TRAVEL CHARACTERISTICS
ON
MD 200 INTERCOUNTY CONNECTOR (ICC)
& VICINITY

A Comparative Analysis of two Scenarios:
“With” and “Without” the Facility in year 2040

Technical Documentation

Prepared for the MD SHA

By

The Transportation Planning Board
of
The Metropolitan Washington Council of Governments

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EXECUTIVE SUMMARY

A study was undertaken at the request of the MD SHA to assess long-term impacts of MD 200 Intercounty Connector (ICC) in its immediate vicinity and the Metropolitan Washington Region. The most recent regional travel demand model of the Metropolitan Washington Council of Governments Transportation Planning Board (MWCOG/TPB), the latest land use planning assumptions, mobile emissions estimating model and highway/transit networks from the TPB Constrained Long Range Plan (CLRP) at the time of the request were used in this study. This is the second time that the MWCOG/TPB provides technical assistance to MD SHA for the ICC corridor. Technical information from a previous study was incorporated into the ICC Final Environmental Impact Statement (FEIS), which was approved in January 2006.

The goal of this study is to assess the long-term role of ICC (year 2040) in the immediate vicinity and the region (I.e., TPB modeled area) by measuring a broad range of travel characteristics ranging from spatial and temporal congestion mitigation, to how much the roadway network is being utilized, to how many more jobs become accessible by highway and transit travel due to the construction of the ICC, to air quality impacts in the study area and the region. These goals were achieved by comparing travel characteristics from two scenarios: a scenario with the ICC completed by year 2040 (i.e., Build Scenario) and a scenario without ICC Built also year 2040 (i.e., No Build Scenario). The No Build Scenario is hypothetical as the first phase of ICC is already constructed and open to traffic. The remainder is scheduled to open in 2013 or 2014. By testing such a hypothetical scenario the long-term impacts – positive and negative – of ICC could be quantified.

Congestion Mitigation Impacts: ICC relieves congestion in its immediate vicinity – the study area – as it reduces approximately 38,000 vehicle hours of delay (VHD) or 8.3 percent of the study area total. At a regional scale the congestion mitigation effects of ICC are considerably smaller as an estimated 58,000 VHD are reduced, or a 1.7 percent of the regional total. It is noteworthy that most of the regional VHD decrease occurs in the study area.

The greatest congestion relief in the study area is expected during the peak periods: with ICC constructed motorists will experience 28 additional miles of uncongested facilities during the AM Peak Period than they will have without the ICC in place; these 28 miles (i.e., 8 percent of the study area total) would have been congested. The corresponding congestion relief for the PM Peak Period is 25 miles of uncongested roadways in the study area (i.e., 7 percent of the study area total).

Among the various user groups of the transportation network, single occupancy vehicles (SOV), which represent the largest market segment of the traveling public, will realize the largest decrease of vehicle hours of delay with approximately 23,000 VHD reduction in the study area and 35,000 in the region. Among smaller market segments of the travelling public, BWI airport-related trips and trucks will realize the greatest VHD reductions – in percentage points reductions -- in the study area with 14% and 8% respectively. The VHD reductions for BWI airport-related trips and trucks in a regional context are 2% for each category. Among three corridors parallel to ICC – and I-495 – that MD SHA asked TPB to evaluate for congestion relief, the northernmost corridor i.e., I-370 to MD 198) yielded the most travel time savings. It is a corridor with a direct connection to I-270 via I-370. It is also noteworthy that no significant travel volume shifts were recorded from I-495 to ICC.

Network Utilization Impacts: The construction of ICC will increase the overall Vehicle Miles Traveled (VMT) in the study area marginally (i.e., an increase of 892,787 VMT or 3.7% of the total). At the regional level the construction of ICC will increase VMT by 507,027 or 0.2% of the regional total. During the peak periods VMT will increase approximately by 6% (i.e., each of the AM and PM peak periods) while the off-peak VMT increase would be around 2%. Regionally the peak periods and daily total VMT increases do not exceed 0.5% of the corresponding totals, which are indicators of the localized effect of ICC on VMT.

