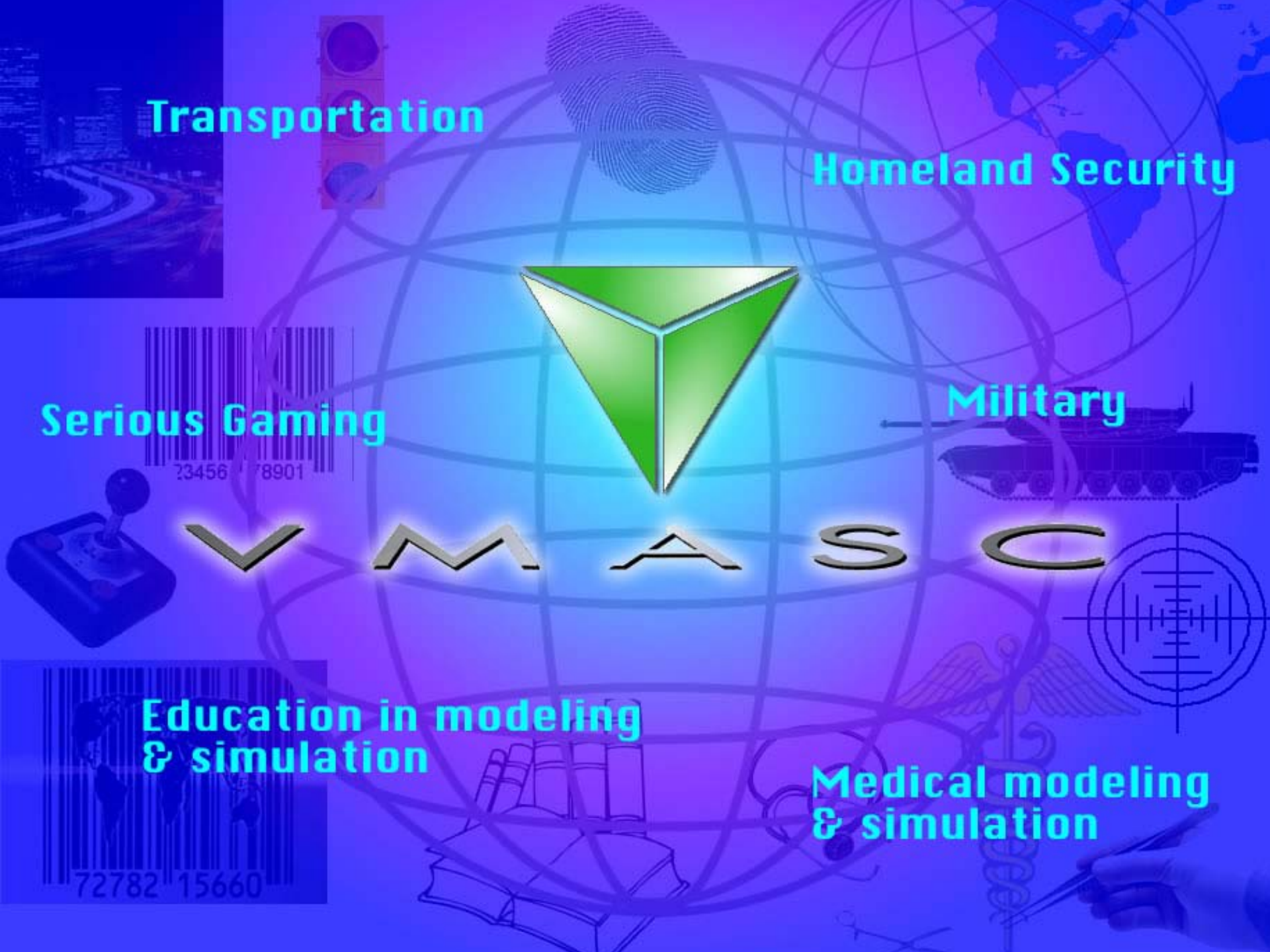
Transportation
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