)		91.2			296.9			60.6			169.8	
Travel Time (s)		5.5			17.8			10.9			7.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	777	8	0	712	0	0	0	0	1721	42	78
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	0	785	0	0	712	0	0	0	0	929	912	0
Turn Type		NA			NA					Split	NA	
Protected Phases		2			6					8	8	
Permitted Phases												
Detector Phase		2			6					8	8	
Switch Phase												
Minimum Initial (s)		18.0			18.0					7.0	7.0	
Minimum Split (s)		24.0			24.0					36.0	36.0	
Total Split (s)		50.0			50.0					70.0	70.0	
Total Split (%)		41.7%			41.7%					58.3%	58.3%	
Maximum Green (s)		44.0			44.0					63.0	63.0	
Yellow Time (s)		4.0			4.0					4.0	4.0	
All-Red Time (s)		2.0			2.0					3.0	3.0	
Lost Time Adjust (s)		0.0			0.0					0.0	0.0	
Total Lost Time (s)		6.0			6.0					7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Recall Mode		Max			Max					None	None	
Walk Time (s)		7.0			7.0					7.0	7.0	
Flash Dont Walk (s)		11.0			11.0					21.0	21.0	
Pedestrian Calls (#/hr)		0			0					0	0	
Act Effct Green (s)		44.0			44.0					63.0	63.0	
Actuated g/C Ratio		0.37			0.37					0.52	0.52	
v/c Ratio		1.14			0.54					1.04	1.02	
Control Delay		114.7			31.9					70.5	65.2	
Queue Delay		0.0			0.0					0.0	0.0	
Total Delay		114.7			31.9					70.5	65.2	

Lanes, Volumes, Timings
32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp

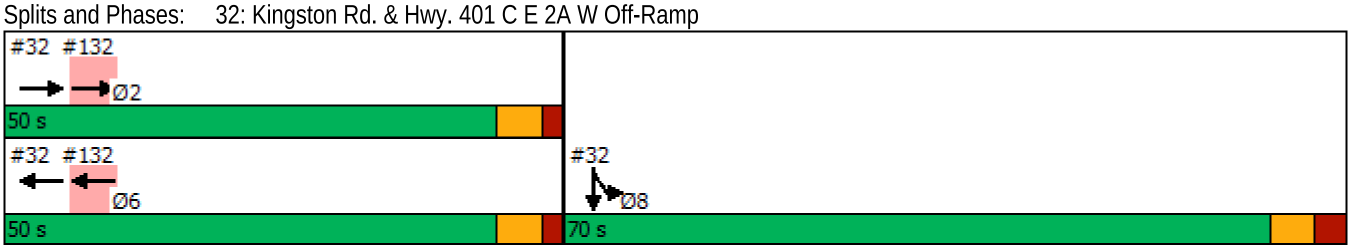
11/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F			C					E	E	
Approach Delay		114.7			31.9						67.8	
Approach LOS		F			C						E	
Queue Length 50th (m)		~215.6			69.1					~249.0	~240.0	
Queue Length 95th (m)		#288.1			87.6					#328.9	#320.7	
Internal Link Dist (m)		67.2			272.9			36.6			145.8	
Turn Bay Length (m)												
Base Capacity (vph)		690			1312					892	891	
Starvation Cap Reductn		0			0					0	0	
Spillback Cap Reductn		0			0					0	0	
Storage Cap Reductn		0			0					0	0	
Reduced v/c Ratio		1.14			0.54					1.04	1.02	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 130
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 71.2 Intersection LOS: E
Intersection Capacity Utilization 96.0% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 32: Kingston Rd. & Hwy. 401 C E 2A W Off-Ramp

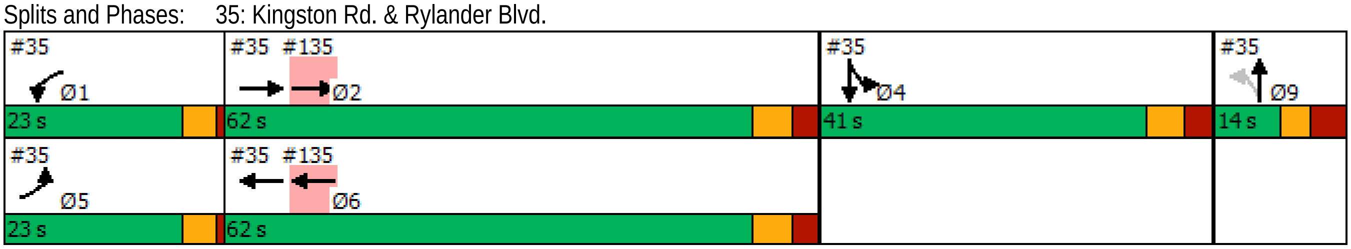


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	268	1600	66	20	776	187	18	8	6	184	13	216
Future Volume (vph)	268	1600	66	20	776	187	18	8	6	184	13	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	96.6		0.0	46.0		0.0	0.0		0.0	83.5		0.0
Storage Lanes	1		0	1		0	0		0	2		0
Taper Length (m)	29.3			29.3			7.6			13.7		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.994			0.971			0.974			0.858	
Flt Protected	0.950			0.950				0.973		0.950		
Satd. Flow (prot)	1789	3557	0	1789	3475	0	0	1785	0	3471	1616	0
Flt Permitted	0.950			0.950				0.819		0.950		
Satd. Flow (perm)	1789	3557	0	1789	3475	0	0	1502	0	3471	1616	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			25			7			235	
Link Speed (k/h)		60			60			30			50	
Link Distance (m)		79.8			309.6			54.4			124.8	
Travel Time (s)		4.8			18.6			6.5			9.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	291	1739	72	22	843	203	20	9	7	200	14	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	291	1811	0	22	1046	0	0	36	0	200	249	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Split	NA	
Protected Phases	5	2		1	6			9		4	4	
Permitted Phases							9					
Detector Phase	5	2		1	6		9	9		4	4	
Switch Phase												
Minimum Initial (s)	5.0	36.0		5.0	36.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	9.5	43.0		9.5	43.0		14.0	14.0		41.0	41.0	
Total Split (s)	23.0	62.0		23.0	62.0		14.0	14.0		41.0	41.0	
Total Split (%)	16.4%	44.3%		16.4%	44.3%		10.0%	10.0%		29.3%	29.3%	
Maximum Green (s)	18.5	55.0		18.5	55.0		7.0	7.0		34.0	34.0	
Yellow Time (s)	3.5	4.0		3.5	4.0		3.0	3.0		4.0	4.0	
All-Red Time (s)	1.0	3.0		1.0	3.0		4.0	4.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.5	7.0		4.5	7.0			7.0		7.0	7.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)		7.0			7.0					7.0	7.0	
Flash Dont Walk (s)		29.0			29.0					27.0	27.0	
Pedestrian Calls (#/hr)		0			0					0	0	
Act Effct Green (s)	18.9	70.2		7.0	51.2			7.2		12.2	12.2	
Actuated g/C Ratio	0.17	0.64		0.06	0.47			0.07		0.11	0.11	
v/c Ratio	0.94	0.79		0.19	0.64			0.34		0.52	0.64	
Control Delay	85.0	20.9		57.1	24.2			55.4		52.6	15.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	85.0	20.9		57.1	24.2			55.4		52.6	15.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	C		E	C			E		D	B	
Approach Delay		29.8			24.9			55.4			32.2	
Approach LOS		C			C			E			C	
Queue Length 50th (m)	~72.7	139.6		4.9	92.5			6.6		23.0	3.0	
Queue Length 95th (m)	#132.1	#272.2		13.6	122.6			18.0		34.8	27.6	
Internal Link Dist (m)		55.8			285.6			30.4			100.8	
Turn Bay Length (m)	96.6			46.0						83.5		
Base Capacity (vph)	311	2293		311	1809			105		1109	676	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.94	0.79		0.07	0.58			0.34		0.18	0.37	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 108.9	
Natural Cycle: 140	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: Err	
Intersection Signal Delay: 28.9	Intersection LOS: C
Intersection Capacity Utilization 83.2%	ICU Level of Service E
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 35: Kingston Rd. & Rylander Blvd.



Lanes, Volumes, Timings
36: Port Union Rd./Sheppard Ave. & Kingston Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	884	817	506	684	218	181	242	644	246	383	65
Future Volume (vph)	50	884	817	506	684	218	181	242	644	246	383	65
Ideal Flow (vphpl)	1900	1900	2100	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	93.9		56.7	95.7		77.7	153.6		34.1	42.7		0.0
Storage Lanes	1		1	2		0	1		2	2		0
Taper Length (m)	17.7			23.8			22.6			37.5		
Lane Util. Factor	1.00	0.95	1.00	*1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Frt			0.850		0.964				0.850		0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3579	1769	3579	3450	0	1789	3579	1601	3471	3500	0
Flt Permitted	0.950			0.950			0.475			0.541		
Satd. Flow (perm)	1789	3579	1769	3579	3450	0	895	3579	1601	1977	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217		33				62		16	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		309.6			195.1			207.1			186.3	
Travel Time (s)		18.6			11.7			12.4			11.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	961	888	550	743	237	197	263	700	267	416	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	961	888	550	980	0	197	263	700	267	487	0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2		1	6			4	1	3	8	
Permitted Phases			2				4		4	8		
Detector Phase	5	2	2	1	6		4	4	1	3	8	
Switch Phase												
Minimum Initial (s)	5.0	34.0	34.0	6.0	34.0		44.0	44.0	6.0	6.0	44.0	
Minimum Split (s)	9.5	41.0	41.0	12.0	41.0		54.0	54.0	12.0	10.0	54.0	
Total Split (s)	22.0	54.0	54.0	22.0	54.0		54.0	54.0	22.0	10.0	64.0	
Total Split (%)	15.7%	38.6%	38.6%	15.7%	38.6%		38.6%	38.6%	15.7%	7.1%	45.7%	
Maximum Green (s)	17.5	47.0	47.0	16.0	47.0		46.0	46.0	16.0	6.0	56.0	
Yellow Time (s)	3.5	4.0	4.0	3.0	4.0		4.0	4.0	3.0	3.0	4.0	
All-Red Time (s)	1.0	3.0	3.0	3.0	3.0		4.0	4.0	3.0	1.0	4.0	
Lost Time Adjust (s)	0.0	0.0	-3.0	-3.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	7.0	4.0	3.0	7.0		8.0	8.0	6.0	4.0	8.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max	Max	None	Max		None	None	None	None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0			7.0	
Flash Dont Walk (s)		27.0	27.0		27.0		39.0	39.0			39.0	
Pedestrian Calls (#/hr)		0	0		0		0	0			0	
Act Effct Green (s)	9.5	47.0	50.0	19.0	57.1		44.4	44.4	68.4	58.4	54.4	
Actuated g/C Ratio	0.07	0.34	0.36	0.14	0.41		0.32	0.32	0.49	0.42	0.39	
v/c Ratio	0.44	0.79	1.14	1.12	0.68		0.69	0.23	0.85	0.30	0.35	
Control Delay	72.3	47.1	110.0	131.2	36.1		55.0	35.1	39.3	26.2	29.4	
Queue Delay	0.0	0.0	0.0	0.0	0.4		0.0	0.0	0.0	0.0	0.0	
Total Delay	72.3	47.1	110.0	131.2	36.5		55.0	35.1	39.3	26.2	29.4	

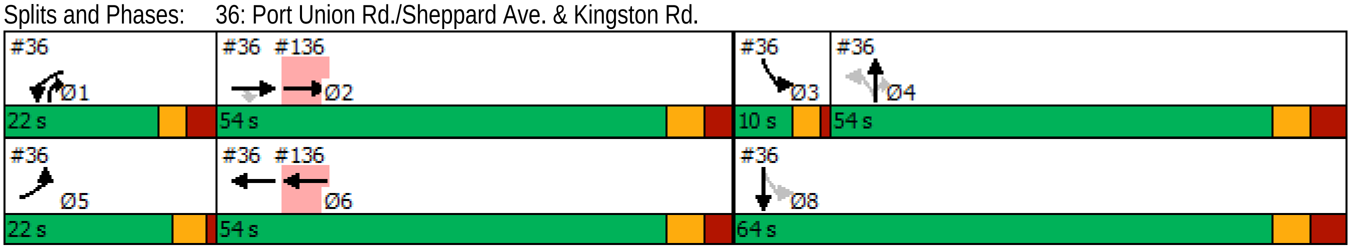
Lanes, Volumes, Timings
36: Port Union Rd./Sheppard Ave. & Kingston Rd.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	D	F	F	D		D	D	D	C	C	
Approach Delay		77.1			70.5			41.0			28.2	
Approach LOS		E			E			D			C	
Queue Length 50th (m)	14.4	124.1	~242.7	~85.9	113.0		46.9	27.7	151.9	23.2	47.3	
Queue Length 95th (m)	28.1	153.1	#327.0	#122.9	147.2		76.9	38.8	213.4	32.6	61.4	
Internal Link Dist (m)		285.6			171.1			183.1			162.3	
Turn Bay Length (m)	93.9		56.7	95.7			153.6		34.1	42.7		
Base Capacity (vph)	225	1215	777	491	1441		297	1189	822	898	1425	
Starvation Cap Reductn	0	0	0	0	137		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.24	0.79	1.14	1.12	0.75		0.66	0.22	0.85	0.30	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 138.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: Err
Intersection Signal Delay: 60.5 Intersection LOS: E
Intersection Capacity Utilization 138.6% ICU Level of Service H
Analysis Period (min) 15
* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 36: Port Union Rd./Sheppard Ave. & Kingston Rd.



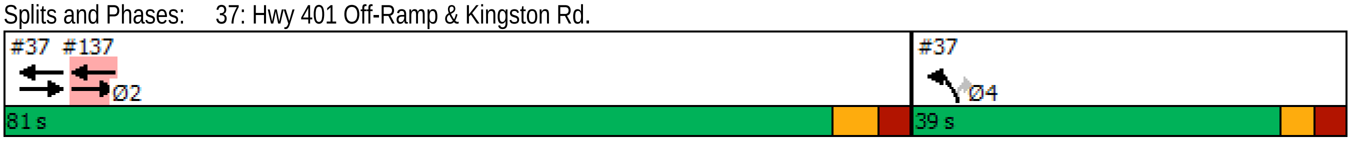
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2283	0	0	919	410	55
Future Volume (vph)	2283	0	0	919	410	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	0.0		149.4	35.1
Storage Lanes		0	0		2	0
Taper Length (m)			7.6		39.6	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	3579	0	0	3579	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	3579	0	0	3579	3471	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						4
Link Speed (k/h)	60			60	60	
Link Distance (m)	195.1			419.5	155.3	
Travel Time (s)	11.7			25.2	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2482	0	0	999	446	60
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2482	0	0	999	446	60
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			2	4	
Permitted Phases	2			2		4
Detector Phase	2			2	4	4
Switch Phase						
Minimum Initial (s)	23.0			23.0	7.0	7.0
Minimum Split (s)	30.0			30.0	38.0	38.0
Total Split (s)	81.0			81.0	39.0	39.0
Total Split (%)	67.5%			67.5%	32.5%	32.5%
Maximum Green (s)	74.0			74.0	33.0	33.0
Yellow Time (s)	4.0			4.0	3.0	3.0
All-Red Time (s)	3.0			3.0	3.0	3.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	7.0			7.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	Max			Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	16.0			16.0	25.0	25.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	74.1			74.1	18.7	18.7
Actuated g/C Ratio	0.70			0.70	0.18	0.18
v/c Ratio	0.99			0.40	0.73	0.21
Control Delay	32.6			7.5	48.5	36.5
Queue Delay	39.6			0.0	0.0	0.0
Total Delay	72.3			7.5	48.5	36.5

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	E			A	D	D
Approach Delay	72.3			7.5	47.1	
Approach LOS	E			A	D	
Queue Length 50th (m)	230.4			39.4	45.1	9.9
Queue Length 95th (m)	#347.0			59.4	61.3	21.4
Internal Link Dist (m)	171.1			395.5	131.3	
Turn Bay Length (m)					149.4	35.1
Base Capacity (vph)	2506			2506	1084	502
Starvation Cap Reductn	270			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	1.11			0.40	0.41	0.12

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 105.8
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: Err
Intersection Signal Delay: 52.8 Intersection LOS: D
Intersection Capacity Utilization 85.6% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 37: Hwy 401 Off-Ramp & Kingston Rd.



Durham-Scarborough Bus Rapid Transit

METROLINX

MTO

JULY 21, 2021

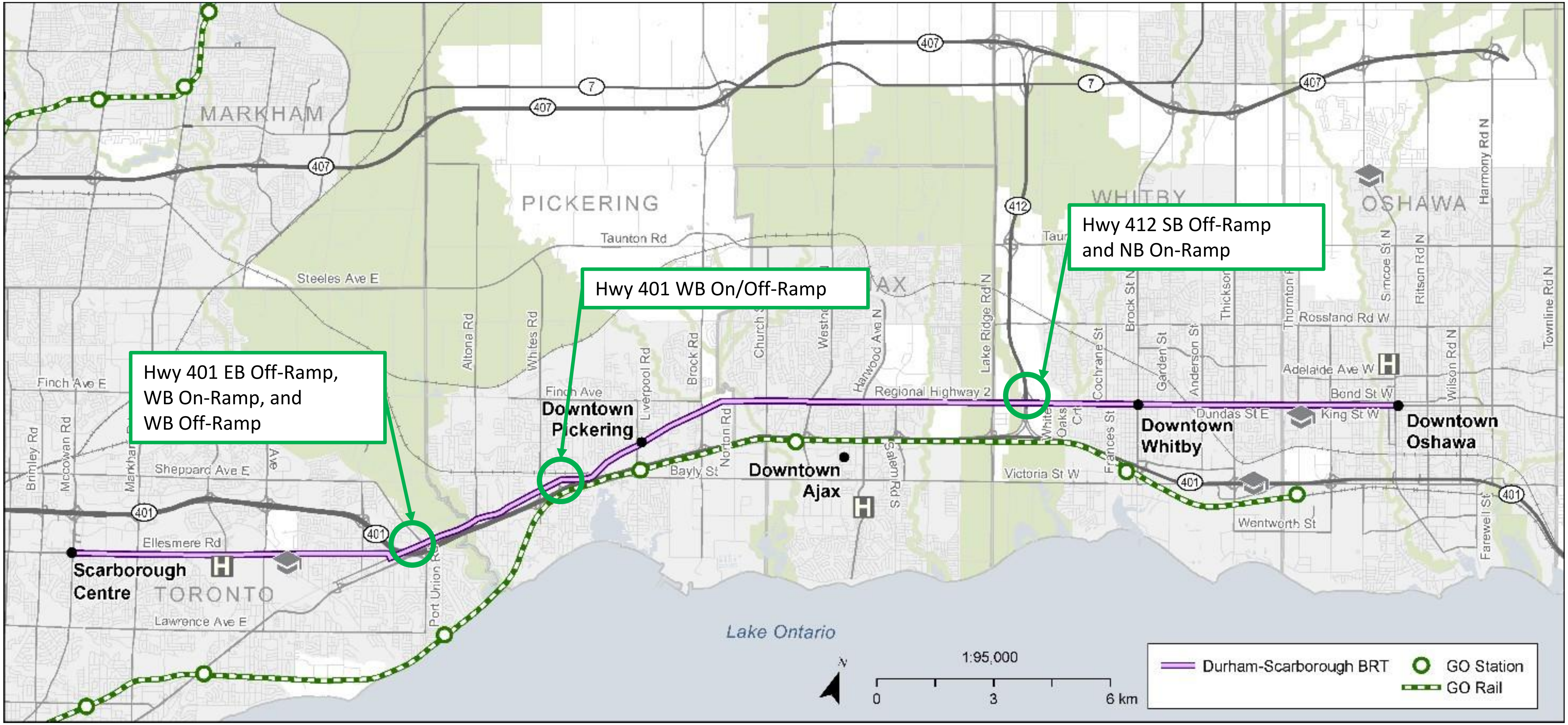
Purpose

- To provide information on the Durham-Scarborough Bus Rapid Transit project around MTO’s right-of-way

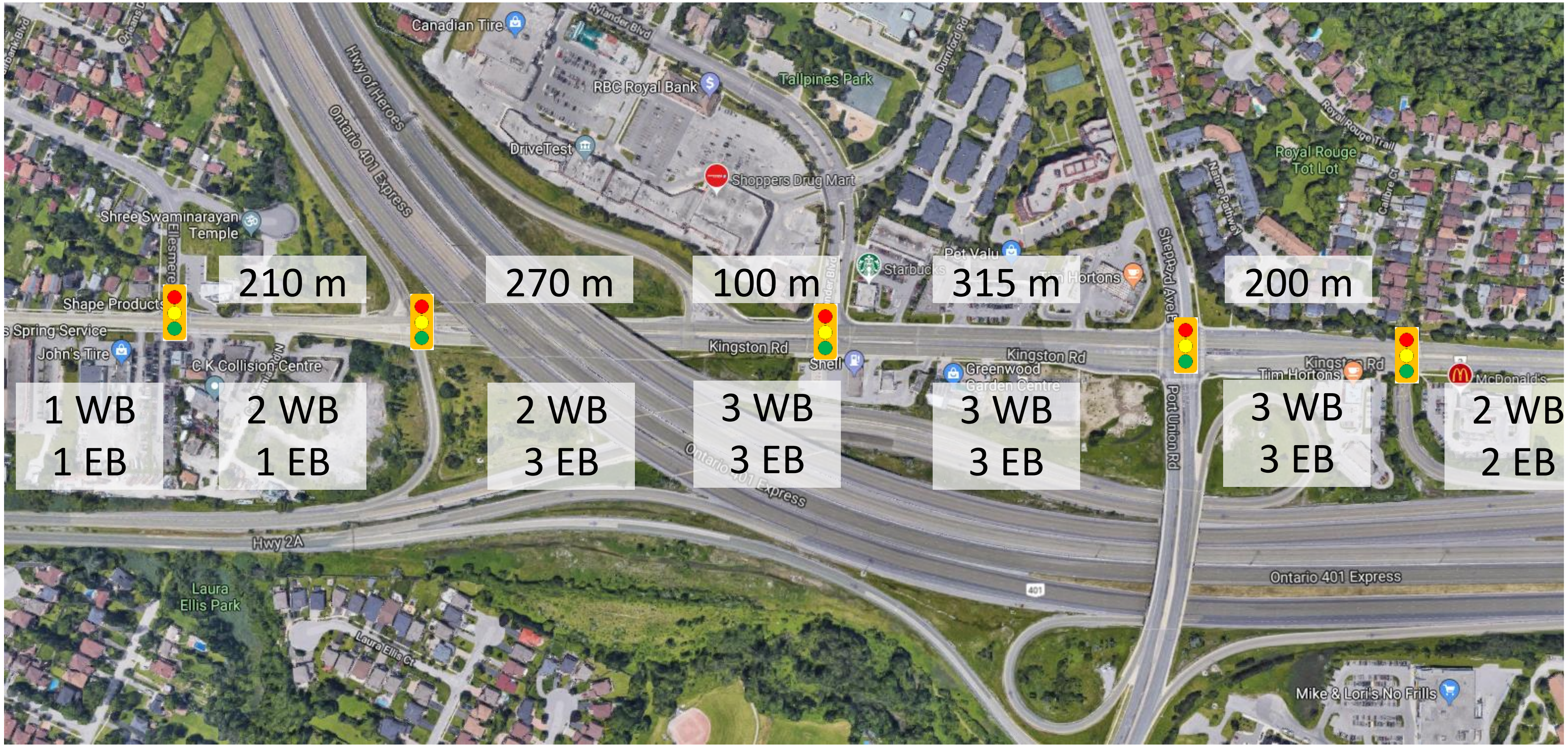
- To present areas of concern to MTO Staff

- To request MTO staff advice ahead of meeting with MTO Senior Management

Study Area


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Sheppard Ave E
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Dundas St E
King St W
Bond St W
Adelaide Ave W
Rossland Rd W
Wentworth St
Brimley Rd
Mccowan Rd
Altona Rd
Whites Rd
Liverpool Rd
Brock Rd
Church St
Westney
Harwood Ave N
Salem Rd S
Lake Ridge Rd N
Cochrane St
Brock St N
Garden St
Anderson St
Thickson
Simcoe St N
Ritson Rd N
Wilson Rd N
Harmony Rd N
Townline Rd N
Farewell St
Port Union Rd
Norton Rd
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

Kingston Road under Highway 401: Ellesmere Road to Port Union Road



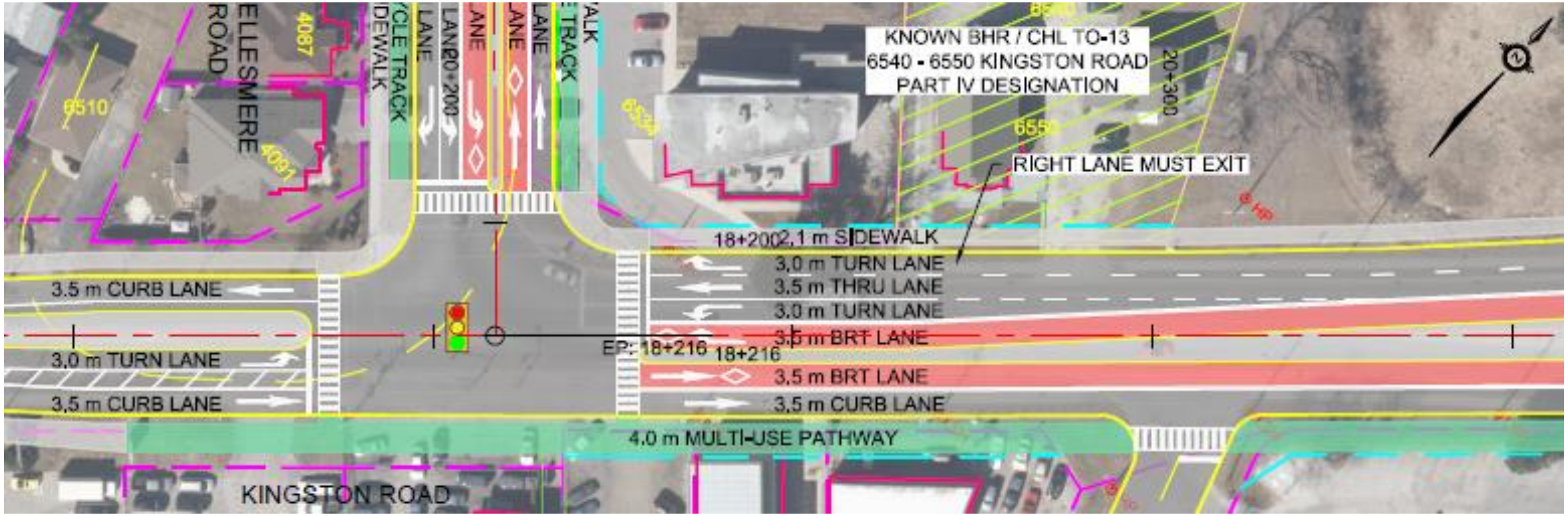
Existing signals: Ellesmere, 401 EB off, Rylander, Port Union, 401 WB off
Proposed BRT stop (opening day) at Port Union / Sheppard Avenue
Protect for future BRT stop (beyond 2041) at Ellesmere / Kingston Road

Ellesmere and Kingston Road Intersection

WB right-turn lane added to the preliminary design in response to MTO concerns of traffic queues extending to Hwy 401 EB Off-Ramp intersection.

WBR lane will operate as "right lane must exit" as it is also a WB receiving lane at the Hwy 401 intersection. This is similar to existing operations.

Impacts to an existing heritage property (no building impacts) require Heritage Impact Assessment.

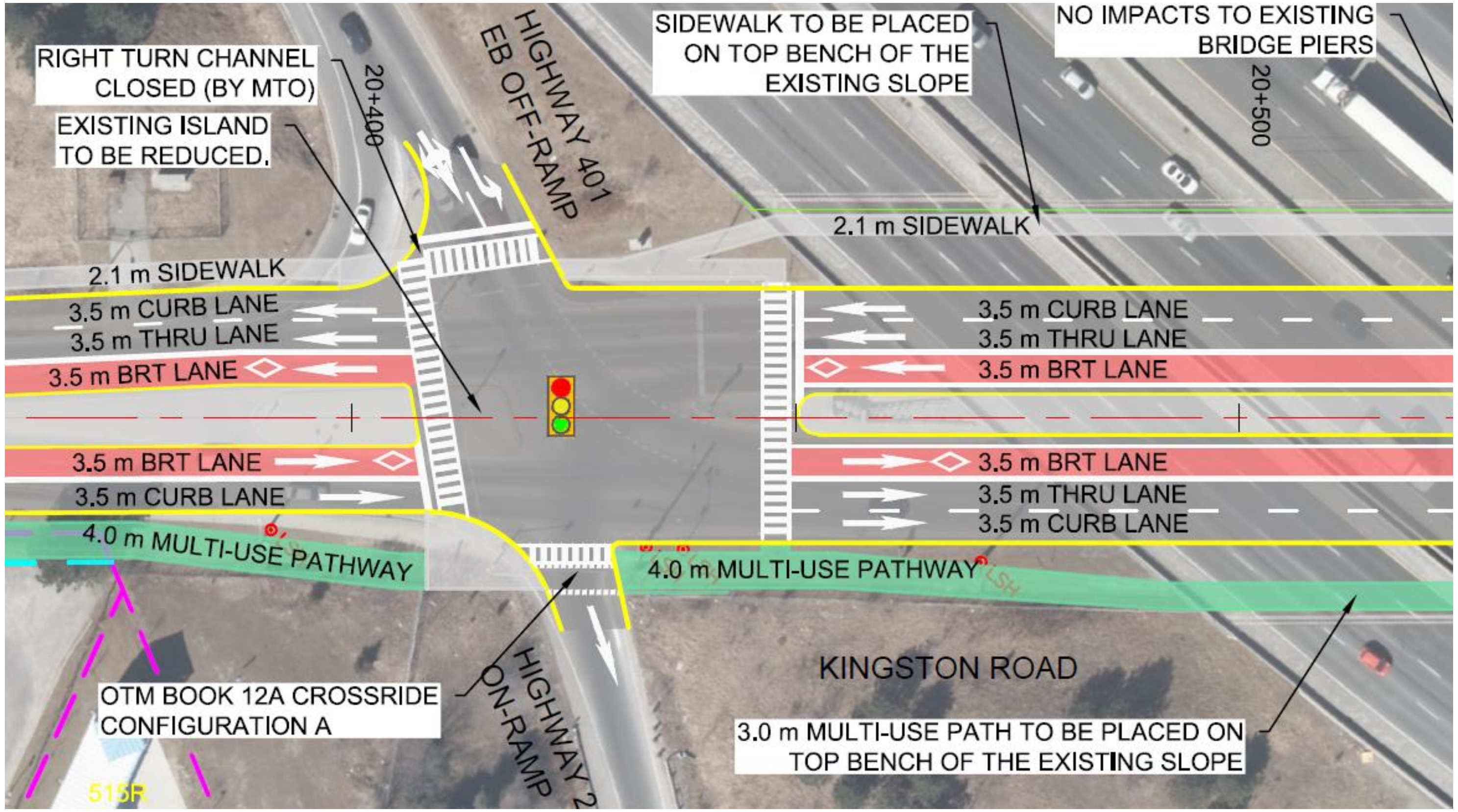


Highway 401 EB Off-Ramp Intersection

Existing WB left-turn lane onto Municipal Hwy 2 On-Ramp to be converted to WB BRT lane.

WB traffic will access Hwy 2 by continuing along Kingston Road as agreed with the City of Toronto.

Highway 401 Eastbound Off-Ramp lane configuration to match current MTO design (currently under construction).

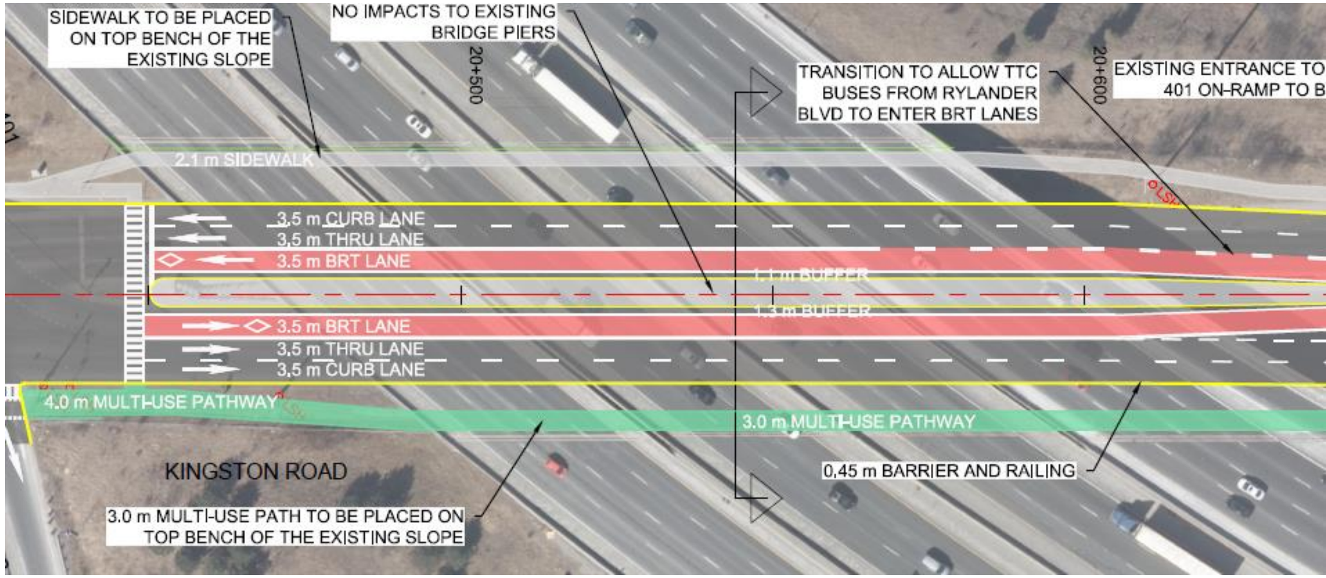


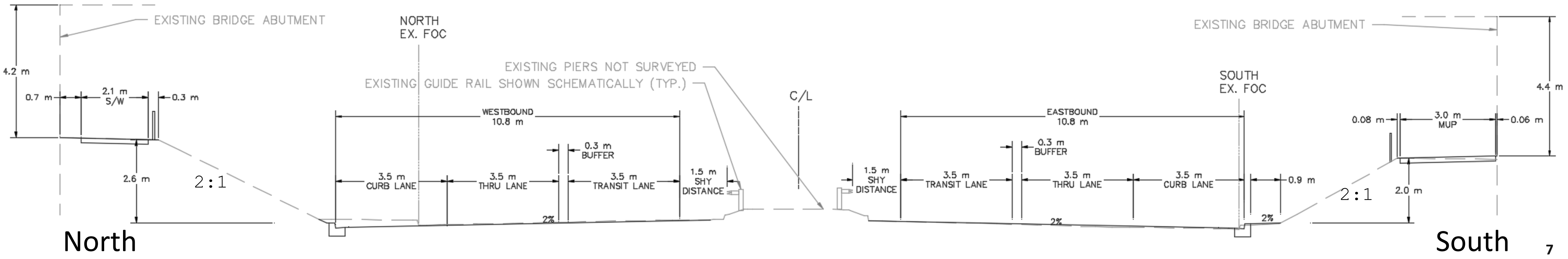
Highway 401 Bridges

6-Lane cross-section proposed.

Existing curbs and guiderails for centre bridge pier protection will be maintained. Approx. 1.5 m shy distance provided between existing guiderails and BRT lanes.

Proposed multi-use path and sidewalk placed on top bench of the existing bridge slopes to maintain existing footings.





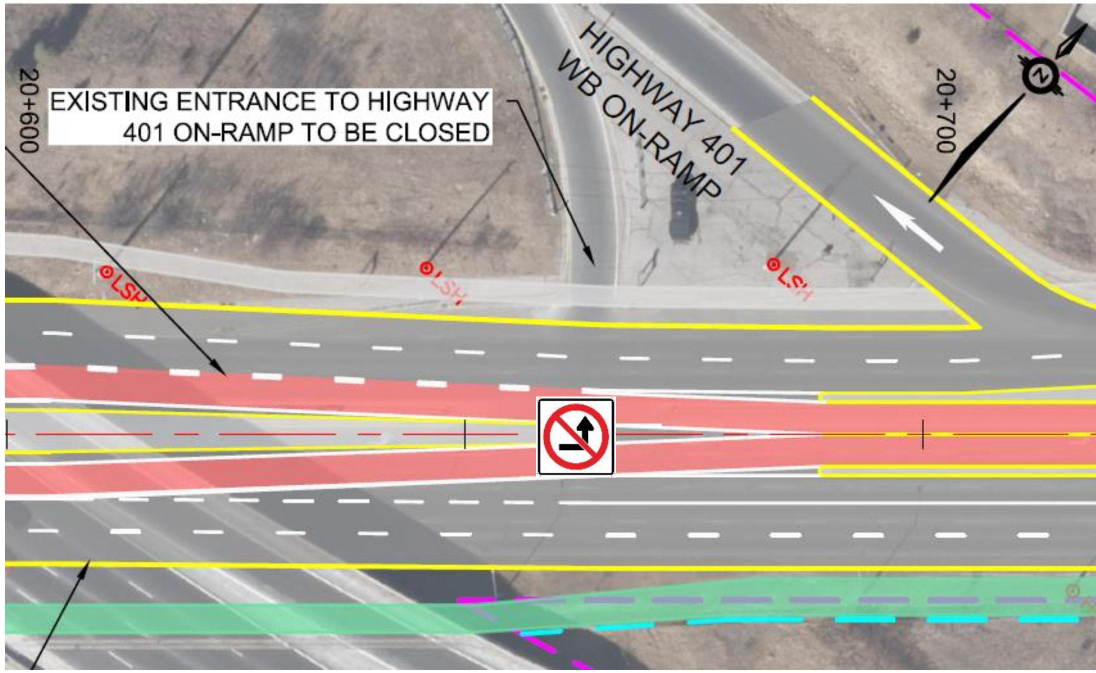
Eastbound Access to Hwy 401 Westbound

6-Lane cross-section with centre-median bus lanes. Raised curb island between bus lanes will prevent mid-block left-turns.

EB traffic will access Hwy 401 Westbound via Northbound Meadowvale Road. There is minimal inconvenience for drivers given the alternate routing is similar length.

Existing hourly volume using NB Meadowvale to WB Highway 401 ramps peaks at 190 vehicles at 12:00 p.m.

Maximum demand of ~ 430 vph at NB Meadowvale loop on-ramp which can be accommodated.



Movement	AM Peak (vph)	PM Peak (vph)
Hwy 401 WB On-Ramp EBL	30	240

MTO Carpool Lot Access

6-Lane cross-section with centre-median bus lanes. Raised curb island between bus lanes will prevent mid-block left-turns.

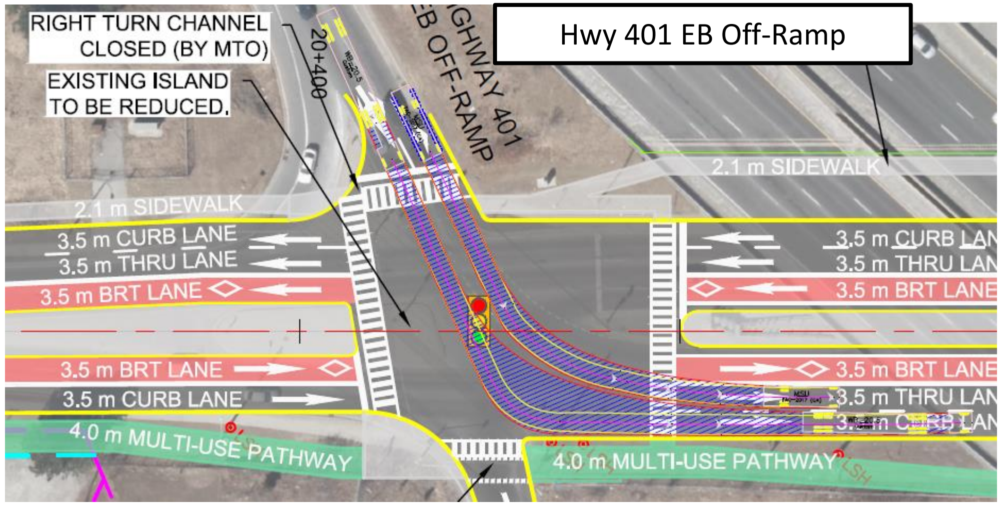
Unsignalized driveways will become right-in, right-out only, including MTO Carpool Lot access.

WB traffic may access the carpool lot by U-turning at the signalized Rylander Blvd intersection with minimal inconvenience.

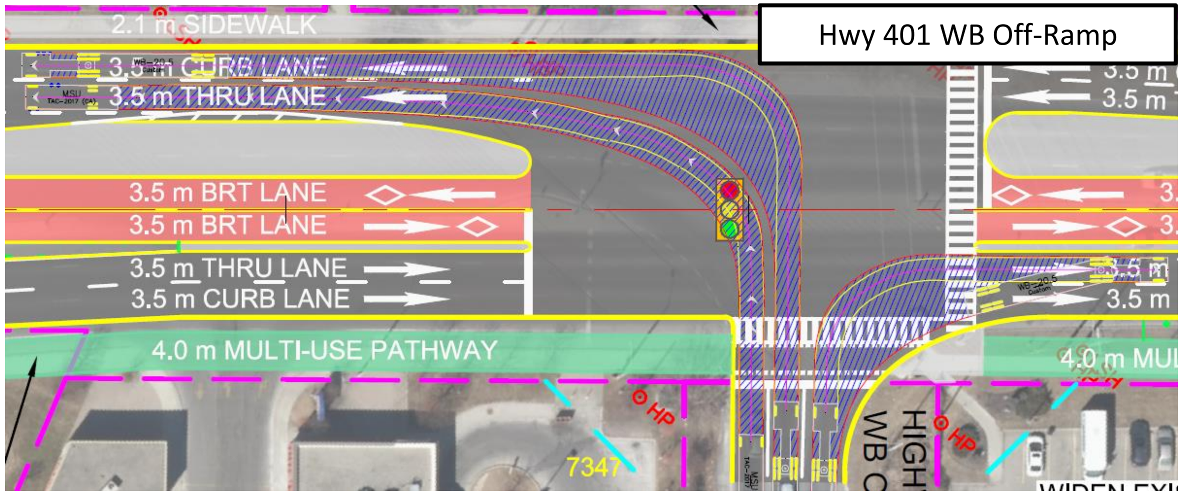
Advised by MTO staff that this change in operation requires approval from MTO Senior Management

AutoTurn at Hwy 401 Intersections

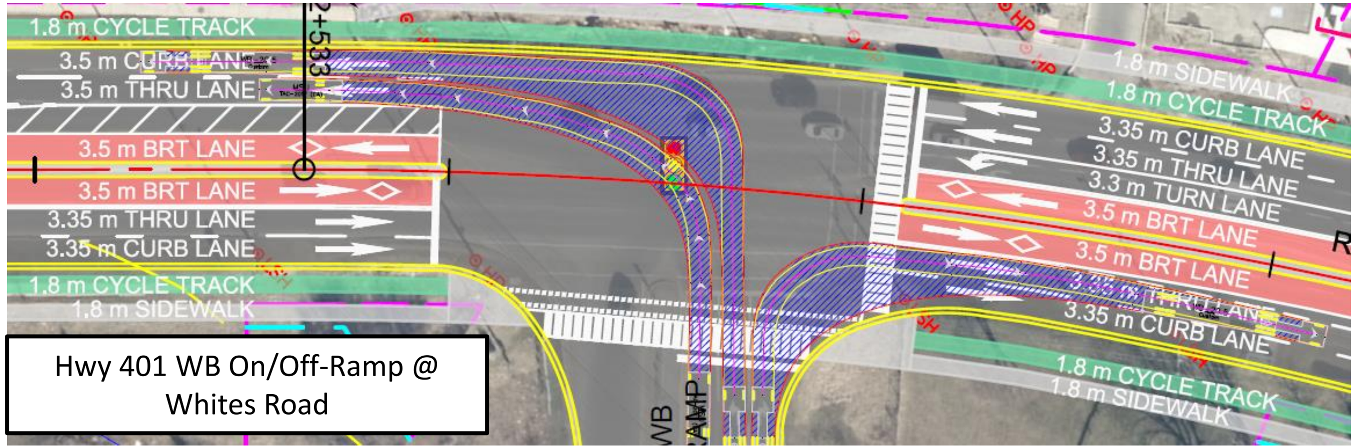
AutoTurn at On/Off-Ramps using WB-20.5 vehicles.
Dual-left turns use MSU and WB-20.5.



Hwy 401 EB Off-Ramp

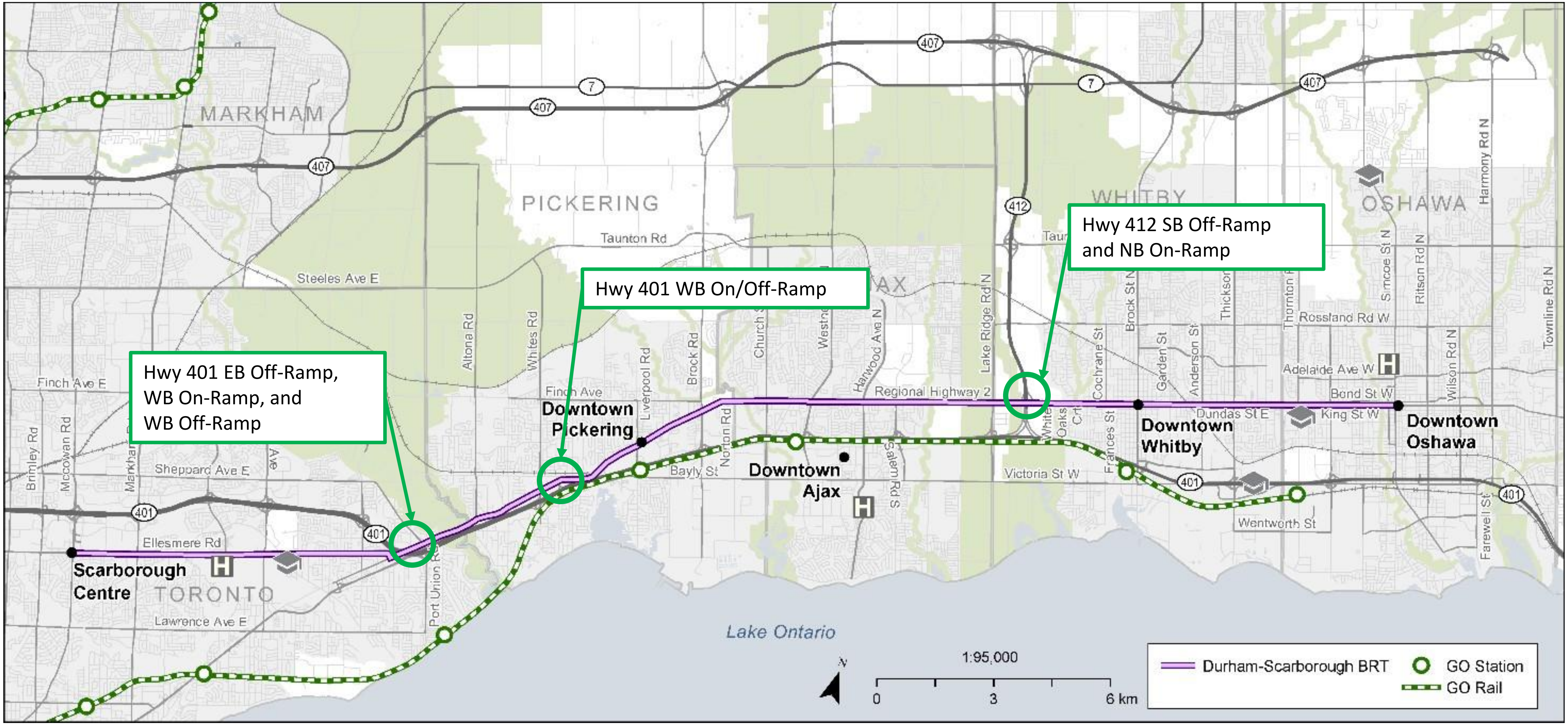


Hwy 401 WB Off-Ramp



Hwy 401 WB On/Off-Ramp @ Whites Road

Study Area


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Sheppard Ave E
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Rossland Rd W
Adelaide Ave W
Bond St W
King St W
Dundas St E
Victoria St W
Wentworth St
Bayly St
Brimley Rd
Mccowan Rd
Altona Rd
Whites Rd
Liverpool Rd
Brock Rd
Lake Ridge Rd N
Cochrane St
Brock St N
Garden St
Anderson St
Thickson
Simcoe St N
Ritson Rd N
Wilson Rd N
Harmony Rd N
Townline Rd N
Farewell St
Port Union Rd
Salem Rd S
Harwood Ave N
Francis St
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

Highway 412 Interchange

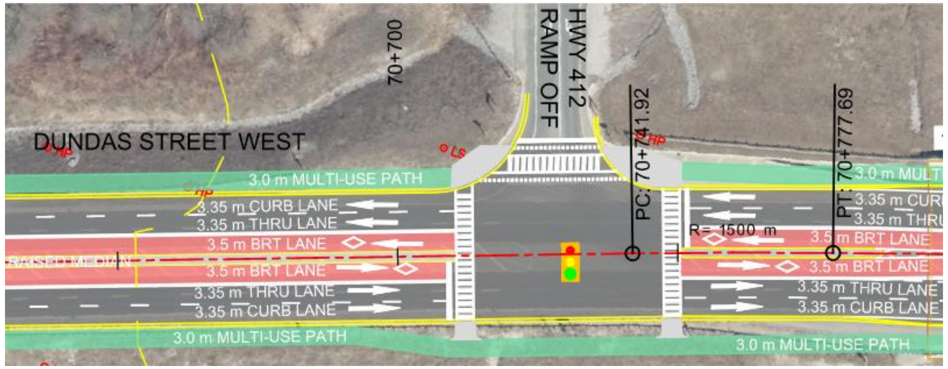
Highway 412 On-Ramp and Off-Ramp at Dundas Street W are proposed to be signalized intersections. Full existing access and traffic movements to be maintained.

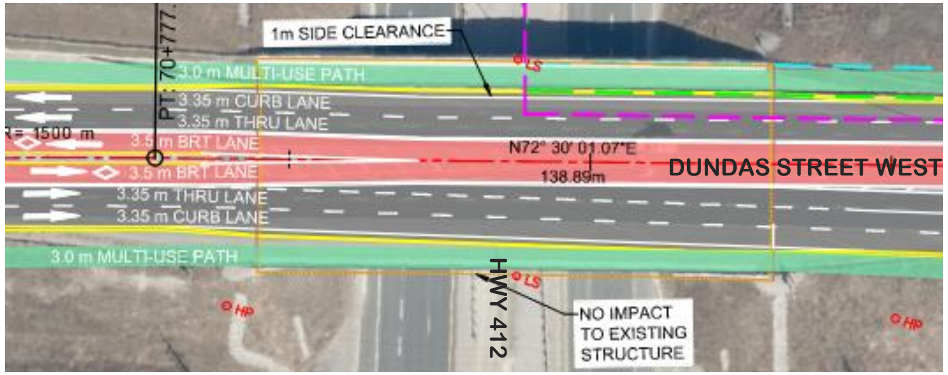
No impacts to Highway 412 bridge structure; proposed work includes asphalt pavement rehabilitation and sidewalk widening to construct MUP.

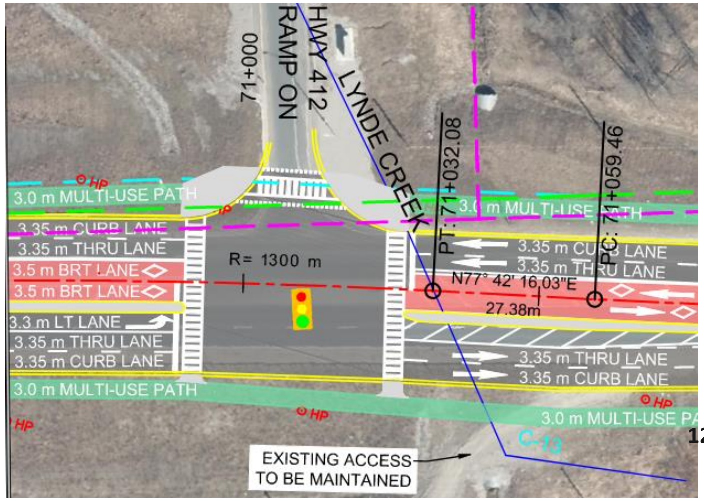
Proposed 3.35m lane widths along Dundas Street W meet Regional standards but are below the 3.5m lane width specified in TAC Manual MTO Supplement. A design speed reduction to 70 km/h is proposed.

1m side clearance maintained over bridge deck provides the opportunity in detailed design to reallocate pavement widths.

Existing access road to SWM Pond will be maintained.

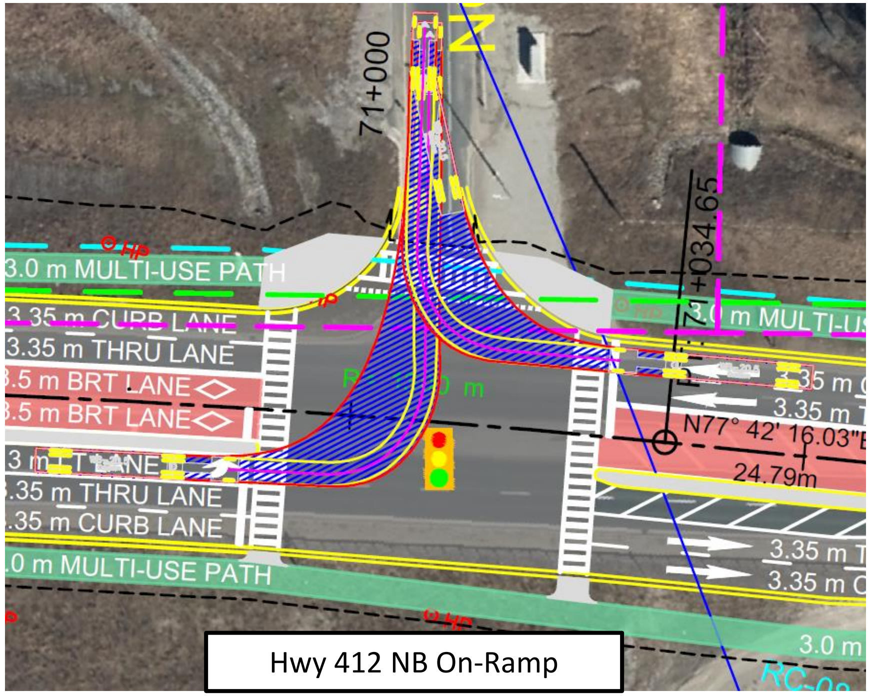




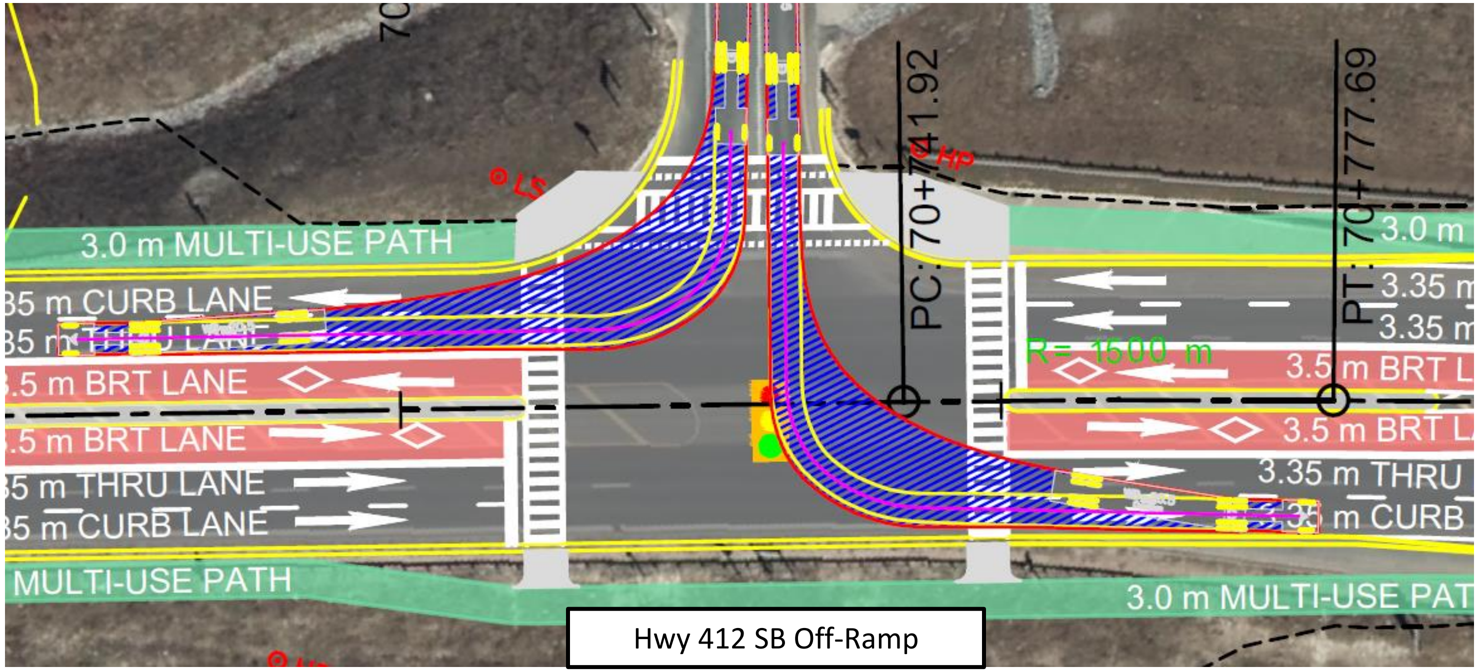


AutoTurn at Hwy 412 Intersections

AutoTurn at On/Off-Ramps using WB-20.5 vehicles.
Dual-left turns use MSU and WB-20.5.



Hwy 412 NB On-Ramp



Hwy 412 SB Off-Ramp

Design Criteria

MTO comments requested separate section in the design criteria for MTO standards.

However, the MTO Road standards require a higher design speed and much more space to implement turn lane taper and deceleration lengths.

In many cases, the required length for turn taper and deceleration far exceed the spacing between intersections.

Advised by MTO staff that any deviation from MTO standards would require approval from MTO Senior Management.

Design Criteria – Kingston Rd from Ellesmere Rd to Raspberry Rd

Standard	Toronto	MTO	Proposed
Posted Speed	60 km/h	-	60 km/h
Design Speed	60 km/h	80 km/h	70 km/h
Through Lane	3.5 m	3.5 m	3.5 m
Curb Lane	3.0 m	3.5 m	3.5 m
Left-Turn Lane	3.0 m	3.0 – 3.25 m	3.0 m
Right-Turn Lane	3.0 m	3.25 m	3.0 m
Left-Turn Taper	20:1 (Approx. 60 m)	130 m	20:1 (Approx. 60 m)
Left-Turn Deceleration Length	-	180 m	Based on traffic analysis

Design Criteria – Kingston Rd at Hwy 401 WB On/Off-Ramp (PIK)

Standard	Durham	MTO	Proposed
Posted Speed	60 km/h	-	60 km/h
Design Speed	70 km/h	80 km/h	70 km/h
Through Lane	Pref. 3.35 m	3.5 m	3.5 m
Curb Lane	Pref. 3.35 m	3.5 m	3.5 m
Left-Turn Lane	3.3 m	3.0 – 3.25 m	3.3 m
Right-Turn Lane	3.3 m	3.25 m	3.3 m
Left-Turn Taper	35:1 (Approx. 115 m)	130 m	35:1 (Approx. 115 m)
Left-Turn Deceleration Length	62 m	180 m	62 m

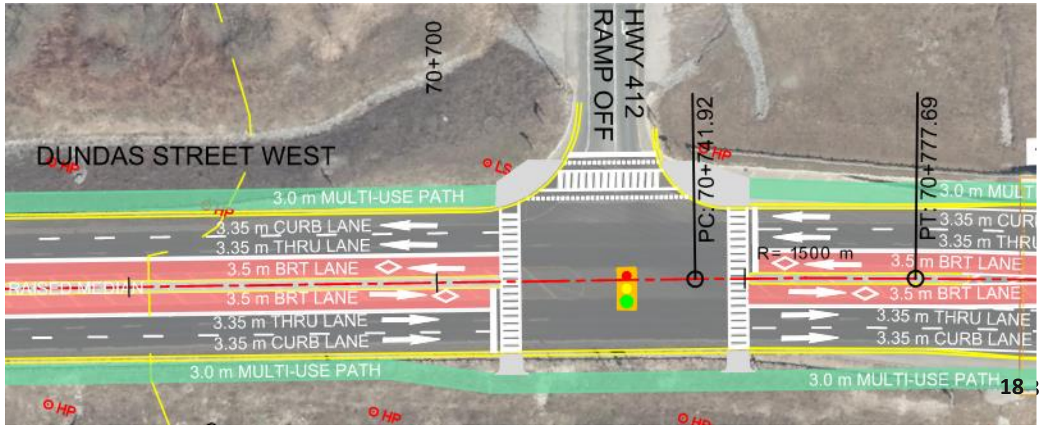
Design Criteria – Dundas St from Hwy 412 SB Off-Ramp to Hwy 412 NB On-Ramp (WHT)

Standard	Durham	MTO	Proposed
Posted Speed	70 km/h	-	60 km/h
Design Speed	80 km/h	80 km/h	70 km/h
Through Lane	Pref. 3.35 m	3.5 m	3.35 m
Curb Lane	Pref. 3.35 m	3.5 m	3.35 m
Left-Turn Lane	3.3 m	3.0 – 3.25 m	3.3 m
Right-Turn Lane	3.3 m	3.25 m	3.3 m
Left-Turn Taper	40:1 (Approx. 132 m)	130 m	30:1 (Approx. 102 m)
Left-Turn Deceleration Length	216 m	180 m	152 m
Side Clearance on Bridge Deck	-	1.0 m	1.0

Active Transportation

Proposed Active Transportation Facilities at MTO Ramp Intersections:

- At Hwy 401 Bridges and Off-Ramps (TOR): Southside multi-use path and northside sidewalk.
- At Hwy 401 On/Off-Ramp (PIK): Uni-directional cycle tracks on both side.
- At Hwy 412 On and Off-Ramps (WHT): MUP on both sides.



Traffic Operations at MTO Ramp Intersections

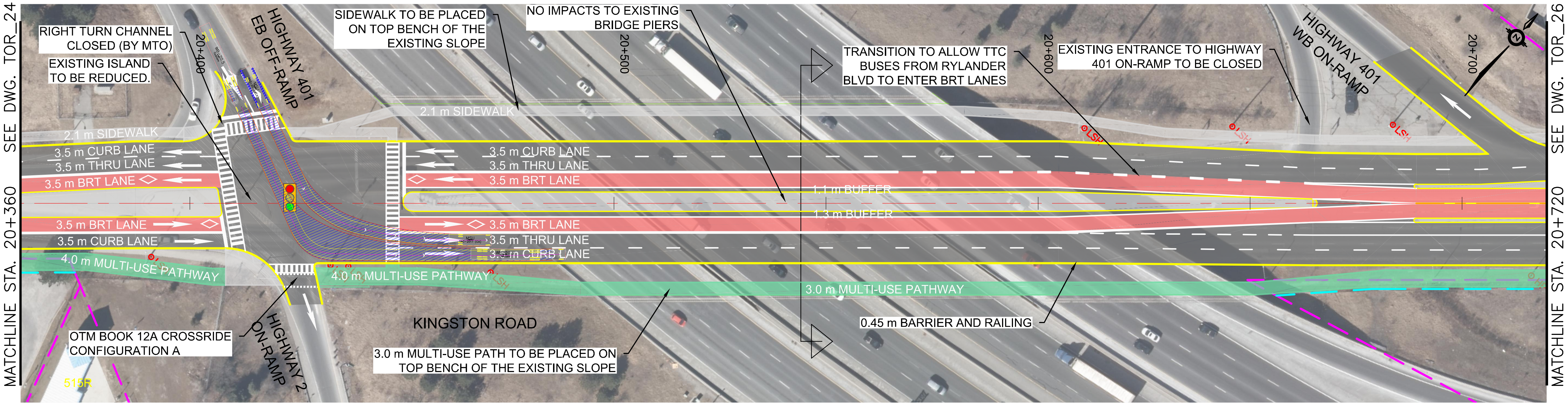
Table below summarizes Future (2041) with BRT Traffic Conditions at MTO Ramp intersections within the corridor.

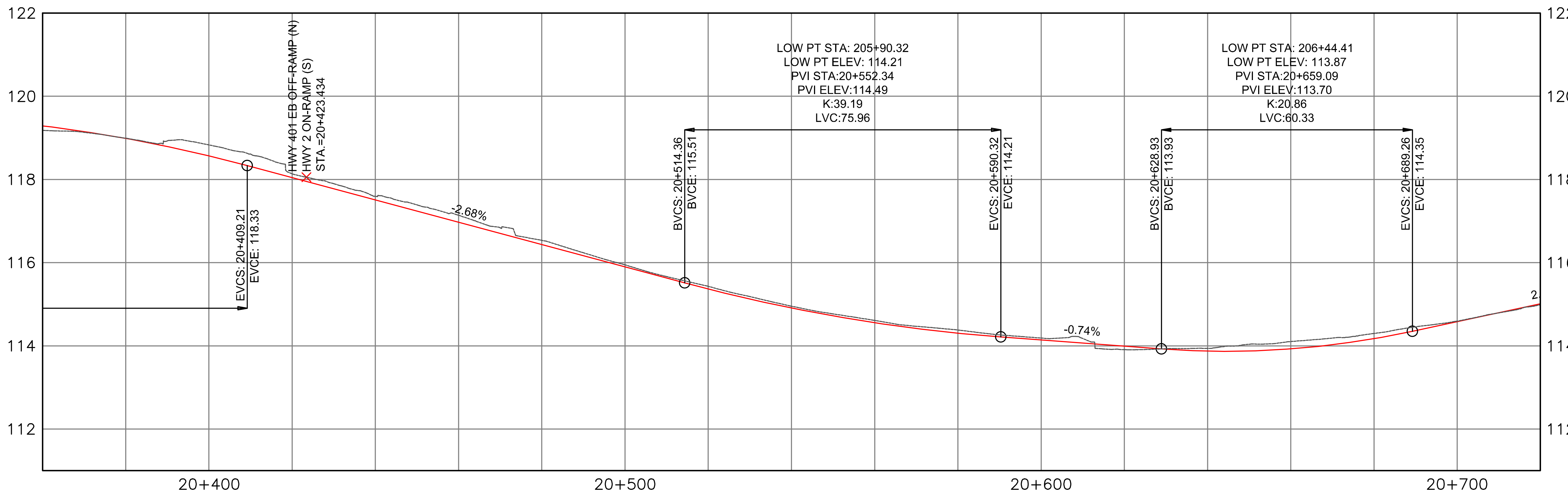
Intersection	Overall Intersection LOS (v/c)	Critical Movements (LOS) [v/c]
Kingston Road at Highway 401 EB Off-Ramp (TOR)	C (0.77)	-
Kingston Road at Highway 401 WB Off-Ramp (TOR)	C (0.76)	-
Kingston Road at Highway 401 WB On/Off-Ramp (PIK)	D (1.03)	EBT (D) [1.08] WBL (F) [1.07] NBL (E) [0.94]
Dundas Street at Highway 412 SB Off-Ramp (WHT)	A (0.74)	-
Dundas Street at Highway 412 NB On-Ramp (WHT)	B (0.79)	EBT (B) [0.89]

Next Steps

- Circulate responses to MTO written comments from May and June
- Circulate design criteria and design exceptions
- Present project to MTO Senior Management

- Address agency comments on draft Environmental Project Report (EPR)
- Draft Preliminary Design Business Case
- Consult the public on draft EPR and refined preliminary design at PIC #4 in Fall 2021
- Funding decisions will be made as the project advances





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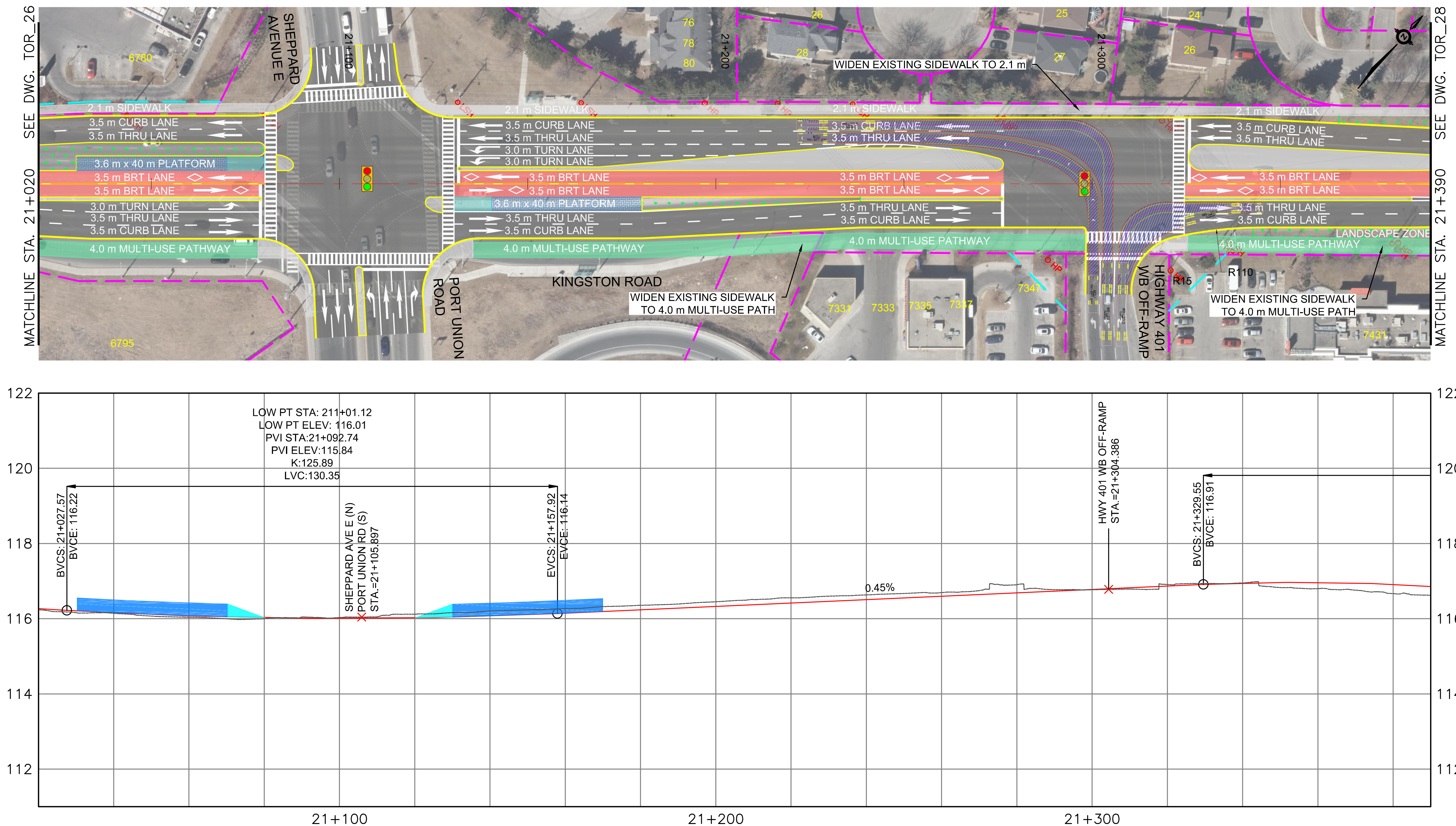

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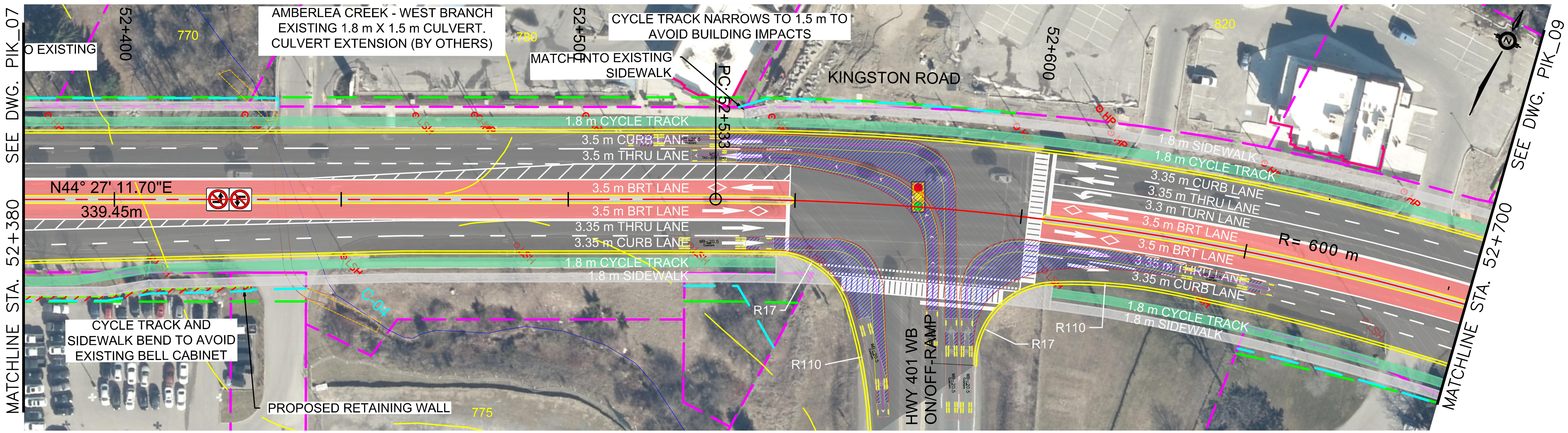

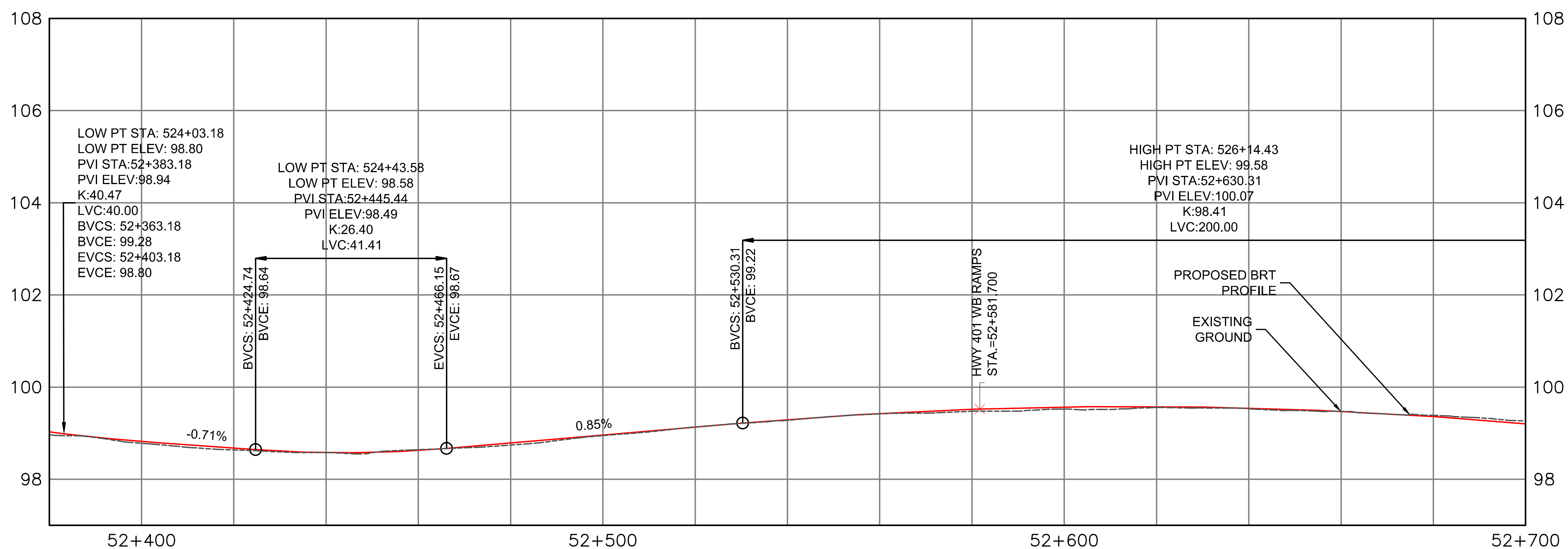

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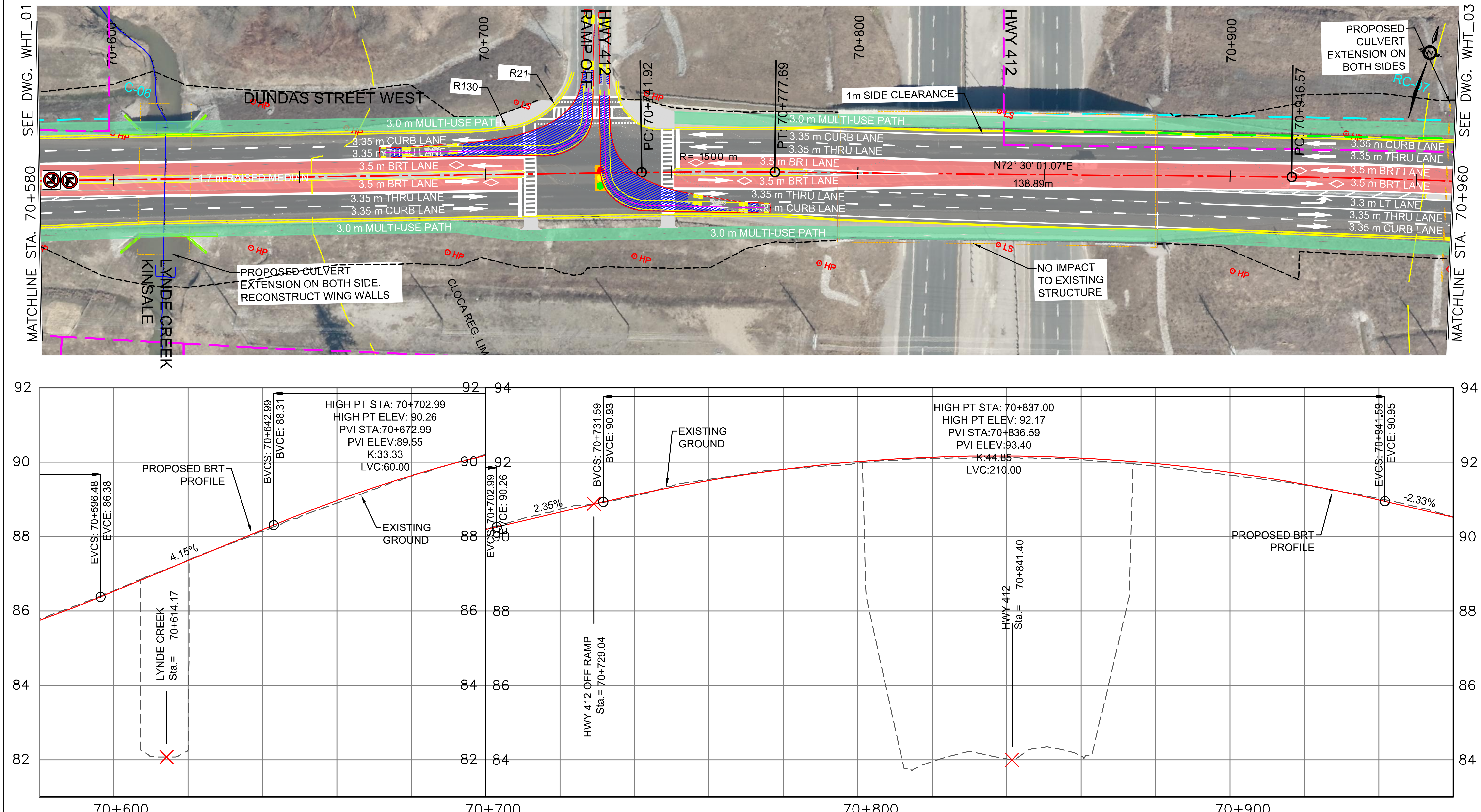

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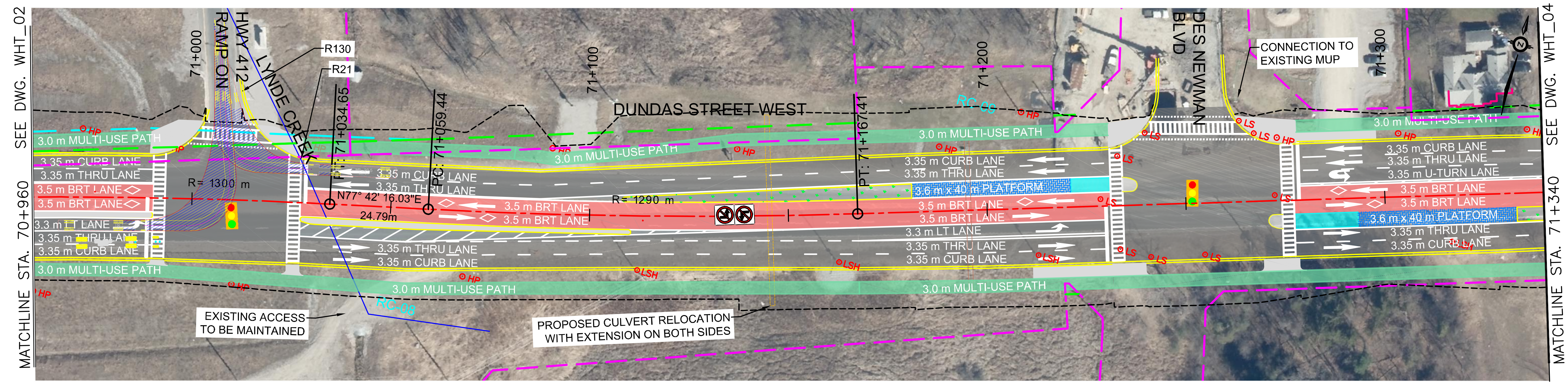

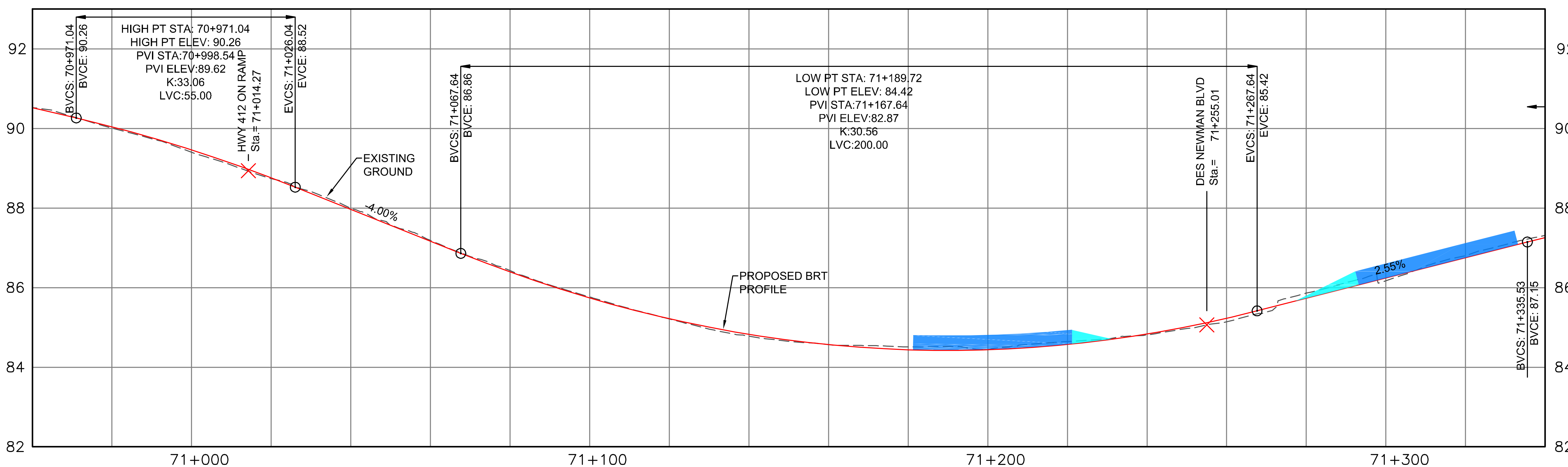

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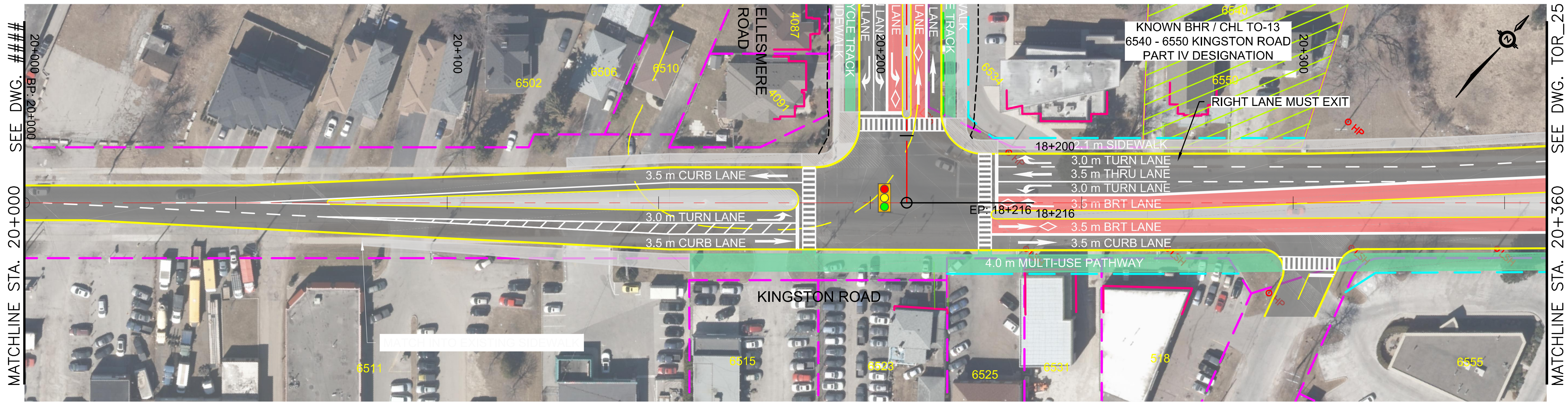

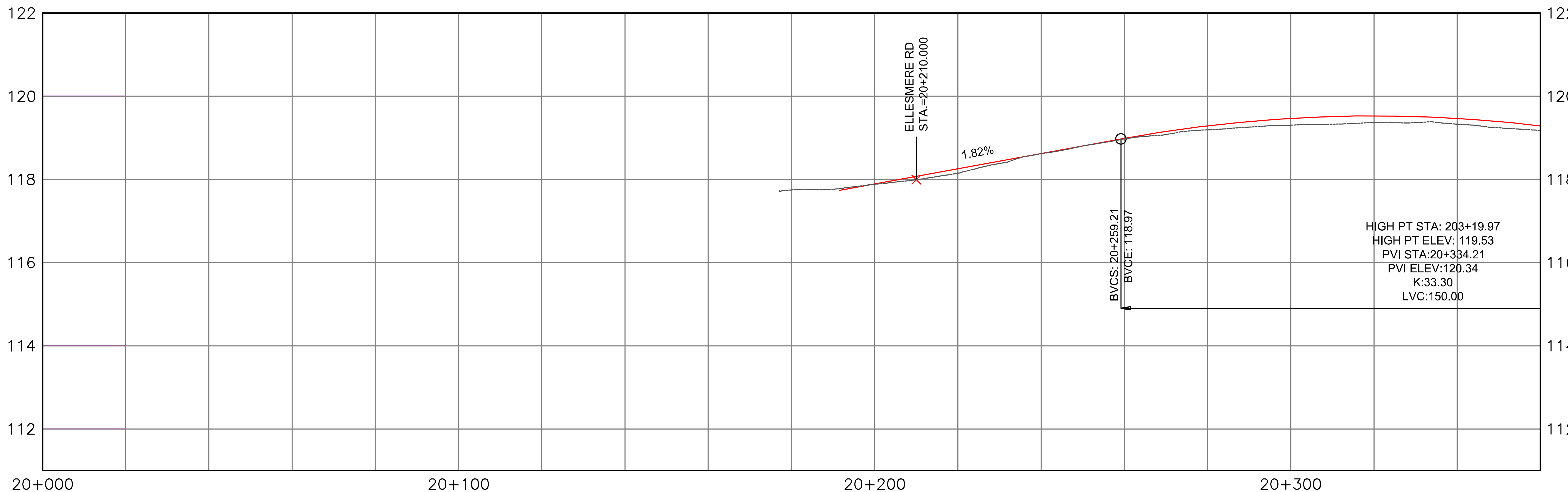

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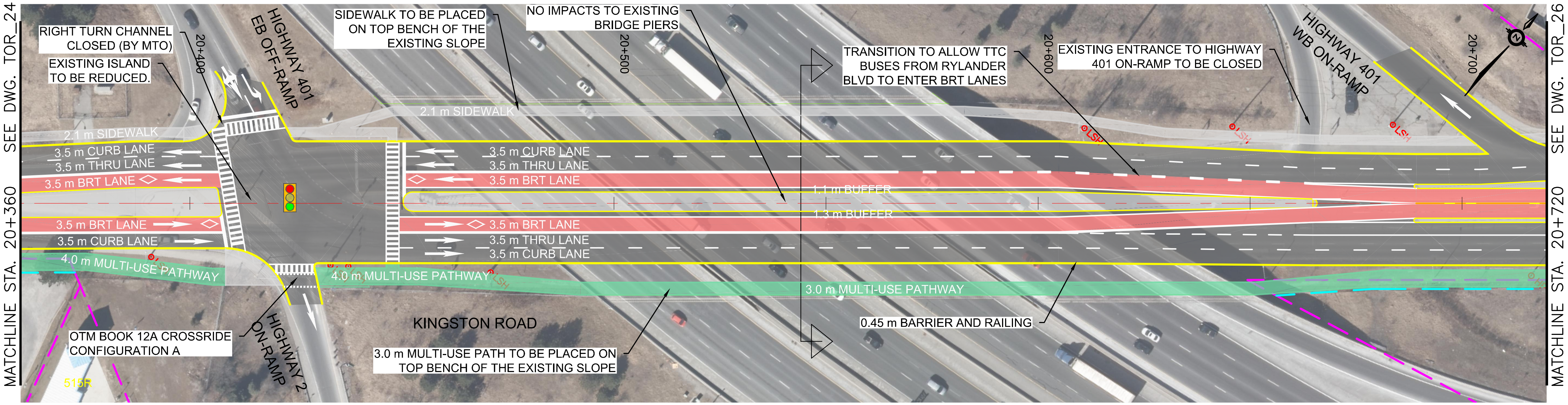

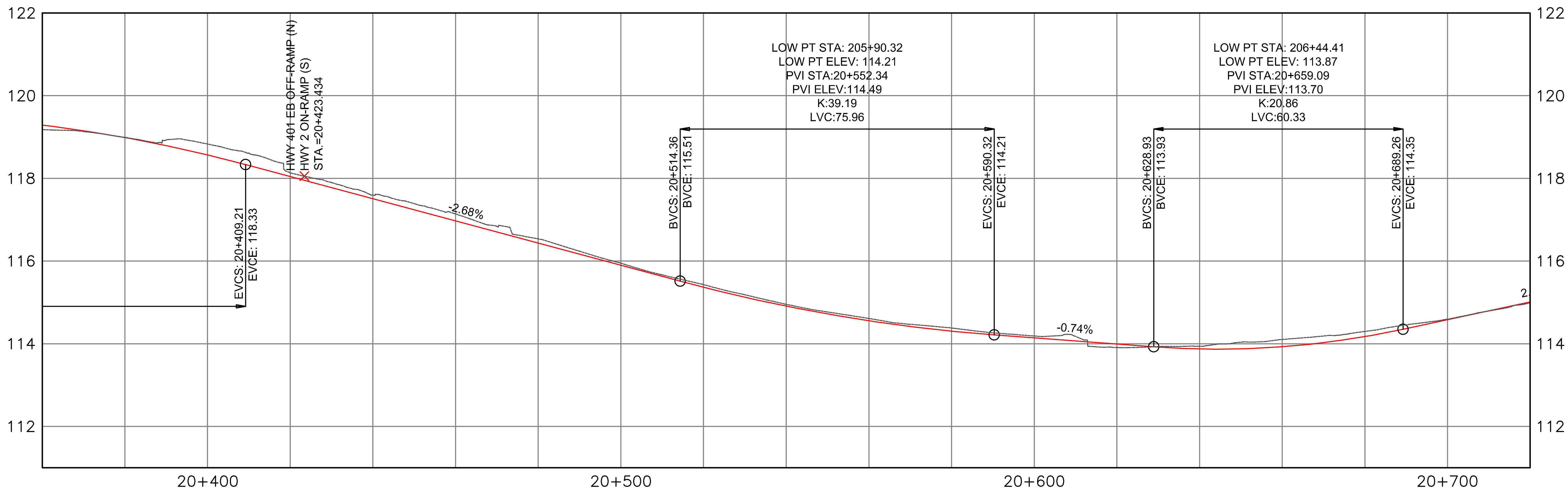

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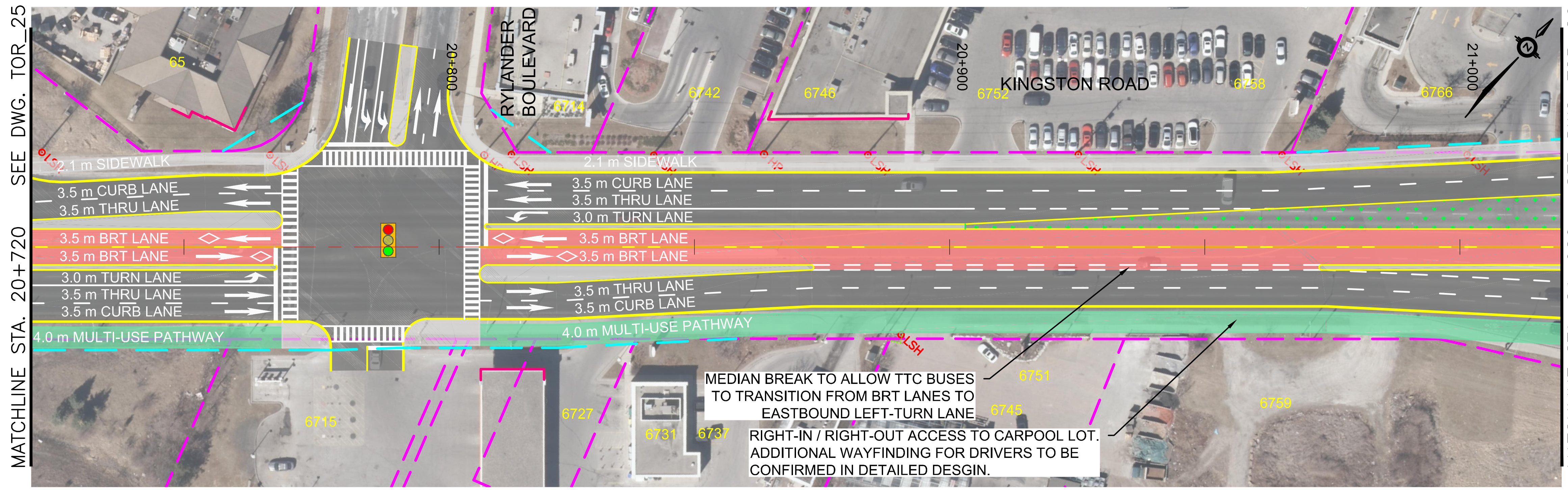