Among the various user groups of the transportation network, single occupancy vehicles (SOV) – representing the largest market share of the traveling public – will be responsible for the largest VMT increase in the study area (i.e., approximately 18,000 VMT) and 322,000 VMT in the region. In terms VMT increases measured in percentage points, HOV+3 and commercial vehicles – representing smaller market shares of the traveling public – exhibit the largest percentage increases in VMT (i.e., over 6% each). However, they do not result in measurable VMT increases in the region.

ICC does not change the total number of person trips in the study area as the difference between the two scenarios is a marginal 3,163 person trips out of 24.5 million. Similarly, ICC will not change the overall transit ridership in the study area as the difference between the two scenarios is 9,706 person trips out of transit ridership of 1.5 million.

Two segments of ICC are the most heavily traveled: (a) a section between I-370 and MD 97 (Georgia Avenue); (b) a section between MD 650 (N. Hampshire Avenue) and I-95. The east end of ICC (i.e., east of I-95) is the least travelled segment carrying approximately 25-35% of the volumes of the remaining segments of ICC. During peak time periods roughly a half of ICC traffic is entering from interchanges at MD 355 and MD 97 and exiting at I-95 and US 29; and the westbound traffic shows the reverse pattern.

Jobs Accessibility and Costs: ICC significantly improves accessibility to jobs in the core of the study area, which is roughly defined by I-270 on the west, I-95 on the east and I-495 on the south. .

Toll projections on ICC to ensure free-flow speeds throughout the day were estimated by the model at present levels. During the peak periods, the modeled tolls were found to be $1.43 for a traveler between MD 97 (Georgia Avenue) and I-370 when the actual toll for the same segment currently stands at $1. 45.

Air Quality Impacts: The construction of ICC yields nominal increases in criteria pollutants in the study area and the region. In the case of Ozone – Volatile Organic Compounds (VOC) there is no measurable change in the levels of VOC between the two scenarios as a nominal increase in Montgomery County is balanced by nominal decreases in neighboring Prince George's and Frederick Counties. In the case of Ozone – NOx there is a nominal increase of 0.163 t/d in Montgomery County and nominal decreases in Prince George's, Frederick, Calvert, and Charles Counties. In the case of Fine Particles emissions, there are increases of 3.8 t/y of Direct PM2.5 and 64.6 t/y in Precursor NOx in Montgomery County and nominal decreases in Frederick County. Montgomery County shows the most significant increase in annual CO2 emissions with an estimated 236,000 ton or a four percent increase.

In summary, the travel-related indicators assessed in this study converge to the same conclusion: MD 200 Intercounty Connector (ICC) yields substantial benefits in its immediate vicinity (i.e., study area) by reducing spatial and temporal congestion, by providing a connecting corridor between I-270, I-95, and the BWI airport further away, by increasing the number of accessible jobs by highway and transit modes at competitive toll rates, while nominally increasing air quality emissions in the region. The beneficial effects of ICC, however, dissipate with distance from the facility.

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BACKGROUND

A study was undertaken by the Metropolitan Washington Council of Governments Transportation Planning Board (MWCOG/TPB) at the request of the Maryland State Highway Administration (MD SHA) in order to assess long-term travel-related characteristics in the area surrounding the Intercounty Connector (ICC). Year 2040 was chosen as the long-term planning horizon year because it is the last year of the 2011 MWCOG/TPB Constrained Long Range Transportation Plan (CLRP).

Comparative analyses across a broad range of performance measures were conducted between two scenarios: "With" and "Without" the ICC constructed by year 2040. Such analysis will quantify the long-term impact of ICC in the adjacent vicinity and further away.

