

Highway 101 Twinning: Three Mile Plains to Falmouth

Presentation to Joint Council July 27, 2017



Project Overview

- Exit 5, Three Mile Plains, to west of Exit 7, near Falmouth
- Approximately 10 km long
- Connects twinned highway on either side of Windsor
- All existing Exits to remain
- Ramps connected between Exits
- Avon River Causeway widening and upgraded aboiteau



Project Benefits

- Improved highway safety with divided traffic by median and barrier
- Improved safety from coastal flooding with climate change adaptation
- Improved safety and traffic at interchanges with ramp connections
- Highway upgraded to modern standard flatter curves, wider shoulders







Project Status

- Environmental Assessment Approved with conditions
- Additional data collection and engineering investigations underway – to support detailed design
- Design consultant for Avon River aboiteau/causeway
- Initial construction starting early 2018
- Project construction 5 year timeframe



Why an aboiteau?



Background

- In the fall of 2013 TIR was planning a bridge option in front of the current aboiteau structure (originally constructed in 1968-70).
- Dept. of Agriculture expressed concerns about the aging infrastructure and the need for a replacement/upgrade.
- Issues and possibilities were discussed for a bridge versus a new aboiteau.
- Ministers were briefed and it was agreed that a joint project similar to the original construction taking into account stakeholders would be in the best interest of the province.
- Preparations were made to move the joint project forward.



Previous Proposal





Agricultural Marshland Conservation Act



Coastal Water Levels:

- Average High Tide
- Spring High Tide
- Climate Change
 - Sea Level Rise
 - Storm Surge

Protected Assets

- Agricultural Lands
- Roads
- Rails
- Municipal Infrastructure
- Commercial and Residential Areas



Land Protection

- A dykeland system consists of dykes or embankments built up to hold back sea waters, and aboiteaux which are culverts to direct the waters through a gate opening at low tide to allow fresh water to drain off the marshland and then closes at high tide to stop sea water from entering.
- The current Windsor/Avon Agricultural Marshland consists of over 3000 acres of active farm land. The dyke system was engineered and built in the late 1960's replacing 26km of dykes and 60 aboiteaux structures.
- The Avon River aboiteau controls the large freshwater reservoir in Lake Pisiquid which helps to prevent freshwater flooding during high tide













Avon River Flood Inundation (10.00 m relative to CGVD1928) – Historic Dykes





Avon River Flood Inundation (10.00 m relative to CGVD1928) – Proposed Dykes









Open Channel				
Expropriation/purchase of land Loss of over 450 hectares of farmland Commercial and residential property	Free flowing tidal river, no recreational lake/reservoir			
Minimum 15 km of dykes and 10 aboiteau structures required	Loss of a fresh water source for irrigation and snow making (Martock)			
Need to provide fish passage on over 10 structures as opposed to one.	Unrestricted fish passage on the main river			
Infill of Lake Pisiquid within 6 months in front of the Boat club and formation of new salt marsh.	Delay of the highway project due to approvals, budget limitations, and significant planning required.			



Summary

- Flood protection for the community would exceed \$50M in infrastructure costs plus ongoing maintenance
- Fish passage issues would transfer to over 10 new aboiteau structures
- Fresh water flooding likely occur with loss of reservoir and risk for private, municipal and provincial infrastructure
- Loss of value on remaining farmland, impact recreational facilities (boat club, Ski Martock)
- Given the various issues a decision was made to keep an aboiteau in place and incorporate improved fish passage



Comparisons to Petitcodiac





Similarities			Differences	
			Petitcodiac	Avon
•	 Tidal range (14-16 m) Built ~late 1960s Protected 1340 ha agriculture land upstream Shape Position 	Sediments	Dominant fluid mud	Mud and sand
•		Tributaries	limited	St. Croix, Kennetcook
		Causeway	1158 m, 5 gates	730 m, 2 gates
		Shape	Long and narrow	Short and wide
		Position in estuary	Estuary dominant	River dominant

• Both significant decrease Immediately Downstream of causeway (P1/A1) in cross sectional area & width P1 10 8 6 Elevation (m CGVD28) Petitcodiac 4 Tide gate construction 2 0 -2 ---<u>∆</u>--- 1861 92% decrease -4 - 1960s Causeway 1960s - 2000s -6 - 1991 construction -8 2003 -10 200 400 600 1000 1200 1400 1600 0 800 8 53% A1 b) 6 decrease 4 1960s-2000s 2 Avon 0 -2 -4--- 1861 -4 - 1960s -6 - 1976 VE =80 -8 2005 -10 200 1000 1200 1400 1600 0 400 600 800

Mid point downstream of causeway (P2/A2)



Avon

Petitcodiac

Mouth of Estuary (P3/A3)

37.8 km downstream:

- 18% decrease in cross sectional area at mouth of estuary
- 3-5 m increase in bed elevation
- downstream grade constant





A3

16 km downstream

• slight increases in cross sectional area and deepening of channel thalweg



Petitcodiac

P3

Avon

Impact of causeway on tidal prism at higher high water large tides



Downstream distance relative to causeway (km)



Avon River Aboiteau and Causeway



Project Objectives

- Maintaining productive salt marsh habitat
- Additional width required for the new highway lanes
- Additional height needed to prevent Windsor/Falmouth and surrounding areas from flooding
- New aboiteau required to provide flood protection, carry highway, and provide fish passage to meet legal requirements of the Agricultural Marshlands Conservation Act and the Fisheries Act.



Design Considerations

- To be designed for improved fish passage throughout the year
- Could allow some tidal exchange
- Controlled fresh water runoff with large storage
- Minimal impacts to community, agriculture, recreation, fish habitat, etc.



Next Steps











Questions / Comments

























