

The Public Safety and Economic Imperative for the George Massey Tunnel Replacement Project

July 10, 2017 Regular Meeting of Council



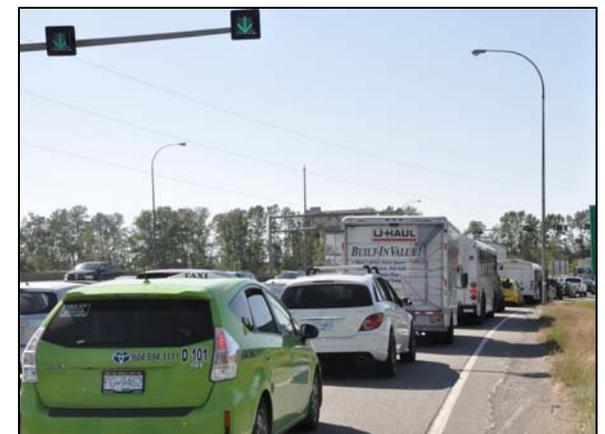
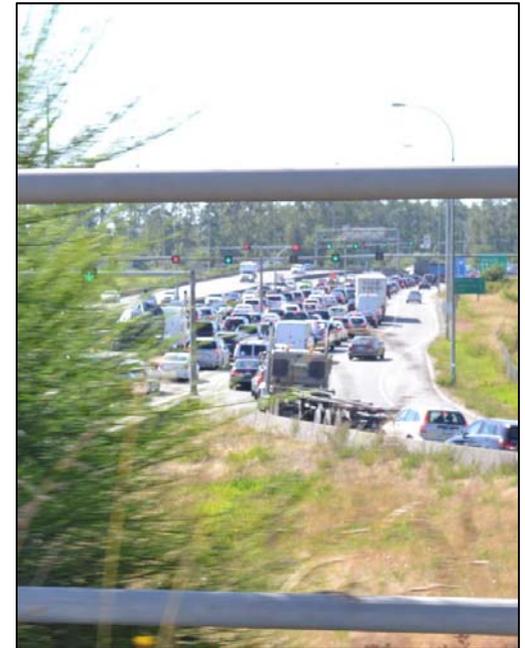
Tunnel Construction History

- The George Massey Tunnel was constructed in the 1950s and opened in 1959
 - Construction occurred when seismic considerations were in their infancy
 - No soil strengthening occurred prior to the tunnel construction
- The Tunnel is not capable of withstanding a moderate to severe earthquake
- The potential for catastrophic failure is real



Background

- The need to replace the tunnel with a new 10 lane bridge is well known and documented
 - Province has 145 technical and scientific reports (14,000 pages) publicly available
 - Cost of congestion: \$66 million in 2008, \$100 million by 2041
- Provincial environmental assessment process
 - 3 rounds of public engagement with 3,000 participants
 - More than 35 meetings with Metro Vancouver and TransLink
 - More than 110 meetings each with Richmond and Delta



Expert Opinion Supports the Bridge

- Keith Sashaw, President of the Association of Consulting Engineering Companies of BC

“Recognizing the need to replace the tunnel, the next consideration is the nature of the replacement. Given the issues surrounding seismic and environmental standards, as well as considering the anticipated usage of the replacement, a bridge is the best answer. Not only would the initial construction costs be lower to build a bridge to the demanding seismic standards of today, but the maintenance and operating costs would be significantly lower.”

“Time is of the essence both with regard to exposure to a seismic event and escalating costs.”

The Risk is Imminent

- Risk of a major earthquake is imminent – 30% chance in next 50 years
- Earthquake standards
 - The tunnel is designed to withstand a 1-in-275 year quake (6.5 magnitude – 18% probability of exceedance in 50 years)
 - 2001 Nisqually earthquake was 6.8 magnitude
 - The bridge is designed to withstand a 1-in-2,475 year quake (9.0 magnitude – 2% probability of exceedance in 50 years)
- It is not technically feasible to upgrade the tunnel to meet current seismic standards

“Analysis has shown that the tunnel structure is fairly certain to be damaged in the design seismic event with or without ground improvements”

Unacceptable Public Safety Risk – Collisions

- The tunnel has a higher than average crash rate and tunnel crashes tend to be more severe than crashes on open roads
 - Average of >300 collisions annually, 40% resulted in injury or fatality
 - A new bridge would reduce collision rates by >35%

“...the cost premium associated with accelerated delivery of such a structure would be very high”



Unacceptable Public Safety Risk – First Responders

- Incidents in the tunnel are often associated with an unacceptable delay in response times and the provision of critical care
 - Traffic and the lack of a travel shoulder make accidents difficult to reach and clear
 - First Responders are forced in some cases to respond on foot carrying emergency equipment
 - Smoke and fire create additional hazards in a confined space and require a below grade response
- A tunnel failure would sever a vital emergency response lifeline – nearly 25 ambulance trips through the tunnel each day (6.3 of those trips are code 3 – lights and sirens)

“There is a possibility of loss of life if the tunnel experiences catastrophic displacements in a seismic event.”