The analyses were conducted using the most recent planning assumptions at the time of the MD SHA request. They were: MWCOG/TPB's Version 2.3 regional travel demand model, Round 8.0a cooperative land use forecasts, and highway/transit networks based on the 2011 Constrained Long Range Plan (CLRP). This is the second time that the MWCOG/TPB provides technical assistance to MD SHA for the ICC corridor. The initial contribution consisted of technical data that were incorporated into the project's Final Environmental Impact Statement (FEIS), which was approved in January 2006. As is customary, MWCOG/TPB updates its regional travel demand model and cooperative land use forecasts for the Metropolitan Washington region periodically. The findings of these analyses will enable MD SHA to "re-benchmark" the long-term performance of the ICC vis-à-vis a hypothetical "No-Build" Scenario using more recent modeling tools, land use and networks assumptions.

Study Area

The project study area extends from I-270 in Montgomery County on the west to the Baltimore Washington Parkway (Route 295) in Prince George's County on the east, and from Patuxent River on the north to the Washington Beltway (I-495) on the south (Figure 1).

Travel Demand Model Parameters

The Version 2.3 MWCOG/TPB model was calibrated based on the most recent 2007/2008 Household Travel Survey (HTS). It is also a tested and approved model as it was used for Air Quality Conformity Determinations for the 2011 CLRP and subsequently for the 2012 CLRP.

The MWCOG/TPB model is structured for regional transportation planning applications, and, when it is applied for subarea/corridor-level analyses, it is customarily enhanced to capture the finer grain level of detail necessary in such studies. Therefore, secondary roadway facilities were added to the highway network of the study area and