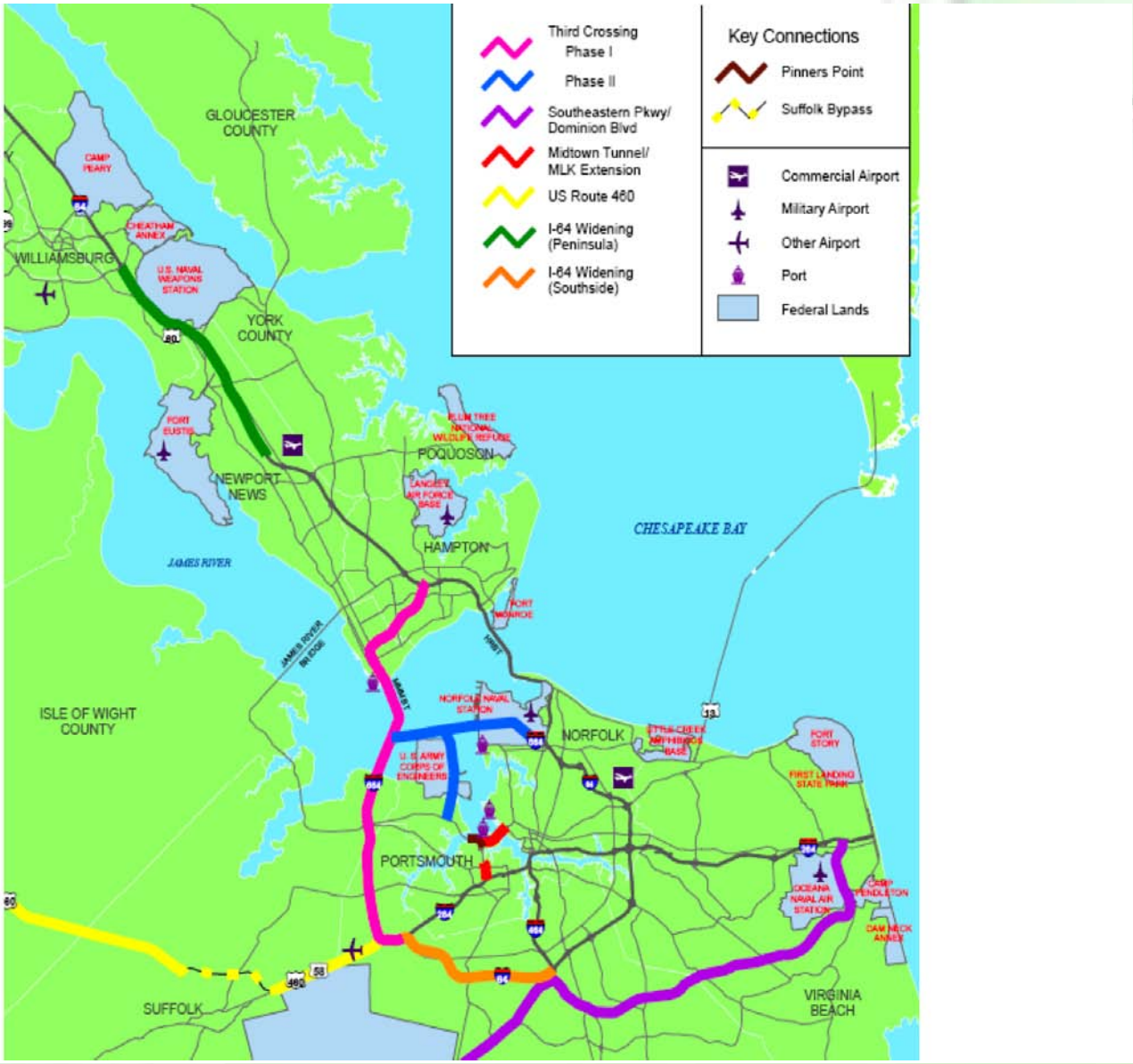
Analysis of Proposed Transportation Alternatives on the Hampton Roads Bridge Tunnel in 2030