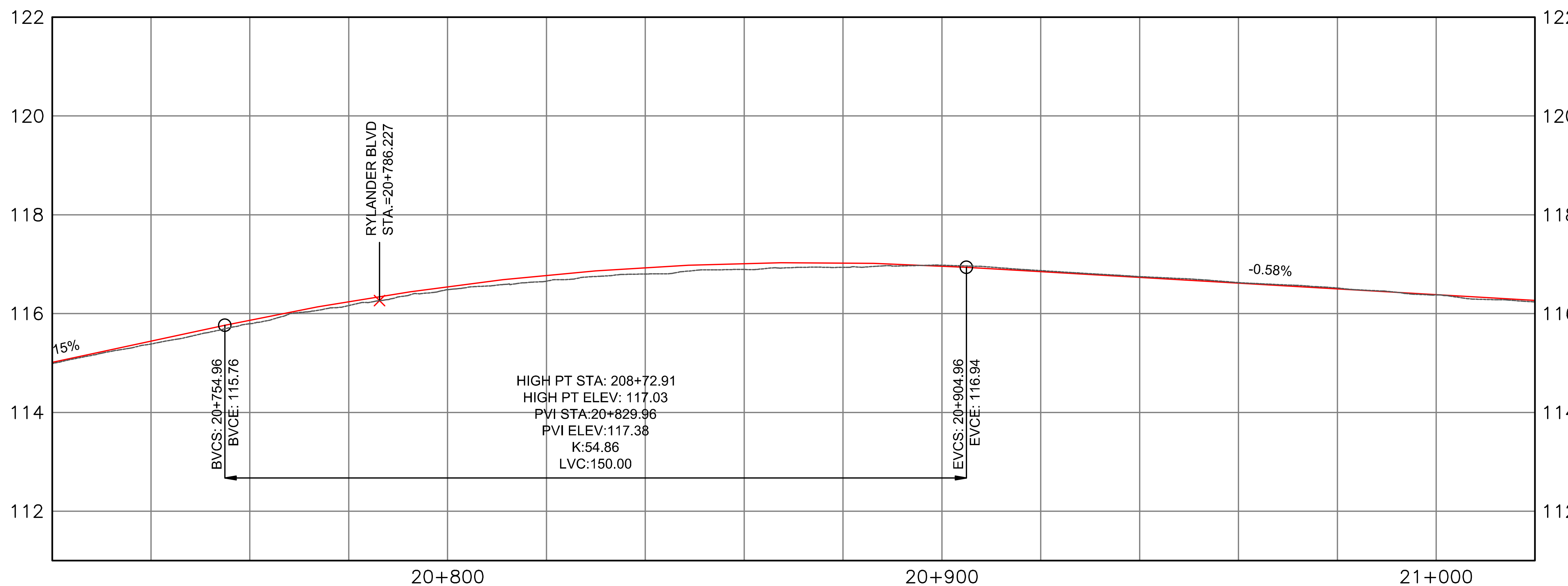

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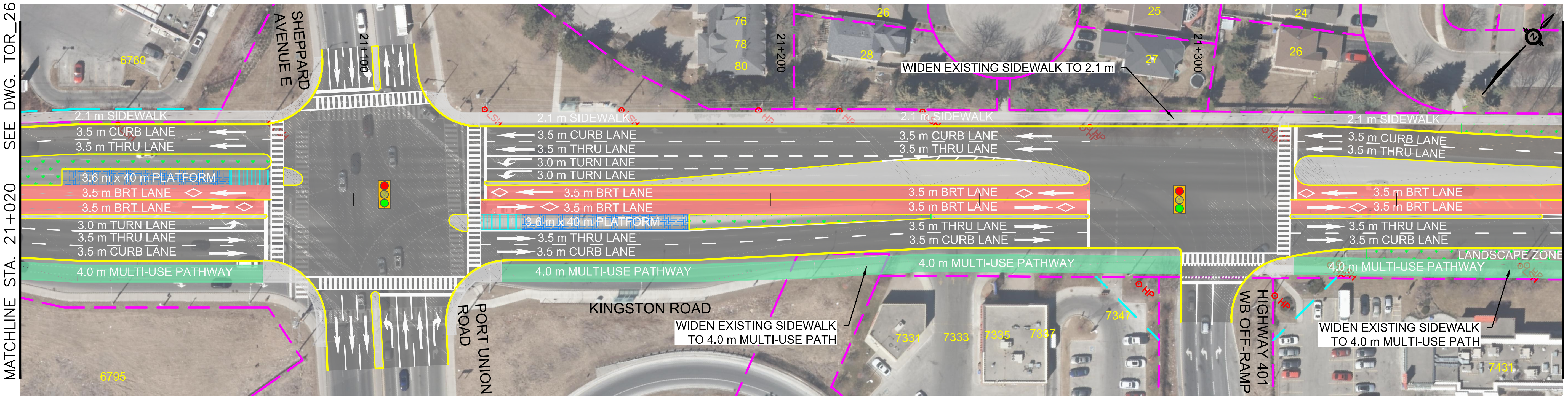

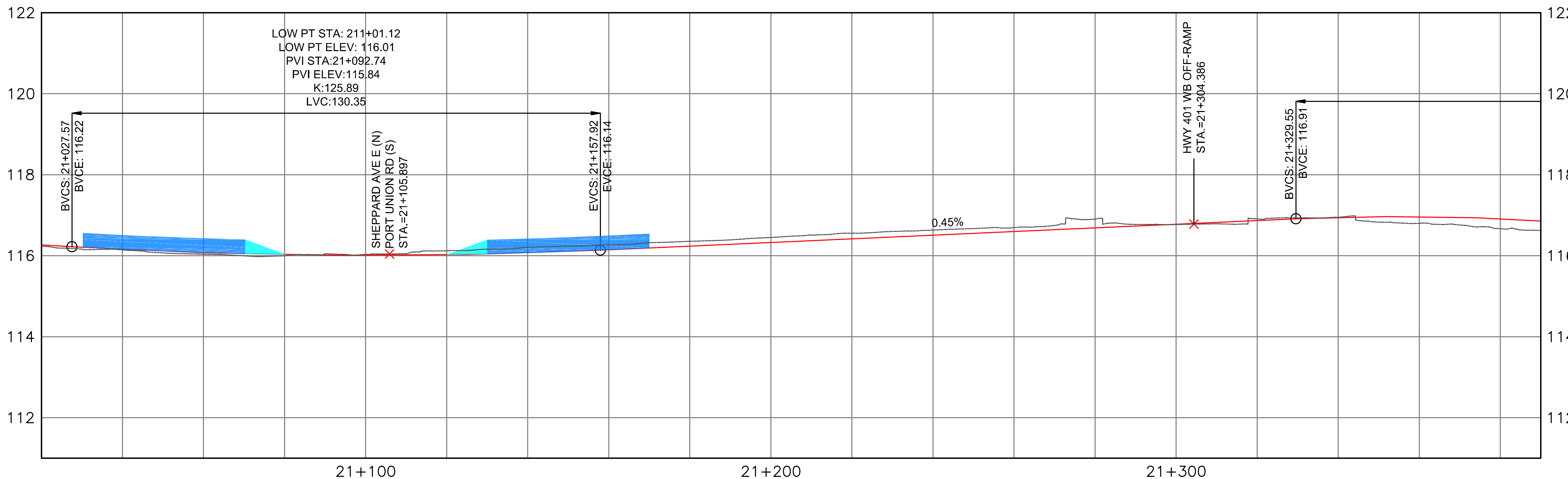

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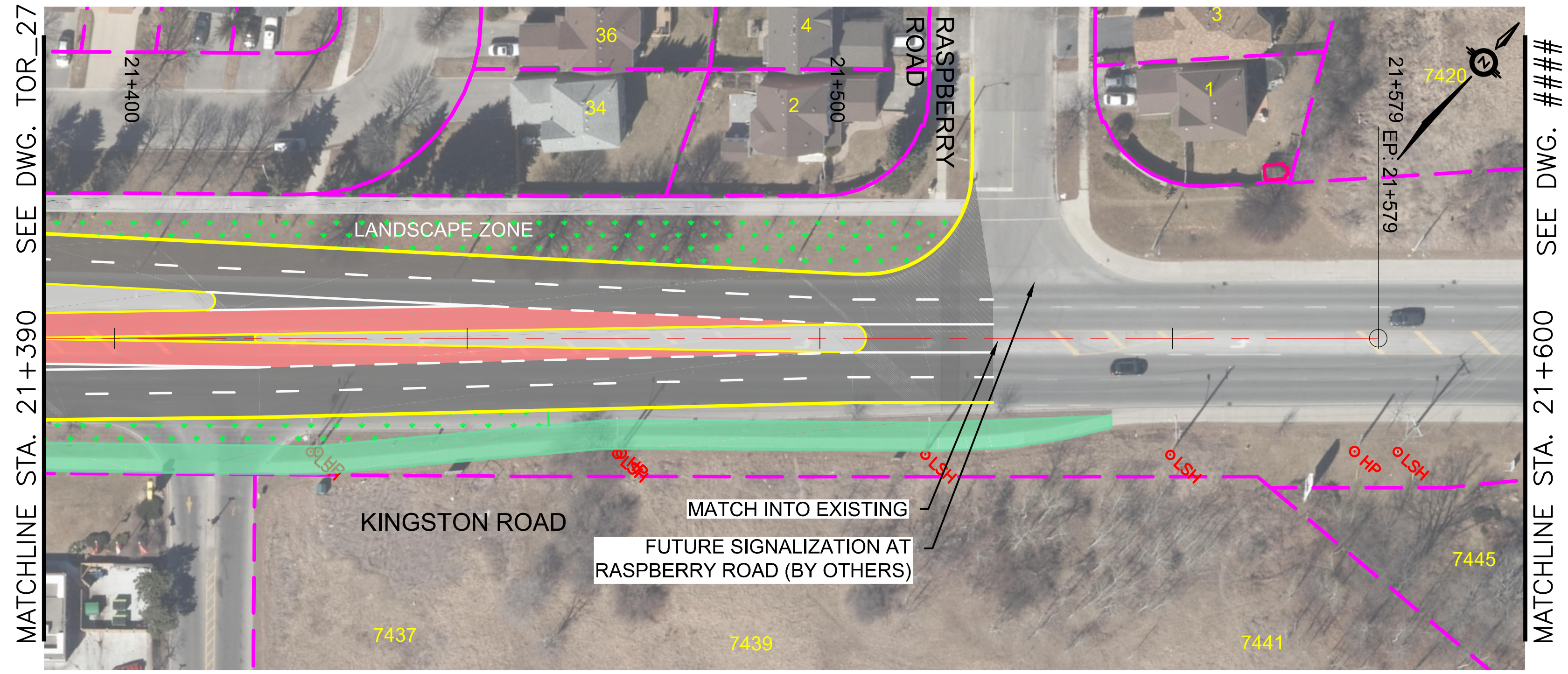

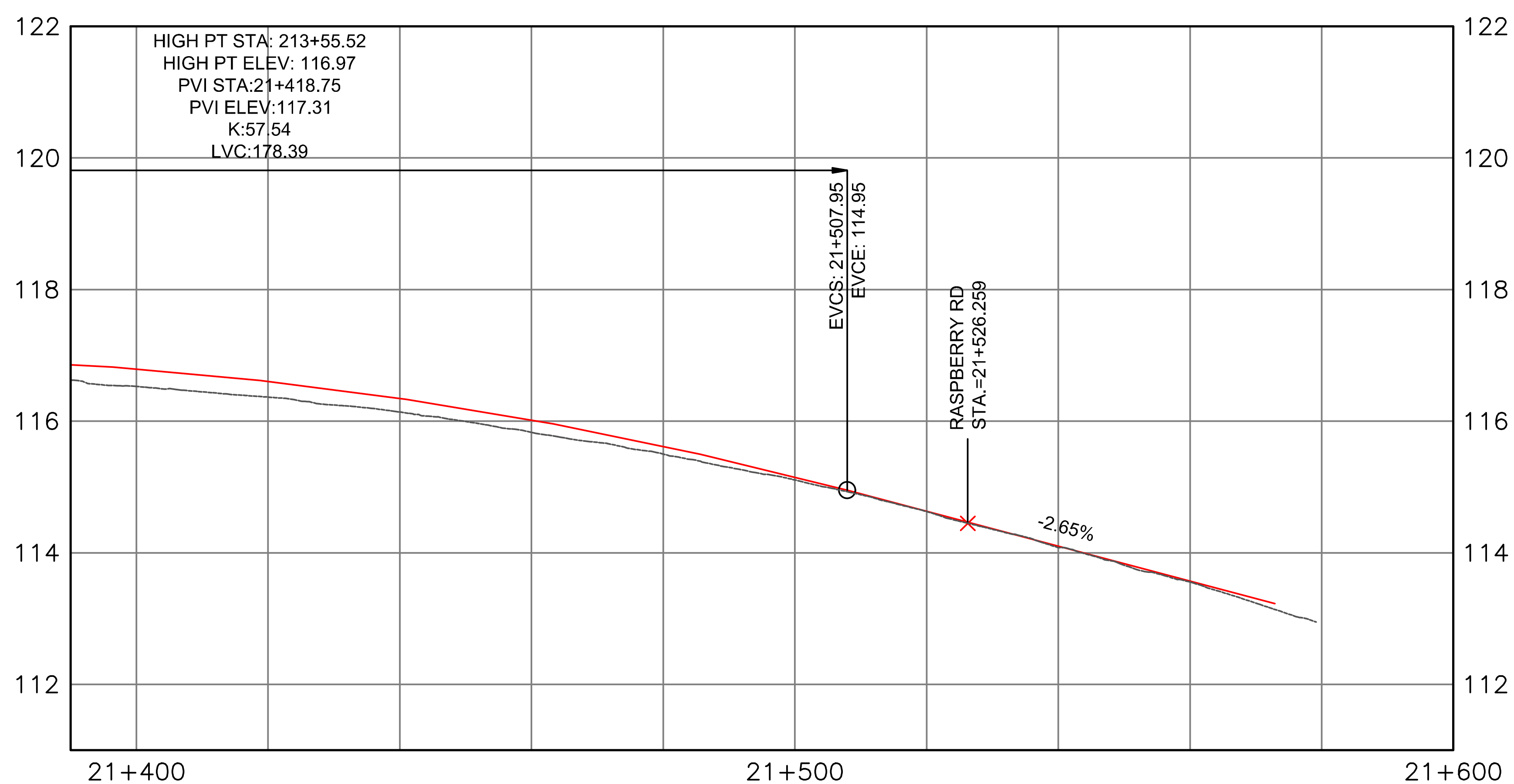

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Durham Region Transit

DURHAM – SCARBOROUGH
Bus Rapid Transit

DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 21+390 TO STA. 21+600

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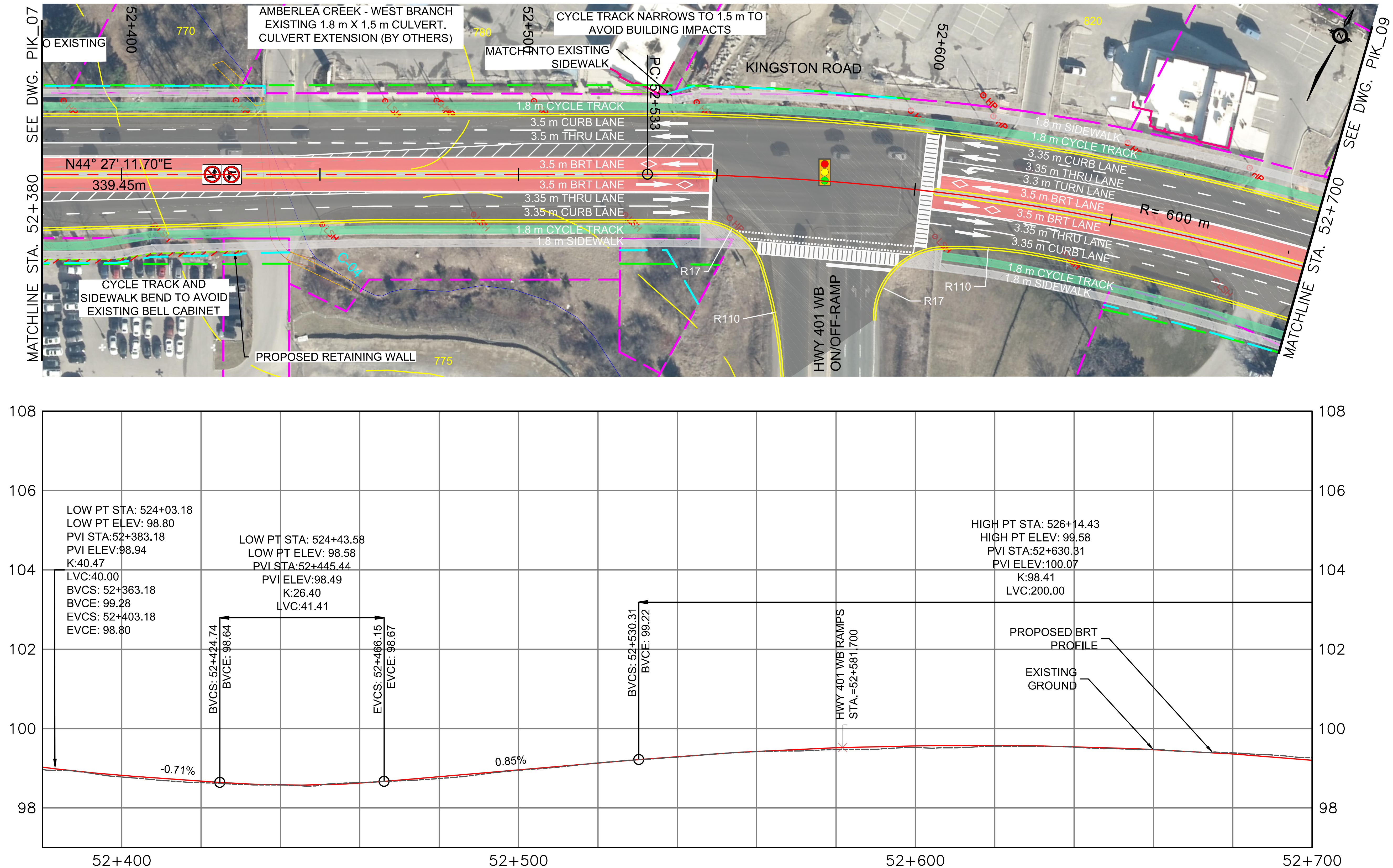

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ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 52+380 TO STA. 52+700

CONTRACT NO.	DWG. NO.	REV.	SHEET
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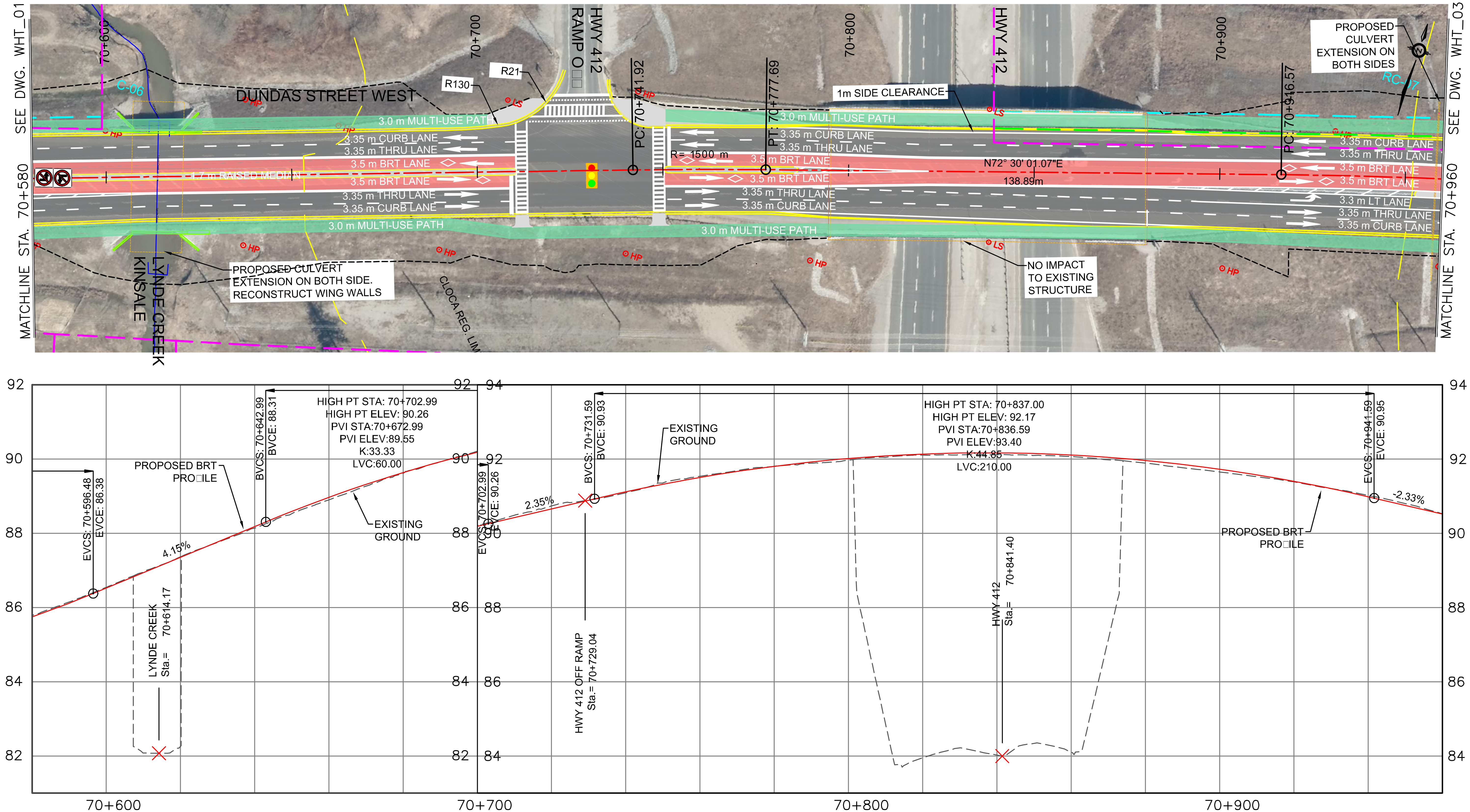

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PLAN AND PROFILE
STA. 70+580 TO STA. 70+960

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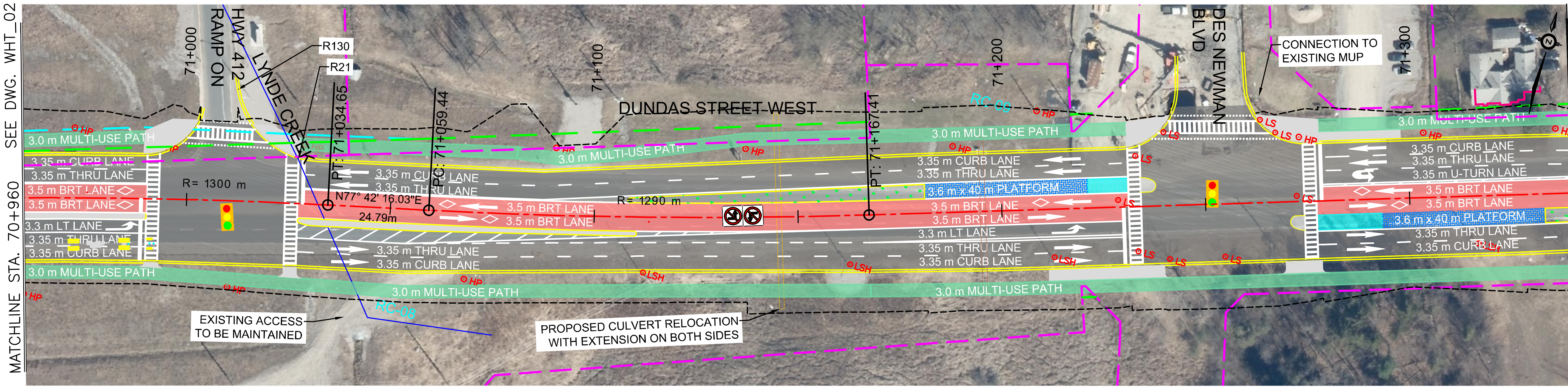

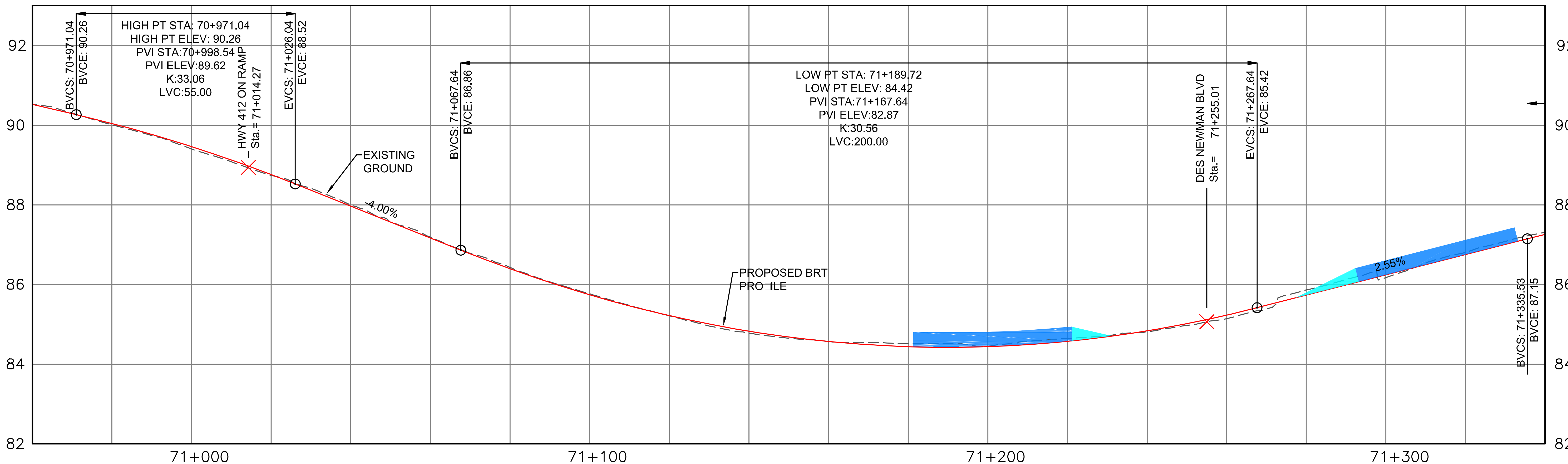

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DURHAM – SCARBOROUGH Bus Rapid Transit

DURHAM–SCARBOROUGH BUS RAPID TRANSIT
ENVIRONMENTAL ASSESSMENT
PLAN AND PROFILE
STA. 70+960 TO STA. 71+340

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IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	August 31, 2021
From	Margaret Parkhill, David Hopper	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
August 26, 2021, 10:00 a.m. to 11:00 p.m.

Present Kristin Demasi, Wilson Taveira, Maria Doyle, Matthew Coelho, Uton Samuels, Metrolinx
Tim Apostolopoulos, Stanley Chan, Les Dzbik, William Francolini, Prashanth Selvakumar, MTO
Andrew Au, Andres Jarrin, City of Toronto
Ragavan Thuraisinganathan, Sam Dinatolo, Nikolaos Papasotiriou, Parsons
Margaret Parkhill, Adrian Chiu, IBI Group

Distribution Meeting invitees and attendees

Item Discussed	Action By
Introduction	
M. Parkhill welcomed attendees and provided an update on the DSBRT project and overview of the interface of DSBRT at 3 MTO jurisdiction areas. The following is a summary of the discussion:	INFO
Previously Circulated/Requested Materials	
• P. Selvakumar asked to confirm the status of the project in Durham Region. M. Parkhill clarified that Durham Region previously received funding to advance portions of the project for detail design and more recently there was a funding announcement for the construction of 7.5 km of dedicated median BRT lanes and bike lanes in Pickering. (https://news.ontario.ca/en/release/1000705/canada-and-ontario-invest-over-1145-million-in-public-transit-infrastructure-for-residents-of-durham)	INFO
• P. Selvakumar noted that MTO has prepared most of the requested information for the project team. P. Selvakumar noted that based on property maps, MTO may not own the road around	

Item Discussed	Action By
the Whites Road Highway 401 On/Off-Ramp. P. Selvakumar will follow up to confirm this.	P. Selvakumar
• P. Selvakumar noted that because the Highway 412 bridges were built during a P3 contract, the drawings are confidential. Metrolinx (K. Demasi) should make a formal request for these drawings.	K. Demasi
• M. Parkhill asked about the timeline on receiving the requested information from MTO. P. Selvakumar responded that the Kingston Road drawings can be sent after the meeting. Whites Road will follow later.	P. Selvakumar
Action Items from Previous July 21st Meeting	
• P. Selvakumar noted that the existing guiderails at the Highway 401 bridge piers along Kingston Road may not meet today's standards. A replacement system may be implemented by MTO at some time in the future. S. Chan noted that if the project is not impacting the existing guiderails, MTO does not expect the Project Team to re-design them. S. Chan also noted that MTO's intention is for the Project Team to be aware that the guiderails may change and may require confirmation during detail design.	INFO
• M. Parkhill asked A. Au if the City of Toronto has reviewed shy distances between the guiderails and transit lane. A. Au responded that after discussing with TTC, they have no issue with the proposed shy distances for the transit lanes along Kingston Road under the Highway 401 bridge.	
Moving Forward	
• M. Parkhill provided a review of the plan forward and asked MTO staff to confirm if there will be any issues with proceeding to TPAP.	
• P. Selvakumar noted that the design at Kingston Road and Highway 401 is close to resolution. The area at Highway 412 will require further discussions. M. Parkhill will arrange a separate follow-up meeting for Highway 412.	M. Parkhill
• P. Selvakumar also noted the area around the Whites Road Highway 401 Ramp may be simplified from MTO's perspective as they do not own the road.	
Kingston Road and Highway 401 – Existing Conditions	
• M. Parkhill provided an overview of the existing conditions at Kingston Road and Highway 401.	
• P. Selvakumar noted that based off MTO's drawings the minimum existing lane width is 3.66 m. M. Parkhill noted that the existing lane widths were measured off the survey. Once MTO provides design drawings or design criteria, the project team can update.	R. Thuraisinganathan

Item Discussed	Action By
• S. Chan asked if the approach at this area intends for the posted speed to be lowered. M. Parkhill responded that the project team is working with the City to propose a lower posted speed of 50 km/h and a design speed of 70 km/h along this segment.	
• A. Jarrin noted that there has been some review along this area as part of Vision Zero. Based off collision history a lower posted speed may be warranted. However any lowering of the posted/design speed would need to be approved by City of Toronto Transportation Services Senior Management and City Council. This process will take time.	
• A. Jarrin noted that the design speed along this segment should not be based solely on the posted speed. The design speed should be reviewed from a multi-faceted approach, considering pedestrian safety, increased activity from BRT implementation, etc. P. Selvakumar noted that MTO would need the justification/ documentation for reducing the design speed below 80km/h.	
• A. Jarrin noted that there have been previous instances of Toronto reducing posted speed without changing the design speed, but there are also several instances of the design speed to be reduced to 10 km/h above the posted speed. P. Selvakumar responded that generally, each area is evaluated on a case-by-case basis using engineering judgement rather than a precedent set by other projects. S. Dinatolo noted that the Project Team will review the existing MTO design criteria at this segment.	R. Thuraisinganathan
• M. Parkhill noted the project team will review factors such as collision history and traffic volumes to provide further justification of reducing the design speed without reducing the posted speed.	
• P. Selvakumar noted that if posted speed is reduced on Kingston Road, the reduction should apply east and west of ramps / MTO section. M. Parkhill clarified that the posted speed along Kingston west of Ellesmere is currently posted at 50 km/h. A. Chiu also noted that the posted speed along the Ellesmere section of the design is also 50 km/h.	
Kingston Road and Highway 401 – Proposed Design	
• **South side active transportation path:** the proposed design includes a 4.0 m multi-use path to provide shy distances and safe operations for cyclists moving in both directions.	
– P. Selvakumar will discuss the 4.0 m multi-use path and resulting change to the south side slope with MTO's structural team.	P. Selvakumar
– A. Jarrin noted that the minimum clearway of the multi-use path would be 3.0 m. Cyclists need lateral clearance from the bridge abutment vertical wall. A. Jarrin also requested that if	

Item Discussed	Action By
further adjustments to the road or lane widths are needed, that the multi-use path width not be reduced.	
• **Centre piers and guiderail**: the proposed design includes a shy distance of 0.8 m to 1.5 m from the existing guiderail. The DSBRT project will not impact the centre piers and existing guiderail.	
– W. Taveira noted that the project team could highlight that the shy distance from the existing guiderails would be from the transit lanes and not a general traffic lane as additional justification.	
• Design criteria:	
– S. Chan requested that the design criteria show the design speed for design standards.	
– R. Thuraisinganathan clarified that the functional classification of Kingston Road is a 4-lane divided roadway.	
– R. Thuraisinganathan asked if the design criteria's justification of keeping the functional classification of the project as a 4-lane divided roadway is acceptable to MTO. S. Chan responded that MTO will review.	S. Chan
– M. Parkhill noted that the project team will review each element of the roadway to evaluate where a design speed of 80 km/h is not met and prepare justification.	
• Rationale: P. Selvakumar requested the design criteria should consider three cases for each road element:	
– Existing road meets standard and BRT will not meet standard	R. Thuraisinganathan
– Existing road does not meet standard and BRT will or will not meet standard (goal is to improve roads to current standards)	
– Existing road meets standard and BRT will meet standard, reduced from existing condition (explain why)	
3-Step Cycling Process	
• M. Parkhill asked if MTO has any comments on the previously circulated 3-Step Cycling Facility Selection Process Memo. P. Selvakumar responded that MTO will provide comments on the memo.	P. Selvakumar
• P. Selvakumar recommended showing the Step 1 nomograph as well as additional justification from the memo when presenting to MTO Senior Management.	M. Parkhill
• P. Selvakumar noted that with the closure of the Highway 401 on-ramp that a crossing over the remaining access provide more visibility to cyclists. M. Parkhill clarified that the design proposes	

Item Discussed	Action By
a sidewalk on the north side and cyclists would use the south-side path.	
Highway 401 On-Ramp Access and MTO Carpool Parking Lot	
• M. Parkhill provided an overview of available travel paths and demand as a result of the closure for the eastbound access to the Highway 401 On- Ramp near Rylander Blvd.	
• P. Selvakumar asked if the demand presented is based on 2041 volumes. M. Parkhill confirmed that they are.	
• P. Selvakumar noted that MTO is concerned with potential complaints from drivers as a result of this closure. Travel distances and travel times are important considerations.	M. Parkhill
• P. Selvakumar requested that swept path analysis be done at the Rylander Blvd intersection to review u-turning vehicles while drivers turn right off Rylander.	A. Chiu
Next Steps	
• M. Parkhill asked if Senior Management should be provided a slide deck of findings or the circulated documents (e.g., design criteria). P. Selvakumar responded that the design criteria will be circulated to Senior Management to review.	
• P. Selvakumar noted that MTO previously had comments on swept path analysis at the on/off-ramp and asked if those comments have been addressed. M. Parkhill responded that updated swept paths were circulated by email on July 30. P. Selvakumar noted MTO will follow up with comments.	P. Selvakumar
• W. Taveira requested that MTO provide specifics for draft PHM-125 drawings. P. Selvakumar responded that MTO will provide specific requests.	P. Selvakumar

Please advise of any errors or omissions to Margaret Parkhill by September 10, 2021.

Durham-Scarborough Bus Rapid Transit

METROLINX

MTO

AUGUST 26, 2021

Purpose

- To review actions arising from previous meeting

- To receive comments from MTO on the Durham-Scarborough Bus Rapid Transit project

- To request MTO staff advice ahead of meeting with MTO Senior Management

Materials circulated

- July 20:
  - Responses to MTO comments received May 17, 2021
  - Responses to MTO comments received June 18, 2021
  - DSBRT project design criteria
  - Design Exceptions memo
- July 30:
  - Plan & Profile of DSBRT preliminary design in MTO jurisdiction
  - Traffic memo for Kingston Road at Highway 401
  - Meeting summary and slide deck from July 21
- August 13:
  - DSBRT design criteria in MTO format
  - 3-step cycling facility selection memo

Input requested from MTO:

Kingston Road @ Highway 401

- Drawings/Plans for the Highway 401 off-ramp reconfiguration currently underway by MTO, including the 3 ramp terminal intersections
- Drawings showing the MTO ROW limits, jurisdiction, and control areas
- Existing PHM-125 drawings
- MTO design criteria for this interchange area along with any documented design criteria exemptions

Kingston Road @ Whites Road Highway 401 Ramp

- Drawings showing the MTO ROW limits, jurisdiction, and control areas
- Existing PHM-125 drawings
- MTO design criteria for this intersection area along with any documented design criteria exemptions

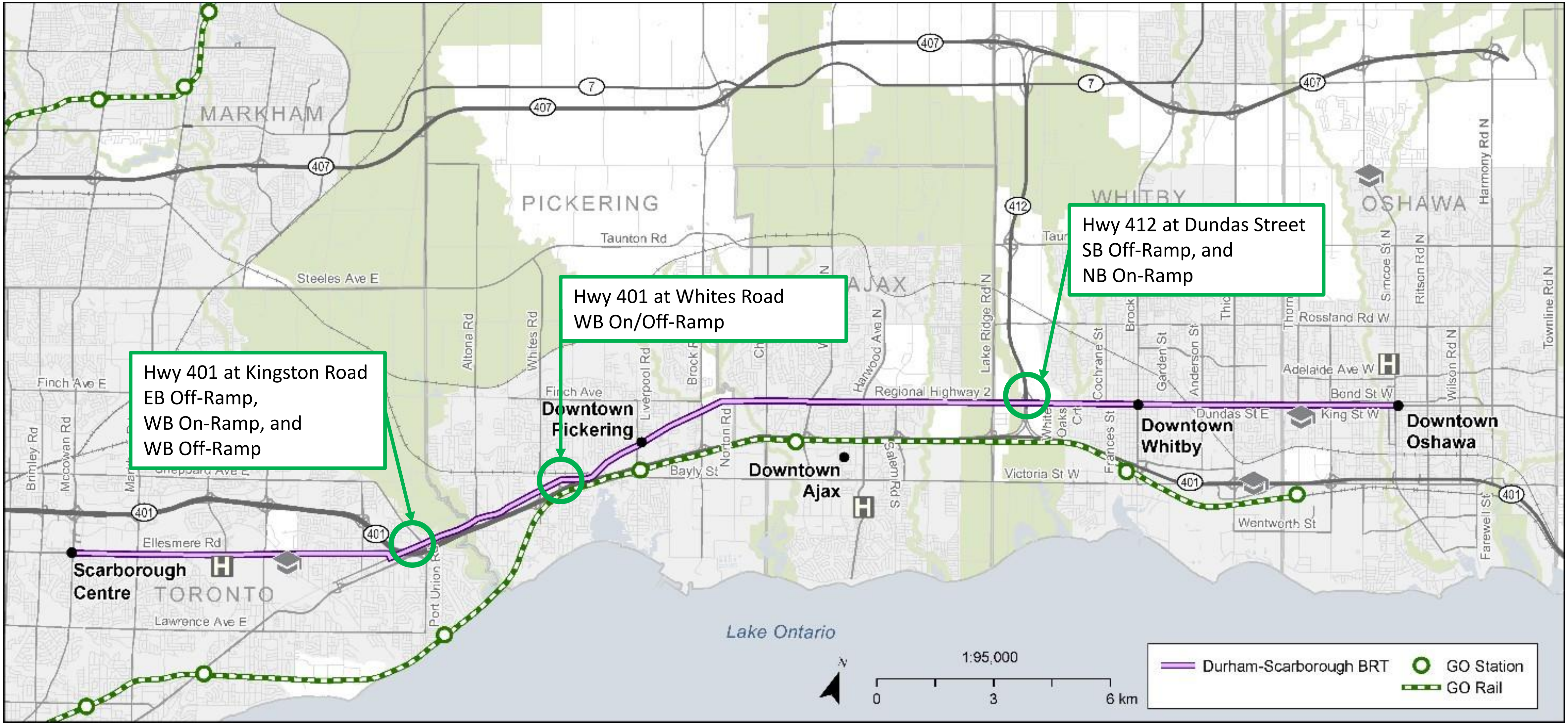
Dundas Street W @ Highway 412

- Drawings showing the MTO ROW limits, jurisdiction, and control areas
- As-built drawings and inspection reports for the Highway 412 bridge – design drawings were previously provided
- MTO design criteria for this interchange area along with any documented design criteria exemptions

Actions arising from July 23, 2021

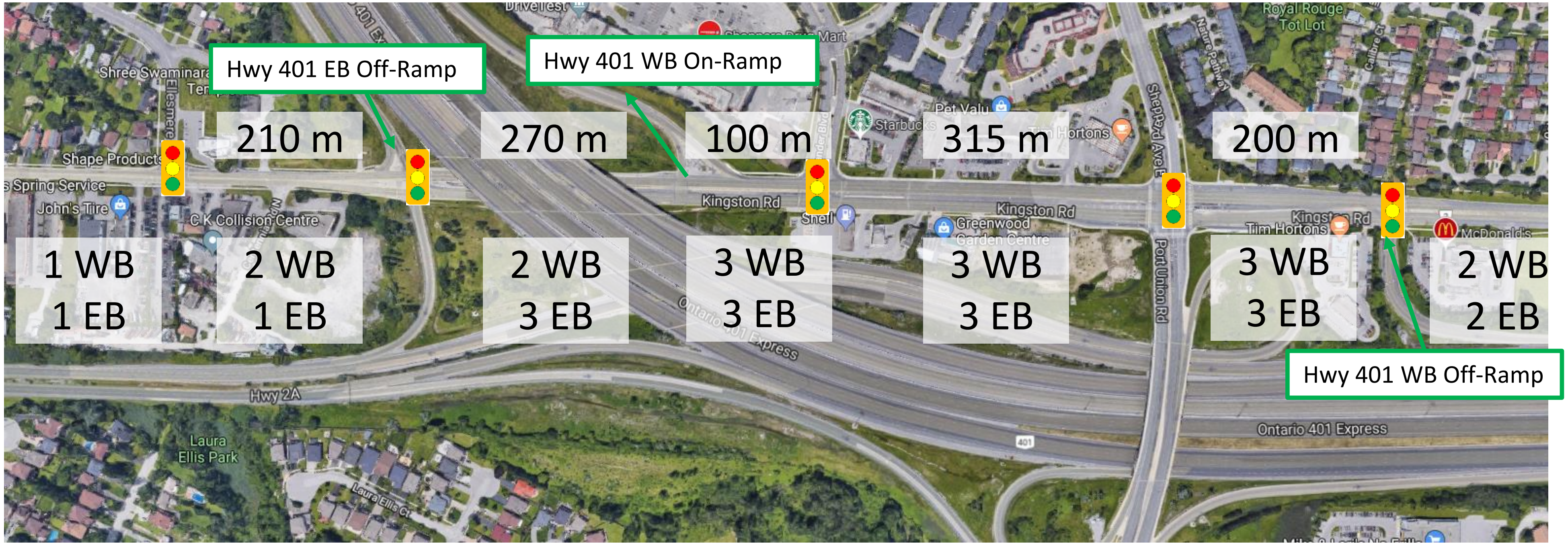
- Refer to meeting summary

Study Area


Hwy 401 at Kingston Road
EB Off-Ramp,
WB On-Ramp, and
WB Off-Ramp
Hwy 401 at Whites Road
WB On/Off-Ramp
Hwy 412 at Dundas Street
SB Off-Ramp, and
NB On-Ramp
MARKHAM
PICKERING
AJAX
WHITBY
OSHAWA
TORONTO
Scarborough
Centre
Downtown
Pickering
Downtown
Ajax
Downtown
Whitby
Downtown
Oshawa
Lake Ontario
Steeles Ave E
Taunton Rd
Finch Ave E
Finch Ave
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Wentworth St
Rossland Rd W
Adelaide Ave W
Bond St W
King St W
Dundas St E
Altona Rd
Whites Rd
Liverpool Rd
Port Union Rd
Lake Ridge Rd N
Harmony Rd N
Townline Rd N
Simcoe St N
Ritson Rd N
Wilson Rd N
Farewell St
Brimley Rd
Mccowan Rd
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

Kingston Road under Highway 401: Ellesmere Road to east of Port Union Road **(Existing)**

- 4-lane Divided Urban Road
- Existing posted speed: 60 km/h
- Existing lane widths: varies 3.6 to 4.2 m
- 5 signalized intersections
- Average spacing 220 m



Kingston Road existing configuration:

- Two-lanes (one-lane in each direction) west of Ellesmere Road
- Three to six-lanes between Ellesmere Road and the Hwy 401 WB Off-ramp
- Four-lanes (two-lanes in each direction) east of the Hwy 401 WB Off-ramp

Kingston Road under Highway 401: Design Speed (1 of 2)

- Current Posted Speed: 60 km/h
- Current Design Speed: 80 km/h
- Required min. lane width: 3.75 m
- Existing min. lane width: 3.6 m

- Significant physical constraints under the bridge
- Cost to widen the bridge would be cost-prohibitive to DSBRT project
- Existing roadway does not meet 80 km/h design speed

"Lane widths for 4-lane divided roads for design speed ≥ 80 km/h should be 3.75 m while 3.5 m width should be used for design speed less than 80 km/h."
(TAC GDG for Canadian Roads – MTO Design Supplement April 2020)

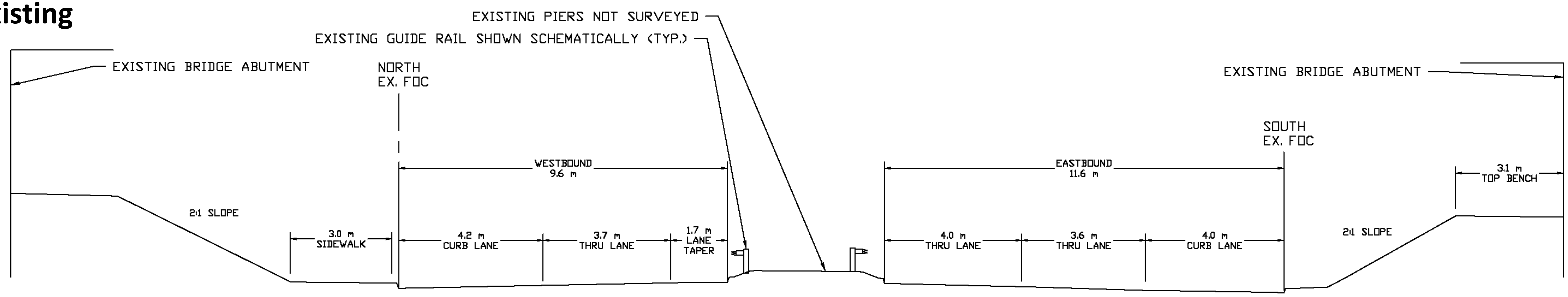
Kingston Road under Highway 401: Design Speed (2 of 2)

- Given significant constraints of the existing bridges, existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
    - **Design speed of 70 km/h is recommended for Kingston Road from Ellesmere Road to east of the Hwy 401 WB Off-ramp**

- Metrolinx in discussion with City of Toronto to reduce posted speed to 50 km/h
    - City of Toronto Vision Zero Speed Reduction Plan

Kingston Road under Highway 401: Bridge Cross-section

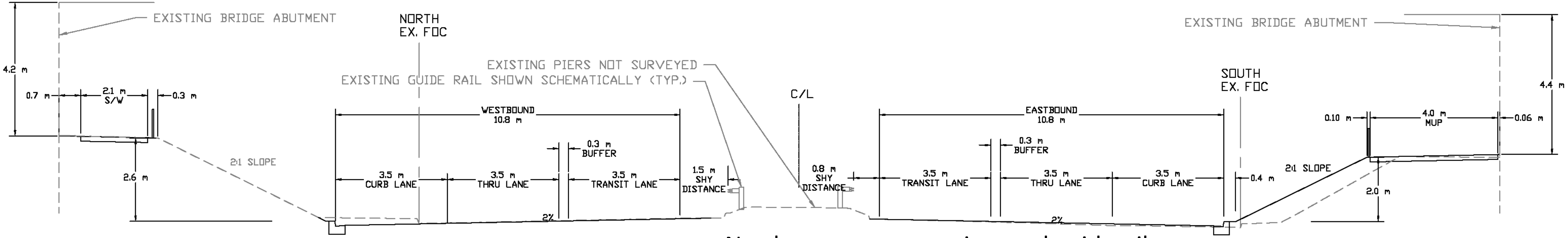
Existing



Proposed

North

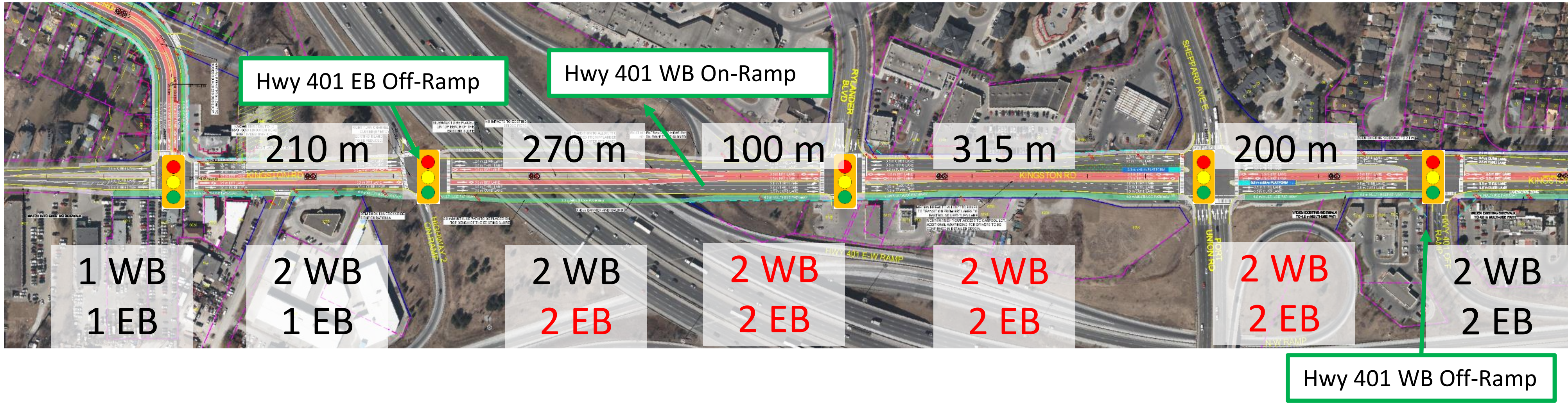
South



- No change to centre piers and guiderails
- No cut around existing bridge foundations
- New shared use AT path (south) and sidewalk (north) on top bench of existing bridge slopes

Kingston Road under Highway 401: Ellesmere Road to east of Port Union Road **(Proposed)**

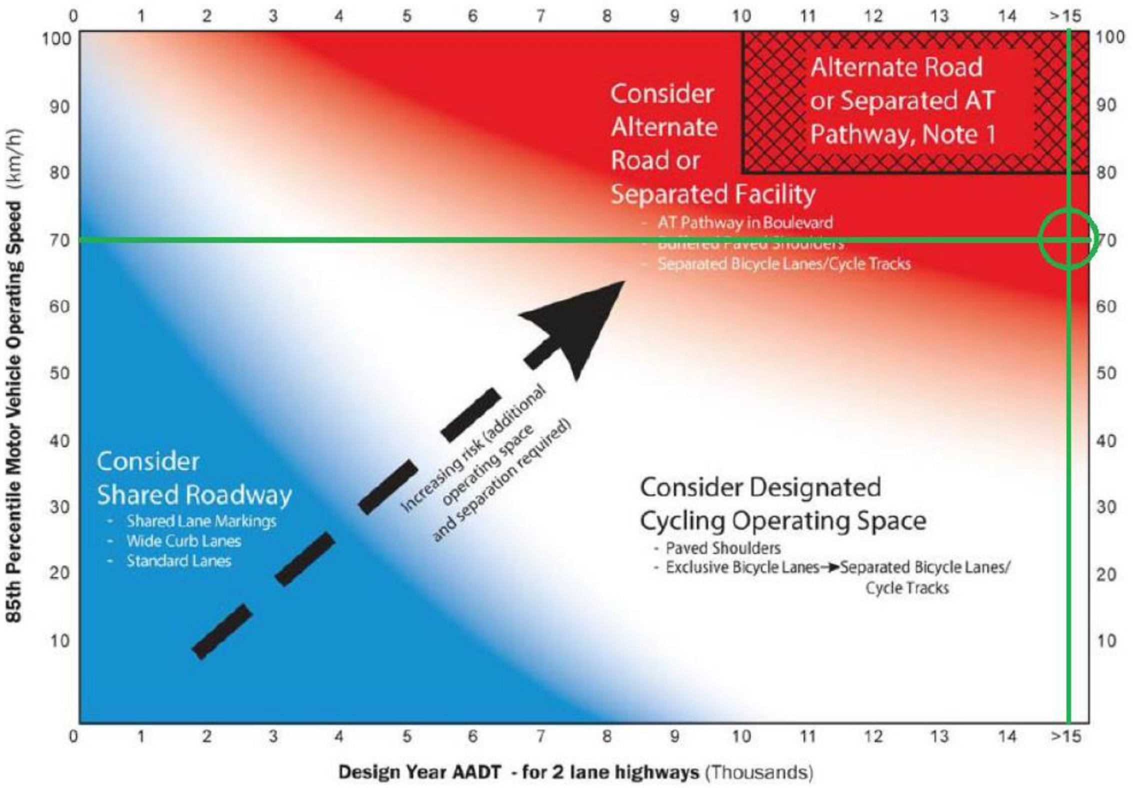
- 4-lane Divided Urban Road
- Proposed posted speed: 50 km/h
- Proposed lane widths: 3.5 m



Kingston Road with BRT configuration:

- Two-lanes (one-lane in each direction) west of Ellesmere Road
- Four-lanes (two-lanes in each direction) from Ellesmere Road to east of the Hwy 401 WB Off-ramp
- Widen / convert existing lanes to centre-median transit-only lanes with a raised curb median island

Kingston Road: Cycling Facility Type Selection



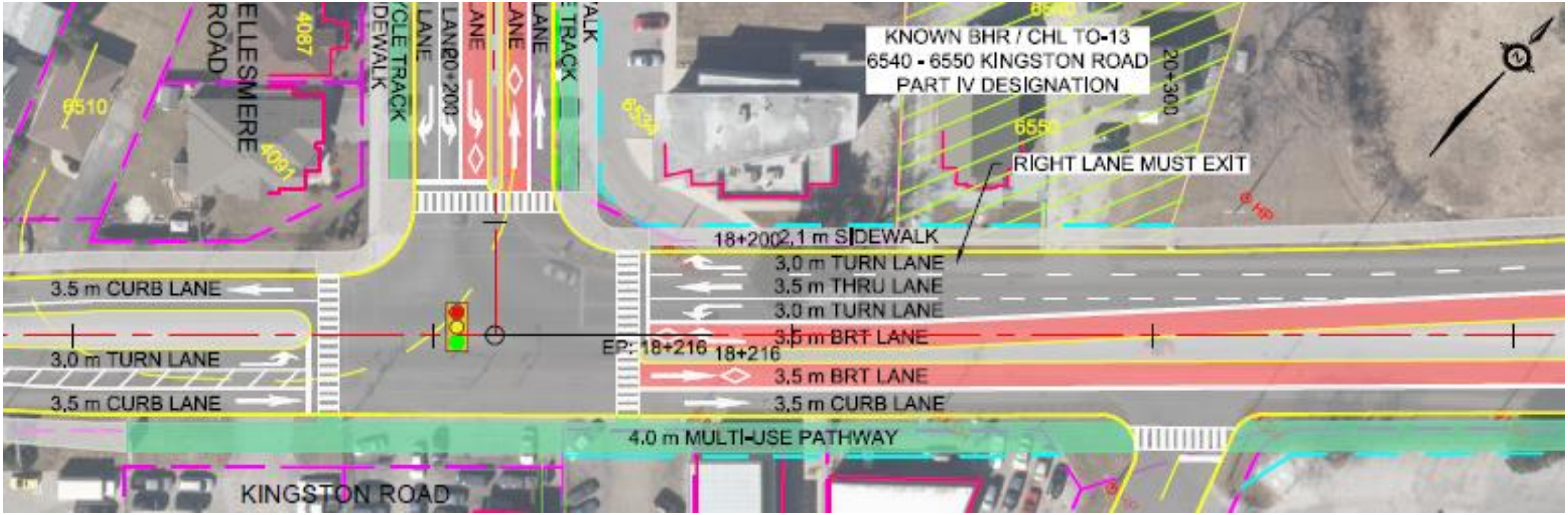
Outcome of Step 1:
"Consider Alternate Road or Separated Facility"

- One-way active transportation paths with sidewalks on both sides would be preferred for consistency
- Underpass is major constraint to providing continuous cycling facilities on both sides
- Widening underpass would be cost-prohibitive to overall DSBRT project
- Conflict zones on north side with free-flow ramp
- **Two-way in-boulevard active transportation path along the south side is recommended, with a sidewalk on the north side**

Kingston Road eastbound towards Highway 401 bridge

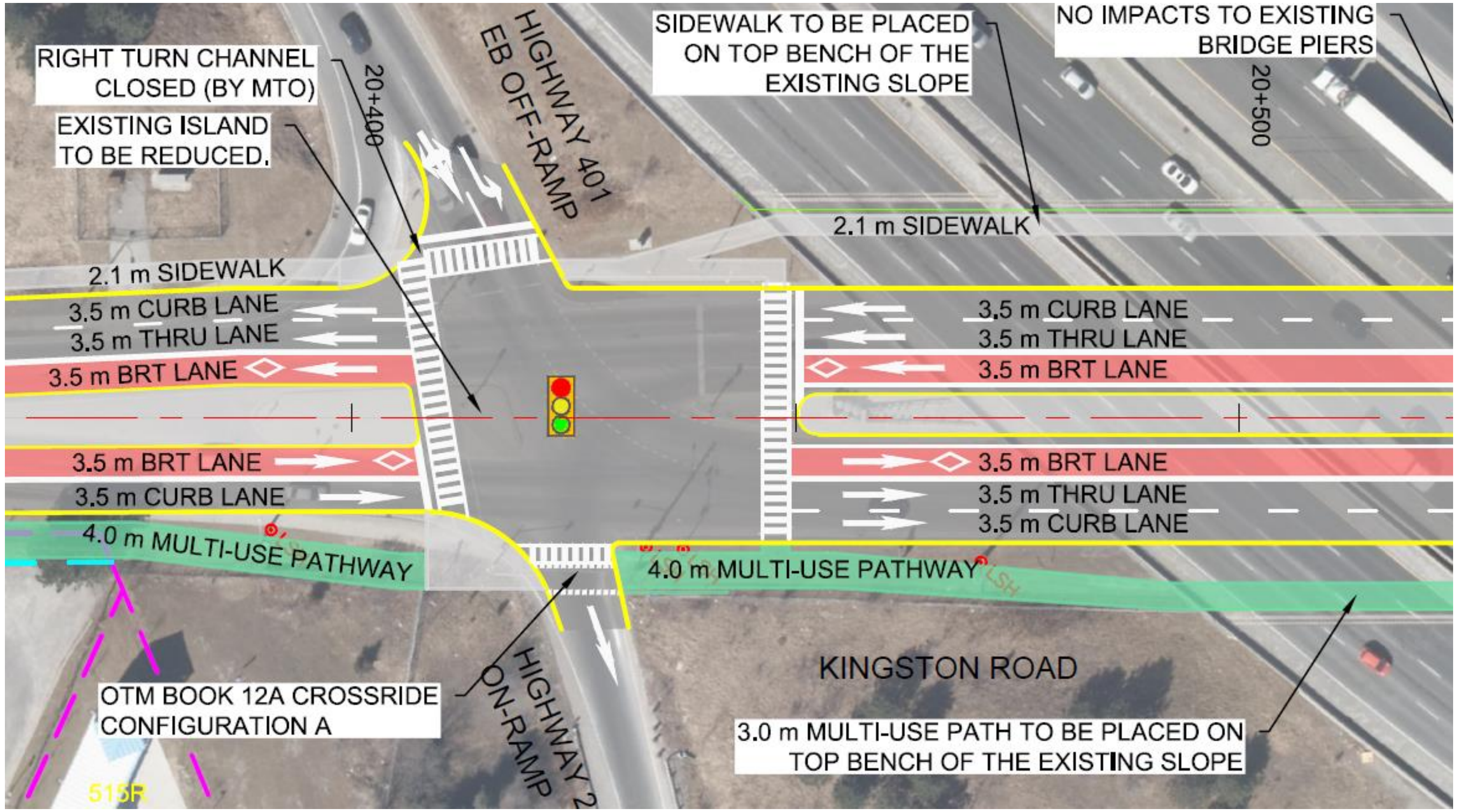
Ellesmere and Kingston Road Intersection (west of bridge)

- WB right-turn lane to avoid traffic queues extending to Hwy 401 EB Off-Ramp intersection
- As existing, WB right-turn lane will operate as “right lane must exit”
- Impacts to an existing heritage property (no building impacts) require Heritage Impact Assessment.



Highway 401 EB Off-Ramp Intersection (west of bridge)

- Existing WB left-turn lane onto Municipal Hwy 2 On-Ramp to be converted to WB BRT lane.
- WB traffic will access Hwy 2 by continuing along Kingston Road as agreed with the City of Toronto.
- Highway 401 Eastbound Off-Ramp lane configuration to match current MTO design (currently under construction).

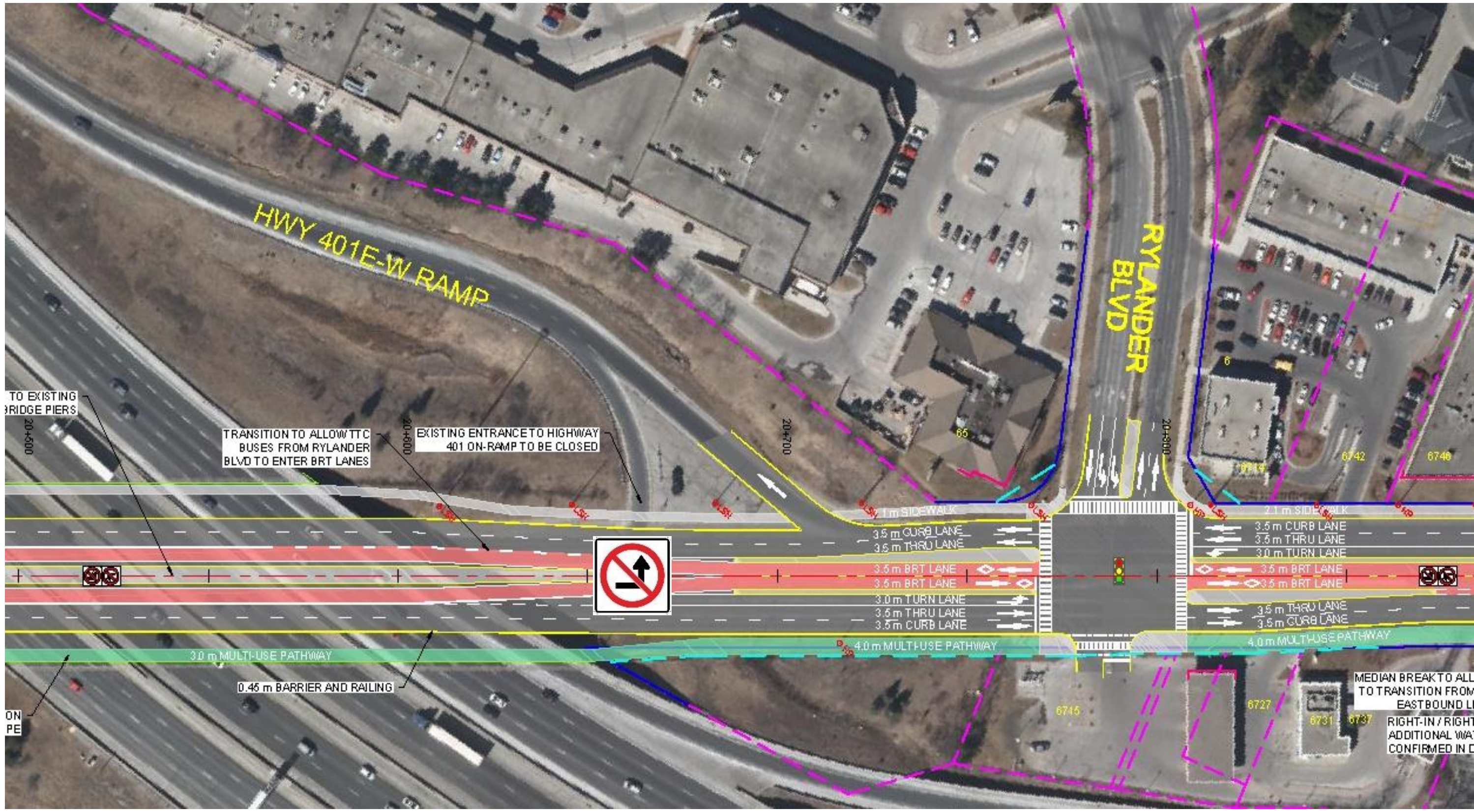


Eastbound Access to Hwy 401 Westbound (east of bridge) (1 of 2)

- 6-lane cross-section with centre-median bus lanes.
- Raised curb island will prevent mid-block left-turns, including eastbound left from Kingston Road to Hwy 401 WB.

Movement	AM Peak (vph)	PM Peak (vph)
EBL to Hwy 401 WB On-Ramp	30	240

- EB traffic can access Hwy 401 WB by U-turning at the signalized Rylander Blvd intersection with minimal inconvenience.
- WB traffic can access Hwy 401 WB by right-in free-flow on-ramp (match existing)

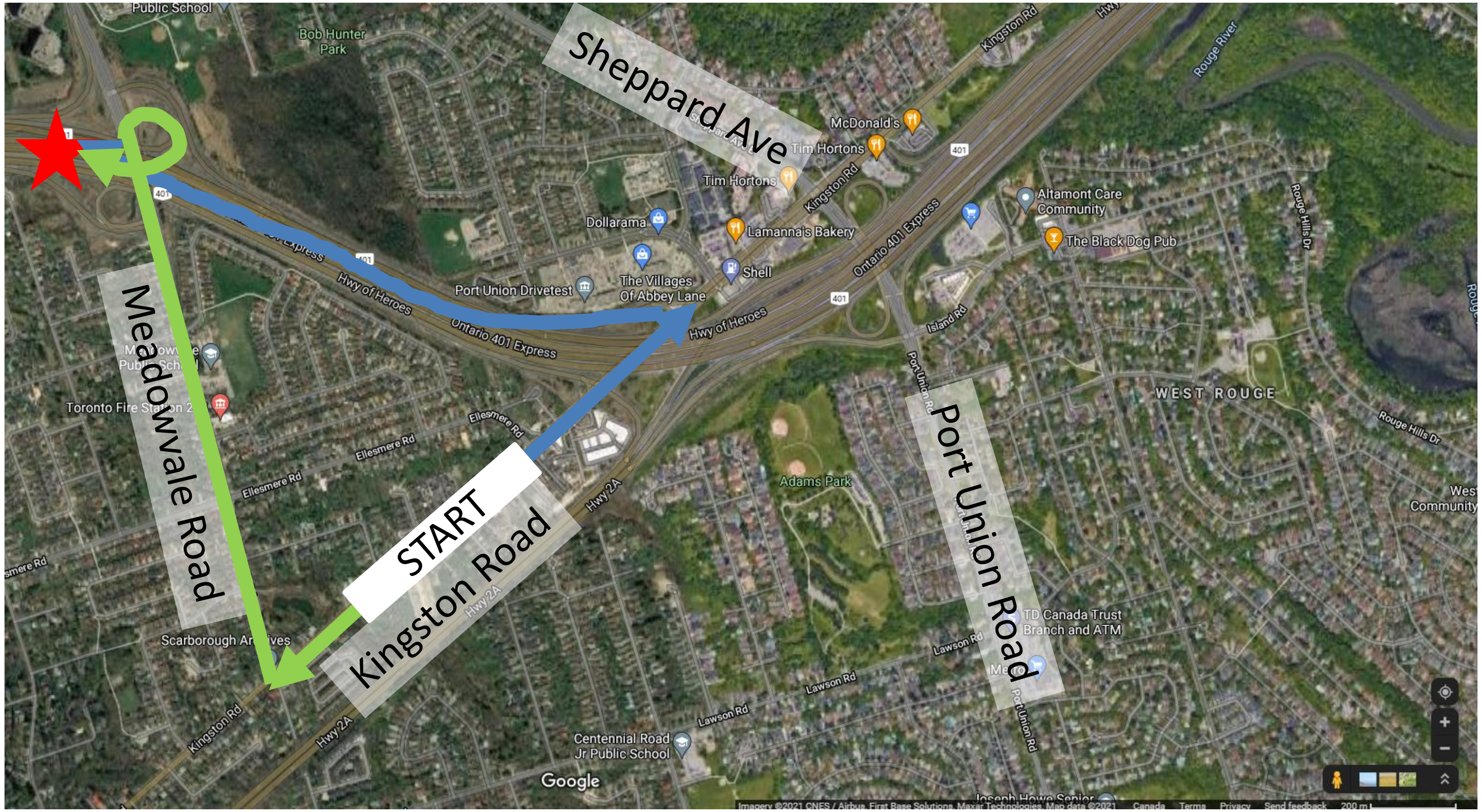


Eastbound Access to Hwy 401 Westbound (east of bridge) (2 of 2)

- EB traffic can also access Hwy 401 WB via Meadowvale Road.
- Minimal inconvenience for drivers given the alternate routing is similar length
  - Start to Finish is 2 to 2.5 km

Movement	AM Peak (vph)	PM Peak (vph)
EBL to Hwy 401 WB On-Ramp	30	240

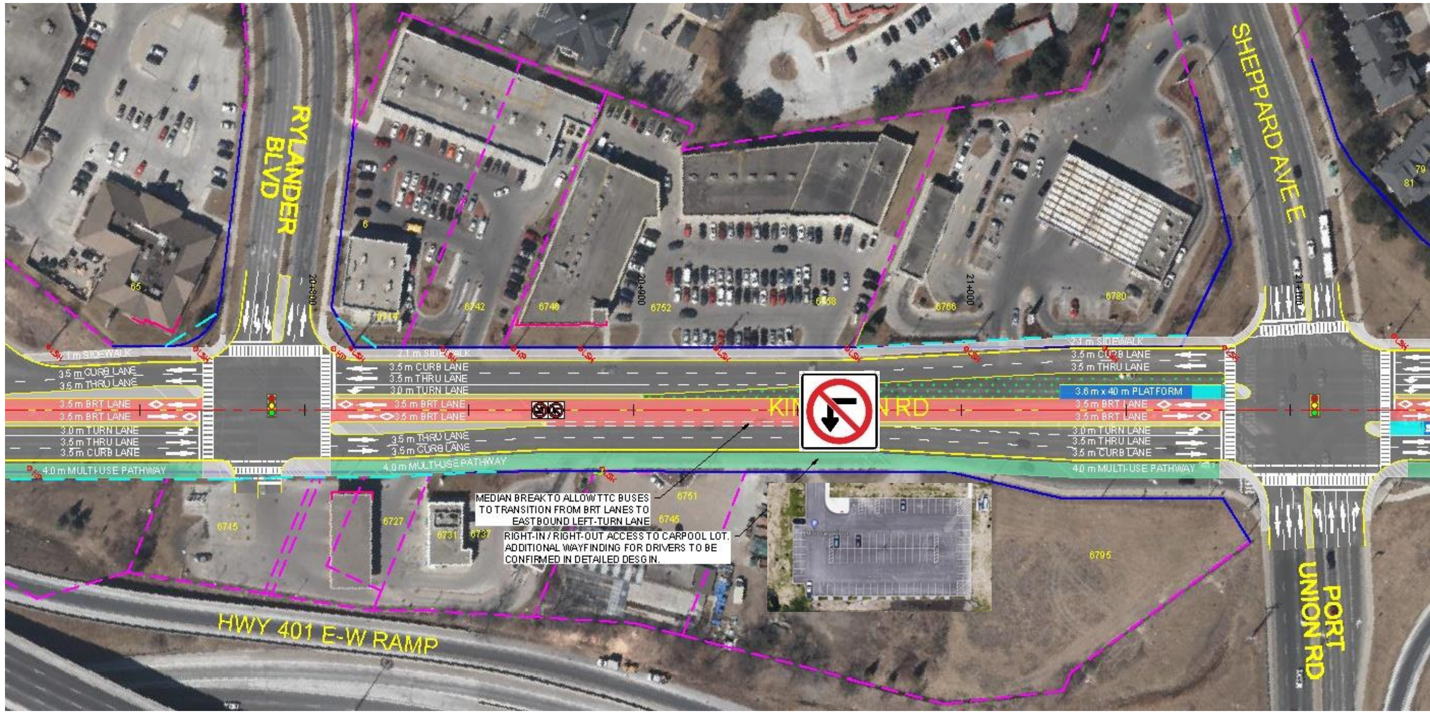
- Existing hourly volume using NB Meadowvale to Highway 401 WB ramps peaks at 190 vehicles at 12:00 p.m.
- Maximum demand of ~ 430 vph (190 + 240) at NB Meadowvale loop on-ramp can be accommodated



MTO Carpool Lot Access (west of Sheppard Ave)

- 6-lane cross-section with centre-median bus lanes.
- Raised curb island will prevent mid-block left-turns, including westbound left from Kingston Road to MTO carpool lot.

- WB traffic can access the carpool lot by U-turning at the signalized Rylander Blvd intersection with minimal inconvenience.



DURHAM – SCARBOROUGH

Bus Rapid Transit

Appendix K4.1 - Review Agencies Meetings and Correspondence (During TPAP)

Prepared for Metrolinx
by IBI Group & Parsons

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Design Criteria Discussion with MTO

IBI

PARSONS

November 3, 2021

Agenda

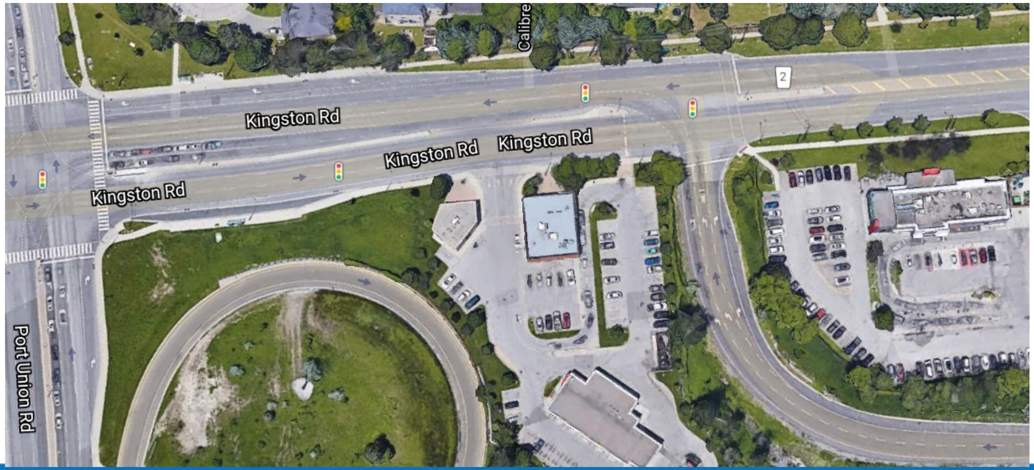
1. Locations
2. Seeking Exemptions from MTO
3. Intersections
4. Typical Road Cross Sections
5. Operational Performance
6. Data to be Received

1. Locations

1. Kingston Road from east of Ellesmere Road to Rylander Boulevard, 576m in length, and 45m east and west of Highway 401 E-N/S off ramp, 90m in length in Toronto.
2. Kingston Road 45m east and west of Highway 401 on/off ramps east of Whites Road / Kingston Road, 90m in length, in Pickering.
3. Dundas Street from Highway 412 off-ramp to Highway 412 on-ramp, 364m in length, in Whitby.

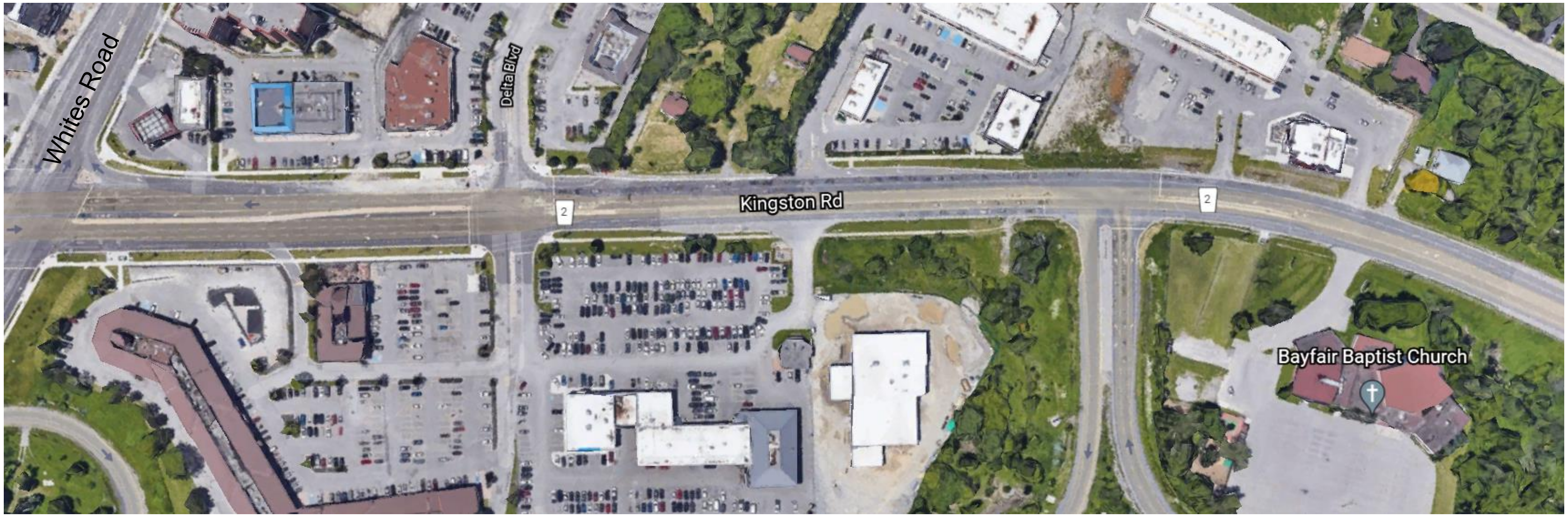
1. Locations

1. Kingston Road from east of Ellesmere Road to Rylander Boulevard, 576m in length, and 45m east and west of Highway 401 E-N/S off ramp, 90m in length.



1. Locations

2. Kingston Road 45m east and west of Highway 401 on/off ramps east of Whites Road / Kingston Road, 90m in length.



1. Locations

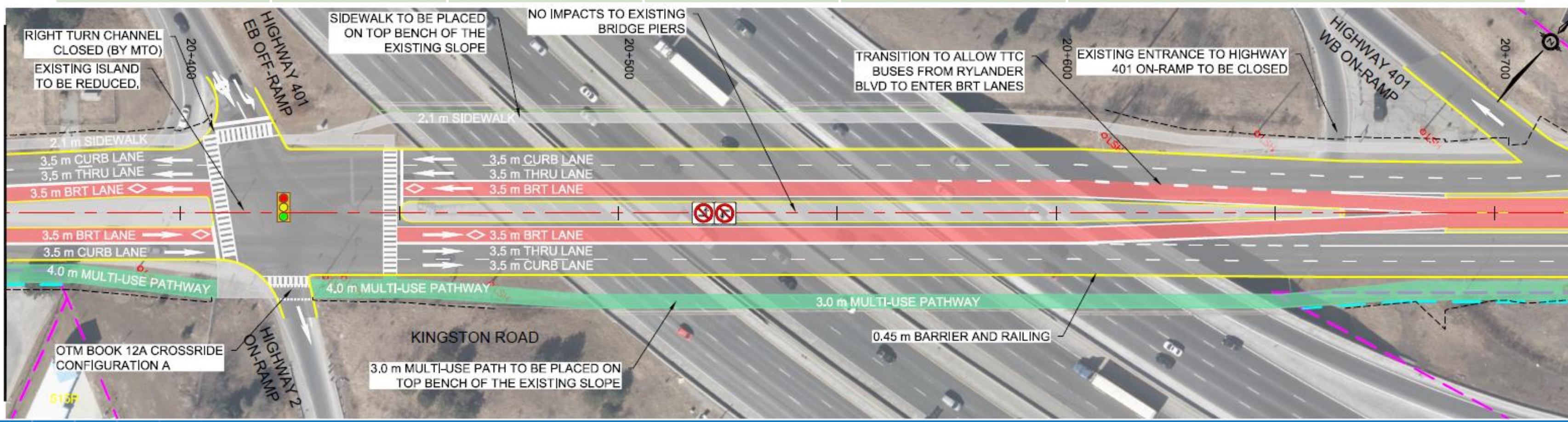
3. Dundas Street from Highway 412 off-ramp to Highway 412 on-ramp, 364m in length.

2. Seeking Exemptions from MTO

1. Reduction in design speed from 80 to 70 km/h on Kingston Road

Kingston Road:

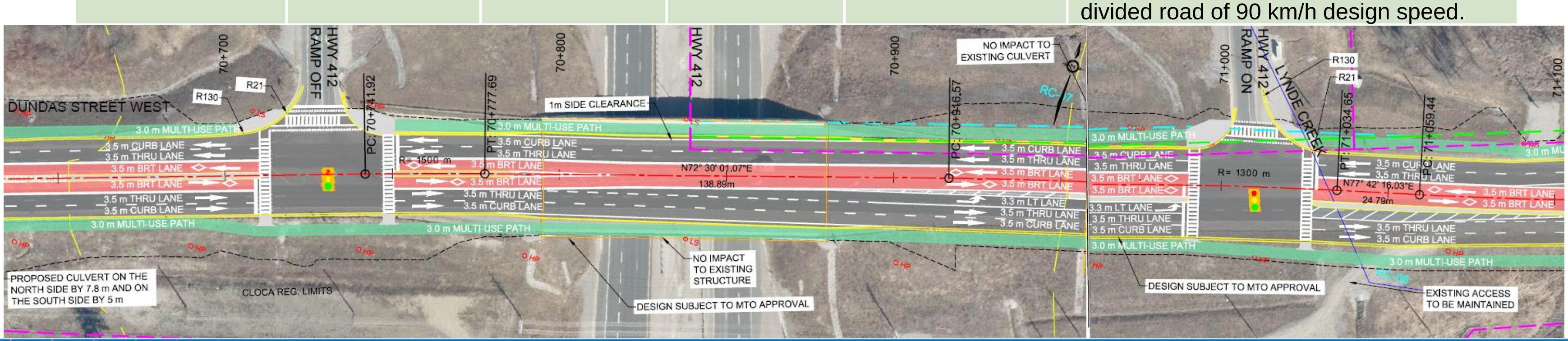
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed (km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers.



2. Seeking Exemptions from MTO

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

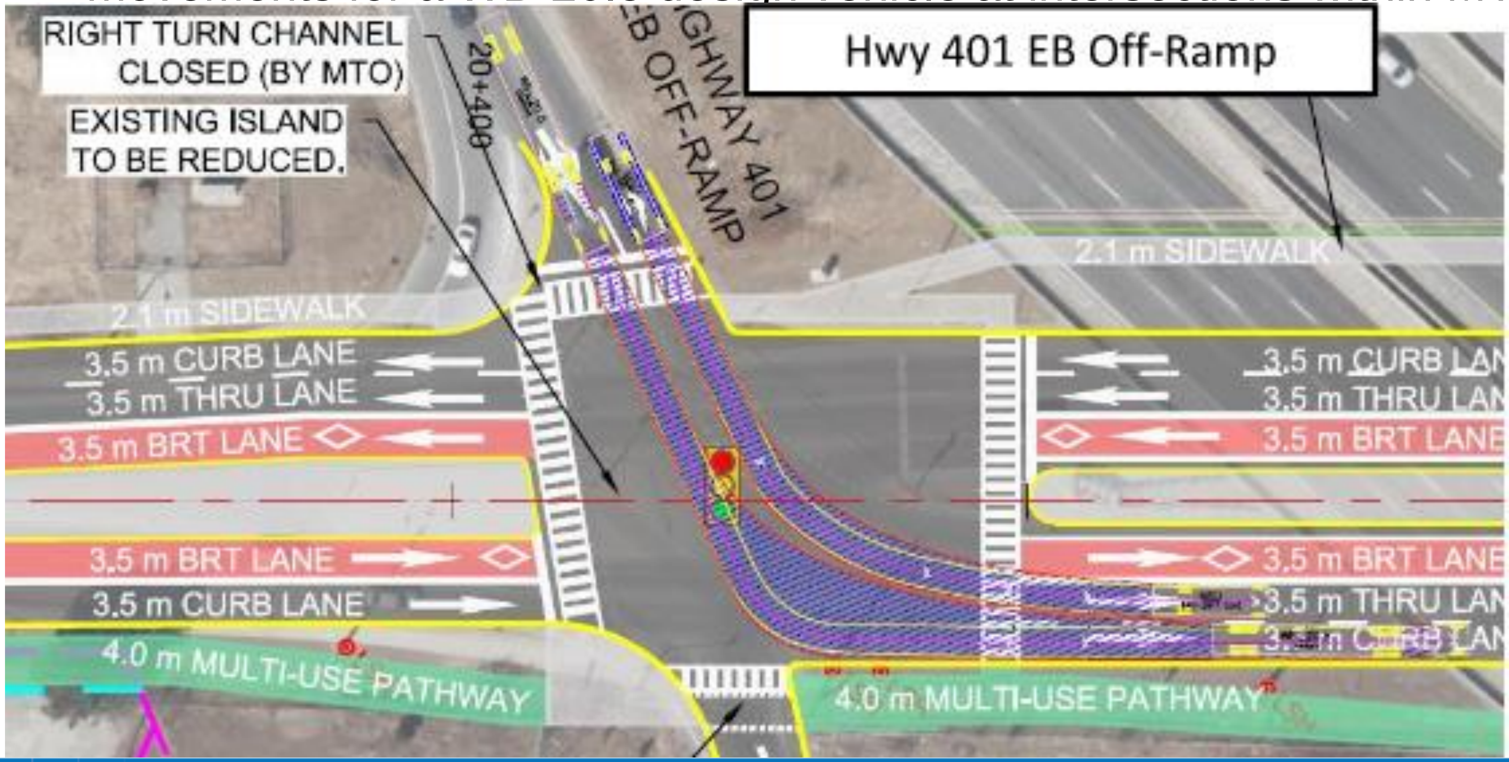
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.



3. Intersections

1. Highway 401 EB off-ramp at Kingston Road

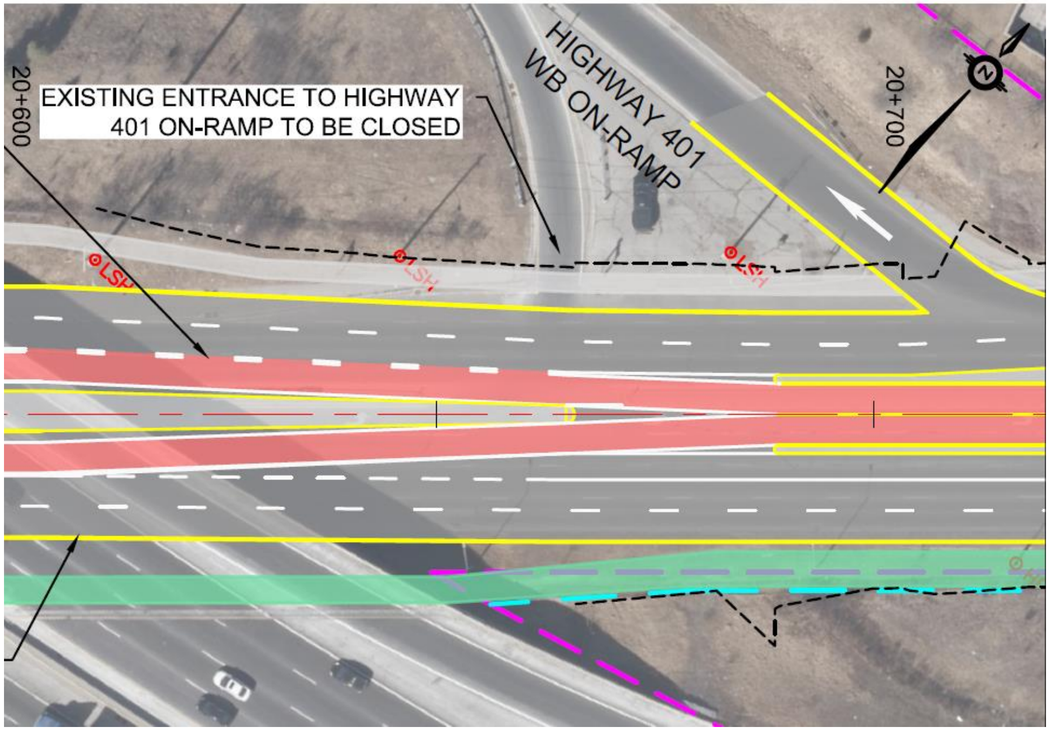
- Right turn channel to be closed by MTO
- All turning movements to be maintained
- New crossride on south leg of the intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

2. Highway 401 WB on-ramp at Kingston Road

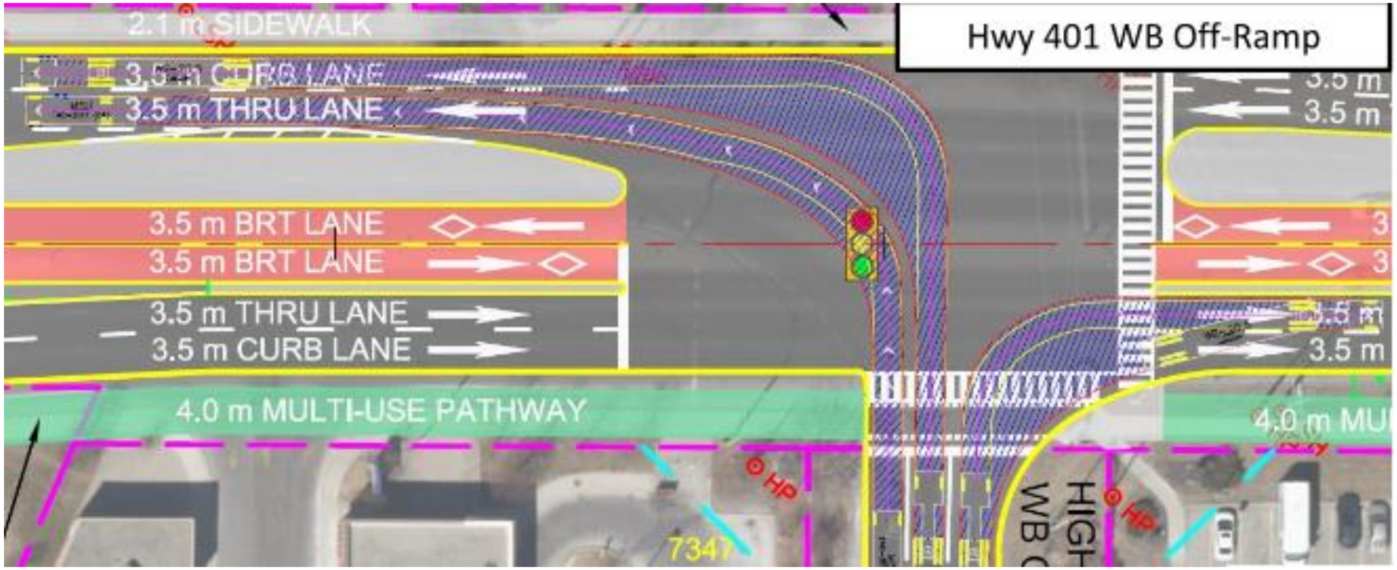
The DSBRT Traffic Impact Analysis recommendation is to close the existing Kingston-West-to-Highway 401-West entrance and this traffic will be diverted to the Rylander Boulevard intersection (just east of this ramp) to make U-turn during the protected-only signal phasing.