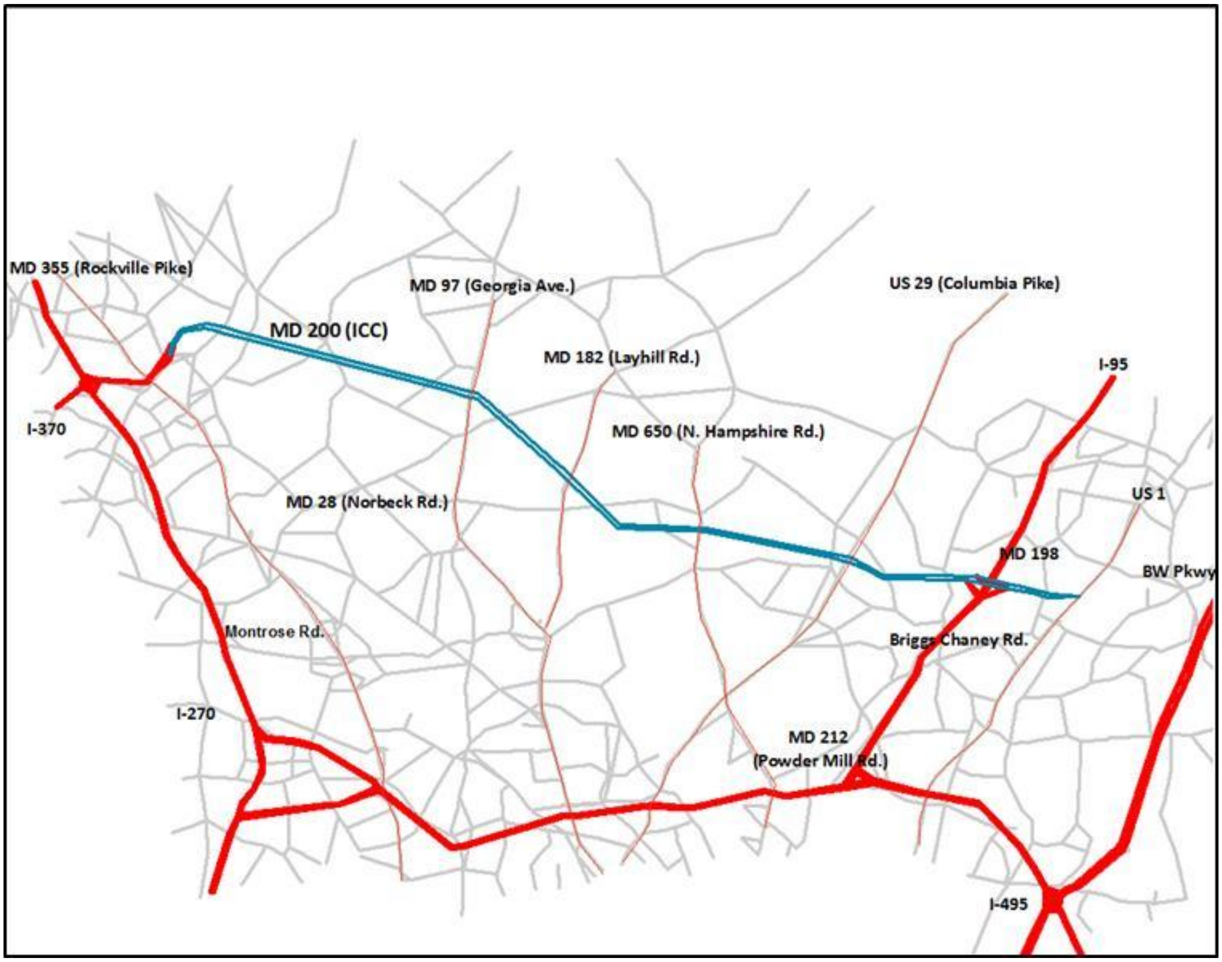


Figure 1 - Project Study Area

supplemental refinements were implemented in order for the model to validate more satisfactorily in the study area.

Prior to applying the model to the comparative analyses its performance was tested (i.e., model validation) by comparing model-generated link volumes to actual traffic count data (where available) for year 2010. Figure 2 illustrates the eleven screenlines drawn emulating major traffic corridors in the study area. "Estimated-to-observed volume ratios" were derived for these screenlines.

Where the screenlines did not provide adequate coverage, cutlines were drawn to supplement the screenline analysis by providing additional points of comparison of the model performance (Figure 3). The introduction of cutlines into the analyses did not skew the 2010 model validation results as the MWCOG/TPB model is validated for traffic volumes on freeways, expressways and major arterials.

Figure 2 - Screenlines in the Study Area

Figure 3 - Cutlines in the Study Area

2010 MODEL VALIDATION

Prior to fully integrating the selective model enhancements into the travel demand modeling processes for year 2040, the model was extensively tested for year 2010 conditions. These tests aimed to assess: (1) whether the selective and reasonable network enhancements in the study area alter the performance of the model in a meaningful way; (2) whether congestion levels – a proxy for comparison of operating speeds – were consistent with congested conditions based on traffic count data because the MWCOG/TPB model is not validated for link-level speeds; and (3) whether the "enhanced" model validated satisfactorily at the screenlines/cutlines in the study area

Networks Utilization Comparisons

The network enhancements in the study area did not alter the overall roadway system utilization, which is measured in vehicle miles traveled (VMT). The difference between the "enhanced" and "original" model versions for year 2010 is merely 212,328 VMT apart, or a 0.1-percent of the total VMT in the study area (Table 1). When the network utilization levels are assessed in greater detail – by facility type – there is a 3.7 million VMT decrease in the freeway category and a simultaneous increase of 2.6 million VMT in the expressway category. This is attributed to a coding change of SR 295 (Baltimore Washington Parkway) from freeway in the "original" model to expressway in the "enhanced" model. In addition to VMT, several other network utilization parameters were assessed: auto and transit trips by trip purpose, VMT/Capita, VMT/Household, VMT/trip. The comparative data between the "original" (i.e., 2011 CLRP) and the "enhanced" (i.e., Validation model) are included in Table A1 in the Appendix.