Old Dominion University
Virginia Modeling, Analysis, and Simulation Center
January 21, 2009

HRMPO Proposed Alternatives

1. 3rd Crossing from Southside to the Northern Peninsula.
   a. Phase 1: Widen I-664 from Bowers Hill to Hampton.
   b. Phase 2: Add a bridge-tunnel between the existing MMMBT and I-564 in Norfolk and a connector across Craney Island from new bridge-tunnel and the Western Freeway.
2. Southeastern Parkway/Dominion Boulevard from Virginia Beach to Chesapeake.
3. Widen Midtown Tunnel and extend MLK Freeway to I-264.
4. Improving Route 460 (eventual construction of a parallel roadway)
5. Widen I-64 on the Northern Peninsula as far west as Route 199.
6. Widen I-64 on the Southside (including the High Rise Bridge) from Battlefield Boulevard in Chesapeake to Bowers Hill in Suffolk

HRMPO Proposed Alternatives



Key Sections of Study

- Macroscopic transportation model (regional traffic demand model)
- Freight Modeling
  - Adds impact of cargo transfer and large trucks to the traffic demand model
- Congestion analysis
  - Mesoscopic transportation simulation
  - Ability of selected sections of network assessed for ability to clear congestion
- Accidents and Incidents

Assistance Provided Study

- **Virginia Department of Transportation**
  - Statewide traffic demand model
  - Hampton Roads regional traffic demand model
  - Global Insight, Inc. Transearch Database (nationwide database of freight traffic flow)
  - Accident and incident data compiled by Virginia State Police (restricted to events with injury or property damage exceeding $1000)
- **Hampton Roads Traffic Operations Center**
  - Hampton Roads accident and incident data based on Safety Service Patrols
- **Hampton Roads Metropolitan Planning Organization**
  - Hourly traffic flow data for 2006
  - Analysis suggestions, reviews, and comments

Metrics Used in Analysis

- **Vehicle Volume**: The number of vehicles assigned to the analyzed road section.
- **Level of Service Indicator (Volume/Capacity)**: Road segment volume is the maximum demand (number of vehicles) using the segment. Capacity is the maximum that can be handled before additional traffic is diverted to other routes. V/C = 1 means a road is operating at its maximum capability. V/C>1 means congestion will occur due to high volume.
- **Speed Decay**: Free-flow speed (FFS) is the vehicle speed for vehicles experiencing no congestion. Congestion forces vehicles to slow. Speed decay is the ratio of free-flow speed to modeled speed. Speed decay values of >1.0 indicate speeds are reduced due to congestion.

Macroscopic Modeling

- “Big Picture”
  - Cannot model individual vehicles
  - All vehicles modeled as passenger cars
- Assesses over 5 million trips/day and over 1000 origin and destination zones
- Sixteen total scenarios analyzed
- All alternatives assumed to be assigned tolls with rates as indicated in the VDOT provided model
- Cube Voyager (Citilabs®, Inc.)

Scenarios Analyzed

- Sixteen total Scenarios
- Four main sections
  - No build scenario
  - All build scenario (includes completion of the six alternatives proposed by the HRMPO)
  - Individual alternatives analyses
  - HRBT analyses

Peak Hour HRBT V/C in 2030

Scenarios	Assigned Regular Volume (daily)	Capacity (per lane) assumed in model	Peak hour traffic 10%	Peak hour V/C 10%
"No build" (HRBT: 4 lanes)	108,518	1871	10852	1.45
HRBT: 6 regular lanes	118,267	1862	11827	1.06
HRBT: 8 regular lanes	123,887	1877	12389	0.83
I-64 widening Peninsula only	108,548	1872	10855	1.45
US 460 only	108,548	1872	10855	1.45
Southeastern Pkwy	108,681	1874	10868	1.45
I-64 Southside Widening	117,027	1867	11703	1.57
Midtown Tunnel	109,112	1881	10911	1.45
Third Crossing—Phase 1	106,337	1866	10634	1.43
Third Crossing—Phase 2	93,332	1879	9333	1.24
"All build" (HRBT-4 lanes, Third Crossing Phase 1)	104,888	1873	10489	1.40
"All build" (HRBT-4 lanes, Third Crossing Phase 2)	94,437	1876	9444	1.26
"All build" (HRBT-6 lanes, Third Crossing Phase 1)	116,383	1862	11638	1.04
"All build" (HRBT-6 lanes, Third Crossing Phase 2)	104,804	1888	10480	0.93
HRBT 6 lanes + Third crossing Phase 1	116,841	1885	11684	1.03
HRBT 6 lanes + Third crossing Phase 2	103,542	1883	10354	0.92

Peak Hour HRBT V/C in 2030

Scenarios	Assigned Regular Volume (daily)	Capacity (per lane) assumed in model	Peak hour traffic 10%	Peak hour V/C 10%
"No build" (HRBT: 4 lanes)	108,518	1871		1.45
HRBT: 6 regular lanes	118,267	1862	1827	1.06
HRBT: 8 regular lanes	123,887		12389	0.83
I-64 widening Peninsula only			10855	1.45
US 460 only			10855	1.45
Southeastern			868	1.45
I-64 Sou				1.57
Midtown				1.45
Third Crossing			0634	1.43
Third Crossing—Phase 2			9333	1.24
"All build" (HRBT-4 lanes, Third Crossing Phase 1)	104,888	1873	10489	1.40
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HRBT 6 lanes + Third crossing Phase 1	116,841	1885	11684	1.03
HRBT 6 lanes + Third crossing Phase 2	103,542	1883	10354	0.92