3. Intersections

3. Highway 401 WB off-ramp at Kingston Road

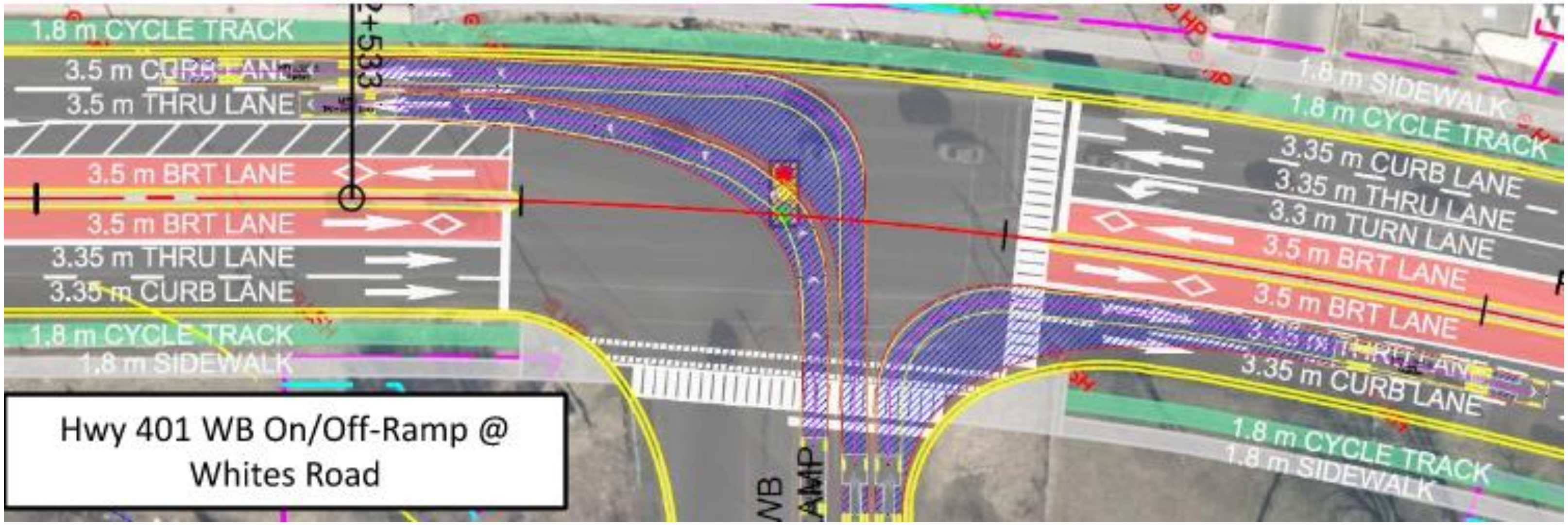
- All turning movements to be maintained
- New crossride on south leg of the intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

4. Highway 401 on/off-ramp east of Whites Road

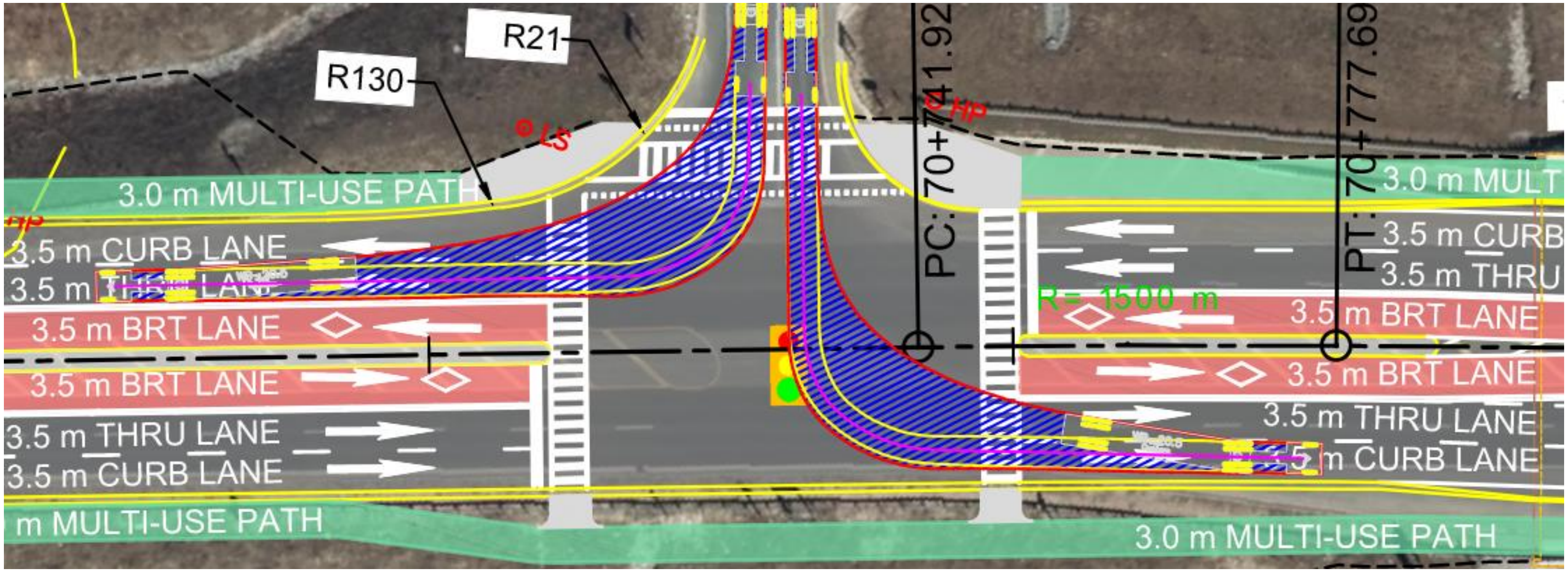
- Intersection curb radii to be aAll turning movements to be maintained
- New crossride on south leg of the intersection
- Stop bar at off-ramp shifted back approximately 8 m
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

5. Highway 412 SB off-ramp at Dundas Street W

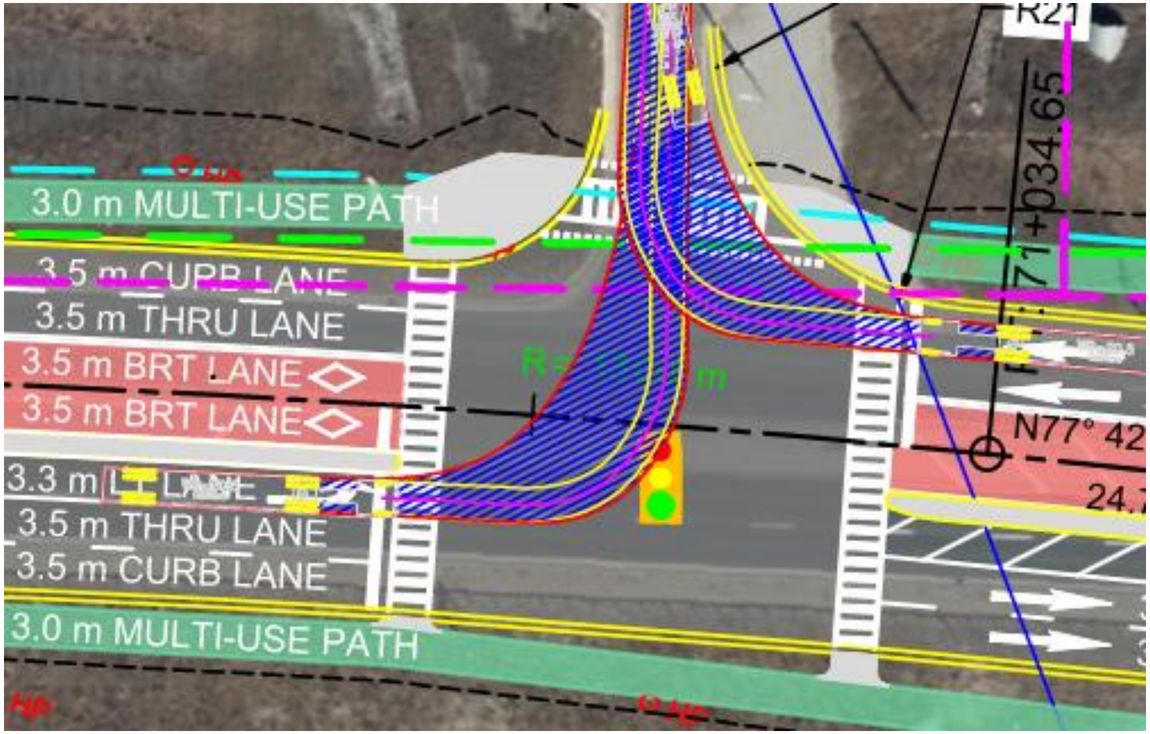
- Proposed traffic signals
- All turning movements to be maintained
- New crossride on north leg of the intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

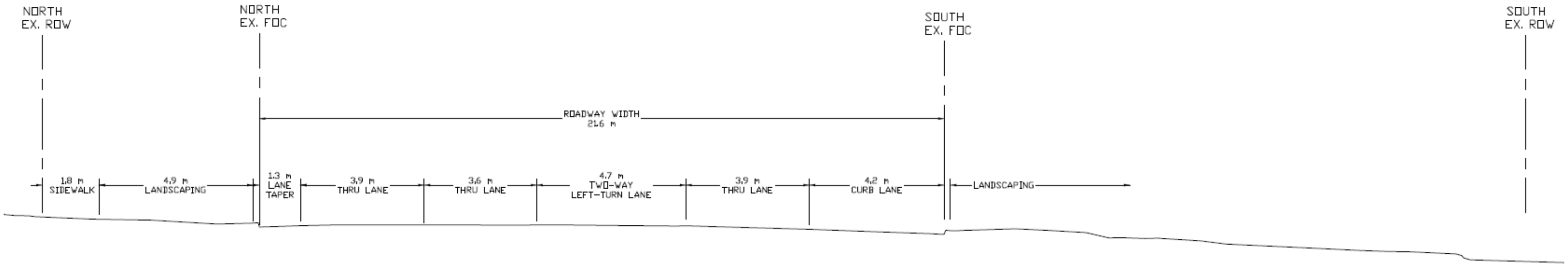
6. Highway 412 NB on-ramp at Dundas Street W

- Proposed traffic signals
- All turning movements to be maintained
- New crossride on north leg of intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO

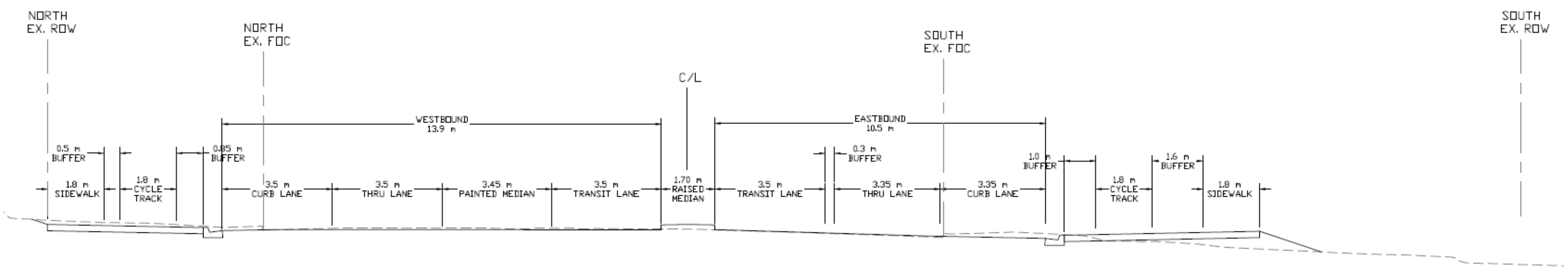


4. Typical Road Cross Sections

Kingston Road at Highway 401 / Whites Road Interchange: EXISTING CONDITION

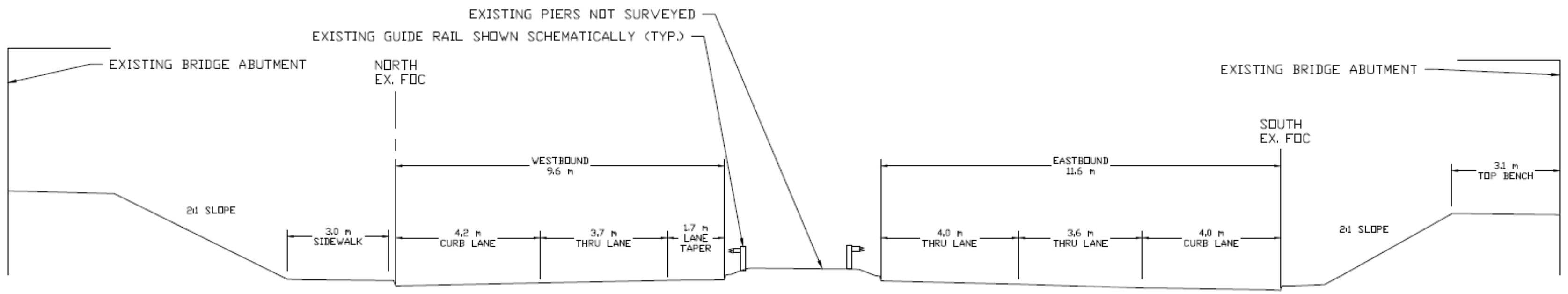


Kingston Road at Highway 401 / Whites Road Interchange: PROPOSED CONDITION

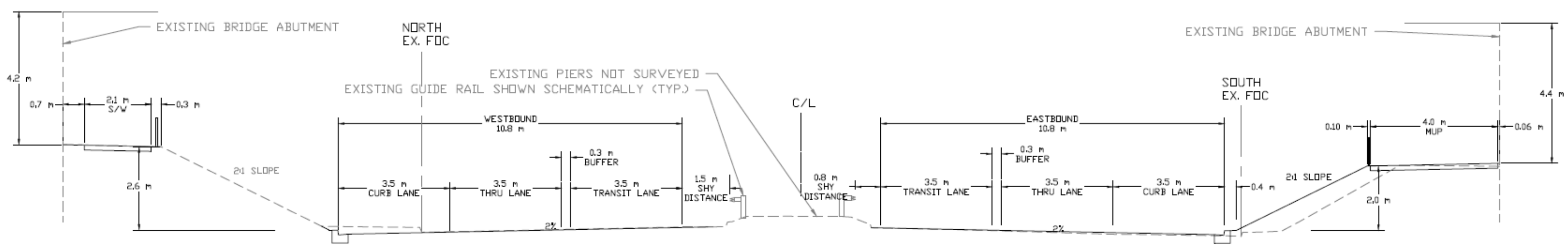


4. Typical Road Cross Sections

Kingston Road under Highway 401: EXISTING CONDITION



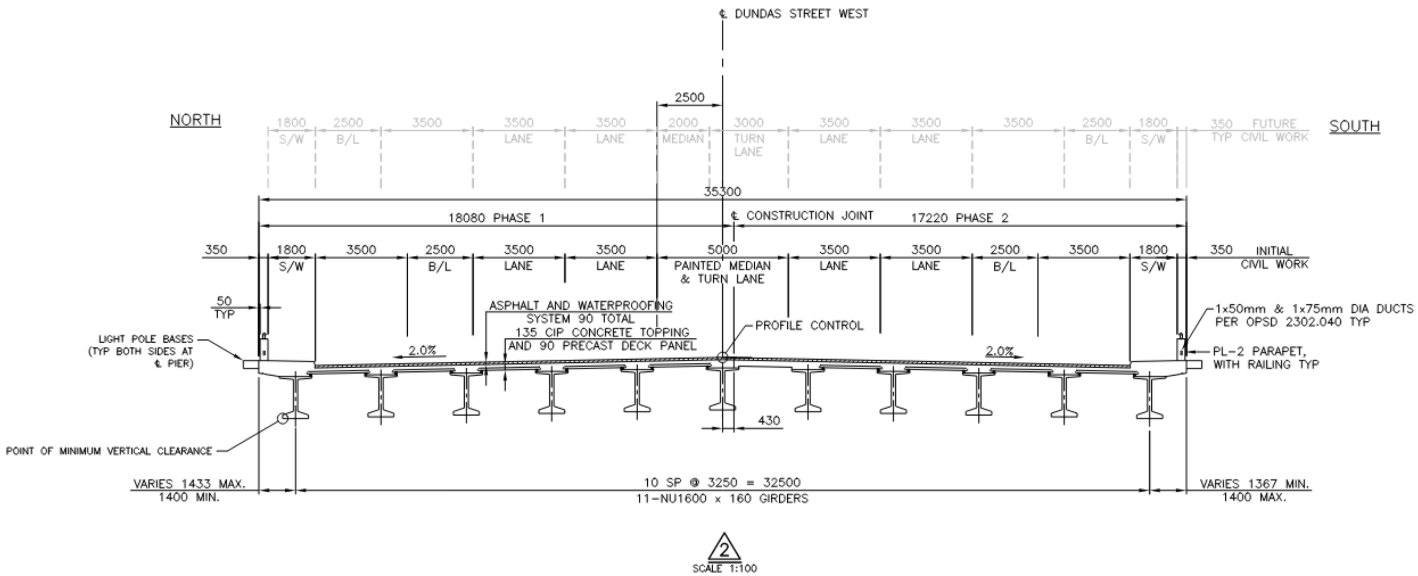
Kingston Road under Highway 401: PROPOSED CONDITION



NOTE: No proposed changes to existing centre piers, guide rails or shallow foundations.

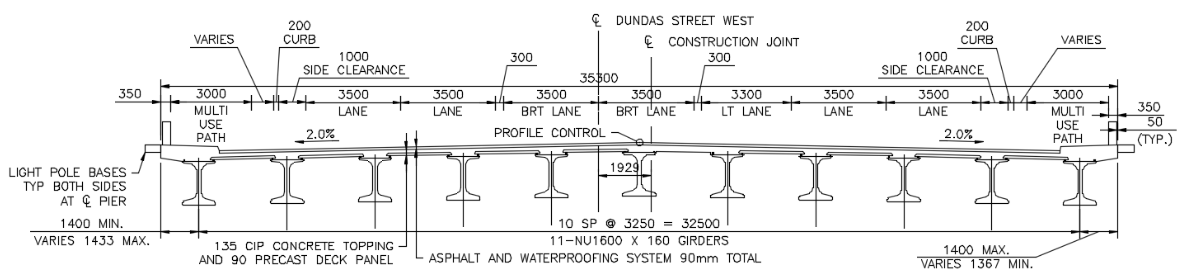
4. Typical Road Cross Sections

Dundas Street W at Highway 412: EXISTING CONDITION



Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Dundas Street W at Highway 412: PROPOSED DESIGN



5. Operational Performance

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from Exhibit 8-1 of DSBRT Traffic Impact Analysis

Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

Excerpt from Exhibit 6-6 of DSBRT Traffic Impact Analysis

6. Data to be Received

1. Present condition design criteria, including ramp design speeds, superelevation maximum rates, shoulder rounding, sight distances at exit/entrance terminal, exit/entrance terminal speed-change lane lengths for:
    1. Highway 401 @ Kingston Road - W-N/S OFF RAMP
    2. Highway 401 @ Kingston Road - N-W ON RAMP
    3. Highway 401 @ Kingston Road – E-N/S OFF RAMP
    4. Highway 401 @ Whites Road/Kingston Road - N/S-W ON RAMP
    5. Highway 401 @ Whites Road/Kingston Road – E-N/S OFF RAMP
    6. Highway 412 @ Dundas Street W – N-E/W OFF RAMP
    7. Highway 412 @ Dundas Street W – E/W-N ON RAMP

6. Data to be Received

2. Contract drawings showing exit/entrance terminal speed-change lanes, Highway 401 collector profile, and Highway 412 collector profile.
3. MTO Corridor Access Plan

Thank you

IBI PARSONS

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	November 22, 2021
From	Margaret Parkhill, David Hopper	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
November 22, 2021, 10:00 a.m. to 11:00 a.m.

Present Kristin Demasi, Wilson Taveira, Madelin Blacha, Matthew Coelho, Metrolinx
Rami El Mawed, Jason Hanna, Adrian Firmani, Eileen Li, Christian Singh, William Francolini, Marek Wiesek, Lewis Lee, MTO
Dave Dunn, Matthew Darling, Kamrul Islam, Region of Durham
Andres Jarrin, City of Toronto
David Hopper, Wendy Ng, Sam Dinatolo, Parsons
Margaret Parkhill, Adrian Chiu, Yash Kulshreshtha, IBI Group

Distribution Meeting attendees

Item Discussed	Action By
Introduction S. Dinatolo welcomed attendees and provided an update on the DSBRT design criteria, preliminary design, and traffic operations at three MTO interface areas: 1. Highway 401 E-N/S off ramp at Kingston Road east of Sheppard Avenue/Port Union Road in City of Toronto, 2. Highway 401 on/off ramps at Kingston Road east of Whites Road in Town of Pickering 3. Dundas Street West from Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby. S. Dinatolo also provided a summary of existing and proposed standards for MTO jurisdiction areas. The following is a summary of the discussion.	INFO
Discussion Included: • S. Dinatolo asked about next steps to take before presenting to MTO senior management. J. Hanna responded that they will discuss with R. El Mawed if any changes need to be made before presenting to senior management.	R. El Mawed / J. Hanna

Item Discussed	Action By
• C. Singh asked if there if any utility investigations have been done to determine if there will be any utility relocations required. M. Parkhill responded that subsurface utility investigations have been performed at certain areas along the corridor. The preliminary design protects space for utilities in the boulevard.	
• C. Singh noted that a utility composite plan is not necessary at this point, but encroachment plans may be required. M. Parkhill responded that the project is an Environmental Assessment in the preliminary design phase. The EPR can include a commitment to future work in detail design for utility relocation and encroachment permits from MTO to be reviewed.	M. Parkhill
• S. Dinatolo noted that it that it may be too early to apply for permits as the project is only at TPAP. C. Singh responded that permits would not be necessary at this time. MTO recommends identifying utility relocations as early as possible so that they do not become showstoppers later on in the project. M. Darling noted that the Region of Durham is currently performing SUE investigations and utility excavation/relocations as part of the detailed design.	

Please advise of any errors or omissions to Margaret Parkhill by December 6, 2021.

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

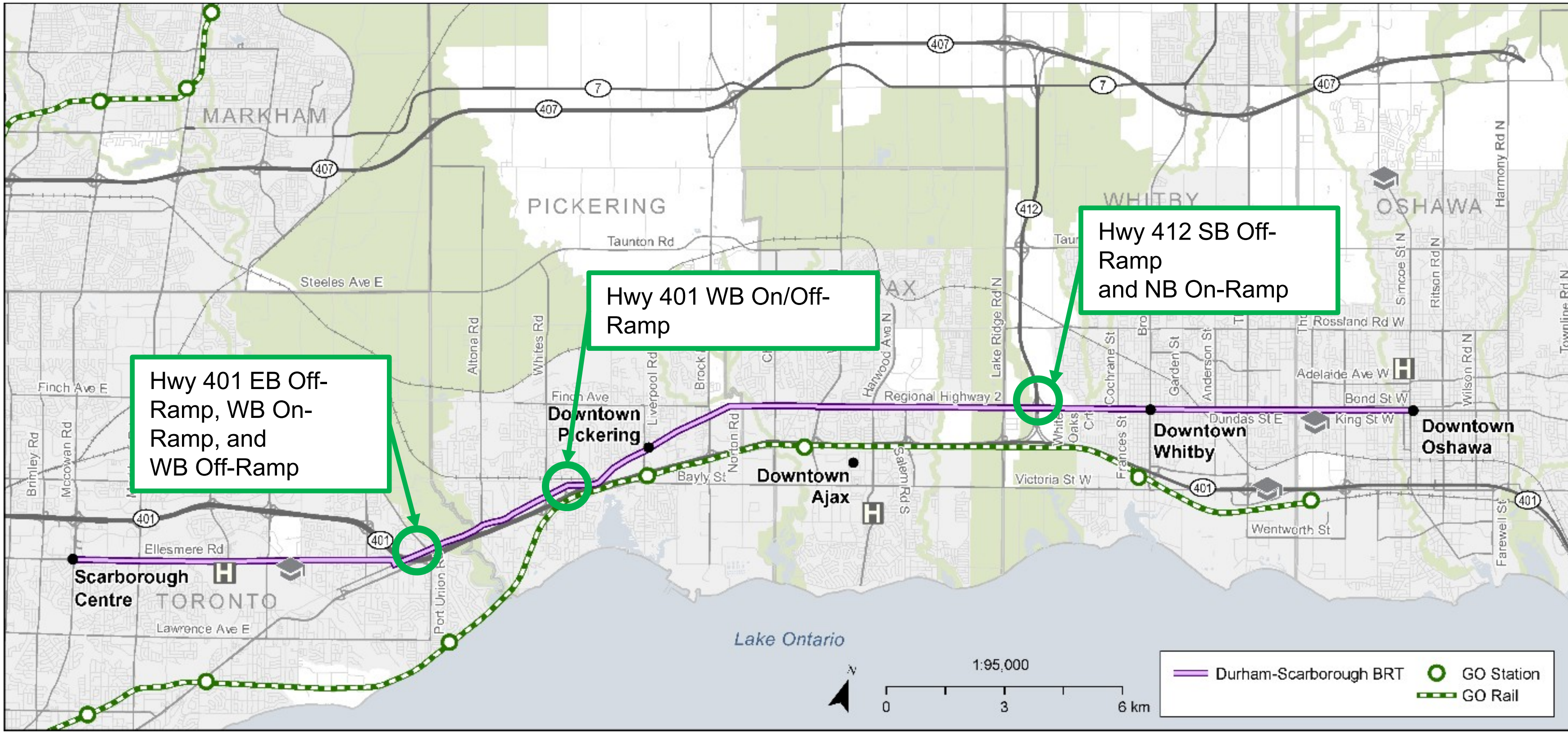
Design Criteria Discussion with MTO

November 22, 2021

Agenda

1. Study Area
2. Operational Performance Overview
3. Draft Preliminary Design Criteria
    1. Kingston Road Highway
    2. Highway 401 Off Ramps
    3. Hwy 412
4. Potential Exemptions
5. Existing Substandard but Improved Criteria
6. Next Steps

Study Area


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Dundas St E
King St W
Bond St W
Adelaide Ave W
Rossland Rd W
Wentworth St
Brimley Rd
Mccowan Rd
Port Union Rd
Altona Rd
Whites Rd
Liverpool Rd
Brock Rd
Harwood Ave N
Salem Rd S
Lake Ridge Rd N
Cochrane St
Frances St
Garden St
Anderson St
Simcoe St N
Ritson Rd N
Wilson Rd N
Harmony Rd N
Townline Rd N
Farewell St
401
407
412
7
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

5. Operational Performance

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from Exhibit 8-1 of DSBRT Traffic Impact Analysis

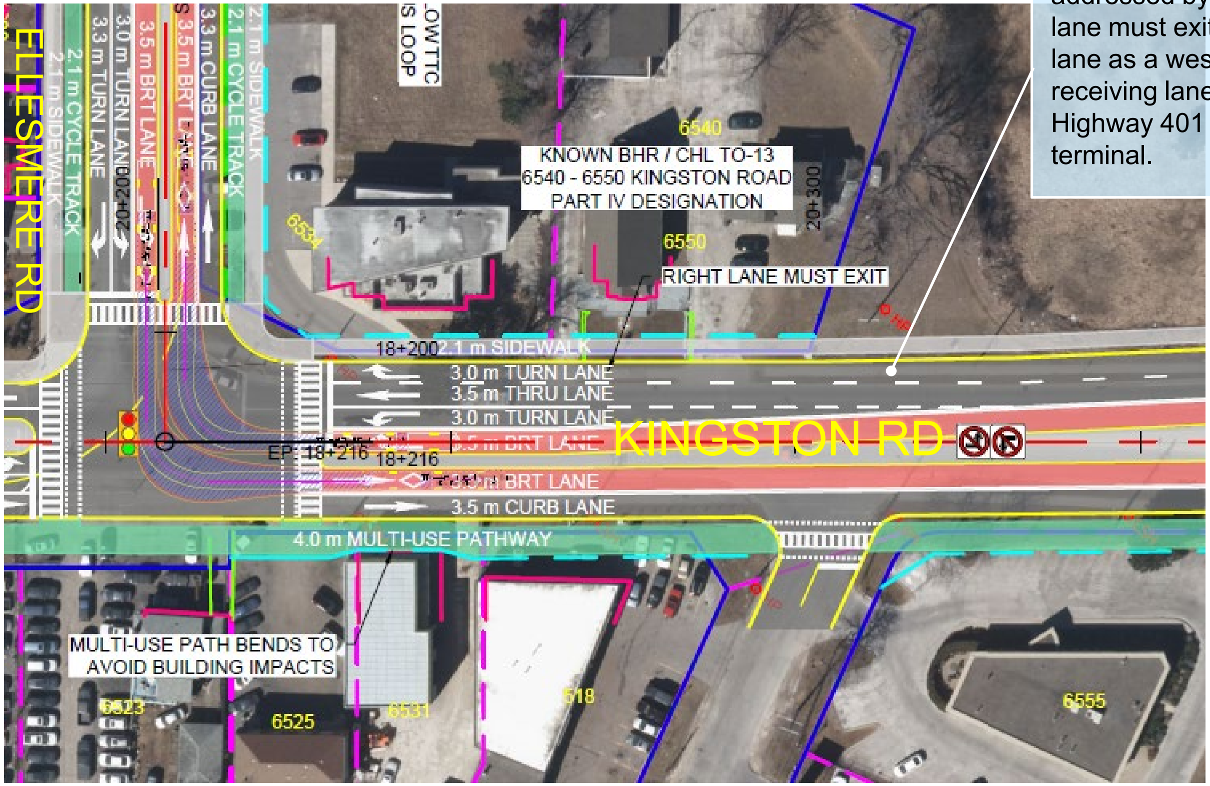
Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

Excerpt from Exhibit 6-6 of DSBRT Traffic Impact Analysis

Location 1: Kingston Road

- Kingston Road from east of Ellesmere Road to Rylander Boulevard
- Highway 401 E-N/S off ramp at Kingston Road east of Sheppard Avenue/Port Union Road in City of Toronto

Previous MTO concern addressed by including “right lane must exit” right turn lane as a westbound receiving lane at the Highway 401 off-ramp terminal.

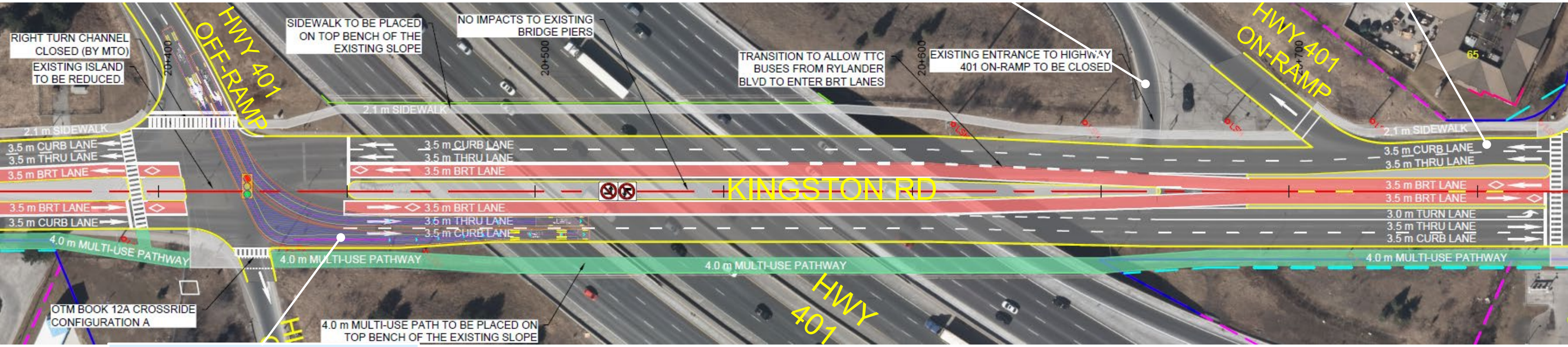


Location 1: Kingston Road (cont'd)

Previous MTO concern addressed by diverting traffic to make u-turns at Rylander Blvd and to the Meadowvale loop on-ramp.

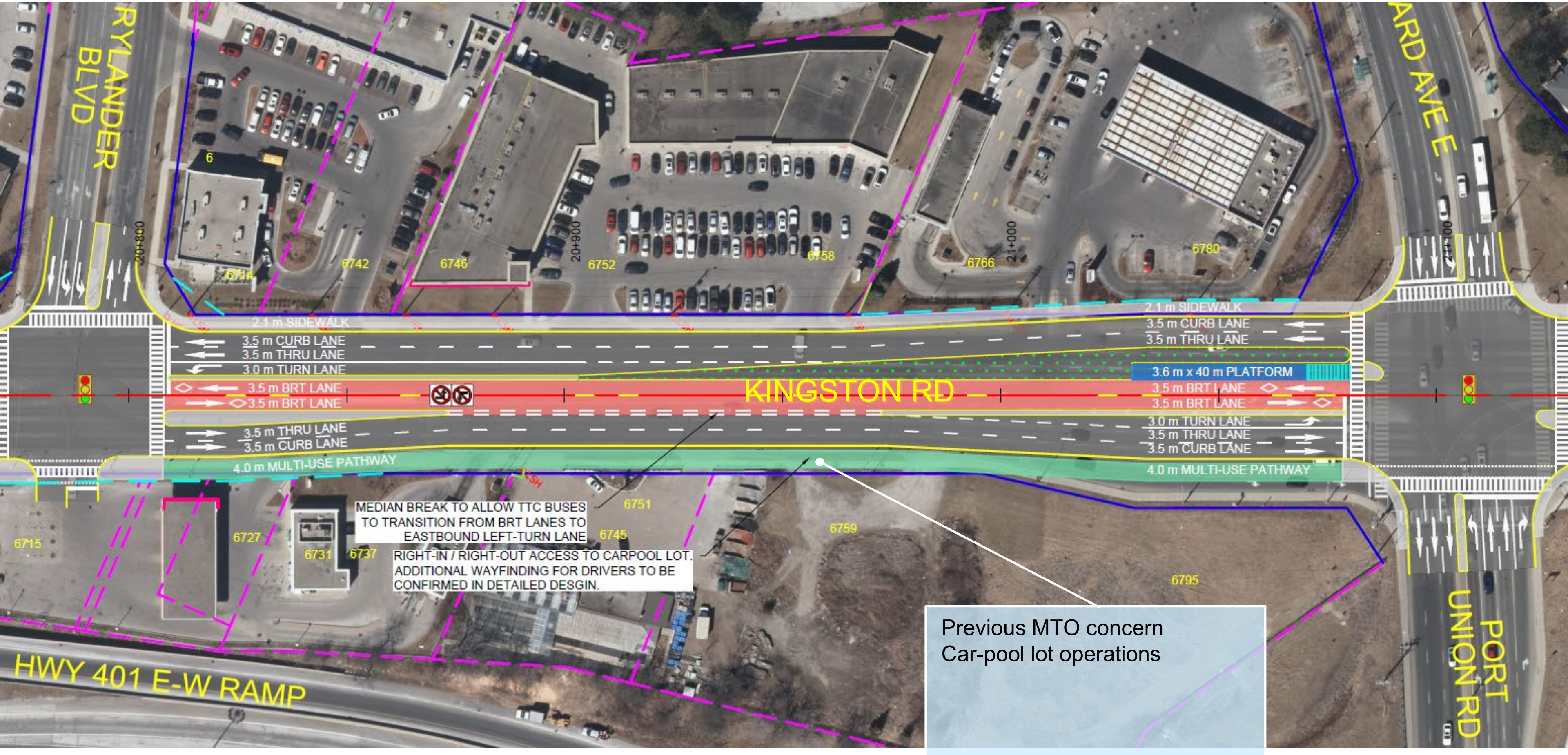
EBL to Hwy 401 WB On-ramp movements are 30 vph for AM and 240 vph for PM.

Anticipated further concern: Existing on ramp lane coincides with through curb lane.



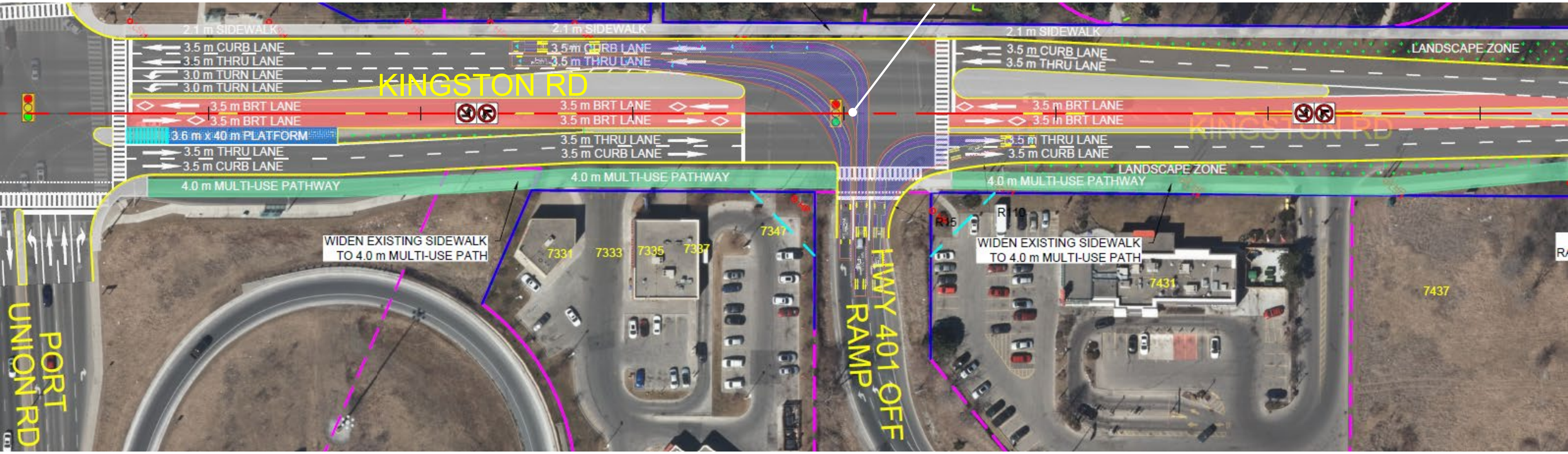
Previous MTO concern addressed by including additional pavement width to accommodate simultaneous dual left turning movement for design vehicles of WB-20.5 and I-BUS.

Location 1: Kingston Road (cont'd)



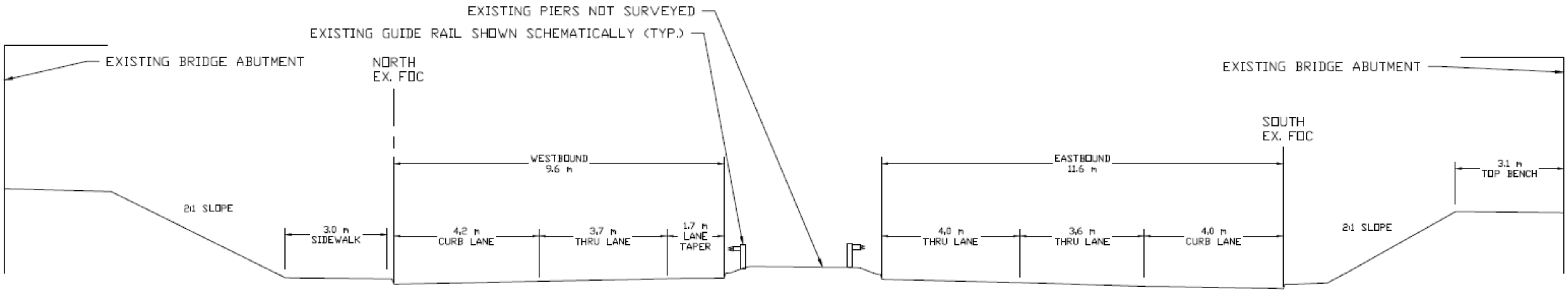
Location 1: Kingston Road (cont'd)

This intersection is not under MTO's jurisdiction, advised by MTO.

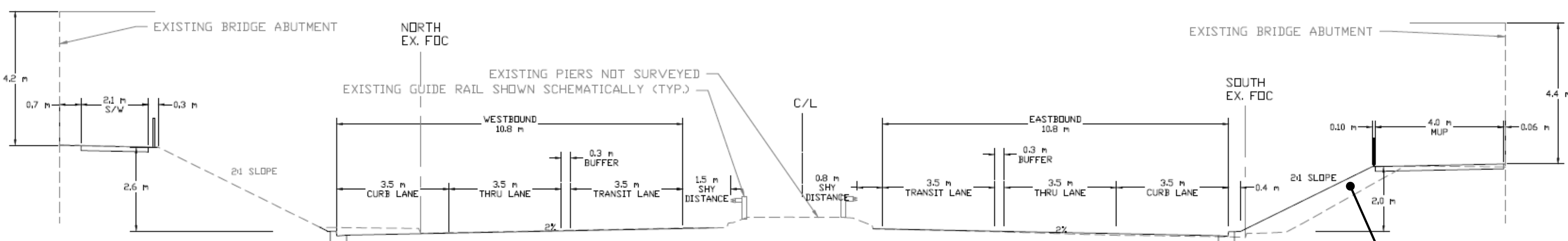


Typical Cross-sections

Kingston Road under Highway 401: EXISTING CONDITION



Kingston Road under Highway 401: PROPOSED CONDITION

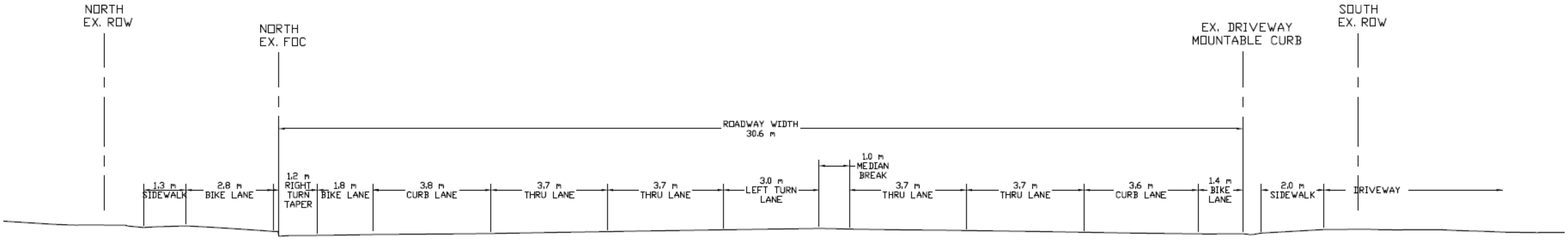


NOTE: No proposed changes to existing centre piers, guide rails (other than standard update) or shallow foundations.

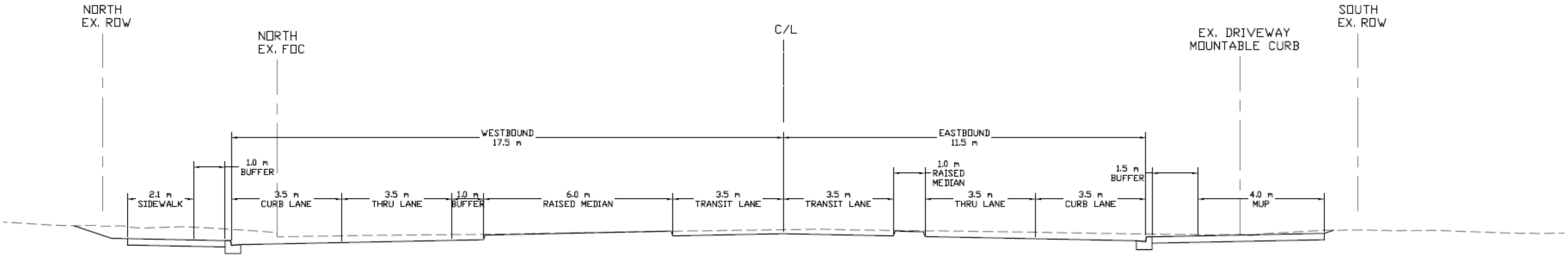
MTO concern of introduction of additional lateral and vertical lading to the existing foundation due to AT path & additional fill on the paved slope under review by Structural team.

Typical Cross-sections (cont'd)

Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: EXISTING CONDITION



Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: PROPOSED CONDITION



Design Criteria

Standards Table 1: Kingston Road (East of Ellesmere Road to Rylander Boulevard), City of Toronto

Design Year: 2041	Superelevation Maximum Rate for determining the Radius: 6%				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	80	80	70	80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	60	60	50	60	(Proposed Standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	142	130	105	148	(✓)
Crest: Minimum “K” factor for Stopping Sight Distance	30.5	26	17	33.3	(✓)
Sag: Minimum “K” factor for Stopping Sight Distance	41.5	12-16	10-12	35	Proposed Sag value is reduced to 35 from 41.5; however, it exceeds standards. Operational issues are not envisioned. (Proposed vertical profile is not being changed from existing; however, it is measuring less than previous design criteria.)
Grades Maximum (%)	3	6-8	6-8	2.68	(✓)
Radius Minimum (m)	Tangent	250	190	Tangent	(✓)
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80 km/h design speed. Proposed condition does not meet the requirement for 80 km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.
Shoulder Width (Left / Right) (m)	n/a	n/a	n/a	n/a	n/a
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Median Width (m)	5.6 - 7	2.0	2.0	2-6.24	(✓)
R.O.W. Width - nominal (m)	26.2 – 36.5			26.2 - 38.7	(Potential property acquisition at Kingston Road/Centennial Road.)

Design Criteria (cont'd)

Interchange Standards Table 1-1: Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	35	17	17	35	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	10	10-12	10-12	10	(✓)
Grades Maximum (%)	4.63	6-8	6-8	4.63	(✓)
Radius Minimum (m)	200	190	130	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2 x 3.75	3.75	3.75	2 x 3.75	(✓)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Design Criteria (cont'd)

Interchange Standards Table 1-2: Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation. (Will develop options for MTO review.)
Crest: Minimum "K" factor for Stopping Sight Distance	40	17	17	40	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	4.1	6-8	6-8	4.1	(✓)
Radius Minimum (m)	200	190	190	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 4.75	4.75	4.75	1 x 4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	?	n/a	n/a	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to present condition.
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Potential Exemptions

1. Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed (km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.

Rationale:

- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Potential Exemptions (cont’d)

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops.

Present Conditions Substandard But Improved

Highway 401 @ Kingston Road - W-N/S OFF RAMP

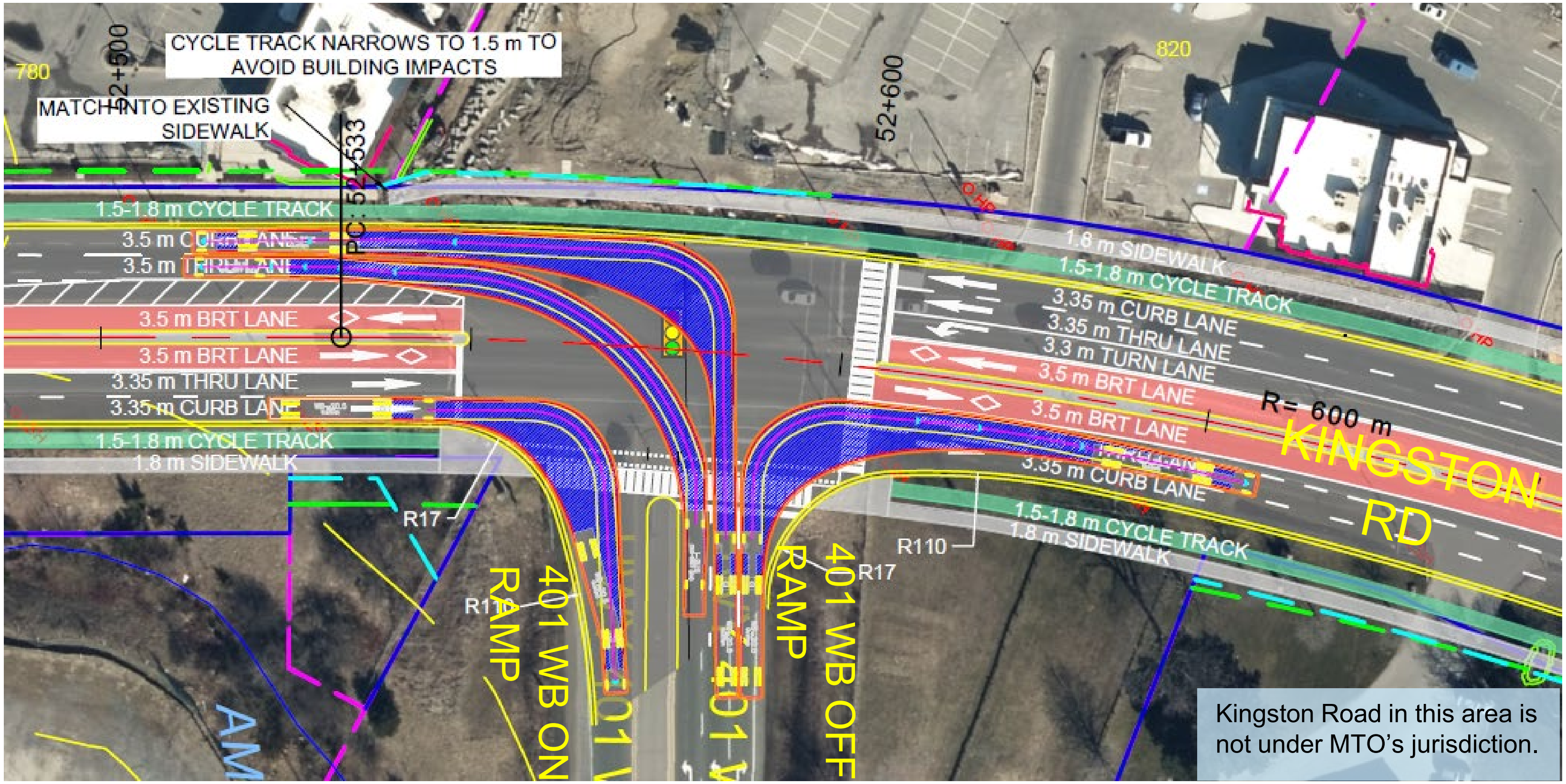
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.

Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation. (Will develop options for MTO review.)

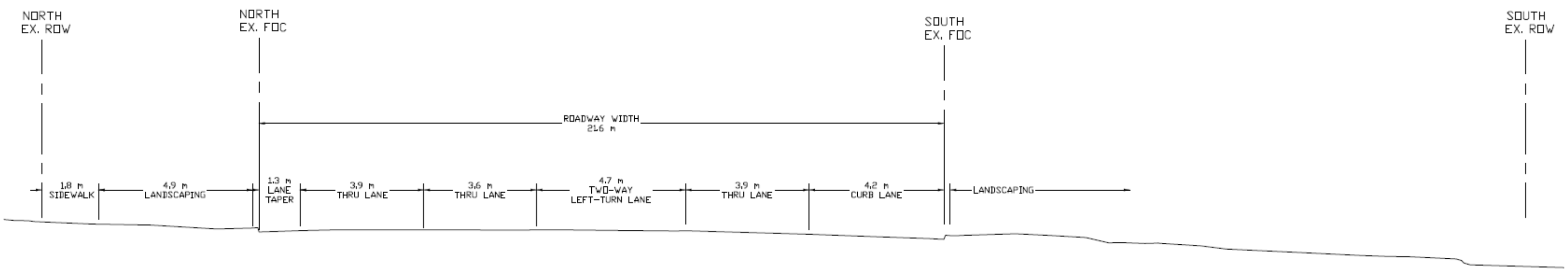
Location 2: Highway 401 On/Off Ramps

- at Kingston Road east of Whites Road in Town of Pickering

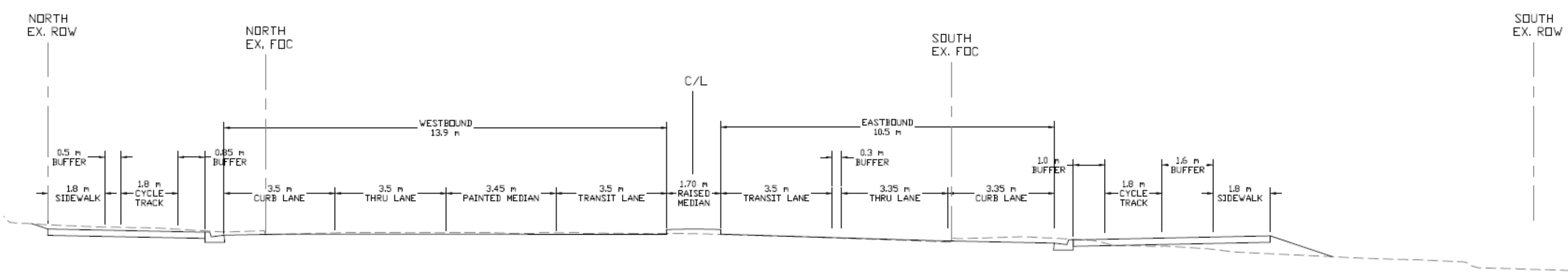


Typical Cross-sections

Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: EXISTING CONDITION



Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: PROPOSED CONDITION



Design Criteria

Interchange Standards Table 2-1: Highway 401 @ Kingston Road - N/S-W ON RAMP east of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	25	10-12	10-12	25	(✓)
Grades Maximum (%)	2.56	6-8	6-8	2.56	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	median / 2.50	1.0 / 2.5	1.0 / 2.5	median / 2.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Design Criteria (cont'd)

Interchange Standards Table 2-2: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	45	10-12	10-12	45	(✓)
Grades Maximum (%)	2.6	6-8	6-8	2.6	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Shoulder Width (Left / Right) (m)	n/a / 2.5	1.0 / 2.5	1.0 / 2.5	n/a / 2.5	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Present Conditions Substandard But Improved

Highway 401 @ Kingston Road - N/S-W ON RAMP East of Whites Road

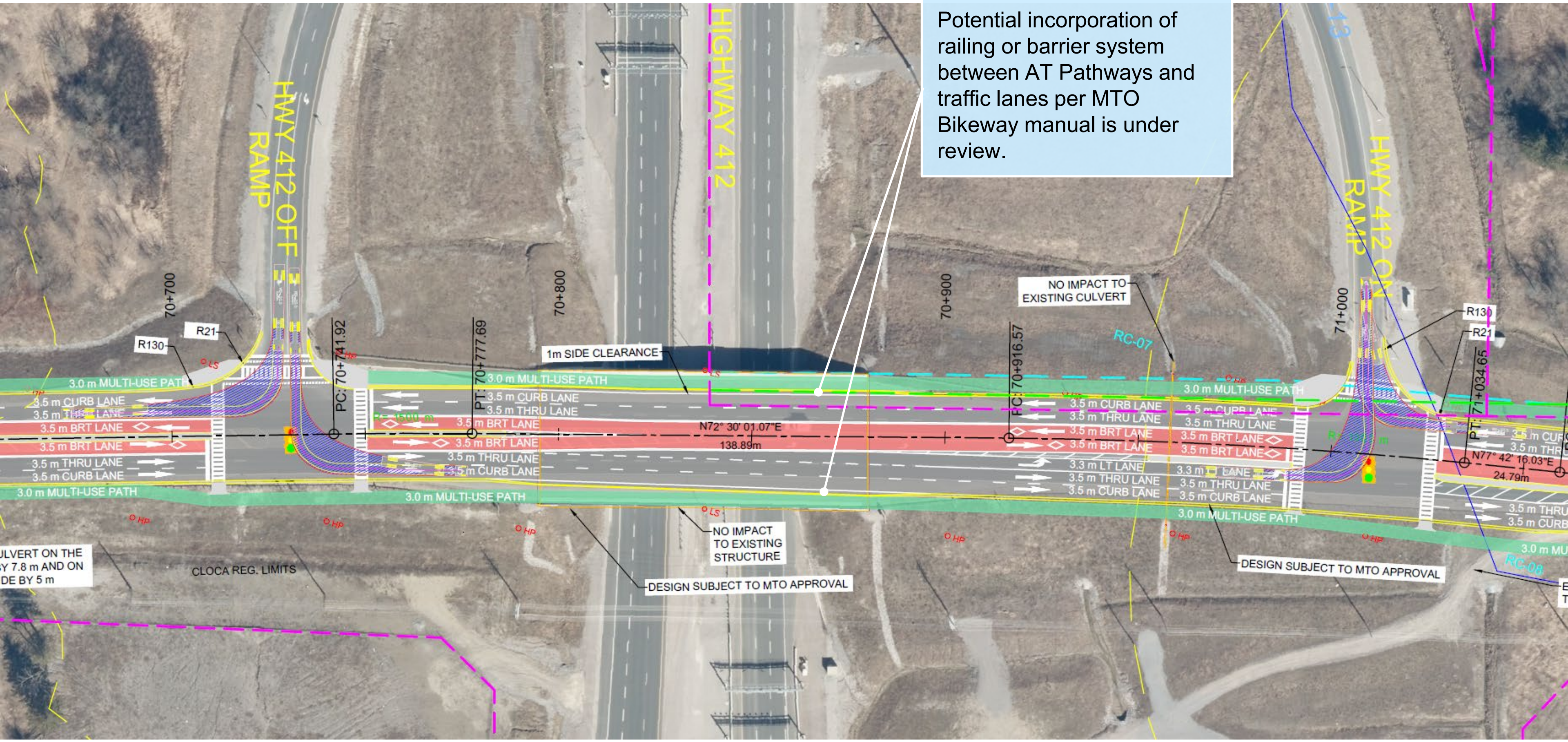
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

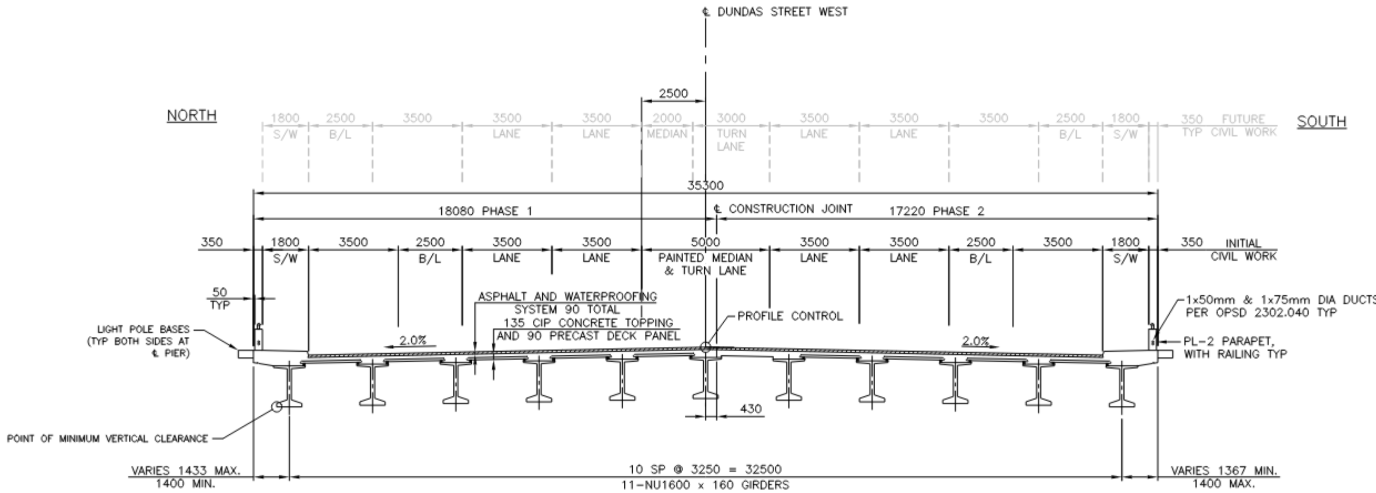
Location 3: Dundas Street West

- From Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby



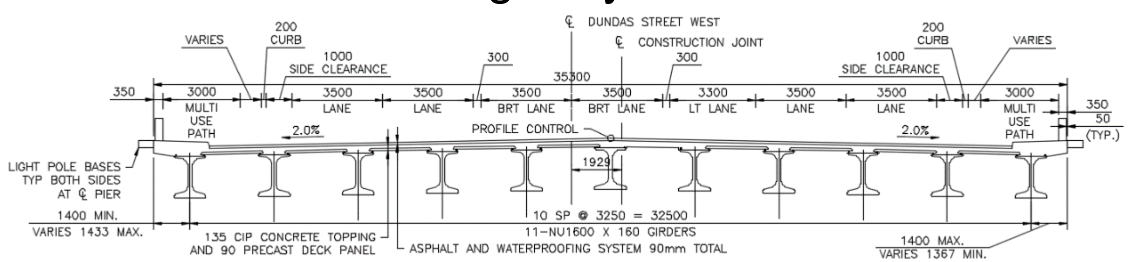
Typical Cross-sections

Dundas Street West at Highway 412: EXISTING CONDITION



Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Dundas Street West at Highway 412: PROPOSED DESIGN



Design Criteria

Standards Table 2: Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

	Superelevation Maximum Rate for Determining the Radius:			6 %	
Design Year: 2041	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Crest: Minimum "K" factor for Stopping Sight Distance	50	39	26	44.87	Present condition will not be changed. Detailed survey to be obtained during detailed design. The proposed are not intended to change the present condition value. (Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	n/a	6-8	6-8	2.35	(✓)
Radius Minimum (m)	5000	340	250	1300	Alignment is being fitted to existing conditions. No significant changes are anticipated.
Lane Widths (m)	4x3.5 Thru Lane 1x3.5 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90 km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.
Shoulder Width (Left / Right) (m)	5.6	1.0	1.0	1.0	(Existing shoulders were built to ultimate condition.) Proposed shoulder meets standard.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	
Median Width (m)	1.5 - 5	2.0	2.0	0 – 1.7	(Raised concrete medians terminate at the approaches of the bridge. In order to minimize impacts to the Highway 412 bridge structure a median is not proposed.)
R.O.W. Width – nominal (m)	55.43 – 59.16			55.43 – 65.23	

Design Criteria (cont'd)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	>200	200	178	>200	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	40	12-16	12-16	40	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2x3.75	2x3.7	2x3.7	2x3.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Design Criteria (cont'd)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	30	12-16	12-16	30	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Potential Exemptions

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Present Conditions Substandard But Improved

Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

Design Year: 2041	Superelevation Maximum Rate for Determining the Radius: 6 %				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)

Present Conditions Substandard But Improved (cont'd)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).

Next Steps

- Discuss design criteria and any potential design exemptions
- Present project to MTO Senior Management
- Address agency comments on draft Environmental Project Report (EPR)
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI PARSONS

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Preliminary Design Criteria

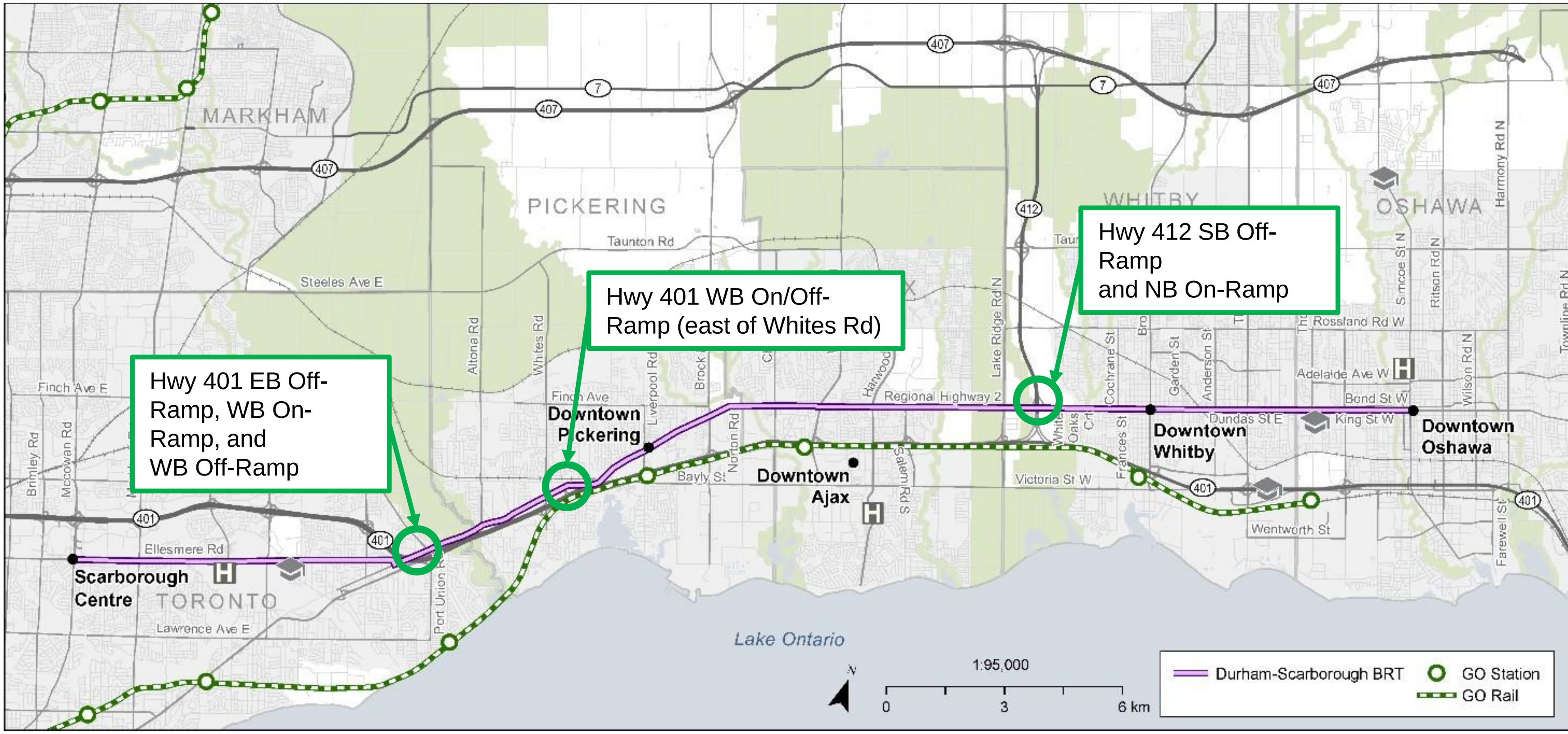
IBI PARSONS

December 7, 2021

Agenda

1. Study Area
2. Draft Preliminary Design Criteria
    1. Kingston Road at Highway 401
    2. Highway 401 On/Off Ramps (east of Whites Road)
    3. Dundas Street West at Highway 412
3. Potential Exemptions
4. Existing Substandard but Improved Criteria
5. Next Steps

Study Area

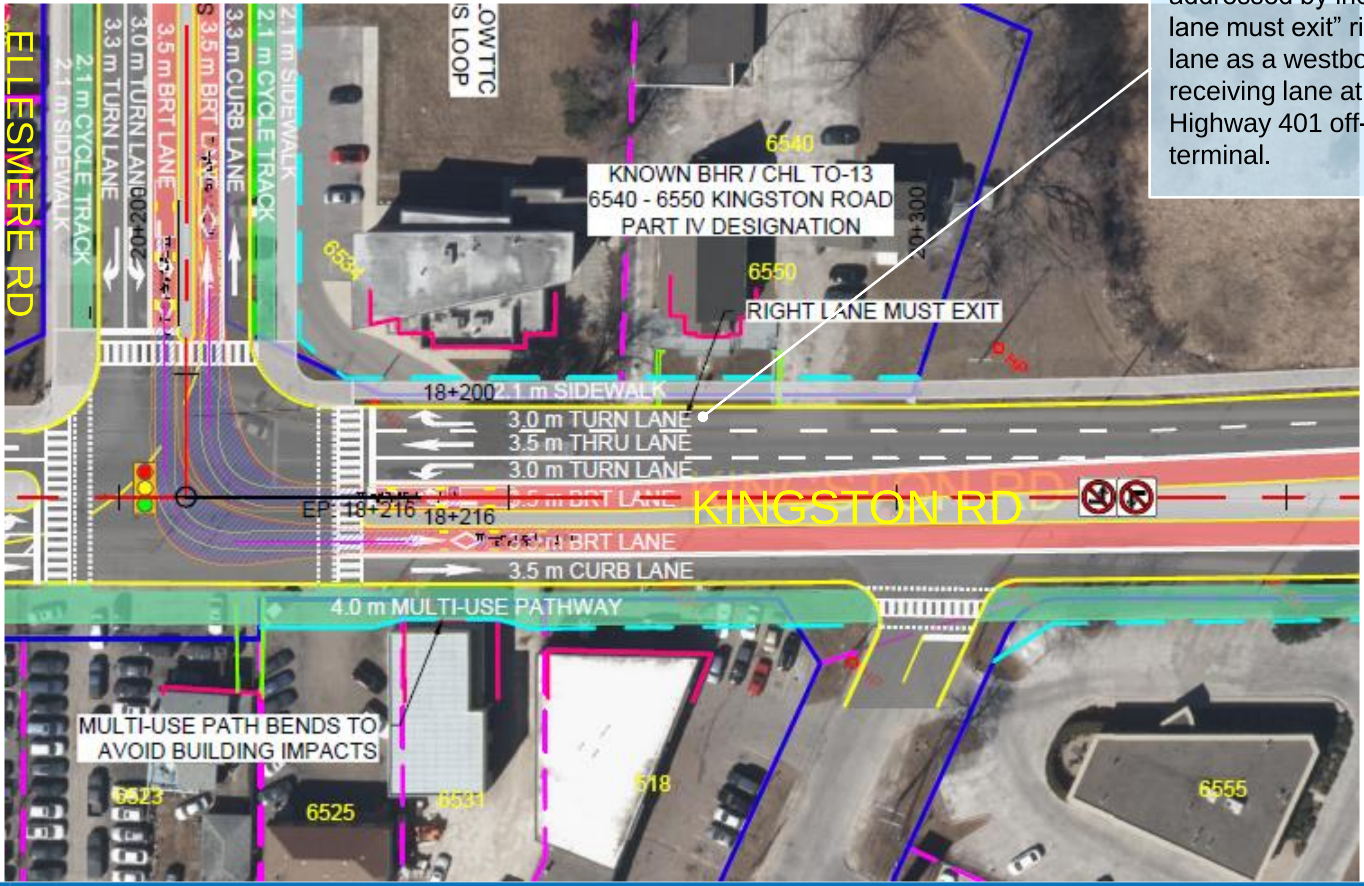


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp (east of Whites Rd)
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Wentworth St
Rossland Rd W
Adelaide Ave W
Bond St W
King St W
Dundas St E
Brimley Rd
Mccowan Rd
Port Union Rd
Altona Rd
Whites Rd
Liverpool Rd
Brock Rd
Harwood
Norton Rd
Salem Rd S
Lake Ridge Rd N
Cochrane St
Frances St
Garden St
Anderson St
Simcoe St N
Ritson Rd N
Wilson Rd N
Harmony Rd N
Townline Rd N
Farewell St
407
7
412
401
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

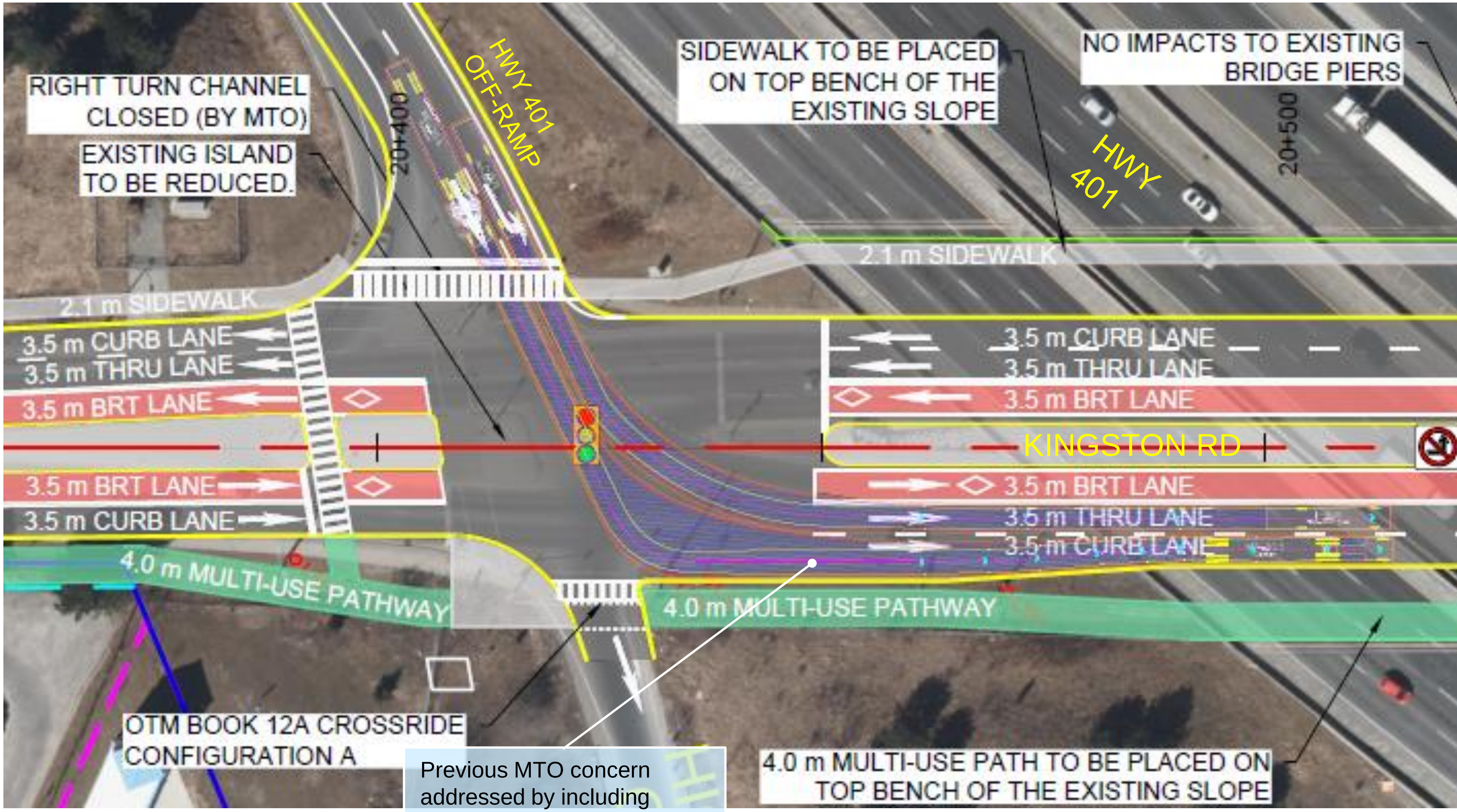
Location 1: Kingston Road

- Kingston Road from east of Ellesmere Road to Rylander Boulevard
- Highway 401 E-N/S off ramp at Kingston Road, east of Sheppard Avenue/Port Union Road, in City of Toronto

Previous MTO concern addressed by including “right lane must exit” right turn lane as a westbound receiving lane at the Highway 401 off-ramp terminal.



Location 1: Kingston Road (cont'd)



Previous MTO concern addressed by including additional pavement width to accommodate simultaneous dual left turning movement for design vehicles of WB-20.5 and I-BUS.

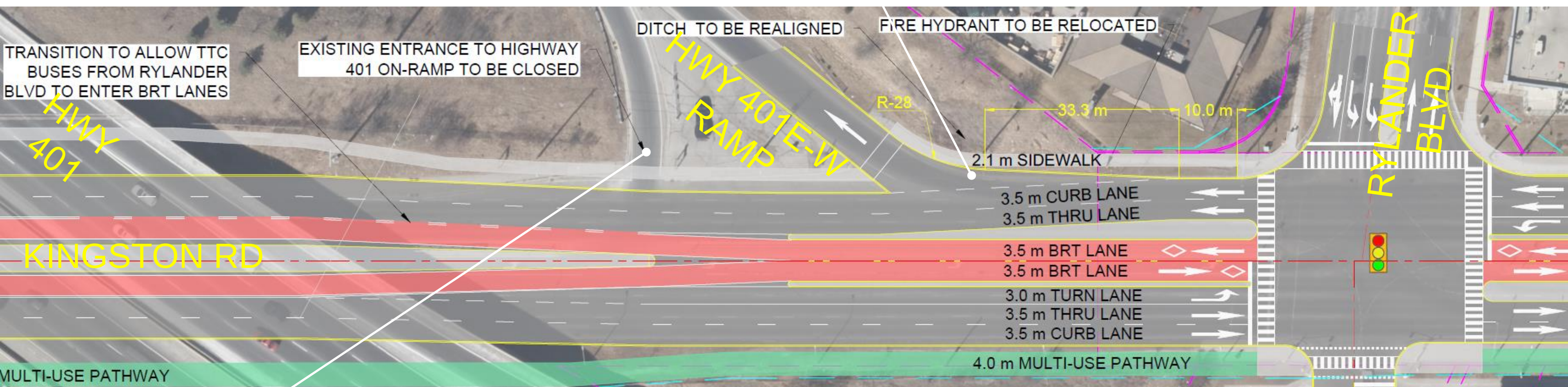
Location 1: Kingston Road (cont’d)

Year	AM Peak	PM Peak
2019	620 vph	260 vph
2041	868 vph	364 vph

DS existing 80 km/h (70 km/h) for Kingston Road

DS existing 70 km/h (60 km/h) for Hwy 401 E-W Ramp

Length of taper achieved - 33.3 m; standard required 70 m (60 m) for 70 km/h (60 km/h) DS



Previous MTO concern addressed by diverting traffic:
1. to make U-turns at Rylander Blvd; and
2. to the Meadowvale loop on-ramp.

Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

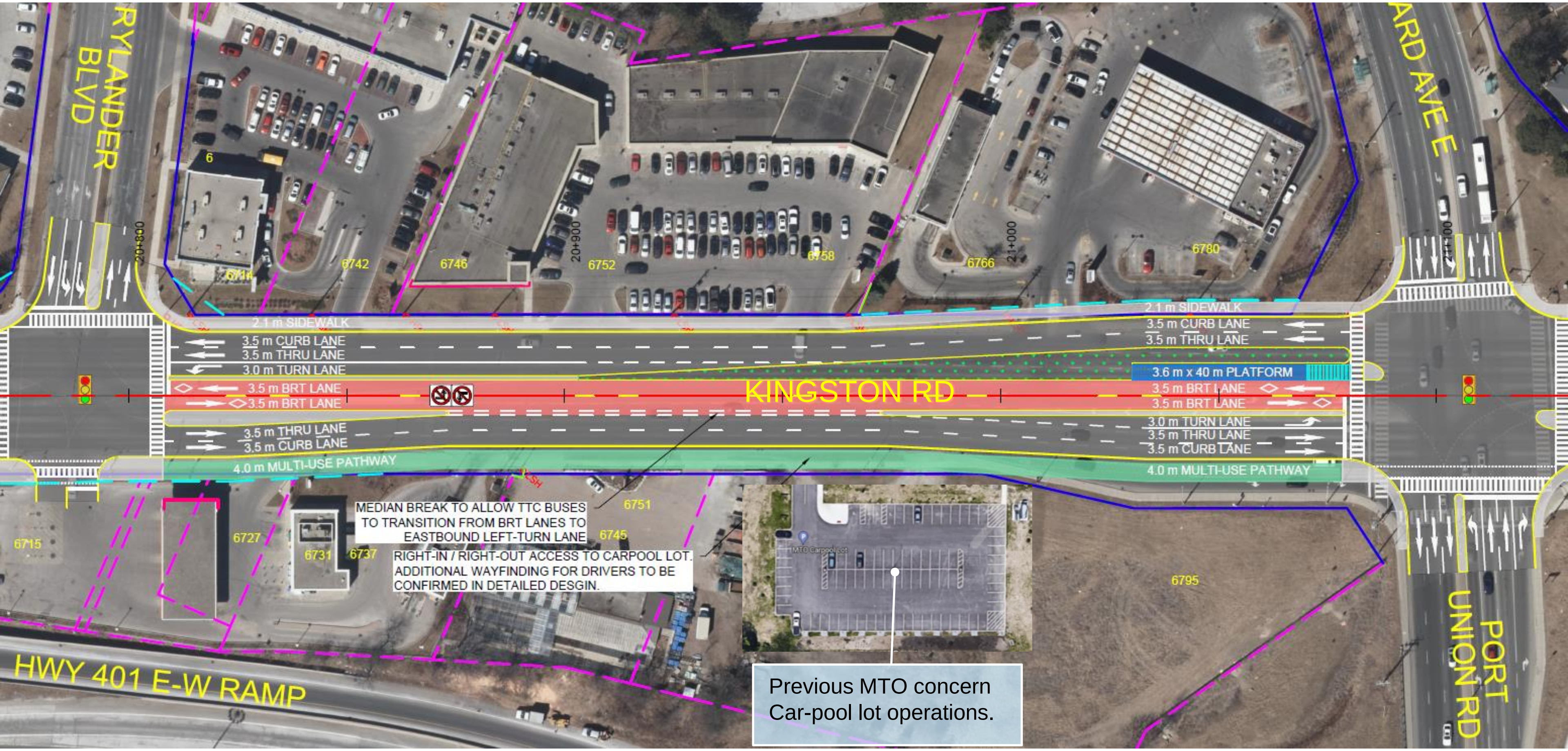
Excerpt from *Exhibit 6-6 of DSBRT Traffic Impact Analysis*

Location 1: Kingston Road (cont'd)

- EB traffic can access Hwy 401 WB via Meadowvale Road.
- Minimal inconvenience for drivers given the alternate routing is similar length
  - Start to Finish is 2 to 2.5 km
- Existing hourly volume using NB Meadowvale to Highway 401 WB ramps peaks at 190 vehicles at 12:00 p.m.
- Maximum demand of ~ 430 vph (190 + 240) at NB Meadowvale loop on-ramp can be accommodated.

Year	AM Peak	PM Peak
2019	30 vph	240 vph
2041	43 vph	345 vph

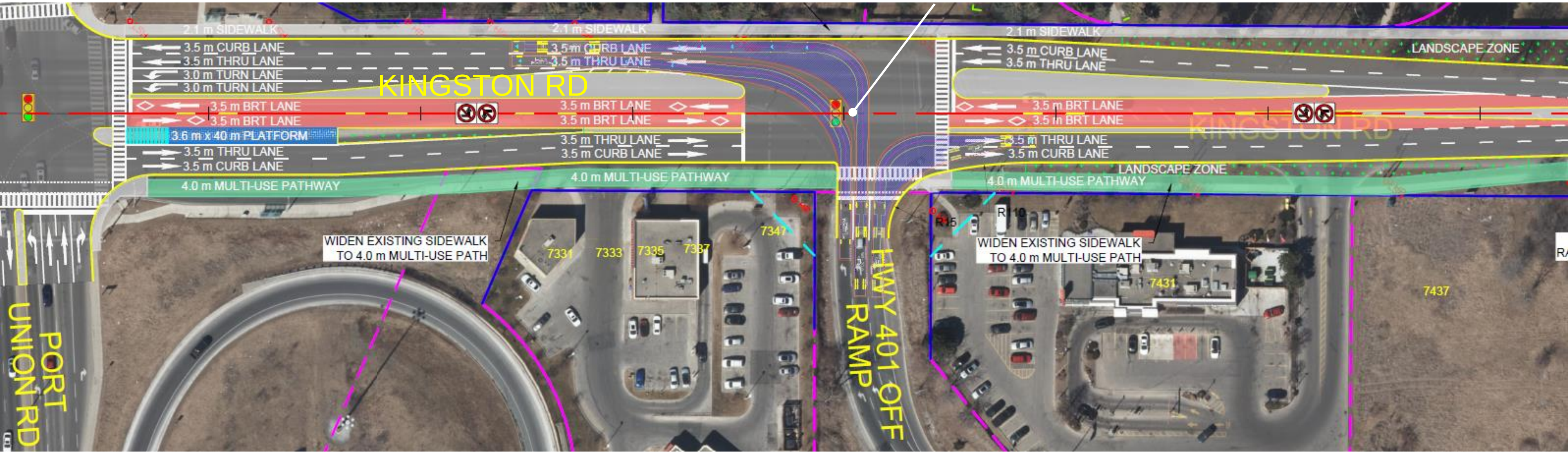
Location 1: Kingston Road (cont'd)



Previous MTO concern Car-pool lot operations.

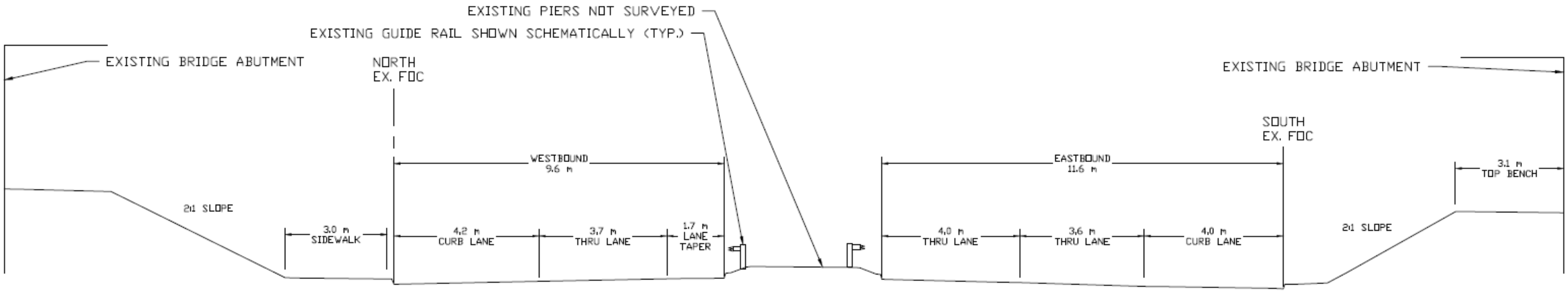
Location 1: Kingston Road (cont'd)

This intersection is not under MTO's jurisdiction, advised by MTO.

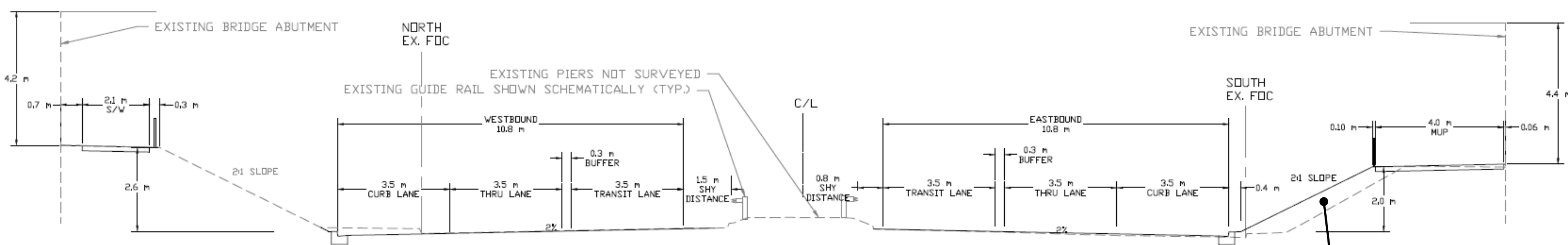


Typical Cross-sections

Kingston Road under Highway 401: EXISTING CONDITION



Kingston Road under Highway 401: PROPOSED CONDITION

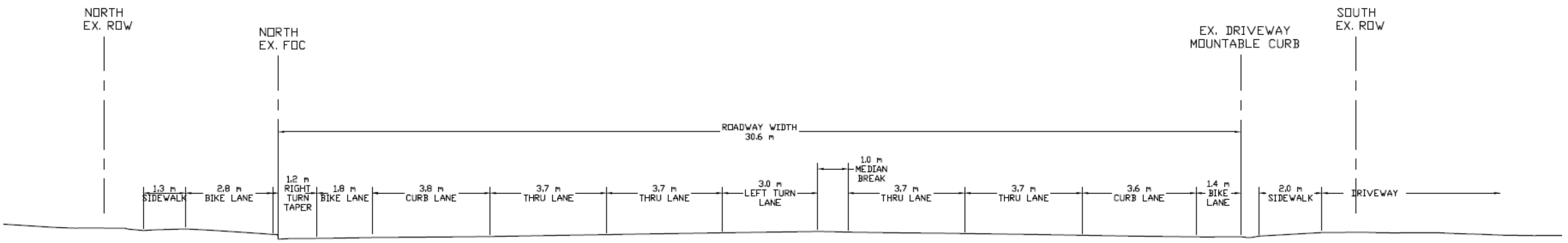


NOTE: No proposed changes to existing centre piers, guide rails (other than standard update) or shallow foundations.

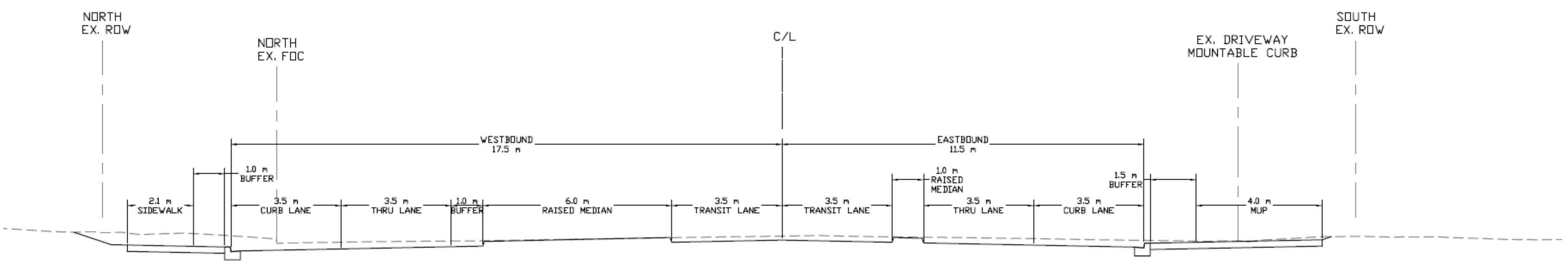
MTO concern of introduction of additional lateral and vertical loading to the existing foundation due to AT path & additional fill on the paved slope:
A detailed foundation assessment during detail design.

Typical Cross-sections (cont'd)

Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: EXISTING CONDITION



Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: PROPOSED CONDITION



Operational Performance

Kingston Road (West of Ellesmere Road to East of Sheppard Avenue/Port Union Road)		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	41,445	44,945
Summer Average Daily Traffic (SADT)	45,980	49,863
Design Hourly Volume (DHV)	PM WB / EB = 842 / 1653	PM WB / EB = 983 / 1934
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1254 / 621 PM WB / EB = 842 / 1653	AM WB / EB = 1475 / 765 PM WB / EB = 983 / 1934
% commercial vehicles	3%	3%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 1: Kingston Road (East of Ellesmere Road to Rylander Boulevard), City of Toronto

Design Year: 2041	Superelevation Maximum Rate for determining the Radius: 6%				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	80	80	70	80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	60	60	50	60	(Proposed Standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	142	130	105	148	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	30.5	26	17	33.3	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	41.5	12-16	10-12	35	Proposed Sag value is reduced to 35 from 41.5; however, it exceeds standards. Operational issues are not envisioned. (Proposed vertical profile is not being changed from existing; however, it is measuring less than previous design criteria.)
Grades Maximum (%)	3	6-8	6-8	2.68	(✓)
Radius Minimum (m)	Tangent	250	190	Tangent	(✓)
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80 km/h design speed. Proposed condition does not meet the requirement for 80 km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.
Shoulder Width (Left / Right) (m)	n/a	n/a	n/a	n/a	n/a
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Median Width (m)	5.6 - 7	2.0	2.0	2-6.24	(✓)
R.O.W. Width - nominal (m)	26.2 – 36.5			26.2 - 38.7	(Potential property acquisition at Kingston Road/Centennial Road.)

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-1: Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	35	17	17	35	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	10	10-12	10-12	10	(✓)
Grades Maximum (%)	4.63	6-8	6-8	4.63	(✓)
Radius Minimum (m)	200	190	130	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2 x 3.75	3.75	3.75	2 x 3.75	(✓)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-2: Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation
Crest: Minimum "K" factor for Stopping Sight Distance	40	17	17	40	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	4.1	6-8	6-8	4.1	(✓)
Radius Minimum (m)	200	190	190	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 4.75	4.75	4.75	1 x 4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	?	n/a	n/a	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to present condition.
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-3: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum "K" factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Sag: Minimum "K" factor for Stopping Sight Distance	12	10-12	10-12	12	(✓)
Grades Maximum (%)	6.3	6-8	6-8	6.3	(✓)
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	3.75	3.75	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	(✓)
Shoulder Width (Left / Right) (m)	1.00 / 3.50	1.0 / 2.5	1.0 / 2.5	1.00 / 3.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

1. Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed(km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Present Conditions Substandard But Improved Criteria

Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.

Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation. (Will develop options for MTO review.)

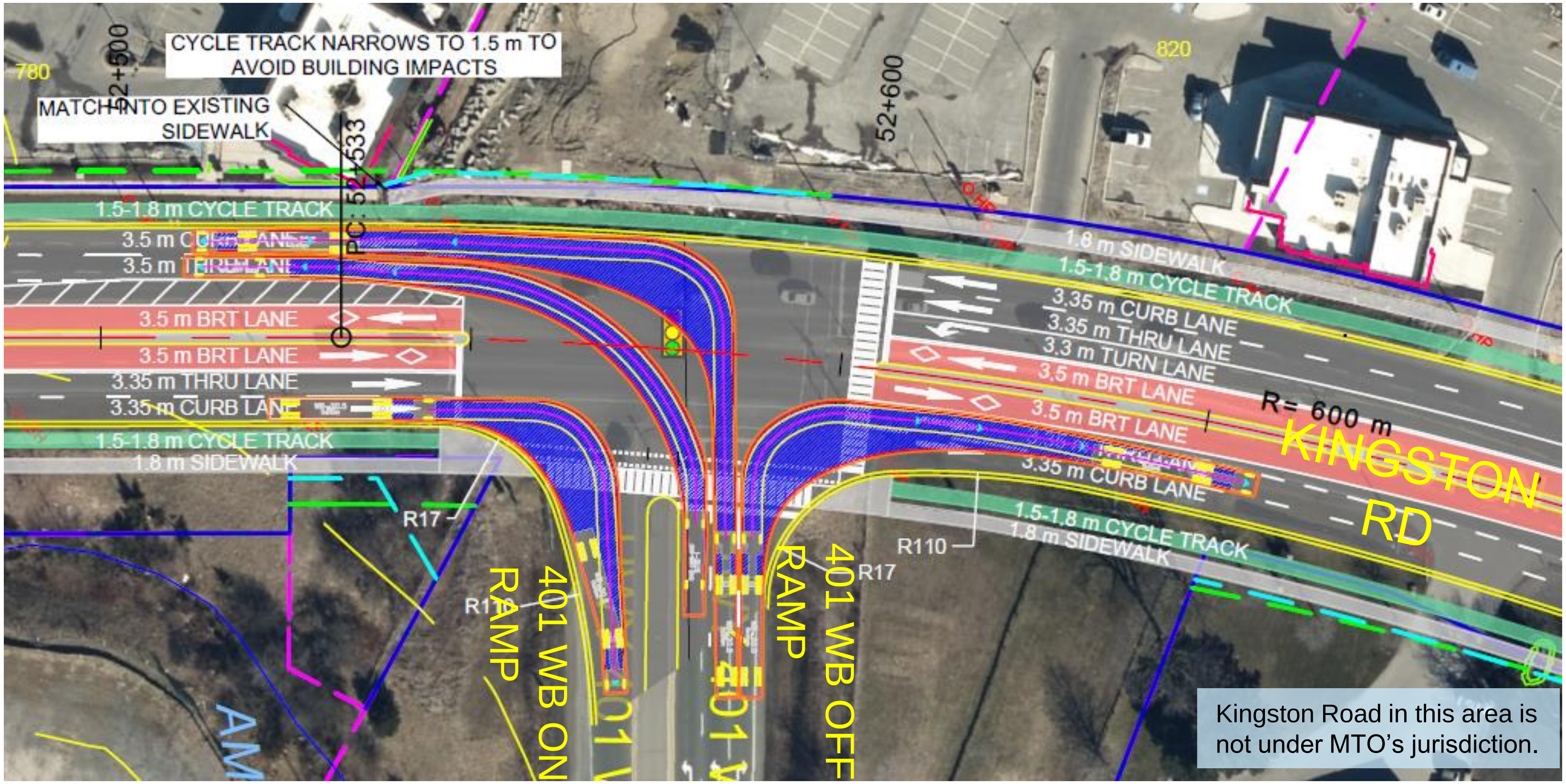
Present Conditions Substandard But Improved Criteria

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum “K” factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

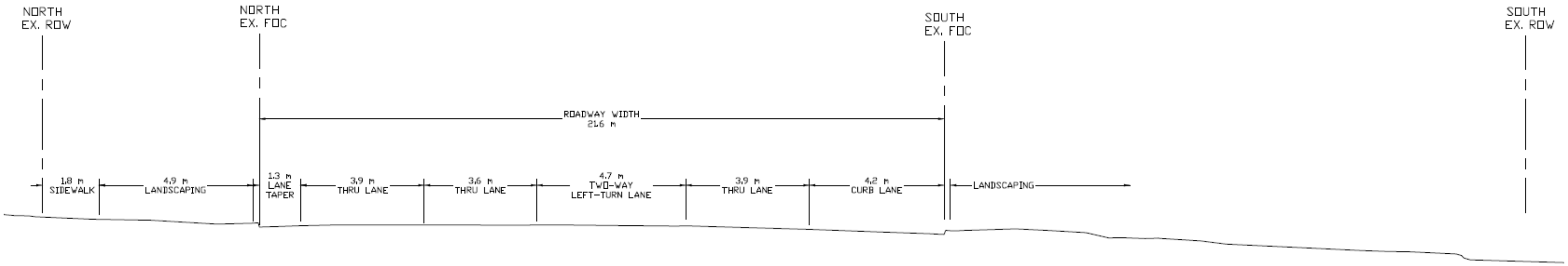
Location 2: Highway 401 On/Off Ramps

- at Kingston Road east of Whites Road in Town of Pickering

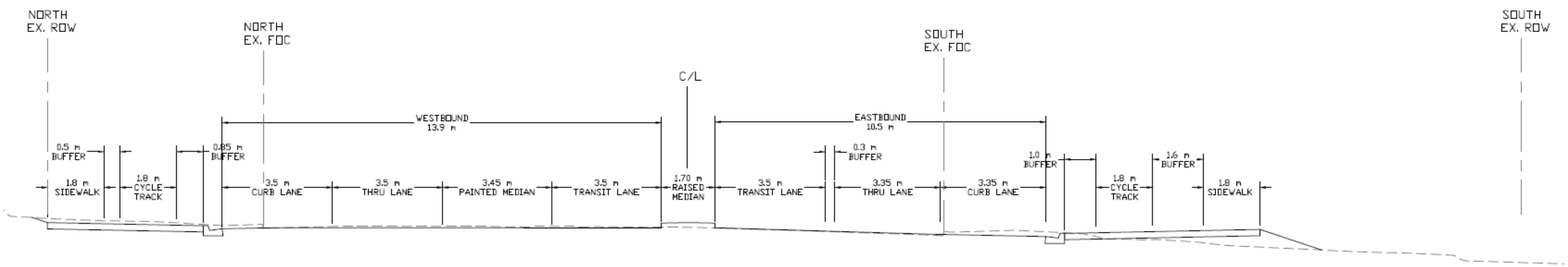


Typical Cross-sections

Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: EXISTING CONDITION



Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: PROPOSED CONDITION



Operational Performance

Kingston Road at Highway 401 On/Off Ramps East of Whites Road		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	20,998	26,198
Summer Average Daily Traffic (SADT)	23,296	29,065
Design Hourly Volume (DHV)	PM WB / EB = 982 / 1537	PM WB / EB = 1145 / 1707
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1043 / 746 PM WB / EB = 982 / 1537	AM WB / EB = 1290 / 869 PM WB / EB = 1145 / 1707
% commercial vehicles	1.6%	1.6%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Interchange Standards Table 2-1: Highway 401 @ Kingston Road - N/S-W ON RAMP east of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum “K” factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum “K” factor for Stopping Sight Distance	25	10-12	10-12	25	(✓)
Grades Maximum (%)	2.56	6-8	6-8	2.56	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	median / 2.50	1.0 / 2.5	1.0 / 2.5	median / 2.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 2-2: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	45	10-12	10-12	45	(✓)
Grades Maximum (%)	2.6	6-8	6-8	2.6	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Shoulder Width (Left / Right) (m)	n/a / 2.5	1.0 / 2.5	1.0 / 2.5	n/a / 2.5	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Present Conditions Substandard But Improved Criteria

Highway 401 @ Kingston Road - N/S-W ON RAMP East of Whites Road

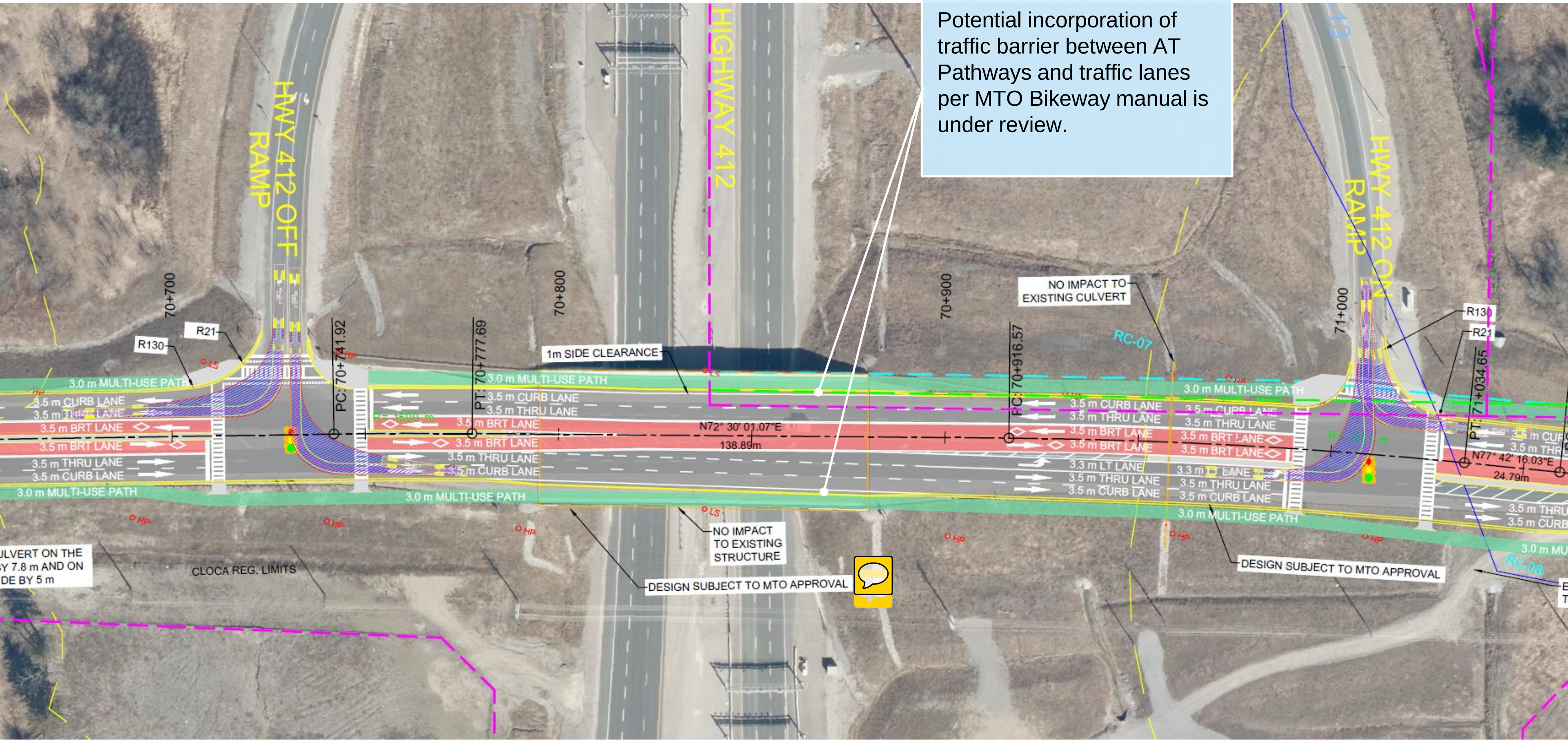
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

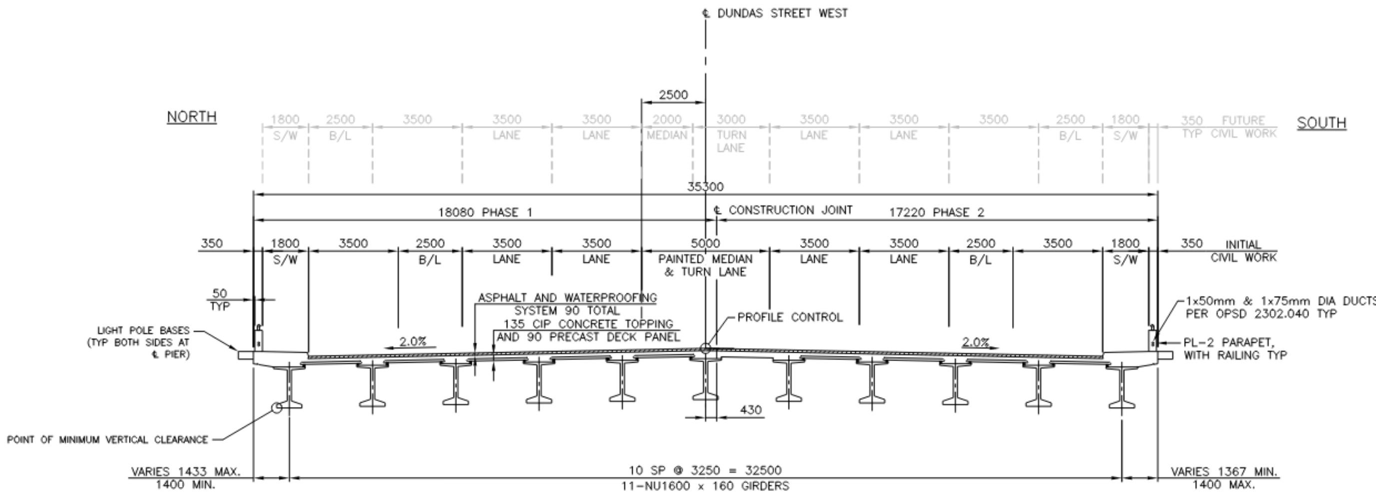
Location 3: Dundas Street West

- From Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby



Typical Cross-sections

Dundas Street West at Highway 412: EXISTING CONDITION



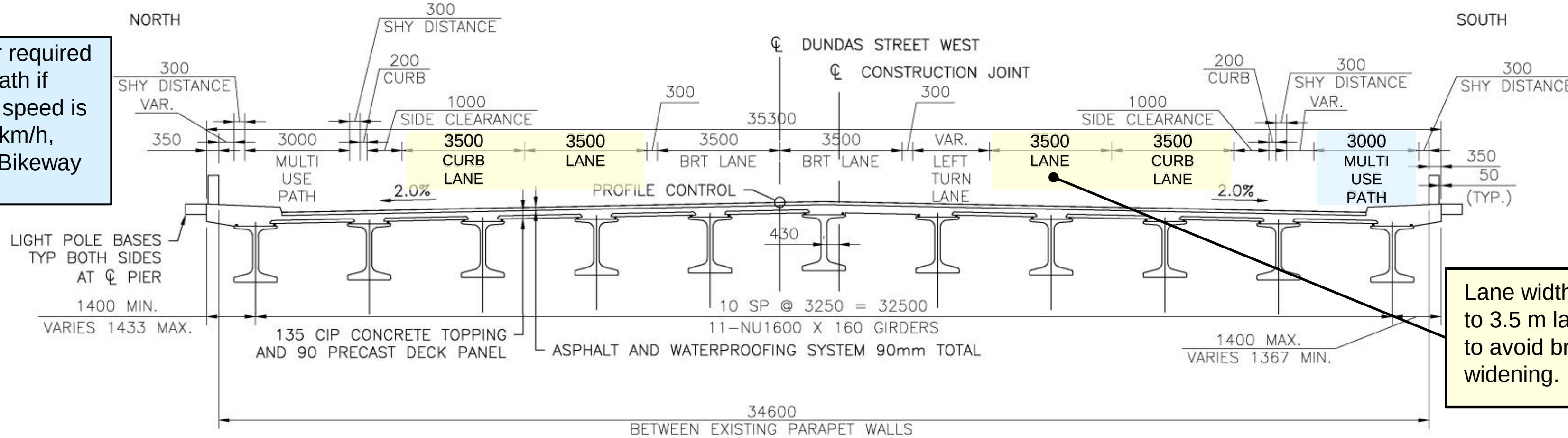
Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Typical Cross-sections

Dundas Street West at Highway 412: PROPOSED DESIGN Option 1

3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers

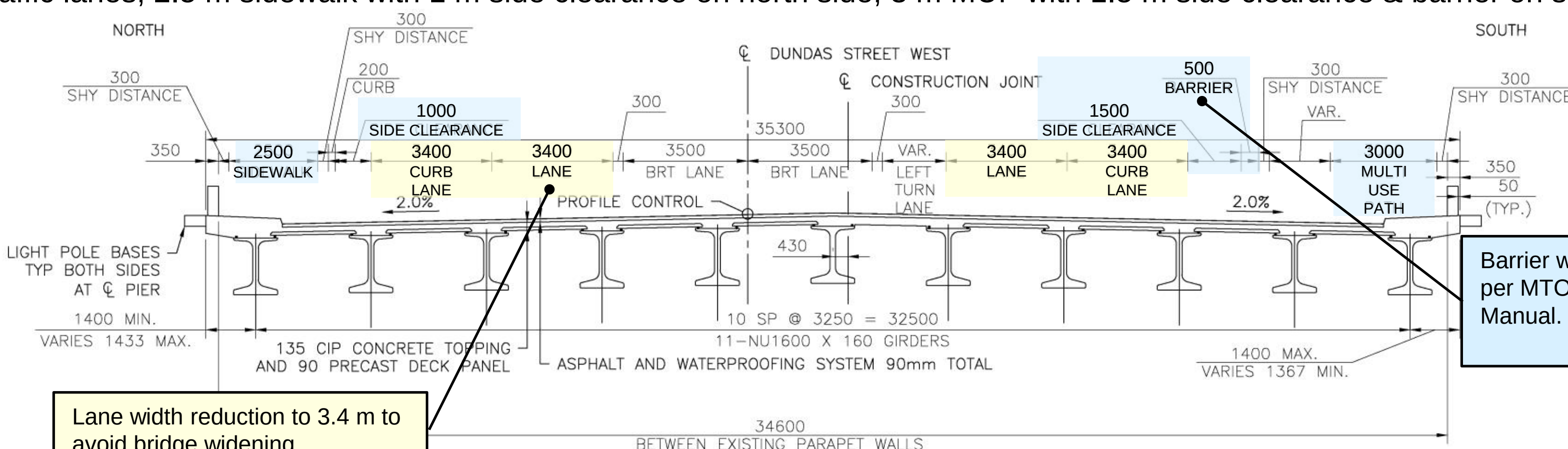
No barrier required with AT Path if operating speed is below 80 km/h, per MTO Bikeway Manual.