Facility Type	CLRP	Validation	Δ	%Δ
Freeway	66,937,418	63,225,453	-3,711,965	-5.5%
Major Arterial	57,612,718	57,817,730	205,012	0.4%
Minor Arterial	20,012,693	20,552,107	539,414	2.7%
Collector	10,992,347	10,951,990	-40,357	-0.4%
Expressway	6,848,068	9,492,815	2,644,747	38.6%
Ramp	1,670,442	1,821,263	150,821	9.0%
Total VMT	164,073,686	163,861,358	-212,328	-0.1%

Table 1 - 2010 VMT Comparisons

Congestion/Operating Speeds Comparisons

A congestion index is used to assess percentages of the study area network under congested conditions, which are defined as follows: a congestion index of equal or greater than 1.3 reflected congested conditions; a congestion index of less than 1.3 reflected uncongested conditions. This index was chosen and calculated as the same with Travel Time Index (TTI) of INRIX, which is a real-time congestion measure. It was calculated by dividing the free-flow speed by congested speed. Comparisons between the model generated congestion estimates and INRIX-based TTI are shown in Table 2.

	Uncongested TTI < 1.3		Congested TTI >= 1.3		Difference INRIX Vs. 2010 Validation	
Time Period	INRIX	2010 Validation	INRIX	2010 Validation	Uncongested	Congested
AM Peak						
Miles	215.8	165.8	173.0	198.7	-50.0	25.6
%	56%	45%	44%	55%	-10%	10%
Midday						
Miles	267.1	298.9	121.7	55.6	31.8	-66.1
%	69%	84%	31%	16%	16%	-16%
PM Peak						
Miles	162.3	136.5	226.5	232.6	-25.9	6.1
%	42%	37%	58%	63%	-5%	5%
Nighttime						
Miles	334.9	377.3	54.0	1.5	42.4	-52.5
%	86%	100%	14%	0%	14%	-14%

*Total mileage slightly differs due to access probihition during peak.

**AM peak: 8 - 9 am; Midday peak: 12 - 1 pm; PM peak: 5 - 6 pm; and Nighttime peak: 8-9 pm

Table 2 - 2010 Congestion Comparisons

Network congestion during the peak periods is evident by both the INRIX data and the model validation: during the AM Peak Period an estimated 44-55 percent of the network is congested, while the corresponding percentages during the PM Peak Period are 58-63 percent. The midday levels of congestion are 16-31 percent of the total network.

During the peak periods the model derived higher levels of congestion than the INRIX data indicate: for example, during the AM Peak Period the model estimates 55 percent of the study area network to be congested while the INRIX data estimate a 44-percent congested network. These estimates indicate that the model yields lower operating speeds than INRIX data indicate. Peak period congestion comparisons are graphically illustrated in Figures A1 and A2 in the Appendix. They illustrate consistent peak period congestion patterns but they differ in the levels of congestion.

Screenline/Cutline Performance Comparisons

High functional class facilities – such as freeways and expressways – validate more satisfactorily than lower functional class roadways. This is attributed to the fact that the model is validated for major roadway facilities. For example, I-270, I-495 or the Baltimore-Washington Parkway show close fit within +/- 10 percent while the estimated volumes fluctuate more in local roads in each screenline.

Table 3 reveals that the model tends to underestimate along most of the north-south screenlines and to overestimate along the east-west screenlines. The overall model performance across all screenlines was at a positive six percent. Table A2 of the Appendix provides further detail on these comparisons.

Screenline	Direction	Location	2010 Counts	Estimated	Est/Cnts
1	North-South	East of I-270	473,240	428,221	0.90
2	North-South	West of Connecticutt Ave	364,140	395,452	1.09
3	North-South	East of Georgia Ave	311,724	339,150	1.09
4	North-South	West of Columbia Pike	468,694	461,638	0.98
5	North-South	West of I-95	528,696	523,348	0.99
6	North-South	West of Baltimore Ave	455,982	393,504	0.86
7	North-South	West of BW Pkwy	336,326	299,039	0.89
8	East-West	North of Beltway	1,183,656	1,322,656	1.12
9	East-West	South of ICC	533,686	588,619	1.10
10	East-West	Between Beltway and ICC	814,678	929,368	1.14
11	East-West	North of ICC	655,780	801,540	1.22
Total			6,126,602	6,482,536	1.06

Table 3 - 2010 Model Validation at Screenlines

Cutline results in Table 4 reveals that volume comparisons show more increase and decrease in comparison to the screenline results as expected because the MWCOG/TPB model was not validated at the local road level. Overall the model tends to overestimate traffic volumes by six percent at cutlines.