Four V/C Values
Near or Below 1.0

Peak Hour HRBT V/C in 2030

Scenarios	Assigned Regular Volume (daily)	Capacity (per lane) assumed in model	Peak hour traffic 10%	Peak hour V/C 10%
"No build" (HRBT: 4 lanes)	108,518	1871	10852	1.45
HRBT: 6 regular lanes	118,267	1862	11827	1.06
HRBT: 8 regular lanes	123,887	1877	12389	0.83
I-64 widening Peninsula only	108,548	1872	[illegible]	1.45
US 460 only	108,548	1872	10855	1.45
Southeastern Pkwy	108,681	[illegible]	10868	1.45
I-64 Southside Widening	[illegible]	[illegible]	11703	1.57
Midtown Tunnel	[illegible]	[illegible]	10911	1.45
Third Cros	[illegible]	[illegible]	[illegible]	1.43
Third Cr	[illegible]	[illegible]	[illegible]	1.24
"All build" (Phase 1)	[illegible]	[illegible]	189	1.40
"All build" (HRBT-4 lanes, Phase 2)	[illegible]	[illegible]	9444	1.26
"All build" (HRBT-6 lanes, Third Crossing Phase 1)	116,383	1862	11638	1.04
"All build" (HRBT-6 lanes, Third Crossing Phase 2)	104,804	1888	10480	0.93
HRBT 6 lanes + Third crossing Phase 1	116,841	1885	11684	1.03
HRBT 6 lanes + Third crossing Phase 2	103,542	1883	10354	0.92

Expand HRBT to Either 6 or 8 lanes

VMASC

Peak Hour HRBT V/C in 2030

Scenarios	Assigned Regular Volume (daily)	Capacity (per lane) assumed in model	Peak hour traffic 10%	Peak hour V/C 10%
"No build" (HRBT: 4 lanes)	108,518	1871	10852	1.45
HRBT: 6 regular lanes	118,267	1862	11827	1.06
HRBT: 8 regular lanes	123,887	1877	12389	0.83
I-64 widening Peninsula only		1872	10855	1.45
US 460 only			10855	1.45
South			10868	1.45
			11703	1.57
			911	1.45
			634	1.43
			9333	1.24
"All Phase 1)			10489	1.40
"All build" (HRBT-4 Phase 2)			9444	1.26
"All build" (HRBT-6 lanes, Third Crossing Phase 1)	116,383	1862	1638	1.04
"All build" (HRBT-6 lanes, Third Crossing Phase 2)	104,804	1888	104	0.93
HRBT 6 lanes + Third crossing Phase 1	116,841	1885	11684	1.03
HRBT 6 lanes + Third crossing Phase 2	103,542	1883	10354	0.92