Lane width reduction to 3.5 m lane width to avoid bridge widening.

Dundas Street West at Highway 412: PROPOSED DESIGN Option 2

3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side



Barrier with AT Path, per MTO Bikeway Manual.

Lane width reduction to 3.4 m to avoid bridge widening.

Operational Performance

Dundas Street West at Highway 412		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	27,849	31,349
Summer Average Daily Traffic (SADT)	30,896	34,779
Design Hourly Volume (DHV)	PM WB / EB = 785 / 1693	PM WB / EB = 975 / 1810
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1467 / 510 PM WB / EB = 785 / 1693	AM WB / EB = 1632 / 700 PM WB / EB = 975 / 1810
% commercial vehicles	1.7%	1.7%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 2: Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

Design Year: 2041	Superelevation Maximum Rate for Determining the Radius: 6 %				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Crest: Minimum "K" factor for Stopping Sight Distance	50	39	26	44.87	Present condition will not be changed. Detailed survey to be obtained during detailed design. The proposed are not intended to change the present condition value. (Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	n/a	6-8	6-8	2.35	(✓)
Radius Minimum (m)	5000	340	250	1300	Alignment is being fitted to existing conditions. No significant changes are anticipated.
Lane Widths (m)	4x3.5 Thru Lane 1x3.5 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90 km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.
Shoulder Width (Left / Right) (m)	5.6	1.0	1.0	1.0	(Existing shoulders were built to ultimate condition.) Proposed shoulder meets standard.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	
Median Width (m)	1.5 - 5	2.0	2.0	0 – 1.7	(Raised concrete medians terminate at the approaches of the bridge. In order to minimize impacts to the Highway 412 bridge structure a median is not proposed.)
R.O.W. Width – nominal (m)	55.43 – 59.16			55.43 – 65.23	

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont’d)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	>200	200	178	>200	(✓)
Crest: Minimum “K” factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum “K” factor for Stopping Sight Distance	40	12-16	12-16	40	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2x3.75	2x3.7	2x3.7	2x3.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 3-2: Highway 412 @ Dundas Street West – E/W-N ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	30	12-16	12-16	30	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Potential Exemptions (cont'd)

To avoid Highway 412 Bridge widening, two options are considered. **[NTD: Design recommendation to be made prior to MTO Senior Management Meeting]**

Option 1 - 3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers

- **Potential Exemption**:
  - Reduction in design speed from 90 km/h to 80 km/h, i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- **Rationale**:
  - Spatial constraints of bridge cross section.
  - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Option 2 - 3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side

- **Potential Exemption**:
  - Lane width reduction from 3.75 m to 3.4 m
- **Rationale**:
  - Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
  - Spatial constraints of bridge cross section.
  - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Present Conditions Substandard But Improved Criteria

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).

Draft Implementation Strategy

Exemption Summary

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**

    - To facilitate the introduction of BRT, traffic lane width of 3.5 m is proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary (cont'd)

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

- Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary (cont'd)

[NTD: Design recommendation to be made prior to MTO Senior Management Meeting]

3.1. Reduction in design speed from 90 to 80 km/h on Dundas St West

- i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- To avoid Highway 412 Bridge widening, Option 1 (3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers) is proposed.

Rationale:

- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

3.2. Reduction in lane width from 3.75 m to 3.4 m on Dundas St West

- To avoid Highway 412 Bridge widening, Option 2 (3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Next Steps

- Address concerns, if any, from MTO Senior Management
- Receive MTO endorsement
- Address agency comments on draft Environmental Project Report (EPR)
- Post EPR on public record for a 30-days period starting January 6th, 2022.
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI PARSONS

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Preliminary Design Criteria

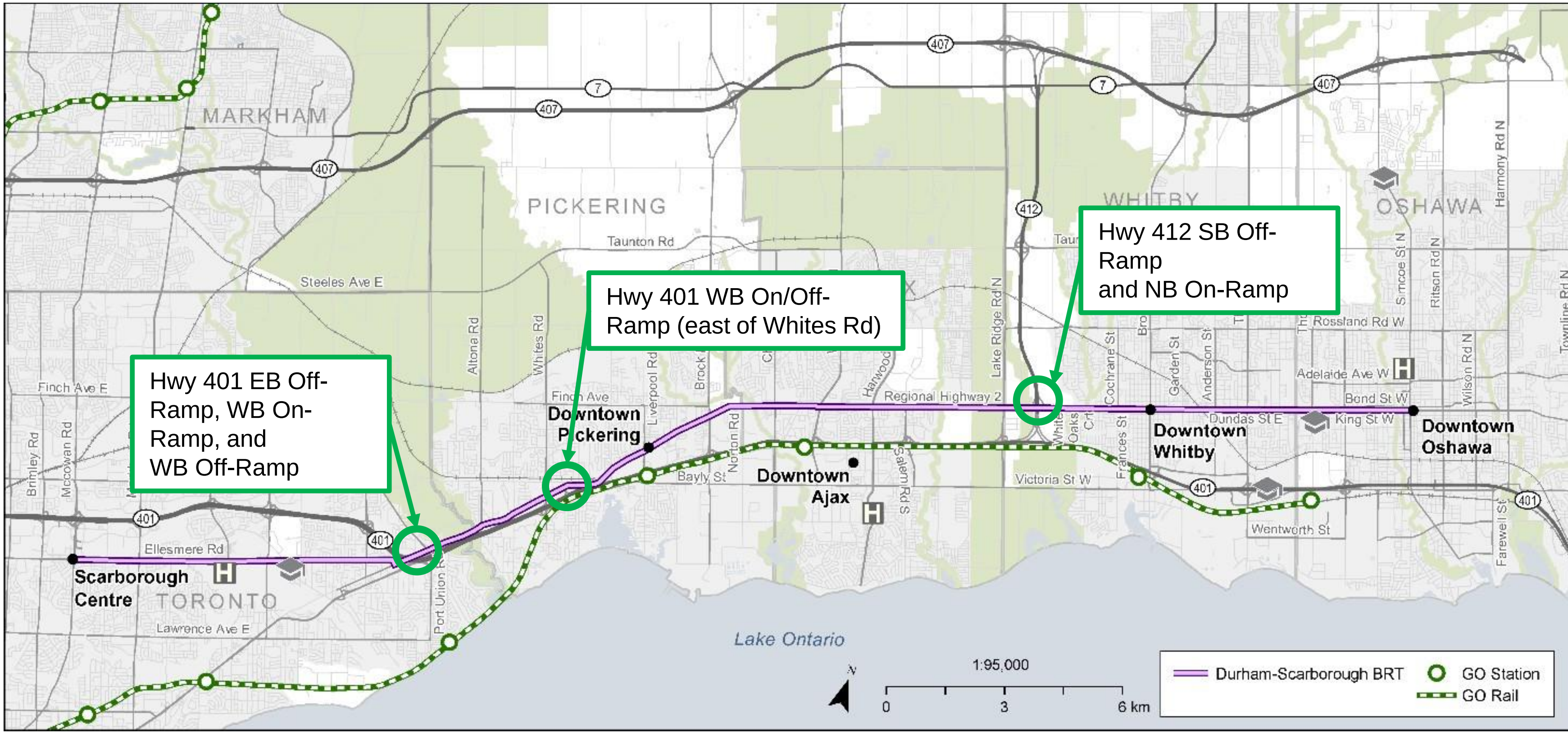
IBI PARSONS

December 7, 2021

Agenda

1. Study Area
2. Draft Preliminary Design Criteria
    1. Kingston Road at Highway 401
    2. Highway 401 On/Off Ramps (east of Whites Road)
    3. Dundas Street West at Highway 412
3. Potential Exemptions
4. Substandard Present Conditions - Improved or Remaining the Same
5. Draft Implementation Strategy
6. Next Steps

Study Area

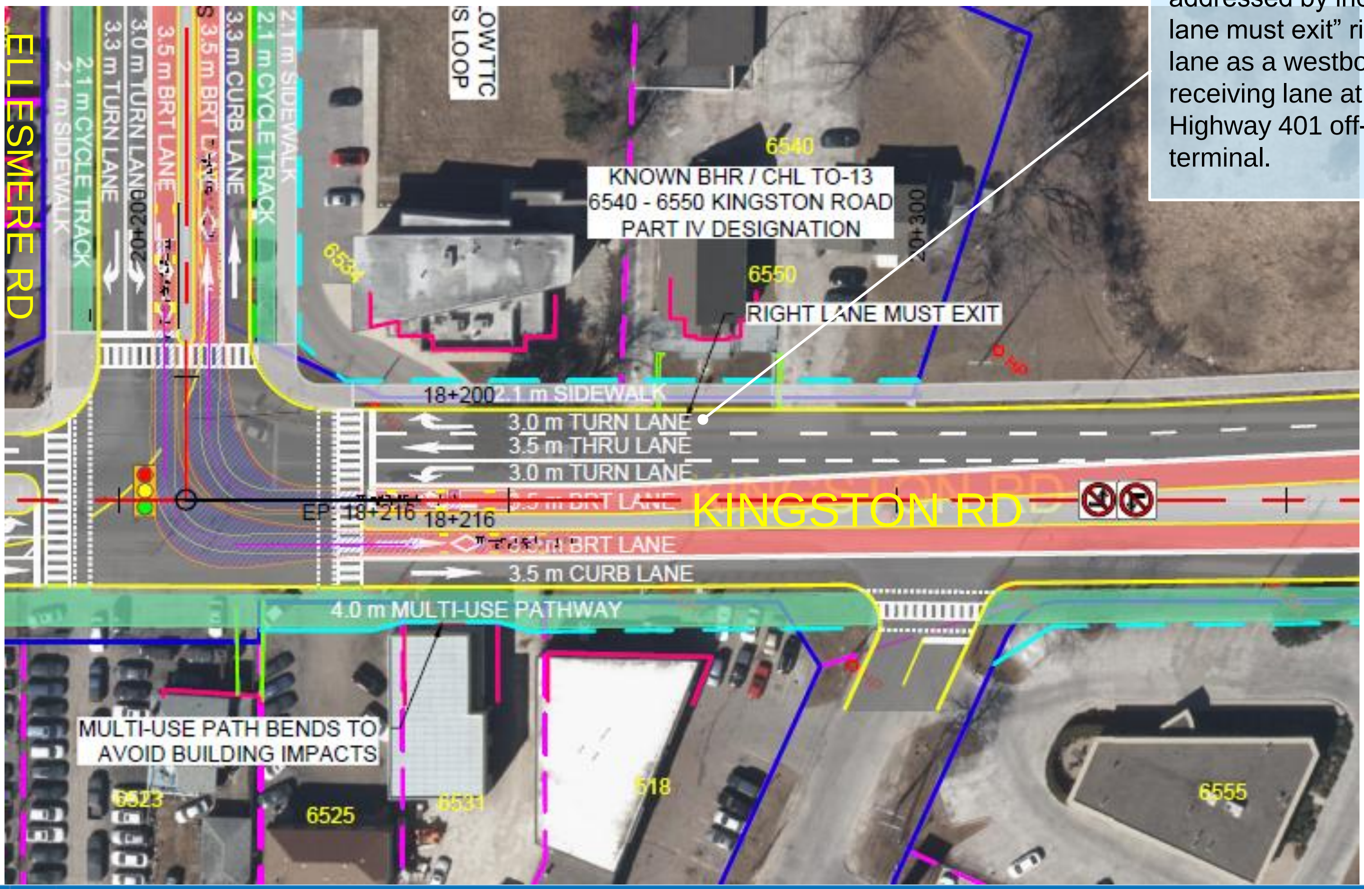


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp (east of Whites Rd)
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Dundas St E
King St W
Bond St W
Adelaide Ave W
Rossland Rd W
Wentworth St
Brimley Rd
Mccowan Rd
Port Union Rd
Altona Rd
Whites Rd
Liverpool Rd
Brock Rd
Harwood
Salem Rd S
Lake Ridge Rd N
Cochrane St
Frances St
Garden St
Anderson St
Simcoe St N
Ritson Rd N
Wilson Rd N
Harmony Rd N
Townline Rd N
Farewell St
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

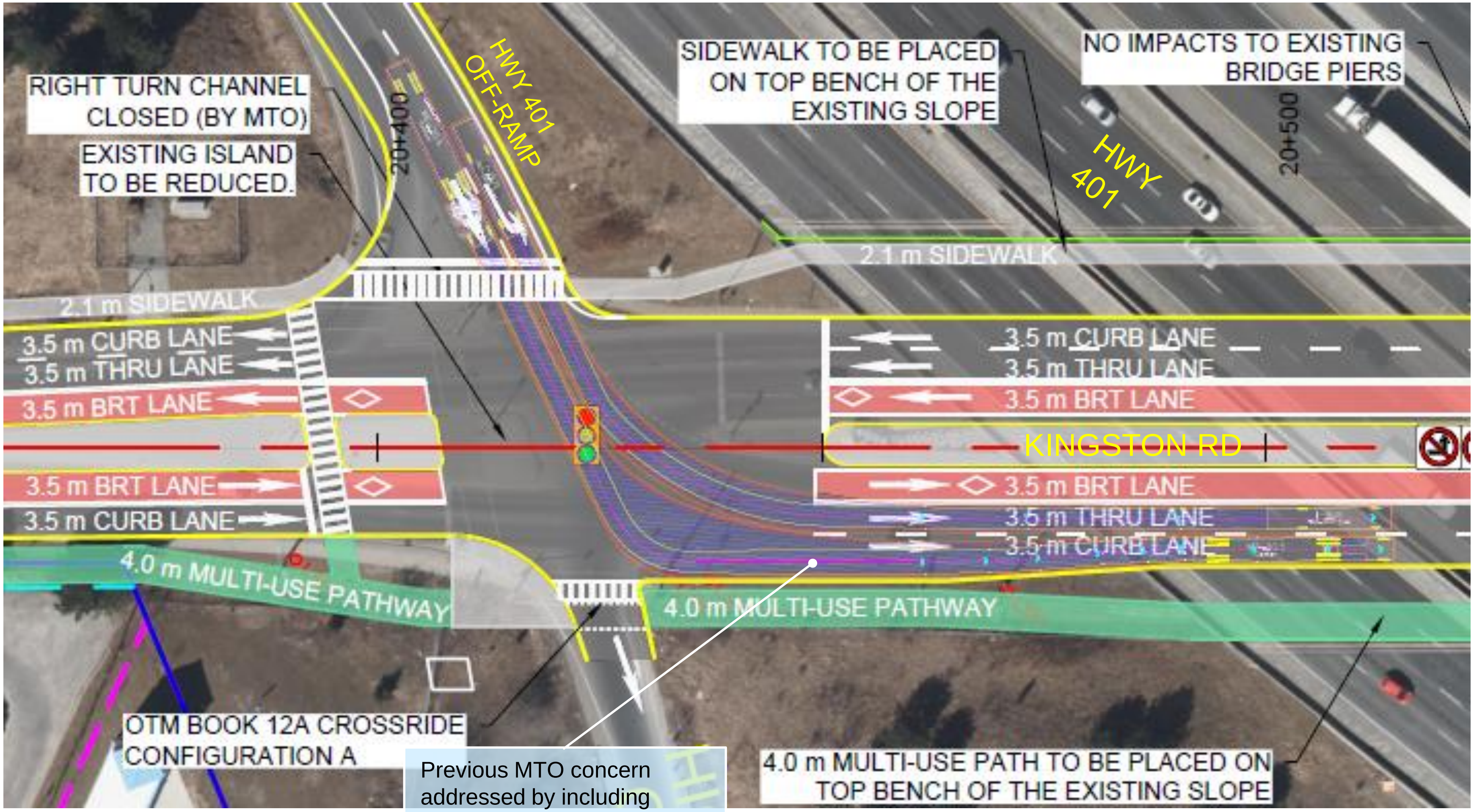
Location 1: Kingston Road

- Kingston Road from east of Ellesmere Road to Rylander Boulevard
- Highway 401 E-N/S off ramp at Kingston Road, east of Sheppard Avenue/Port Union Road, in City of Toronto

Previous MTO concern addressed by including "right lane must exit" right turn lane as a westbound receiving lane at the Highway 401 off-ramp terminal.



Location 1: Kingston Road (cont'd)



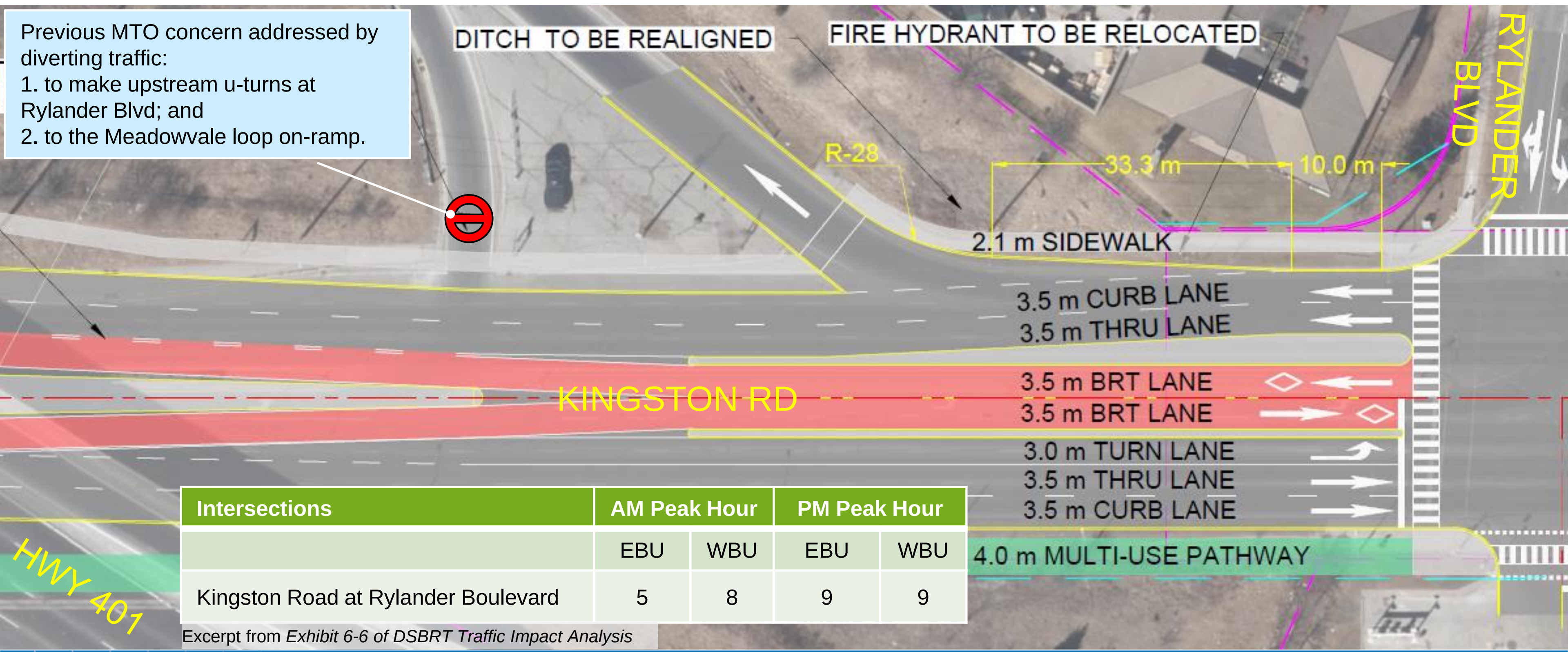
Previous MTO concern addressed by including additional pavement width to accommodate simultaneous dual left turning movement for design vehicles of WB-20.5 and I-BUS.

Location 1: Kingston Road (cont'd)

Highway 401 S-W On-Ramp Closure

Existing entrance to Highway 401 On-ramp to be closed due to the removal of existing EB left turn lane to facilitate the introduction of BRT.

Previous MTO concern addressed by diverting traffic:
1. to make upstream u-turns at Rylander Blvd; and
2. to the Meadowvale loop on-ramp.



Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

Excerpt from *Exhibit 6-6 of DSBRT Traffic Impact Analysis*

Location 1: Kingston Road (cont'd)

- EB traffic can access Hwy 401 WB via Meadowvale Road.
- Minimal inconvenience for drivers given the alternate routing is similar length
    - Start to Finish is 2 to 2.5 km
- Existing hourly volume using NB Meadowvale to Highway 401 WB ramps peaks at 190 vehicles at 12:00 p.m.
- Maximum demand of ~ 430 vph (190 + 240) at NB Meadowvale loop on-ramp can be accommodated.

Highway 401 S-W On-Ramp Closure

Year	AM Peak	PM Peak
2019	30 vph	240 vph
2041	43 vph	345 vph

Location 1: Kingston Road (cont'd)

Year	AM Peak	PM Peak
2019	620 vph	260 vph
2041	868 vph	364 vph

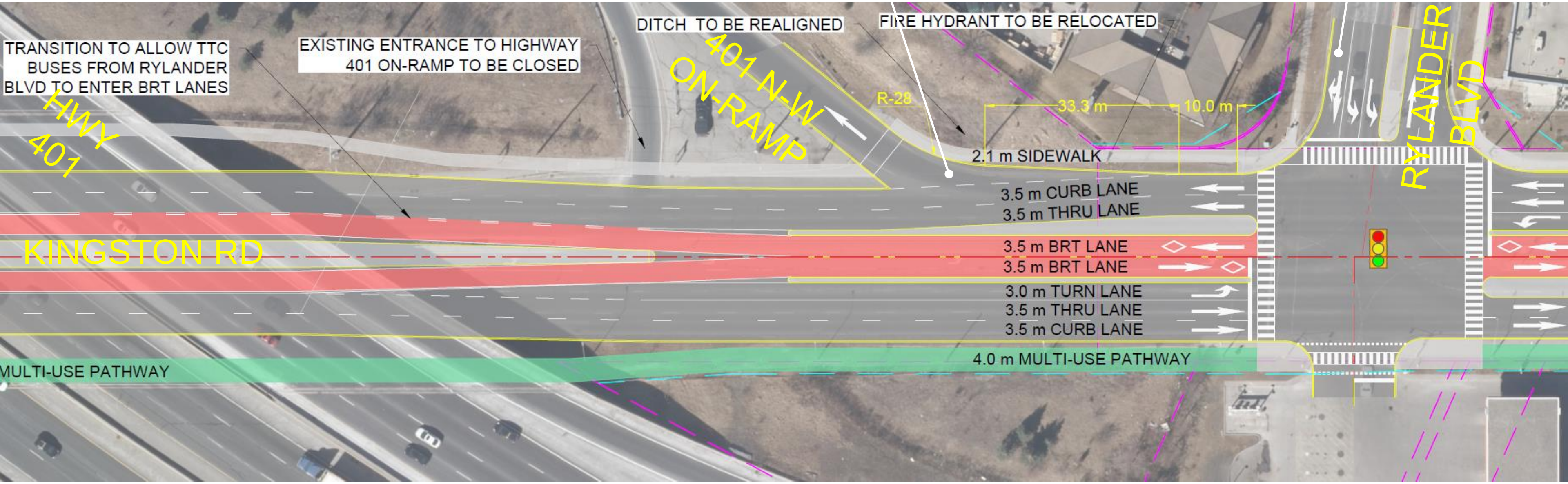
DS existing 80 km/h (70 km/h) for Kingston Road

DS existing 70 km/h (60 km/h) for Hwy 401 N-W Ramp

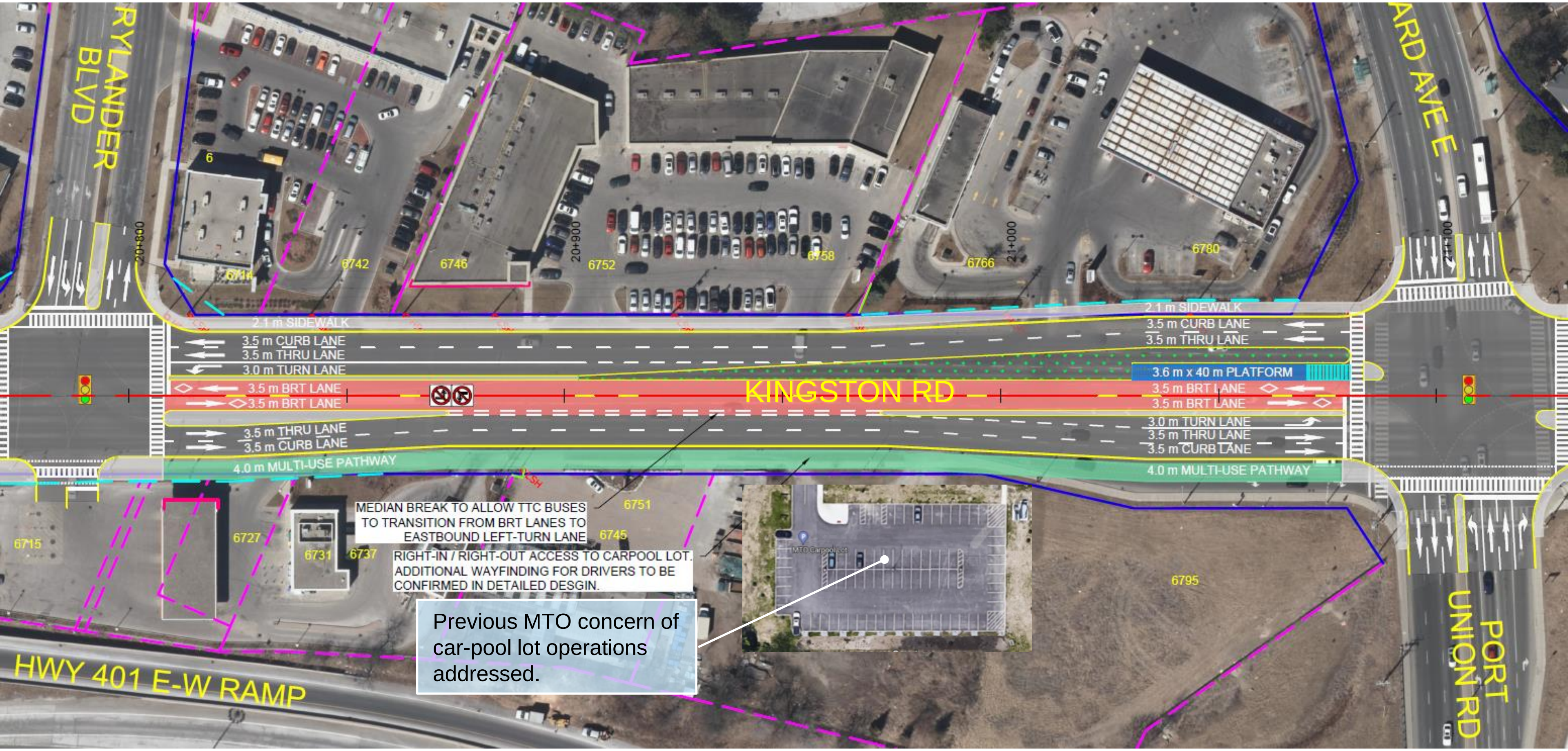
Length of taper achieved - 33.3 m; standard requires 70 m (60 m) for 70 km/h (60 km/h) DS

Highway 401 N-W On-Ramp Taper

Proposed "No Right Turn On Red" to reduce traffic weaving.

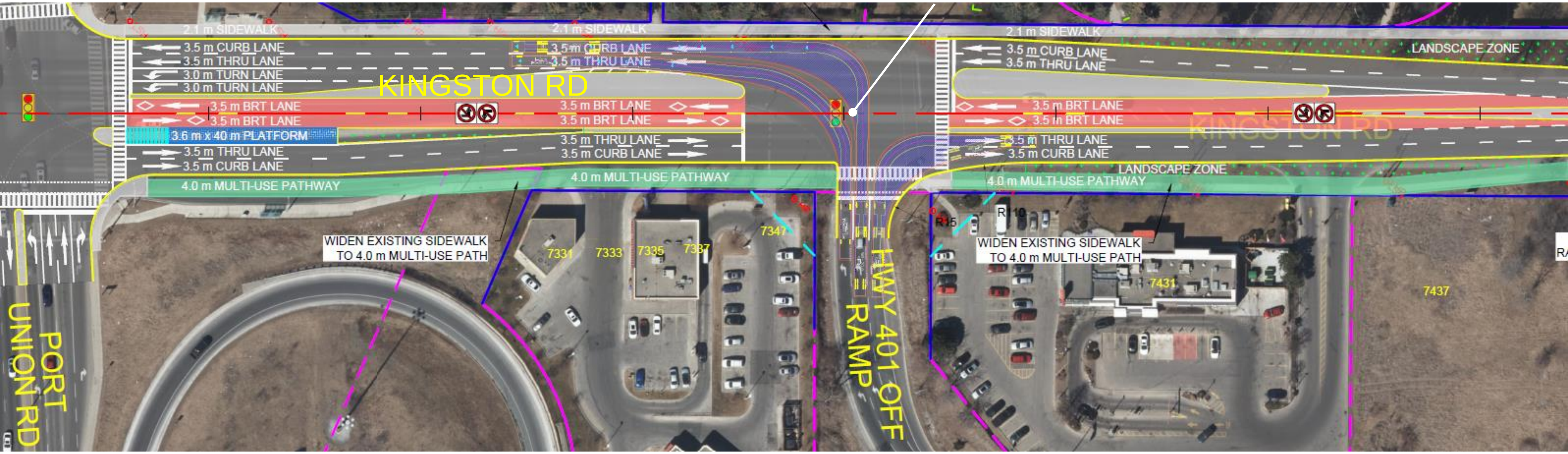


Location 1: Kingston Road (cont'd)



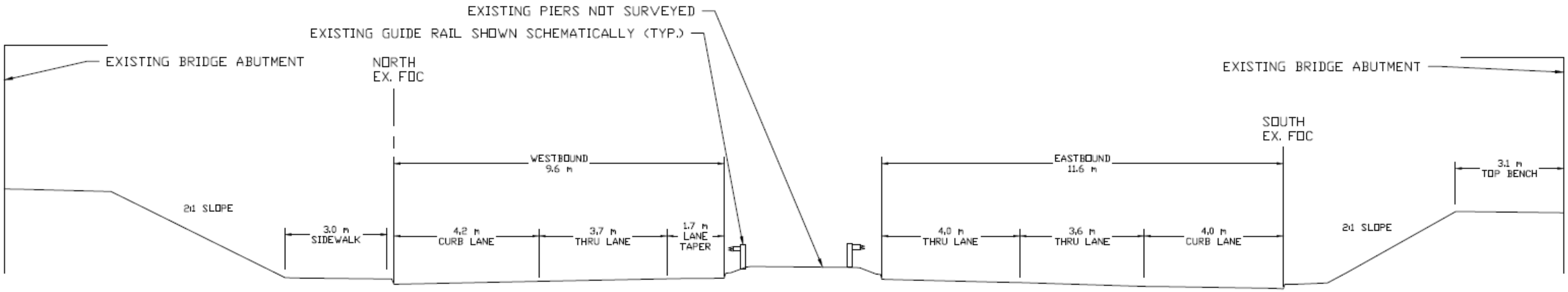
Location 1: Kingston Road (cont'd)

This intersection is not under MTO's jurisdiction, advised by MTO.

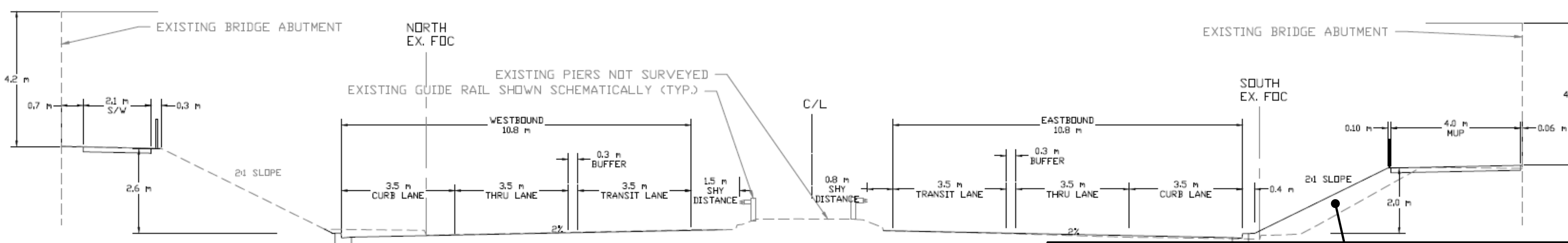


Typical Cross-sections

Kingston Road under Highway 401: EXISTING CONDITION



Kingston Road under Highway 401: PROPOSED CONDITION

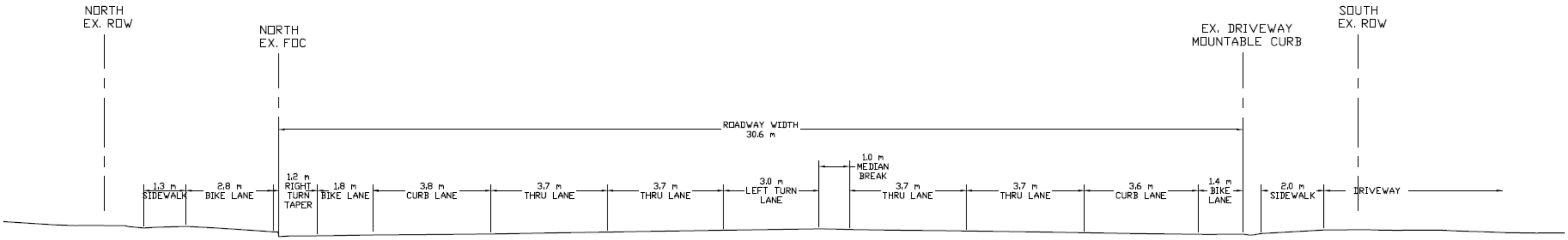


NOTE: No proposed changes to existing centre piers, guide rails (other than standard update) or shallow foundations.

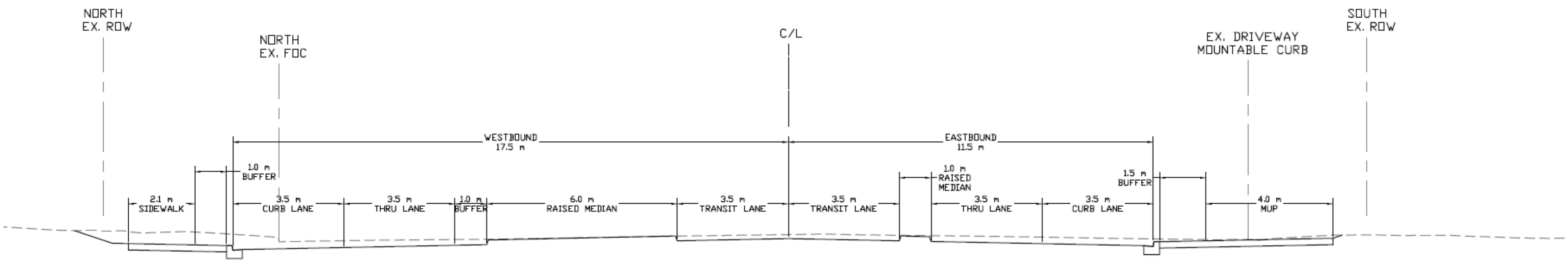
MTO concern of introduction of additional lateral and vertical loading to the existing foundation due to AT path & additional fill on the existing paved slope:
A detailed foundation assessment will be completed during detail design.

Typical Cross-sections (cont'd)

Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: EXISTING CONDITION



Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: PROPOSED CONDITION



Operational Performance

Kingston Road (West of Ellesmere Road to East of Sheppard Avenue/Port Union Road)		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	41,445	44,945
Summer Average Daily Traffic (SADT)	45,980	49,863
Design Hourly Volume (DHV)	PM WB / EB = 842 / 1653	PM WB / EB = 983 / 1934
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1254 / 621 PM WB / EB = 842 / 1653	AM WB / EB = 1475 / 765 PM WB / EB = 983 / 1934
% commercial vehicles	3%	3%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 1: Kingston Road (East of Ellesmere Road to Rylander Boulevard), City of Toronto

	Superelevation Maximum Rate for determining the Radius: 6%				
Design Year: 2041	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	80	80	70	80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	60	60	50	60	(Proposed Standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	142	130	105	148	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	30.5	26	17	33.3	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	41.5	12-16	10-12	35	Proposed Sag value is reduced to 35 from 41.5; however, it exceeds standards. Operational issues are not envisioned. (Proposed vertical profile is not being changed from existing; however, it is measuring less than previous design criteria.)
Grades Maximum (%)	3	6-8	6-8	2.68	(✓)
Radius Minimum (m)	Tangent	250	190	Tangent	(✓)
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80 km/h design speed. Proposed condition does not meet the requirement for 80 km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.
Shoulder Width (Left / Right) (m)	n/a	n/a	n/a	n/a	n/a
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Median Width (m)	5.6 - 7	2.0	2.0	2-6.24	(✓)
R.O.W. Width - nominal (m)	26.2 – 36.5			26.2 - 38.7	(Potential property acquisition at Kingston Road/Centennial Road.)

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-1: Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	35	17	17	35	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	10	10-12	10-12	10	(✓)
Grades Maximum (%)	4.63	6-8	6-8	4.63	(✓)
Radius Minimum (m)	200	190	130	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2 x 3.75	3.75	3.75	2 x 3.75	(✓)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-2: Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation.
Crest: Minimum "K" factor for Stopping Sight Distance	40	17	17	40	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	4.1	6-8	6-8	4.1	(✓)
Radius Minimum (m)	200	190	190	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 4.75	4.75	4.75	1 x 4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	?	n/a	n/a	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to present condition.
Sight Distance at Entrance Terminal (m)	401: ? Kingston: 150	401: 370–470 Kingston: 130	401: 370–470 Kingston: 130	401: ? Kingston: 150	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-3: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum "K" factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Sag: Minimum "K" factor for Stopping Sight Distance	12	10-12	10-12	12	(✓)
Grades Maximum (%)	6.3	6-8	6-8	6.3	(✓)
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	3.75	3.75	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	(✓)
Shoulder Width (Left / Right) (m)	1.00 / 3.50	1.0 / 2.5	1.0 / 2.5	1.00 / 3.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed(km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Substandard Present Conditions – Remaining the Same

Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.

Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation.

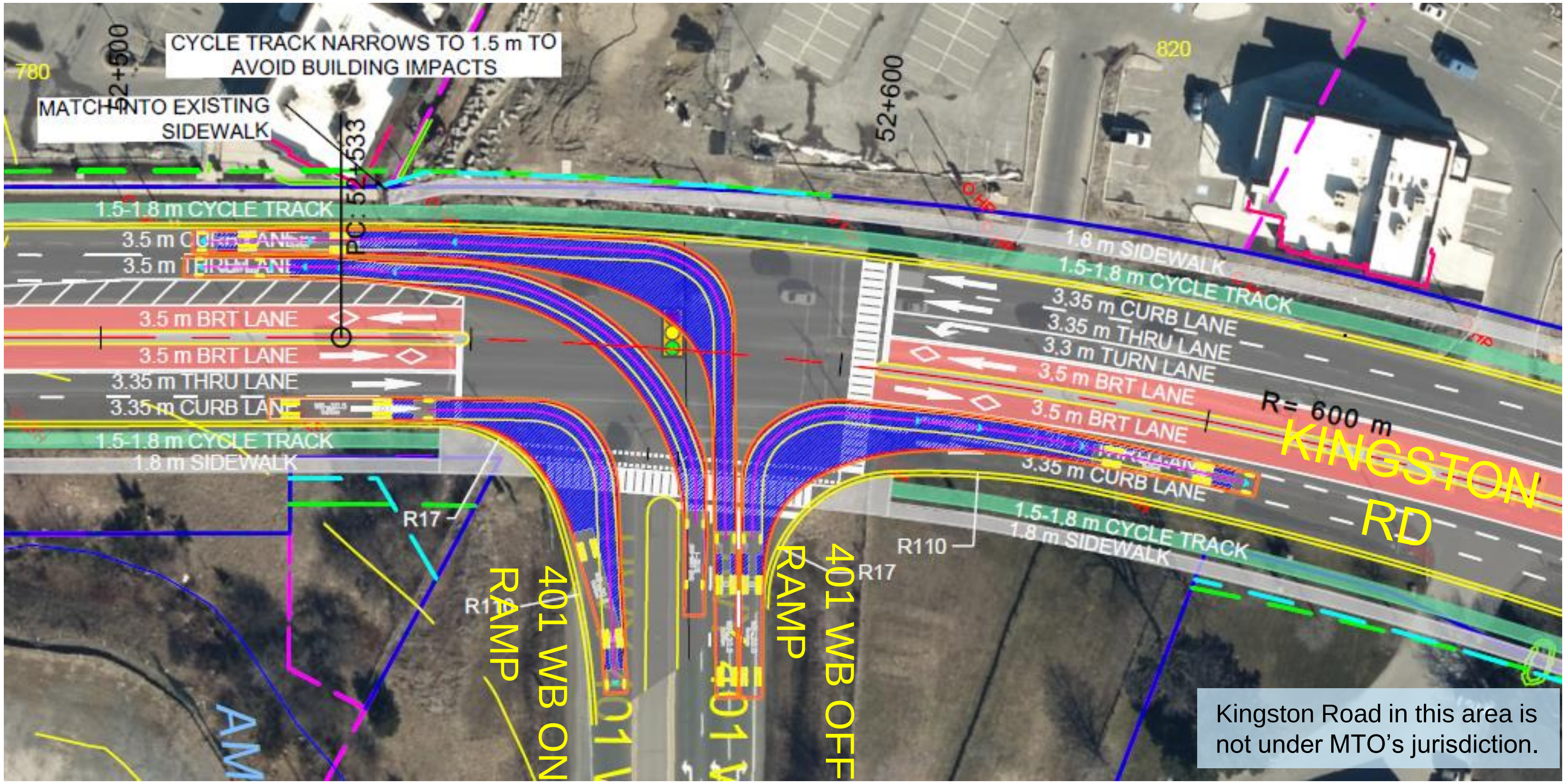
Substandard Present Conditions – Improved/ Remaining the Same

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum “K” factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

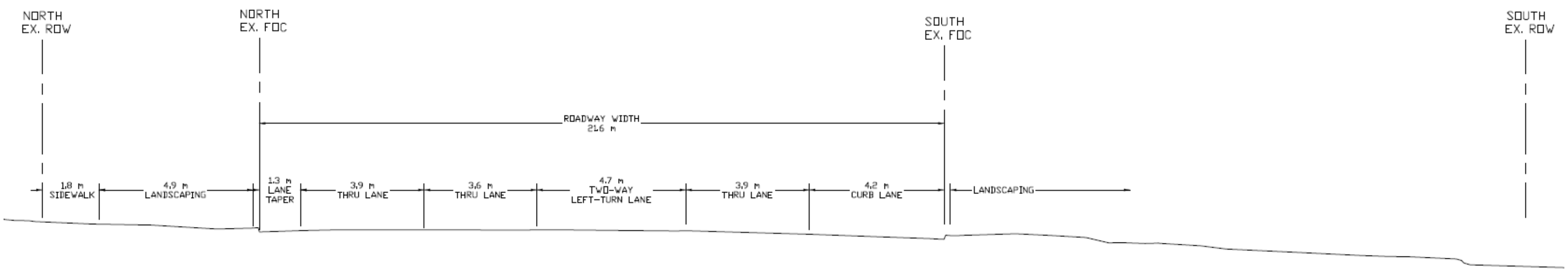
Location 2: Highway 401 On/Off Ramps

- At Kingston Road east of Whites Road in Town of Pickering

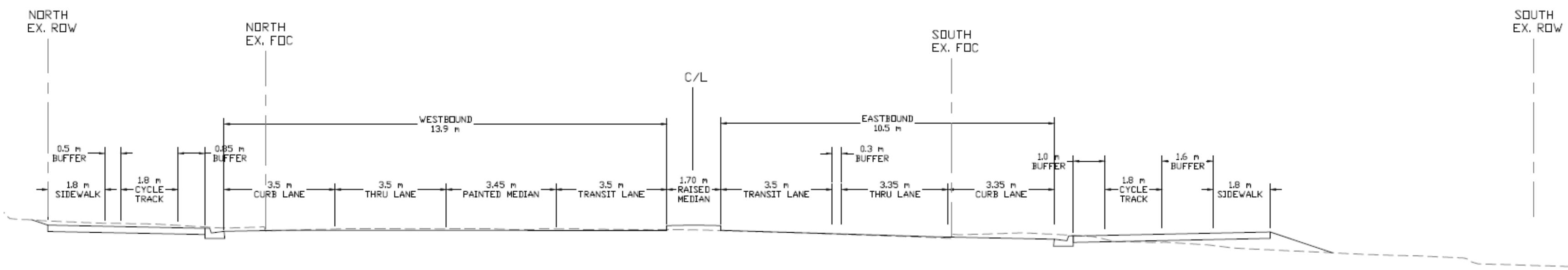


Typical Cross-sections

Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: EXISTING CONDITION



Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: PROPOSED CONDITION



Operational Performance

Kingston Road at Highway 401 On/Off Ramps East of Whites Road		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	20,998	26,198
Summer Average Daily Traffic (SADT)	23,296	29,065
Design Hourly Volume (DHV)	PM WB / EB = 982 / 1537	PM WB / EB = 1145 / 1707
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1043 / 746 PM WB / EB = 982 / 1537	AM WB / EB = 1290 / 869 PM WB / EB = 1145 / 1707
% commercial vehicles	1.6%	1.6%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Interchange Standards Table 2-1: Highway 401 @ Kingston Road - N/S-W ON RAMP east of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	25	10-12	10-12	25	(✓)
Grades Maximum (%)	2.56	6-8	6-8	2.56	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	median / 2.50	1.0 / 2.5	1.0 / 2.5	median / 2.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 2-2: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	45	10-12	10-12	45	(✓)
Grades Maximum (%)	2.6	6-8	6-8	2.6	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Shoulder Width (Left / Right) (m)	n/a / 2.5	1.0 / 2.5	1.0 / 2.5	n/a / 2.5	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Substandard Present Conditions – Remaining the Same

Highway 401 @ Kingston Road - N/S-W ON RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

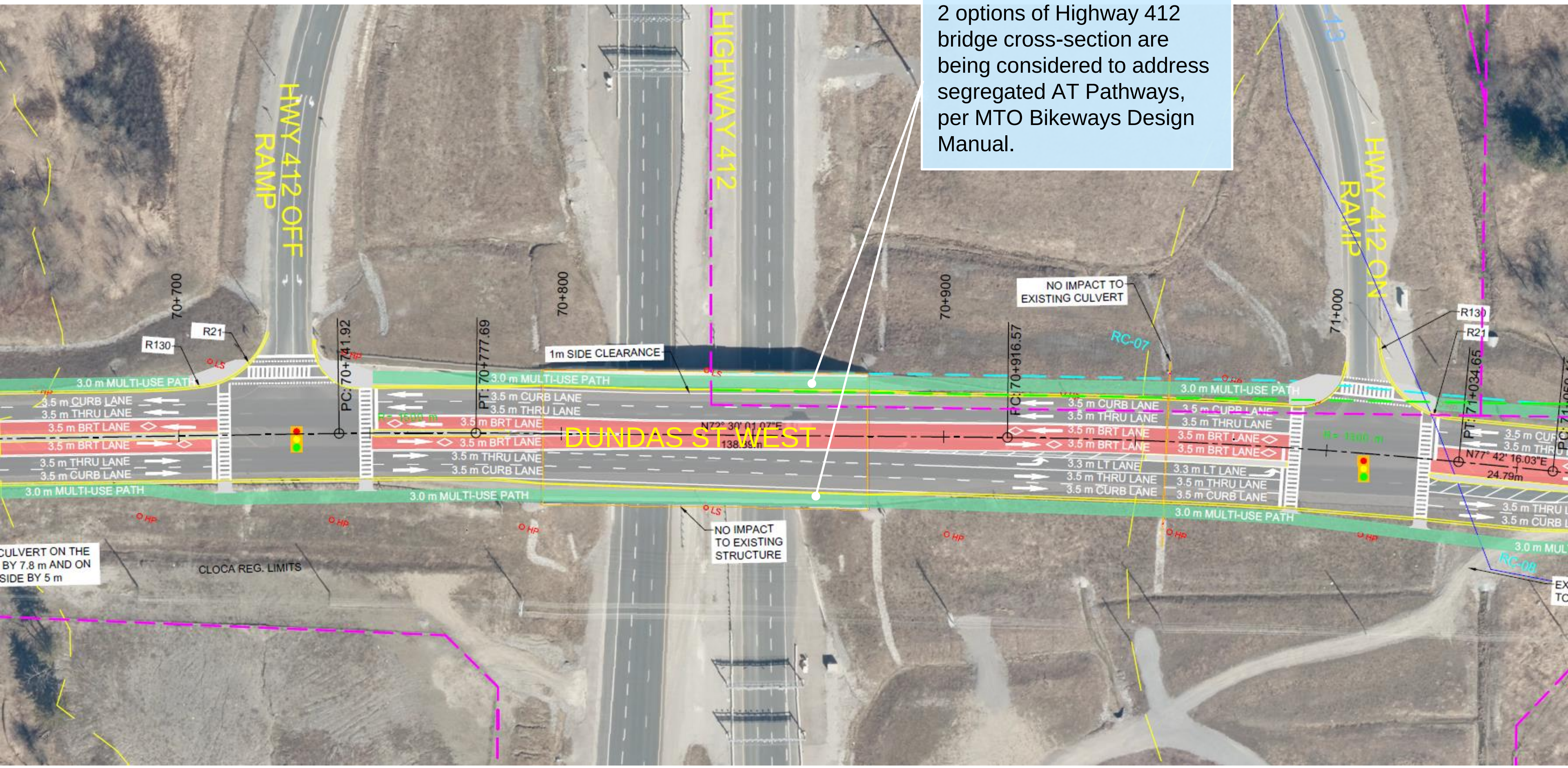
Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Location 3: Dundas Street West

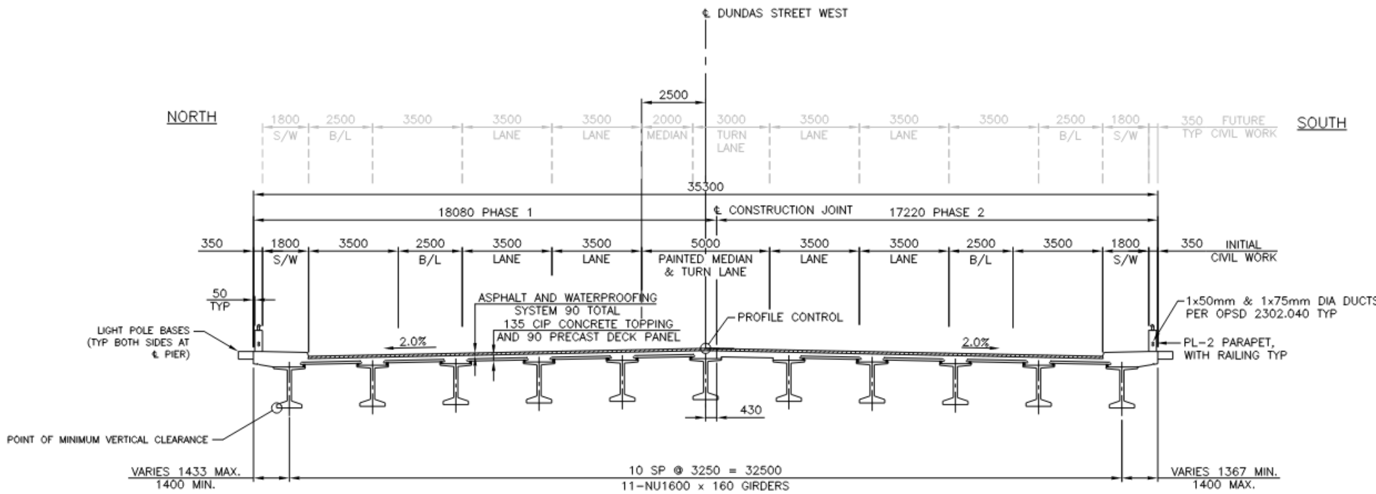
- From Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby

2 options of Highway 412 bridge cross-section are being considered to address segregated AT Pathways, per MTO Bikeways Design Manual.



Typical Cross-sections

Dundas Street West at Highway 412: EXISTING CONDITION

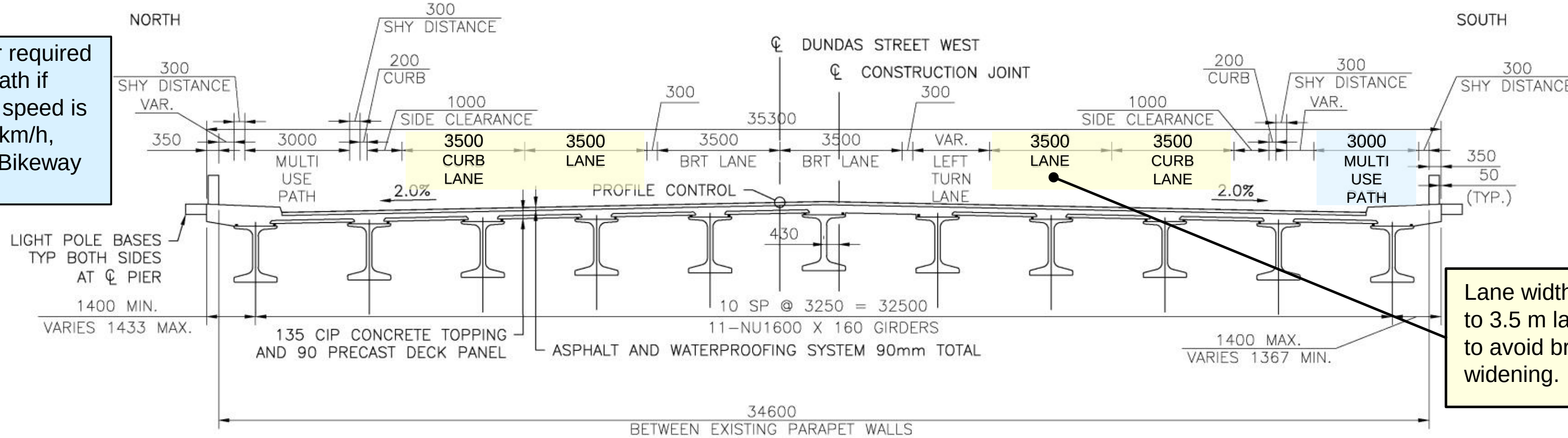


Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Typical Cross-sections

Dundas Street West at Highway 412: PROPOSED DESIGN Option 1

3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers

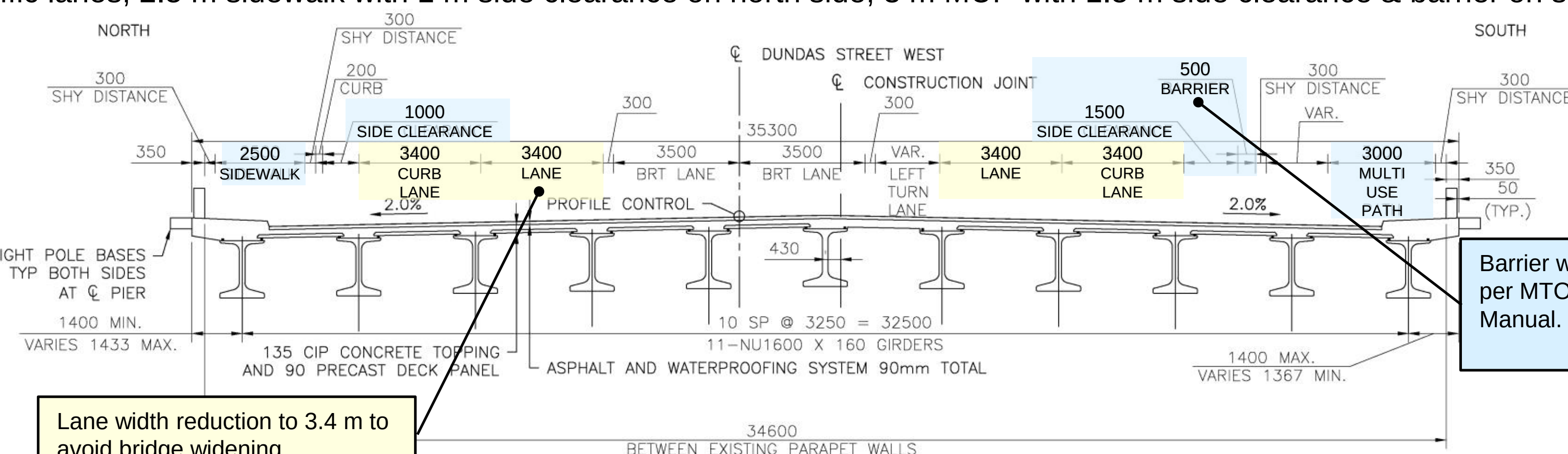


No barrier required with AT Path if operating speed is below 80 km/h, per MTO Bikeway Manual.

Lane width reduction to 3.5 m lane width to avoid bridge widening.

Dundas Street West at Highway 412: PROPOSED DESIGN Option 2

3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side



Barrier with AT Path, per MTO Bikeway Manual.

Lane width reduction to 3.4 m to avoid bridge widening.

Operational Performance

Dundas Street West at Highway 412		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	27,849	31,349
Summer Average Daily Traffic (SADT)	30,896	34,779
Design Hourly Volume (DHV)	PM WB / EB = 785 / 1693	PM WB / EB = 975 / 1810
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1467 / 510 PM WB / EB = 785 / 1693	AM WB / EB = 1632 / 700 PM WB / EB = 975 / 1810
% commercial vehicles	1.7%	1.7%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 2: Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

Design Year: 2041	Superelevation Maximum Rate for Determining the Radius:	6 %			
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Crest: Minimum "K" factor for Stopping Sight Distance	50	39	26	44.87	Present condition will not be changed. Detailed survey to be obtained during detailed design. The proposed are not intended to change the present condition value. (Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	n/a	6-8	6-8	2.35	(✓)
Radius Minimum (m)	5000	340	250	1300	Alignment is being fitted to existing conditions. No significant changes are anticipated.
Lane Widths (m)	4x3.5 Thru Lane 1x3.5 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90 km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.
Shoulder Width (Left / Right) (m)	5.6	1.0	1.0	1.0	(Existing shoulders were built to ultimate condition.) Proposed shoulder meets standard.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	
Median Width (m)	1.5 - 5	2.0	2.0	0 – 1.7	(Raised concrete medians terminate at the approaches of the bridge. In order to minimize impacts to the Highway 412 bridge structure a median is not proposed.)
R.O.W. Width – nominal (m)	55.43 – 59.16			55.43 – 65.23	

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont’d)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	>200	200	178	>200	(✓)
Crest: Minimum “K” factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum “K” factor for Stopping Sight Distance	40	12-16	12-16	40	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2x3.75	2x3.7	2x3.7	2x3.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 3-2: Highway 412 @ Dundas Street West – E/W-N ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	30	12-16	12-16	30	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

Reduction in design speed from 90 to 80 km/h on Dundas St West

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Potential Exemptions (cont'd)

To avoid Highway 412 Bridge widening, two options are considered.

Option 1 - 3.5 m traffic lanes, 3 m MUPs on both sides with 1 m side clearance without barriers

- **Potential Exemption**:
    - Reduction in design speed from 90 km/h to 80 km/h
    - i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- **Rationale**:
    - Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
    - Spatial constraints of bridge cross section.
    - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Option 2 - 3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side

- **Potential Exemption**:
    - Lane width reduction from 3.75 m to 3.4 m
- **Rationale**:
    - Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
    - Spatial constraints of bridge cross section.
    - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Substandard Present Conditions – Remaining the Same

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).

Exemption Summary

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**
   - To facilitate the introduction of BRT, traffic lane width of 3.5 m is proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops.
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary

2. Closure of Highway 401 S-W On-Ramp

- Existing EB left turn lane is to be removed to facilitate the introduction of BRT. Traffic diversions are proposed. No operational issues are anticipated. Safety is improved as risk of collisions from EB left turning movements is eliminated.

Rationale:

- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity.
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary

3. Reduction in Taper Length at Highway 401 N-W On-Ramp

- Existing speed change lane is to be modified to a taper lane to facilitate the introduction of BRT.
- Length of taper achieved is 33.3 m. Standard requires 70 m (60 m) for design speed of 70 km/h (60 km/h).
- “No Right Turn On Red” is proposed to SB right turn/ through lane to reduce traffic weaving.

Rationale:

- Existing speed change lane does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity.
- Physical constraints to existing building.

Exemption Summary (cont’d)

4. Reduction in design speed from 90 to 80 km/h on Dundas St West

- Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary (cont'd)

5-1. Reduction in design speed from 90 to 80 km/h on Dundas St West

- i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- To avoid Highway 412 Bridge widening, Option 1 (3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

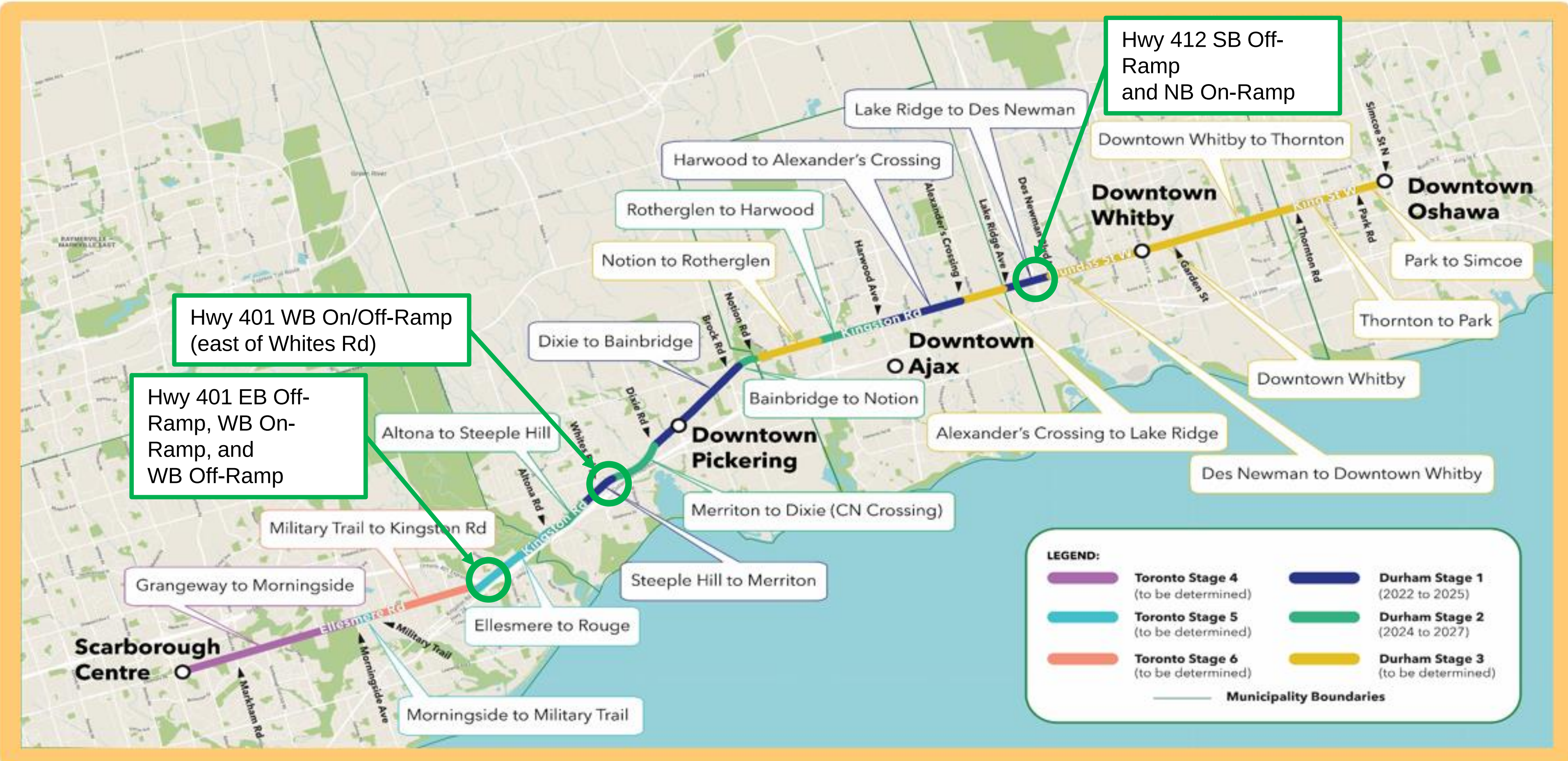
5-2. Reduction in lane width from 3.75 m to 3.4 m on Dundas St West

- To avoid Highway 412 Bridge widening, Option 2 (3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Draft Implementation Strategy



Next Steps

- Address concerns, if any, from MTO Senior Management
- Receive MTO endorsement
- Address agency comments on draft Environmental Project Report (EPR)
- Post EPR on public record for a 30-days period starting January 6th, 2022.
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI PARSONS

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	December 20, 2021
From	Margaret Parkhill, Sam Dinatolo	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
December 20, 2021, 9:30 a.m. to 10:00 a.m.

Present Juan Mora Triana, Wilson Taveira, Matthew Coelho, Metrolinx
Rami El Mawed, Jason Hanna, Les Dzbik, Eric Hakomaki, Salia Kalali, Kris Mermigas, MTO
Sam Dinatolo,Wendy Ng, Parsons
Margaret Parkhill, IBI Group

Distribution Meeting attendees and invitees

Item Discussed	Action By
Introduction S. Dinatolo welcomed attendees and provided an update on the DSBRT design criteria, preliminary design, and traffic operations at three MTO interface areas: 1. Highway 401 E-N/S off ramp at Kingston Road east of Sheppard Avenue/Port Union Road in City of Toronto, 2. Highway 401 on/off ramps at Kingston Road east of Whites Road in Town of Pickering 3. Dundas Street West from Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby. S. Dinatolo also provided a summary of existing and proposed standards for MTO jurisdiction areas. The following is a summary of the discussion.	INFO
Discussion Included:	
• S. Dinatolo asked about next steps to take before presenting to MTO senior management. J. Hanna responded that they will discuss with R. El Mawed if any changes need to be made before presenting to senior management.	R. El Mawed / J. Hanna
• C. Singh asked if there if any utility investigations have been done to determine if there will be any utility relocations required. M.	

Item Discussed	Action By
Parkhill responded that subsurface utility investigations have been performed at certain areas along the corridor. The preliminary design protects space for utilities in the boulevard.	
• C. Singh noted that a utility composite plan is not necessary at this point, but encroachment plans may be required. M. Parkhill responded that the project is an Environmental Assessment in the preliminary design phase. The EPR can include a commitment to future work in detail design for utility relocation and encroachment permits from MTO to be reviewed.	M. Parkhill
• S. Dinatolo noted that it that it may be too early to apply for permits as the project is only at TPAP. C. Singh responded that permits would not be necessary at this time. MTO recommends identifying utility relocations as early as possible so that they do not become showstoppers later on in the project. M. Darling noted that the Region of Durham is currently performing SUE investigations and utility excavation/relocations as part of the detailed design.	

Please advise of any errors or omissions to Margaret Parkhill by December 6, 2021.

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Preliminary Design Criteria

IBI

PARSONS

December 20, 2021

Agenda

1. Highway 401 Underpass Side Slope Review - Rationale for Current Configuration (Highway 401 S-W On-ramp Closure)
2. Optimization of Highway 401 N-W On-ramp Alignment
3. Cross-walk Reconfiguration at Highway 412
4. Highway 412 Lane Configuration
5. Potential Exemption Summary
6. Next Steps

Potential Exemption Summary – 3.5 m Lane

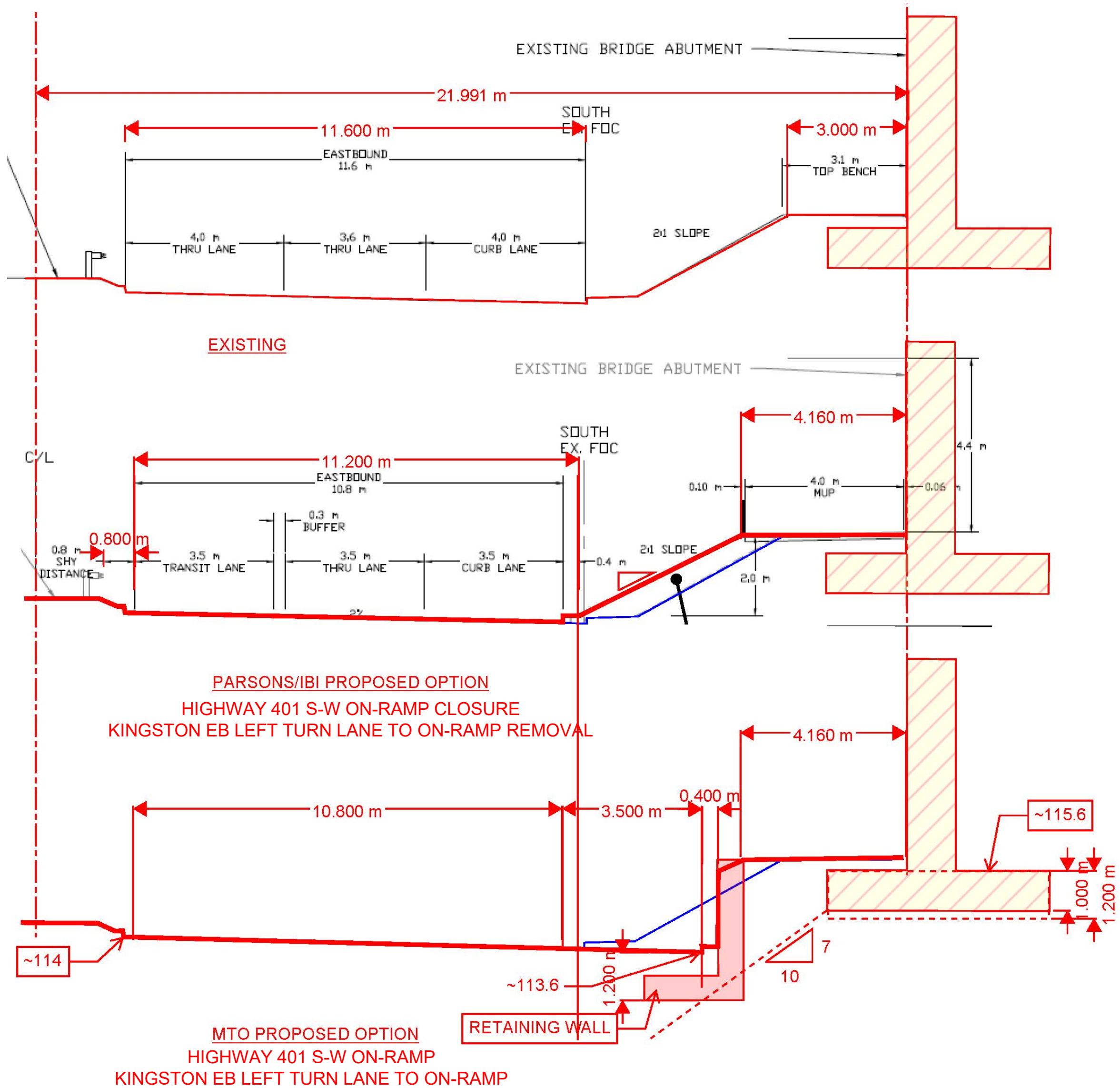
1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**
    - To facilitate the introduction of BRT, traffic lane width of 3.5 m is proposed. No operational issues are anticipated.

PE

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops.

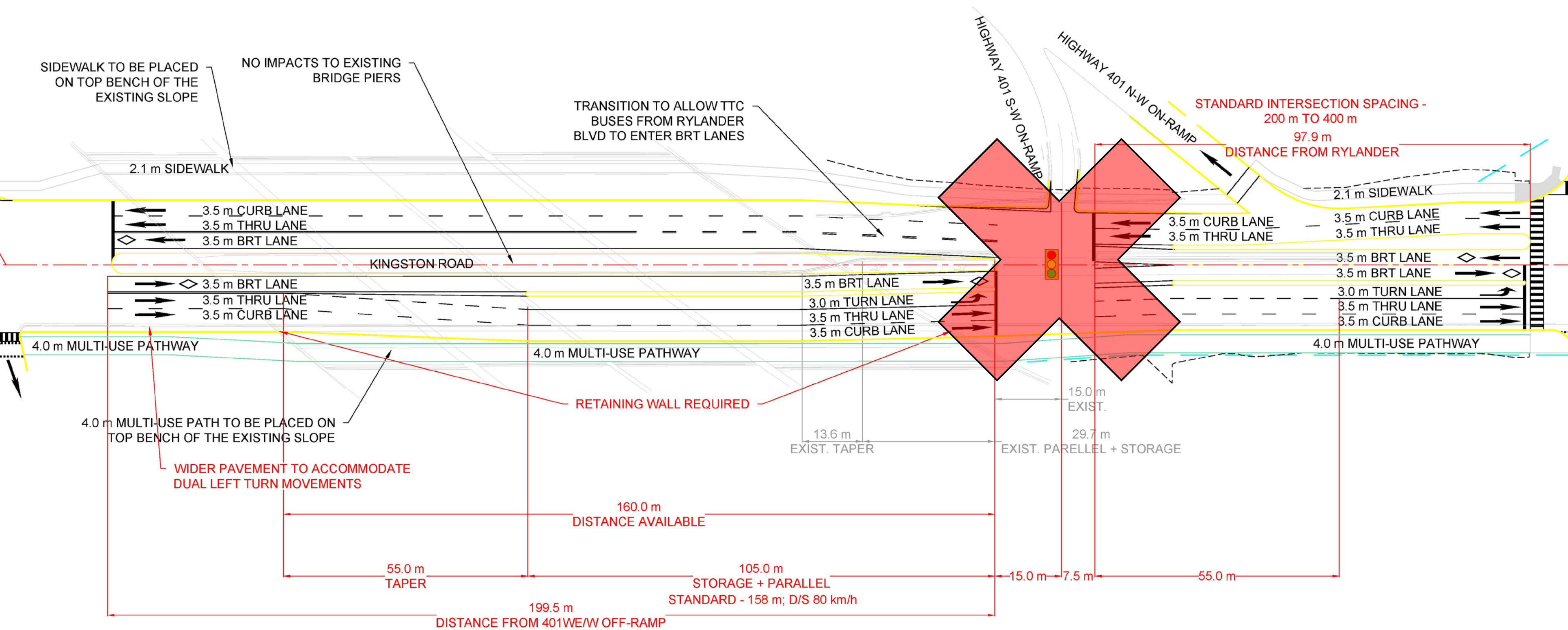
Highway 401 Underpass Side Slope Review



Rationale for Highway 401 S-W On-ramp Closure

Controlled EB left turn with protected phrasing and turning lane outside of BRT lanes was reviewed. South pavement widening is required with retaining wall for slope support.

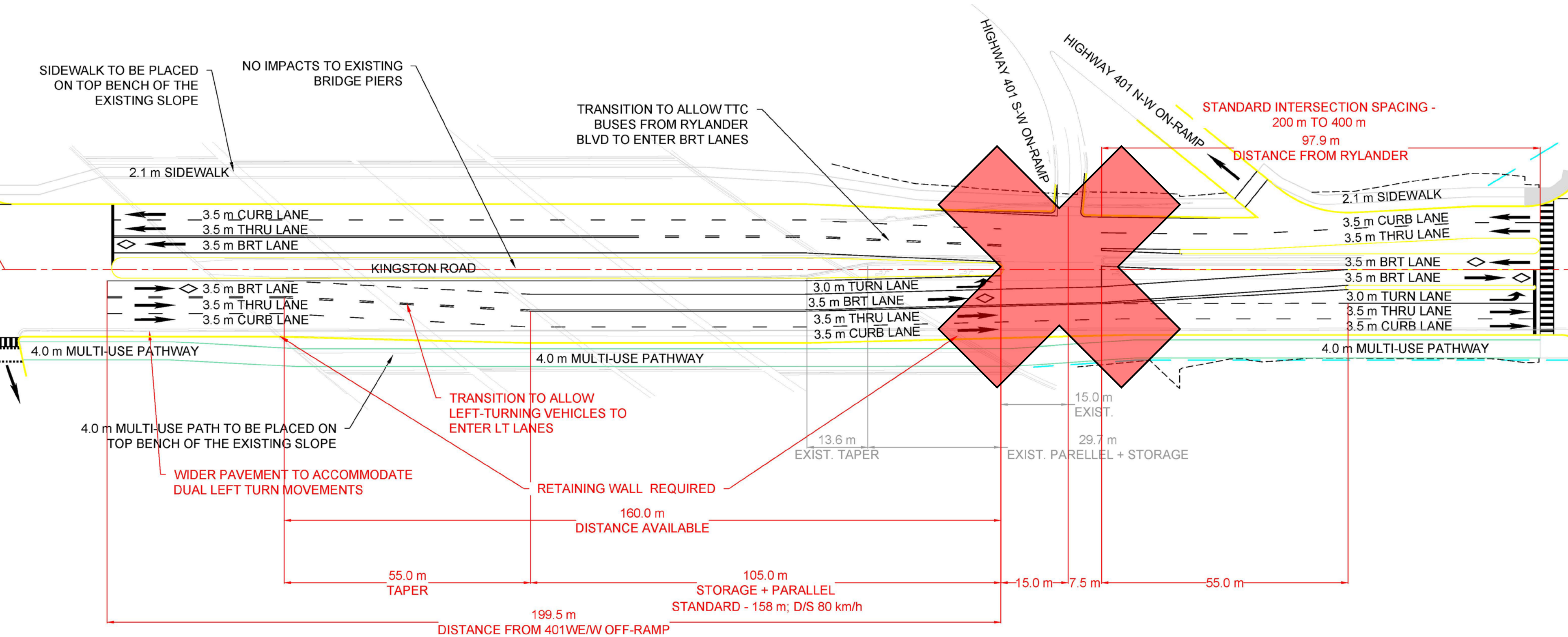
This option is against Ministry guidelines and policies (inadequate intersection spacing to permit signal progression; inadequate turning lane length).



Rationale for Highway 401 S-W On-ramp Closure

Uncontrolled EB left turn with turning lane between BRT lanes was reviewed. South pavement widening is required with retaining wall for slope support.

This option is operationally unsafe and is against Ministry guidelines and policies (intermixing with BRT traffic; inadequate intersection spacing; and inadequate turning lane length).



Potential Exemption Summary

2. Closure of Highway 401 S-W On-Ramp

PE

- Propose to remove existing Kingston Road EB left turn lane to facilitate the introduction of BRT.
- Traffic diversions are proposed.
- No operational issues are anticipated.
- Safety is improved as risk of collisions from EB left turning movements is eliminated.

Rationale:

- Safety and operational issues pertaining to EB left turns into Highway 401 WB with the introduction of BRT.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity.

Potential Exemption Summary

3. Optimization of Highway 401 N-W On-Ramp Alignment

PE

- Realign exit terminal to the location of the closed S-W on-ramp and approx. 200 m of ramp
- Existing speed change lane is to be modified to a taper lane to facilitate the introduction of BRT.
- Length of taper achieved is 77.8 m. Standard requires 70 m (65 m) for design speed of 80 km/h (70 km/h). Existing speed change lane is 57 m in length.
- “No Right Turn On Red” is proposed to Rylander Blvd SB right turn/ through lane to reduce traffic weaving.
- Relocations: Utility poles, drainage under existing ramp, fire hydrant, ramp gate, steel beam guiderail, ditch on west side
- Removal: pavement of existing N-W on-ramp

Rationale:

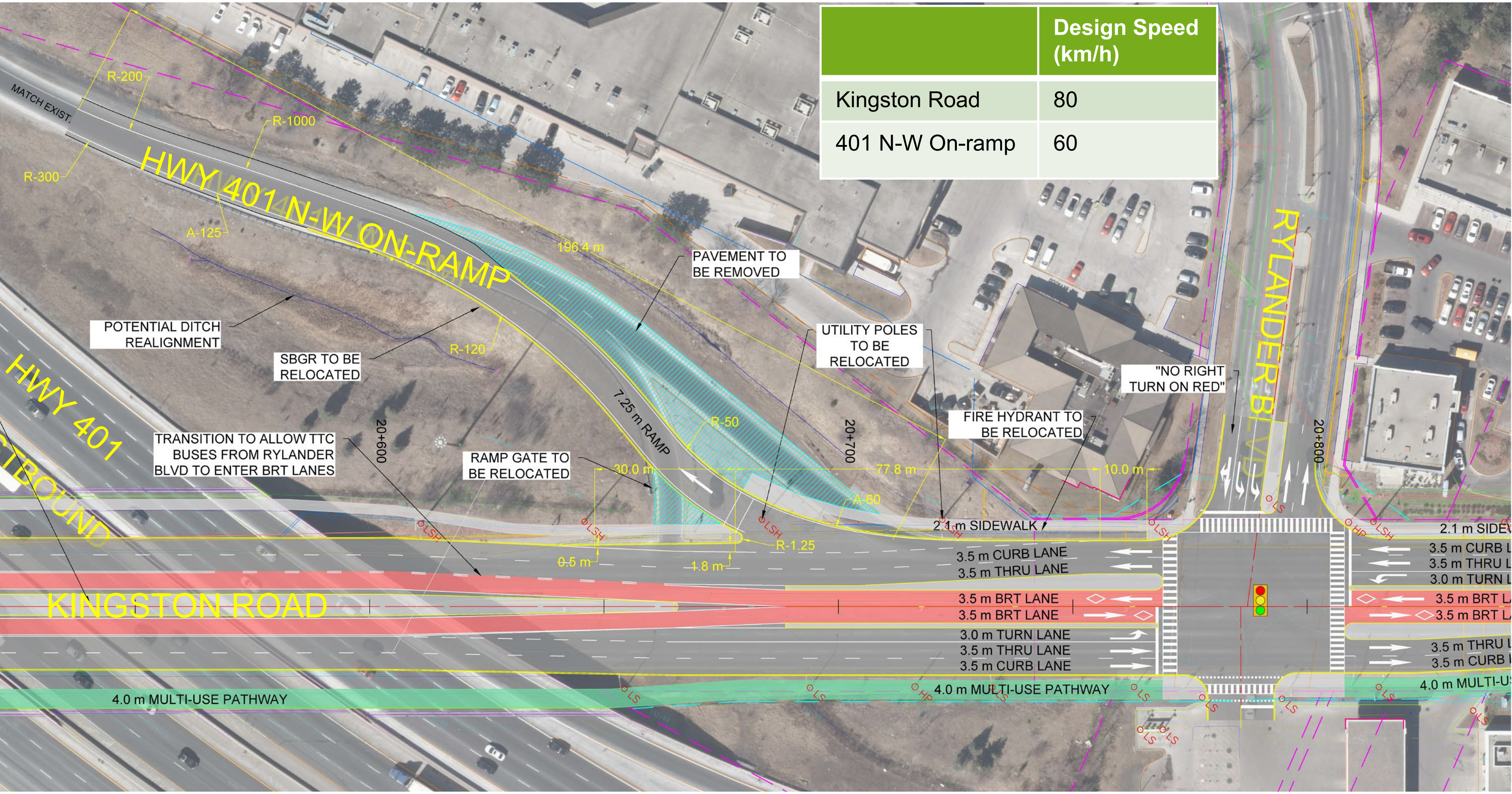
- Existing speed change lane does not meet 80 km/h design speed.
- Take advantage of the additional property from closing the S-W ramp.