Tunnel Systems Failing

- The George Massey Tunnel has approximately 10 years left before major components, such as lighting, ventilation and pumping systems need replaced
- The design of the tunnel's sprinkler system creates a serious hazard
 - The system is susceptible to damage from large trucks
 - Between June 23, 2017 and July 1, 2017 the sprinkler system was damaged twice
 - As of July 6, the system was still completely inoperable – no standpipes or sprinkling capability
 - The lack of a fire suppression system creates an increased and significant hazard for First Responders and the traveling public

“the tunnel is submerged which introduces seismic risk unusual for bridge structures”

Impact on the Entire Metro Vancouver Region

- Approximately 400,000 trips use the four Fraser River crossings each day
 - A seismic event causing the failure of the tunnel would likely cause the failure of the Pattullo Bridge
 - 157,000 (80,000 from the tunnel and 77,000 from the Pattullo Bridge) vehicles/day would need an alternate crossing – Alex Fraser Bridge has no spare capacity
 - The current 16 km trip from Ladner to Richmond Centre would become 36 km trip over Alex Fraser Bridge, 77 km over the Port Mann Bridge

the tunnel is *“a brittle structure in highly unstable/liquefiable soils”*

Critical Economic and Quality of Life Impacts

- Failure would be regionally disruptive, locally unbearable, and economically devastating
- The economic impacts would be long-term, far reaching and impact the entire region
- The Tunnel is a critical component of the local, regional and provincial economies, essential for Asia-Pacific trade
- Resulting traffic paralysis would severely impact quality of life in North Delta, Surrey, and beyond

“The potential for liquefaction of the upper sand deposits is high in an earthquake. This would lead to major movements of the foundation soils and distortions of the tunnel tube. ”

Impact of Emergency Tunnel Replacement

- Replacement would take at least 5 years and require a significant accelerated delivery cost premium
- Re-construction period costs:
 - Travel time delay costs would be greater than cost of construction
 - Major impacts to businesses based in Richmond and Delta, as well as to the regional and national economies
- The I-5 Skagit River collapse (May 2013) – estimated by WSDOT at \$320,000/day
 - This figure would be much higher for the tunnel given the larger vehicle volumes, the lack of viable detour routes, the 5 year construction period and the vital economic role of the Hwy 99 corridor

Importance of Public Transit

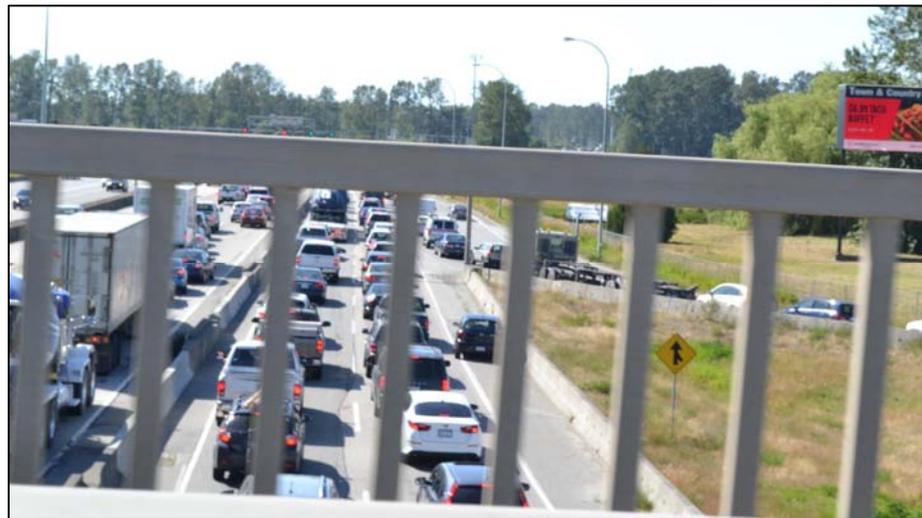
- The tunnel carries more transit passengers than any other non-rapid transit crossing of the Fraser River
 - 10,000 riders/day
 - 1 bus every 3 minutes during rush hour
- AM peak – 60% of trips to downtown Vancouver from South Delta and South Surrey are by transit
- Bridge project includes \$500 million of new transit infrastructure:
 - 50 km of new dedicated transit/HOV lanes
 - Integrated transit stops
 - Space for future rapid transit
 - Dedicated transit on ramp

“Commitment to World Class Transit”