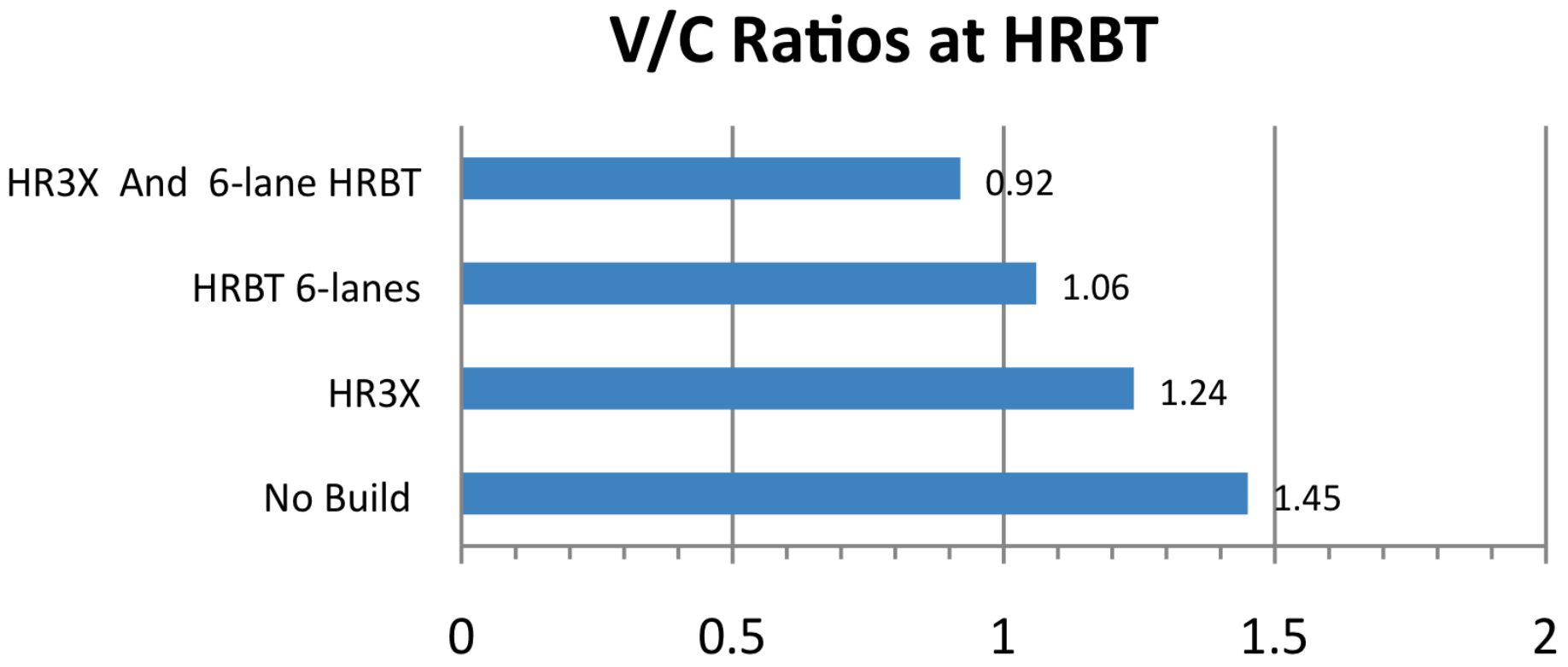
3rd Crossing Phase 1 and HRBT Expansion to 6 lanes

Peak Hour HRBT V/C in 2030

Scenarios	Assigned Regular Volume (daily)	Capacity (per lane) assumed in model	Peak hour traffic 10%	Peak hour V/C 10%
"No build" (HRBT: 4 lanes)	108,518	1871	10852	1.45
HRBT: 6 regular lanes	118,267	1862	11827	1.06
HRBT: 8 regular lanes	123,887	1877	12389	0.83
I-64 widening Peninsula only	108,548	1872	10855	1.45
US 460 only	108,548	1872	10855	1.45
Southeastern Pkwy			10868	1.45
I-64 Southside			11703	1.57
Midtown				1.45
Third				1.43
Thir				1.24
"All Phase 1)				1.40
"All build" (Phase 2)			9444	1.26
"All build" (HRBT-6 lanes, Phase 1)			11638	1.04
"All build" (HRBT-6 lanes, Third Crossing Phase 2)	104,804	1888		0.93
HRBT 6 lanes + Third crossing Phase 1	116,841	1885	11684	1.03
HRBT 6 lanes + Third crossing Phase 2	103,542	1883	10354	0.92