Potential Exemption Summary

3. Optimization of Highway 401 N-W On-Ramp Alignment (cont'd)

PE

	Design Speed (km/h)
Kingston Road	80
401 N-W On-ramp	60



Potential Exemption Summary

4. Reduction in design speed from 90 to 80 km/h on Dundas St West PE

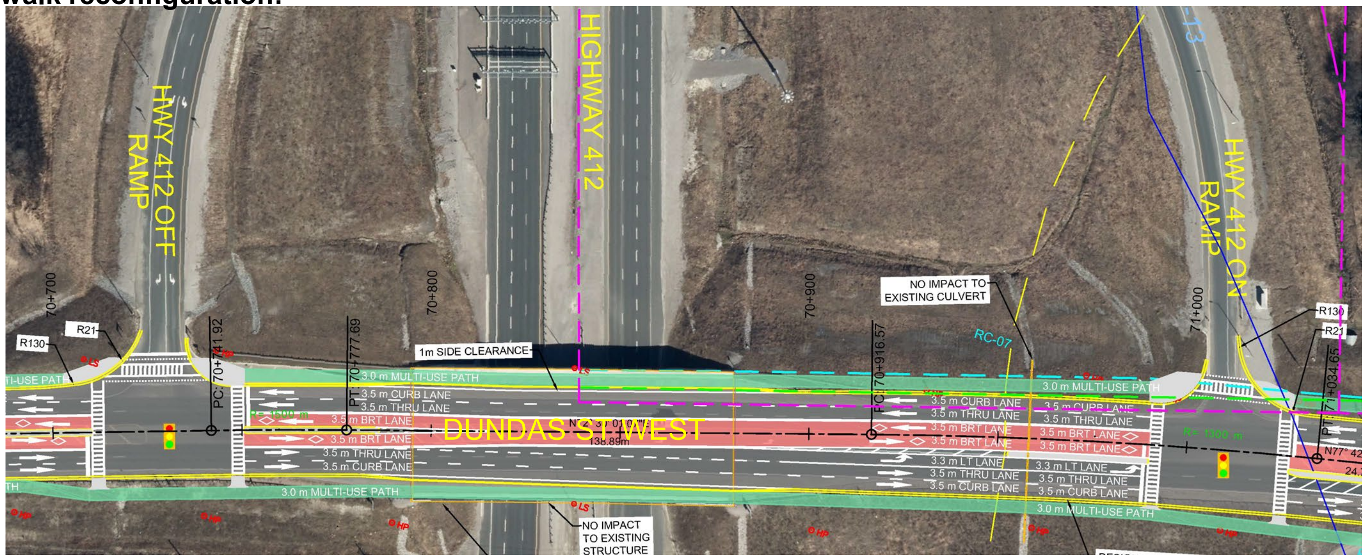
- Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

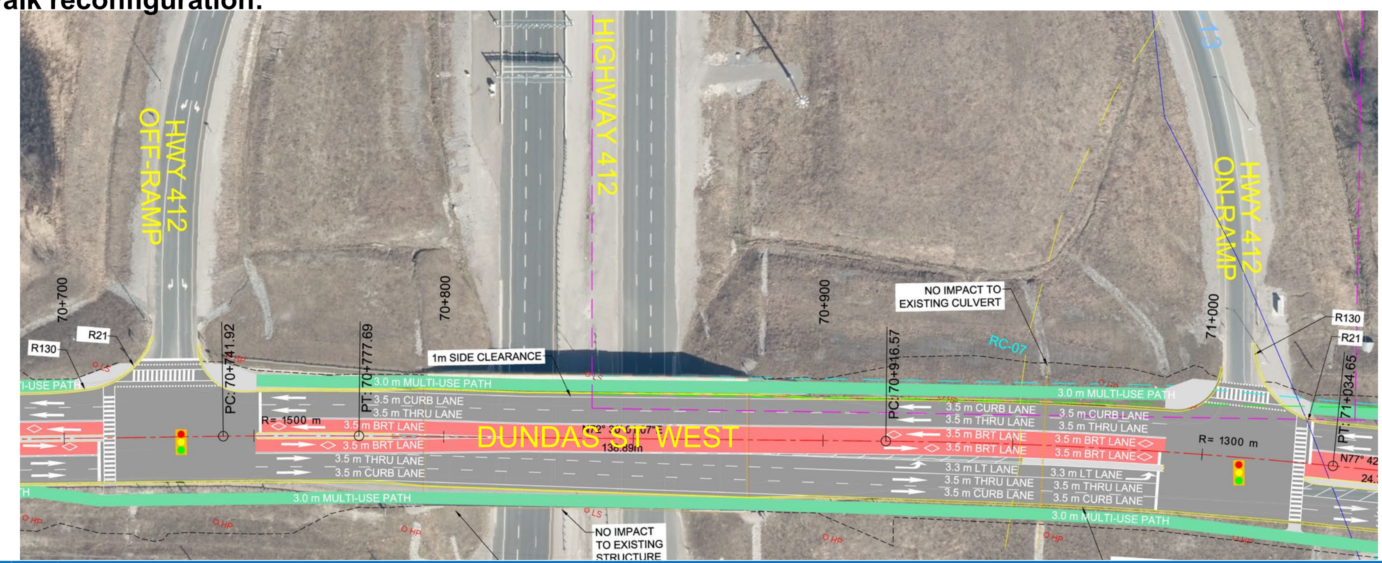
- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Cross-walk Reconfiguration at Highway 412

Prior to cross-walk reconfiguration:



After cross-walk reconfiguration:



Potential Exemption Summary

5-1. Reduction in design speed from 90 to 80 km/h on Dundas St West

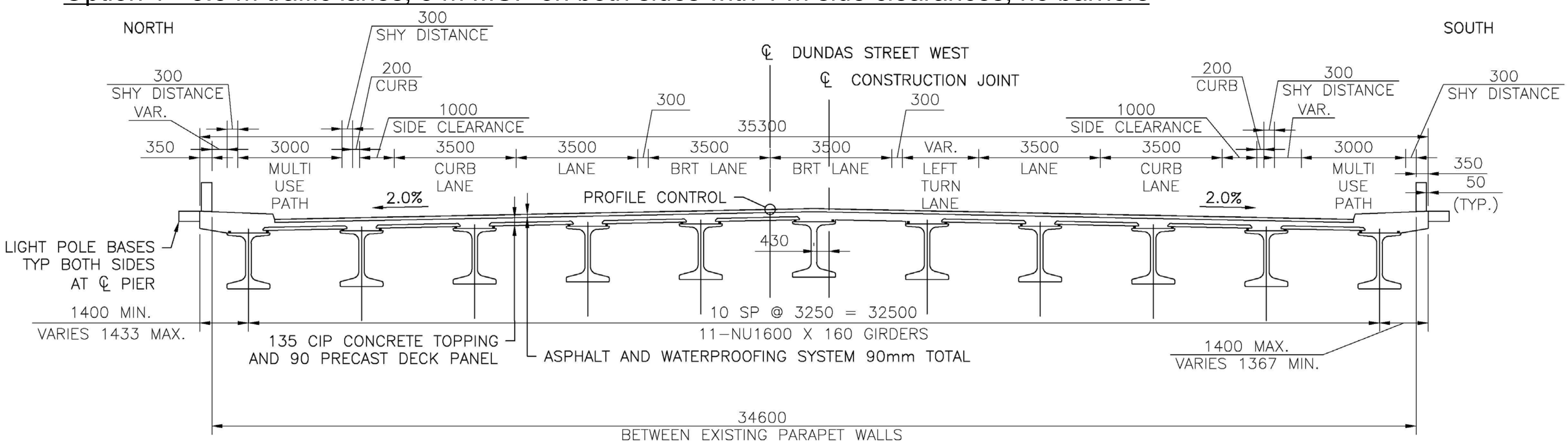
PE

- i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- To avoid Highway 412 Bridge widening, Option 1 (3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearances without barriers) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Option 1 - 3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearances, no barriers



Potential Exemption Summary

5-2. Reduction in lane width from 3.75 m to 3.5 m on Dundas St West

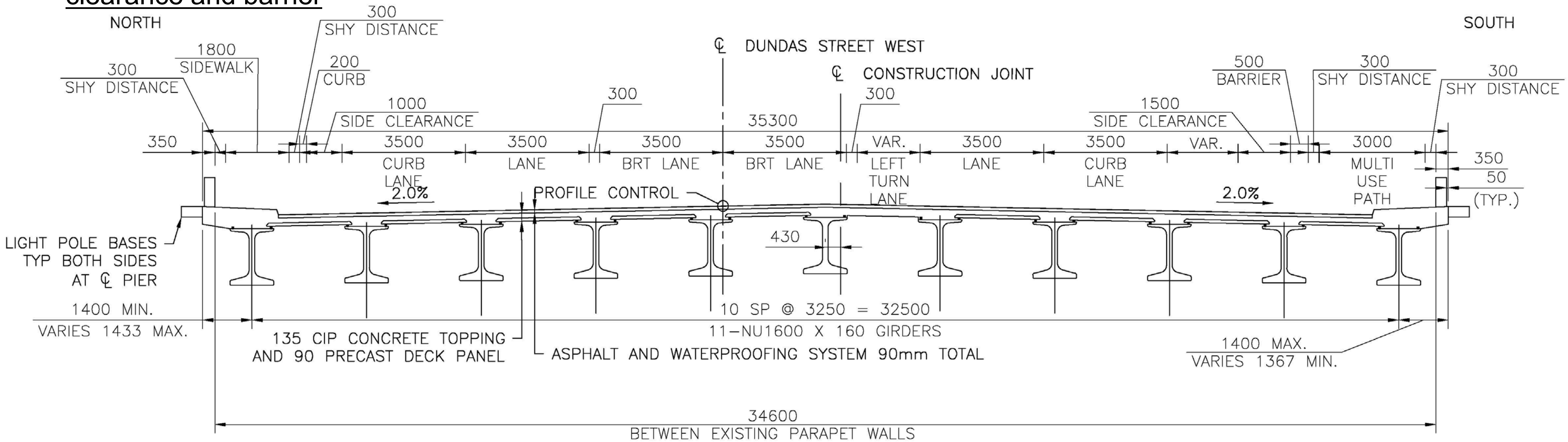
PE

- To avoid Highway 412 Bridge widening, Option 2 (3.5 m traffic lanes, 1.8 m north-side sidewalk with 1 m side clearance, 3 m south-side MUP with 1.5 m side clearance and barrier) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

<u>Option 2 - 3.5 m traffic lanes, 1.8 m north-side sidewalk with 1 m side clearance, 3 m south-side MUP with 1.5 m side clearance and barrier</u>



Next Steps

- Address concerns, if any, from MTO Engineering
- Receive MTO endorsement
- Address agency comments on draft Environmental Project Report (EPR)
- Post EPR on public record for a 30-days period starting January 6th, 2022.
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI PARSONS

DURHAM – SCARBOROUGH
Bus Rapid Transit

Hydro One

Prepared for Metrolinx
by IBI Group & Parsons

Yash Kulshreshtha

From:	Margaret Parkhill
Sent:	Tuesday, November 30, 2021 6:12 PM
To:	Yash Kulshreshtha
Subject:	FW: Mississauga Transitway - Hydro One
Attachments:	HONI - DSBRT Utilities - 12.15.2020.pdf; TTM_2020-12-15_HydroOne_2020-12-18.pdf; Landscape Species List - Native Shrubs 15 09 11.pdf; Landscape Species List - Native Perennials and Grasses 15 09 11.pdf; [EXTERNAL] Hydro One - Preliminary Technical Review - Durham-Scarborough Bus Rapid Transit - Utility Coordination (Hydro One)
Follow Up Flag:	Follow up
Flag Status:	Flagged

Hi Yash,
Please confirm this is part of the GRT documentation for DSBRT, thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Thuraisinganath, Ragavan <Ragavan.Thuraisinganath@parsons.com>
Sent: Thursday, September 16, 2021 9:33 AM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Hopper, David <David.Hopper@parsons.com>; Adrian Chiu <adrian.chiu@ibigroup.com>
Subject: RE: Mississauga Transitway - Hydro One

Hi Margaret,

Please see attached the following from previous correspondence with HONI:

- Slide deck for presentation held on 12/15/2020
- Meeting minutes from the presentation
- HONI-approved landscaping species list provided by Rick Schatz following the meeting
- Design comments provided by Hydro One for the design presented on 12/15/2020

Design team next steps:

- Revise Hydro One technical drawings to update design

Regards,

Ragavan

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: Monday, September 13, 2021 10:19 AM
To: Thuraisinganath, Ragavan <Ragavan.Thuraisinganath@parsons.com>

Cc: Hopper, David <David.Hopper@parsons.com>; Adrian Chiu <adrian.chiu@ibigroup.com>
Subject: [EXTERNAL] FW: Mississauga Transitway - Hydro One

Hi Ragavan,
See below and attached. Before our Thursday 10 am meeting, can you please compile our Hydro One meeting meetings to date, emails etc.
We might need to circle back with Hydro One during TPAP to confirm they are still ok with the stop at Orton Park.

Thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Wilson Taveira <Wilson.Taveira@metrolinx.com>
Sent: Wednesday, September 8, 2021 3:45 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Kristin Demasi <Kristin.Demasi@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>; Matthew Coelho <Matthew.Coelho@metrolinx.com>; Cary Devries <Cary.DeVries@metrolinx.com>
Subject: FW: Mississauga Transitway - Hydro One

Hi Margaret,

Further to our meeting this morning, we've checked internally within our bus group and there were definitely some challenges encountered within HONI jurisdiction on our past/current projcets. There are horizontal and vertical clearance requirements that need to be met. It appears that the vertical clearances are handled on a more of a case-by-case basis. All of the expectations from HONI are covered in the **attached checklist**.

Not sure if past discussions with HONI as part of the DSBRT Project have touched on any of these specific requirements? I think it would be a good idea to capture and document HONI's expectations/requirements with respect to our preliminary design for DSBRT as early as possible to avoid major design modifications down the road. Once we have agreed upon design principles through HONI's jurisdiction for DSBRT, Metrolinx can handle any agreements as part of the procurement and delivery phases.

Wilson

From: Kimberley Botelho <Kimberley.Botelho@metrolinx.com>
Sent: September-08-21 3:22 PM
To: Matthew Coelho <Matthew.Coelho@metrolinx.com>
Cc: Wilson Taveira <Wilson.Taveira@metrolinx.com>; Marie Hibbert <Marie.Hibbert@metrolinx.com>
Subject: RE: Mississauga Transitway - Hydro One

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KIMBERLEY BOTELHO, B.Arch. Sc., PMP
Project Manager | Rapid Transit | Capital Projects Group
METROLINX
10 Bay Street | Suite 1700 | Toronto | Ontario | M5J 2W3
T: (416) 202-4992 | C: (647) 926-8179

METROLINX

From: Matthew Coelho <Matthew.Coelho@metrolinx.com>
Sent: September-08-21 10:38 AM
To: Kimberley Botelho <Kimberley.Botelho@metrolinx.com>; Marie Hibbert <Marie.Hibbert@metrolinx.com>
Cc: Wilson Taveira <Wilson.Taveira@metrolinx.com>
Subject: Mississauga Transitway - Hydro One

Good Morning Kim/Marie,

We were hoping you guys might have some insight/information into what Hydro One allows in terms of structures built within their corridor based on your experiences with the Mississauga Transitway.

Regards

Matthew Coelho | Project Coordinator
METROLINX | Capital Projects Group | Bus Rapid Transit
10 Bay Street | Suite 1700 | Toronto, ON | M5J 2W3
T: (416) 202-5151 | C: (416) 471-9527
E: matthew.coelho@metrolinx.com | W: www.metrolinx.com [can01.safelinks.protection.outlook.com]

METROLINX

Please direct mail to: 20 Bay Street, Suite 600, Toronto, ON M5J 2W3

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Utility Coordination
Hydro One

IBI PARSONS

December 15, 2020

Agenda

1. Project Overview

2. Utility Scope

3. Design
   - Crossing at Ellesmere Rd / Orton Park (Toronto)
   - Crossing at Kingston Rd east of Valley Farm Dr (Pickering)
   - Crossing at Dundas St west of Glen Hill Dr (Whitby)

4. Next Steps

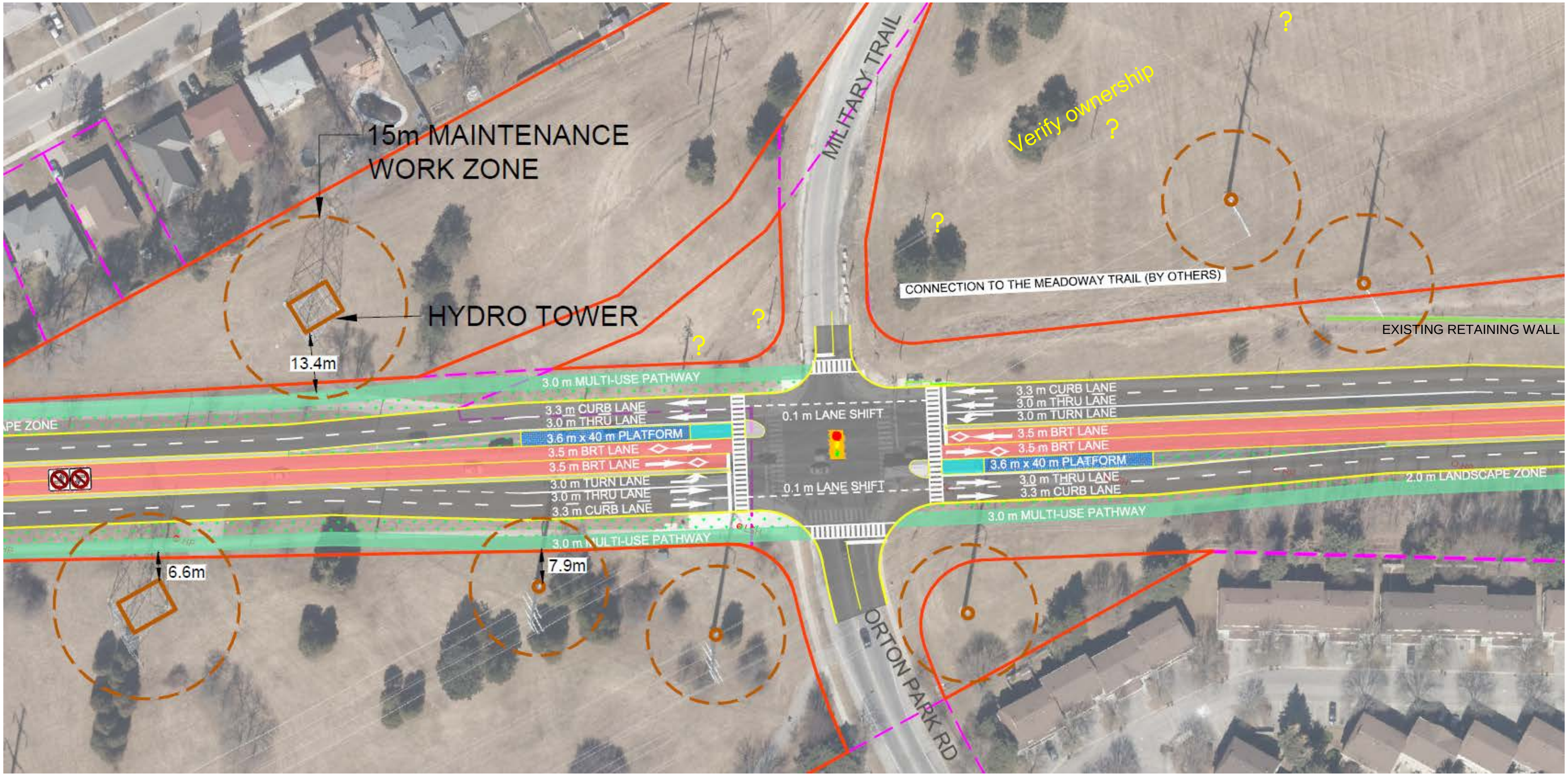
1. Project Overview

- Bus Rapid Transit corridor to link transit users between Scarborough Centre and UTSC to Oshawa
- 36 km of guideway and 47 stops along Ellesmere Road, and Highway 2 (Kingston Road, Dundas Street, and King/Bond couplet)
- TPAP, Preliminary Design, and a Preliminary Design Business Case

2. Utility Scope

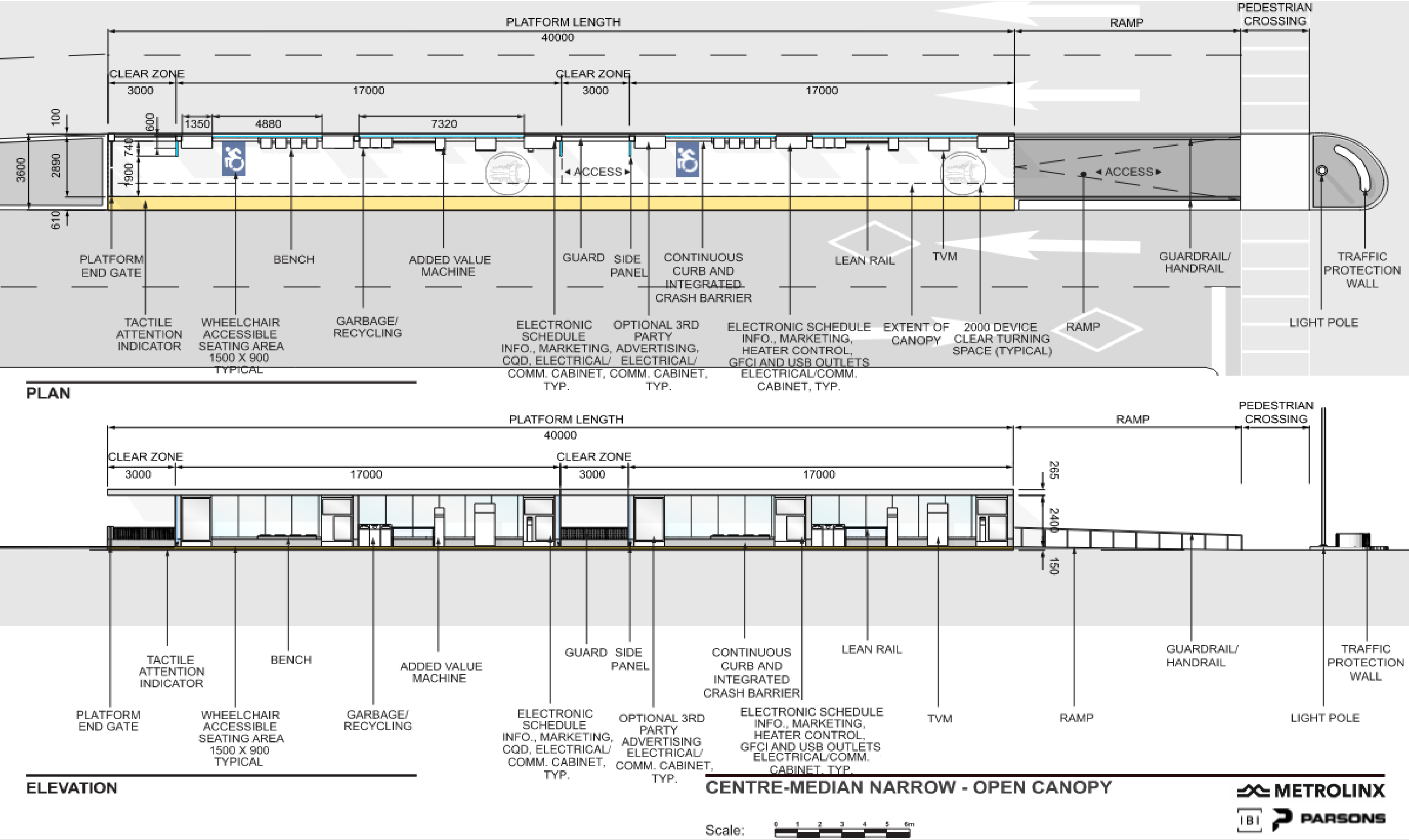
- Preliminary design to identify any utility conflicts
- EA design to protect for adequate clearance or ROW for utility works during detail design phase
- Utility infrastructure costs to be accounted for in the Preliminary Design Business Case

3. Hydro Corridor Crossing – Ellesmere / Orton Park



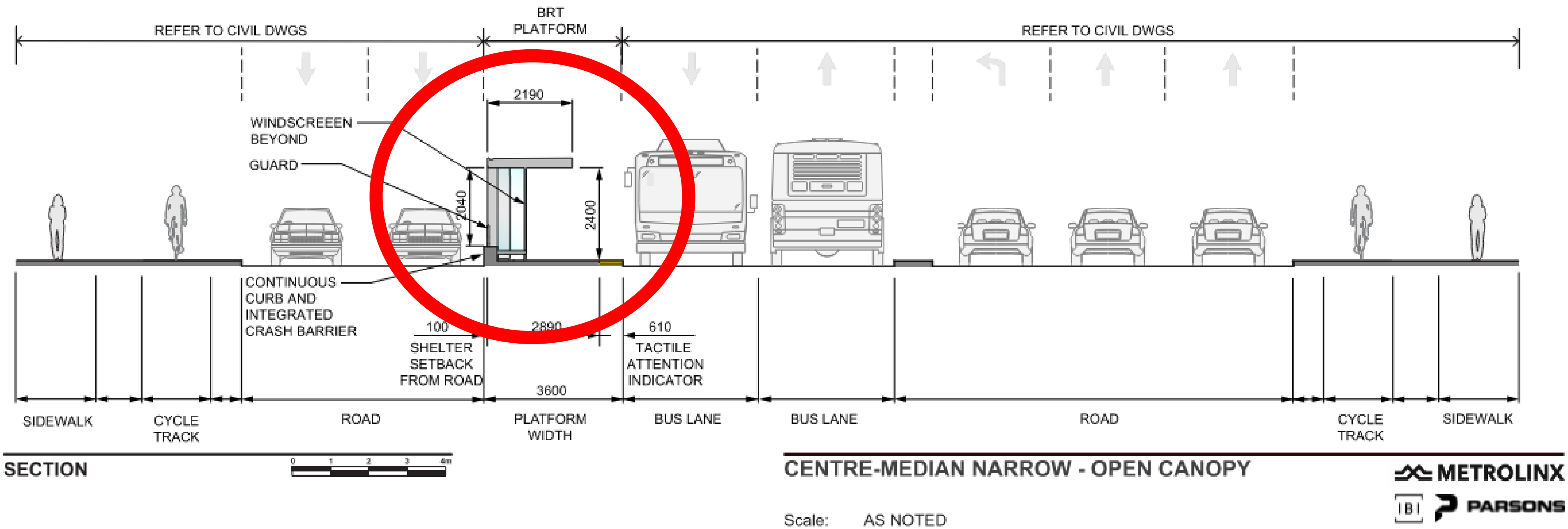
- 3 Hydro towers within 15m radius of proposed pavement widening
- Proposed road profile to match existing road profile
- BRT stop platform height approximately matches existing bus shelter height

3. DSBRT Shelter Design in Toronto



METROLINX
IBI PARSONS

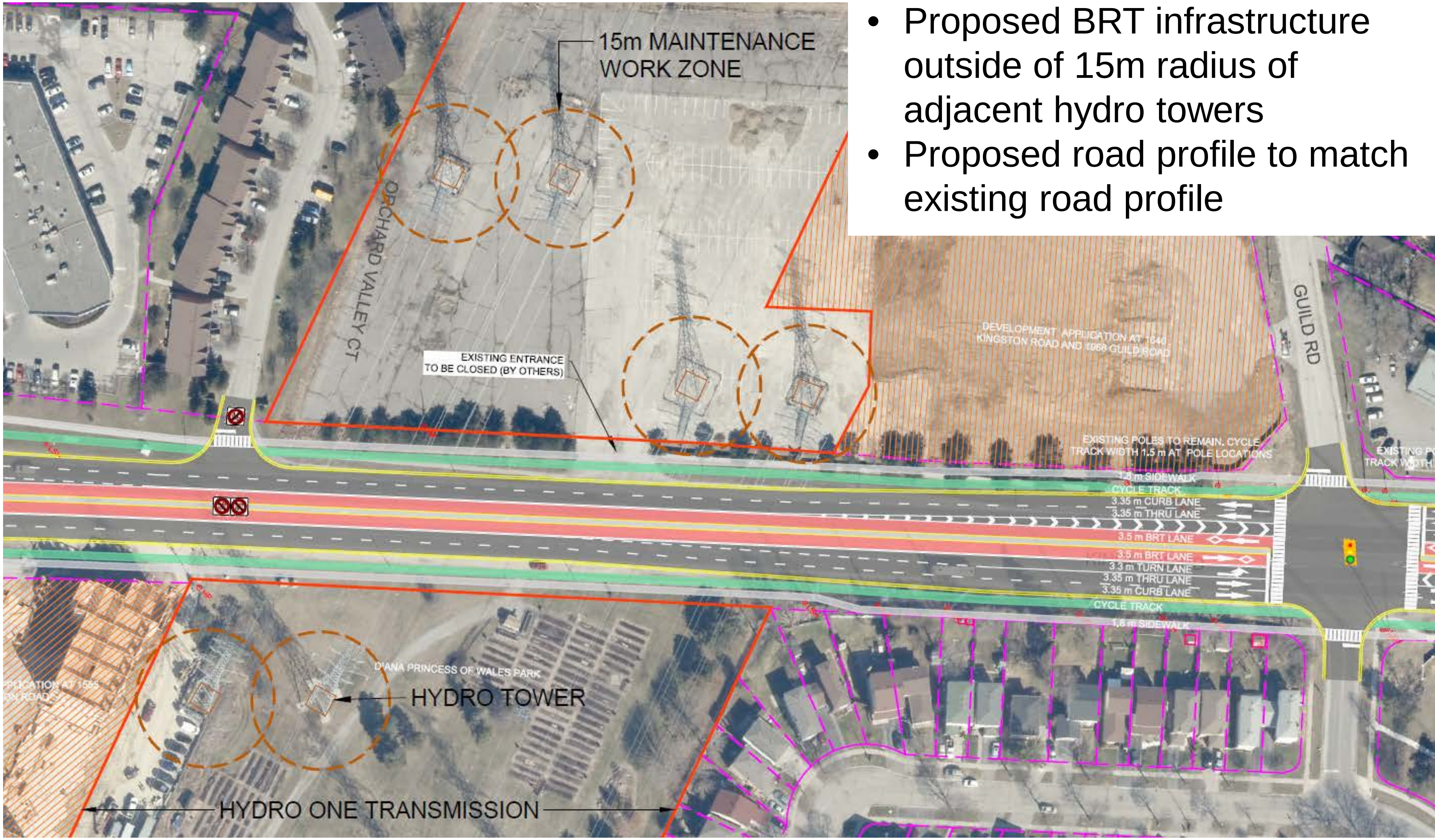
3. DSBRT Shelter Design in Toronto



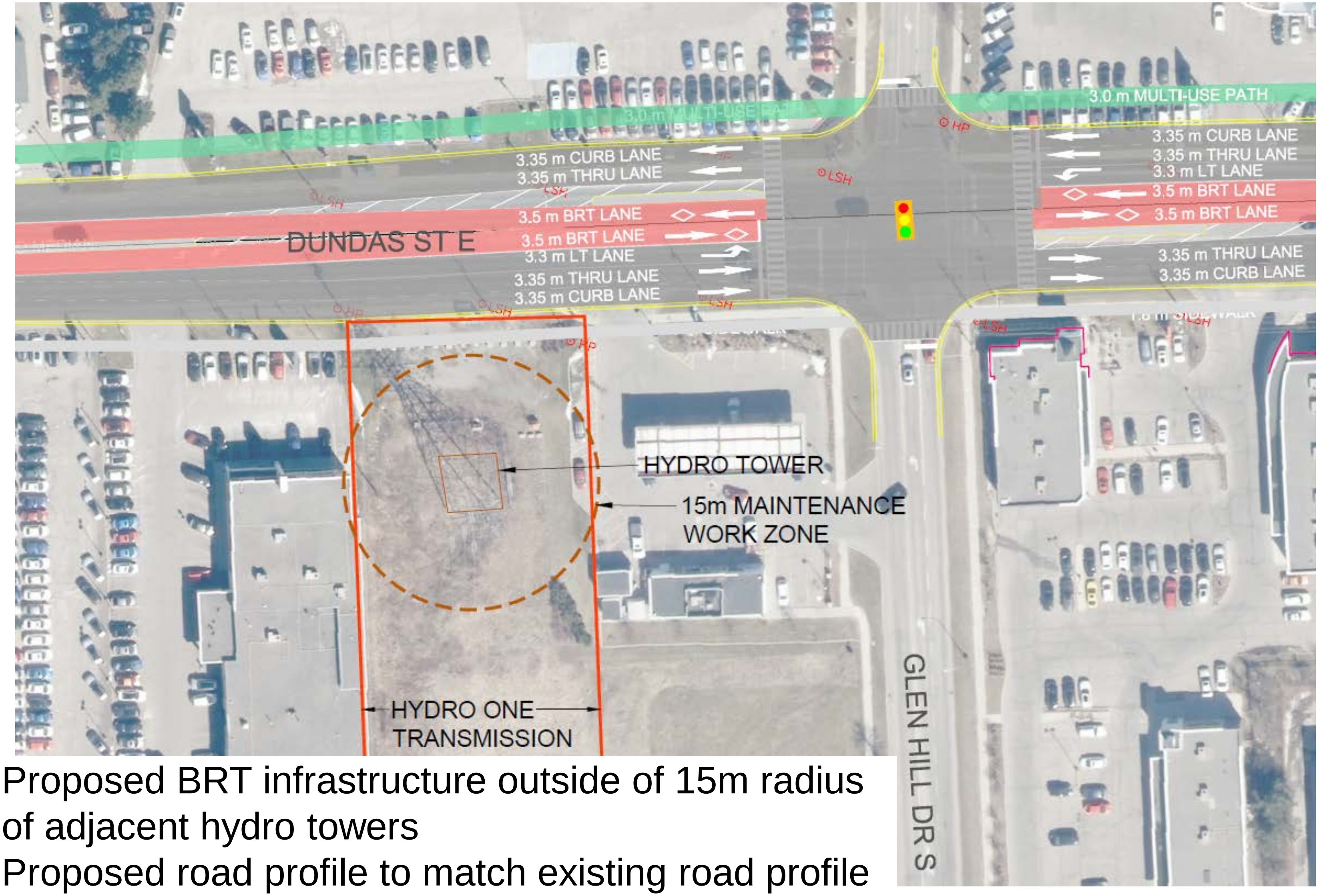
Note: Total maximum platform shelter height = <u>3415mm</u> from top of pavement.

3. Hydro Corridor Crossing – East of Valley Farm Rd

- Proposed BRT infrastructure outside of 15m radius of adjacent hydro towers
- Proposed road profile to match existing road profile



3. Hydro Corridor Crossing – West of Glen Hill Rd



- Proposed BRT infrastructure outside of 15m radius of adjacent hydro towers
- Proposed road profile to match existing road profile

Next Steps

- Provide Hydro One standard guidelines for clearances
- Future developments in the corridor?
- Specific construction requirements?
- Tree planting requirements?

Thank you

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Native Perennials & Grasses (≤3m hgt.)

Hydro One Networks Right-of-Ways and Corridors

15.09.11 - R0

hydro one

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Favoured Moisture	Favoured Light Conditions	Flower Colour/ Time	Hardiness Zone	Notes
			Achillea millefolium	Common Yarrow	0.45 - 0.6	Dry-Moist	full sun	White/ June-August	2	Perennial
			Andropogon gerardii	Big Bluestem	2.0 - 2.5	Dry	full sun	July-August	4	Grass
			Asclepias incarnata ssp. incarnata	Swamp Milkweed	0.3 - 1.5	Dry-Moist	full sun	Pink/ July-August	3	Perennial
			Asclepias syriaca	Common Milkweed	0.5 - 1.5	Dry-Moist	full sun	Pink/ June-August	3	Perennial
			Athyrium filix-femina	Lady Fern	0.3 - 0.9	Moist	part shade to full shade	N/A	4	Fern
			Calamagrostis canadensis	Canada Bluejoint	0.5 - 1.8	Moist-Wet	full sun to part shade	July-September	3	Grass
			Carex bebbii	Bebb's Sedge	0.6 - 0.8	Moist-Wet	full sun to part shade	May-June	3	Grass/Sedge
			Carex elata	Tussock Sedge	1.2 - 1.5	Moist-Wet	full sun to part shade	May-June	4	Grass/Sedge
			Cimicifuga racemosa	Bugbane	1.2 - 1.8	Moist	part shade to full shade	White/ June-July	3	Perennial
			Clematis virginiana	Virgin's Bower	1.8 - 3.0	Moist-Wet	full sun to part shade	White/ August-October	3	Perennial/Vine
			Doellingeria umbellata	Flat-topped Aster	1.0 - 2.0	Moist-Wet	full sun to part shade	White/ September-October	2	Perennial
			Elymus canadensis	Canada Wild Rye	0.9 - 1.5	Dry-Moist	full sun to part shade	July-August	3	Grass
			Elymus riparus	Riverbank Rye	1.5	Moist	part shade to full shade	July-August	3	Grass
			Eupatorium fistulosum	Joe Pye Weed	1.5 - 2.0	Moist-Wet	full sun to part shade	Pink/ July-September	4	Perennial
			Eupatorium maculatum ssp. Maculatum	Spotted Joe-Pye Weed	1.5 - 1.75	Moist-Wet	full sun	Purple/ July-September	4	Perennial
			Glyceria striata and/or stricta	Fowl Manna Grass	1.0 - 1.8	Moist	part shade	June-July	4	Grass
			Juncus effusus	Soft Rush	0.6 - 1.2	Wet	full sun	June-August	4	Perennial rush, erect form
			Juncus tenuis	Path Rush	0.15 - 0.6	Moist-Wet	full sun to part shade	May-September	2	Perennial rush, erect form
			Onoclea sensibilis	Sensitive Fern	0.3 - 0.5	Moist	full sun to part shade	N/A	2	Fern

Native Perennials & Grasses (≤3m hgt.)

Hydro One Networks Right-of-Ways and Corridors

15.09.11 - R0

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Favoured Moisture	Favoured Light Conditions	Flower Colour/ Time	Hardiness Zone	Notes
			Panicum virgatum	Switchgrass	0.7 - 2.2	Dry-Moist	full sun	August-September	3	Grass
			Physostegia virginiana	Obedient Plant	0.6 - 0.9	Moist	full sun	Pink/ June-September	2	Perennial
			Sanguinaria canadensis	Bloodroot	0.15 - 0.25	Moist	part shade to full shade	White/ April-May	2	Perennial
			Schizachyrium scoparium	Little Bluestem	0.6 - 1.2	Dry-Moist	full sun	August-February	3	Grass
			Scirpus atrovirens	Green Bulrush	1.2-1.8	Moist-Wet	full sun to part shade	June-July	3	Perennial (wetland)
			Scirpus cyperinus	Wool Grass	0.9-1.8	Wet	full sun	June-August	4	Grass
			Solidago canadensis var. canadensis	Canada Goldenrod	1.8-2.0	Moist	full sun to part shade	Yellow/ August-October	5	Perennial
			Sorghastrum nutans	Indiangrass	0.9-1.8	Dry-Moist	full sun	September-February	4	Grass
			Spartina pectinata	Prairie Cordgrass	1.2-2.1	Moist-Wet	full sun to part shade	July-August	4	Grass
			Sporobolus cryptandrus	Sand Dropseed	0.9	Dry	full sun to part shade	Yellow/ May-November	3	Grass
			Symphyotrichum novae-angliae	New England Aster	0.6 - 1.5	Moist	full sun	Pink-Purple/ August-September	3	Perennial
			Symphyotrichum puniceum	Swamp Aster	0.6 - 1.5	Moist	full sun to part shade	Blue-Violet/ August-October	3	Perennial
			Verbena hastata	Blue Vervain	0.6 - 1.8	Moist-Wet	full sun	Purple/ July-September	3	Perennial

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Soil Condition	Soil Type	Light Condition	Hardiness Zone	Notes
			DECIDUOUS							
			Amelanchier sanguinea	Roundleaf Serviceberry	3	dry-moist	sand-loam-clay	full sun to part shade	4	white to pinkish flowers, dark purple berries
			Aronia melanocarpa	Black Chokeberry	2	sry-moist	sand-loam-clay	full sun to part shade	3	white flowers, black berries, excellent fall colour
			Ceanothus americanus	New Jersey Tea	1.25	dry	sand-silt	full sun to part shade	4	tiny white fragant flowers with dark green leaves and young twigs are yellow and standout in the winter, attracts butterflies
			Cephalanthus occidentalis	Buttonbush	2	moist-wet	sand-silt-clay	full sun	4	fragrant flowers attract bees, may be difficult to source
			Cornus amomum	Silky Dogwood	2.5	wet-moist	sand-silt-clay	full sun	5	white flowers, blue berries
			Cornus racemosa	Gray Dogwood	3	dry-moist	sand-silt-clay	full sun to part shade	4	white flowers, white berries
			Cornus sericea/stolonifera	Red Osier Dogwood	2.5	moist-wet	sand-silt-clay	full sun	2	white flowers, white/bluish berries and red stems
			Diervilla lonicera	Bush Honeysuckle	1	dry	sand-silt-clay	sun to part shade	3	reddish-bronze fall colour, good mass planting and slopes, yellow fowers in midsummer, fast grower
			Elaeagnus commutata	Silverberry	3	dry-moist	sand-loam-clay	full sun	4	small yellowish inconspicuous flowers, mealy whitish berries
			Hypericum kalmianum	Kalm St. John's-Wort	0.6	dry-moist	sand-loam-clay	full sun to part shade	4	widely adaptable and hardy, golden-yellow blooms in midsummer, persistant brown seed capsules and exfoliating bark, good winter interest and an excellent xeriscape plant
			Hypericum prolificum	Shrubby St. John's-Wort	1	dry-moist	sand-loam-clay	full sun to part shade	3	bright yellow blooms in june to august with cone shaped seed capsules, exfoliating bark for winter interest
			Ilex verticillata	Winterberry	2.5	moist-wet	peat-muck-silt	full sun to part shade	4	attractive red fruit in winter
			Lindera benzoin	Spicebush	3	moist-wet	silt-loam	part shade to full shade	4	scented leaves, excellent fall colour
			Lonicera dioica	Glaucous Honeysuckle	3	dry-moist	sand-silt-clay	full sun to full shade	3	orange-red berries, drought tolerant, ensure nursery can prove native status of plant stock

Native Shrubs
(≤3m hgt.)

Hydro One Networks Right-of-Ways and Corridors

15.09.11 - R0

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Soil Condition	Soil Type	Light Condition	Hardiness Zone	Notes
			Lonicera involucrata	Black Twinberry/Bearberry Honeysuckle	3	dry-moist	sand-silt-clay	full sun to part shade	5	adaptable and good streamside and moist open sites, small trumpet-shaped yellow flowers surrounded by red bracts follwed by shiny, black twinberries nestled in red capes, needs pruning to keep size
			Myrica gale	Sweet Gale	1.5	moist-wet	sand-silt-loam	full sun	1	cone-like flower clusters, scented leaves
			Myrica pensylvanica	Bayberry	2	dry-moist	poor sand soils	full sun to part shade	4	requires a few plants to produce the gray fruit, fragrant with glossy dark green leaves, will attract ducks and fox, salt tolerant
			Physocarpus opulifolius	Ninebark	3	dry-moist	sand	full sun	2	showy white flowers
			Rhus aromatica	Fragrant Sumac	1.5	dry	sand	full sun	3	low grower spread by suckers, good for banks and slopes, green aromatic foliage turns to a brilliant scarlet and red berries in the fall
			Rhus typhina	Staghorn Sumac	3	dry-moist	sand-silt-clay	full sun	3	attractive crimson fruit, excellent fall colour
			Rhus glabra	Smooth Sumac	3	dry-moist	poor soils	full sun	2	branches or smooth not hairy, mass plantings or screening, foliage turns bright red, orange and purple in the fall
			Ribes americanum	Wild Black Currant	1.8	moist	sand-silt-loam	full sun to part shade	2	edilbe dark berries
			Rose blanda	Meadow Rose	1.5	dry-moist	sand-clay	full sun	2	single, pink, fragrant blooms in May to June, few thorns with red bark
			Rosa carolina	Pasture Rose	1.75	dry-moist	sand-loam	full sun to part shade	4	five petal, pink fragrant blooms, edible hip are high in vitamin C, orange to red fall colours, good in low wet grounds near swamps and streams, adaptable, salt tolerant
			Rosa palustris	Swamp Rose	2	moist-wet	sand-silt-clay	full sun	3	attractive pink flowers
			Rosa setigera	Prairie Rose	1	dry-moist	sand-loam-clay	full sun to part shade	4	shrub or vine, pink to white blooms in June to July, deep red, purple in the fall

Native Shrubs
(≤3m hgt.)

Hydro One Networks Right-of-Ways and Corridors

15.09.11 - R0

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Soil Condition	Soil Type	Light Condition	Hardiness Zone	Notes
			Rosa woodsii	Wood's Rose	2	dry-moist	sand-clay	full sun to part shade	2	white to pink flowers
			Rubus allegheniensis	Common Blackberry	3	moist	sand-loam-clay	full sun to part shade	3	white flower, black aggregate fruit
			Rubus canadensis	Smooth Blackberry	2	moist	sand-loam-clay	full sun to part shade	3	white flowers, black aggregate fruit
			Rubus ideaus var. strigosus	Wild Red Raspberry	2	most	sand-loam-clay	full sun to part shade	3	cluster of green flowers in June to July, small red drupelets fruit in July and August
			Rubus occidentalis	Black Raspberry	1.55	most	sand-loam-clay	full sun to part shade	3	berries turn red to black
			Rubus odoratus	Purple-flowering Raspberry	2.5	dry-moist	silt-loam	full sun to full shade	3	showy purple flowers

Native Shrubs
(≤3m hgt.)

Hydro One Networks Right-of-Ways and Corridors

15.09.11 - R0

hydro one

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Soil Condition	Soil Type	Light Condition	Hardiness Zone	Notes
			Salix candida	Sage-leaved Willow	2	moist-wet	sand-loam	full sun	1	narrow silvery foliage, yellow flowers, tolerant of compaction
			Salix cordata	Heart-leaved Willow	2	dry-moist	clay-sand	full sun	2	silvery hairy foliage, pink flowers, tolerant of compaction
			Salix exigua/interior	Sandbar Willow	3	dry-moist-wet	clay-sand-loam	full sun	2	drought and compaction tolerant
			Salix petiolaris	Slender or Meadow Willow	3	moist-wet	sand-silt-clay	full sun to part shade	2	emerging stems have puplish colour,like moist soil but is drought tolerant, good along streams and in low areas, good woodland planting
			Sambucus canadensis	American Elder	3	moist-wet	sand-silt-clay	full sun to part shade	3	white flowers, black/purple berries
			Sambucus pubens	Scarlet or Redberry Elder	3	moist-wet	loam	full sun	3	needs loamy soils, yellow to white flowers in May with scarlet-red fruit
			Shepherdia canadensis	Buffaloberry	2.5	dry	sand	full sun	2	bright red to orange fruit in the fall, good xeriscape plant
			Spiraea alba	Meadowsweet	1.5	moist-wet	sand-silt-clay	full sun	3	white flowers
			Spiraea latifolia	Steeplebush	1.25	moist-wet	loam	full sun to part shade	2	wetland plant with white astilbe-shaped flower clusters, brown fruit capsules in winter
			Symphoricarpos albus	White Snowberry	1.5	dry-moist	sand-silt-loam	full sun to full shade	3	dainty white flowers in profusion in July follwed by white berries, broad, rounded shape, good in shade
			Viburnum acerifolium	Maple-leaf Viburnum	2	dry-moist	sand-silt-clay	part shade to full shade	3	slow growing with white cluster flowers, leaves turn red to purple in the fall
			Viburnum alnifoilium	Hobblebush	2	moist	sand-silt-loam	part shade to full shade	2	large leaves with showy white flowers, new leaves emerge like two hands held together in prayer

Native Shrubs
(≤3m hgt.)

Hydro One Networks Right-of-Ways and Corridors

15.09.11 - R0

hydro one

Northern Ontario	Central Ontario	Southern Ontario	Botanical Name	Common Name	Hgt. (m)	Soil Condition	Soil Type	Light Condition	Hardiness Zone	Notes
			Viburnum cassinoides	Viburnum Cassinoides	1.5	moist	sand-loam-clay	full sun to part shade	2	flat top white flowers followed by fruits that change from pink to red to blue and black in the fall, good mass planting or naturalizing, leaves emerge bronze to purple and dull green in summer and orange to red, crimson to purple in the fall
			Viburnum trilobum var. *americanum*	American Cranberry	3	dry-moist	sand-loam	full sun	2	white flowers, red/orange berries
			CONIFEROUS							
			Juniperus communis	Common Juniper	1	dry	sand	full sun	2	blue-black berries, evergreen
			Taxus canadensis	Canadian Yew	2	dry-moist	clay-sand-loam	full sun to full shade	4	red-orange berries, evergreen

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary – Hydro One

To/Attention	Notes to File	**Date**	December 17, 2020
From	Margaret Parkhill	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
December 15, 2020, 2:00 p.m. to 3:00 p.m.

Present Richard Schatz, Hydro One
Dominic Ho, TTC
Viji Mathi, Durham Region
Ragavan Thuraisinganathan, Parsons
Margaret Parkhill, Mai-Linh Ho, Adrian Chiu, IBI Group

Distribution Meeting attendees

Item Discussed	Action By
Introduction	
R. Thuraisinganathan welcomed attendees and provided an overview of the project corridor, noting the two Hydro One corridor crossings along the corridor.	INFO
Crossing at Ellesmere Road and Orton Park Road	
Discussions included:	
• R. Schatz asked if any hydro corridor property would need to be acquired for this design. M. Ho clarified that a construction easement may be required but that would be confirmed at a later stage. No permanent property easements are expected.	
• R. Thuraisinganathan asked if the poles with unknown ownership were owned by Hydro One. R. Schatz responded that they are for a distribution line owned by Toronto Hydro.	
• M. Parkhill provided an overview of the platform design, noting that these would be platform stops rather than bus stations. R. Schatz noted that a technician would need to be sent on-site to determine maximum sags of overhead lines and confirm required clearances. R. Schatz also noted that they don’t expect issues as the cables have been designed to accommodate the height of a bus.	

Item Discussed	Action By
• M. Parkhill also noted that the shelter height may increase to 3.0 m but this is yet to be confirmed by Metrolinx. R.Schatz requested to be sent an updated drawing showing the shelter height increase for further clarity.	Design Team
• R. Schatz requested designs for any proposed traffic poles to be considered for vertical clearances as well. R. Thuraisinganathan clarified the assumption of future traffic poles being the same height as existing ones and will be located on the bullnose islands in front of the platforms.	Design Team
• R. Schatz requested that the design be provided to Hydro One before going to construction. M. Parkhill clarified that this project is at the EA stage, but a commitment can be included to continue consultation with Hydro One as the project progresses to detailed design.	
• R. Thuraisinganathan asked if there would be issues with the multi-use paths being within 15 m of the existing hydro towers. R. Schatz clarified that the 15 m around each hydro tower is needed for access by maintenance vehicles. R. Schatz also noted that if 15 m is available on at least two sides of a hydro tower, it should be acceptable.	
• R. Schatz asked about the continuation of the northwest multi-use path as the northeast corner of the intersection does not show one. R. Thuraisinganathan clarified that the north-side multi-use path connects to the planned Meadoway trail that is being designed as part of a separate project.	
• R. Schatz noted that providing information from Hydro One’s line technicians may take 8-10 weeks.	
• R. Thuraisinganathan asked if documents outside of the meeting materials would be required by Hydro One. R. Schatz responded that the materials shown should be adequate.	
Crossing at Kingston Road and East of Valley Farm Road	
Discussions included:	
• R. Thuraisinganathan noted that “no left-turn” signage may be placed in the centre median. R. Schatz noted that the he does not foresee any issues with this sign placement.	
• R. Schatz noted that there is a smaller crossing east of Thickson Road at Whitby. R. Thuraisinganathan noted that they do not foresee any impacts to the hydro tower from road widening, but will also provide a drawing markup at this location.	
Next Steps	
• R. Thuraisinganathan requested that any Hydro One standards for vertical clearances be provided to the design team.	

Item Discussed	**Action By**
• R. Thuraisinganathan noted TPAP will likely be undertaken in the Spring or Summer of 2021.	
• R. Thuraisinganathan asked if there is any utility construction taking place along the corridor. R. Schatz responded that he is unaware of any, but they would be done in coordination with Metrolinx if they affect the DSBRT project.	
• R. Schatz suggested that the project team request information on the maximum height of a structure within each hydro corridor. He also noted that this information needs to be specifically requested.	
• R. Thuraisinganathan asked about guidelines for tree planting and vertical clearances. R. Schatz clarified that trees are generally not planted within their hydro corridors. Instead, Hydro One has a list of approved shrubberies that can be placed in hydro corridors. R. Schatz will provide the approved landscaping species list.	Hydro One

Please advise of any errors or omissions to Ragavan Thuraisinganathan by January 8, 2020.

Yash Kulshreshtha

From: rick.schatz@HydroOne.com
Sent: Thursday, February 4, 2021 10:36 AM
To: Thuraisinganath, Ragavan
Cc: Hopper, David; Margaret Parkhill; Hailey McWilliam; Mai-Linh Ho; Adrian Chiu; Kristin Demasi; Viji Mathi; David Dunn; Dominic.Ho@ttc.ca; Andrew Au
Subject: [EXTERNAL] Hydro One - Preliminary Technical Review - Durham-Scarborough Bus Rapid Transit - Utility Coordination (Hydro One)
Attachments: HONI - DSBRT Utilities - 12.15.2020.pdf

Good Morning Ragavan,

Hydro One has had a chance to review the presentation / drawing material recently submitted and can provide the following preliminary comments:

A. Ellesmere Rd and Orton Park in Scarborough

- This proposal affects the Cherrywood TS to Leaside TS row. The ultimate plan is to build a total of 5 double circuit lines on this corridor.
- We strongly caution against having a bus shelter and bus loading zone directly beneath our hydro line right of way to avoid induction complaints and avoid positioning the public under the lines during conditions when ice may be falling from the conductors. Metrolinx must understand that if they proceed, it will be at their risk.
- There is adequate clearance for the bus shelter shown at 3.415m from existing grade. Although the road widening will affect ongoing maintenance, it is minimal.
- The maximum underbuild for the bus shelter is 7m through this area measured from the existing road centre line, and lighting would be 10m.
- Where the road widening encroaches on the 15m maintenance radius, work barriers as well as permanent barriers should be added.
- All existing curb cuts / access driveways to Hydro corridors must remain.

B. Kingston Rd, east of Valley Farm Drive in the City of Pickering

- This proposal affects the Cherrywood TS x Pickering GS. Carries 4 double circuit 230kV lines There are no plans for additional facilities on this row. These lines supply Pickering Nuclear station.
- There is adequate clearance for the proposed road widening and the 15m radius around the towers is maintained for ongoing maintenance.
- In order to ensure adequate line clearances, we recommend placing the proposed signage beyond the limit of the hydro corridor.
- All existing curb cuts / access driveways to Hydro corridors must remain.

C. Dundas Street East and Glen Hill Drive S in the City of Whitby

- This proposal affects the Columbus Jct x Lasco Jct. corridor. Currently carries one double circuit line. There are no plans for additional facilities on this row.
- There is adequate clearance for the proposed road widening and the tower access is not affected.
- All existing curb cuts / access driveways to Hydro corridors must remain.

We request final drawings including plan view, grading (before and after), drainage, lighting, structure and signage details (ie height) and landscaping for our final review and approval.

If you have any questions or concerns please let me know.

Regards,

Richard (Rick) Schatz
Senior Real Estate Coordinator

Hydro One Networks Inc.
Facilities and Real Estate
185 Clegg Road
Markham, Ont. L6G 1B7

Cell: 416-735-2909
E-mail: Rick.Schatz@HydroOne.com

www.HydroOne.com [hydroone.com]

DURHAM – SCARBOROUGH
Bus Rapid Transit

Review Agencies Meetings and Correspondence (During TPAP)

Prepared for Metrolinx
by IBI Group & Parsons

DURHAM – SCARBOROUGH
Bus Rapid Transit

Ministry of the Enviornment, Conservation and Parks (MECP)

Prepared for Metrolinx
by IBI Group & Parsons

Yash Kulshreshtha

From: Margaret Parkhill
Sent: Monday, January 17, 2022 10:27 AM
To: Yash Kulshreshtha
Subject: FW: Durham-Scarborough BRT - Draft NVIA for MECP Review

Follow Up Flag: Follow up
Flag Status: Flagged

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: Thursday, January 13, 2022 2:24 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Hopper, David <David.Hopper@parsons.com>
Subject: FW: Durham-Scarborough BRT - Draft NVIA for MECP Review

See below.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Sent: January 13, 2022 2:18 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

Hi Madelin,

I just heard back from the ministry's Noise Reviewer and he is satisfied with Metrolinx's response to all of his comments.

Also, for the errata letter, I would ask that within the letter/document Metrolinx provides an overview of the changes and why they are needed:
e.g.

Overview

This Errata documents changes to the Scarborough Junction Grade Separation(Project) Final Environmental Project Report (EPR) based on comments received during the 30-day public review

period following the publication of the Notice of Completion on December 21, 2020. Specific additions, deletions and revisions are identified in yellow in the document that follows.
This Errata was prepared to incorporate revisions to the EPR and associated environmental technical reports based on comments provided by the City of Toronto, Ministry of the Environment, Conservation and Parks and the Ministry of Heritage, Sport, Tourism and Culture Industries during the 30-day public review period following the publication of the Notice of Completion which began on December 21, 2020 and ended on January 20, 2021.

Let me know if you have any questions, happy to chat anytime.

Thanks,
Anne

Anne Cameron I Project Officer
Environmental Assessment Services Section I Environmental Assessment Branch
135 St. Clair Avenue West I 1st Floor I Toronto ON M4V 1P5
☎: 437-246-2066 I ✉ anne.cameron@ontario.ca

Ministry of the Environment, Conservation and Parks

If you have any accommodation needs or require communication supports or alternate formats, please let me know.
Si vous avez des besoins en matière d'adaptation, ou si vous nécessitez des aides à la communication ou des médias substituts, veuillez me le faire savoir.

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: January 12, 2022 11:32 AM
To: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Anne,

Do you have a timeline for when N&V staff can confirm the responses/edits by?

Also, do you have any availability today or tomorrow for a quick chat? As we're approaching Notice of Completion next week, I have a few questions regarding the 30-day review period.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Sent: January 10, 2022 10:06 AM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

EXTERNAL SENDER: Do not click any links or open any attachments unless you trust the sender and know the content is safe.
EXPÉDITEUR EXTERNE: Ne cliquez sur aucun lien et n'ouvrez aucune pièce jointe à moins qu'ils ne proviennent d'un expéditeur fiable, ou que vous ayez l'assurance que le contenu provient d'une source sûre.

Hi Margaret,

The file download worked. Thank you very much.

Anne

Anne Cameron I Project Officer
Environmental Assessment Services Section I Environmental Assessment Branch
135 St. Clair Avenue West I 1st Floor I Toronto ON M4V 1P5
☎: 437-246-2066 I ✉ anne.cameron@ontario.ca

Ministry of the Environment, Conservation and Parks

If you have any accommodation needs or require communication supports or alternate formats, please let me know.
Si vous avez des besoins en matière d'adaptation, ou si vous nécessitez des aides à la communication ou des médias substituts, veuillez me le faire savoir.

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: January 9, 2022 4:33 PM
To: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Hopper, David <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Anne,
You should receive an email from the system with a link to access.
Please note there are 2 PDFs in the folder. The most recent one file name includes "23Dec2021".
Let me know if it works or not,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Sent: Wednesday, January 5, 2022 12:59 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; Hopper, David <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: Re: Durham-Scarborough BRT - Draft NVIA for MECP Review

Hi Madelin,

Happy new year to you as well!

Thank you for the email and attached items. I tried clicking on the link you included in the text of the email but an error message came up saying that I did not have access. Can you try resending it or changing the access?

Thank you
Anne

Anne Cameron
Project Officer
Environmental Assessment Branch
437-246-2066

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: Wednesday, January 5, 2022 11:33:12 AM
To: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Anne,

Happy new year! Hope you had a great holiday.

Please see attached responses and MX Noise Guide per comment #1. The revised report dated Dec 23 is available here: https://ibigroup-my.sharepoint.com/:f:/r/personal/margaret_parkhill_ibigroup_com/Documents/DSBRT_GRTreview_2021-11/AppendixI_NoiseVibration?csf=1&web=1&e=Ag3g4I
The revised report includes the updated Appendix B with wall heights noted, as requested in the previous set of comments.

Please let me know if you have any issues accessing the file or any questions.

Per my email sent December 23, reminder we are proceeding with Notice of Completion on January 20.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Sent: December 17, 2021 3:47 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Margaret Parkhill

<margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

EXTERNAL SENDER: Do not click any links or open any attachments unless you trust the sender and know the content is safe.
EXPÉDITEUR EXTERNE: Ne cliquez sur aucun lien et n'ouvrez aucune pièce jointe à moins qu'ils ne proviennent d'un expéditeur fiable, ou que vous ayez l'assurance que le contenu provient d'une source sûre.

Hi Madelin,

Please find attached comments from the ministry's Noise Reviewer.

We look forward to receiving Metrolinx's responses.

Have a great weekend,
Anne

Anne Cameron I Project Officer
Environmental Assessment Services Section I Environmental Assessment Branch
135 St. Clair Avenue West I 1st Floor I Toronto ON M4V 1P5
☎: 437-246-2066 I ✉ anne.cameron@ontario.ca

Ministry of the Environment, Conservation and Parks

If you have any accommodation needs or require communication supports or alternate formats, please let me know.
Si vous avez des besoins en matière d'adaptation, ou si vous nécessitez des aides à la communication ou des médias substituts, veuillez me le faire savoir.

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: December 14, 2021 3:26 PM
To: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Anne,

Please see attached responses to the MECP's NVIA comments. Could you please confirm the responses are acceptable to the MECP by Friday December 17?

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Sent: December 2, 2021 2:32 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

Hi Madelin,

Please find attached the ministry's review and comments on the Noise and Vibration report for the Durham-Scarborough Bus Rapid Transit project.

Please let me know if you have any questions about the comments made. We look forward to Metrolinx's responses on the comments made.

All the best,
Anne

Anne Cameron I Project Officer
Environmental Assessment Services Section I Environmental Assessment Branch
135 St. Clair Avenue West I 1st Floor I Toronto ON M4V 1P5
☎: 437-246-2066 I ✉ anne.cameron@ontario.ca

Ministry of the Environment, Conservation and Parks

If you have any accommodation needs or require communication supports or alternate formats, please let me know.
Si vous avez des besoins en matière d'adaptation, ou si vous nécessitez des aides à la communication ou des médias substituts, veuillez me le faire savoir.

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: December 2, 2021 12:29 PM
To: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

Hi Anne,

Checking in to see if the Ministry still plans to provide noise and vibration comments tomorrow.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

Vacation Dec 3-6

From: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Sent: November 4, 2021 12:02 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Uton Samuels <Uton.Samuels@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>
Subject: RE: Durham-Scarborough BRT - Draft NVIA for MECP Review

Hi Madelin,

Unfortunately when myself and the noise reviewer try to open the file it is not possible and says that the file is damaged. Can you please try to send it again or by another means?

Also, I spoke with the noise reviewer and due to workload constraints the date proposed in your email below (November 17) is not possible. The noise reviewer will work towards providing his review by December 3, 2021.

Thanks,
Anne

Anne Cameron I Project Officer
Environmental Assessment Services Section I Environmental Assessment Branch
135 St. Clair Avenue West I 1st Floor I Toronto ON M4V 1P5
☎: 437-246-2066 I ✉ anne.cameron@ontario.ca

Ministry of the Environment, Conservation and Parks

If you have any accommodation needs or require communication supports or alternate formats, please let me know.
Si vous avez des besoins en matière d'adaptation, ou si vous nécessitez des aides à la communication ou des médias substituts, veuillez me le faire savoir.

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: November 3, 2021 5:18 PM
To: Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>
Cc: Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Uton Samuels <Uton.Samuels@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>
Subject: Durham-Scarborough BRT - Draft NVIA for MECP Review

Good afternoon Anne,

The draft noise and vibration impact assessment report for the Durham-Scarborough BRT project is available for the Ministry's review: https://we.tl/t-pN9SPDdfq6

Could you please confirm if the Ministry is able to complete a 2-week expedited review? Metrolinx is requesting comments in the attached comment sheet by November 17, if possible.

Please let me know if you have any questions.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
Metrolinx
10 Bay Street | Toronto | Ontario | M5J 2R8
C: 416-821-3931
E: madelin.blacha@metrolinx.com

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DURHAM – SCARBOROUGH
Bus Rapid Transit

Toronto and Region Conservation Authority (TRCA)

Prepared for Metrolinx
by IBI Group & Parsons

Yash Kulshreshtha

From:	Margaret Parkhill
Sent:	Sunday, January 9, 2022 4:27 PM
To:	Yash Kulshreshtha
Subject:	FW: DSBRT TPAP - All Reports Review - TRCA Comments (CFN 61663)
Follow Up Flag:	Follow up
Flag Status:	Flagged

GRT track and file

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Margie Akins <Margie.Akins@trca.ca>
Sent: Tuesday, January 4, 2022 8:36 AM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Hopper, David <David.Hopper@parsons.com>; Caroline Mugo <Caroline.Mugo@trca.ca>; ecameron@cloca.com; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Yu, Mia <Mia.Yu@parsons.com>
Subject: RE: DSBRT TPAP - All Reports Review - TRCA Comments (CFN 61663)

Hi Margaret,

Happy New Year!

I can confirm that there will be no additional comments on January 5th.

Regards,

Margie Akins, B.URPI (*she/her/hers*) (*mar-jee ay-kinz*)
Planner
Infrastructure Planning and Permits I Development and Engineering Services

T: (416) 661-6600 ext. 5925
E: margie.akins@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

TRCA festive closure days: December 24-January 3
I am currently working remotely 7:30 am – 3:30 pm Monday to Friday.

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: Thursday, December 23, 2021 10:37 AM
To: Margie Akins <Margie.Akins@trca.ca>
Cc: Hopper, David <David.Hopper@parsons.com>; Caroline Mugo <Caroline.Mugo@trca.ca>; ecameron@cloca.com; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Yu, Mia <Mia.Yu@parsons.com>
Subject: RE: DSBRT TPAP - All Reports Review - TRCA Comments (CFN 61663)

Hi Margie,
Could you kindly confirm that these are all the TRCA comments? Will any further comments be provided by January 5? We are working to address all by January 7.

Thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Margie Akins <Margie.Akins@trca.ca>
Sent: Monday, December 20, 2021 2:41 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Hopper, David <David.Hopper@parsons.com>; Caroline Mugo <Caroline.Mugo@trca.ca>; ecameron@cloca.com; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Yu, Mia <Mia.Yu@parsons.com>
Subject: RE: DSBRT TPAP - All Reports Review - TRCA Comments (CFN 61663)

Thanks for that update Margaret. Attached is the WORD version.

Margie Akins, B.URPI (*she/her/hers*) (*mar-jee ay-kinz*)
Planner
Infrastructure Planning and Permits I Development and Engineering Services

T: (416) 661-6600 ext. 5925
E: margie.akins@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

TRCA festive closure days: December 24-January 3
I am currently working remotely 7:30 am – 3:30 pm Monday to Friday.

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: Monday, December 20, 2021 2:40 PM
To: Margie Akins <Margie.Akins@trca.ca>
Cc: Hopper, David <David.Hopper@parsons.com>; Caroline Mugo <Caroline.Mugo@trca.ca>; ecameron@cloca.com; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Yu, Mia <Mia.Yu@parsons.com>
Subject: RE: DSBRT TPAP - All Reports Review - TRCA Comments (CFN 61663)

Hi Margie,
Thank you for the comments. Could you please provide a Word version?
PDF was included in your email.

Also note that Madelin Blacha is the main point of contact from Metrolinx, while Uton is on leave. I've copied Madelin here.
Thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Margie Akins <Margie.Akins@trca.ca>
Sent: Monday, December 20, 2021 1:47 PM
To: Uton Samuels <Uton.Samuels@metrolinx.com>
Cc: Kristin Demasi <Kristin.Demasi@metrolinx.com>; Hopper, David <David.Hopper@parsons.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; Caroline Mugo <Caroline.Mugo@trca.ca>; ecameron@cloca.com
Subject: RE: DSBRT TPAP - All Reports Review - TRCA Comments (CFN 61663)

Hi Uton,

TRCA staff have reviewed the November 24, 2021, submission for the above-noted project. Please see the attached letter for our detailed comments.

For your convenience, a WORD version of our comment table is attached for you to include detailed responses for each TRCA comment. If you would like to set up a meeting to discuss the comments, staff may have availability after January 3, 2022.

Thanks,

Margie Akins, B.URPI (*she/her/hers*) (*mar-jee ay-kinz*)
Planner
Infrastructure Planning and Permits I Development and Engineering Services

T: (416) 661-6600 ext. 5925
E: margie.akins@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

TRCA festive closure days: December 24-January 3
I am currently working remotely 7:30 am – 3:30 pm Monday to Friday.

From: Margie Akins
Sent: Thursday, November 25, 2021 12:37 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Caroline Mugo <Caroline.Mugo@trca.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>; Ric.DaLuz@metrolinx.com
Subject: RE: DSBRT TPAP - NER / Arborist Report Review - TRCA Comments (CFN 61663)

Hi Madelin,

Thank you for providing the responses to TRCA comments on the NER, Arborist Report, EPR, and SWMH Report. I noted that the NER/Arborist Report will be available on Friday and I downloaded the EPR. Please clarify whether the NER and Arborist Report in the EPR appendices should be removed? Please also note that if the NER is not provided by end of this week I will need to extend our review time based on when it is submitted.

Additionally the link to the SWMH did not work and I did not receive a separate email. Please re-send the SWMH report and models.

With regard to the requested review timeline of December 8th, that timeline will not be feasible. We will provide responses in line with the SLA during the holiday closure (Section 2.1.16 of the SLA) by **January 5, 2022**.

We will also require a Work Order Request Form for this review as soon as possible.

Regards,

Margie Akins, B.URPI (*she/her/hers*) (*mar-jee ay-kinz*)
Planner
Infrastructure Planning and Permits I Development and Engineering Services

T: (416) 661-6600 ext. 5925
E: margie.akins@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

TRCA festive closure days: December 24-January 3
I am currently working remotely 7:30 am – 3:30 pm Monday to Friday.

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: Wednesday, November 24, 2021 5:51 PM
To: Margie Akins <Margie.Akins@trca.ca>
Cc: Caroline Mugo <Caroline.Mugo@trca.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: DSBRT TPAP - NER / Arborist Report Review - TRCA Comments (CFN 61663)

Hi again Margie,

Please see attached responses to TRCA's comments on the NER and Arborist Report. The updated NER and Arborist Report will be available for review by this Friday, November 26. We will advise once the files are available on OneDrive. In the meantime, it would be very much appreciated if TRCA staff could scan the responses and let us know if there are any concerns.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Margie Akins <Margie.Akins@trca.ca>
Sent: May 13, 2021 1:20 PM
To: Darcy Wiltshire <Darcy.Wiltshire@metrolinx.com>
Cc: Lee Caragiale <Lee.Caragiale@metrolinx.com>; David Hopper <David.Hopper@parsons.com>; Caroline Mugo <Caroline.Mugo@trca.ca>; Ragavan.Thuraisinganath@parsons.com; ecameron@cloca.com
Subject: DSBRT TPAP - NER / Arborist Report Review - TRCA Comments (CFN 61663)

Hi Darcy,

Please find TRCA staff's comments on the above-noted submission attached.

Thanks,

Margie Akins, B.URPI (*she/her/hers*) (*mar-jee ay-kinz*)
Planner
Infrastructure Planning and Permits I Development and Engineering Services

T: (416) 661-6600 ext. 5925
E: margie.akins@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

Toronto and Region Conservation Authority

From: Margie Akins <Margie.Akins@trca.ca>
Sent: April 20, 2021 2:39 PM
To: Thuraisinganath, Ragavan <Ragavan.Thuraisinganath@parsons.com>

Cc: Caroline Mugo <Caroline.Mugo@trca.ca>; Alexander Lefort <Alexander.Lefort@metrolinx.com>; Lee Caragiale <Lee.Caragiale@metrolinx.com>; Darcy Wiltshire <Darcy.Wiltshire@metrolinx.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>
Subject: RE: DSBRT - Draft Reports - TRCA

Hi Ragavan,

Thank you for the submission of the draft Arborist Report and draft Natural Environment Report. I am confirming that the reports were circulated last week to technical staff for review.

I have noted that you are requesting comments by April 29th, 2021. If possible, we will try to accommodate this request; however, please anticipate a response no later than May 14th 2021, as per the Service Level Agreement review timelines.

Additionally, it is now MX/TRCA protocol to provide a Metrolinx Word Order Request Form to TRCA with every request/submission. Please provide the WORF for this submission as soon as possible. I have cc'd Alexander Lefort at Metrolinx should you have any questions re: WORFs.

Thanks,

Margie Akins, B.URPI (*she/her/hers*)
Planner
Infrastructure Planning and Permits I Development and Engineering Services

T: (416) 661-6600 ext. 5925
E: margie.akins@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 [can01.safelinks.protection.outlook.com] | trca.ca [can01.safelinks.protection.outlook.com]

Toronto and Region Conservation Authority [can01.safelinks.protection.outlook.com]

From: Thuraisinganath, Ragavan <Ragavan.Thuraisinganath@parsons.com>
Sent: Friday, April 16, 2021 9:45 AM
To: Caroline Mugo <Caroline.Mugo@trca.ca>
Cc: Margie Akins <Margie.Akins@trca.ca>; Sharon Lingertat <Sharon.Lingertat@trca.ca>
Subject: RE: DSBRT - Draft Reports - TRCA

Good morning Caroline,

Please see the links below, which should now be accessible for Margie and yourself. Let me know if you have any issues.

Arborist Report - 03.11.2021 [can01.safelinks.protection.outlook.com]
04.05.2021 - Revised 75% NER [can01.safelinks.protection.outlook.com]

Regards,

Ragavan Thuraisinganathan, P.Eng
Rail & Transit Engineer

PARSONS
625 Cochrane Drive, Suite 500, Markham, ON L3R 9R9
Ragavan.Thuraisinganath@parsons.com | (905) 943-0517

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From: Caroline Mugo <Caroline.Mugo@trca.ca>
Sent: Friday, April 16, 2021 9:21 AM
To: Thuraisinganath, Ragavan <Ragavan.Thuraisinganath@parsons.com>
Cc: Margie Akins <Margie.Akins@trca.ca>; Sharon Lingertat <Sharon.Lingertat@trca.ca>
Subject: [EXTERNAL] FW: DSBRT - Draft Reports - TRCA

Hi Ragavan,
Thank you for your email. Margie (copied) will be taking over this file from Sharon. I think you have only given Sharon access to download the documents. Could you kindly re-send the link to the documents and give both Margie and I access?
Thank you,

Caroline Mugo, Ph.D
Senior Planner, Infrastructure Planning and Permits
Development and Engineering Services Division

T: (416) 661-6600 ext. 5689
E: caroline.mugo@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 [google.com] [can01.safelinks.protection.outlook.com] | trca.ca [trca.ca] [can01.safelinks.protection.outlook.com]

Toronto and Region Conservation Authority [trca.ca] [can01.safelinks.protection.outlook.com]

From: Thuraisinganath, Ragavan <Ragavan.Thuraisinganath@parsons.com>
Sent: Wednesday, April 14, 2021 4:00 PM
To: Sharon Lingertat <Sharon.Lingertat@trca.ca>
Cc: Hopper, David <David.Hopper@parsons.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; Hailey McWilliam <hailey.mcwilliam@ibigroup.com>; Lee Caragiale <Lee.Caragiale@metrolinx.com>; Darcy Wiltshire <darcy.wiltshire@metrolinx.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>; Yu, Mia <Mia.Yu@parsons.com>
Subject: DSBRT - Draft Reports - TRCA

Good afternoon Sharon,

Please find in the two links below the 75% submission for the draft Natural Environment Report as well as the draft Arborist Report for the Durham Scarborough Bus Rapid Transit project.

The links contain the report documents, supplementary data files as well as comment/response spreadsheets from stakeholder review to date.

Arborist Report - 03.11.2021 [parsons365can-my.sharepoint.com] [can01.safelinks.protection.outlook.com]

[04.05.2021 - Revised 75% NER [parsons365can-my.sharepoint.com] [can01.safelinks.protection.outlook.com]]

Your review and comments by Thursday April 29, 2021 would be much appreciated.

Feel free to let me know if you have any questions.

Regards,

Ragavan Thuraisinganathan, P.Eng
Rail & Transit Engineer

PARSONS
625 Cochrane Drive, Suite 500, Markham, ON L3R 9R9
Ragavan.Thuraisinganath@parsons.com | (905) 943-0517

www.parsons.com [can01.safelinks.protection.outlook.com] | LinkedIn [can01.safelinks.protection.outlook.com] | Twitter [can01.safelinks.protection.outlook.com] | Facebook [can01.safelinks.protection.outlook.com]

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DURHAM – SCARBOROUGH

Bus Rapid Transit

Ministry of Natural Resources and Forestry (MNRF)

Prepared for Metrolinx
by IBI Group & Parsons

Yash Kulshreshtha

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: Wednesday, January 12, 2022 2:21 PM
To: Margaret Parkhill; Yash Kulshreshtha
Subject: FW: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

Follow Up Flag: Flag for follow up
Flag Status: Flagged

FYI – please include in Appendix K

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Mott, Ken (NDMNRF) <ken.mott@ontario.ca>
Sent: January 12, 2022 2:19 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Hislop, Chris (NDMNRF) <Chris.Hislop@ontario.ca>
Subject: RE: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

Good afternoon Madelin;
Appreciate your response to the potential issues we have identified as the project moves forward. Thanks for clarifying your opinion.

I don't expect that MNRF will be providing further comment on this project unless our technical advice is required.

Regards
Ken

Ken Mott
District Planner
NDMNRF - Midhurst District
(Bruce, Grey, Simcoe, Dufferin)
E-mail: Ken.Mott@Ontario.ca
Cell: (249) 288-4624

Ontario

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: January 12, 2022 7:10 AM

To: Mott, Ken (NDMNRF) <ken.mott@ontario.ca>
Cc: Hislop, Chris (NDMNRF) <Chris.Hislop@ontario.ca>
Subject: RE: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

Hi Ken,

If possible, could you please let me know today if the responses are acceptable to MNRF? Please reach out if any additional questions.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Madelin Blacha
Sent: January 6, 2022 10:53 AM
To: 'Mott, Ken (NDMNRF)' <ken.mott@ontario.ca>
Cc: 'Hislop, Chris (NDMNRF)' <Chris.Hislop@ontario.ca>
Subject: RE: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

Hi Ken,

For comment 2, our consultant included a mapping excerpt in columns L through W. I've pasted below for your convenience. Please let me know if this answers your question or if you require further clarification.

Thanks,

Madelin Blacha

Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Mott, Ken (NDMNRF) <ken.mott@ontario.ca>
Sent: January 6, 2022 9:56 AM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Hislop, Chris (NDMNRF) <Chris.Hislop@ontario.ca>
Subject: RE: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

Good morning Madelin

Appreciate your quick responses to these items and we understand the tight timelines that your are managing.

Several of them were potential considerations that we wanted to raise awareness about at an early stage (fisheries passages, wildlife passages, potential permitting requirements) prior to potential issues that might come up during your detailed design stage.

The item that we are a bit unclear on is item number 2 – the deciduous wetland that you have indicated is outside of the grading area. In the Metrolinx comments it indicates that we should "see mapping excerpt --→".

Would you be able to provide some additional information on that? I wasn't sure what your reviewer was referencing.

Thanks
Ken

Ken Mott
District Planner
NDMNRF - Midhurst District
(Bruce, Grey, Simcoe, Dufferin)
E-mail: Ken.Mott@Ontario.ca
Cell: (249) 288-4624

Ontario

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: January 6, 2022 8:18 AM
To: Mott, Ken (NDMNRF) <ken.mott@ontario.ca>
Cc: Hislop, Chris (NDMNRF) <Chris.Hislop@ontario.ca>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper

<David.Hopper@parsons.com>
Subject: RE: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good morning Ken,

Happy new year and hope you enjoyed the holiday season.

Could you please advise when we can expect your feedback regarding the attached responses?

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Madelin Blacha
Sent: December 21, 2021 11:07 AM
To: 'Mott, Ken (NDMNRF)' <ken.mott@ontario.ca>
Cc: Hislop, Chris (NDMNRF) <Chris.Hislop@ontario.ca>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>
Subject: RE: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

Hi Ken,

Please see attached responses. If you could please kindly confirm the responses and proposed edits are acceptable to the MNRF by Thurs. Dec 23, would be much appreciated, or no later than Wed. Jan 5.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Mott, Ken (NDMNRF) <ken.mott@ontario.ca>
Sent: December 14, 2021 8:28 AM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Hislop, Chris (NDMNRF) <Chris.Hislop@ontario.ca>
Subject: DurhamScarboroughRT_MNRF Draft Comments Dec 14 2021

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Good Morning Madelin;
My apologies for the delay in our comments. If you have any questions about the contents, please contact me via email or at the
phone number below.

Regards
Ken Mott

Ken Mott
NDMNRF
E-mail: Ken.Mott@Ontario.ca
Cell: (249) 288-4624

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DURHAM – SCARBOROUGH
Bus Rapid Transit

Ontario Ministry of Transportation (MTO)

Prepared for Metrolinx
by IBI Group & Parsons

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Design Criteria Discussion with MTO

IBI PARSONS

November 3, 2021

Agenda

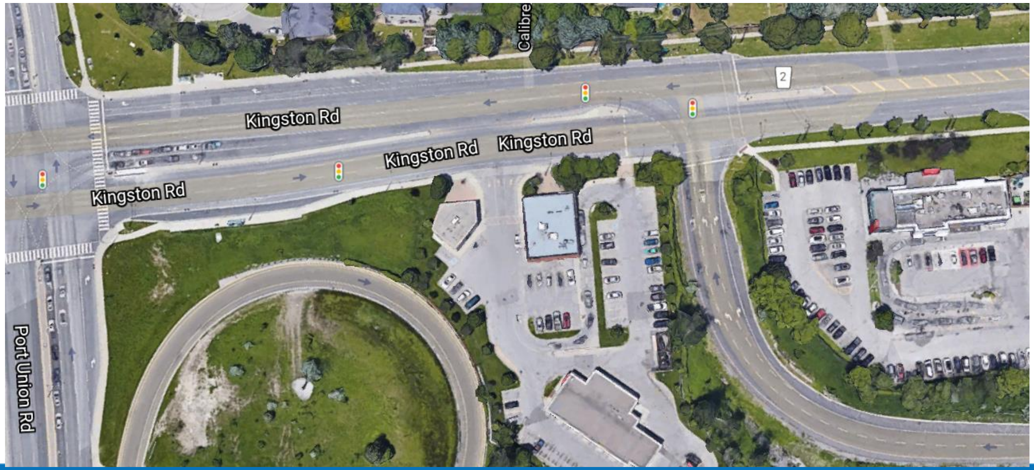
1. Locations
2. Seeking Exemptions from MTO
3. Intersections
4. Typical Road Cross Sections
5. Operational Performance
6. Data to be Received

1. Locations

1. Kingston Road from east of Ellesmere Road to Rylander Boulevard, 576m in length, and 45m east and west of Highway 401 E-N/S off ramp, 90m in length in Toronto.
2. Kingston Road 45m east and west of Highway 401 on/off ramps east of Whites Road / Kingston Road, 90m in length, in Pickering.
3. Dundas Street from Highway 412 off-ramp to Highway 412 on-ramp, 364m in length, in Whitby.

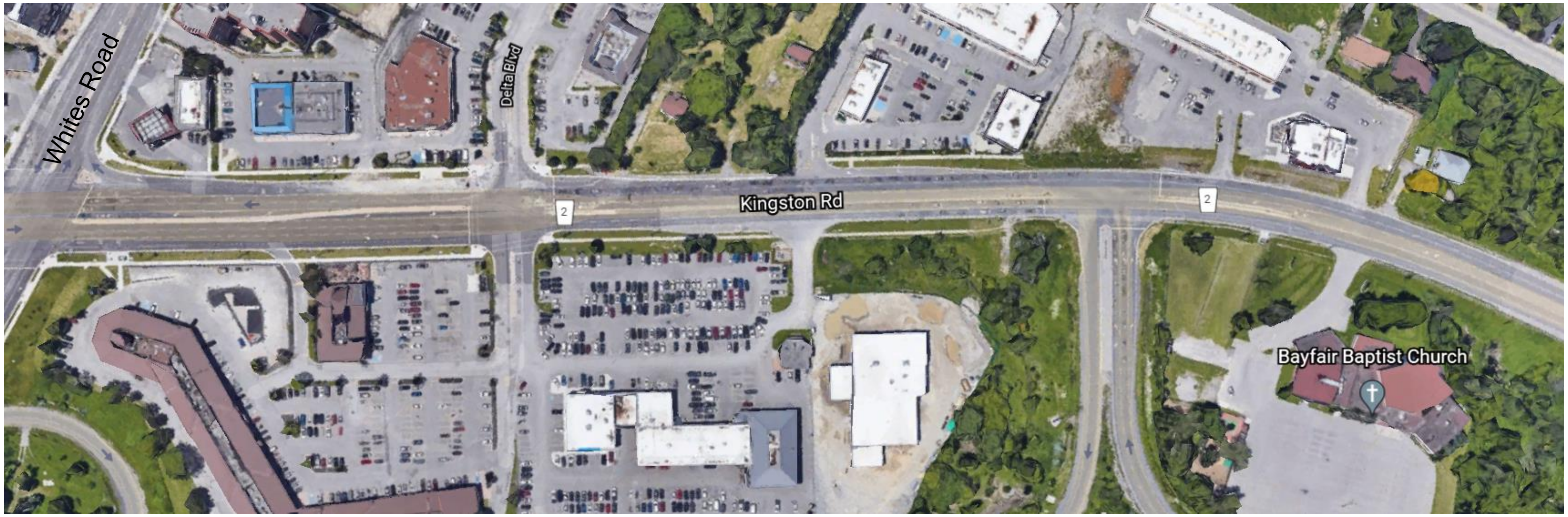
1. Locations

1. Kingston Road from east of Ellesmere Road to Rylander Boulevard, 576m in length, and 45m east and west of Highway 401 E-N/S off ramp, 90m in length.



1. Locations

2. Kingston Road 45m east and west of Highway 401 on/off ramps east of Whites Road / Kingston Road, 90m in length.



1. Locations

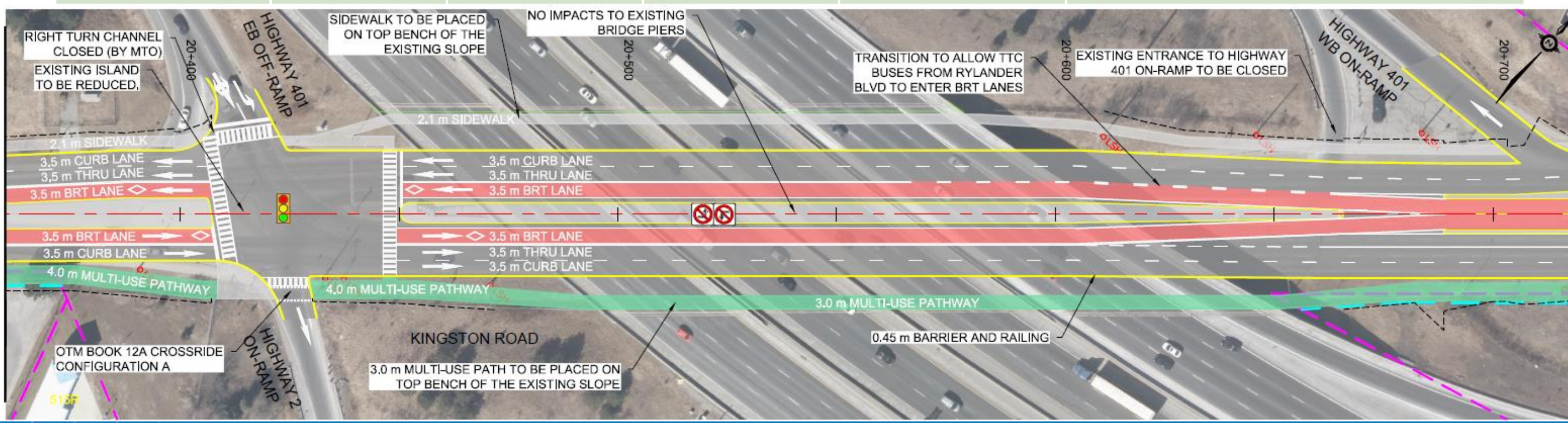
3. Dundas Street from Highway 412 off-ramp to Highway 412 on-ramp, 364m in length.

2. Seeking Exemptions from MTO

1. Reduction in design speed from 80 to 70 km/h on Kingston Road

Kingston Road:

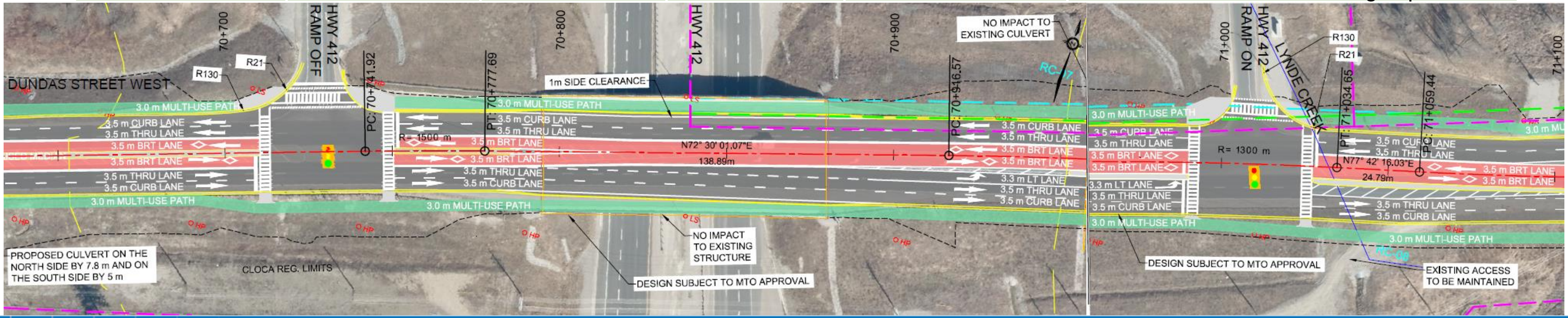
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed (km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers.



2. Seeking Exemptions from MTO

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

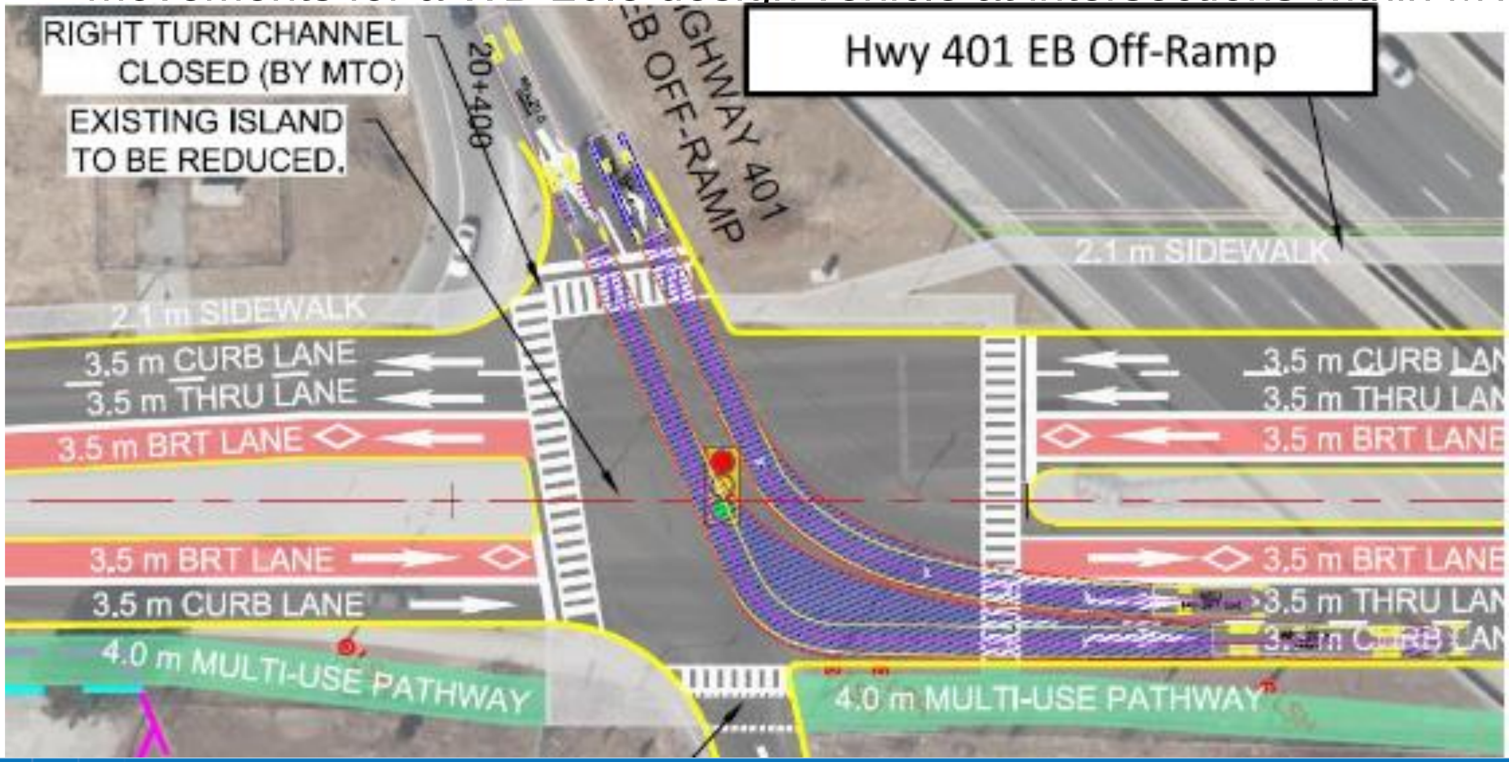
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.



3. Intersections

1. Highway 401 EB off-ramp at Kingston Road

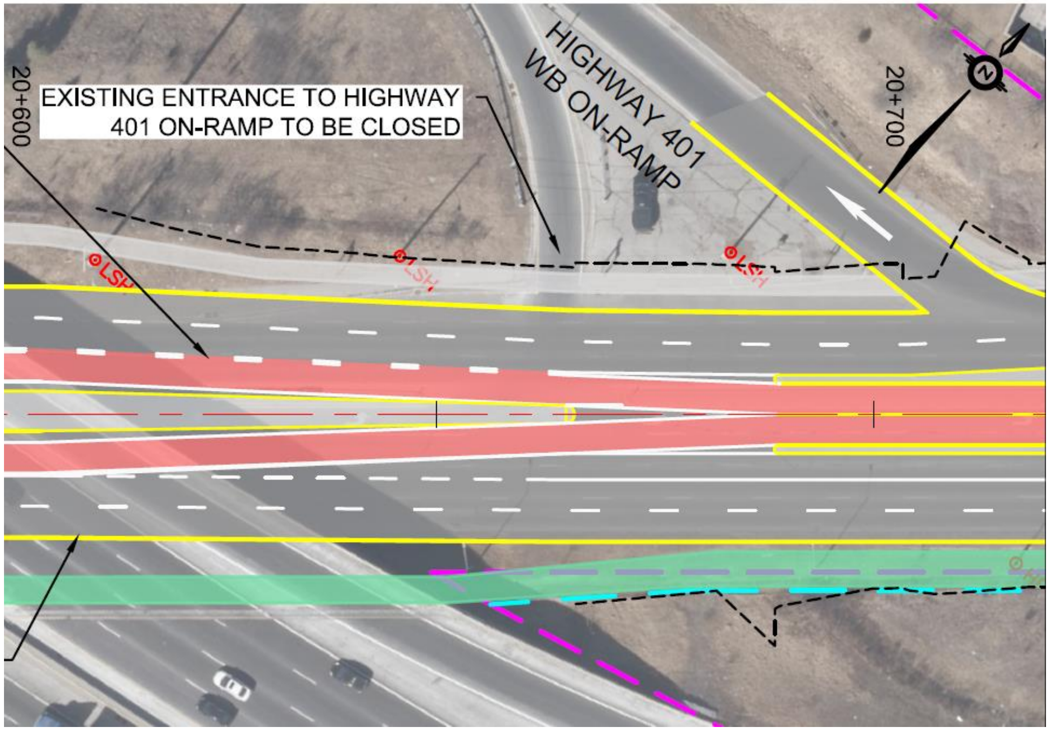
- Right turn channel to be closed by MTO
- All turning movements to be maintained
- New crossride on south leg of the intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

2. Highway 401 WB on-ramp at Kingston Road

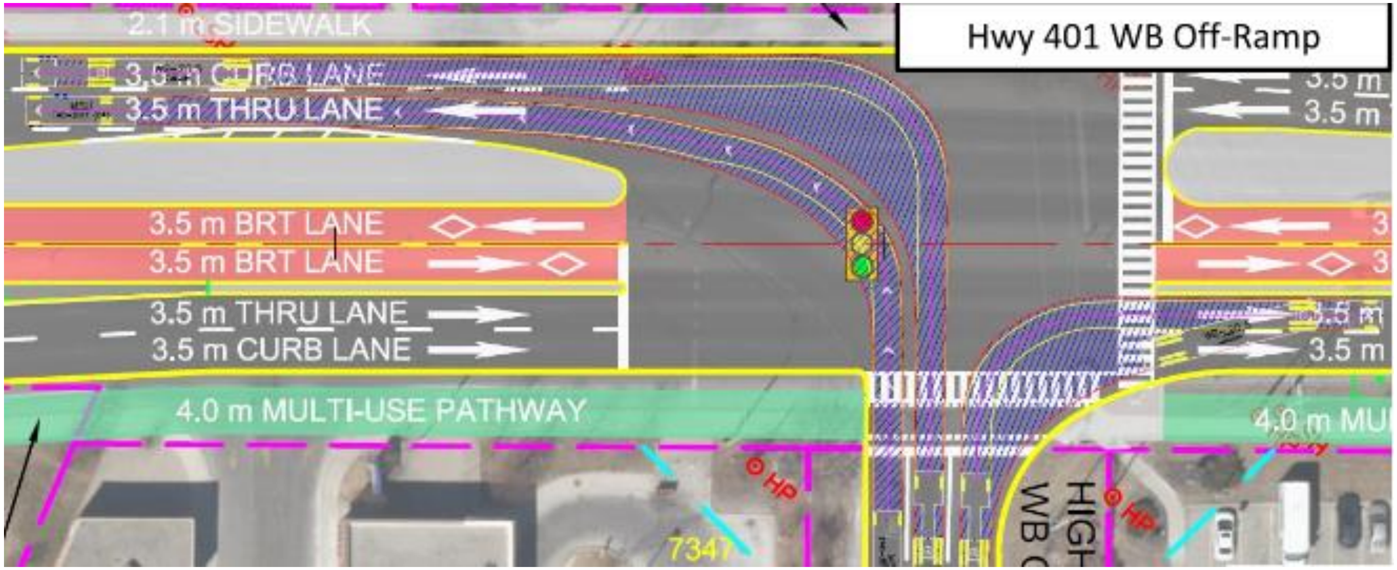
The DSBRT Traffic Impact Analysis recommendation is to close the existing Kingston-West-to-Highway 401-West entrance and this traffic will be diverted to the Rylander Boulevard intersection (just east of this ramp) to make U-turn during the protected-only signal phasing.