Pedestrians and Cyclist Facilities

- The new bridge will provide pedestrian/cyclist connectivity between Delta and Richmond
 - Continuation of existing cycling networks at the only crossing with a broken cycling link
- Existing bike shuttle does not operate on weekends in the winter months (Nov-Mar)
 - Shuttle is very inefficient and is a limiting factor to public use yet still transports an average of 900 cyclists/month



Alternatives

Criteria	Maintain tunnel	New bridge	New tunnel	Maintain tunnel + new crossing	Maintain tunnel + new bridge on new corridor
Achievement of project goals	20%	90%	80%	60%	40%
Risk profile	High	Medium	High	Medium-high	Medium-high
Cost	\$0.59B	\$3.5B	\$4.3B	\$3.5-\$4B	\$5.8B
Additional factors	Poor seismic performance, no increase in traffic capacity	Minimal property and enviro impacts	Significant property and enviro impacts	Significant property and enviro impacts, existing tunnel seismic performance	Significant property, ALR, enviro impacts, existing tunnel seismic performance

Recent Misinformation

- 24/7 port operations and banning trucks during peak hours from tunnel would increase tunnel capacity by 30% in 30 days
 - **FACT:** Deltaport already operates 24/7 with extended gates and reduced fees to encourage trucks off-peak; however, warehouses and other receiving facilities are only open standard hours, which means there is nowhere for trucks to go – extended gate hours are regularly cancelled due to the lack of appointments by truckers
 - **FACT:** Commercial trucks make up 12% of peak hour traffic through the tunnel, but less than 2% of total traffic is container trucks

Recent Misinformation

- Agricultural land will be lost and the salt wedge will threaten irrigation
 - FACT: The Province has committed to no net loss of agricultural land with the new bridge and is seeking to achieve a net gain of farmland in Delta
 - FACT: Farmers will benefit from reduced congestion and travel times, and better access to farms on either side of Highway 99

Recent Misinformation

- The bridge costs \$12 billion after financing
 - FACT: Introducing the cost of financing to the discussion is deliberately misleading – can only compare the cost of two projects based on their present cost
 - FACT: A new tunnel would cost more than a new bridge
- The bridge could not accommodate rapid transit due to the steep climb
 - FACT: The bridge includes \$500 million of transit improvements and is designed to accommodate future rapid transit

Recent Misinformation

- Popular Mechanics (1959) stated a bridge was ruled out because of lack of firm foundation to allow ocean-going freighters to pass underneath and hazard to aircraft due to height
 - **FACT: Science, design, and geotechnical procedures have significantly advanced since 1959 – the professionals and experts have shown a bridge can meet modern seismic standards while the tunnel cannot.**
 - **FACT: The bridge would be similar in height to the Alex Fraser Bridge and therefore not impact aircraft**

Recent Misinformation

- A twinned tunnel could be achieved in two years at half the cost
 - FACT: Twinning the tunnel would cost \$4.05 billion (WSP and MMM Group 2016)
 - FACT: Twinning the tunnel would not resolve the seismic issues associated with the existing tunnel
 - FACT: Twinning the tunnel would create additional environmental issues and have a significant impact on agricultural land

Tunnel Twinning is not an Option

- The proliferation of misinformation and the willingness by many to take that misinformation as fact is potentially detrimental to public safety, our economy, and the future of our region – the facts:
 - The existing tunnel cannot be sufficiently seismically upgraded (a 1-in-275 year design vs. a 1-in-2475 year design)
 - A replacement tunnel is more expensive (\$4.3 billion vs. \$3.5 billion) with more associated risk
 - A replacement tunnel is significantly more environmentally damaging than a bridge – requires an open river cut of approximately 150 metres in width, coupled with soil strengthening
 - A replacement tunnel has more negative implications for air quality, agriculture, marine traffic during construction, wildlife and terrestrial habitat, and marine life and habitat
 - A replacement tunnel provides less transportation efficiency and lower incident response capability
 - A replacement tunnel meets fewer evaluation criteria than a bridge at a higher cost

Lessons Learned

- The Christchurch Earthquake: Lessons Learned from Disaster, M.W. Hamburger and W.D. Mooney, 2011

“While we cannot forecast which city will be the next victim of such an earthquake, we can mitigate potential impacts. For the most part, we already know what needs to be done. Now the challenge is transforming the geoscience knowledge into action. Let’s not be caught unaware – or unprepared.”

Conclusion

- Public safety is at risk and the solution is known – the new 10 lane bridge is necessary, supported by evidence, and vital for the economy of the region and province
- The new bridge is ready to be constructed
 - Technical studies are complete
 - Public consultation has concluded
 - Approvals have been issued
 - Preparatory works have begun
- The time to construct the bridge is now – not after disaster strikes