3rd Crossing Phase 2 and HRBT Expansion to 6 lanes

Peak Hour V/C in 2030

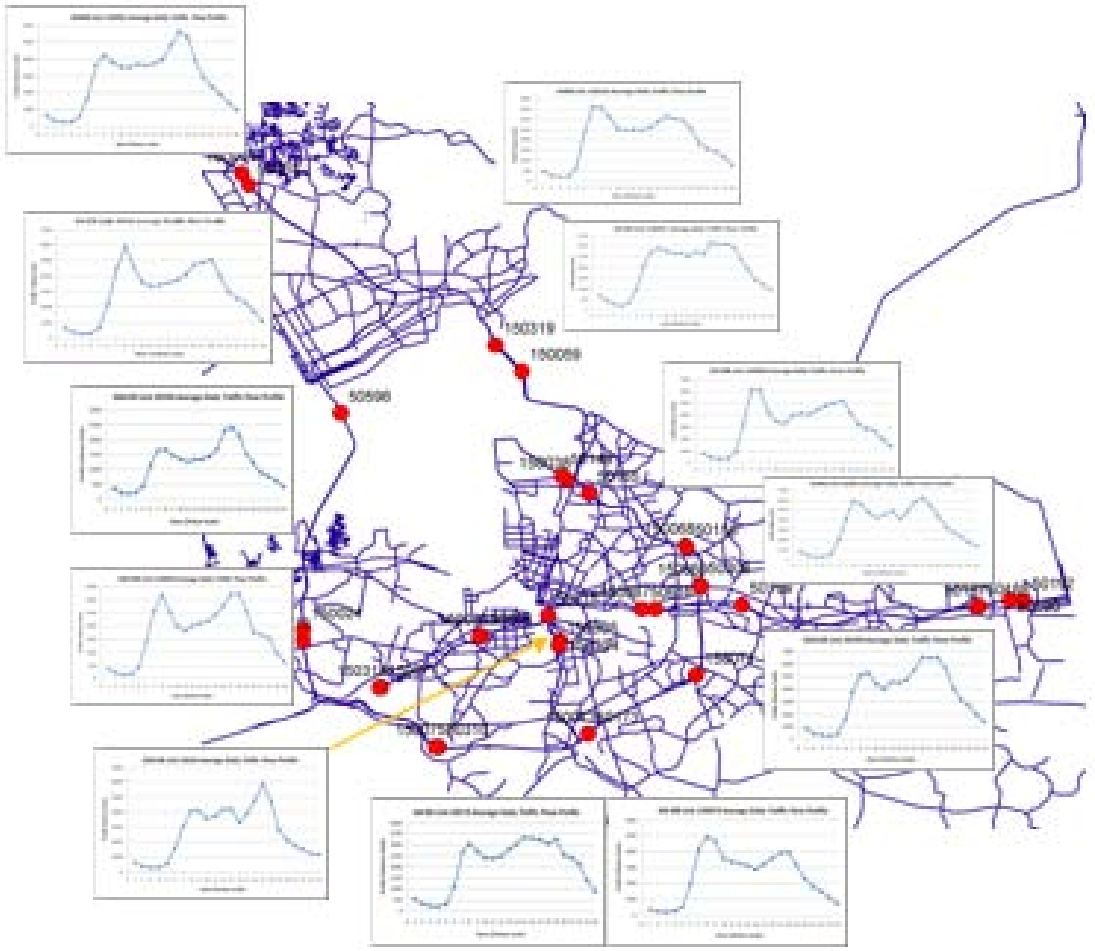


Incident-Induced Congestion Analysis

- Mesoscopic simulation: Citilabs® Cube Avenue
- Selected sections of network tested
- Testing assumed rush hour conditions and three incident scenarios:
  - Shoulder blocked
  - One lane blocked
  - Two lanes blocked (selected sections)
- For simplicity of comparison, all incidents assumed to have 15 minute duration

Critical Segment Daily Traffic Flow

- Note variances in flow during the day and variances between segments
- Rush hour volumes simulated during incident



Congestion Analysis Results

Location of Simulated Incident	Incident Severity	% Increase in Max traffic flow rate (veh/hour)	% Reduction in Average Travel Time
I-664 Expansion Between Bowers Hill and MMMBT (on I-664 Northbound)			
North of Bowers Hill (I-664 North)	Shoulder closed	50.0	49.6
	One lane closed		51.9
	Two lanes closed		51.2
I-664 Expansion Between Bowers Hill and MMMBT (on I-664 Southbound)			
North of Bowers Hill (I-664 South)	Shoulder closed	46.7	48.7
	One lane closed		53.7
	Two lanes closed		47.0
Hampton Roads Bridge Tunnel (expanded to six lanes)			
Eastbound I-64, south of HRBT	Shoulder closed	50.0	49.9
	One lane closed		48.2
	Two lanes closed		44.0
Westbound I-64, north of HRBT	Shoulder closed	49.8	44.9
	One lane closed		45.0
	Two lanes closed		40.0
I-664 3rd Crossing (Phases 1 & 2) and HRBT (expanded to six lanes)			
Westbound, north of the HRBT	Shoulder closed	No change at HRBT until traffic reroutes	59.8
	One lane closed		61.8
	Two lanes closed		51.5

Third Crossing Video

- Video link coming soon

HRBT Video

- Video link coming soon

Study Conclusions

- **Taking no action should not be an option**
  - HRBT traffic demand will be nearly 1.5 times capacity during peak travel hours
- **Of 6 proposed alternatives, only the 3rd Crossing appreciably improves conditions at the HRBT**
- **Only expanding the HRBT can relieve both recurrent and incident-induced congestion at the HRBT**
  - Expanding the HRBT to 6 lanes (or more) and imposition of tolls will relieve some, but not all, of the recurrent congestion
  - Combining an expanded HRBT and the 3rd Crossing (Phase 2) provides significant improvement

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Questions?