3. Intersections

3. Highway 401 WB off-ramp at Kingston Road

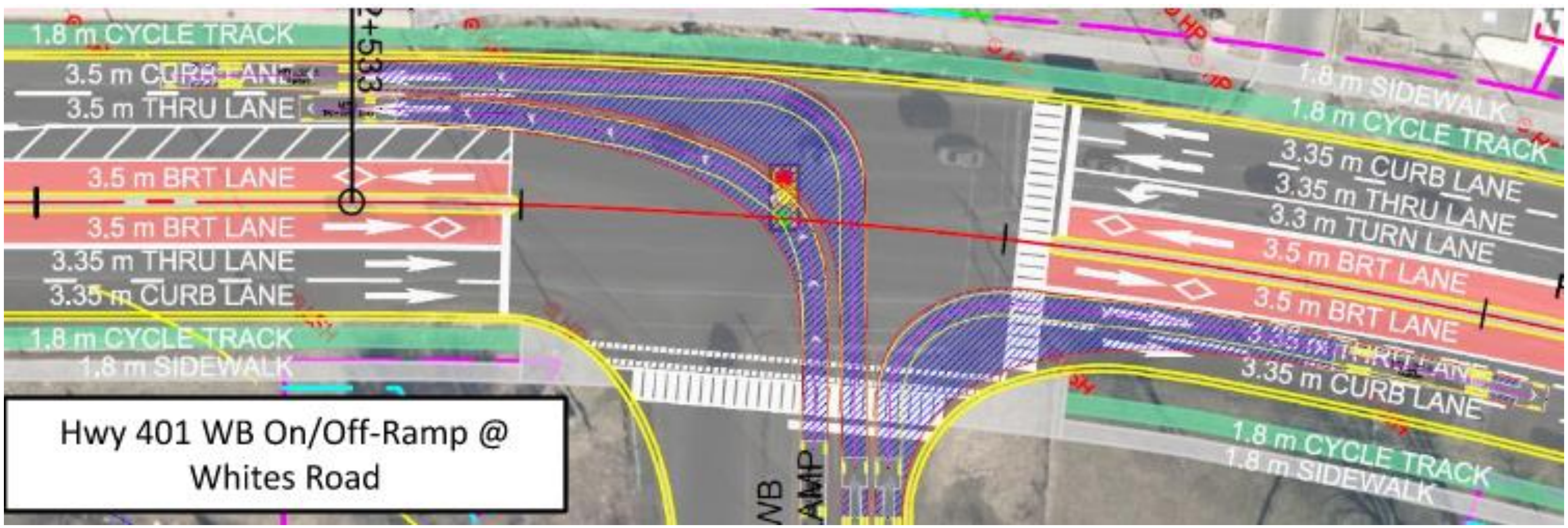
- All turning movements to be maintained
- New crossride on south leg of the intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

4. Highway 401 on/off-ramp east of Whites Road

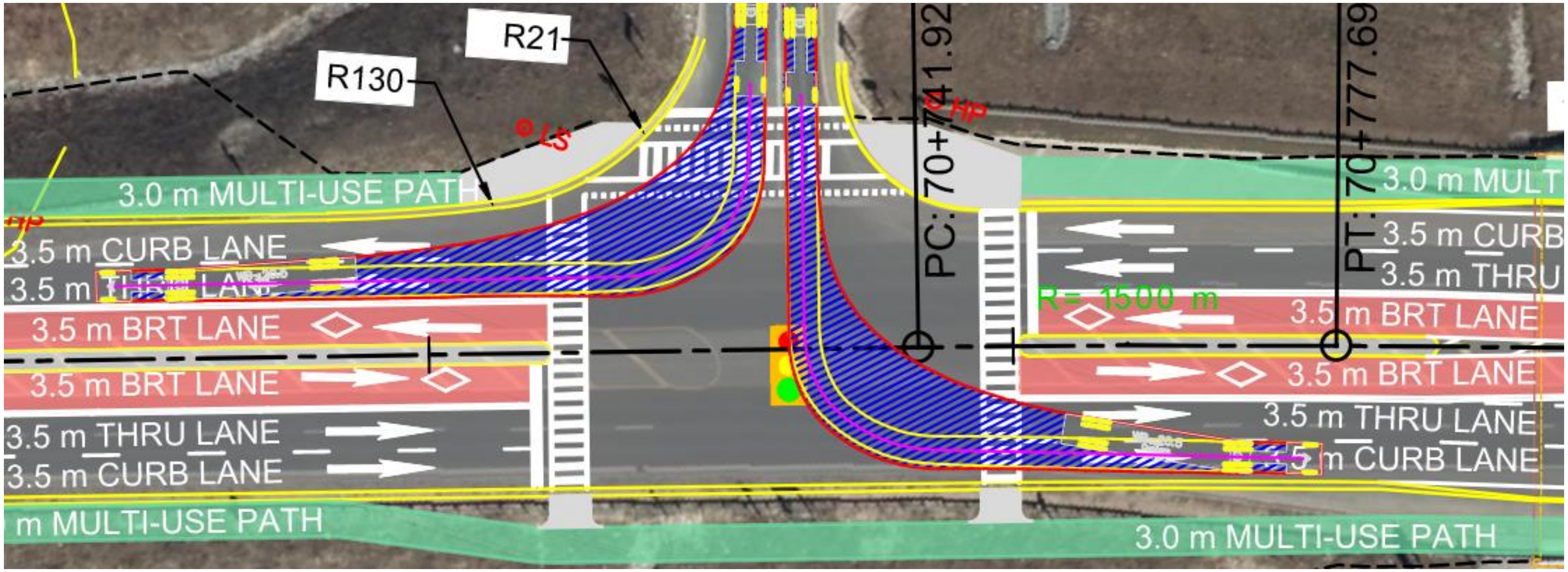
- Intersection curb radii to be aAll turning movements to be maintained
- New crossride on south leg of the intersection
- Stop bar at off-ramp shifted back approximately 8 m
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

5. Highway 412 SB off-ramp at Dundas Street W

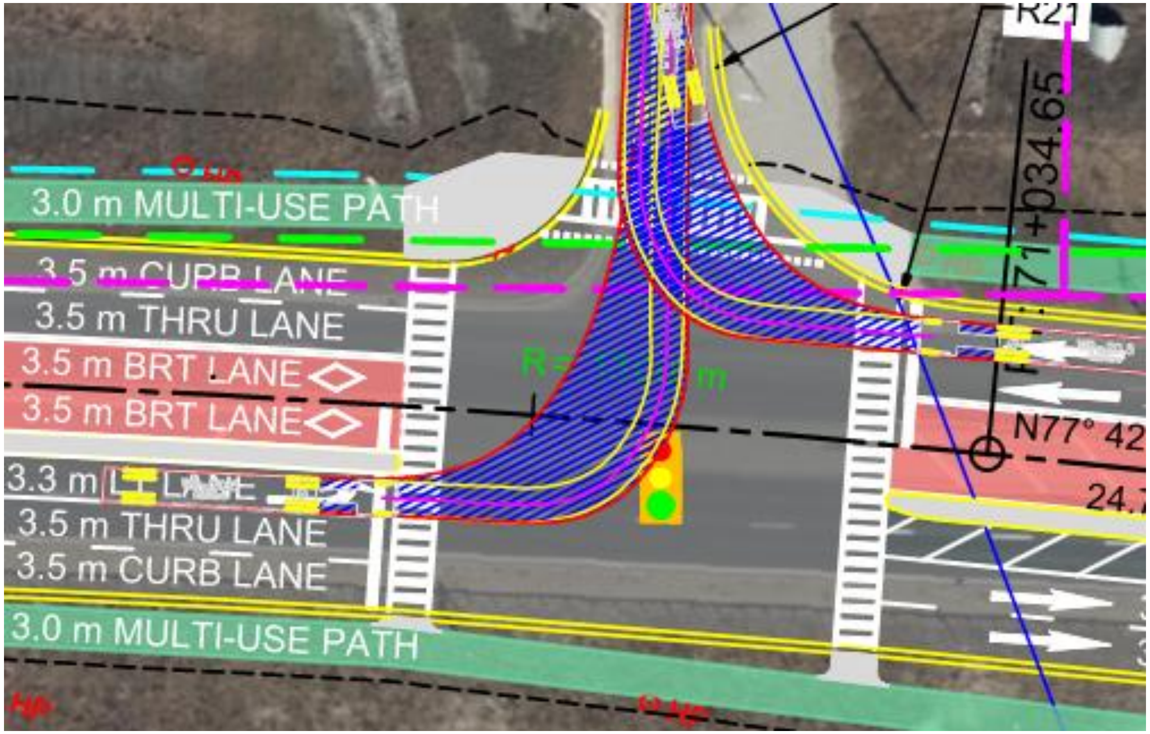
- Proposed traffic signals
- All turning movements to be maintained
- New crossride on north leg of the intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO



3. Intersections

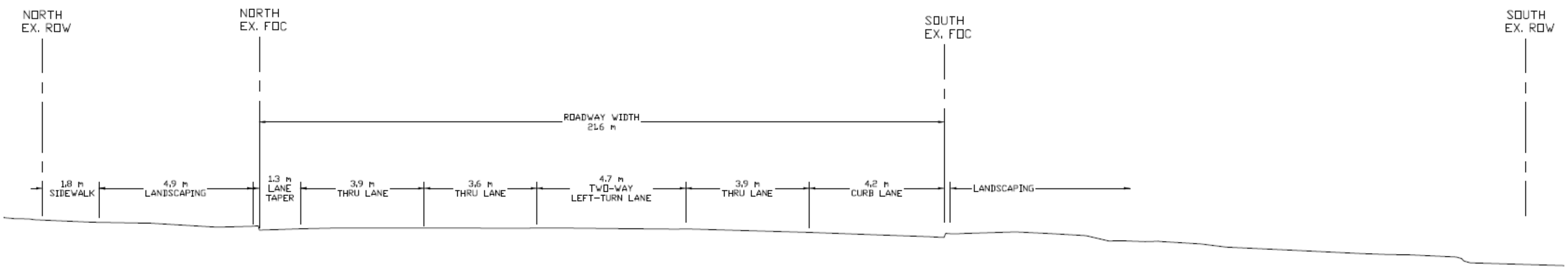
6. Highway 412 NB on-ramp at Dundas Street W

- Proposed traffic signals
- All turning movements to be maintained
- New crossride on north leg of intersection
- Intersection curb radii to be adjusted to accommodate turning movements for a WB-20.5 design vehicle at intersections within MTO

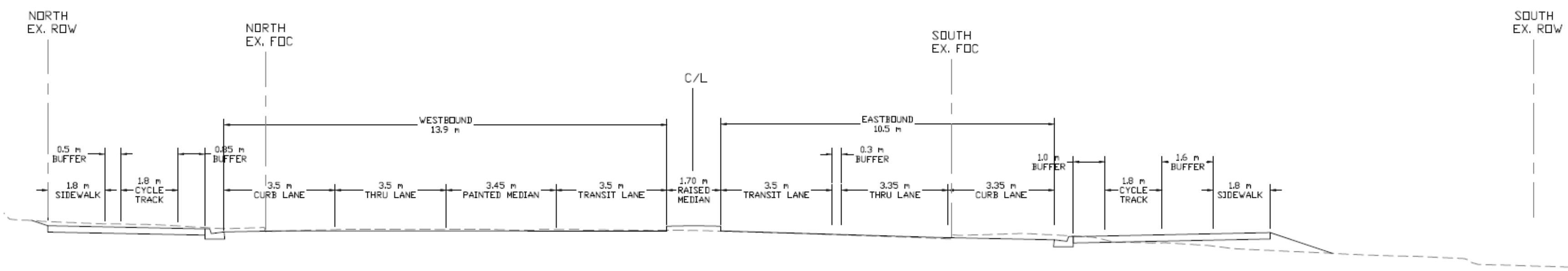


4. Typical Road Cross Sections

Kingston Road at Highway 401 / Whites Road Interchange: EXISTING CONDITION

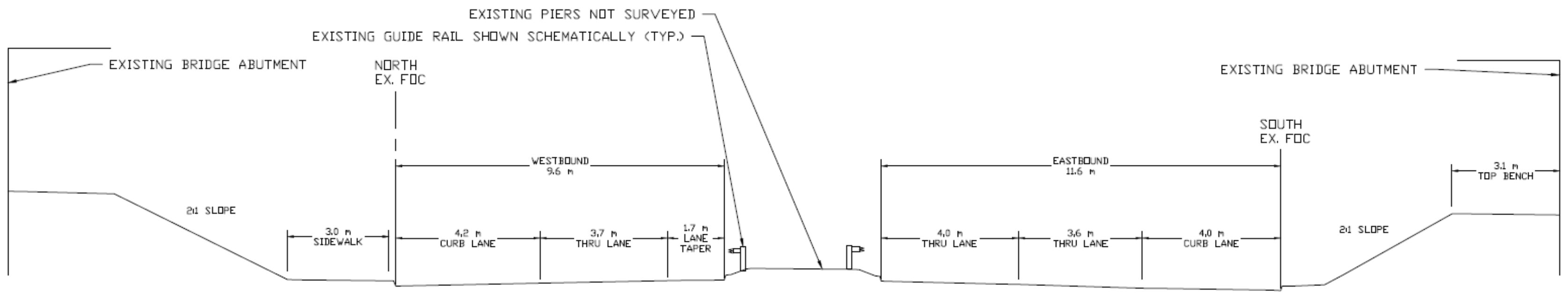


Kingston Road at Highway 401 / Whites Road Interchange: PROPOSED CONDITION

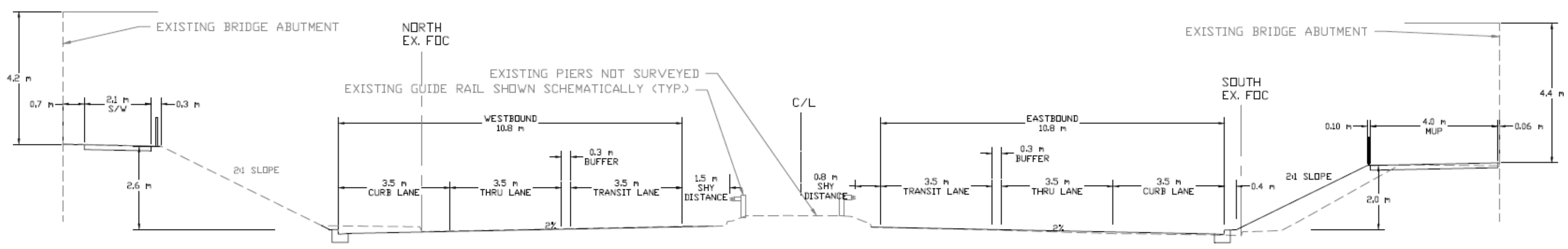


4. Typical Road Cross Sections

Kingston Road under Highway 401: EXISTING CONDITION



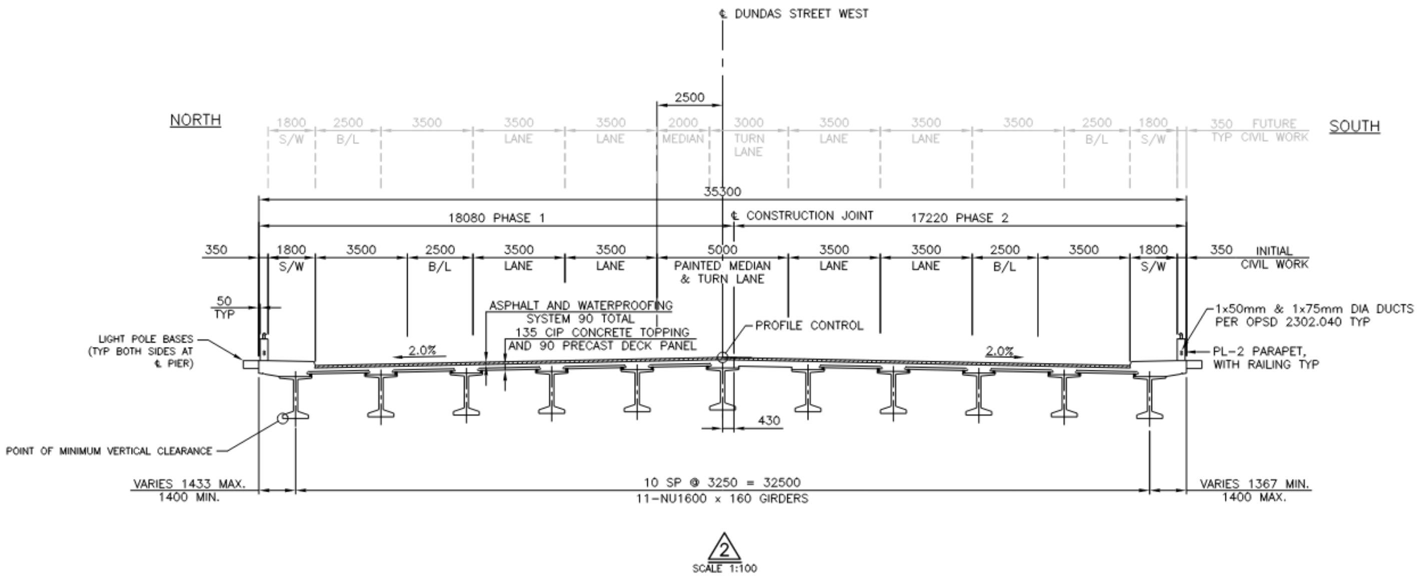
Kingston Road under Highway 401: PROPOSED CONDITION



NOTE: No proposed changes to existing centre piers, guide rails or shallow foundations.

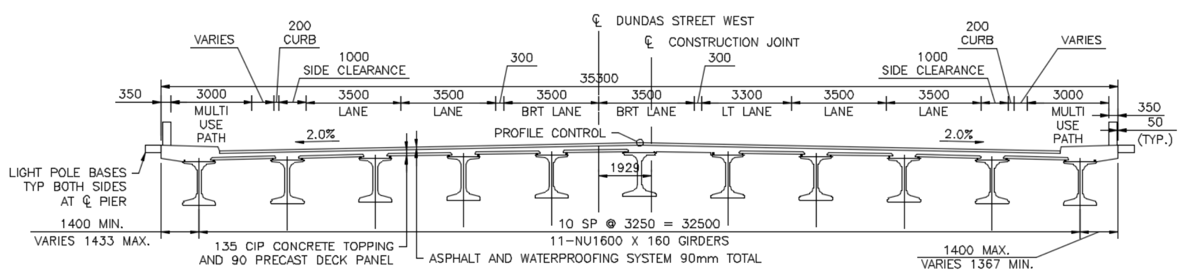
4. Typical Road Cross Sections

Dundas Street W at Highway 412: EXISTING CONDITION



Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Dundas Street W at Highway 412: PROPOSED DESIGN



5. Operational Performance

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from Exhibit 8-1 of DSBRT Traffic Impact Analysis

Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

Excerpt from Exhibit 6-6 of DSBRT Traffic Impact Analysis

6. Data to be Received

1. Present condition design criteria, including ramp design speeds, superelevation maximum rates, shoulder rounding, sight distances at exit/entrance terminal, exit/entrance terminal speed-change lane lengths for:
    1. Highway 401 @ Kingston Road - W-N/S OFF RAMP
    2. Highway 401 @ Kingston Road - N-W ON RAMP
    3. Highway 401 @ Kingston Road – E-N/S OFF RAMP
    4. Highway 401 @ Whites Road/Kingston Road - N/S-W ON RAMP
    5. Highway 401 @ Whites Road/Kingston Road – E-N/S OFF RAMP
    6. Highway 412 @ Dundas Street W – N-E/W OFF RAMP
    7. Highway 412 @ Dundas Street W – E/W-N ON RAMP

6. Data to be Received

2. Contract drawings showing exit/entrance terminal speed-change lanes, Highway 401 collector profile, and Highway 412 collector profile.
3. MTO Corridor Access Plan

Thank you

IBI PARSONS

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	November 22, 2021
From	Margaret Parkhill, David Hopper	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
November 22, 2021, 10:00 a.m. to 11:00 a.m.

Present Kristin Demasi, Wilson Taveira, Madelin Blacha, Matthew Coelho, Metrolinx
Rami El Mawed, Jason Hanna, Adrian Firmani, Eileen Li, Christian Singh, William Francolini, Marek Wiesek, Lewis Lee, MTO
Dave Dunn, Matthew Darling, Kamrul Islam, Region of Durham
Andres Jarrin, City of Toronto
David Hopper, Wendy Ng, Sam Dinatolo, Parsons
Margaret Parkhill, Adrian Chiu, Yash Kulshreshtha, IBI Group

Distribution Meeting attendees

Item Discussed	Action By
Introduction S. Dinatolo welcomed attendees and provided an update on the DSBRT design criteria, preliminary design, and traffic operations at three MTO interface areas: 1. Highway 401 E-N/S off ramp at Kingston Road east of Sheppard Avenue/Port Union Road in City of Toronto, 2. Highway 401 on/off ramps at Kingston Road east of Whites Road in Town of Pickering 3. Dundas Street West from Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby. S. Dinatolo also provided a summary of existing and proposed standards for MTO jurisdiction areas. The following is a summary of the discussion.	INFO
Discussion Included: • S. Dinatolo asked about next steps to take before presenting to MTO senior management. J. Hanna responded that they will discuss with R. El Mawed if any changes need to be made before presenting to senior management.	R. El Mawed / J. Hanna

Item Discussed	**Action By**
• C. Singh asked if there if any utility investigations have been done to determine if there will be any utility relocations required. M. Parkhill responded that subsurface utility investigations have been performed at certain areas along the corridor. The preliminary design protects space for utilities in the boulevard.	
• C. Singh noted that a utility composite plan is not necessary at this point, but encroachment plans may be required. M. Parkhill responded that the project is an Environmental Assessment in the preliminary design phase. The EPR can include a commitment to future work in detail design for utility relocation and encroachment permits from MTO to be reviewed.	M. Parkhill
• S. Dinatolo noted that it that it may be too early to apply for permits as the project is only at TPAP. C. Singh responded that permits would not be necessary at this time. MTO recommends identifying utility relocations as early as possible so that they do not become showstoppers later on in the project. M. Darling noted that the Region of Durham is currently performing SUE investigations and utility excavation/relocations as part of the detailed design.	

Please advise of any errors or omissions to Margaret Parkhill by December 6, 2021.

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Design Criteria Discussion with MTO

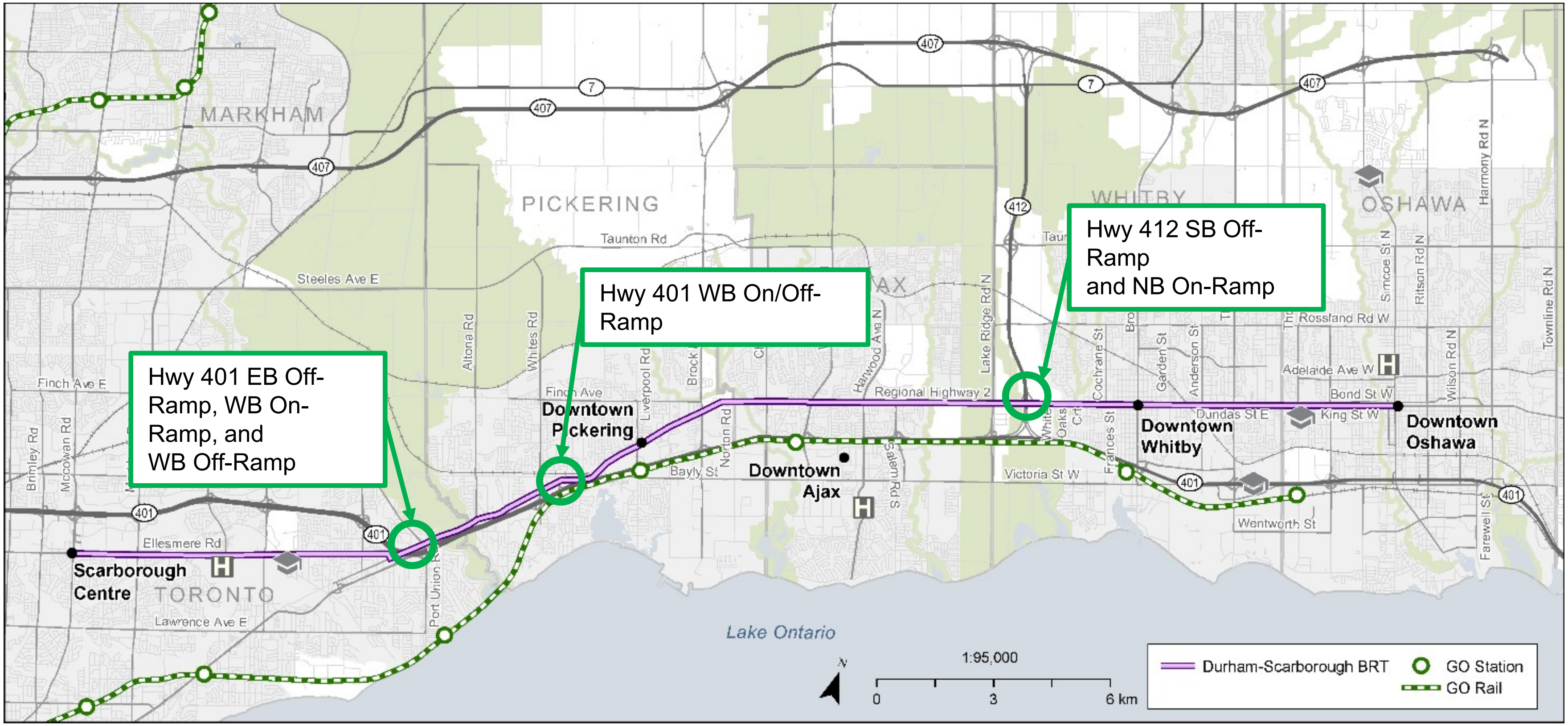
IBI PARSONS

November 22, 2021

Agenda

1. Study Area
2. Operational Performance Overview
3. Draft Preliminary Design Criteria
    1. Kingston Road Highway
    2. Highway 401 Off Ramps
    3. Hwy 412
4. Potential Exemptions
5. Existing Substandard but Improved Criteria
6. Next Steps

Study Area



Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Dundas St E
King St W
Bond St W
Adelaide Ave W
Rossland Rd W
Wentworth St
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

5. Operational Performance

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from Exhibit 8-1 of DSBRT Traffic Impact Analysis

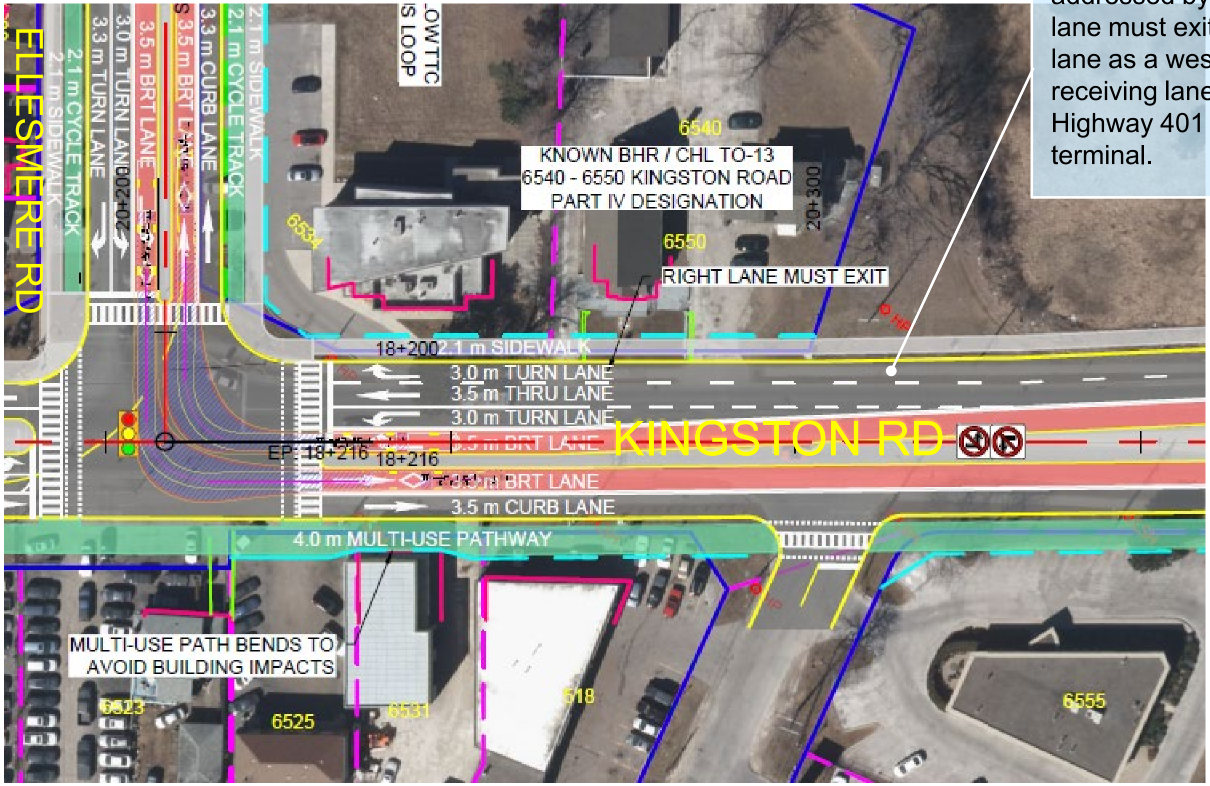
Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

Excerpt from Exhibit 6-6 of DSBRT Traffic Impact Analysis

Location 1: Kingston Road

- Kingston Road from east of Ellesmere Road to Rylander Boulevard
- Highway 401 E-N/S off ramp at Kingston Road east of Sheppard Avenue/Port Union Road in City of Toronto

Previous MTO concern addressed by including “right lane must exit” right turn lane as a westbound receiving lane at the Highway 401 off-ramp terminal.

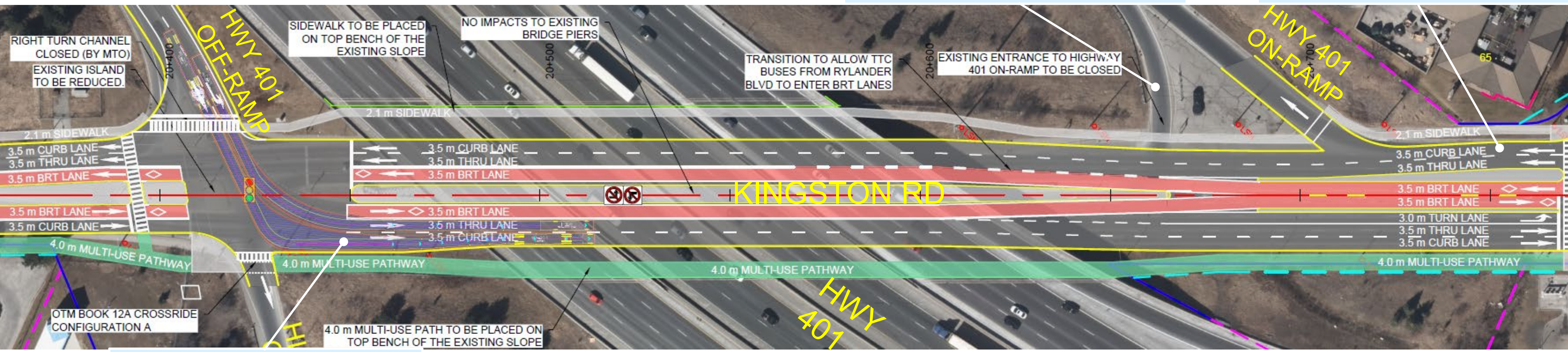


Location 1: Kingston Road (cont'd)

Previous MTO concern addressed by diverting traffic to make u-turns at Rylander Blvd and to the Meadowvale loop on-ramp.

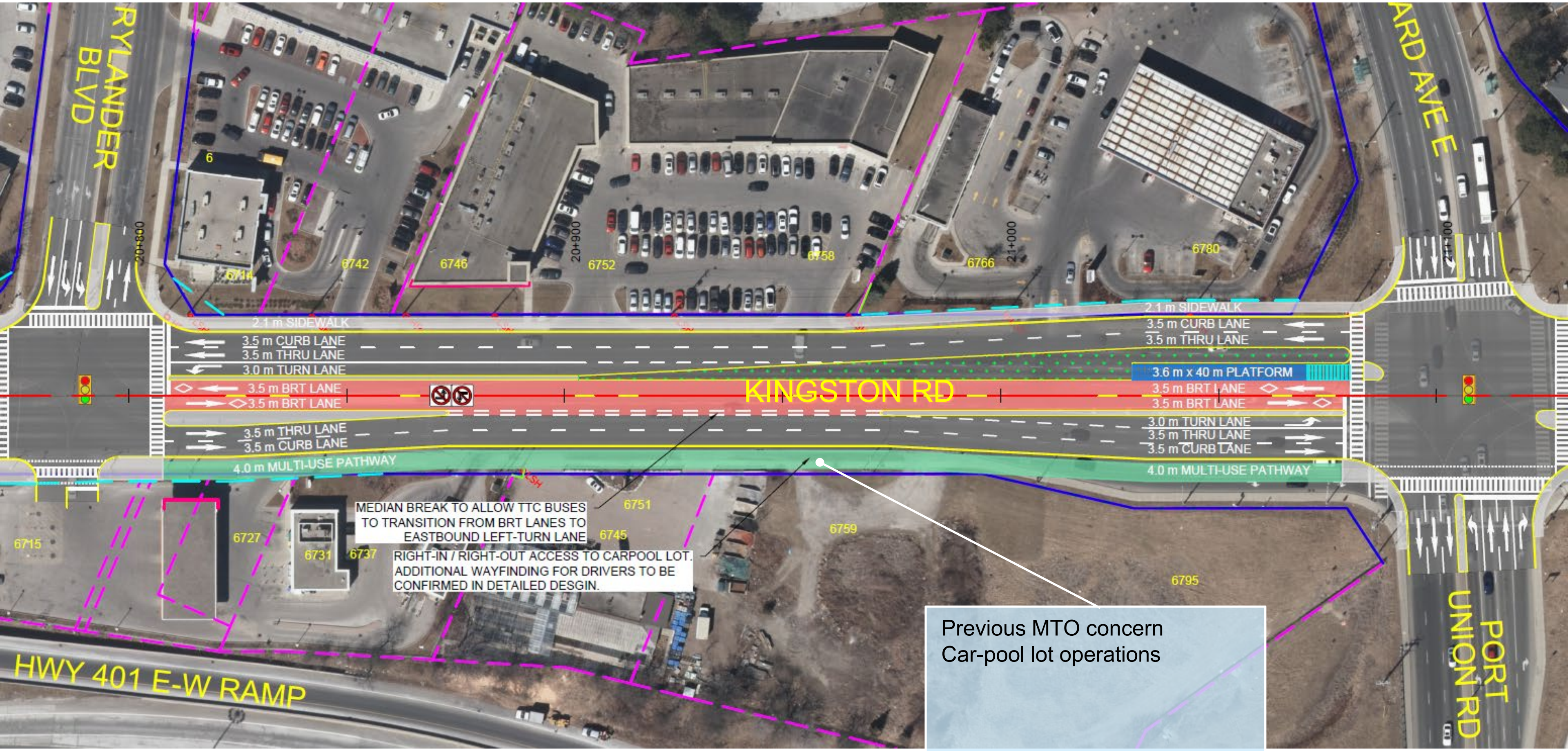
EBL to Hwy 401 WB On-ramp movements are 30 vph for AM and 240 vph for PM.

Anticipated further concern: Existing on ramp lane coincides with through curb lane.



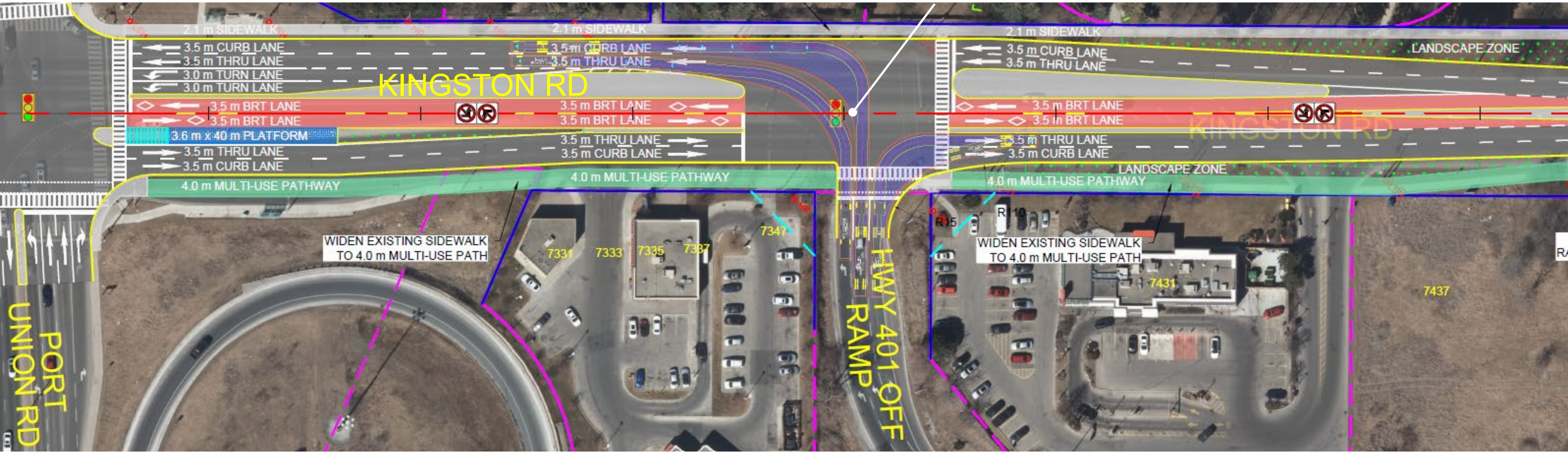
Previous MTO concern addressed by including additional pavement width to accommodate simultaneous dual left turning movement for design vehicles of WB-20.5 and I-BUS.

Location 1: Kingston Road (cont'd)



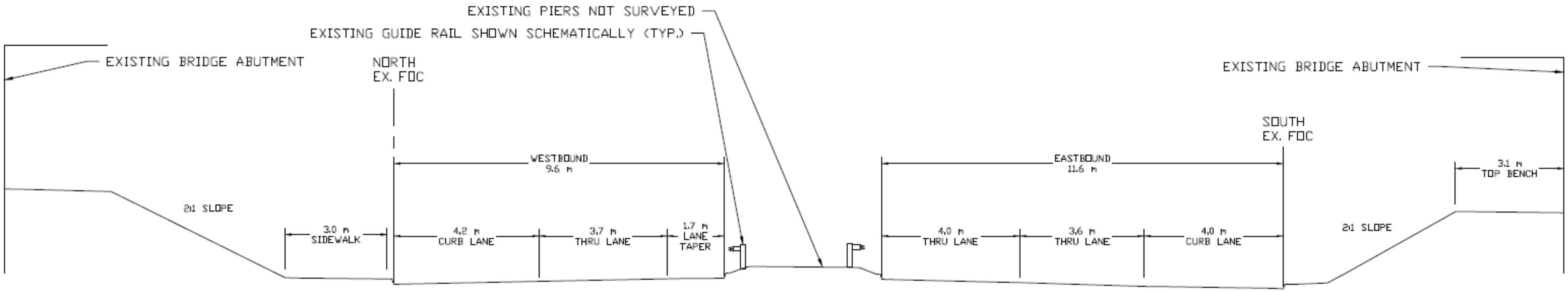
Location 1: Kingston Road (cont'd)

This intersection is not under MTO's jurisdiction, advised by MTO.

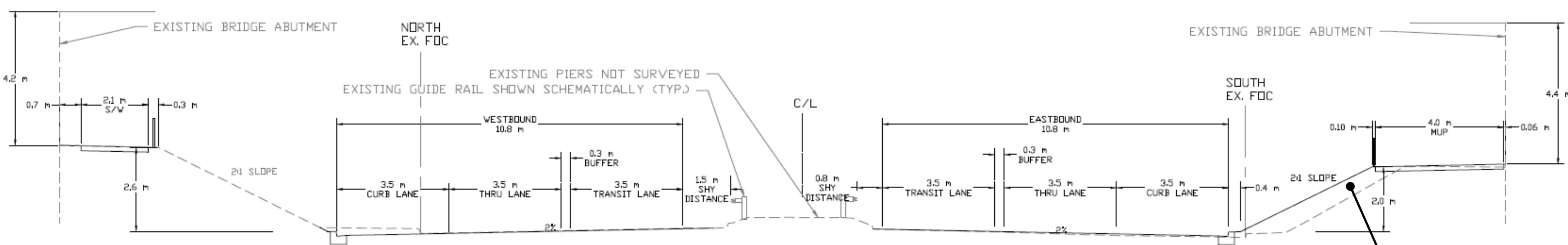


Typical Cross-sections

Kingston Road under Highway 401: EXISTING CONDITION



Kingston Road under Highway 401: PROPOSED CONDITION

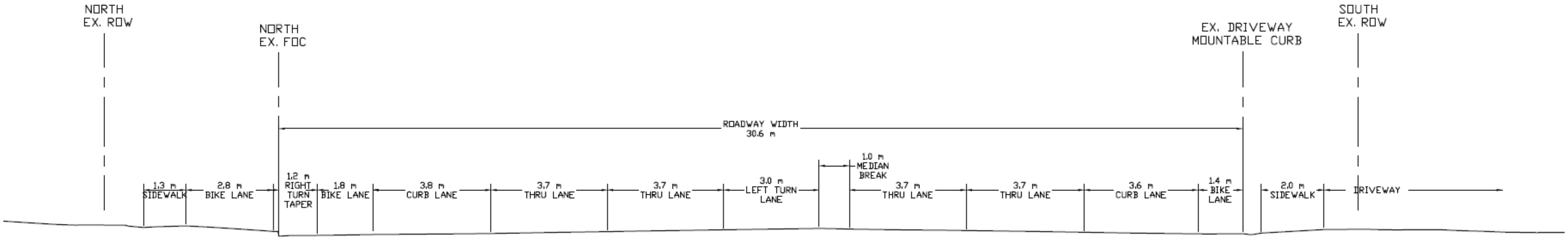


NOTE: No proposed changes to existing centre piers, guide rails (other than standard update) or shallow foundations.

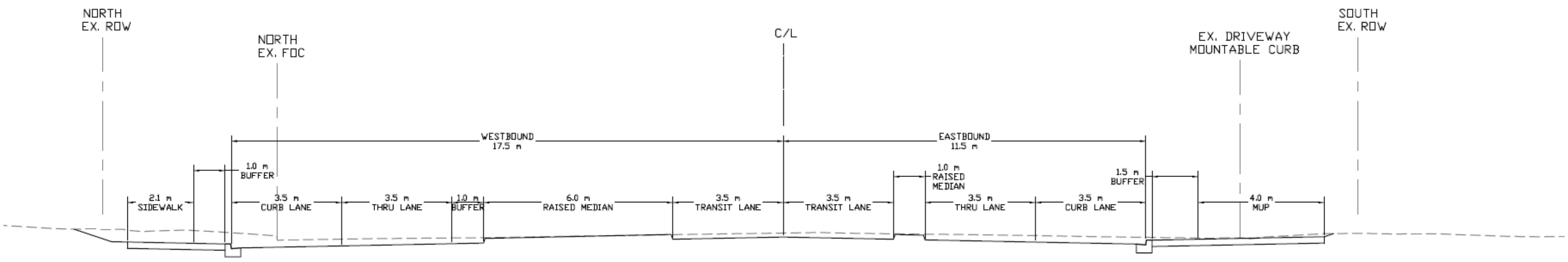
MTO concern of introduction of additional lateral and vertical lading to the existing foundation due to AT path & additional fill on the paved slope under review by Structural team.

Typical Cross-sections (cont'd)

Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: EXISTING CONDITION



Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: PROPOSED CONDITION



Design Criteria

Standards Table 1: Kingston Road (East of Ellesmere Road to Rylander Boulevard), City of Toronto

	Superelevation Maximum Rate for determining the Radius: 6%				
Design Year: 2041	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	80	80	70	80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	60	60	50	60	(Proposed Standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	142	130	105	148	(✓)
Crest: Minimum “K” factor for Stopping Sight Distance	30.5	26	17	33.3	(✓)
Sag: Minimum “K” factor for Stopping Sight Distance	41.5	12-16	10-12	35	Proposed Sag value is reduced to 35 from 41.5; however, it exceeds standards. Operational issues are not envisioned. (Proposed vertical profile is not being changed from existing; however, it is measuring less than previous design criteria.)
Grades Maximum (%)	3	6-8	6-8	2.68	(✓)
Radius Minimum (m)	Tangent	250	190	Tangent	(✓)
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80 km/h design speed. Proposed condition does not meet the requirement for 80 km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.
Shoulder Width (Left / Right) (m)	n/a	n/a	n/a	n/a	n/a
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Median Width (m)	5.6 - 7	2.0	2.0	2-6.24	(✓)
R.O.W. Width - nominal (m)	26.2 – 36.5			26.2 - 38.7	(Potential property acquisition at Kingston Road/Centennial Road.)

Design Criteria (cont'd)

Interchange Standards Table 1-1: Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	35	17	17	35	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	10	10-12	10-12	10	(✓)
Grades Maximum (%)	4.63	6-8	6-8	4.63	(✓)
Radius Minimum (m)	200	190	130	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2 x 3.75	3.75	3.75	2 x 3.75	(✓)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Design Criteria (cont'd)

Interchange Standards Table 1-2: Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation. (Will develop options for MTO review.)
Crest: Minimum "K" factor for Stopping Sight Distance	40	17	17	40	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	4.1	6-8	6-8	4.1	(✓)
Radius Minimum (m)	200	190	190	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 4.75	4.75	4.75	1 x 4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	?	n/a	n/a	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to present condition.
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Potential Exemptions

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed (km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.

Rationale:

- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Potential Exemptions (cont'd)

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops.

Present Conditions Substandard But Improved

Highway 401 @ Kingston Road - W-N/S OFF RAMP

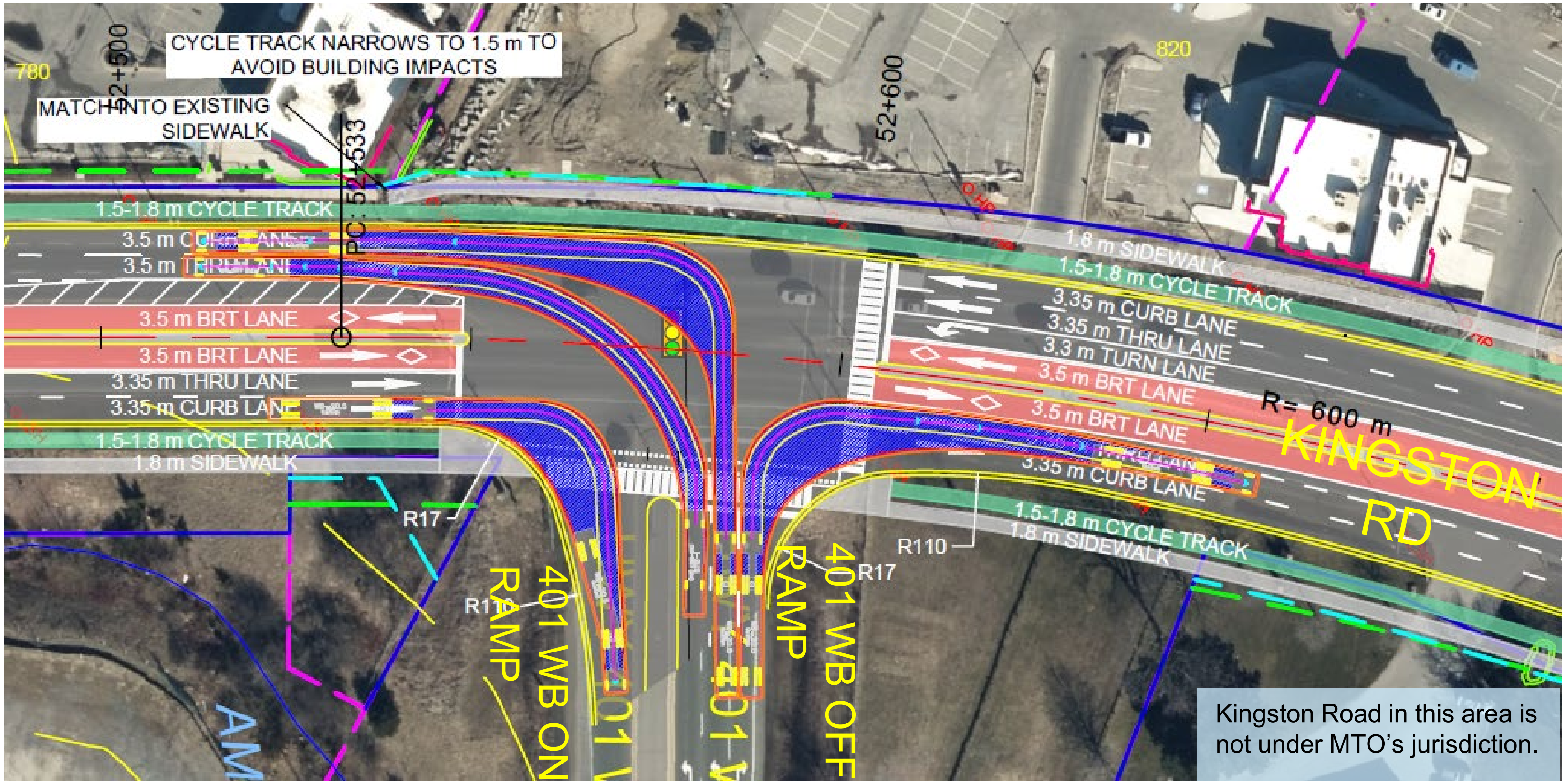
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.

Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation. (Will develop options for MTO review.)

Location 2: Highway 401 On/Off Ramps

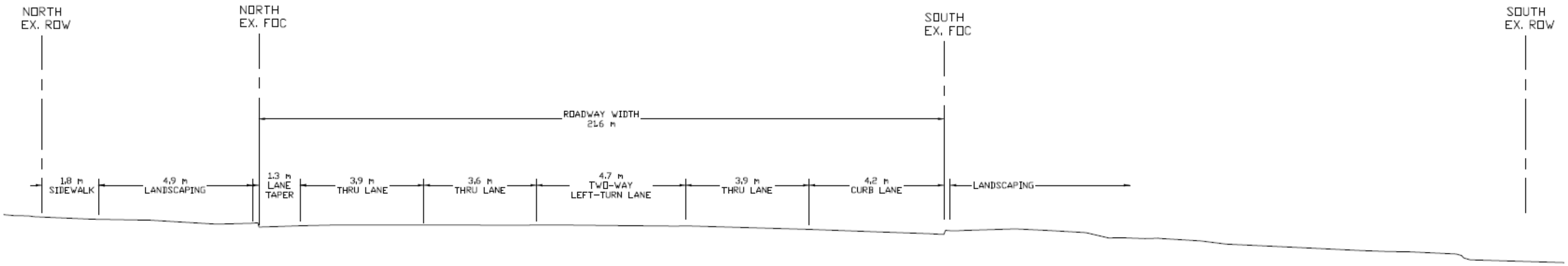
- at Kingston Road east of Whites Road in Town of Pickering



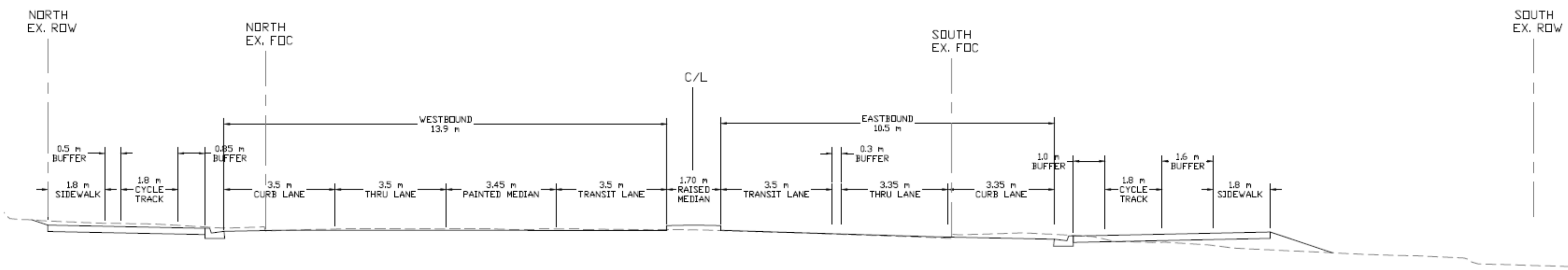
Kingston Road in this area is not under MTO's jurisdiction.

Typical Cross-sections

Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: EXISTING CONDITION



Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: PROPOSED CONDITION



Design Criteria

Interchange Standards Table 2-1: Highway 401 @ Kingston Road - N/S-W ON RAMP east of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum “K” factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum “K” factor for Stopping Sight Distance	25	10-12	10-12	25	(✓)
Grades Maximum (%)	2.56	6-8	6-8	2.56	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	median / 2.50	1.0 / 2.5	1.0 / 2.5	median / 2.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Design Criteria (cont'd)

Interchange Standards Table 2-2: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	45	10-12	10-12	45	(✓)
Grades Maximum (%)	2.6	6-8	6-8	2.6	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Shoulder Width (Left / Right) (m)	n/a / 2.5	1.0 / 2.5	1.0 / 2.5	n/a / 2.5	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Present Conditions Substandard But Improved

Highway 401 @ Kingston Road - N/S-W ON RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

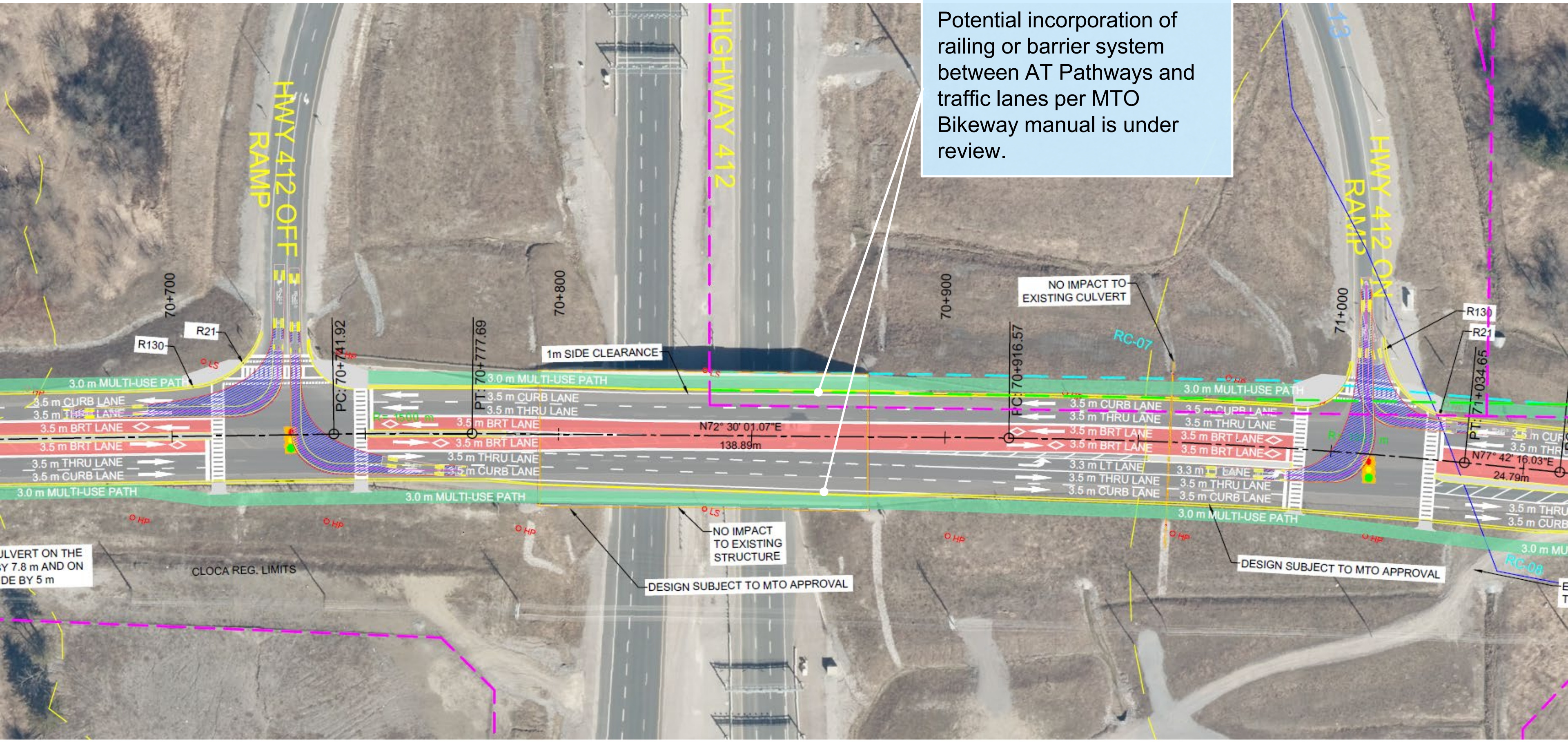
Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Location 3: Dundas Street West

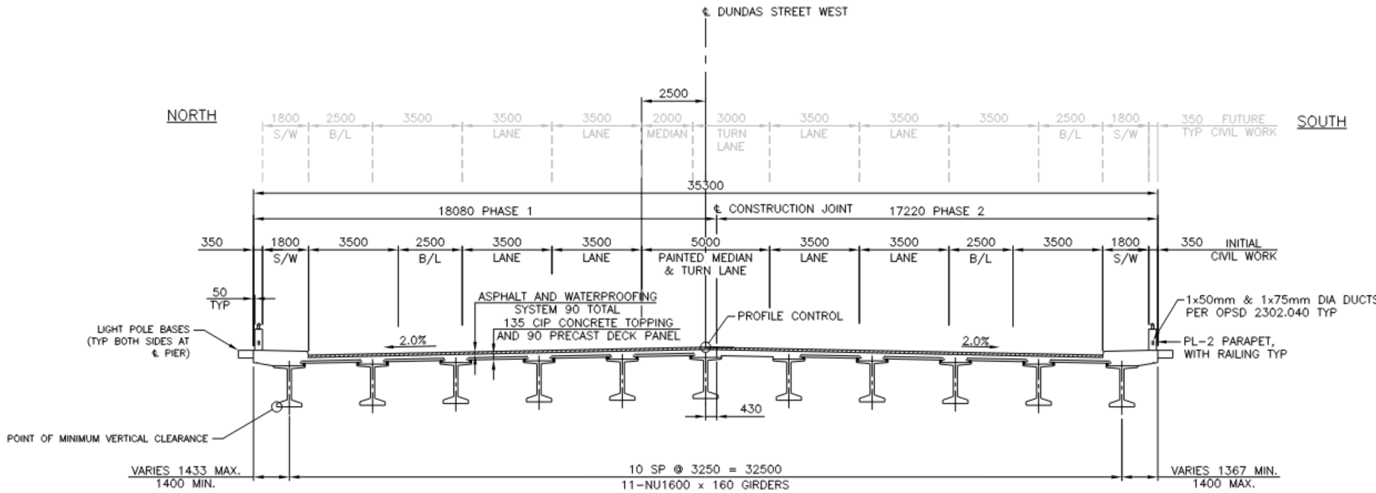
- From Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby

Potential incorporation of railing or barrier system between AT Pathways and traffic lanes per MTO Bikeway manual is under review.



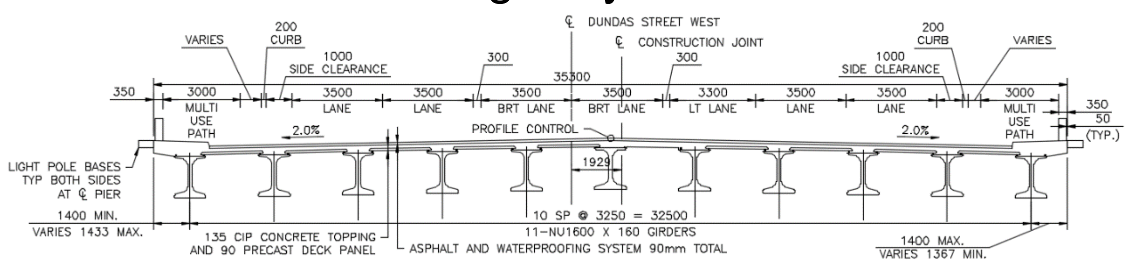
Typical Cross-sections

Dundas Street West at Highway 412: EXISTING CONDITION



Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Dundas Street West at Highway 412: PROPOSED DESIGN



Design Criteria

Standards Table 2: Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

Design Year: 2041	Superelevation Maximum Rate for Determining the Radius:			6 %	
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Crest: Minimum "K" factor for Stopping Sight Distance	50	39	26	44.87	Present condition will not be changed. Detailed survey to be obtained during detailed design. The proposed are not intended to change the present condition value. (Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	n/a	6-8	6-8	2.35	(✓)
Radius Minimum (m)	5000	340	250	1300	Alignment is being fitted to existing conditions. No significant changes are anticipated.
Lane Widths (m)	4x3.5 Thru Lane 1x3.5 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90 km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.
Shoulder Width (Left / Right) (m)	5.6	1.0	1.0	1.0	(Existing shoulders were built to ultimate condition.) Proposed shoulder meets standard.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	
Median Width (m)	1.5 - 5	2.0	2.0	0 – 1.7	(Raised concrete medians terminate at the approaches of the bridge. In order to minimize impacts to the Highway 412 bridge structure a median is not proposed.)
R.O.W. Width – nominal (m)	55.43 – 59.16			55.43 – 65.23	

Design Criteria (cont’d)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	>200	200	178	>200	(✓)
Crest: Minimum “K” factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum “K” factor for Stopping Sight Distance	40	12-16	12-16	40	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2x3.75	2x3.7	2x3.7	2x3.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Design Criteria (cont'd)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	30	12-16	12-16	30	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Potential Exemptions

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Present Conditions Substandard But Improved

Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

Design Year: 2041	Superelevation Maximum Rate for Determining the Radius: 6 %				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)

Present Conditions Substandard But Improved (cont'd)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).

Next Steps

- Discuss design criteria and any potential design exemptions
- Present project to MTO Senior Management
- Address agency comments on draft Environmental Project Report (EPR)
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI

PARSONS

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Preliminary Design Criteria

IBI

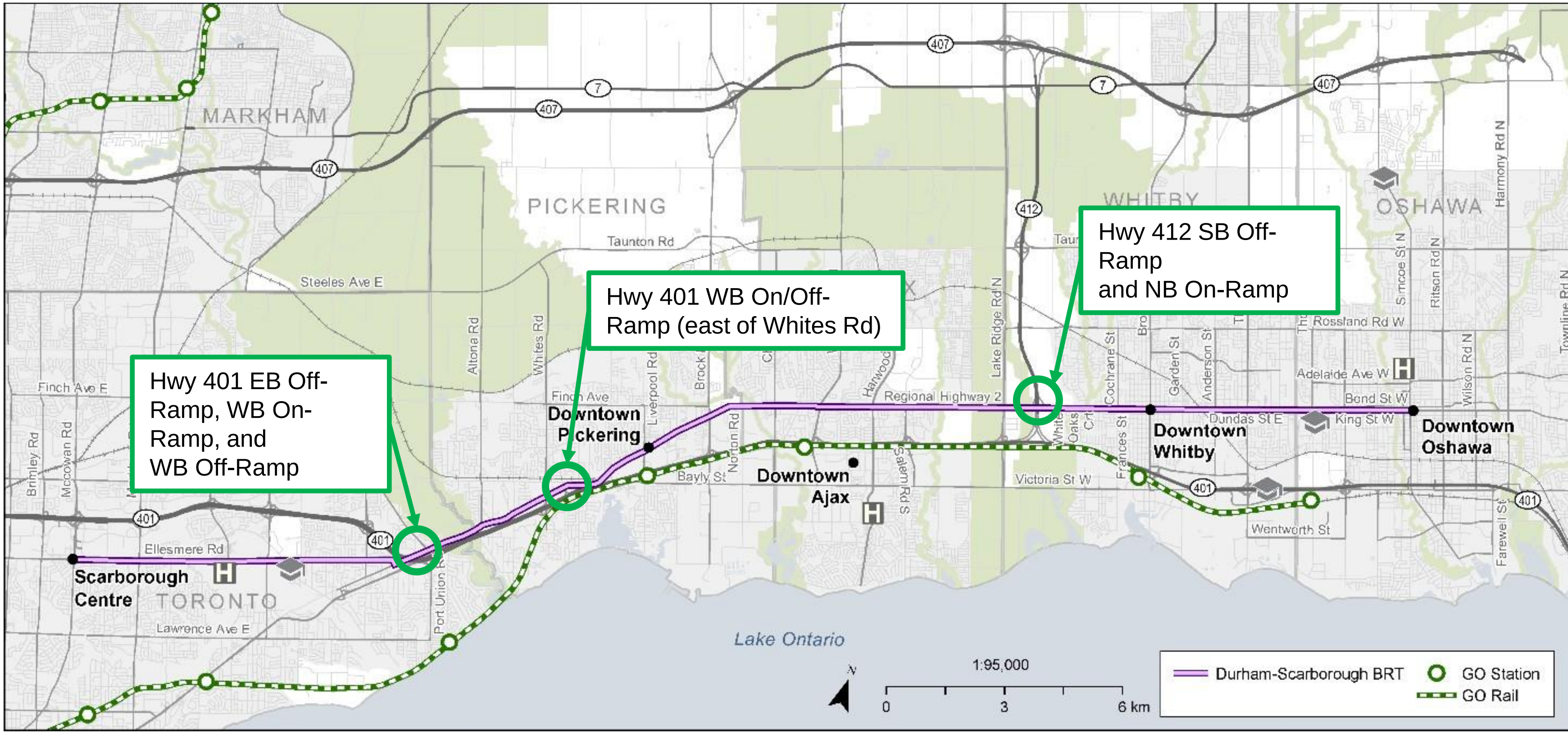
PARSONS

December 7, 2021

Agenda

1. Study Area
2. Draft Preliminary Design Criteria
    1. Kingston Road at Highway 401
    2. Highway 401 On/Off Ramps (east of Whites Road)
    3. Dundas Street West at Highway 412
3. Potential Exemptions
4. Existing Substandard but Improved Criteria
5. Next Steps

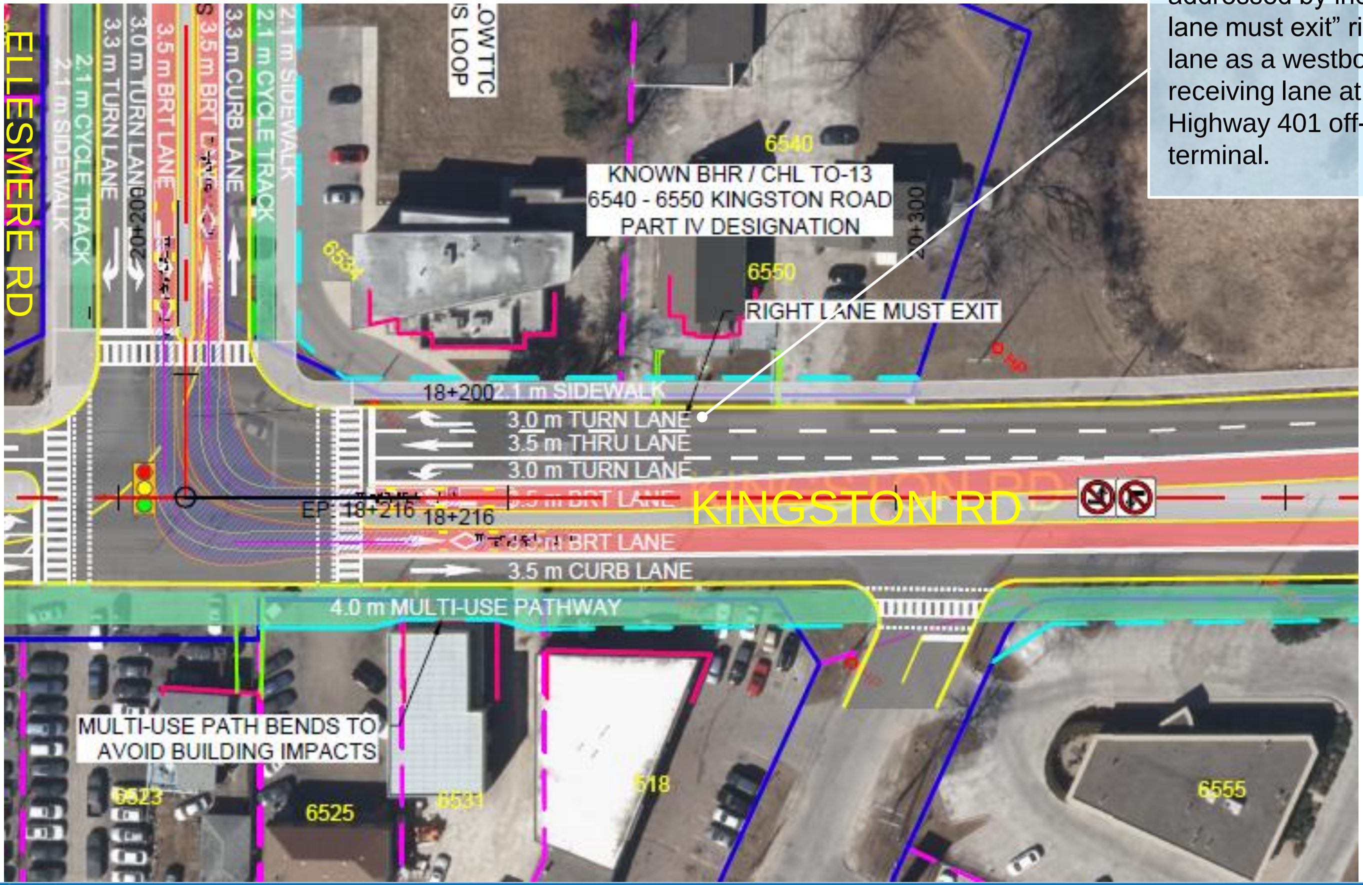
Study Area


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp (east of Whites Rd)
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
Taunton Rd
Steeles Ave E
Finch Ave E
Finch Ave
Ellesmere Rd
Lawrence Ave E
Regional Highway 2
Bayly St
Victoria St W
Wentworth St
Rossland Rd W
Adelaide Ave W
Bond St W
King St W
Dundas St E
Brimley Rd
Mccowan Rd
Port Union Rd
Altona Rd
Whites Rd
Liverpool Rd
Brock Rd
Harwood
Norton Rd
Salem Rd S
Lake Ridge Rd N
Cochrane St
Frances St
Garden St
Anderson St
Simcoe St N
Ritson Rd N
Wilson Rd N
Harmony Rd N
Townline Rd N
Farewell St
407
401
412
7
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

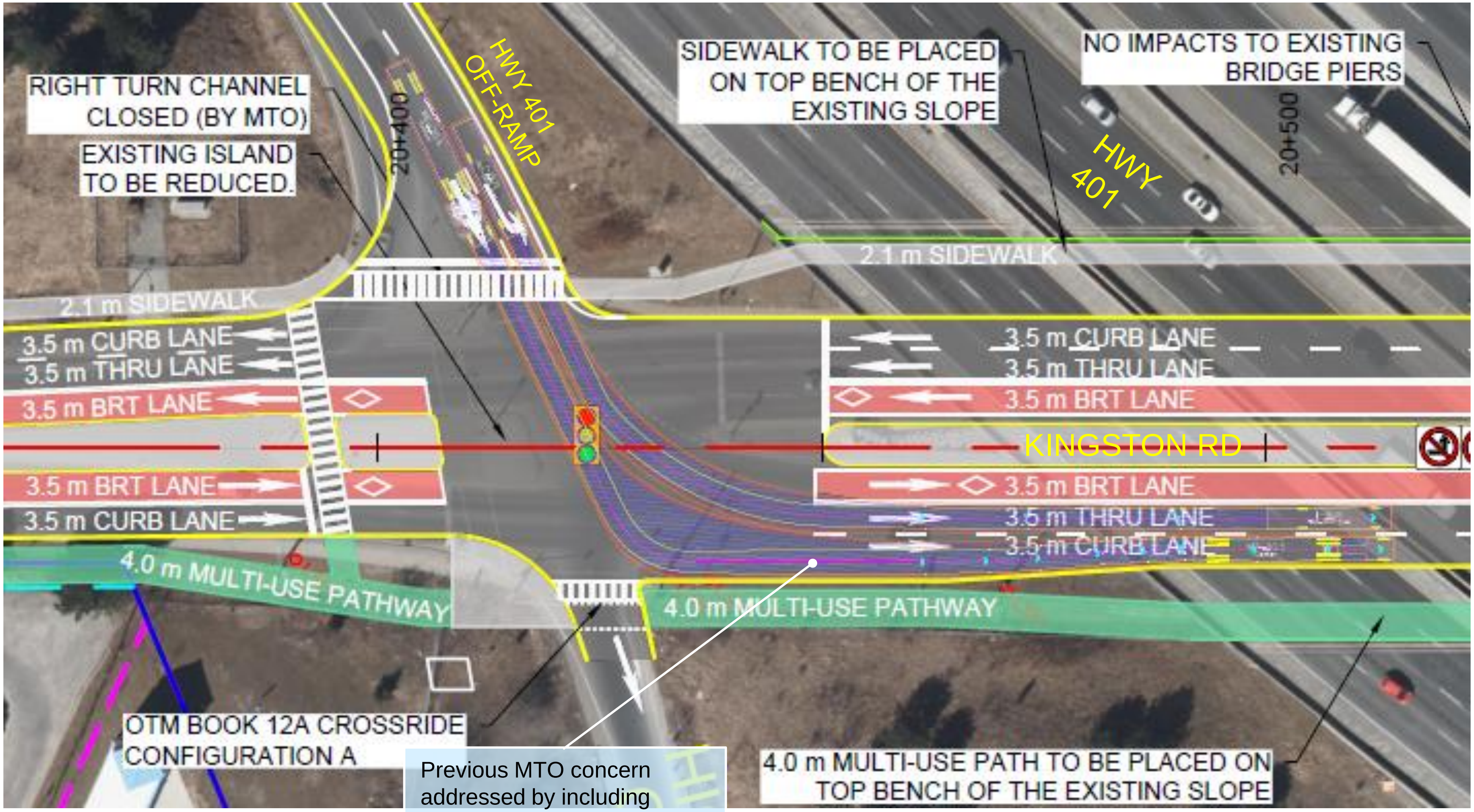
Location 1: Kingston Road

- Kingston Road from east of Ellesmere Road to Rylander Boulevard
- Highway 401 E-N/S off ramp at Kingston Road, east of Sheppard Avenue/Port Union Road, in City of Toronto

Previous MTO concern addressed by including "right lane must exit" right turn lane as a westbound receiving lane at the Highway 401 off-ramp terminal.



Location 1: Kingston Road (cont'd)



Previous MTO concern addressed by including additional pavement width to accommodate simultaneous dual left turning movement for design vehicles of WB-20.5 and I-BUS.

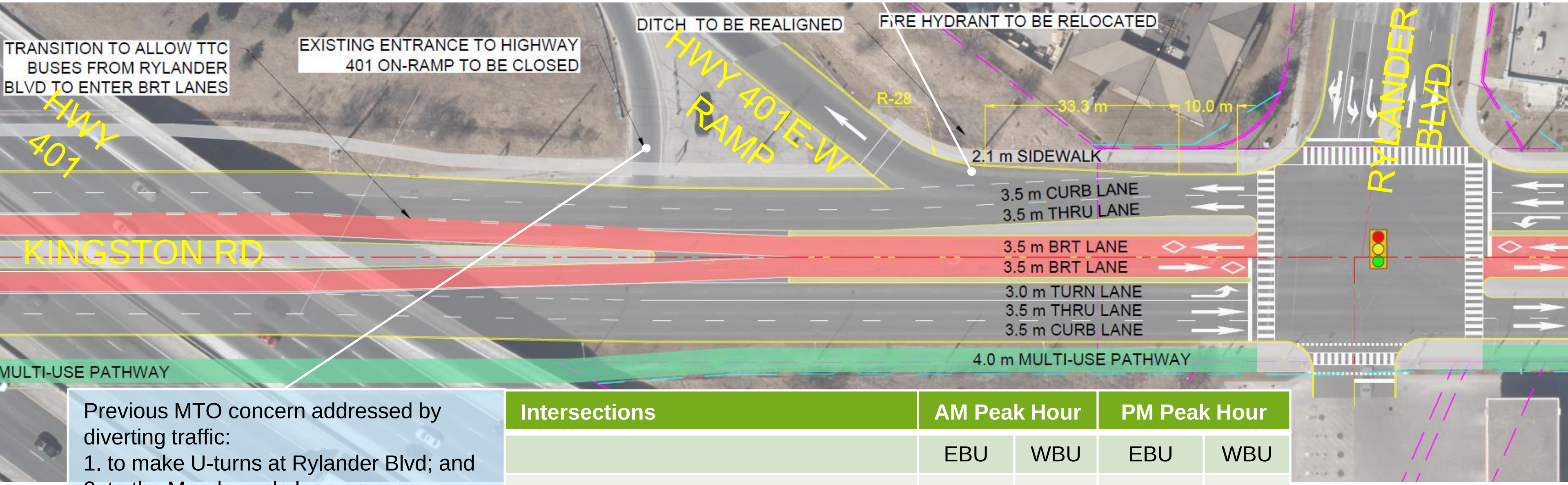
Location 1: Kingston Road (cont'd)

Year	AM Peak	PM Peak
2019	620 vph	260 vph
2041	868 vph	364 vph

DS existing 80 km/h (70 km/h) for Kingston Road

DS existing 70 km/h (60 km/h) for Hwy 401 E-W Ramp

Length of taper achieved - 33.3 m; standard required 70 m (60 m) for 70 km/h (60 km/h) DS



Previous MTO concern addressed by diverting traffic:
1. to make U-turns at Rylander Blvd; and
2. to the Meadowvale loop on-ramp.

Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

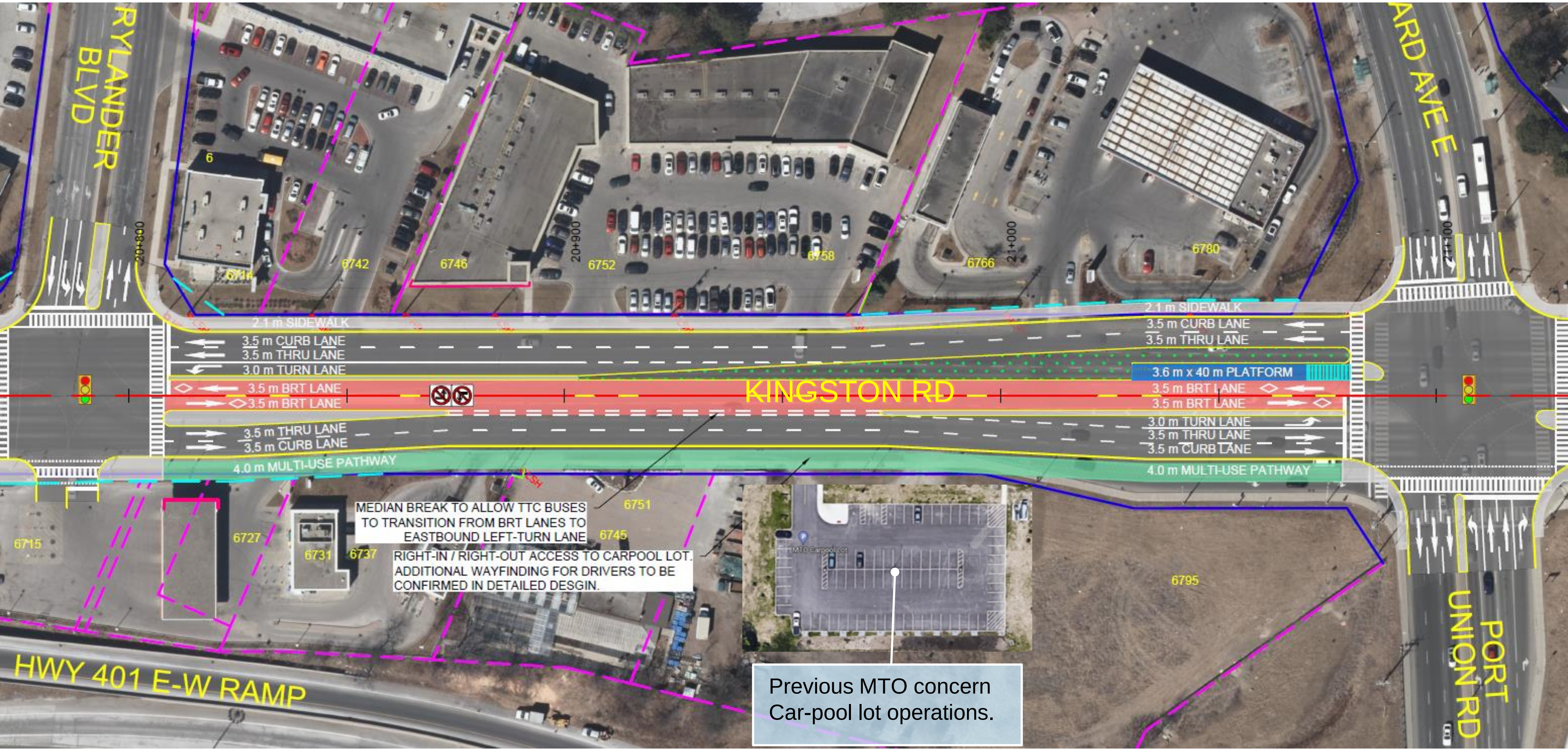
Excerpt from *Exhibit 6-6 of DSBRT Traffic Impact Analysis*

Location 1: Kingston Road (cont'd)

- EB traffic can access Hwy 401 WB via Meadowvale Road.
- Minimal inconvenience for drivers given the alternate routing is similar length
  - Start to Finish is 2 to 2.5 km
- Existing hourly volume using NB Meadowvale to Highway 401 WB ramps peaks at 190 vehicles at 12:00 p.m.
- Maximum demand of ~ 430 vph (190 + 240) at NB Meadowvale loop on-ramp can be accommodated.

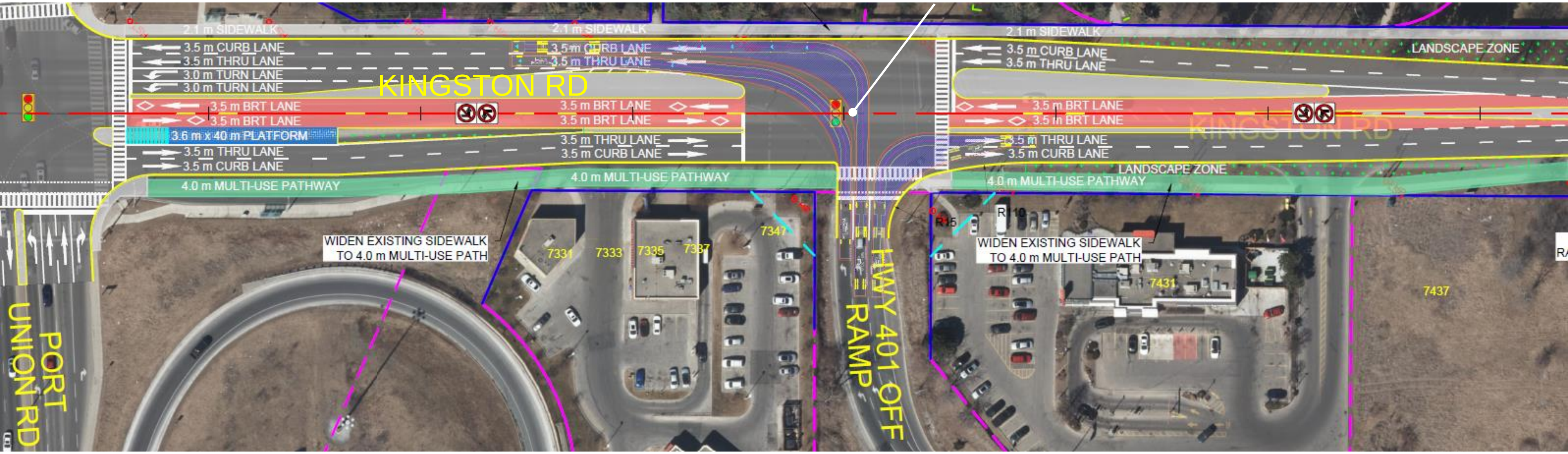
Year	AM Peak	PM Peak
2019	30 vph	240 vph
2041	43 vph	345 vph

Location 1: Kingston Road (cont'd)



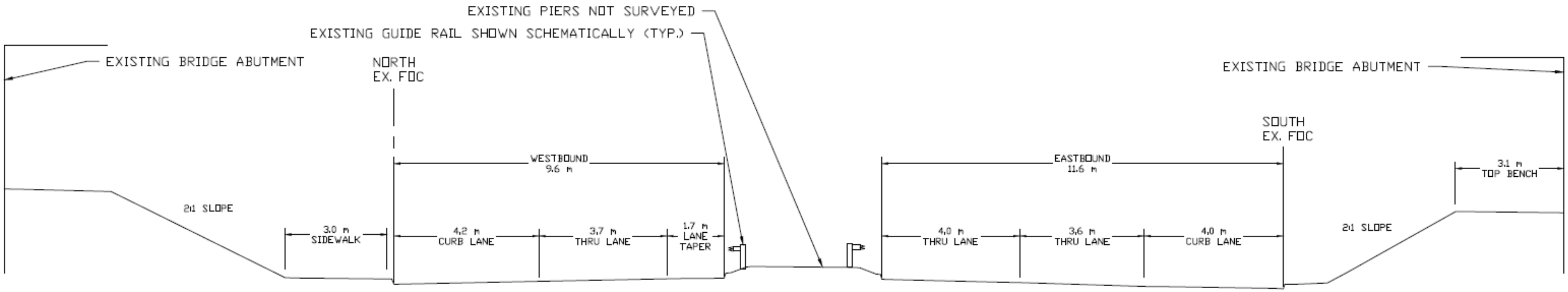
Location 1: Kingston Road (cont'd)

This intersection is not under MTO's jurisdiction, advised by MTO.

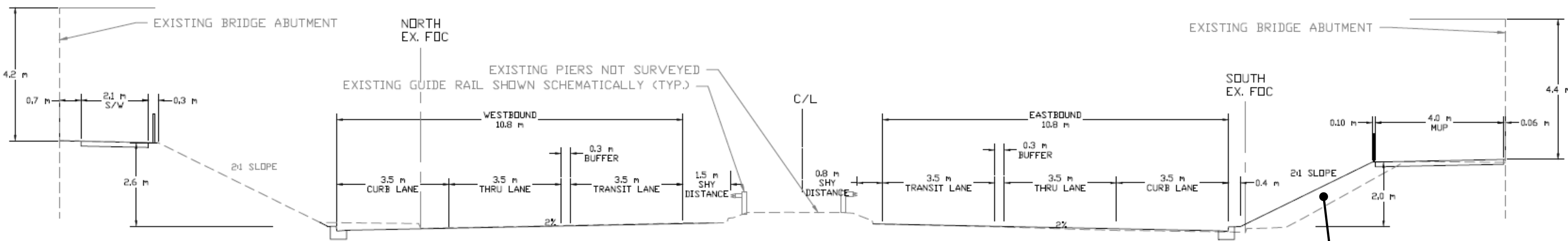


Typical Cross-sections

Kingston Road under Highway 401: EXISTING CONDITION



Kingston Road under Highway 401: PROPOSED CONDITION

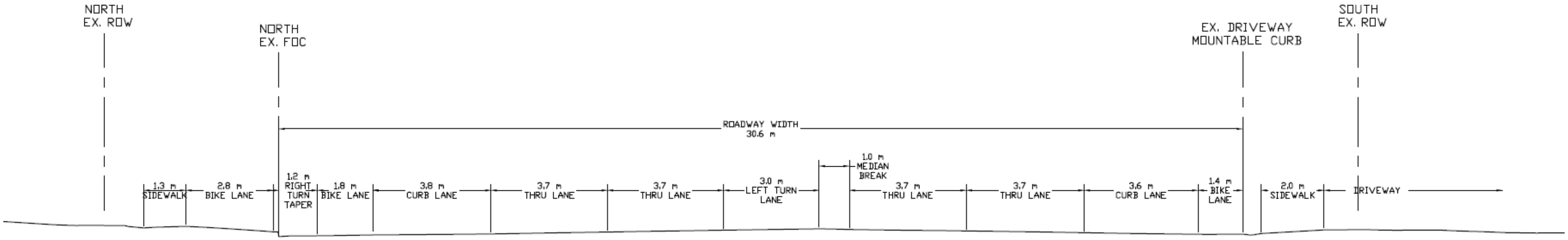


NOTE: No proposed changes to existing centre piers, guide rails (other than standard update) or shallow foundations.

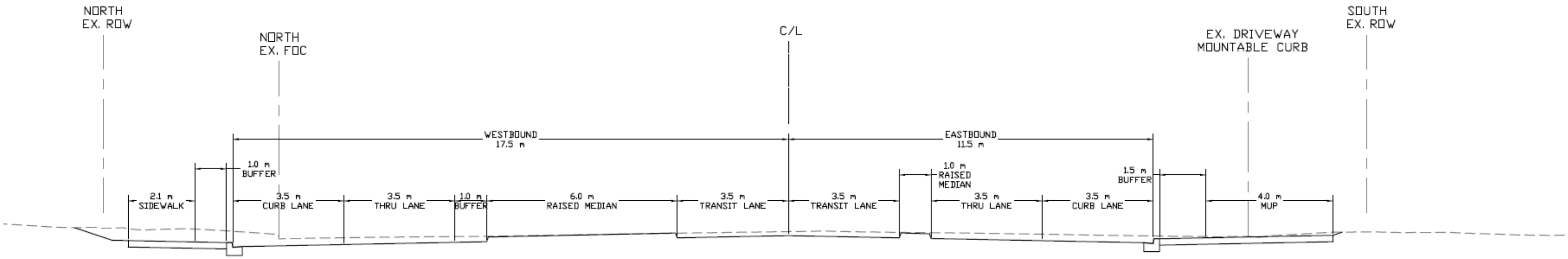
MTO concern of introduction of additional lateral and vertical loading to the existing foundation due to AT path & additional fill on the paved slope:
A detailed foundation assessment during detail design.

Typical Cross-sections (cont’d)

Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: EXISTING CONDITION



Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: PROPOSED CONDITION



Operational Performance

Kingston Road (West of Ellesmere Road to East of Sheppard Avenue/Port Union Road)		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	41,445	44,945
Summer Average Daily Traffic (SADT)	45,980	49,863
Design Hourly Volume (DHV)	PM WB / EB = 842 / 1653	PM WB / EB = 983 / 1934
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1254 / 621 PM WB / EB = 842 / 1653	AM WB / EB = 1475 / 765 PM WB / EB = 983 / 1934
% commercial vehicles	3%	3%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 1: Kingston Road (East of Ellesmere Road to Rylander Boulevard), City of Toronto

Design Year: 2041	Superelevation Maximum Rate for determining the Radius: 6%				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	80	80	70	80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	60	60	50	60	(Proposed Standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	142	130	105	148	(✓)
Crest: Minimum “K” factor for Stopping Sight Distance	30.5	26	17	33.3	(✓)
Sag: Minimum “K” factor for Stopping Sight Distance	41.5	12-16	10-12	35	Proposed Sag value is reduced to 35 from 41.5; however, it exceeds standards. Operational issues are not envisioned. (Proposed vertical profile is not being changed from existing; however, it is measuring less than previous design criteria.)
Grades Maximum (%)	3	6-8	6-8	2.68	(✓)
Radius Minimum (m)	Tangent	250	190	Tangent	(✓)
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80 km/h design speed. Proposed condition does not meet the requirement for 80 km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.
Shoulder Width (Left / Right) (m)	n/a	n/a	n/a	n/a	n/a
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Median Width (m)	5.6 - 7	2.0	2.0	2-6.24	(✓)
R.O.W. Width - nominal (m)	26.2 – 36.5			26.2 - 38.7	(Potential property acquisition at Kingston Road/Centennial Road.)

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-1: Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	35	17	17	35	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	10	10-12	10-12	10	(✓)
Grades Maximum (%)	4.63	6-8	6-8	4.63	(✓)
Radius Minimum (m)	200	190	130	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2 x 3.75	3.75	3.75	2 x 3.75	(✓)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-2: Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation
Crest: Minimum "K" factor for Stopping Sight Distance	40	17	17	40	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	4.1	6-8	6-8	4.1	(✓)
Radius Minimum (m)	200	190	190	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 4.75	4.75	4.75	1 x 4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	?	n/a	n/a	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to present condition.
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-3: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum "K" factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Sag: Minimum "K" factor for Stopping Sight Distance	12	10-12	10-12	12	(✓)
Grades Maximum (%)	6.3	6-8	6-8	6.3	(✓)
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	3.75	3.75	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	(✓)
Shoulder Width (Left / Right) (m)	1.00 / 3.50	1.0 / 2.5	1.0 / 2.5	1.00 / 3.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed(km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Present Conditions Substandard But Improved Criteria

Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.

Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation. (Will develop options for MTO review.)

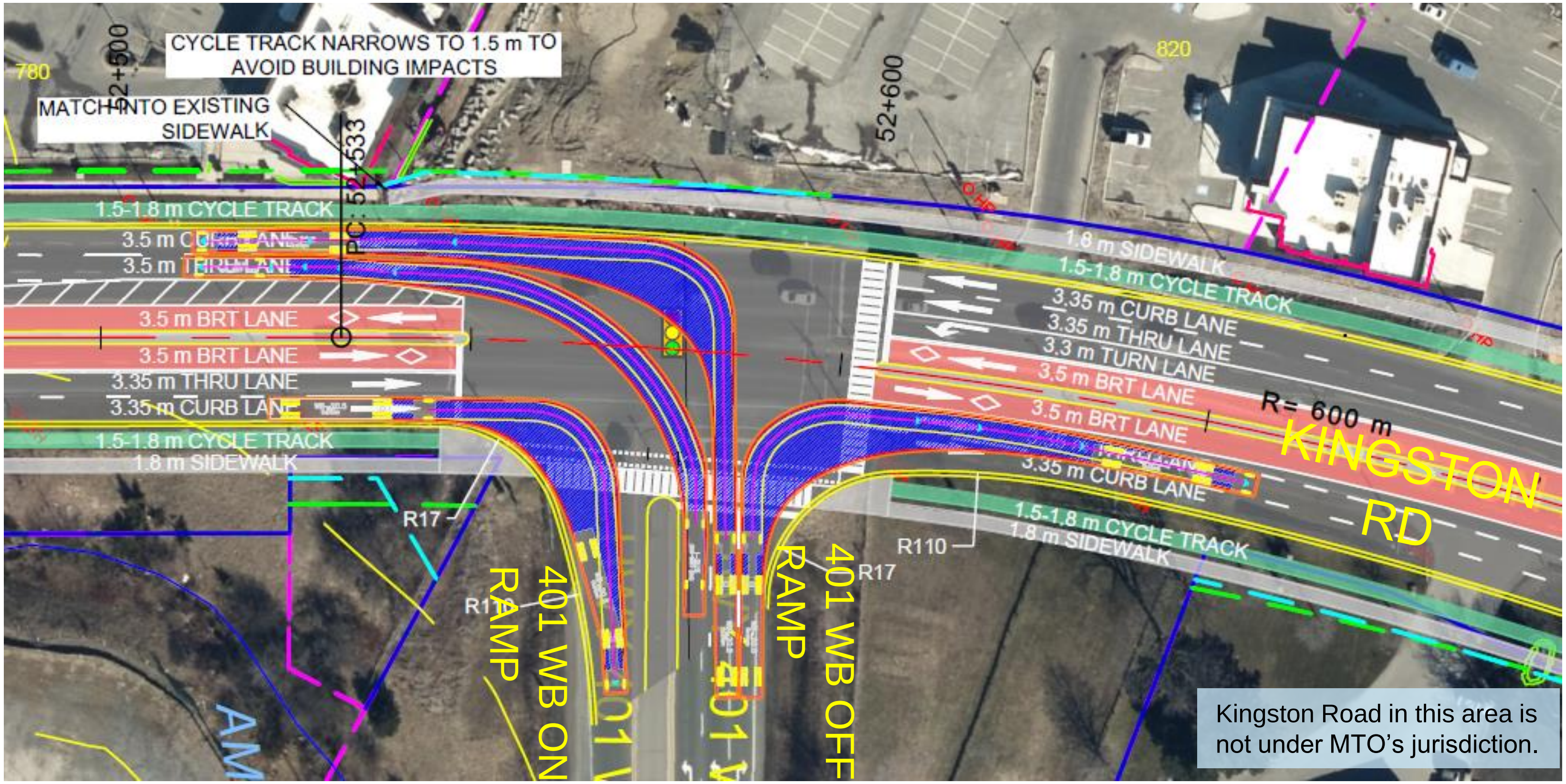
Present Conditions Substandard But Improved Criteria

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum “K” factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

Location 2: Highway 401 On/Off Ramps

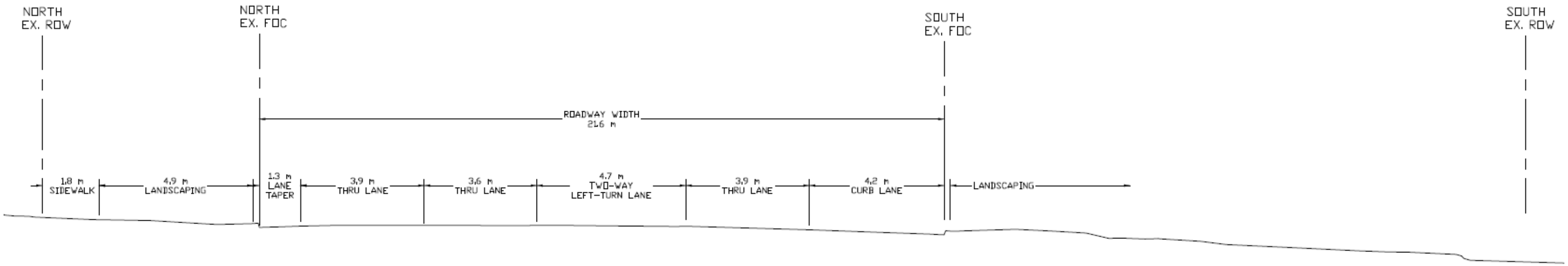
- at Kingston Road east of Whites Road in Town of Pickering



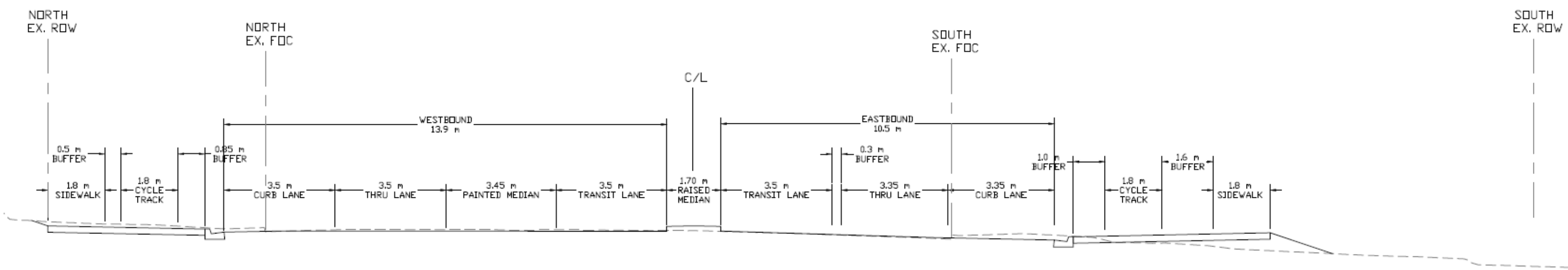
Kingston Road in this area is not under MTO's jurisdiction.

