

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Design Considerations

Tunnels

The proposed location for the new tunnel crossing is about 250 feet away from the existing westbound tunnel. This matches the distance between the existing eastbound and westbound tubes. It allows for the excavation and placement of the new tunnel without impacting the existing tunnels while also providing flexibility in the future should the existing tubes need to be replaced.

While it may be possible to place a two-lane tunnel between the existing tunnels, it is likely that the existing tunnels would be disturbed during the process. It also creates major complications if any of the tubes has to be replaced in the future. Use of a tunnel boring machine is not likely a practical solution as the regional soils are not conducive to boring due to the looseness of the upper layers. If tunnel boring were utilized, the tunnel would need to be much lower than the existing tunnels to provide adequate cover. This increased depth would result in a significantly longer tunnel. Given those considerations it is recommended that the new tunnel be placed as shown in the proposed alignments.

Bridges

While most of the structures over roads can be widened to the inside, the majority of structures over water will have to be widened to the outside. The necessity for outside widening is mostly due to the size and amount of the equipment required to drive the large piles

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Alternative 1

Two additional lanes of bridge-tunnel capacity to provide a contiguous, six-lane facility

From: Settler's Landing Road Interchange on the Peninsula

To: I-64 / I-564 Interchange on the Southside

- existing eastbound tunnel would be converted to accommodate two-way traffic
- bridge sections before and after the existing eastbound tunnel would be widened
- existing westbound bridge-tunnel facility would remain unchanged
- new facility would be constructed for eastbound traffic
- existing Willoughby Bay bridge would be widened to the outside on each side
 - minimizes impacts to the Willoughby Spit Marina
 - results in impacts along the land adjacent to the westbound bridge

Further Study Considerations:

- Critical issue - two-way traffic in the existing eastbound bridge-tunnel facility
- Results in a 4 mile section of undesirable two-way traffic
- Lower speed limit required for safety
- Likely to Negate much of the capacity improvement this alternative will offer
- Unlikely that this alternative will provide the desired relief

Conceptual Construction Estimate: \$2.2 Billion (2008 dollars)

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Alternative 2

Two additional lanes of reversible bridge-tunnel capacity to provide greater peak period and evacuation capacity

From: I-64 / I-664 Interchange on the Peninsula

To: I-64 / I-564 Interchange on the Southside

- Barrier separated from the general lanes
- Operate as “express” lanes
- Could be converted to multimodal lanes if desired
- Existing eastbound bridge-tunnel – no change
- New 2-lane bridge-tunnel constructed to carry eastbound traffic
- Requires all bridges from I-664 to I-564 to be modified
- Willoughby Bay bridge work accomplished on the water side of the existing structures
 - Little construction activity on land side
 - Minimal inconvenience to property owners
 - No private piers should be affected

Further Study Considerations:

- Direct connections at I-664 and I-564 need to be further studied
- Incident management is more difficult with “express” lanes
- Does not address capacity problems of off-peak direction

Conceptual Construction Estimate: \$2.3 Billion (2008 dollars)

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Alternative 3

Four additional lanes of bridge-tunnel capacity

From: I-64 / I-664 Interchange on the Peninsula

To: I-64 / I-564 Interchange on the Southside

- Existing westbound bridge-tunnel – no change
- Existing eastbound bridge-tunnel converted to carry westbound traffic
- New 4-lane bridge-tunnel constructed to carry eastbound traffic
- Requires all bridges from I-664 to I-564 to be modified
- Willoughby Bay bridge work accomplished on the water side of the existing structures
 - Little construction activity on land side
 - Minimal inconvenience to property owners
 - No private piers should be affected

Further Study Considerations:

- Mainline traffic split is not common, but not without precedent among Interstate roadways
- Mimics Baltimore's Fort McHenry Tunnel (I-95) traffic split
- Right of way impacts greater than 2-lane alternatives

Conceptual Construction Estimate: \$3.3 Billion (2008 dollars)

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Alternative 4

Four additional lanes of bridge-tunnel capacity, including two multimodal lanes

From: I-64 / I-664 Interchange on the Peninsula

To: I-64 / I-564 Interchange on the Southside

- Existing westbound bridge-tunnel – no change
- Existing eastbound bridge-tunnel converted to carry westbound traffic, one general lane and one multimodal lane
- New 4-lane bridge-tunnel constructed to carry eastbound traffic, three general lanes and one multimodal lane
- Requires all bridges from I-664 to I-564 to be modified
- Willoughby Bay bridge work accomplished on the water side of the existing structures
 - Little construction activity on land side
 - Minimal inconvenience to property owners
 - No private piers should be affected

Further Study Considerations:

- Westbound traffic split is not common, but not without precedent among Interstate roadways
- Mimics Baltimore's Fort McHenry Tunnel (I-95) traffic split
- Right of way impacts greater than 2-lane alternatives
- 4' buffer between general lane and multimodal lane could not be provided through existing tunnels

Conceptual Construction Estimate: \$3.3 Billion (2008 dollars)

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Alternative 5

Two additional lanes of bridge capacity to provide a contiguous, six-lane facility

From: Settler's Landing Road Interchange on the Peninsula

To: I-64 / I-564 Interchange on the Southside

This alternative is the same as Alternative 1 except that the additional lanes over the channel are provided by a high level bridge as opposed to tunnels. As with Alternative 1 there would still be a reduced speed and two-way traffic in the existing eastbound tunnel. The benefit gained by adding two lanes will be reduced by changing one of the tunnels to two-way traffic.

Using a two lane high rise bridge versus a four lane high rise bridge will generate a cost savings of only about 10%. The magnitude of this bridge is not effective unless it carries at least four lanes of traffic. Additionally, it is recommended that a two lane bridge not be attempted because of the adverse affect of the aerodynamics of such a narrow structure.

Because of the reduced benefit and poor aerodynamics versus the minimum cost savings, Alternative 5 is eliminated from further consideration.

Hampton Roads Bridge-Tunnel Expansion Feasibility Study

Alternative 6

Four additional lanes of bridge capacity

From: I-64 / I-664 Interchange on the Peninsula

To: I-64 / I-564 Interchange on the Southside

This alternative is identical to Alternative 3 except that the additional lanes over the channel are provided by a high level bridge as opposed to tunnels.

- Existing westbound bridge-tunnel – no change
- Existing eastbound bridge-tunnel converted to carry westbound traffic
- New 4-lane high-rise bridge constructed to carry eastbound traffic
- Requires all bridges from I-664 to I-564 to be modified
- Willoughby Bay bridge work accomplished on the water side of the existing structures
 - Little construction activity on land side
 - Minimal inconvenience to property owners
 - No private piers should be affected

Further Study Considerations:

- Westbound traffic split is not common, but not without precedent among Interstate roadways
- Mimics Baltimore's Fort McHenry Tunnel (I-95) traffic split
- Right of way impacts greater than 2-lane alternatives

Conceptual Construction Estimate: \$3.2 Billion (2008 dollars)