Typical Cross-sections

Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: EXISTING CONDITION



Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: PROPOSED CONDITION



Operational Performance

Kingston Road at Highway 401 On/Off Ramps East of Whites Road		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	20,998	26,198
Summer Average Daily Traffic (SADT)	23,296	29,065
Design Hourly Volume (DHV)	PM WB / EB = 982 / 1537	PM WB / EB = 1145 / 1707
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1043 / 746 PM WB / EB = 982 / 1537	AM WB / EB = 1290 / 869 PM WB / EB = 1145 / 1707
% commercial vehicles	1.6%	1.6%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Interchange Standards Table 2-1: Highway 401 @ Kingston Road - N/S-W ON RAMP east of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	25	10-12	10-12	25	(✓)
Grades Maximum (%)	2.56	6-8	6-8	2.56	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	median / 2.50	1.0 / 2.5	1.0 / 2.5	median / 2.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 2-2: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	45	10-12	10-12	45	(✓)
Grades Maximum (%)	2.6	6-8	6-8	2.6	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Shoulder Width (Left / Right) (m)	n/a / 2.5	1.0 / 2.5	1.0 / 2.5	n/a / 2.5	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Present Conditions Substandard But Improved Criteria

Highway 401 @ Kingston Road - N/S-W ON RAMP East of Whites Road

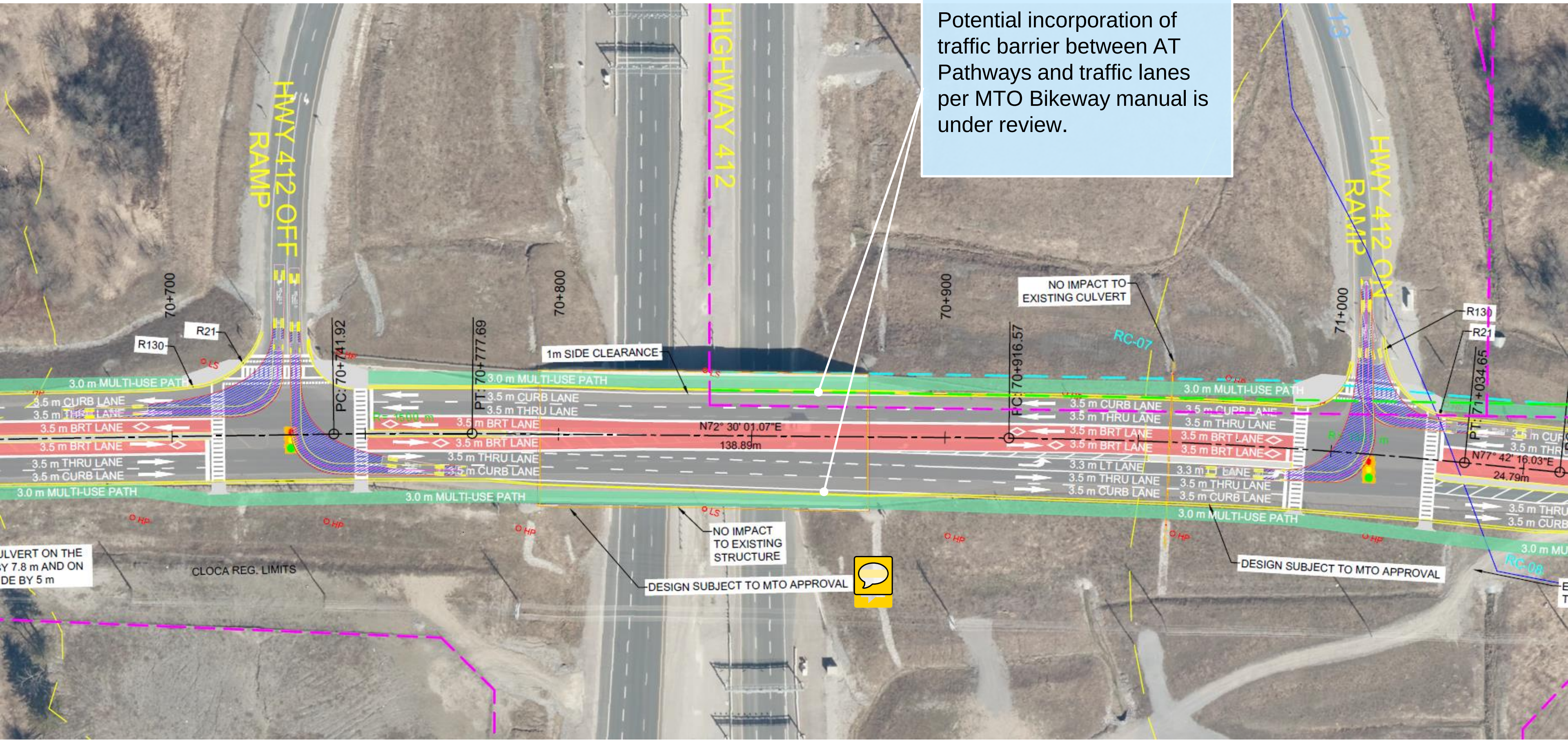
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

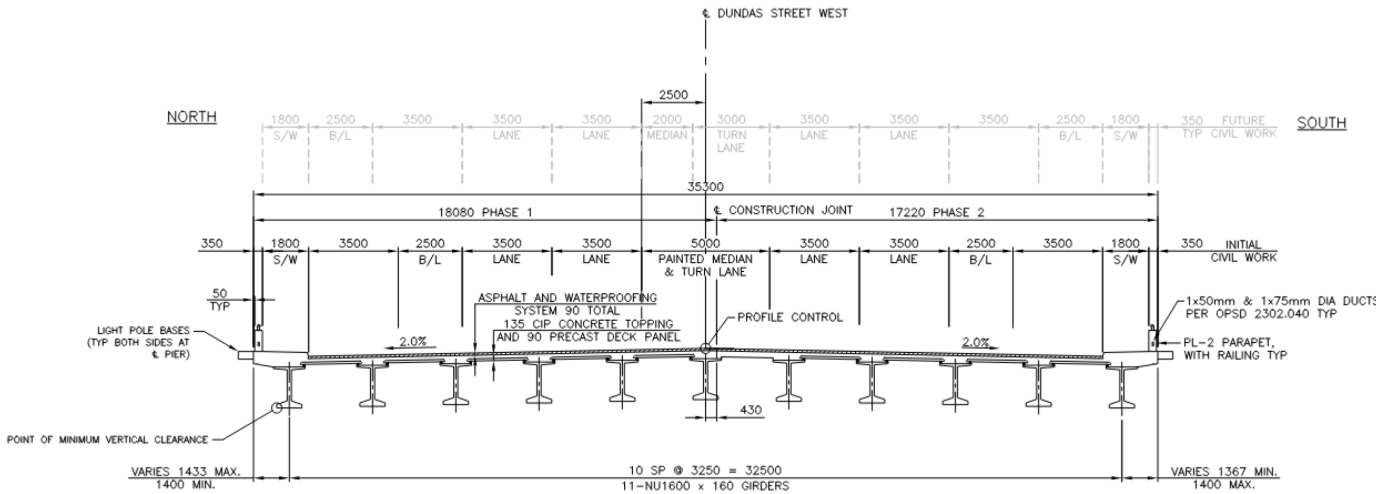
Location 3: Dundas Street West

- From Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby



Typical Cross-sections

Dundas Street West at Highway 412: EXISTING CONDITION



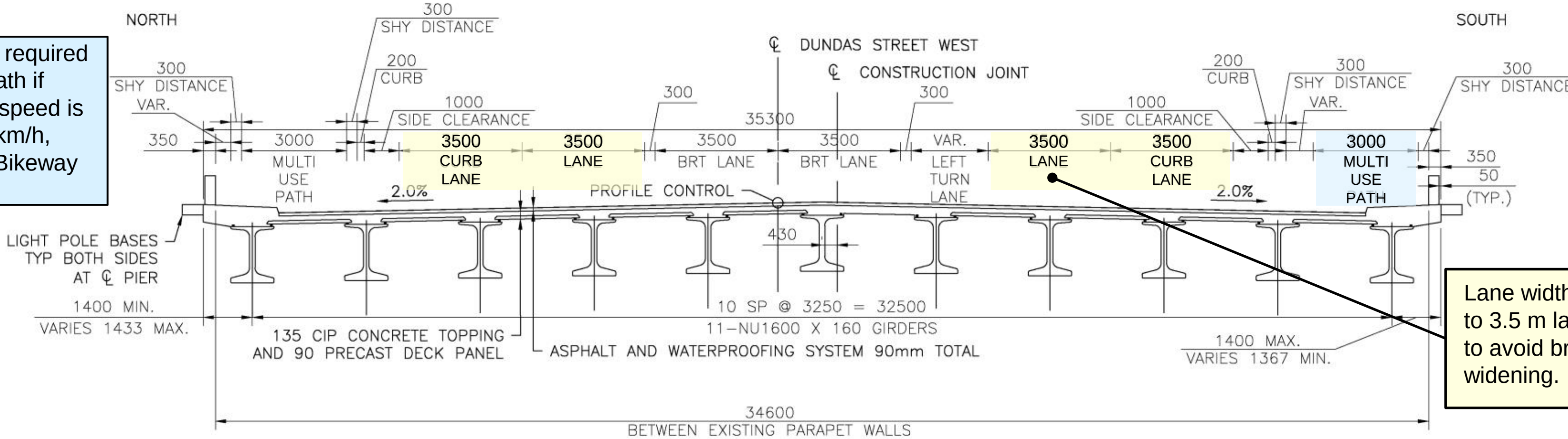
Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Typical Cross-sections

Dundas Street West at Highway 412: PROPOSED DESIGN Option 1

3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers

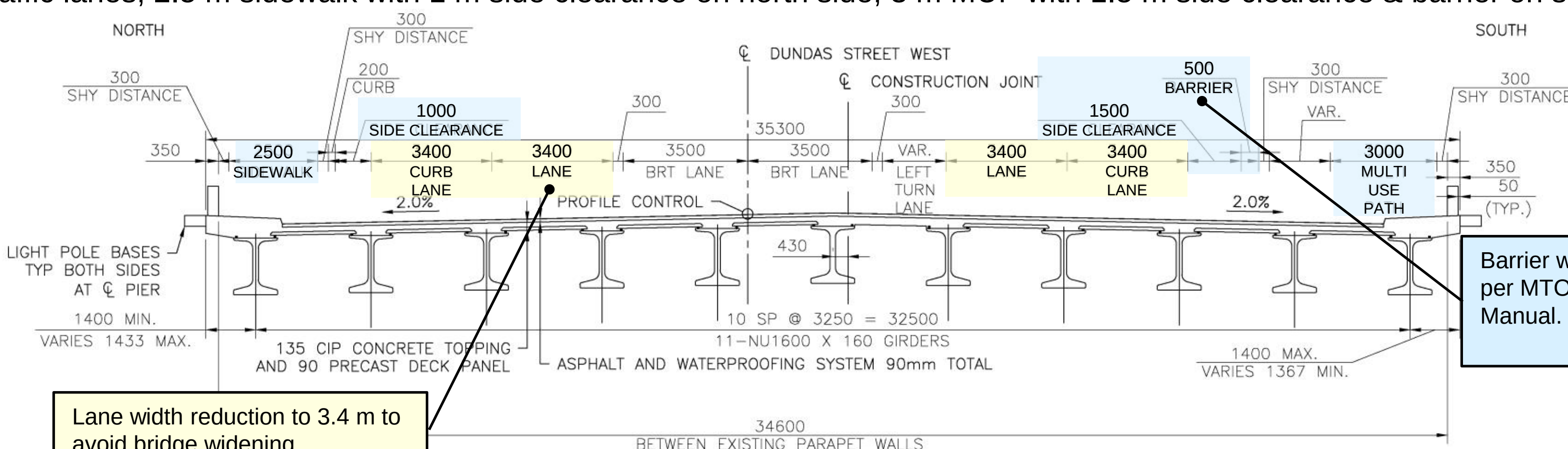
No barrier required with AT Path if operating speed is below 80 km/h, per MTO Bikeway Manual.



Lane width reduction to 3.5 m lane width to avoid bridge widening.

Dundas Street West at Highway 412: PROPOSED DESIGN Option 2

3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side



Barrier with AT Path, per MTO Bikeway Manual.

Lane width reduction to 3.4 m to avoid bridge widening.

Operational Performance

Dundas Street West at Highway 412		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	27,849	31,349
Summer Average Daily Traffic (SADT)	30,896	34,779
Design Hourly Volume (DHV)	PM WB / EB = 785 / 1693	PM WB / EB = 975 / 1810
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1467 / 510 PM WB / EB = 785 / 1693	AM WB / EB = 1632 / 700 PM WB / EB = 975 / 1810
% commercial vehicles	1.7%	1.7%

Intersection	**Existing (2019) LOS**		**Future (2041) Background LOS**		**Future (2041) With-BRT LOS**	
	AM	PM	AM	PM	AM	PM
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 2: Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

Design Year: 2041	Superelevation Maximum Rate for Determining the Radius: 6 %				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Crest: Minimum “K” factor for Stopping Sight Distance	50	39	26	44.87	Present condition will not be changed. Detailed survey to be obtained during detailed design. The proposed are not intended to change the present condition value. (Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Sag: Minimum “K” factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	n/a	6-8	6-8	2.35	(✓)
Radius Minimum (m)	5000	340	250	1300	Alignment is being fitted to existing conditions. No significant changes are anticipated.
Lane Widths (m)	4x3.5 Thru Lane 1x3.5 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90 km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.
Shoulder Width (Left / Right) (m)	5.6	1.0	1.0	1.0	(Existing shoulders were built to ultimate condition.) Proposed shoulder meets standard.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	
Median Width (m)	1.5 - 5	2.0	2.0	0 – 1.7	(Raised concrete medians terminate at the approaches of the bridge. In order to minimize impacts to the Highway 412 bridge structure a median is not proposed.)
R.O.W. Width – nominal (m)	55.43 – 59.16			55.43 – 65.23	

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	>200	200	178	>200	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	40	12-16	12-16	40	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2x3.75	2x3.7	2x3.7	2x3.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 3-2: Highway 412 @ Dundas Street West – E/W-N ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	30	12-16	12-16	30	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

2. Reduction in design speed from 90 to 80 km/h on Dundas St West

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Potential Exemptions (cont'd)

To avoid Highway 412 Bridge widening, two options are considered. **[NTD: Design recommendation to be made prior to MTO Senior Management Meeting]**

Option 1 - 3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers

- **Potential Exemption**:
  - Reduction in design speed from 90 km/h to 80 km/h, i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- **Rationale**:
  - Spatial constraints of bridge cross section.
  - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Option 2 - 3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side

- **Potential Exemption**:
  - Lane width reduction from 3.75 m to 3.4 m
- **Rationale**:
  - Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
  - Spatial constraints of bridge cross section.
  - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Present Conditions Substandard But Improved Criteria

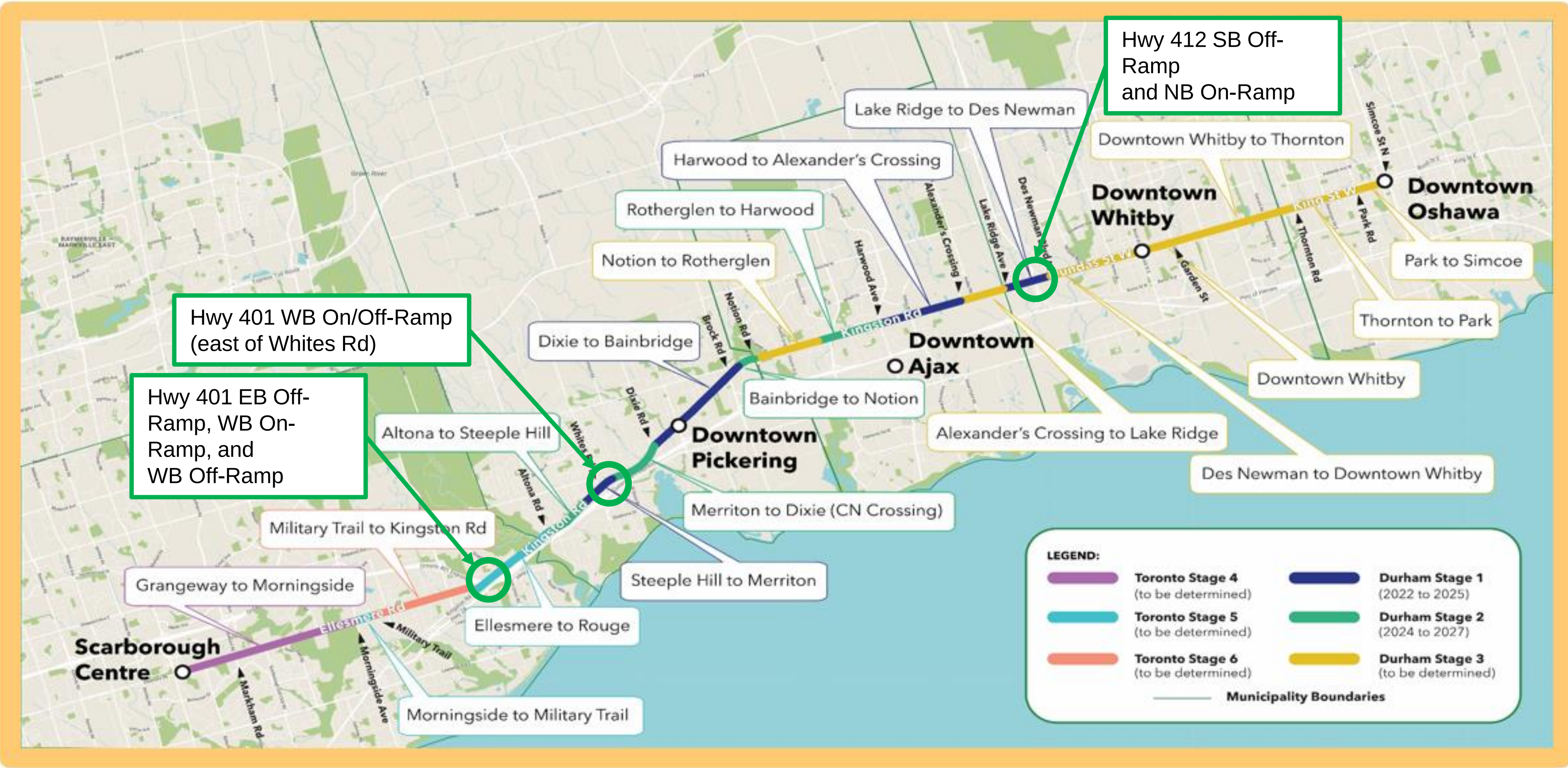
Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).

Draft Implementation Strategy



Exemption Summary

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**

    - To facilitate the introduction of BRT, traffic lane width of 3.5 m is proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary (cont'd)

2. **Reduction in design speed from 90 to 80 km/h on Dundas St West**

    - Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary (cont'd)

[NTD: Design recommendation to be made prior to MTO Senior Management Meeting]

3.1. Reduction in design speed from 90 to 80 km/h on Dundas St West

- i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- To avoid Highway 412 Bridge widening, Option 1 (3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers) is proposed.

Rationale:

- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

3.2. Reduction in lane width from 3.75 m to 3.4 m on Dundas St West

- To avoid Highway 412 Bridge widening, Option 2 (3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Next Steps

- Address concerns, if any, from MTO Senior Management
- Receive MTO endorsement
- Address agency comments on draft Environmental Project Report (EPR)
- Post EPR on public record for a 30-days period starting January 6th, 2022.
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Preliminary Design Criteria

IBI

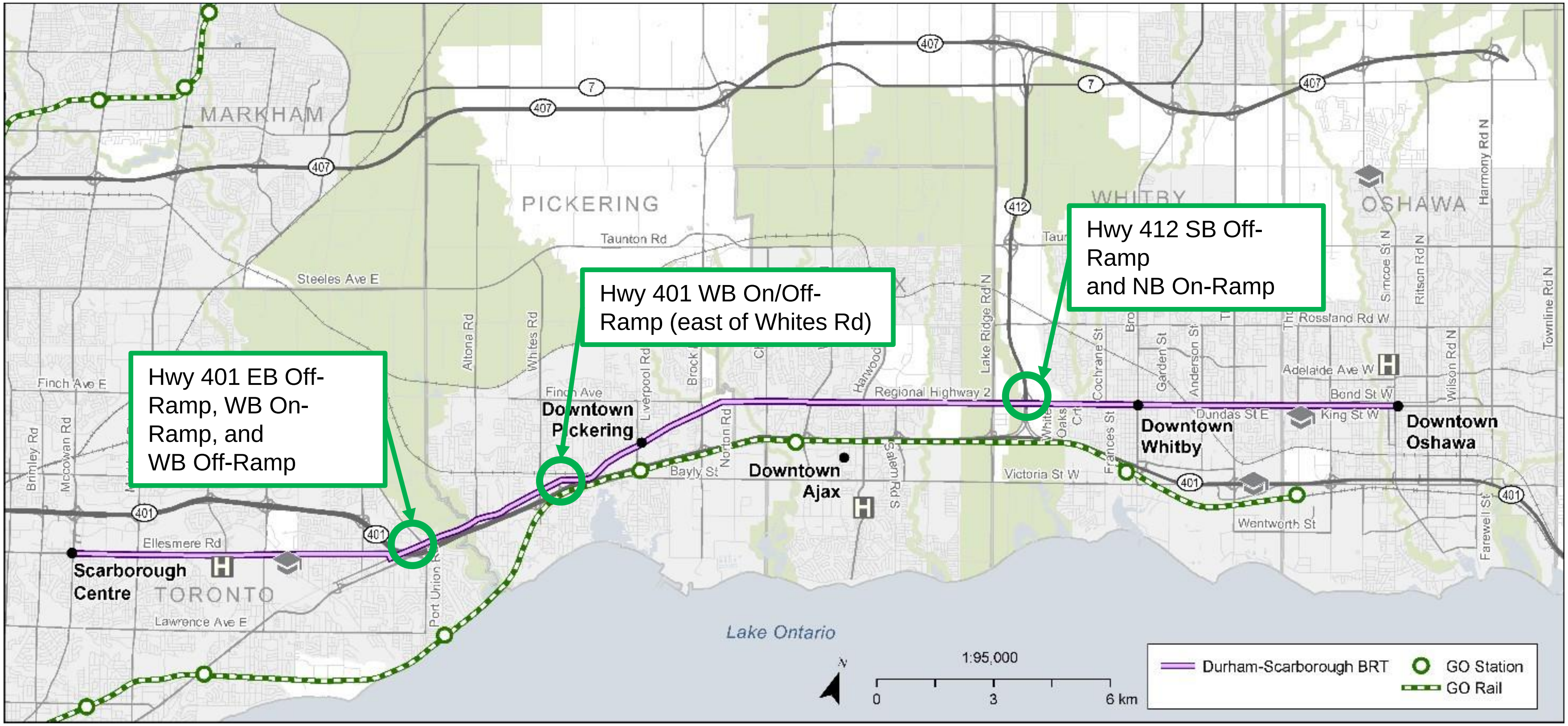
PARSONS

December 7, 2021

Agenda

1. Study Area
2. Draft Preliminary Design Criteria
    1. Kingston Road at Highway 401
    2. Highway 401 On/Off Ramps (east of Whites Road)
    3. Dundas Street West at Highway 412
3. Potential Exemptions
4. Substandard Present Conditions - Improved or Remaining the Same
5. Draft Implementation Strategy
6. Next Steps

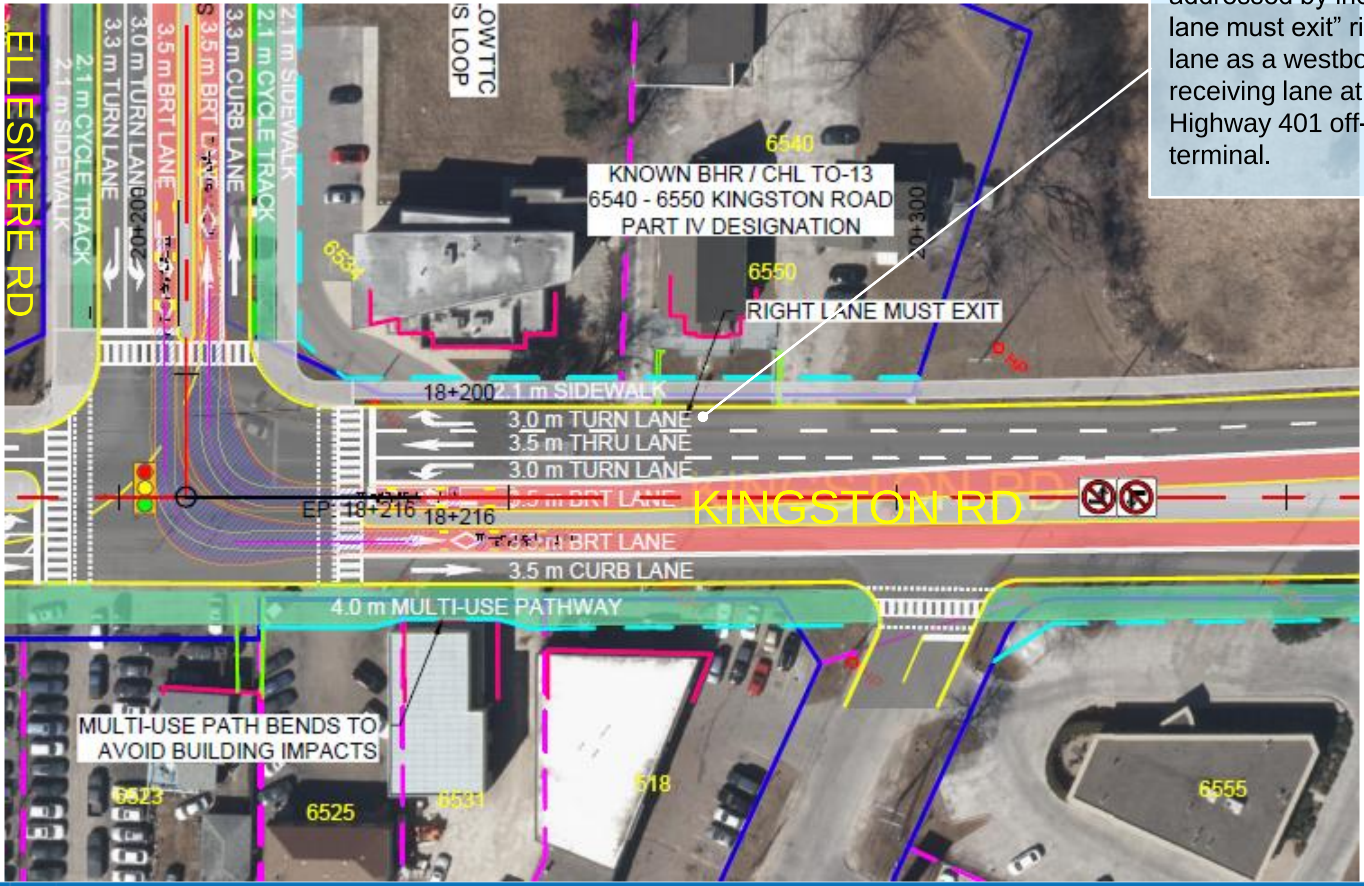
Study Area


Hwy 401 EB Off-Ramp, WB On-Ramp, and WB Off-Ramp
Hwy 401 WB On/Off-Ramp (east of Whites Rd)
Hwy 412 SB Off-Ramp and NB On-Ramp
MARKHAM
PICKERING
WHITBY
OSHAWA
TORONTO
Scarborough Centre
Downtown Pickering
Downtown Ajax
Downtown Whitby
Downtown Oshawa
Lake Ontario
1:95,000
0
3
6 km
Durham-Scarborough BRT
GO Station
GO Rail

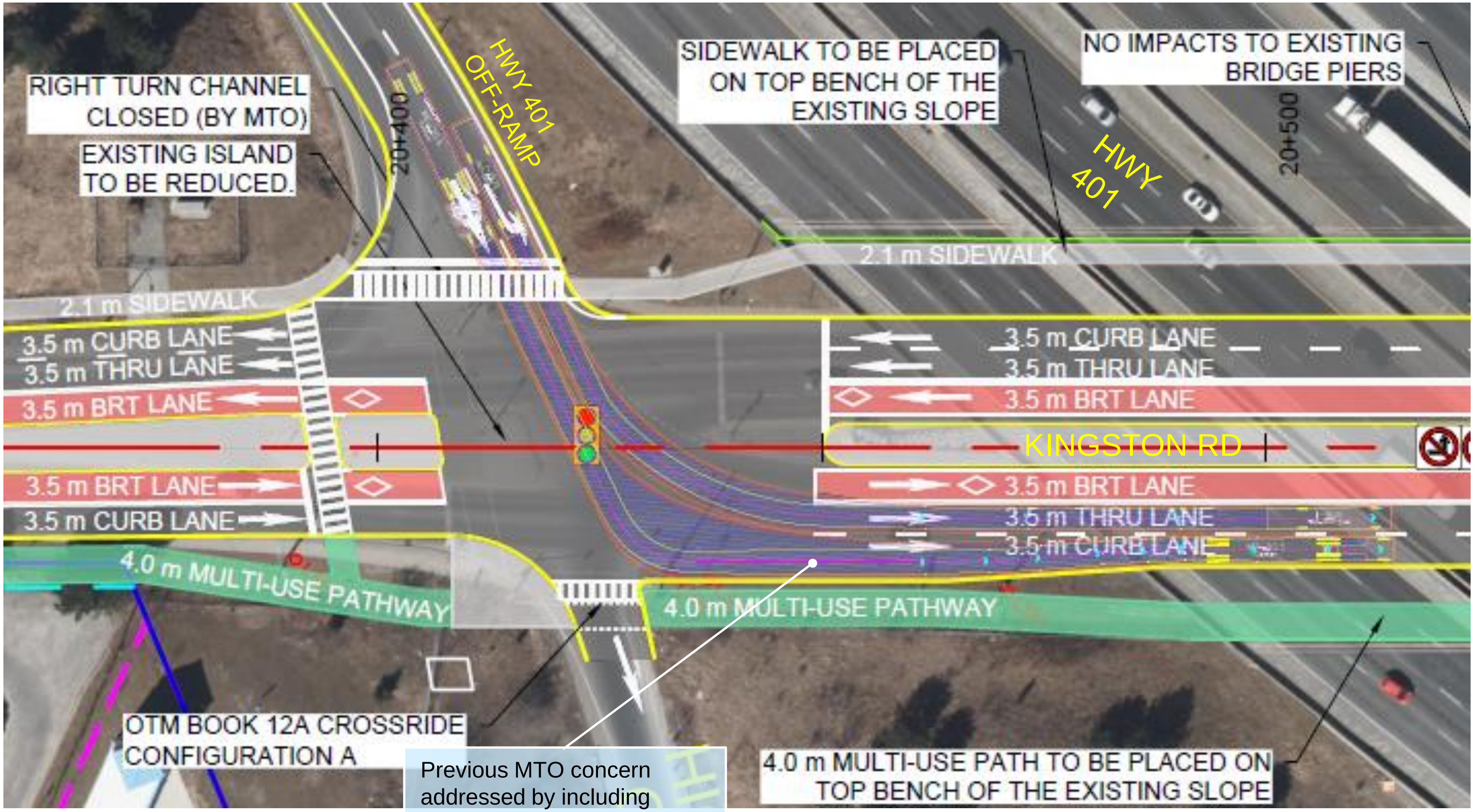
Location 1: Kingston Road

- Kingston Road from east of Ellesmere Road to Rylander Boulevard
- Highway 401 E-N/S off ramp at Kingston Road, east of Sheppard Avenue/Port Union Road, in City of Toronto

Previous MTO concern addressed by including "right lane must exit" right turn lane as a westbound receiving lane at the Highway 401 off-ramp terminal.



Location 1: Kingston Road (cont'd)



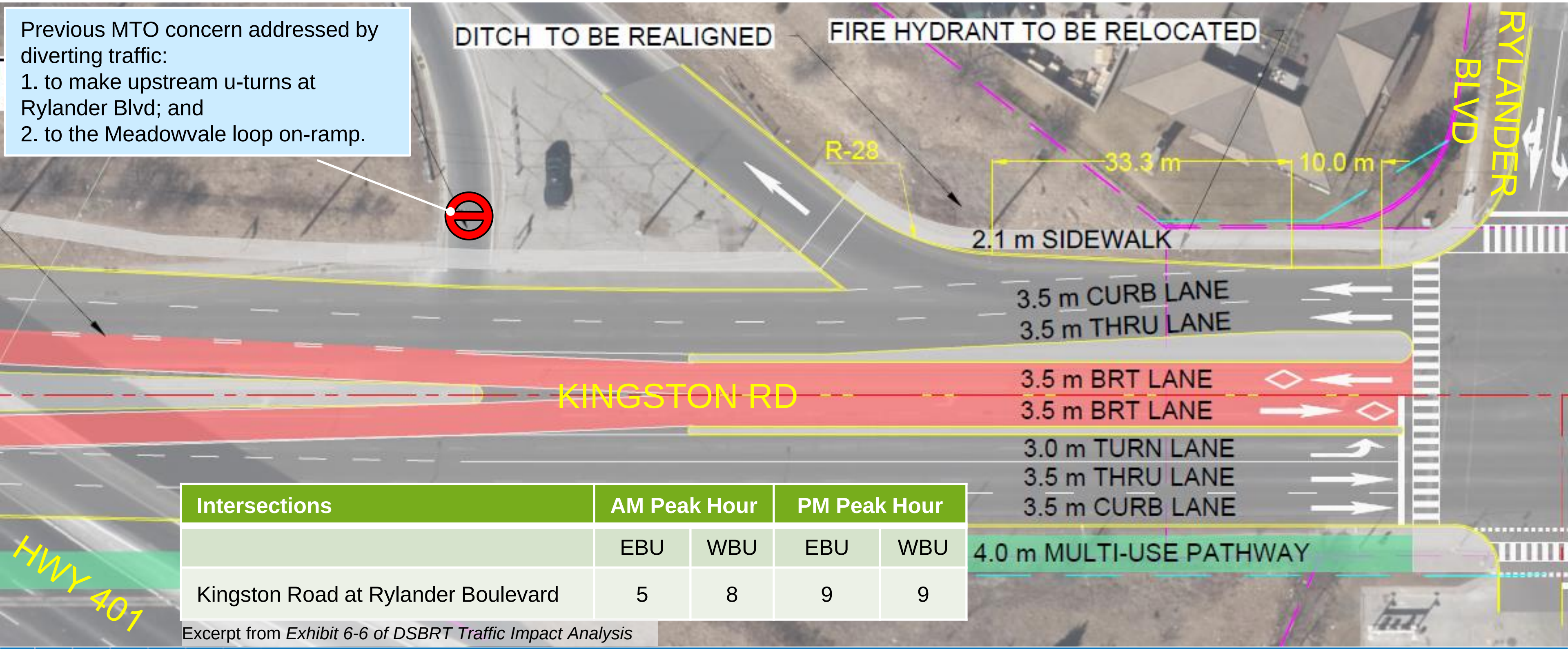
Previous MTO concern addressed by including additional pavement width to accommodate simultaneous dual left turning movement for design vehicles of WB-20.5 and I-BUS.

Location 1: Kingston Road (cont'd)

Highway 401 S-W On-Ramp Closure

Existing entrance to Highway 401 On-ramp to be closed due to the removal of existing EB left turn lane to facilitate the introduction of BRT.

Previous MTO concern addressed by diverting traffic:
1. to make upstream u-turns at Rylander Blvd; and
2. to the Meadowvale loop on-ramp.



Intersections	AM Peak Hour		PM Peak Hour	
	EBU	WBU	EBU	WBU
Kingston Road at Rylander Boulevard	5	8	9	9

Excerpt from *Exhibit 6-6 of DSBRT Traffic Impact Analysis*

Location 1: Kingston Road (cont'd)

- EB traffic can access Hwy 401 WB via Meadowvale Road.
- Minimal inconvenience for drivers given the alternate routing is similar length
  - Start to Finish is 2 to 2.5 km
- Existing hourly volume using NB Meadowvale to Highway 401 WB ramps peaks at 190 vehicles at 12:00 p.m.
- Maximum demand of ~ 430 vph (190 + 240) at NB Meadowvale loop on-ramp can be accommodated.

Highway 401 S-W On-Ramp Closure

Year	AM Peak	PM Peak
2019	30 vph	240 vph
2041	43 vph	345 vph

Location 1: Kingston Road (cont'd)

Year	AM Peak	PM Peak
2019	620 vph	260 vph
2041	868 vph	364 vph

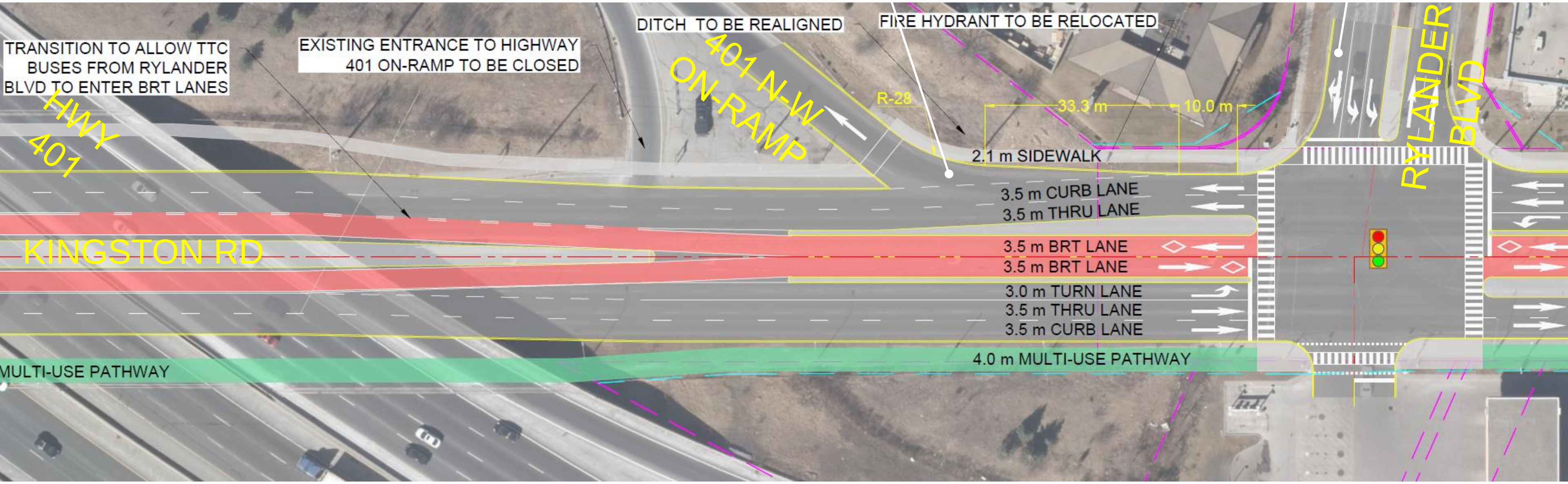
DS existing 80 km/h (70 km/h) for Kingston Road

DS existing 70 km/h (60 km/h) for Hwy 401 N-W Ramp

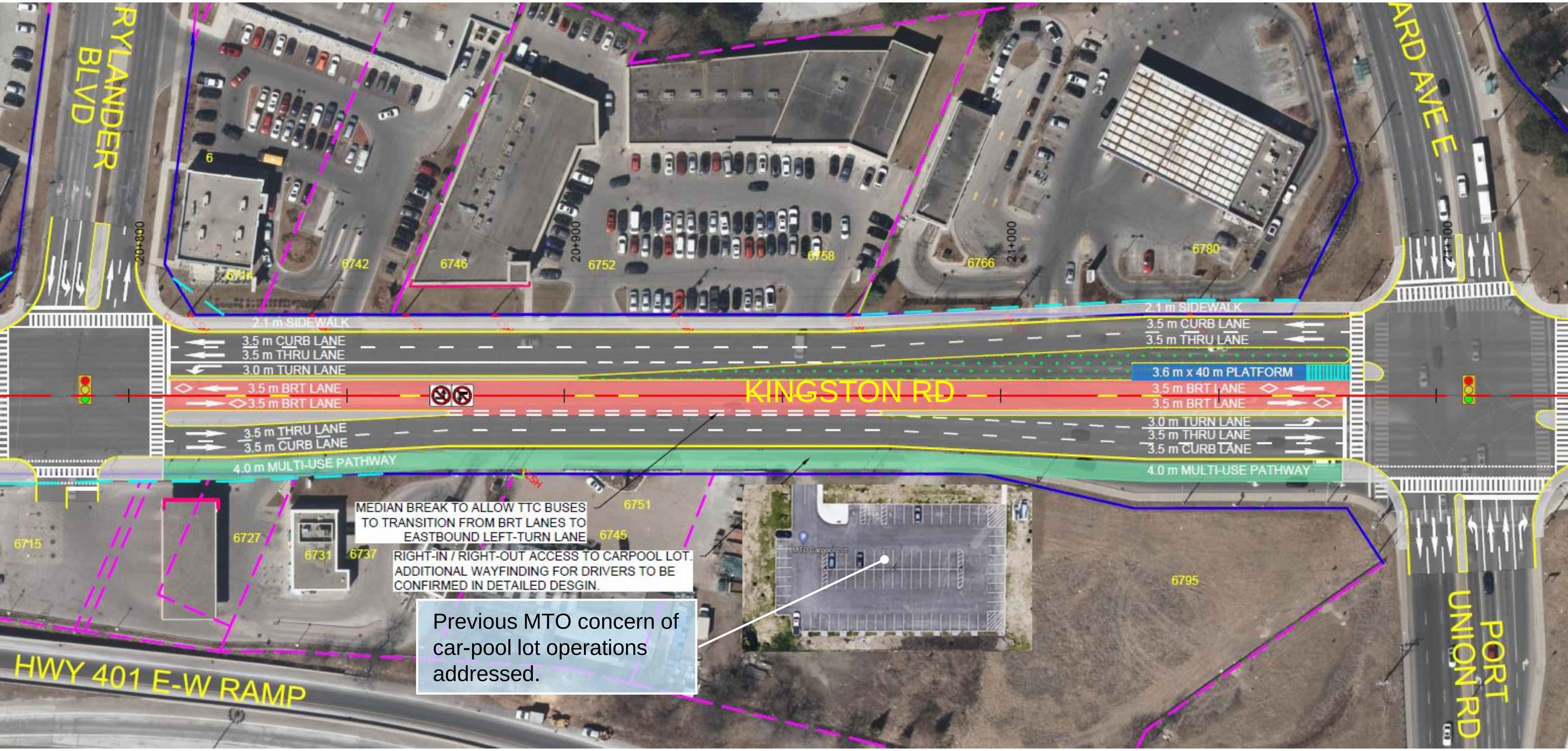
Length of taper achieved - 33.3 m; standard requires 70 m (60 m) for 70 km/h (60 km/h) DS

Highway 401 N-W On-Ramp Taper

Proposed "No Right Turn On Red" to reduce traffic weaving.

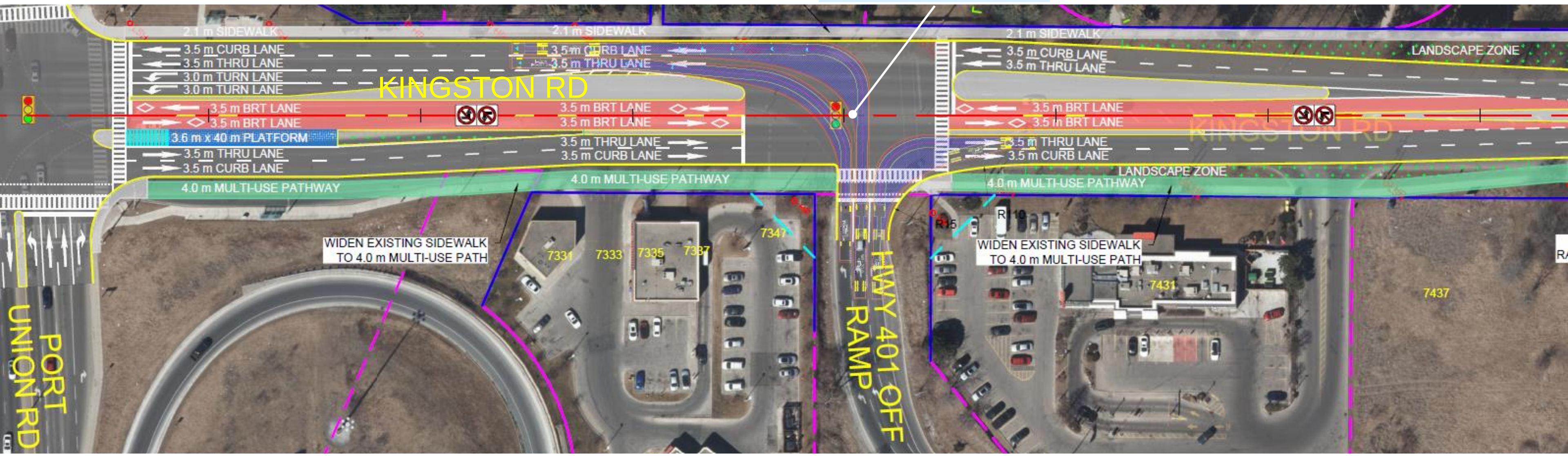


Location 1: Kingston Road (cont'd)



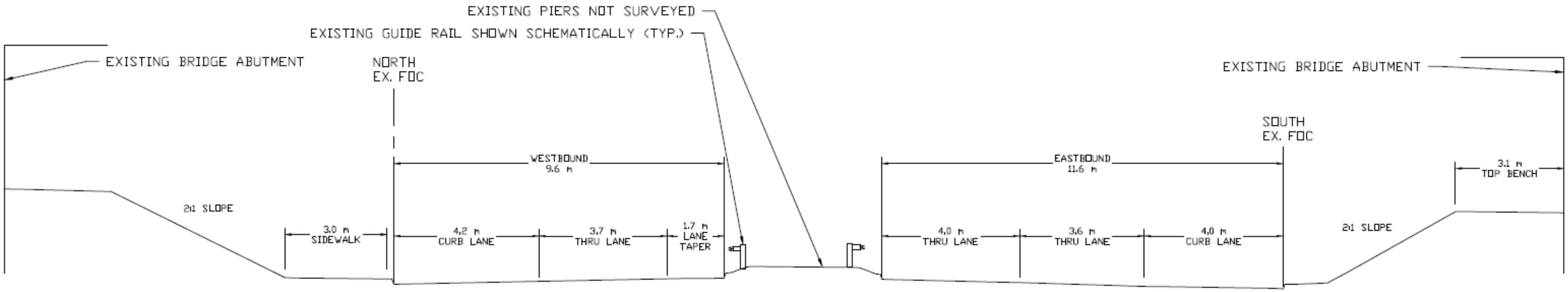
Location 1: Kingston Road (cont'd)

This intersection is not under MTO's jurisdiction, advised by MTO.

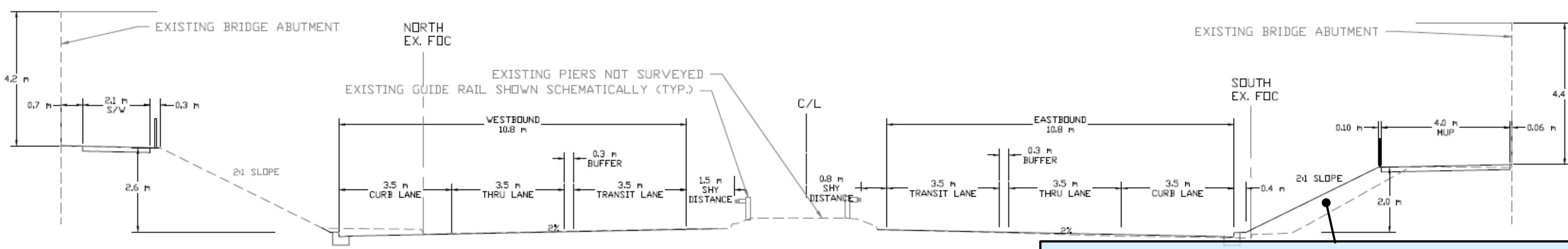


Typical Cross-sections

Kingston Road under Highway 401: EXISTING CONDITION



Kingston Road under Highway 401: PROPOSED CONDITION



NOTE: No proposed changes to existing centre piers, guide rails (other than standard update) or shallow foundations.

MTO concern of introduction of additional lateral and vertical loading to the existing foundation due to AT path & additional fill on the existing paved slope:
A detailed foundation assessment will be completed during detail design.

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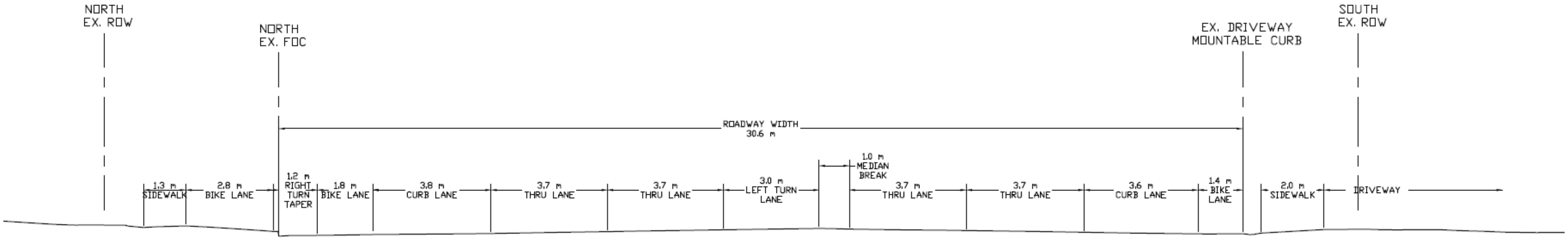
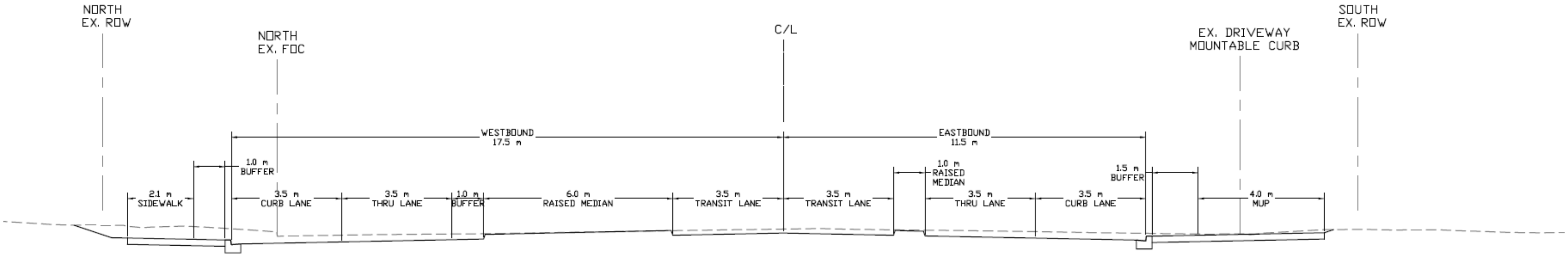
Typical Cross-sections (cont'd)

Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: EXISTING CONDITION



Kingston Road at Highway 401 Off Ramp Terminal East of Sheppard Avenue/Port Union Road: PROPOSED CONDITION



Operational Performance

Kingston Road (West of Ellesmere Road to East of Sheppard Avenue/Port Union Road)		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	41,445	44,945
Summer Average Daily Traffic (SADT)	45,980	49,863
Design Hourly Volume (DHV)	PM WB / EB = 842 / 1653	PM WB / EB = 983 / 1934
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1254 / 621 PM WB / EB = 842 / 1653	AM WB / EB = 1475 / 765 PM WB / EB = 983 / 1934
% commercial vehicles	3%	3%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 Eastbound Off-Ramp	B	C	C	E	C	E
Kingston Road & Rylander Boulevard	B	B	B	B	C	B
Kingston Road & Highway 401 Westbound Off-Ramp	B	B	B	B	B	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 1: Kingston Road (East of Ellesmere Road to Rylander Boulevard), City of Toronto

Design Year: 2041	Superelevation Maximum Rate for determining the Radius: 6%				
	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	80	80	70	80	(Proposed standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	60	60	50	60	(Proposed Standards UAD80 is included. Proposed reduction of design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	142	130	105	148	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	30.5	26	17	33.3	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	41.5	12-16	10-12	35	Proposed Sag value is reduced to 35 from 41.5; however, it exceeds standards. Operational issues are not envisioned. (Proposed vertical profile is not being changed from existing; however, it is measuring less than previous design criteria.)
Grades Maximum (%)	3	6-8	6-8	2.68	(✓)
Radius Minimum (m)	Tangent	250	190	Tangent	(✓)
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80 km/h design speed. Proposed condition does not meet the requirement for 80 km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.
Shoulder Width (Left / Right) (m)	n/a	n/a	n/a	n/a	n/a
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Median Width (m)	5.6 - 7	2.0	2.0	2-6.24	(✓)
R.O.W. Width - nominal (m)	26.2 – 36.5			26.2 - 38.7	(Potential property acquisition at Kingston Road/Centennial Road.)

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-1: Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	35	17	17	35	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	10	10-12	10-12	10	(✓)
Grades Maximum (%)	4.63	6-8	6-8	4.63	(✓)
Radius Minimum (m)	200	190	130	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2 x 3.75	3.75	3.75	2 x 3.75	(✓)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-2: Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation.
Crest: Minimum "K" factor for Stopping Sight Distance	40	17	17	40	(✓)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	4.1	6-8	6-8	4.1	(✓)
Radius Minimum (m)	200	190	190	200	(✓)
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 4.75	4.75	4.75	1 x 4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	?	n/a	n/a	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to present condition.
Sight Distance at Entrance Terminal (m)	401: ? Kingston: 150	401: 370–470 Kingston: 130	401: 370–470 Kingston: 130	401: ? Kingston: 150	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 1-3: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum "K" factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Sag: Minimum "K" factor for Stopping Sight Distance	12	10-12	10-12	12	(✓)
Grades Maximum (%)	6.3	6-8	6-8	6.3	(✓)
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	3.75	3.75	1 x 3.5-4.00 RT Lane 2 x 3.75 LT Lane	(✓)
Shoulder Width (Left / Right) (m)	1.00 / 3.50	1.0 / 2.5	1.0 / 2.5	1.00 / 3.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAD80	UAD80	UAD70	UAD80	
Design Speed(km/h)	80	80	70	80	
Lane Widths (m)	5x3.66	3.75	3.5	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for 80km/h design speed. Proposed condition does not meet the requirement for 80km/h design speed due to constrained median width accommodating structure piers. To facilitate introduction of BRT, 3.5 m lanes are proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Substandard Present Conditions – Remaining the Same

Highway 401 @ Kingston Road - W-N/S OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Shoulder Width (Left / Right) (m)	0.6 / 2.2	1.0 / 2.5	1.0 / 2.5	0.6 / 2.2	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to present condition.

Highway 401 @ Kingston Road - N-W ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed Standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	130	130	n/a	Ramp modification anticipated to improve operation.

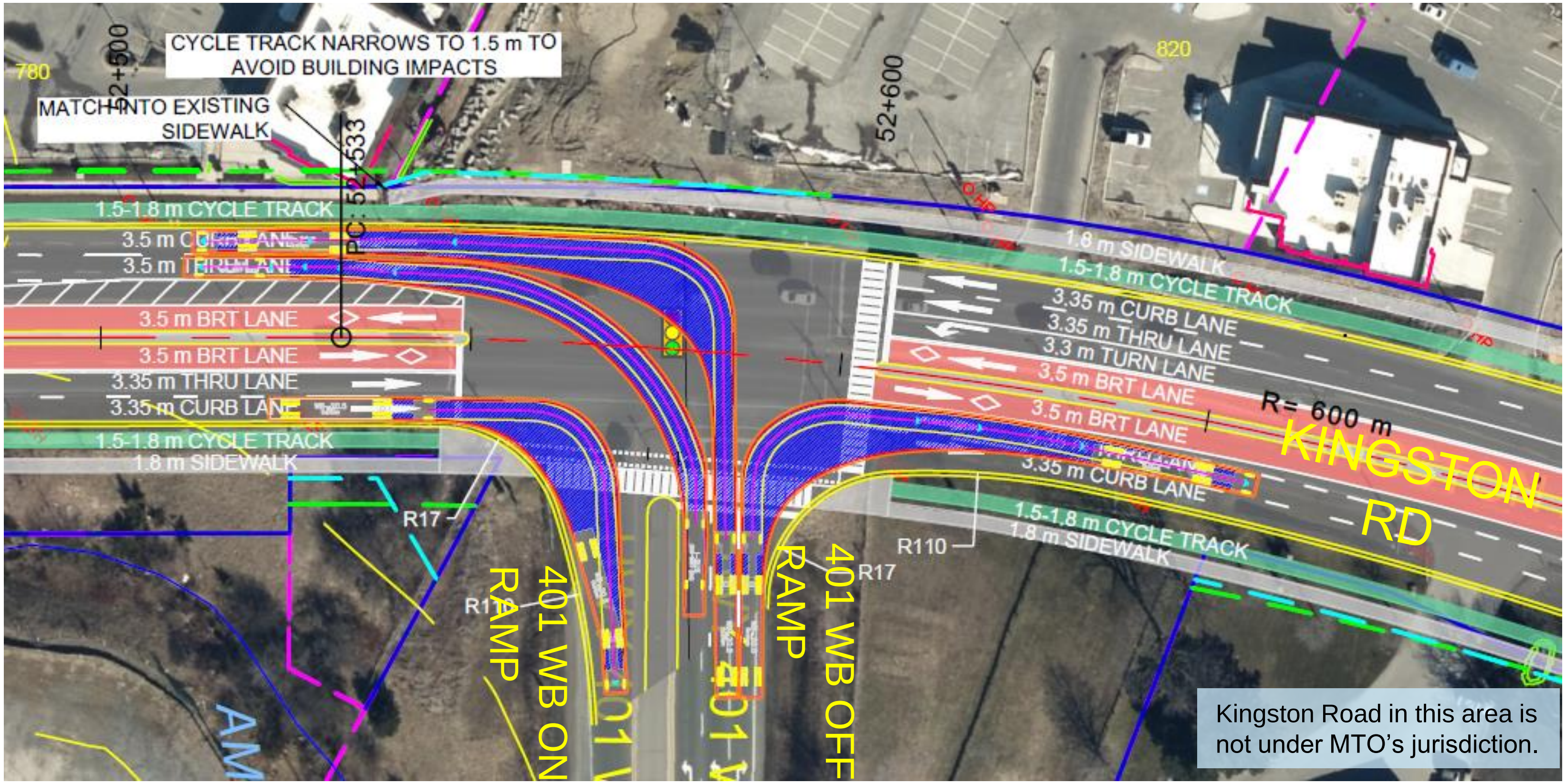
Substandard Present Conditions – Improved/ Remaining the Same

Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Sheppard Avenue/Port Union Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	122	178	156	141	Existing and proposed intersection sight distances are below standard for 80 km/h and 70 km/h crossing road design speed. Proposed condition is an improvement.
Crest: Minimum “K” factor for Stopping Sight Distance	8	17	17	8	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp geometry. Only changes to the ramp terminal anticipated (20 m – 30 m).
Radius Minimum (m)	60	190	190	60	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	304	535	535	304	Existing length of speed change lane is below design standard of 70 km/h ramp design speed. No proposed change to Highway 401 ramp terminal geometry.

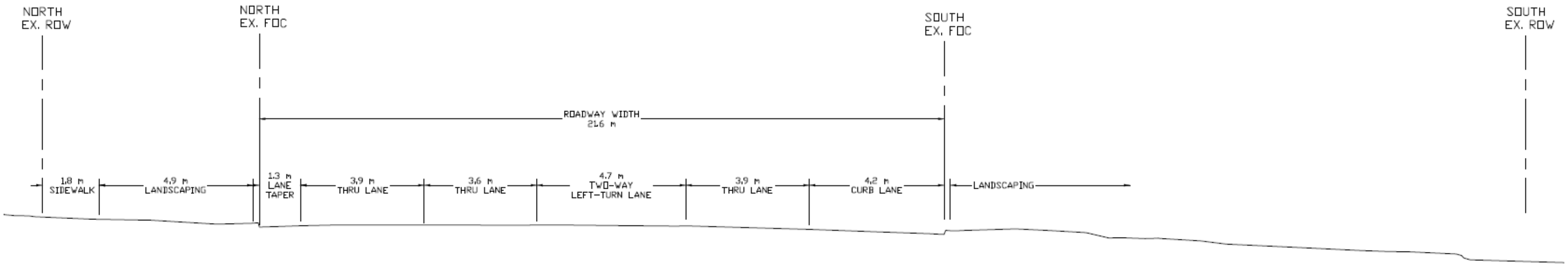
Location 2: Highway 401 On/Off Ramps

- At Kingston Road east of Whites Road in Town of Pickering

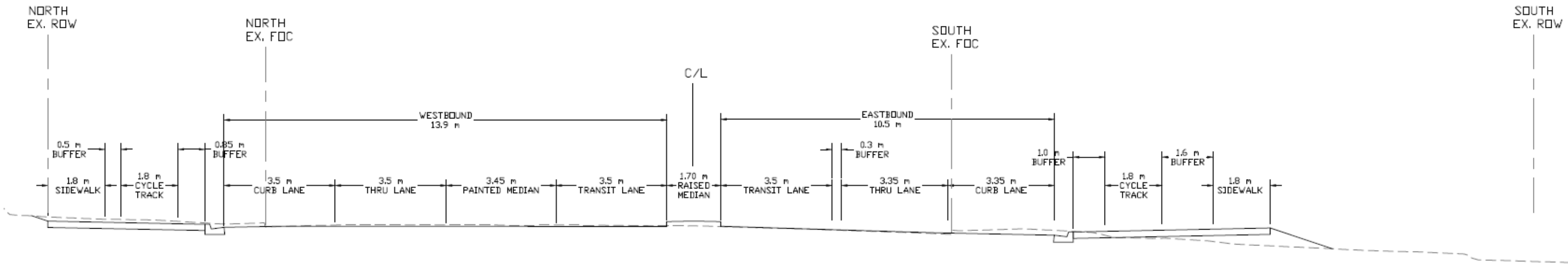


Typical Cross-sections

Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: EXISTING CONDITION



Kingston Road at Highway 401 On/Off Ramp Terminal East of Whites Road: PROPOSED CONDITION



Operational Performance

Kingston Road at Highway 401 On/Off Ramps East of Whites Road		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	20,998	26,198
Summer Average Daily Traffic (SADT)	23,296	29,065
Design Hourly Volume (DHV)	PM WB / EB = 982 / 1537	PM WB / EB = 1145 / 1707
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1043 / 746 PM WB / EB = 982 / 1537	AM WB / EB = 1290 / 869 PM WB / EB = 1145 / 1707
% commercial vehicles	1.6%	1.6%

Intersection	**Existing (2019) LOS**		**Future (2041) Background LOS**		**Future (2041) With-BRT LOS**	
	AM	PM	AM	PM	AM	PM
Kingston Road & Highway 401 WB Off Ramp (East of Whites Road)	C	D	C	D	E	D

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Interchange Standards Table 2-1: Highway 401 @ Kingston Road - N/S-W ON RAMP east of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	25	10-12	10-12	25	(✓)
Grades Maximum (%)	2.56	6-8	6-8	2.56	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	median / 2.50	1.0 / 2.5	1.0 / 2.5	median / 2.50	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 2-2: Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	> 178	178	156	> 178	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	45	10-12	10-12	45	(✓)
Grades Maximum (%)	2.6	6-8	6-8	2.6	(✓)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Shoulder Width (Left / Right) (m)	n/a / 2.5	1.0 / 2.5	1.0 / 2.5	n/a / 2.5	(✓)
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	n/a
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 401 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Substandard Present Conditions – Remaining the Same

Highway 401 @ Kingston Road - N/S-W ON RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Entrance Terminal Speed-Change Lane Length (m)	365	535	535	365	Existing length of speed change lane is below design standard. No proposed change to Highway 401 ramp terminal geometry.

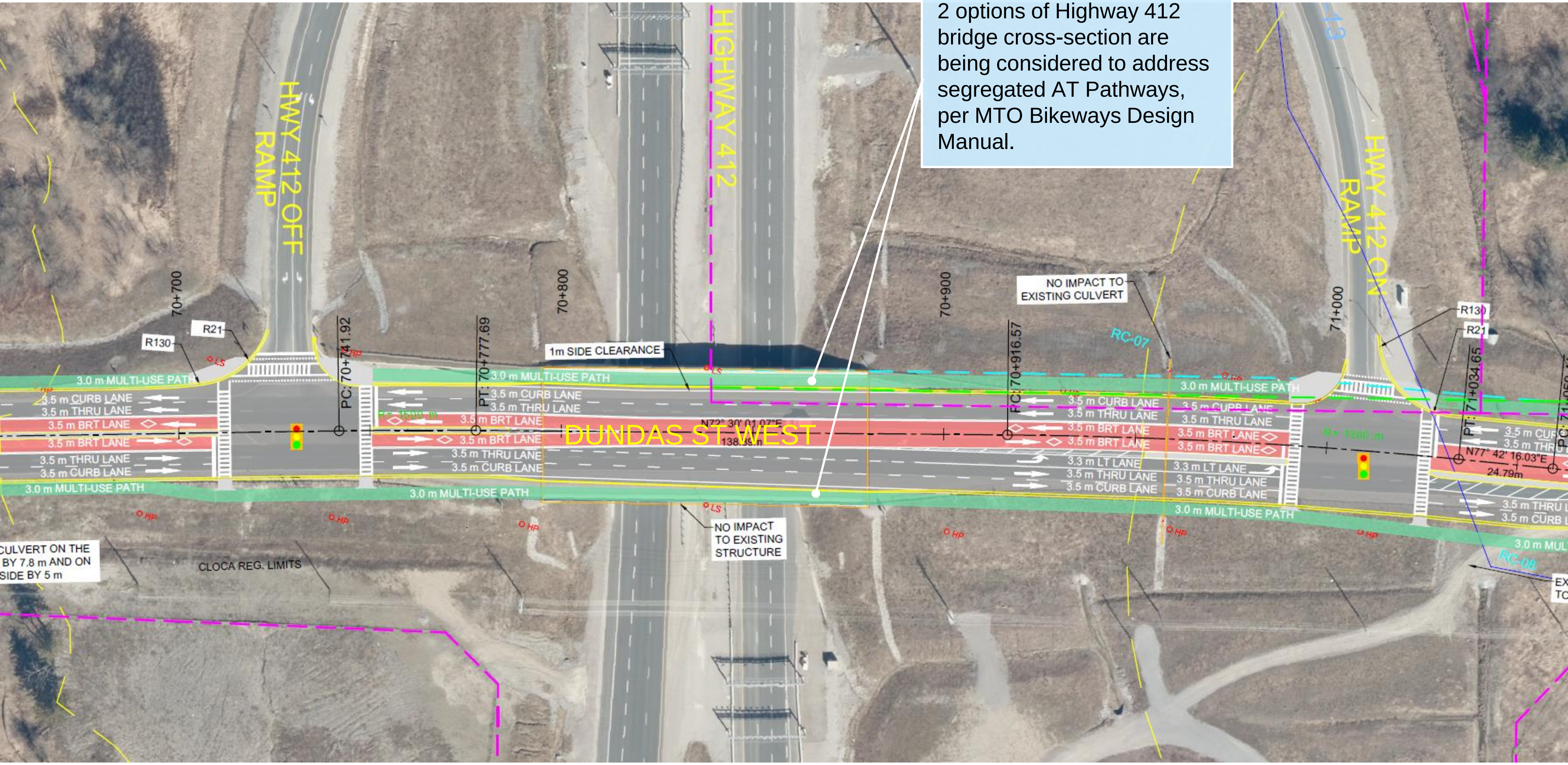
Highway 401 @ Kingston Road – E-N/S OFF RAMP East of Whites Road

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	80	80	70	80	(Proposed standards of crossing road design speed 80 km/h is included. Proposed reduction of crossing road design speed from 80 km/h to 70 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	70	70	70	70	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	90	190	190	90	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Pavement Width (m)	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	3.75	3.75	1x3.5-4 Right Turn Lane 2x3.75 Left Turn Lane	Present condition does not meet the requirement for 70 km/h ramp design speed. No proposed change to ramp width. Operational issues not anticipated.
Exit Terminal Speed-Change Lane Length (m)	459	535	535	459	No proposed change to Highway 401 ramp terminal geometry.

Location 3: Dundas Street West

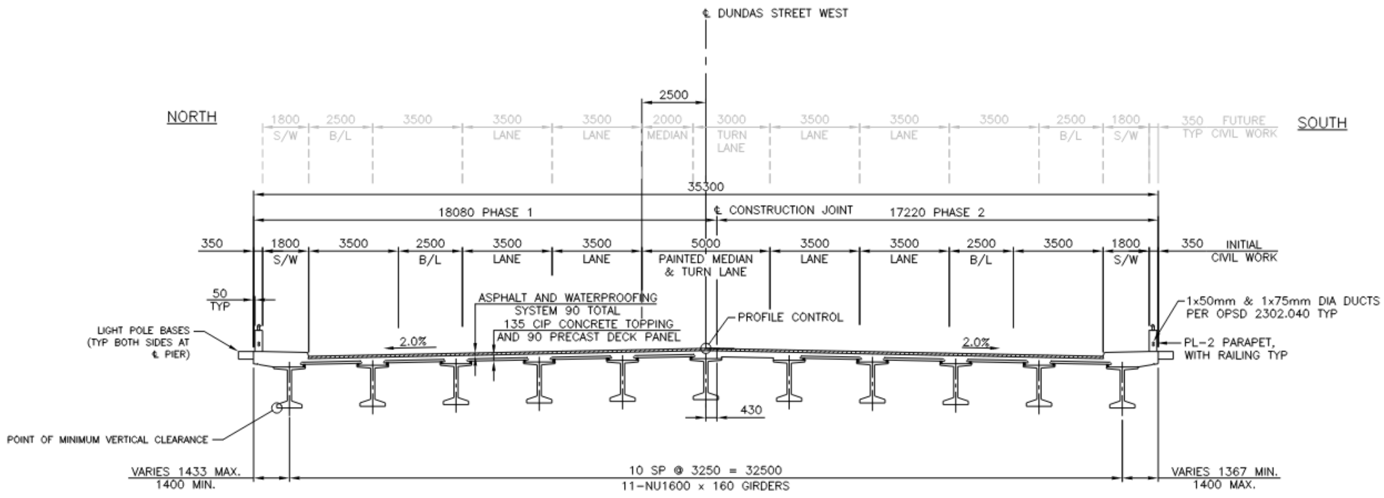
- From Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby

2 options of Highway 412 bridge cross-section are being considered to address segregated AT Pathways, per MTO Bikeways Design Manual.



Typical Cross-sections

Dundas Street West at Highway 412: EXISTING CONDITION



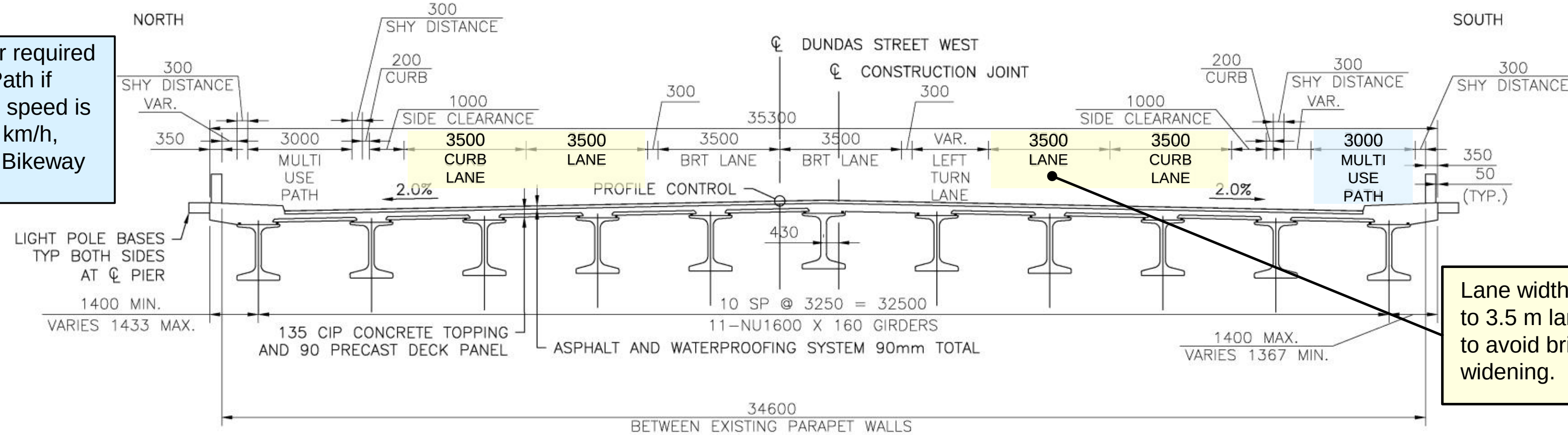
Existing Condition provided by MTO: Structure W12, Sheet 2 of 2
Drawing set Highway 407 East Extension, Dundas Street underpass at West Durham Link
Record Drawing dated 2016-11-30

Typical Cross-sections

Dundas Street West at Highway 412: PROPOSED DESIGN Option 1

3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers

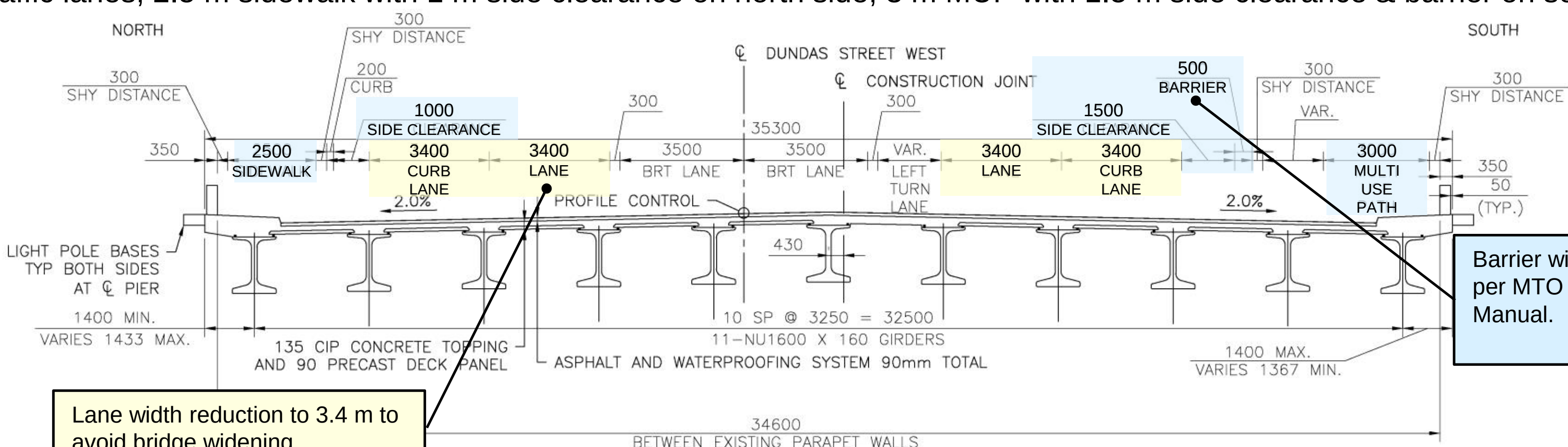
No barrier required with AT Path if operating speed is below 80 km/h, per MTO Bikeway Manual.



Lane width reduction to 3.5 m lane width to avoid bridge widening.

Dundas Street West at Highway 412: PROPOSED DESIGN Option 2

3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side



Barrier with AT Path, per MTO Bikeway Manual.

Lane width reduction to 3.4 m to avoid bridge widening.

Operational Performance

Dundas Street West at Highway 412		
	Latest available year (2019)	Design Year (2041)
Average Annual Daily Traffic (AADT)	27,849	31,349
Summer Average Daily Traffic (SADT)	30,896	34,779
Design Hourly Volume (DHV)	PM WB / EB = 785 / 1693	PM WB / EB = 975 / 1810
Peak Hourly Volume (PHV) (optional)	AM WB / EB = 1467 / 510 PM WB / EB = 785 / 1693	AM WB / EB = 1632 / 700 PM WB / EB = 975 / 1810
% commercial vehicles	1.7%	1.7%

Intersection	Existing (2019) LOS		Future (2041) Background LOS		Future (2041) With-BRT LOS	
	AM	PM	AM	PM	AM	PM
Dundas Street & Highway 401 SB Off-Ramp	-	-	A	C	A	A
Dundas Street & Highway 401 NB On-Ramp	-	-	A	A	A	B

Excerpt from *Exhibit 8-1 of DSBRT Traffic Impact Analysis*

Design Criteria

Standards Table 2: Dundas Street (from Highway 412 off-ramp to on-ramp), Town of Whitby, Durham Region

	Superelevation Maximum Rate for Determining the Radius:			6 %	
Design Year: 2041	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	(Proposed standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h and proposed change from undivided to divided roadway is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Design Speed (km/h)	90	90	80	90	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Posted Speed – prevailing (km/h)	70	70	60	70	(Proposed Standards UAD90 is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Minimum Stopping Sight Distance (m)	181	160	130	172	(Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Crest: Minimum "K" factor for Stopping Sight Distance	50	39	26	44.87	Present condition will not be changed. Detailed survey to be obtained during detailed design. The proposed are not intended to change the present condition value. (Proposed vertical profile is not being changed from existing. However, it is measuring less than previous design criteria.)
Sag: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Grades Maximum (%)	n/a	6-8	6-8	2.35	(✓)
Radius Minimum (m)	5000	340	250	1300	Alignment is being fitted to existing conditions. No significant changes are anticipated.
Lane Widths (m)	4x3.5 Thru Lane 1x3.5 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90 km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.
Shoulder Width (Left / Right) (m)	5.6	1.0	1.0	1.0	(Existing shoulders were built to ultimate condition.) Proposed shoulder meets standard.
Shoulder Rounding (m)	n/a	n/a	n/a	n/a	
Median Width (m)	1.5 - 5	2.0	2.0	0 – 1.7	(Raised concrete medians terminate at the approaches of the bridge. In order to minimize impacts to the Highway 412 bridge structure a median is not proposed.)
R.O.W. Width – nominal (m)	55.43 – 59.16			55.43 – 65.23	

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 3-1: Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	>200	200	178	>200	(✓)
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	40	12-16	12-16	40	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	2x3.75	2x3.7	2x3.7	2x3.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Exit Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Exit Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Design Criteria (cont'd)

Interchange Standards Table 3-2: Highway 412 @ Dundas Street West – E/W-N ON RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Sight Distance Requirement for Stopping, Crossing and Turning Movements at the Crossing Road (m)	n/a	n/a	n/a	n/a	
Crest: Minimum "K" factor for Stopping Sight Distance	n/a	n/a	n/a	n/a	
Sag: Minimum "K" factor for Stopping Sight Distance	30	12-16	12-16	30	(✓)
Grades Maximum (%)	2	6-8	6-8	2	(✓)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Superelevation Maximum Rate (%)	?	6	6	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to ramp superelevation.
Pavement Width (m)	4.75	4.75	4.75	4.75	(✓)
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)
Shoulder Rounding (m)	1	0.5-1.0	0.5-1.0	1	(✓)
Sight Distance at Entrance Terminal (m)	?	370 - 470	370 - 470	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.
Entrance Terminal Speed-Change Lane Length (m)	?	535	535	?	(Present condition to be obtained from MTO or developed during detailed design.) No proposed change to Highway 412 ramp terminal geometry.

Notes: Blue text indicates data provided by MTO.

Potential Exemptions

Reduction in design speed from 90 to 80 km/h on Dundas St West

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Functional Highway Classification	UAU90	UAD90	UAD80	UAD90	
Design Speed (km/h)	90	90	80	90	
Lane Widths (m)	4x3.5 Thru Lane 1x3.50 Left Turn Lane	3.75 (divided) 3.5-3.75 (undivided)	3.75 (divided) 3.5-3.75 (undivided)	2x3.5 Curb Lane 2x3.5 Thru Lane 2x3.5 BRT Lane	Present condition does not meet the requirement for divided road of 90km/h design speed. Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Potential Exemptions (cont'd)

To avoid Highway 412 Bridge widening, two options are considered.

Option 1 - 3.5 m traffic lanes, 3 m MUPs on both sides with 1 m side clearance without barriers

- **Potential Exemption**:
  - Reduction in design speed from 90 km/h to 80 km/h
  - i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- **Rationale**:
  - Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
  - Spatial constraints of bridge cross section.
  - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Option 2 - 3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side

- **Potential Exemption**:
  - Lane width reduction from 3.75 m to 3.4 m
- **Rationale**:
  - Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
  - Spatial constraints of bridge cross section.
  - Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Substandard Present Conditions – Remaining the Same

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions*	Design Standards	Design Standards	Proposed Standards	Notes (Information for Review Only)
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).
Shoulder Width (Left / Right) (m)	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	1.0 / 2.5	(✓)

Highway 412 @ Dundas Street West – N-E/W OFF RAMP

	Present Conditions	Design Standards	Design Standards	Proposed Standards	Notes
Crossing Road Design Speed (km/h)	90	90	80	90	(Proposed standards of crossing road design speed 90 km/h is included. Proposed reduction of design speed from 90 km/h to 80 km/h is under discussion. One of the Design Standards columns will be removed after rationale is provided and agreed upon for reducing speed.)
Ramp Design Speed (km/h)	80	80	80	80	(Present condition estimated as 10 km/h below crossing road design speed, per TAC Table 10.6.1.)
Radius Minimum (m)	190	250	250	190	Present condition does not meet the requirement for 80 km/h ramp design speed. No proposed change to ramp radii. Only changes to the ramp terminal anticipated (20 m – 30 m).

Exemption Summary

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**
    - To facilitate the introduction of BRT, traffic lane width of 3.5 m is proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops.
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary

2. **Closure of Highway 401 S-W On-Ramp**
    - Existing EB left turn lane is to be removed to facilitate the introduction of BRT. Traffic diversions are proposed. No operational issues are anticipated. Safety is improved as risk of collisions from EB left turning movements is eliminated.

Rationale:

- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity.
- Significant physical constraints under the bridge.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary

3. Reduction in Taper Length at Highway 401 N-W On-Ramp

- Existing speed change lane is to be modified to a taper lane to facilitate the introduction of BRT.
- Length of taper achieved is 33.3 m. Standard requires 70 m (60 m) for design speed of 70 km/h (60 km/h).
- “No Right Turn On Red” is proposed to SB right turn/ through lane to reduce traffic weaving.

Rationale:

- Existing speed change lane does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity.
- Physical constraints to existing building.

Exemption Summary (cont'd)

4. Reduction in design speed from 90 to 80 km/h on Dundas St West

- Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Exemption Summary (cont'd)

5-1. Reduction in design speed from 90 to 80 km/h on Dundas St West

- i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- To avoid Highway 412 Bridge widening, Option 1 (3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearance without barriers) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

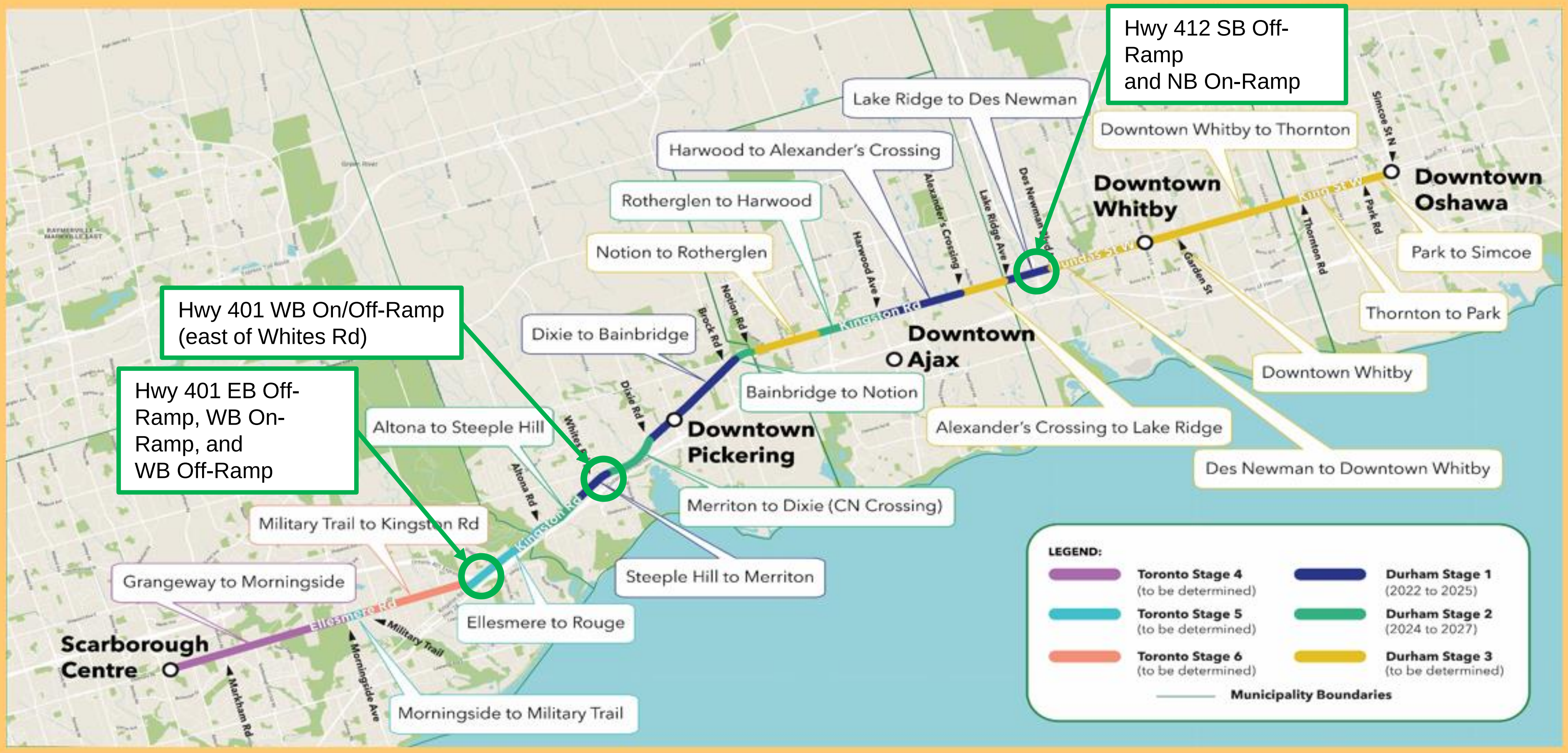
5-2. Reduction in lane width from 3.75 m to 3.4 m on Dundas St West

- To avoid Highway 412 Bridge widening, Option 2 (3.4 m traffic lanes, 2.5 m sidewalk with 1 m side clearance on north side, 3 m MUP with 1.5 m side clearance & barrier on south side) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Draft Implementation Strategy



Next Steps

- Address concerns, if any, from MTO Senior Management
- Receive MTO endorsement
- Address agency comments on draft Environmental Project Report (EPR)
- Post EPR on public record for a 30-days period starting January 6th, 2022.
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI GROUP
7th Floor – 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

Meeting Summary DRAFT – MTO

To/Attention	Notes to File	**Date**	December 20, 2021
From	Margaret Parkhill, Sam Dinatolo	**IBI Project No**	119887

Subject Durham-Scarborough BRT
Metrolinx
December 20, 2021, 9:30 a.m. to 10:00 a.m.

Present Juan Mora Triana, Wilson Taveira, Matthew Coelho, Metrolinx
Rami El Mawed, Jason Hanna, Les Dzbik, Eric Hakomaki, Salia Kalali, Kris Mermigas, MTO
Sam Dinatolo,Wendy Ng, Parsons
Margaret Parkhill, IBI Group

Distribution Meeting attendees and invitees

Item Discussed	Action By
Introduction S. Dinatolo welcomed attendees and provided an update on the DSBRT design criteria, preliminary design, and traffic operations at three MTO interface areas: 1. Highway 401 E-N/S off ramp at Kingston Road east of Sheppard Avenue/Port Union Road in City of Toronto, 2. Highway 401 on/off ramps at Kingston Road east of Whites Road in Town of Pickering 3. Dundas Street West from Highway 412 off-ramp to Highway 412 on-ramp in Town of Whitby. S. Dinatolo also provided a summary of existing and proposed standards for MTO jurisdiction areas. The following is a summary of the discussion.	INFO
Discussion Included:	
• S. Dinatolo asked about next steps to take before presenting to MTO senior management. J. Hanna responded that they will discuss with R. El Mawed if any changes need to be made before presenting to senior management.	R. El Mawed / J. Hanna
• C. Singh asked if there if any utility investigations have been done to determine if there will be any utility relocations required. M.	

Item Discussed	Action By
Parkhill responded that subsurface utility investigations have been performed at certain areas along the corridor. The preliminary design protects space for utilities in the boulevard.	
• C. Singh noted that a utility composite plan is not necessary at this point, but encroachment plans may be required. M. Parkhill responded that the project is an Environmental Assessment in the preliminary design phase. The EPR can include a commitment to future work in detail design for utility relocation and encroachment permits from MTO to be reviewed.	M. Parkhill
• S. Dinatolo noted that it that it may be too early to apply for permits as the project is only at TPAP. C. Singh responded that permits would not be necessary at this time. MTO recommends identifying utility relocations as early as possible so that they do not become showstoppers later on in the project. M. Darling noted that the Region of Durham is currently performing SUE investigations and utility excavation/relocations as part of the detailed design.	

Please advise of any errors or omissions to Margaret Parkhill by December 6, 2021.

Preliminary Design and EA/TPAP for the Durham-Scarborough Bus Rapid Transit Corridor

Preliminary Design Criteria

IBI

PARSONS

December 20, 2021

Agenda

1. Highway 401 Underpass Side Slope Review - Rationale for Current Configuration (Highway 401 S-W On-ramp Closure)
2. Optimization of Highway 401 N-W On-ramp Alignment
3. Cross-walk Reconfiguration at Highway 412
4. Highway 412 Lane Configuration
5. Potential Exemption Summary
6. Next Steps

Potential Exemption Summary – 3.5 m Lane

1. **Reduction in design speed from 80 to 70 km/h on Kingston Road at Highway 401**

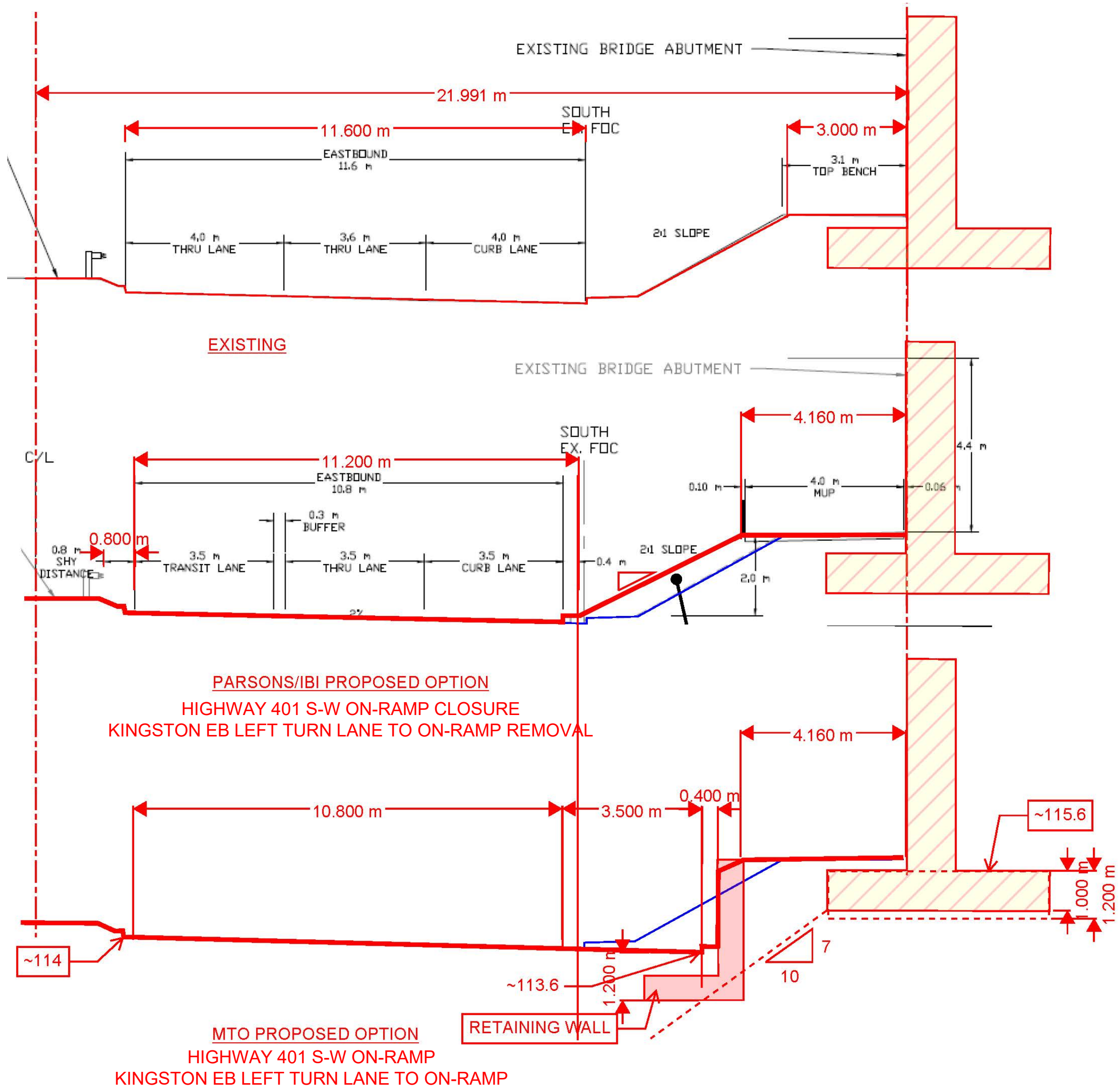
   PE

   - To facilitate the introduction of BRT, traffic lane width of 3.5 m is proposed. No operational issues are anticipated.

Rationale:

- Existing roadway does not meet 80 km/h design speed.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity around transit stops.

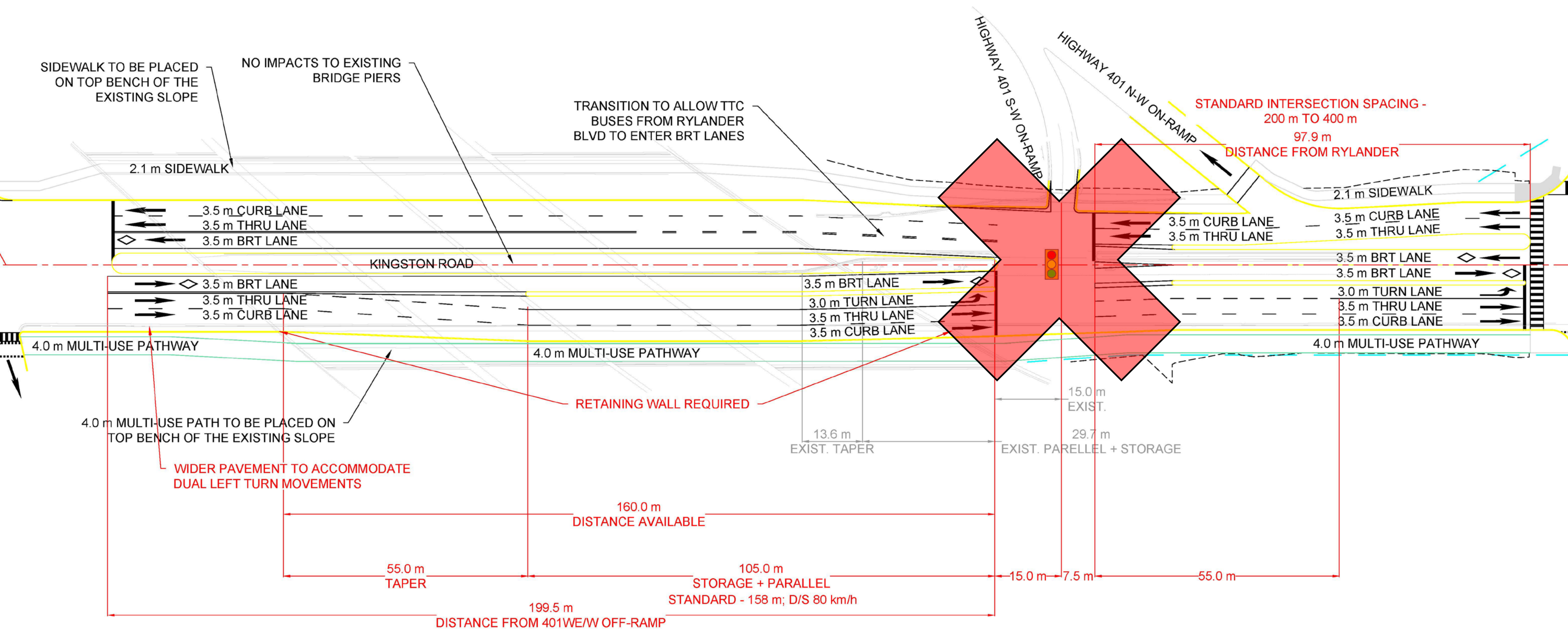
Highway 401 Underpass Side Slope Review



Rationale for Highway 401 S-W On-ramp Closure

Controlled EB left turn with protected phrasing and turning lane outside of BRT lanes was reviewed. South pavement widening is required with retaining wall for slope support.

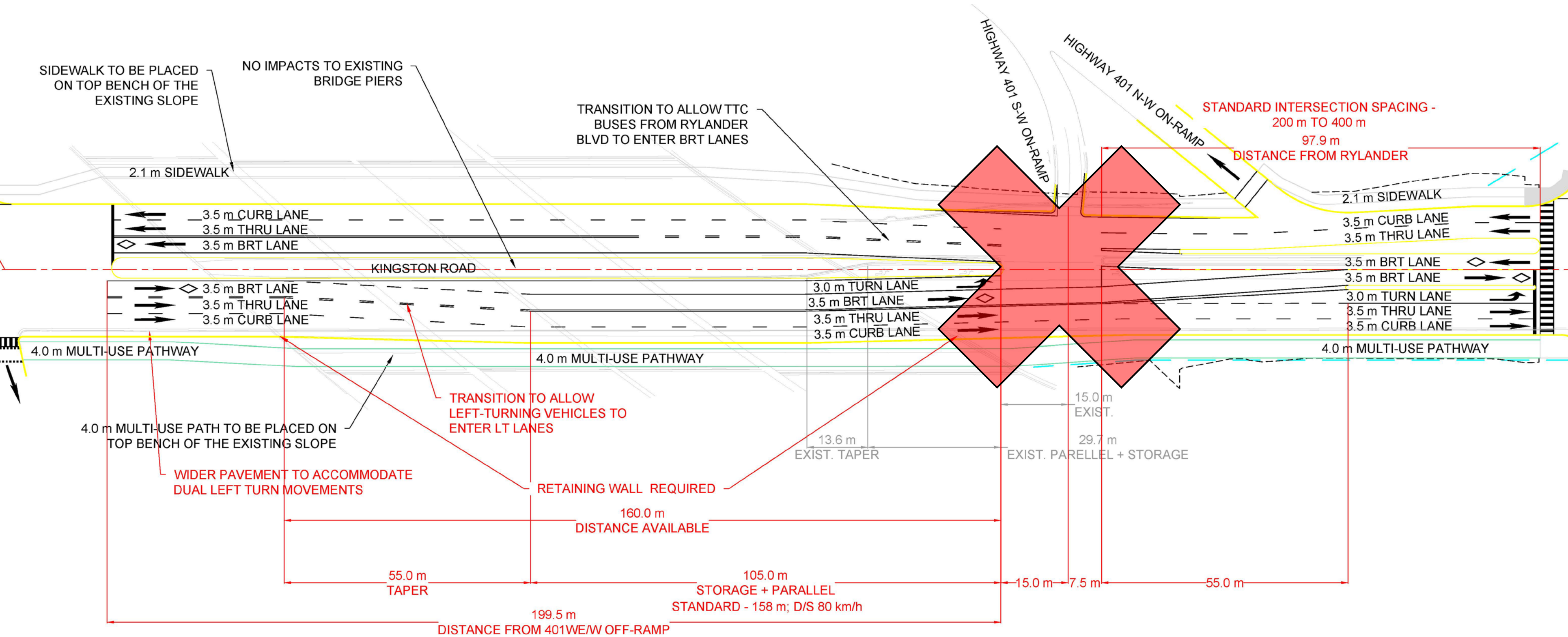
This option is against Ministry guidelines and policies (inadequate intersection spacing to permit signal progression; inadequate turning lane length).



Rationale for Highway 401 S-W On-ramp Closure

Uncontrolled EB left turn with turning lane between BRT lanes was reviewed. South pavement widening is required with retaining wall for slope support.

This option is operationally unsafe and is against Ministry guidelines and policies (intermixing with BRT traffic; inadequate intersection spacing; and inadequate turning lane length).



Potential Exemption Summary

2. Closure of Highway 401 S-W On-Ramp

PE

- Propose to remove existing Kingston Road EB left turn lane to facilitate the introduction of BRT.
- Traffic diversions are proposed.
- No operational issues are anticipated.
- Safety is improved as risk of collisions from EB left turning movements is eliminated.

Rationale:

- Safety and operational issues pertaining to EB left turns into Highway 401 WB with the introduction of BRT.
- Constraints of existing urban conditions, closely spaced intersections, and increasing pedestrian activity.

Potential Exemption Summary

3. Optimization of Highway 401 N-W On-Ramp Alignment

PE

- Realign exit terminal to the location of the closed S-W on-ramp and approx. 200 m of ramp
- Existing speed change lane is to be modified to a taper lane to facilitate the introduction of BRT.
- Length of taper achieved is 77.8 m. Standard requires 70 m (65 m) for design speed of 80 km/h (70 km/h). Existing speed change lane is 57 m in length.
- “No Right Turn On Red” is proposed to Rylander Blvd SB right turn/ through lane to reduce traffic weaving.
- Relocations: Utility poles, drainage under existing ramp, fire hydrant, ramp gate, steel beam guiderail, ditch on west side
- Removal: pavement of existing N-W on-ramp

Rationale:

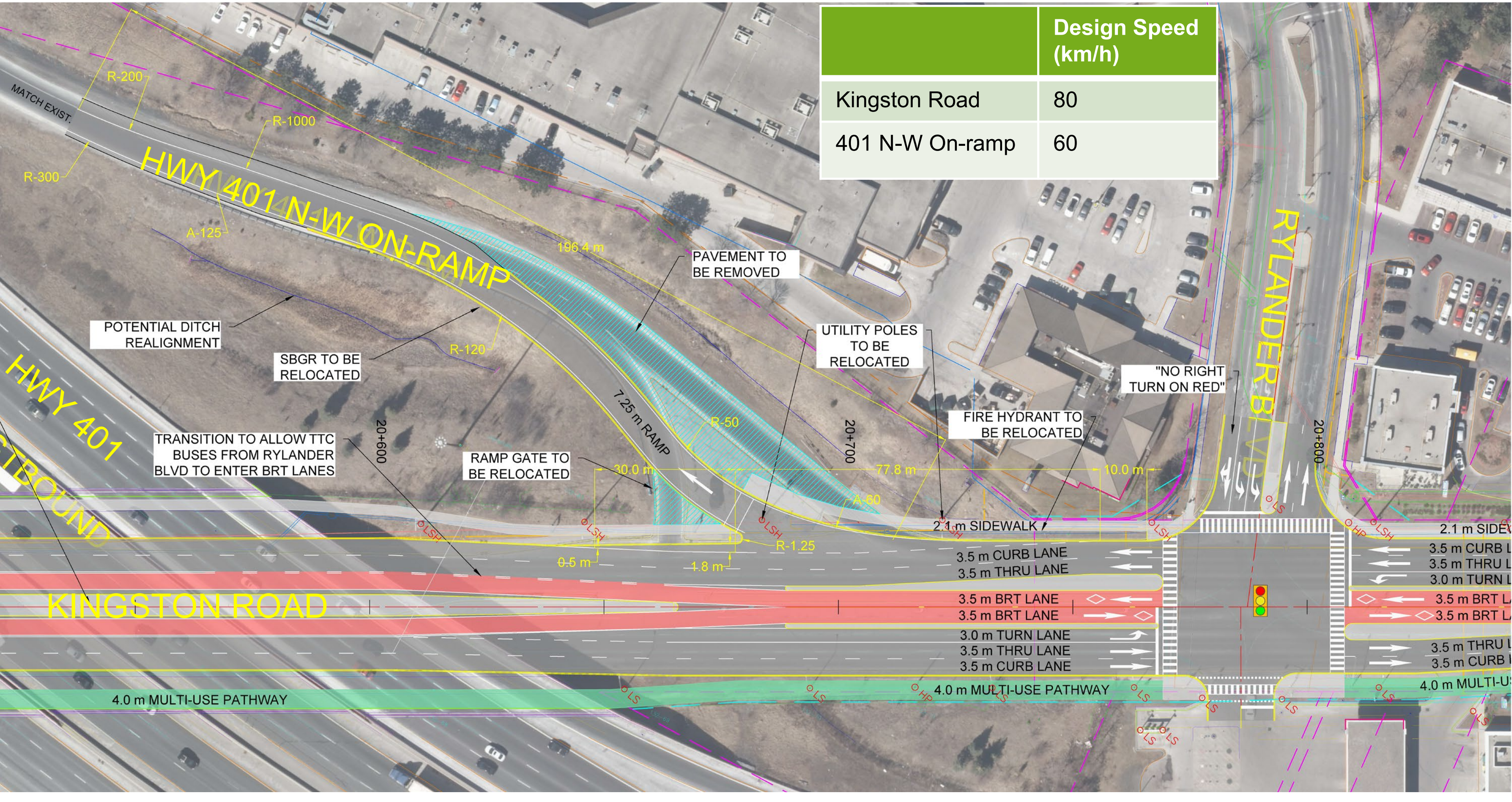
- Existing speed change lane does not meet 80 km/h design speed.
- Take advantage of the additional property from closing the S-W ramp.

Potential Exemption Summary

3. Optimization of Highway 401 N-W On-Ramp Alignment (cont'd)

PE

	Design Speed (km/h)
Kingston Road	80
401 N-W On-ramp	60



Potential Exemption Summary

4. Reduction in design speed from 90 to 80 km/h on Dundas St West PE

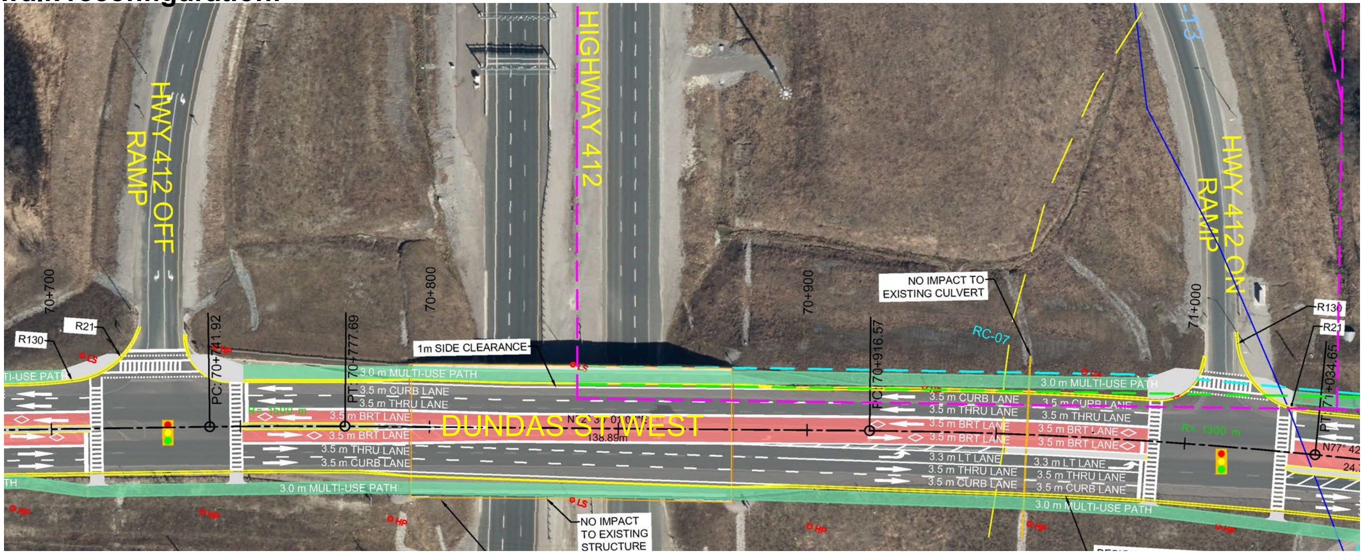
- Proposed condition consists of a section of undivided (on Highway 412 structure) and divided (west of Highway 412 structure) that meets the requirement for undivided road of 90 km/h design speed and does not meet the requirement for divided road of 90 km/h design speed.

Rationale:

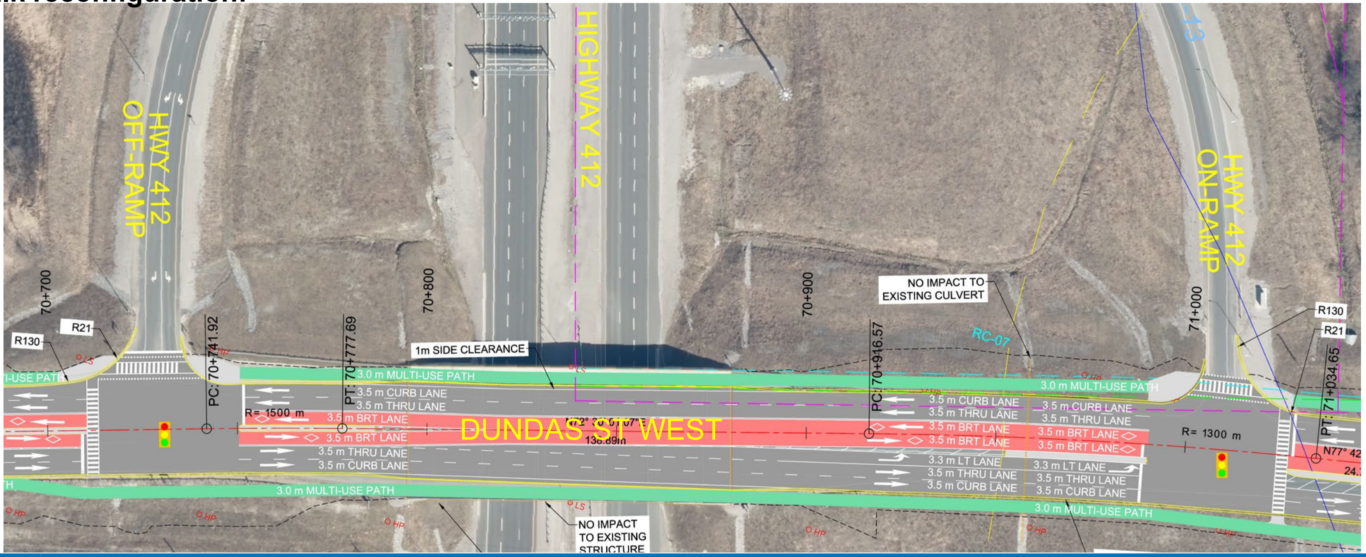
- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Cross-walk Reconfiguration at Highway 412

Prior to cross-walk reconfiguration:



After cross-walk reconfiguration:



Potential Exemption Summary

5-1. Reduction in design speed from 90 to 80 km/h on Dundas St West

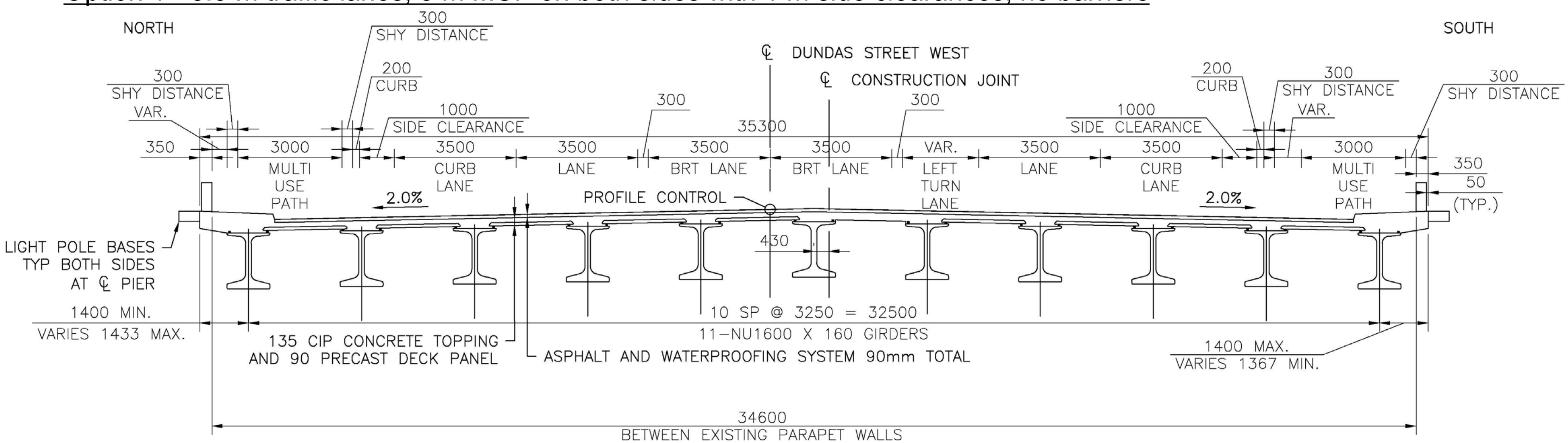
PE

- i.e. posted speed from 70 km/h to 60 km/h to achieve 70 km/h operating speed.(Per 3-Step Cycling memo, operating speed is assumed to be 10 km/h above posted speed).
- To avoid Highway 412 Bridge widening, Option 1 (3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearances without barriers) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

Option 1 - 3.5 m traffic lanes, 3 m MUP on both sides with 1 m side clearances, no barriers



Potential Exemption Summary

5-2. Reduction in lane width from 3.75 m to 3.5 m on Dundas St West

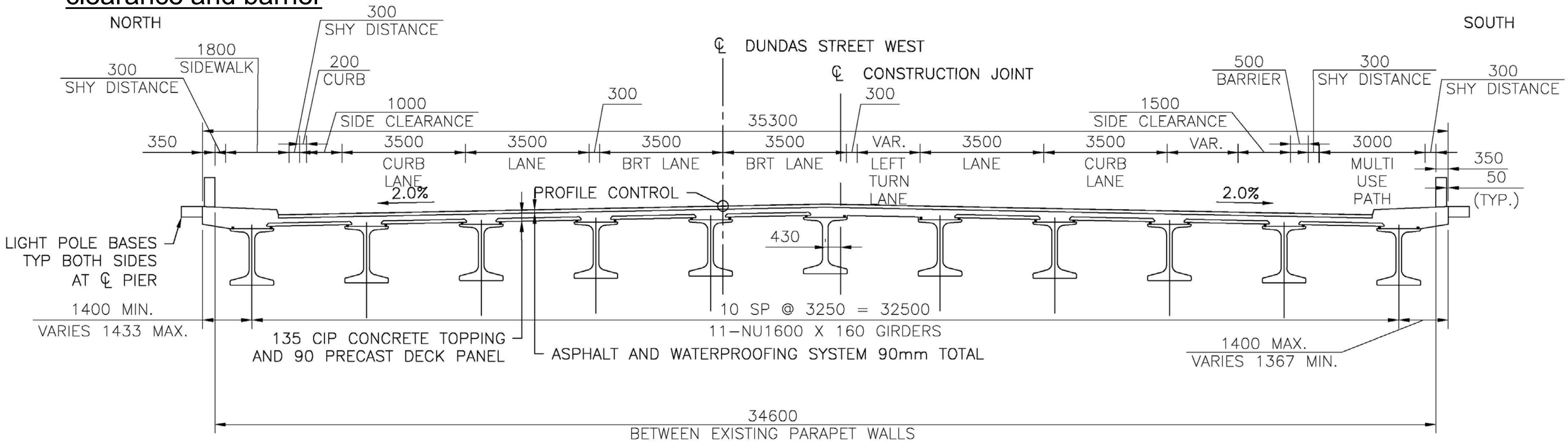
PE

- To avoid Highway 412 Bridge widening, Option 2 (3.5 m traffic lanes, 1.8 m north-side sidewalk with 1 m side clearance, 3 m south-side MUP with 1.5 m side clearance and barrier) is proposed.

Rationale:

- Highway 412 bridge was designed to accommodate bus lanes and bike lanes but design guidance has been updated since the Highway 412 PDR was completed.
- Spatial constraints of bridge cross section.
- Cost to widen the bridge would be cost-prohibitive to DSBRT project.

<u>Option 2 - 3.5 m traffic lanes, 1.8 m north-side sidewalk with 1 m side clearance, 3 m south-side MUP with 1.5 m side clearance and barrier</u>



Next Steps

- Address concerns, if any, from MTO Engineering
- Receive MTO endorsement
- Address agency comments on draft Environmental Project Report (EPR)
- Post EPR on public record for a 30-days period starting January 6th, 2022.
- Draft Preliminary Design Business Case
- Funding decisions will be made as the project advances

Thank you

IBI PARSONS

Yash Kulshreshtha

From: El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Sent: Friday, January 14, 2022 9:55 AM
To: Margaret Parkhill
Cc: Hanna, Jason (MTO); sam.dinatolo@parsons.com; Hopper, David; 'Kristin Demasi'; 'Wilson Taveira'; Madelin Blacha; Yash Kulshreshtha; Adrian Chiu; 'Matthew Coelho'; Paul Niejadlik; Juan.MoraTriana@metrolinx.com
Subject: RE: DSBRT- Update meeting with MTO

Hi Margaret,

Everything that was presented to the executives were endorsed. This includes

- The design speed reduction at Kingston Road.
- Closure of Highway 401 S-W On-Ramp with the proposed modification of the 401 N-W On-Ramp Alignment
- MTO has not reached a final decision on Highway 412 bridge cross-section. Our current preference is Option 1 (3.5 m traffic lanes, 3m MUPs on both sides with 1 m side clearance without barriers) to avoid bridge widening. This includes the reduction in design speed from 90km/h to 80 km/h on Dundas St West. We are working with Head Office to reach a final decision. The EPR can state the design may be refined during detail design.

All the additional commitments in your email can be stated as is in the EPR. MTO has no concerns with the wording.

Rami El Mawed, P.Eng.|Project Engineer|Major Planning Innovations Office – Major Planning Projects Section – AMB|MTO
615 S. James Street| 3rd Floor | Thunder Bay, Ontario P7E 6P6 | ☎ : (807) 356-1731 | : rami.elmawed@ontario.ca
Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: January 11, 2022 2:36 PM
To: El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>; Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Juan Mora Triana <Juan.MoraTriana@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Jason and Rami, happy new year!
As you know, we are planning to publish the Environmental Project Report on Thursday, January 20.

Before this Friday, January 14, could you please provide confirmation that the information presented on December 20 addresses MTO's concerns? And that we have MTO senior endorsement of the preliminary design? For Highway 412, which option does MTO prefer be included with the EPR, recognizing that refinements can occur during detail design.

We have included various commitments to future work in the EPR, see excerpt below. Let me know if you have any suggested edits to these commitments.

Happy to have a call this week if that would help,
Margaret

Commitments to future work specific to MTO:

- Continue correspondence with MTO to address any outstanding concerns raised by MTO staff and obtain all required permits and approvals.
- Follow the MTO approval process during the detail design for those locations within MTO jurisdiction.
- Provide design criteria and PHM-125 drawings to MTO for those locations within MTO jurisdiction.
- Adhere to MTO requirements for construction, quality control, and commissioning with respect to the MTO ROW design.
- Consult with MTO to define and document considerations such as additional maintenance agreements, insurance and/or warranty arrangements for Dundas Street bridge over Highway 412.

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Margaret Parkhill
Sent: Monday, December 13, 2021 5:23 PM
To: El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>; Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Rami and Jason,
Attached is a draft slide deck for the 30 min meeting on Dec 20.
Look forward to any comments or suggestions you may have,
Thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Sent: Friday, December 10, 2021 12:06 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Subject: RE: DSBRT- Update meeting with MTO

Hi Margaret,

DSBRT is now added to the agenda. Jason and I will review the slides and provide any comments by end of day Tuesday Dec 14.

Thank you,

Rami El Mawed, P.Eng. | Project Engineer | Major Planning Projects Section – Asset Management Branch | MTO
615 S. James Street| 3rd Floor | Thunder Bay, Ontario P7E 6P6 | ☎ : (807) 356-1731 | : rami.elmawed@ontario.ca

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: December 10, 2021 11:53 AM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Jason,
That's great, yes please add us to the agenda for Dec 20 at 9:30 am.
We will provide a draft slide deck for your review by end of day Monday, Dec 13.
Thanks very much,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Thursday, December 9, 2021 1:51 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Margaret,

Sorry for the confusion in my previous email. Engineering Meetings are every Monday.

There is a time slot available on **Monday December 20, 2021 from 9:30-10.**

Thank you,
Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: December 9, 2021 1:48 PM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Jason,
Are you suggesting a meeting on Monday, Dec 13 at 9:30 am? Unfortunately it will take us the rest of today and tomorrow to develop the design options for the 2 locations, so we won't be ready for Monday at 9:30 am.

Would any other day next week work? Agree that 30 minutes will be enough time.
Please let us know,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Thursday, December 9, 2021 10:11 AM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Margaret,

There is a time slot from 9:30-10. Also during a meeting yesterday unrelated to DSBRT which included Sam. Jason White requested MX review additional cross sections including no barriers at highway 412.

Thank you,
Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: December 8, 2021 9:55 AM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Jason,
Thank you, these notes and actions match our understanding.
The team is already working to address the feedback received during the meeting.

Would it be possible to schedule the next engineering meeting before the end of 2021 to get the final endorsement?
We should have a draft slide deck for you to review on Monday, Dec 13.
Please let me know,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Wednesday, December 8, 2021 9:43 AM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

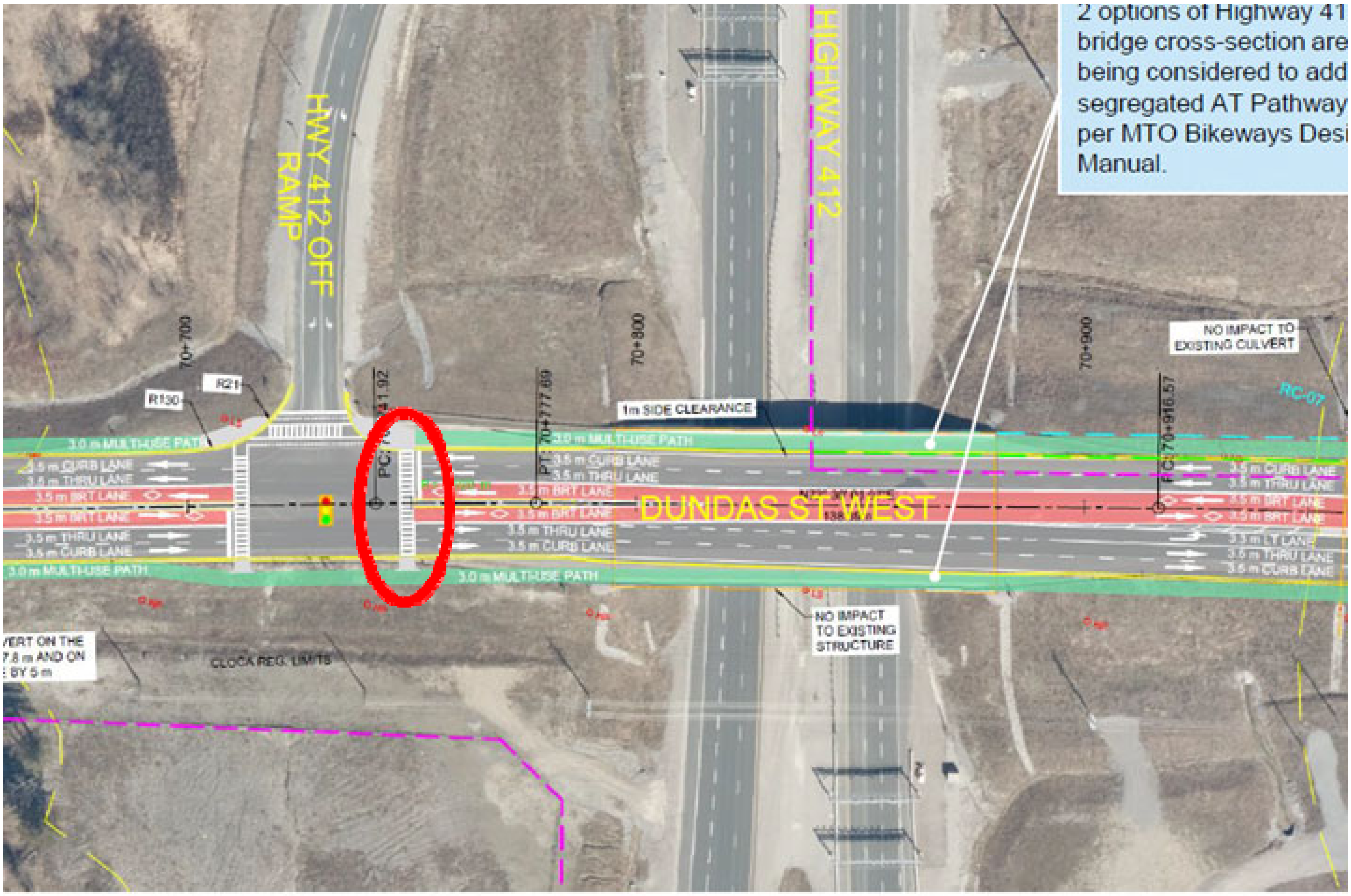
Hi Margaret and Team,

Good job with the presentation yesterday to the executives. There was some great feedback from the meeting and a few action items that I made a note of.

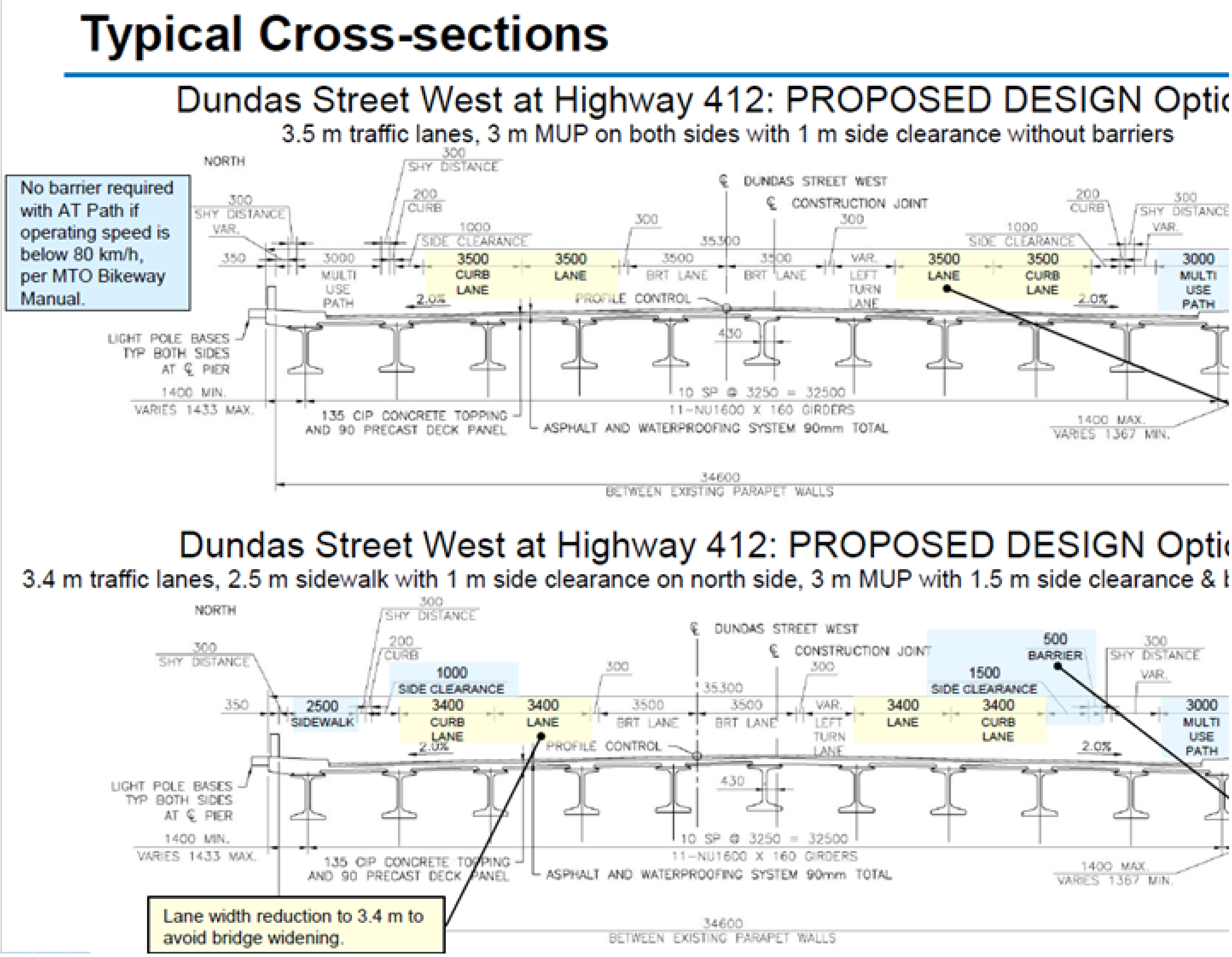
1. Review of additional on ramp options, specifically reviewing modifying the existing N-W to take advantage of the additional property from closing the S-W ramp. I took a look at google street view this morning and noticed this will likely result in utility relocations.

2. Review of cross section underneath the structure at Kingston Rd. and 401. It’s my understanding that both Structures and Foundations do not want to change the slopes to protect the existing shallow foundations. I would suggest, confirmation from the Team that the cross section is restricted due to the shallow foundation.

3. Removal of cross walks at Highway 412 that have additional points of conflict. We likely don’t need both cross walks at each intersection. I’m not 100% certain which cross walk we’d remove at the east intersection but I highlighted what I think needs ot be removed from yesterday’s discussion. I will let your team decide which one is not required. In addition, it should be noted that both these intersections will now be signalized.



4. Additional options including how they impact the lane width
   - Removing the AT Path on the North side
   - Maintaining the existing 1.8m sidewalk on the North Side.



All the other proposed endorsements including lane widths seemed to be fine. We got no comments or conerns about them execpt at the 412 stucture which an additional review I required under action item 4 above.

After the 4 items noted above are complete, the next step would be get the final endorsement at an engineering meeting. Since all the execs are up to speed on the projects, the endorsement presentation will be a summary what was presented in slides 37-41 with additional information as required.

Feel free to call me or Rami to discuss any questions or concerns you may have.

Thank you,

Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: December 1, 2021 6:12 PM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Jason,
Attached is the revised slide deck for Dec 7, and a PDF with responses to each of your comments.

Main changes to the slide deck include:

Slide 6 – new slide
Slide 8 – "No Right Turn On Red" recommendation added.
Slide 27 – Text updated in the blue box to reflect 2 options being presented.
Slide 38 – new Exemption Summary slide: Closure of Highway 401 S-W On-Ramp
Slide 39 - new Exemption Summary slide: Reduction in Taper Length at Highway 401 N-W On-Ramp.

We received the meeting invite for Dec 7, and understand we are to join the meeting at 3:30 pm for this project.
Sam Dinatolo will present the slides, 3 to 4 others from the project team and Metrolinx will attend to answer questions.
Please confirm your receipt, and let me know if you need anything else,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Tuesday, November 30, 2021 2:34 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Margaret,

Rami and I reviewed the presentation. We've including some comments in the PDF. Overall we like the format and it looks good. Our only real concern is we'd like you to include a slide about an exemption request for 401/ Kingston Road off ramp closure.

Feel free to reach out to us if you have any questions to discuss the comments. Adriano will send out the invite to the meeting tomorrow, once received I will forward it to you and Sam so you can share it with anyone else who may be joining us.

Thank you,

Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: November 29, 2021 5:47 PM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Jason and Rami,
Attached for your review is the draft slide deck for December 7 presentation.

As discussed, we kindly request your comments by noon on Wednesday, December 1.
We will incorporate your feedback by noon on Thursday, December 2.

Thanks in advance,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Thursday, November 25, 2021 7:12 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Margaret,

Thank you for sending this email confirmation summarizing the discussion you had with Rami.

I've booked the exec meeting for the 7th. It's my understanding that there are going to be two meetings before our so it's currently tentatively 3pm. I've requested our meeting be the last one and a minimum of 1 hour.

Thank you,

Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: November 25, 2021 6:22 PM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Jason and Rami,
Confirming that we will provide a draft presentation by end of day Monday, November 29 for your review.
We would appreciate receiving any comments by noon on Wednesday, December 1. We will incorporate your feedback by noon on Thursday, December 2.

Also confirming that we are available on December 7 to present to the MTO exec team.
Sam Dinatolo will lead the presentation.

Please advise what time the meeting will be held?

Thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Tuesday, November 23, 2021 4:33 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Margaret,

I'm just following up with our meeting earlier his week.

I'm proposing the following

1- MX to send draft presentation that they would like to share for the MTO exec team. In the presentation MX should have specific slides outlining endorsement requirements and rational. I envisioned the presentation similar to what Sam presented this week with a few additional slides for each endorsement – MX to send presentation to MTO by November 30th
2- Rami and I will review and comment on any changes we require before circulating it to the executives. – MTO to send comments to MX by December 3rd
3 -MX to address comments – MX to send presentation by December 7th
4- MX to present to senior management on December 14 – MTO to book meeting timeslot

The presentation must be supplied 1 week in advance of the exec meeting, if December 14th is unachievable, we may have to wait until the new year.

Thank you,
Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104

Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: November 18, 2021 2:26 PM
To: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>; Adrian Chiu <adrian.chiu@ibigroup.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Jason,
If your team is still available on Monday, Nov 22, we can meet from 10 to 11 am, or from 3 to 4 pm.
Please let me know and I'll send a meeting invite.
If not, what other days/times work at your end next week?

Attached are updated materials for MTO review, and responses to comments received.
Sending across multiple emails due to file size.

This email includes:

1. Responses to MTO Comments on Design Criteria August version (v0)
   a. TTM_DSBRT_DesignCriteria_VNcommentsAug2021v0_Responses-2021-11-17
2. Responses to MTO Comments on Design Criteria September version (v1)
   a. TTM_DSBRT_DesignCriteria_MTOcomments_Sep2021v1_Responses-2021-11-17
3. Responses to MTO Comment on Rollplan PIK-002 (embedded in PDF)
   a. 2_CPG_DSBRT_ROLLPLAN-PIK-002_MTO_2021-09-24 MTO Comments_Responses-2021-11-17.pdf
4. Responses to MTO comments received via November 15 email (XLS)
5. Responses to MTO comments on 3-step cycling memo received October 1 (XLS)

Thanks,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Sent: Monday, November 15, 2021 8:07 AM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Margaret,

The 22nd looks to be open. Anytime between 9:30 and 12:00 or after 2:00 pm.

With regards to the comments here is a few comments I've gotten so far:

The Highway Concessions Section(HCS) would like to provide the following comments in regards to the design at Kingston Road:

- HCS expects that all standards will meet or exceed current MTO ones
- The Concessionaire (407EDG) will likely require a series of conditions/requirements such as longer warranty periods and/or letters of credit and insurance obligations to be included in any potential encroachment permits that MTO and the Corridor Management Section may issue
- The Proponent will be expected to cover any additional costs to the Concessionaire including Capital and Operations, Maintenance and Rehabilitation costs (OM&R)
- HCS expects that all other specialty offices in MTO have been consulted and given an opportunity to share their respective comments/concerns on the submission. Including those related to the 412 crossing.

Regarding the information you provided we have the comments below;

- Dundas is used as a route for plow trucks. Plow trucks will use this interchange to turn, so this should be considered during design since can dramatically affect the route times.
- In general, according to the project agreement we are obligated to follow some conditions that the new designer should take account and follow also. Otherwise, the incompliance with PA obligations should be accepted by MTO and serve as a waiver of PA obligations (special attention to obligations included in schedules 15.2 and 15.3 of our PA)
- Regarding pavement. Since this is under discussion, we would ask the same requirements we requested to our subcontractor, for us to accept any new pavement, if finally this is the case (responsibility for new assets would need further discussion as we have been commenting in previous emails);

    - The threshold for wheel track rutting shall be as follows:
        - No wheel track ruts exceeding 4 mm on any Highway Running Surfaces (traffic lanes, crossing roads or ramps
        - The average wheel track rutting on any lane in any Roadway Section (as defined by Availability Segments) shall not exceed 2 mm

- International Roughness Index (IRI)
    - The average IRI on any traffic lane in each Roadway Section shall be less than or equal to 1.0 m/km.
    - The IRI performance value for any individual 50 meter length of traffic lane shall be less than or equal to 1.7 m/km.
- Skid resistance
    - The average skid resistance number shall be greater than or equal to 40. According to ASTM E 274 all Highway Running surfaces on all Roads shall be tested at posted speed in segments of 500 meters.

- Asphaltic concrete shall conform to OPSS 1151, November 2006 and the PGAC grade required shall be as follows;

  Hot Mix Type Grade
  Superpave 12.5 FC2 64-28
  Superpave 19.0 58-28
  Superpave 25.0 58-28

Apart from the comments we have been provided in previous emails that we would like to be taken account and discussed, these are preliminary comments to the information we have received. We hope to issue new comments as the process and conversation (and decision) about new asset responsibility progresses.

Regarding the AT 3 Step Memo and DC:

It's not clear what design standards are being used in the tables i.e. TAC & MTO supplement?

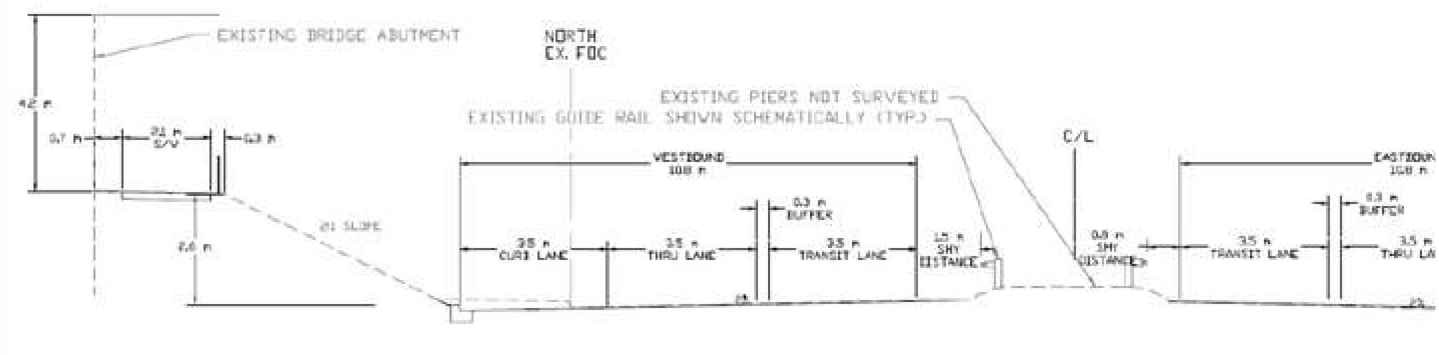
It's not clear why the Standards Table has 2 columns for "Design standards Urban Arterial Divided" with different values

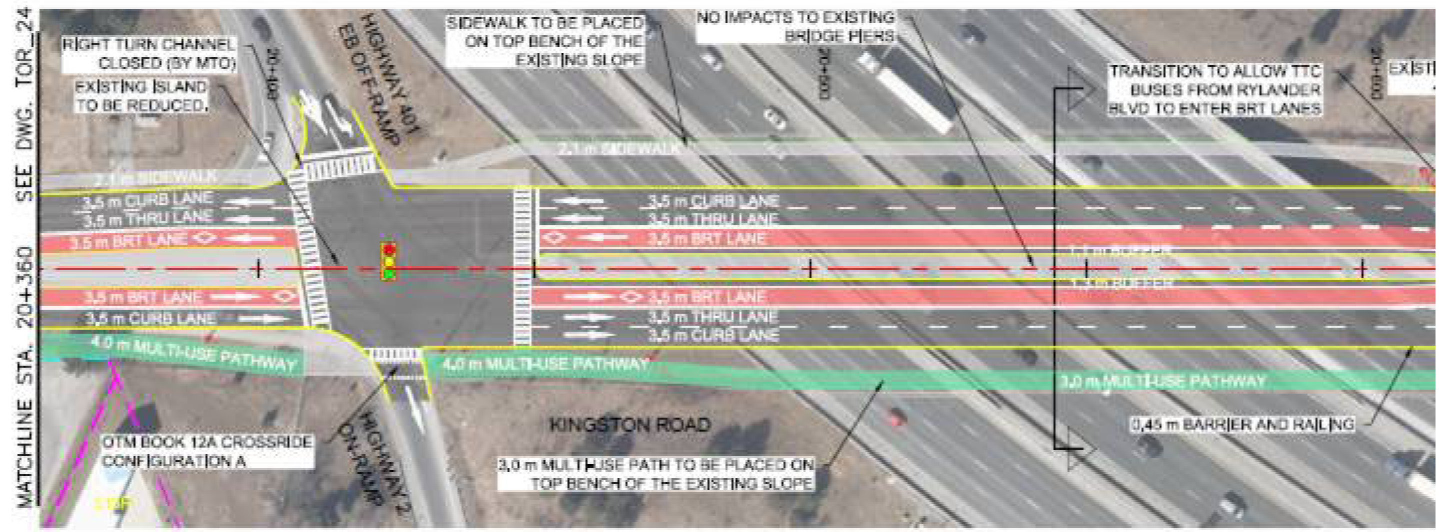
Does "Proposed Condition – Match Existing" mean there is no change from existing conditions?

The Standards Tables do not mention standards used for AT facilities

The cross-section shown in the DC for Kingston Road under Highway 401 shows proposed 4m MUP. However the other drawing provided shown below indicates that the MUP is 3m under the structure and 4m before and after the structure.

Kingston Road under Highway 401: PROPOSED C





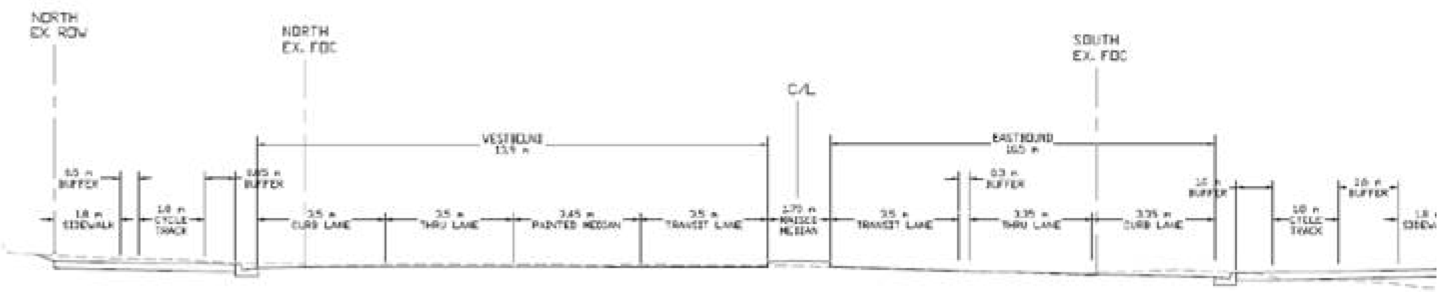
The document states “Proposed work on Kingston Road underneath the Highway 401 structure will be limited to pavement rehabilitation, lane re-striping and construction of a Shared Use Active Transportation Path at the top of the paved slope bench” Is there no opportunity to widen to provide wider lane widths?

The AT 3-step selection Memo states that the two-way AT path on the south side will end near Raspberry Road where cycle tracks and sidewalks will be started and go to the east. However, the design drawing and cross-section shown in the DC show the cycle tracks and sidewalks at the Hwy 401WB off-ramp terminal rather than a 4m wide multiuse path that appears to be the preferred design presented in the other drawing that was previously provided and what appears to be described in the AT Memo.

The text in the DC also states “At the Highway 401 interchange at Whites Road in Pickering, 1.8 m wide raised One-way Active Transportation Paths are proposed on both sides of Kingston Road. These will be located at sidewalk level with a minimum 0.8 m landscaped buffer from the proposed sidewalks" Is this description correct or is there a 4m wide MUP at the ramp terminal?

Standards Table 2 for Kingston Road (Highway 401 Whites Road Interchange) shows the design standard for Median lane = 3.50m and Other lanes = 3.75. Proposed standard is 3.5m. However the drawings provided show that the through lane widths are primarily 3.35m

Kingston Road at Highway 401 / Whites Road Interchange: PROPOSED CON



A couple comments on the Design Criteria.

Design Year
The Design Year for this project is 2041. The Program Year is as early as 2024, based on planned works in Durham Region.

If Program Year is 2024, we have a conflict with existing 2019-2025 - MEGA1B-Highway 401 EB Neilson to Whites EB Core/Collector, under construction 2019-2024 and MEGA 2B-Highway 401 EB Neilson to Whites WB Core/Collector, under construction 2025-2029.

Related Studies and Adjacent Projects

Did not see the MTO Projects listed.

Typical Structure Sections

From the Typical Structure Sections at Kingston Road under Highway 401: EXISTING CONDITION and PROPOSED CONDITION it is noted that there will be Active Transportation Path at the top of the paved slope bench and additional fill on the paved slope which introduces additional Lateral and Vertical Lading to the existing Foundation. The Ministry will need confirmation from the Structural and Foundation Section from the City of Toronto, that these changes will not impact the existing Structure.

The Typical Structure Sections shall be in the same scale.

I'm still following up with all the previous requests to get all the existing DC's and contracts requested.

Thank you,
Jason Hanna, P.Eng.
Senior Project Engineer
Major Planning Innovations Office – Major Planning Projects Section

T: (249) 733-1104
Ontario

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: November 12, 2021 1:48 PM
To: El Mawed, Rami (MTO) <Rami.ElMawed@ontario.ca>; Hanna, Jason (MTO) <Jason.Hanna@ontario.ca>
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David <david.hopper@parsons.com>; 'Kristin Demasi' <Kristin.Demasi@metrolinx.com>; 'Wilson Taveira' <Wilson.Taveira@metrolinx.com>; 'Matthew Coelho' <Matthew.Coelho@metrolinx.com>
Subject: RE: DSBRT- Update meeting with MTO

Hi Rami and Jason,
Just following up on the email below. Will you be able to provide all comments you have on file from MTO subject matter experts?

Jason, could we look at holding a meeting time the week of November 22?

Please let me know,
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Margaret Parkhill
Sent: Friday, November 5, 2021 2:47 PM
To: Rami.ElMawed@ontario.ca; Jason.Hanna@ontario.ca
Cc: sam.dinatolo@parsons.com; wendy.ng@parsons.com; Hopper, David (david.hopper@parsons.com) <david.hopper@parsons.com>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Wilson Taveira <Wilson.Taveira@metrolinx.com>; Matthew Coelho <Matthew.Coelho@metrolinx.com>
Subject: DSBRT- Update meeting with MTO

Hi Rami and Jason,
Attached is the slide deck from our Nov 4 meeting.

As noted, we are in the TPAP period, and would appreciate your support in advancing MTO's technical review of the DSBRT to be able to bring the project forward to MTO Senior Management in December 2021.
To meet Durham Region's funding timelines, we plan to conclude the TPAP period on January 6, 2022.

From the discussion, I understand our next steps to be:

1. Jason to provide all comments on file from MTO subject matter experts from Aug/Sept 2021
2. Jason and Margaret to schedule next technical meeting week of November 15 – Jason can you provide options that work best for MTO?
3. MTO to confirm if the following information is available:
    a. Present condition design criteria, including ramp design speeds, superelevation maximum rates, shoulder rounding, sight distances at exit/entrance terminal, exit/entrance terminal speed-change lane lengths for:
        i. Highway 401 @ Kingston Road - W-N/S OFF RAMP
        ii. Highway 401 @ Kingston Road - N-W ON RAMP
        iii. Highway 401 @ Kingston Road – E-N/S OFF RAMP
        iv. Highway 401 @ Whites Road/Kingston Road - N/S-W ON RAMP
        v. Highway 401 @ Whites Road/Kingston Road – E-N/S OFF RAMP
        vi. Highway 412 @ Dundas Street W – N-E/W OFF RAMP
        vii. Highway 412 @ Dundas Street W – E/W-N ON RAMP
    b. Contract drawings showing exit/entrance terminal speed-change lanes, Highway 401 collector profile, and Highway 412 collector profile.
    c. MTO Corridor Access Plan
    d. PHM-125 drawing for PHM for the ramp terminal intersection of 401 & Kingston E-N/S (east of Port Union Rd).
4. DSBRT project team (IBI & Parsons) will revise Design Criteria and 3-step Cycling Facility Selection memo based on comments received
5. DSBRT project team (IBI & Parsons) to circulate draft PHM-125 drawings at 5 intersections

Let me know if I missed or misunderstood anything.
Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

DURHAM – SCARBOROUGH
Bus Rapid Transit

Hydro One

Prepared for Metrolinx
by IBI Group & Parsons

Yash Kulshreshtha

From:	SUN Hongxia <Susan.SUN@HydroOne.com> on behalf of SECONDARY LAND USE Department <SecondaryLandUse@HydroOne.com>
Sent:	Thursday, December 2, 2021 3:51 PM
To:	Madelin Blacha
Cc:	Paul Niejadlik; Kristin Demasi; Margaret Parkhill; Yash Kulshreshtha; KING-COSTA Daniel; SECONDARY LAND USE Department
Subject:	RE: Durham-Scarborough Bus Rapid Transit - For Review
Follow Up Flag:	Flag for follow up
Flag Status:	Flagged

Good afternoon Madelin,

Thanks for your response. Hydro One will not provide further comments regarding the draft EPR.

Hydro One will require detailed engineering drawings of all proposed permanent changes occurring within the operating limits of the corridor. Please ensure these drawings are met Hydro One Technical Review requirements.

Thanks,
Susan

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: Tuesday, November 30, 2021 5:16 PM
To: KING-COSTA Daniel <Daniel.King-Costa@HydroOne.com>; SECONDARY LAND USE Department <SecondaryLandUse@HydroOne.com>
Cc: Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: Durham-Scarborough Bus Rapid Transit - For Review

Good afternoon Secondary Land Use,

We received the attached email and letter in response to the Notice of Commencement for this project. We are trying to understand if Hydro One will be providing any additional comments. Could you please confirm if Hydro One is reviewing the draft EPR for this project per the below request? If so, when do you anticipate comments will be provided to the project team?

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

Vacation Dec 3-6

From: Madelin Blacha
Sent: November 18, 2021 11:46 AM
To: 'Daniel.King-Costa@HydroOne.com' <Daniel.King-Costa@HydroOne.com>
Cc: 'SecondaryLandUse@HydroOne.com' <SecondaryLandUse@HydroOne.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: Durham-Scarborough Bus Rapid Transit - For Review
Importance: High

Good morning,

The Transit Project Assessment Process (TPAP) for the Durham-Scarborough Bus Rapid Transit (BRT) project commenced on October 14, 2021. The draft Environmental Project Report is now available for review and comment by government agencies.

You should receive a separate email with a link to this OneDrive location for file sharing:
https://ddei5-0-ctp.trendmicro.com:443/wis/clicktime/v1/query?url=https%3a%2f%2fibigroup%2dmy.sharepoint.com%2f%3af%3a%2fr%2fpersonal%2fmargaret%5fparkhill%5fibigroup%5fcom%2fDocuments%2fDSBRT%5fGRTreview%5f2021%2d11&umid=247AE373-D208-E505-841E-402F93C31366&auth=2d642bc0e91c4252d9fd41a45fae119e296f143e-44c4a95e304cf5a4c0ae3b58ced4db385daae04d

We kindly request all comments by **Friday, December 3, 2021** using the attached tracking table. If reviewing more than one document, we ask that you create a different XLS for each document you review. If more than one reviewer per document from your agency, we ask that you nominate one person to assemble the comments from all into one XLS per document.

NOTE: This material is not to be shared publicly. Once we have received comments from all municipal agencies, conservation authorities, and ministries, we will respond to comments in writing and update the reports accordingly. The Environmental Project Report will be made public for a 30-day review period in January 2022.

Please reach out if you have any issues with accessing the files or any other questions.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
Metrolinx
10 Bay Street | Toronto | Ontario | M5J 2R8
C: 416-821-3931
E: madelin.blacha@metrolinx.com

METROLINX

DURHAM – SCARBOROUGH
Bus Rapid Transit

Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)

Prepared for Metrolinx
by IBI Group & Parsons

From: Hatcher, Laura (MHSTCI)
To: Madelin Blacha
Cc: Barboza, Karla (MHSTCI); Zirger, Rosi (MHSTCI); Hamilton, James (MHSTCI); Kristin Demasi; Paul Niejadlik; Jennifer Smith; Lindsay Prihoda; Margaret Parkhill; Hopper, David; Yash Kulshreshtha; Cameron, Anne (MECP); Desautels, Solange (MECP)
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit
Date: Friday, December 3, 2021 3:10:21 PM

Hi Madelin,

Thank you for the draft CHERs. We are available for a meeting on Friday at that time. I'm also adding Anne and Solange from MECP to the email, in case they would also like to attend.

Have a good weekend,

Laura

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: December 3, 2021 10:34 AM
To: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Jennifer Smith <Jennifer.Smith@metrolinx.com>; Lindsay Prihoda <Lindsay.Prihoda@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

Hi Laura,

We can certainly provide the 10 Draft CHERs to the MHSTCI as information. Please note, of the 10 Draft CHERs prepared:

- 2 CHERs have been reviewed by municipal heritage staff and Indigenous Nations. Feedback has been incorporated and the reports will be reviewed by the Metrolinx Heritage Committee this month.
- 8 CHERs were provided to municipal heritage staff for review this week and will be provided to Indigenous Nations for review next week.

You should receive a separate email with a link to this OneDrive location: [redacted]

The project team is available to discuss the CHER approach and evaluation results with MHSTCI on Fri Dec 10 at 9:30am-12pm. Please let me know if you're available at this time and I will schedule the meeting.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931
Vacation Dec 3-6

From: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Sent: November 30, 2021 12:37 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

Hi Madelin,

I will aim to provide comments as soon as possible, but we can not commit to providing all comments by the 9th. I will prioritize providing you with comments on the Cultural Heritage Report by the 9th, as it forms the basis for the built heritage resources and cultural heritage landscape sections in the EPR. Then, comments on the EPR will follow.

I see that the Cultural Heritage Report states that CHERs will be finalized during detailed design, and that the Metrolinx Heritage Committee will provide provisional decisions and draft CHER reports during TPAP. We understand that Metrolinx has not yet determined ownership of some properties, but we continue to advise that for directly impacted properties, CHERs need to be finalized during TPAP in order to meet Metrolinx's obligations as TPAP proponent and under the Ontario Heritage Act.

Please let us know if you would like to set up a meeting to discuss any of this.

Sincerely,

Laura

Laura Hatcher, MCIP, RPP
Heritage Planner
Heritage Planning Unit | Programs and Services Branch | Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
401 Bay Street Suite 1700 Toronto ON M7A 0A7
Tel. 437-239-3404 New | email: laura.e.hatcher@ontario.ca

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: November 25, 2021 5:46 PM
To: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

Hi Laura,
Please see attached responses to MHSTCI's comments on the CHR and EPR. The updated files are available for review. You should receive a separate email with a link to this OneDrive location:
[redacted]
If you could please kindly review and confirm the responses and edits are acceptable to the MHSTCI, no later than **Thursday, December 9, 2021**. It would be very much appreciated if MHSTCI staff could scan the responses sooner, if possible, and let us know if there are any concerns that should be discussed with the project team. This timing is important to issue Notice of Completion and start the 30-day public review in January 2022.
Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Sent: June 23, 2021 1:14 PM
To: Kristin Demasi <Kristin.Demasi@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Darcy Wiltshire <Darcy.Wiltshire@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; David Hopper <David.Hopper@parsons.com>; Mia.Yu@parsons.com; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>
Subject: FW: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

Good afternoon Kristin and Margaret,
Please find attached a letter and comments from MHSTCI on the above mentioned project.
Sincerely,
Laura

Laura Hatcher, MCIP, RPP
Heritage Planner
Heritage Planning Unit | Programs and Services Branch | Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
401 Bay Street Suite 1700 Toronto ON M7A 0A7
Tel. 437-239-3404 New | email: laura.e.hatcher@ontario.ca

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: May-25-21 10:03 AM
To: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>
Cc: Kristin Demasi <Kristin.Demasi@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>; Darcy Wiltshire <Darcy.Wiltshire@metrolinx.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Hopper, David <david.hopper@parsons.com>; Yu, Mia <Mia.Yu@parsons.com>

Subject: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

We are providing the draft Environmental Project Report (EPR) for the Durham-Scarborough Bus Rapid Transit (DSBRT) project to the
Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) for review electronically.
We kindly request all comments by **Friday, June 18, 2021**.
Notice of TPAP Commencement is currently planned for mid-July 2021.
The draft EPR sections and appendices can be found at the below link:
[redacted]
Note the following information:
1. The preliminary design is expected to undergo refinements for two segments before TPAP commencement. These refinements will reduce the overall footprint of the project. Once the design is confirmed, including on-going consultation with the local municipalities, the draft EPR will be revised including the extent of impacts. In general, impacts are expected to be reduced compared to the analysis completed to date. The two segments being refined are:
a. In the City of Toronto, along Ellesmere Road from Military Trail to Kingston Road, and
b. In the Town of Whitby, along Dundas Street from Annes/Cochrane to Garden Street.
2. Pre-TPAP consultation with local resident groups, businesses, and elected officials will continue through early June 2021. Documentation of this consultation will be added to the draft EPR after this round of consultation concludes. Note two on-line live events:
a. May 20, 2021 in the Town of Whitby, and
b. June 3, 2021 in the City of Oshawa.
This draft EPR circulation includes the majority of supporting technical studies completed in support of the project. Note that there are four draft EPR appendices that will be provided for review in the next 2 weeks, by June 4, 2021. The relevant EPR subsections will be provided as well (e.g. Section 3, 4, 7, 8), with additional review time:

- Appendix B2: Traffic Analysis – Downtown Whitby
- Appendix H: Air Quality Impact Assessment
- Appendix I: Noise and Vibration Impact Assessment
- Appendix J: Stormwater and Hydrology Report

We look forward to receiving your comments on these materials by **Friday, June 18, 2021**.
Should you have any questions or concerns, or trouble accessing the files, please let me know,
Margaret

Margaret Parkhill
Associate Director - Practice Lead, Transportation Engineering
IBI GROUP
7th Floor - 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel +1 416 596 1930 ext 61578 fax +1 416 596 0644

This e-mail is intended only for the person or entity to which it is addressed. If you received this in error, please contact the sender and delete all copies of the e-mail together with any attachments.

From:	Hatcher, Laura (MHSTCI)
To:	Margaret Parkhill
Cc:	Madelin Blacha
Subject:	RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit
Date:	Friday, December 17, 2021 12:39:14 PM

Hi Margaret and Madelin,

I'll be sending over our comments shortly today. Considering the tight timelines Rosi stepped in to review the EPR and she's just completed that -- I will be sending those comments along as well.

Laura

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: December 16, 2021 4:37 PM
To: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Cc: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

Hi Laura,

Just checking in on your review of the two CHERs – is there anything else you need from us?

Do you still expect to provide comments tomorrow?

Thanks in advance,

Margaret

Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Sent: Friday, December 10, 2021 2:58 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Hopper, David <David.Hopper@parsons.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

Thank you Margaret, I was able to download the CHERs. I will focus on CHERs 1 and 7.

Madelin, when you have a moment, would you be able to send over the DSBRT Heritage Guidance document?

Thanks,

Laura

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: December 10, 2021 12:17 PM

To: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>; Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Hopper, David <David.Hopper@parsons.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Laura,
Thank you for the comments, we will start reviewing right away.
Further to this morning's meeting, we kindly request that you prioritize review of the following two CHERs:

- CHER 1 (report 20CH-136): includes 3 properties. We are interested in your comments on the structural/organizational level. If possible, could you also comment on the research/analysis of at least one of the properties:
    - CHR #s AJ-007, AJ-008, and AJ-009
    - 2 properties met O.Reg. 9/06 and 1 did not meet O.Reg. 9/06
- CHER 7 (report 21CH-057): includes 1 property.
    - CHR # OS-006; 731 King Street West, City of Oshawa
    - Commercial property meeting O.Reg. 9/06

Please let me know if you have any trouble accessing the CHERs on Sharepoint.
[redacted]
Thanks,
Margaret
Margaret Parkhill, P.Eng.
IBI Group
416 596 1930 ext 61578

From: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Sent: Friday, December 10, 2021 11:33 AM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; Hopper, David <David.Hopper@parsons.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit
Hi Madelin,
Thank you for the meeting this morning. Please find attached MHSTCI's comments on the Cultural Heritage Report. These comments build on the comments and responses between MHSTCI and Metrolinx since March 2021 and reflect feedback on the most recent Cultural Heritage Report.

I have kept this email to the original circulation list, and so have not copied everyone who was in attendance at our meeting this morning.
Please let me know if there are any questions about these comments.
Sincerely,
Laura

From: Hatcher, Laura (MHSTCI)
Sent: November 30, 2021 12:37 PM
To: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit
Hi Madelin,
I will aim to provide comments as soon as possible, but we can not commit to providing all comments by the 9th. I will prioritize providing you with comments on the Cultural Heritage Report by the 9th, as it forms the basis for the built heritage resources and cultural heritage landscape sections in the EPR. Then, comments on the EPR will follow.
I see that the Cultural Heritage Report states that CHERs will be finalized during detailed design, and that the Metrolinx Heritage Committee will provide provisional decisions and draft CHER reports during TPAP. We understand that Metrolinx has not yet determined ownership of some properties, but we continue to advise that for directly impacted properties, CHERs need to be finalized during TPAP in order to meet Metrolinx's obligations as TPAP proponent and under the Ontario Heritage Act.
Please let us know if you would like to set up a meeting to discuss any of this.
Sincerely,
Laura
Laura Hatcher, MCIP, RPP
Heritage Planner
Heritage Planning Unit | Programs and Services Branch | Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
401 Bay Street Suite 1700 Toronto ON M7A 0A7
Tel. 437-239-3404 New | email: laura.e.hatcher@ontario.ca

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: November 25, 2021 5:46 PM
To: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Cc: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Batista, Cindy (MECP) <Cindy.Batista@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>; David Hopper <David.Hopper@parsons.com>; 'Yash

Kulshreshtha' <yash.kulshreshtha@ibigroup.com>
Subject: RE: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Laura,

Please see attached responses to MHSTCI's comments on the CHR and EPR. The updated files are available for review. You should receive a separate email with a link to this OneDrive location:

[redacted]

If you could please kindly review and confirm the responses and edits are acceptable to the MHSTCI, no later than **Thursday, December 9, 2021**. It would be very much appreciated if MHSTCI staff could scan the responses sooner, if possible, and let us know if there are any concerns that should be discussed with the project team. This timing is important to issue Notice of Completion and start the 30-day public review in January 2022.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Sent: June 23, 2021 1:14 PM
To: Kristin Demasi <Kristin.Demasi@metrolinx.com>; Margaret Parkhill <margaret.parkhill@ibigroup.com>
Cc: Darcy Wiltshire <Darcy.Wiltshire@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; David Hopper <David.Hopper@parsons.com>; Mia.Yu@parsons.com; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>
Subject: FW: File 0010832: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

EXTERNAL SENDER: Do not click any links or open any attachments unless you trust the sender and know the content is safe.
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Good afternoon Kristin and Margaret,

Please find attached a letter and comments from MHSTCI on the above mentioned project.

Sincerely,

Laura

Laura Hatcher, MCIP, RPP
Heritage Planner
Heritage Planning Unit | Programs and Services Branch | Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
401 Bay Street Suite 1700 Toronto ON M7A 0A7
Tel. 437-239-3404 New | email: laura.e.hatcher@ontario.ca

From: Margaret Parkhill <margaret.parkhill@ibigroup.com>
Sent: May-25-21 10:03 AM
To: Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>

Cc: Kristin Demasi <Kristin.Demasi@metrolinx.com>; Oscar A Tapia <Oscar.Tapia1@metrolinx.com>; Darcy Wiltshire <Darcy.Wiltshire@metrolinx.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>; Hopper, David <david.hopper@parsons.com>; Yu, Mia <Mia.Yu@parsons.com>
Subject: Draft EPR for review - Durham-Scarborough Bus Rapid Transit

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

We are providing the draft Environmental Project Report (EPR) for the Durham-Scarborough Bus Rapid Transit (DSBRT) project to the
Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) for review electronically.
We kindly request all comments by **Friday, June 18, 2021**.
Notice of TPAP Commencement is currently planned for mid-July 2021.
The draft EPR sections and appendices can be found at the below link:
[redacted]
Note the following information:
1. The preliminary design is expected to undergo refinements for two segments before TPAP commencement. These refinements will reduce the overall footprint of the project. Once the design is confirmed, including on-going consultation with the local municipalities, the draft EPR will be revised including the extent of impacts. In general, impacts are expected to be reduced compared to the analysis completed to date. The two segments being refined are:
a. In the City of Toronto, along Ellesmere Road from Military Trail to Kingston Road, and
b. In the Town of Whitby, along Dundas Street from Annes/Cochrane to Garden Street.
2. Pre-TPAP consultation with local resident groups, businesses, and elected officials will continue through early June 2021. Documentation of this consultation will be added to the draft EPR after this round of consultation concludes. Note two on-line live events:
a. May 20, 2021 in the Town of Whitby, and
b. June 3, 2021 in the City of Oshawa.
This draft EPR circulation includes the majority of supporting technical studies completed in support of the project. Note that there are four draft EPR appendices that will be provided for review in the next 2 weeks, by June 4, 2021. The relevant EPR subsections will be provided as well (e.g. Section 3, 4, 7, 8), with additional review time:

- Appendix B2: Traffic Analysis – Downtown Whitby
- Appendix H: Air Quality Impact Assessment
- Appendix I: Noise and Vibration Impact Assessment
- Appendix J: Stormwater and Hydrology Report

We look forward to receiving your comments on these materials by **Friday, June 18, 2021**.
Should you have any questions or concerns, or trouble accessing the files, please let me know,
Margaret

Margaret Parkhill
Associate Director - Practice Lead, Transportation Engineering
IBI GROUP
7th Floor - 55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel +1 416 596 1930 ext 61578 fax +1 416 596 0644

[redacted]

From: Madelin Blacha <Madelin.Blacha@metrolinx.com>
Sent: Tuesday, February 22, 2022 11:48 AM
To: 'Laura.E.Hatcher@ontario.ca'
Subject: FW: MHSTCI comments on Draft EPR and CHERs for Durham-Scarborough BRT
Attachments: DSBRT-Draft_CHR_CommentsResponses-MHSTCI-MX response.xlsx

Hi Laura,

Please see attached comment spreadsheet and responses below.

Thanks,

Madelin Blacha
Project Coordinator, Environmental Programs & Assessment
C: 416-821-3931

From: Hatcher, Laura (MHSTCI) <Laura.E.Hatcher@ontario.ca>
Sent: December 24, 2021 2:15 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; David Hopper <David.Hopper@parsons.com>; Yash Kulshreshtha <yash.kulshreshtha@ibigroup.com>
Subject: RE: MHSTCI comments on Draft EPR and CHERs for Durham-Scarborough BRT

Good afternoon,

I have reviewed the remaining eight Draft Cultural Heritage Evaluation Reports (CHER) that were provided to the Ministry on December 3, 2021.

The CHERs were all prepared by ASI and are for the following properties:

CHER 2: 571 Kingston Road West, 575 Kingston Road West, 577 Kingston Road West and 579 Kingston Road West, Town of Ajax
CHER 3: 3344 Ellesmere Road and 3832 Ellesmere Road, City of Toronto
CHER 4: 365 Kingston Road, City of Pickering
CHER 5: 944 Dundas Street East, 326 Dundas Street East, and 708 Dundas Street West, Town of Whitby
CHER 6: Pringle Creek Culvert and Canadian Pacific (CP) Rail Bridge over Dundas Street East, Town of Whitby
CHER 8: King Street West Bridge over Oshawa Creek, City of Oshawa
CHER 9: 1723 Dunchurch Street, City of Pickering
CHER 10: 207 Dundas Street West, 425 Dundas Street East, and 528 Dundas Street East, Town of Whitby

As with the other reports, the reports are organized and well researched. The evaluations against criteria set out in O.Regs 9/06 and 10/06 are adequately supported by research and analysis.

We have the same comment regarding the standard recommendation that appears in the reports in the Executive Summary and Section 11.0 Conclusions and Recommendations. When reviewing CHERs, the Metrolinx Heritage Committee should review the results of both O. Reg 9/06 and 10/06 evaluations. Furthermore, ownership does not need to be confirmed in order to review or confirm the findings of the CHERs. Therefore, this recommendation should be revised as follows in the reports:

> 3. The Metrolinx Heritage Committee will review the results of the *Ontario Regulation* ~~*10/06* evaluation and make a provisional decision. This decision will be confirmed once property ownership is confirmed (i.e., will the property come under provincial control).~~ *9/06 and 10/06 evaluation within this CHER before the completion of TPAP. If it is confirmed during detailed design that the property will be owned or controlled by Metrolinx, Metrolinx will issue a Metrolinx Heritage Committee Decision Form to confirm whether the property is a Provincial Heritage Property, a Provincial Heritage Property of provincial significance, or whether it is not a Metrolinx Heritage Property*." A similar edit was made in the reports:

Metrolinx Heritage Committee has reviewed the results of the Ontario Regulations 9/06 and 10/06 evaluations and has made an interim decision. Metrolinx Heritage Committee is in agreement with the results and recommendations of this report. It should be noted that the Metrolinx Heritage Committee will confirm the decision if Metrolinx owns or controls the property in the future.

As with our comments on the first two CHERs we reviewed, we recommend notes to draft are deleted entirely, or revised to simply say that property ownership and/or control will be confirmed during detailed design. There is no need to update the CHER. This edit was made in the reports. All NTDs removed.

Finally, we note that for two properties (944 Dundas Street East, Whitby and 1723 Dunchurch Street, Pickering), the Municipal Heritage Committee (or LACAC) had inventoried these properties as being of interest (although not listed on the municipal register or designated), but ASI's evaluation found that they did not meet O.Reg 9/06 or 10/06 Criteria. We understand that these reports are being shared with the relevant municipalities and that they may have more information to contribute that could have bearing on these evaluations. Following municipal review and input, the following two properties were found to meet O. Reg. 9/06 criteria: 3344 Ellesmere Rd (Toronto) and 1723 Dunchurch St (Pickering). These are reflected in the CHERs made available online during the 30-day review period.

Thank you, and happy holidays.

Sincerely,

Laura

Laura Hatcher, MCIP, RPP
Heritage Planner
Heritage Planning Unit | Programs and Services Branch | Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
Tel. 437-239-3404 New | email: laura.e.hatcher@ontario.ca

From: Hatcher, Laura (MHSTCI)
Sent: December 17, 2021 1:01 PM
To: Margaret Parkhill <margaret.parkhill@ibigroup.com>; Madelin Blacha <Madelin.Blacha@metrolinx.com>
Cc: Hamilton, James (MHSTCI) <James.Hamilton@ontario.ca>; Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>; Zirger, Rosi (MHSTCI) <Rosi.Zirger@ontario.ca>; Desautels, Solange (MECP) <Solange.Desautels@ontario.ca>; Cameron, Anne (MECP) <Anne.Cameron@ontario.ca>; Kristin Demasi <Kristin.Demasi@metrolinx.com>; Paul Niejadlik <Paul.Niejadlik@metrolinx.com>; Hopper, David <David.Hopper@parsons.com>; Yash Kulshreshtha

<yash.kulshreshtha@ibigroup.com>
Subject: MHSTCI comments on Draft EPR and CHERs for Durham-Scarborough BRT

Good afternoon DSBRT Project Team,

Thank you for sending the Revised Draft Environmental Project Report (EPR) (provided to MHSCTI on November 25, 2021, prepared by Parsons and IBI Group). We also thank you for sending the Draft Cultural Heritage Evaluation Reports (CHER) (provided on December 3, 2021 and prepared by ASI).

As agreed at our December 10th meeting, we have reviewed a sample of two of the seven CHERs and have the following general observations, comments and recommendations.

Detailed comments for the Revised Draft EPR are provided in the consolidate tables of comments/response attached.

Draft Cultural Heritage Evaluation Reports (CHERs)

- CHER #1: *601 Kingston Road West, 605 Kingston Road West and 607-611 Kingston Road West, Town of Ajax* (dated September 2021 (revised Nov 2021 and Dec 2021) and prepared by ASI
- CHER #7: *731 King Street West, City of Oshawa* (dated May 2021 (Revised September and December 2021) Prepared by ASI

Overall, we find that both reports are organized and well researched. The evaluations against criteria set out in O.Regs 9/06 and 10/06 are adequately supported by research and analysis. That being said we have the following report specific comments:

- Recommendation #3 (in the Executive Summary and Section 11.0 Conclusions and Recommendations)
  When reviewing CHERs, the Metrolinx Heritage Committee should review the results of both O. Reg 9/06 and 10/06. Therefore, this recommendation should be revised as follows:

  3. The Metrolinx Heritage Committee will review the results of the *Ontario Regulation* ~~*10/06* evaluation and make a provisional decision. This decision will be confirmed once property ownership is confirmed (i.e., will the property come under provincial control).~~ *9/06 and 10/06 evaluation within this CHER before the completion of TPAP. If it is confirmed during detailed design that the property will be owned or controlled by Metrolinx, Metrolinx will issue a Metrolinx Heritage Committee Decision Form to confirm whether the property is a Provincial Heritage Property, a Provincial Heritage Property of provincial significance, or whether it is not a Metrolinx Heritage Property*."

- The following "Note to Draft" should be deleted entirely or revised as follows:
  "NTD: Property ownership and /or control of ~~as a result of the direct impacts to~~ 601 Kingston Road West, 605 Kingston Road West and 607-611 Kingston Road West will be confirmed during detailed design. ~~This Draft CHER will be updated and finalized accordingly at that time."~~

Revised Draft Environmental Project Report (EPR) (provide to MHSCTI on November 25, 2021 prepared by Parsons and IBI Group)

The Draft EPR requires extensive and substantive revisions to update the Cultural Heritage Components of this TPAP, including:

- Inclusion of the findings and outcomes of CHERs. This will require updates to the Existing Conditions sections and also corresponding updates to the Impacts / Mitigation Measures and also the future Commitments sections.

- Revision to the language used to described impacts. For example, encroachments are direct impacts. Therefore, the corresponding tables in both the Cultural Heritage Reports and the Revised Draft EPR should be revised to removed contradictory information that categories encroachment as “No Direct Impact to Property”.

  If further clarification is required at this point, our availability to discuss this prior to the holiday break is limited to the morning of Tuesday December 21st.

Given the truncated TPAP period, and in order to support Metrolinx in the project, please send us revised chapters of the EPR (e.g. Chapter 3-Existiign Conditions; Chapter 4 – Impacts, Mitigation and Monitoring and Chapter 8- Commitments to Future Work) prior to the end of the review period for our review. Providing a response table alone will not be sufficient.

Thank you for the opportunity to review these reports and to support Metrolinx in its delivery of this important transit project.

Sincerely,
Laura

Laura Hatcher, MCIP, RPP
Heritage Planner
Heritage Planning Unit | Programs and Services Branch | Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
Tel. 437-239-3404 New | email: laura.e.hatcher@ontario.ca

Item No.	Discipline	Reviewer Name	Dwg. #/ Spec Section/ Page #	Review Comment (Metrolinx, Third Party Reviewers)	Response & Details (Designer)	Action 1 / 2 / 3* (Designer)	Review Comment (Metrolinx, Third Party Reviewers)	Response & Details (Designer)	Action 1 / 2 / 3* (Designer)	Review Comment (Metrolinx, Third Party Reviewers)	Response & Details (Designer)	Action 1 / 2 / 3* (Designer)
MHSTCI Comments March 2021												
50	MHSTCI - Coverletter	Dan Minkin		Cultural Heritage Evaluation Reports (CHERs) should be completed for a known or potential built heritage resource (BHR) or cultural heritage landscape (CHL) that may be adversely impacted whether the potential adverse impact is direct or indirect; during the TPAP if it is direct, and during detailed design at the latest if it is indirect. Various sections of the report suggest that CHERs would only be carried out for directlyimpacted resources	CHERs are in progress for all properties where direct significant impacts are anticipated to structures or heritage trees that are not likely to change as a result of design refinement. These are anticipated to be complete before the TPAP is complete. Where there are direct impacts that do not impact a structure, a commitment will be made in the EPR to complete these CHERs during design and well before construction or impact. This is because design refinement may alter these anticipated impacts.	1	Thank you for the clarification. Resolution of this comment is pending completion of CHER reports and updates to report language.	As a result of design adjustments, additional impacts to properties with Potential BHR were identified in November and Draft CHERs are underway. Draft CHERs include an evaluation of O. Reg. 10/06 criteria for each property and will therefore require review by the Metrolinx Heritage Committee (MHC). As a result, Draft CHERs will not be finalized during the TPAP but will be finalized during detail design. CHR and EPR will include preliminary O. Reg. 9/06 and10/06 results. Metrolinx will provide MHSTCI with a schedule of when Draft CHERs will be reviewed by the MHC.	2	The process outlined this table and in the Cultural Heritage Report differs from the process agreed upon by Metrolinx and MHSTCI in the past. CHERs will need to be completed during TPAP and provided in the EPR for any properties that may be directly impacted regardless of ownership – see MHSTCI's original comments on this project. Both O.Regs 9/06 and 10/06 will be applied and the CHER will confirm whether those properties have cultural heritage value or interest, and whether they are of provincial significance. The Cultural Heritage Report will summarize these findings and recommended preliminary mitigation measures. Then, during detailed design, if it is determined the property(ies) will be under Metrolinx's ownership and/or control, then Metrolinx Heritage Committee will confirm their status as provincial heritage properties based on the findings of the technical cultural heritage studies. This approach has been used for other Metrolinx TPAP projects in the past. It is not necessary for the Metrolinx Heritage Committee to issue a "provisional decision" on the CHERs during TPAP, and then convert this to a "confirmed decision" once ownership is confirmed during detailed design. Language regarding "provisional decision" should be removed from the Cultural Heritage Report to avoid confusion. Section "8.0 Conclusions and Recommendations", recommendation 8, should be revised regarding the timing for finalizing CHERs and MHC approvals. This change should also be made in the Executive Summary. Section "1.0 Introduction" and section "2.1 Regulatory Requirements" (last two paragraphs) also describe this approach and should be updated as well. We suggest the following wording can be adapted for the recommendations section and in the other sections above: "Property ownership and impacts for properties identified in Table 7 to Table detailed design. CHERs for directly impacted properties identified as Potential BHRs are underway and will be finalized before the completion of the TPAP. Once ownership and control are determined during detailed design, Metrolinx can then identify the properties as Provincial Heritage Properties (PHP), or Provincial Heritage Properties of Provincial Significance (PHPPS). Draft CHERs have indicated that none of the properties meet the criteria for provincial significance set out on O.Reg 10/06. If the finalized CHERs confirm this finding, the requirement that Metrolinx obtain the MHSTCI Minister's consent before removing or demolishing any buildings or structures on a PHPPS will not apply."	CHERs will be completed and finalized during the TPAP, including reviews by MHSTCI, municipalities, and Indigenous Nations. MHC will review each report as it is a requirement of Metrolinx if there is potential that the property may become provincially owned. Report indicates that property ownership will be confirmed during detail design.	1
51	MHSTCI - Coverletter	Dan Minkin		In the context of this project, any BHR or CHL that is subject to direct impacts will be property under the control of Metrolinx at the time of project implementation. This being the case, all properties identified as having cultural heritage value or interest and potentially subject to direct impacts should be treated as Metrolinx provincial heritage properties as defined under the Standards and Guidelines for Conservation of Provincial Heritage Properties and for purposes of Metrolinx Heritage Committee involvement	The known/potential BHRs/CHLs identified as subject to direct impacts are not currently owned/under control of Metrolinx, and are not expected to be at the time of project implementation. Should this change for any of the identified heritage properties that are being directly impacted, it is acknowledged that they should be treated as Metrolinx PHP.	3	MHSTI asks the project team to explain who will be controlling the properties at the time of project implementation. Please see our cover letter for the definition of "control" in the *Standards and Guidelines for Conservation of Provincial Heritage Properties*. MHSTCI recommends that language is added to the report to explain property ownership and control, currently and over the course of project implementation. Revisions should be made to section "1.1 Project Overview" to explain this. We also recommend including a statement in "2.1 Regulatory Requirements" where the *Standards and Guidelines for Conservation of Provincial Heritage Properties* are discussed.	Property ownership cannot be confirmed until detail design. This has been noted in the Draft CHERs. Property ownership will be confirmed in the Final CHERs.	2	Noted re: property ownership. However, CHERs can and should be finalized during TPAP, as their main purpose is to evaluate properties against O.Reg 9/06 and/or O.Reg 10/06. Once property ownership and control are determined during detailed design, this will determine whether a property is a PHP or a PHPPS.	CHERs will be completed and finalized during the TPAP.	1
53	MHSTCI - Coverletter	Dan Minkin		We note that CHERs have been undertaken for several properties on Kingston Road West in the Town of Ajax, with a finding that 571, 575, 577, 579, 601, and 607-611 Kingston Road West have cultural heritage value or interest under the criteria of Ontario Regulation 9/06. The CHERs indicate that none of the properties were evaluated under Ontario Regulation 10/06 because they are currently privately owned and are not expected to be under provincial ownership in the future. However, if they are being directly impacted and under provincial control, it may be appropriate to also apply the criteria of Ontario Regulation 10/06.	The properties were not evaluated under Ontario Regulation 10/06 because they are not currently, nor expect to be, under provincial ownership/control.	3	MHSTCI recommends that language is added to the CHERs to explain property ownership and control, currently and over the course of project implementation. In any case, the CHERs should evaluate the properties against O. Reg. 10/06, as per MHSTCI and MECP TPAP guidance (see cover letter).	Property ownership cannot be confirmed until detail design. This has been noted in the Draft CHERs. Property ownership will be confirmed in the Final CHERs. Draft CHERs include an evaluation of O. Reg. 10/06 criteria for each property.	2	Thank you for confirming these properties will be evaluated against O.Reg 10/06. Please see our comments above regarding CHER timing	Noted	

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54	MHSTCI - Coverletter	Dan Minkin		Based on the documentation provided, it is not clear whether relevant municipalities have reviewed the draft CHERs and, if so, how their comments were addressed. MHSTCI would appreciate further clarification regarding the proponent's application of the above-noted regulatory criteria under the Ontario Heritage Act and about the record of community engagement. We look forward to the Metrolinx Heritage Committee's review of the CHERs	Report to be revised to provide further detail on the record of community engagement.	1	Accepted, pending revisions to report.	The recommendations in the CHERs include submitting the report for review to the relevant municipality (and the MHSTCI) and the CHERs each contain a "Summary of Community Engagement" section. The requirement that a CHER should be submitted for review to relevant municipalities has been added to the report (Section 2.1). Language added to the report noting that the Draft CHERs will be reviewed by the MHC. The Draft CHERs will be circulated to the MHSTCI for review thereafter.	2	Thank you for the updates. Please see our comments above regarding MHC review and CHER timing.	Noted	
55	MHSTCI - Heritage Planning Unit	Dan Minkin		Executive Summary - Several of the comments below recommend revisions to components of the report that are also reflected in the Executive Summary, and so the Executive Summary should be revised in accordance with the revisions made pursuant to the comments below. This applies particularly to the recommendations.	Acknowledged.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Please revise Executive Summary to reflect new changes within the body of the report that arise from this round of review comments.	Noted and Executive Summary revised.	
56	MHSCTI - Heritage Planning Unit	Dan Minkin		Figure 1: Location of the Project Study Area Page 3 - This section should also refer to Appendix B for a detailed map depicting the study area.	Report will be revised to refer to Appendix B for detailed mapping.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Accepted	Noted	
57	MHSCTI - Heritage Planning Unit	Dan Minkin		2.1 Regulatory Requirements Page 4 - For clarity to the reader, we suggest that the reference to the TPAP note its connection to Ontario Regulation 231/08 under the *Environmental Assessment Act*	Report will be revised as requested.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Accepted	Noted	
58	MHSCTI - Heritage Planning Unit	Dan Minkin		2.1 Regulatory Requirements Page 5 - This section states that according to MHSTCI guidance, "Where a known or potential BHR or CHL may be directly and adversely impacted, and where it has not yet been evaluated for CHVI, completion of a CHER is required to fully understand its CHVI and level of significance. The Cultural Heritage Report will recommend a CHER to be completed during the TPAP or during detailed design phase, where the design and property impacts have been confirmed." In fact, our guidance is that a CHER must be completed for a known or potential BHR or CHL that may be adversely impacted whether the potential adverse impact is direct or indirect; during the TPAP if it is direct, and during detailed design at the latest if it is indirect. Please revise the text to reflect this.	Report will be revised; see response to Comment #50.	1	Accepted, pending revisions to report.	Please see response to Comment #50.	2	Text has been added to page 6 of this section to account for a provisional CHER decision from Metrolinx. Please see our first comment regarding this language and update as necessary.	Noted and Section 2.1 revised.	
59	MHSCTI - Heritage Planning Unit	Dan Minkin		2.3 Approach to Screening Bridges and Culverts Page 6 - Please clarify the rationale for the use of the Municipal Engineers Association Heritage Bridge Checklist as a screening tool for a Metrolinx TPAP undertaking. This checklist is ntended, and normally used, for undertakings under the Municipal Class Environmental Assessment.	Using the 2014 MCEA Bridge Checklist was understood to be 'best practice'. No further rationale can be provided. Report to be revised to indicate that bridges/culverts were screened as per the 2016 MTCS Checklist. The structural list will be reviewed again but this will not likely result in any additional BHRs (or CHERs) being identified or recommended.	1	Accepted.	Noted and report has been updated.	1	Accepted.	Noted	
60	MHSCTI - Heritage Planning Unit	Dan Minkin		2.5 Preliminary Impact Assessment Methodology Page 11 - We suggest removing the words "above-ground" in the sentence "Where any identified above-ground BHRs and CHLs may be affected by direct or indirect impacts…". Since "BHRs and CHLs" already excludes archaeological resources, the purpose of the modifier is unclear.	Report will be revised as requested.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Accepted.	Noted	

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61	MHSCTI - Heritage Planning Unit	Dan Minkin		Tables 2 through 6 Pages 26-39 - It is unclear what purpose is served by having these summary tables in the body of the report and the full tables, consistent with MHSTCI guidance, in Appendix C. We recommend replacing these tables with those from Appendix C	Report will be revised as requested.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Accepted.	Noted	
62	MHSCTI - Heritage Planning Unit	Dan Minkin		5.0 Preliminary Impact Assessment Page 40 - Based on PIC materials that we have had the opportunity to review, there is potential for indirect impacts in the form of impacts to views and vistas of BHRs and CHLs. These potential impacts should be considered in this report.	Report will be revised as requested. In particular, known/potential BHR/CHLs in proximity to proposed platforms will be reviewed for impacts to views and vistas and/or setting. Currently there is a general recommendation on minimizing impacts of this infrastructure to its surroundings, however the report will be updated with more specific detail on a resource by resource basis and tailored to the known qualities of that resource that may be impacted by the platform infrastructure. While there is the potential for the recommendation of additional CHERs during TPAP or Detail Design, the addition of platforms and other infrastructure is not necessarily considered adverse to the setting because it may be considered compatible, given there is already transit along this route.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Accepted.	Noted	
63	MHSCTI - Heritage Planning Unit	Dan Minkin		Table 7: Preliminary Impact Assessment of Built Heritage Resources and Cultural Heritage Landscapes within the City of Toronto and Recommended Mitigation Measures Page 41 - The language around HIA should be consistent with MHSTCI materials: *An HIA will be undertaken by a qualified person as early as possible of the preliminary design phase, and developed in consultation with, and submitted for review to, MHSTCI and interested parties (e.g. municipal heritage planner and/or municipal heritage committee and Indigenous communities, as appropriate). The HIA will discuss the alternatives considered and recommend the alternative to minimize or mitigate adverse effects on the property.*	HIA recommendations throughout report (ie Sections 5, 7) will be revised to be more consistent with MHSTCI materials as requested.	1	Accepted, pending revisions to report.	Noted. Updated in Section 2, 5 and 7.	1	Accepted.	Noted	
64	MHSCTI - Heritage Planning Unit	Dan Minkin		6.0 Summary of Community Data Collection Page 97 - The end of this section refers to consultation with the community, which generated feedback that was addressed in the report. The report should contain a separate section to describe the content of this feedback and how it was addressed.	Report to be revised to provide further detail on the record of community engagement.	1	Accepted, pending revisions to report.	A Summary of Community Engagement sections has been added to the report. (Section .7.0)	1	Accepted. Typically, a copy of the Cultural Heritage Report is made available to the public. If an earlier draft of this report was shared during public consultation, this should be noted here.	Noted.	3
65	MHSCTI - Heritage Planning Unit	Dan Minkin		1) 7.1 General Recommendations Page 98 - Rather than a description of general recommendations, we recommend that Sections 7.1 and 7.4 be merged so that all recommendations are presented in the context of clear information as to the resources and impacts to which they apply. We nonetheless offer the following comments on the existing Section 7.1, for consideration in applying this information to a merged section: **2)Under "The following general recommendations are to be followed:"** MHSTCI's guidance on Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment applies to the preparation of this document. It does not provide guidance on work carried out after the completion of the TPAP process and so such work cannot be performed in accordance with it.	1) Will merge Section 7.1 - 7.4 and organize information by resources and any identified impacts to them; 2) Will remove guidance doc. 3) See response to Item #51. 4) See response to Item#50. 5) "non-PHPs" was meant to refer to those BHRs/CHLs with CHVI (confirmed through a CHER, or Designation By-Law) that are not under provincial ownership/control. This can be clarified in the report. 6) Acknowledged, ASI will update report to address indirect impacts more fully to provide enhanced detail about mitigation measures as appropriate and/or instances where a CHER may be required during detailed designed should indirect impacts	1) 1 2) 1 3) 3 4) 1 5) 1 6) 1	Accepted, pending revisions to report.	1) Addressed in the revised report. 2) Addressed in the revised report. 3) See response to #51 regarding property ownership. Statement regarding Part III.1 of the OHA has been included. 4) See response to #50. 5) Addressed in the revised report. 6) Addressed in the revised report.	1) 1 2) 1 3) 2 4) 2 5) 1 6) 1	Items 1,2,5,6 are accepted. For other items, see our first two responses in this table.	Noted	

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				3) Under "Direct impacts to the heritage attribute(s) of a known or potential BHR or CHL due to installation of new/modified infrastructure:" Several bullets under "Direct impacts to the heritage attribute(s) of a known or potential BHR or CHL due to installation of new/modified infrastructure" draw a distinction between properties that are or are anticipated to become provinciallyowned and those which are not. We note that a property set to experience direct impacts would necessarily have been acquired by Metrolinx, whether through ownership or some other form of occupation and control. In any case Part III.1 of the Ontario Heritage Act and its derivative processes would apply. 4)The second of these bullets also says that "Where the design and the property impact has not been confirmed or has the potential to change, the CHER will not be completed as part of the TPAP." Where a potential BHR or CHL may be subject to direct adverse impacts, the CHER should be completed during the TPAP. As the purpose of a CHER (as opposed to an HIA) is to evaluate the cultural heritage value or interest (CHVI) of the potential resource, it is not necessary for details of the anticipated impact to be known at the time the CHER is being prepared. 5) The third of these bullets expressly applies to "all Metrolinx PHPs/PHPPS and non-PHPs". This is confusing, as it appears to be inclusive of all Metrolinx properties, and any Metrolinx property with confirmed CHVI would by definition be a PHP or PHPPS. The commitment to complete an HIA should apply to all Metrolinx properties that are confirmed through a CHER to have CHVI and that are expected to be impacted by the project. 6) Under "Potential indirect impacts on known or potential properties of CHVI resulting from construction activities:" We reiterate that these properties need to be subject to a CHER, at least during detailed design phase	change to result in adverse impacts.							
66	MHSCTI - Heritage Planning Unit	Dan Minkin		Table 12: Additional Cultural Heritage Reporting to be Undertaken - This table should be revised consistent with our comments on reporting requirements for potential BHRs and CHLs with anticipated indirect impacts. See item #11 above re General Recommendations.	Acknowledged. Table 12 will be updated as appropriate.	1	Accepted, pending revisions to report.	Noted and report has been updated.	1	Accepted.	Noted	
New Comments Received Dec 10 from MHSTCI												
67	MHSCTI - Heritage Planning Unit		Executive Summary Section 5.2 City of Pickering, Table 8	Only one property with indirect impacts has been identified as requiring a CHER following the completion of TPAP: PK- 002. Impacts to this property (encroachment and impacts to the driveway) appear to be like many other properties identified in the Cultural Heritage Report. Please explain why the other properties will not require a CHER.	The recommended design indicated that the driveway for this property will need relocation, therefore an indirect adverse impact was identified. While undertaking the preliminary impact assessment and reviewing the updated designs/roll plan, intention to relocate driveways/alter access signficiantly was looked for when identifing impacts to individual BHR/CHLs, and no other instances were identified. Note that Recommendation #6 further addresses this .	3						
68	MHSCTI - Heritage Planning Unit		1.0 Introduction (New comment)	Please provide MHSTCI with a copy of the "DSBRT Heritage Studies Guidance" document. We may have further comments once we review it.	Acknowledged. Metrolinx to provide document.	1						

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69	MHSCTI - Heritage Planning Unit		4.0 Existing Conditions Tables 2 through 6 (New comment)	The Cultural Heritage Report Tables 2 through 6 provide a preliminary screening about whether the properties meet O.Reg 10/06. This determination should be made in the CHER, based on research and evaluation. We recommend that this statement is removed, or modified as follows, wherever it appears in the tables: "This property is unlikely to have CHVI under Ontario Regulation 10/06, but this will be confirmed by a CHER"	The preliminary sceening for BOTH regulations has been removed from Tables 2 through 6.	1						