Cutline No	Cutline	2010 Counts	Estimated	Est/Cnts
1	S of Falls Road	65,614	42,953	0.65
2	I-270 Spur	316,826	352,302	1.11
3	N of Rock Creek Trail	147,094	159,961	1.09
4	E of I-95 at Powder Mill Road	42,896	47,748	1.11
5	E of US 1	69,056	62,516	0.91
6	N of North Bethesda	150,552	136,960	0.91
7	NE of North Bethesda	119,880	138,380	1.15
8	W of I-370	178,500	180,682	1.01
9	N of I-370	39,740	32,692	0.82
10	E of I-370	31,244	33,614	1.08
11	NE of I-370	77,204	92,112	1.19
12	E of I-95 at Laurel	45,794	46,589	1.02
13	S of Randolph Road	128,332	158,272	1.23
14	Wheaton Glenmont	150,872	183,797	1.22
15	E of MD 108: Clarksville	62,896	59,044	0.94
16	W of Germantown	18,256	20,416	1.12
	Total	1,644,756	1,748,037	1.06

Table 4 - 2010 Model Validation at Cutlines

Travel Time Savings along Local Corridors

The model underestimates travel time on three local corridors when compared to actual travel time measured for the corridors before ICC is built (Table 5). Model travel times exhibit shorter travel time in most of corridor segments regardless of time periods; however, the comparison results should not be used to determine the performance of the Validation model. It is because the MWCOG/TPB model is a regional model neither validated for the small areas nor by travel speed but by travel volume in the region.

			AM Travel Time			PM Travel Time		
Direction	Corridor	Distance (in miles)	SHA Data	2010 Validation	% Δ	SHA Data	2010 Validation	% Δ
EB	1: MD 28 - Briggs Chaney Rd	16.37	43	36	-16.8%	46	44	-4.3%
	2: Montrose Rd - MD 212	15.22	37	28	-24.1%	46	41	-10.9%
	3: I-370 - MD 198	19.12	47	41	-13.2%	41	50	23.9%
WB	1: Briggs Chaney Rd - MD 28	16.37	45	42	-7.1%	40	41	0.5%
	2: MD 212 - Montrose Rd	15.22	42	37	-11.4%	37	34	-7.5%
	3: MD 198 - I-370	19.12	44	49	10.5%	47	45	-5.9%

Table 5 - Travel Time Comparisons of Local Corridors (in minutes)

Upon achieving satisfactory model performance for year 2010, the selective network enhancements were carried over to year 2040 scenario analyses.

2040 COMPARATIVE ANALYSES

2010-2040 Growth Patterns

During the 30-year period the number of households in the study area is anticipated to increase by approximately 35 percent, which reflects an average annual growth of approximately 1.16%. Jobs are forecasted to increase by 39 percent, which reflects an average annual growth of 1.30%. During the same period the forecasted person-trips will also increase by 30 %, or approximately one percent per year, while transit trips will increase over 37 %, or approximately 1.23% annually. Among the various subcategories of transit, it is forecasted that commuter rail will increase at the fastest rate despite the fact that it represents a small market share of the total regional transit ridership.

During the same period the roadway system utilization – measured in VMT – is forecasted to increase by 32%, or approximately one percent annually. The most rapid growth is anticipated along the collectors – an estimated growth of 46.5% – although collectors represent just 7.5% of total VMT in the study area in 2040.

The fundamental trip generating characteristics of the households in the study area are expected to remain unchanged: the forecasted VMT per capita is expected to remain stable during the 30 year period as substantiated by the nominal growth of 1.6% for the entire period; the average trip length per household is expected to be reduced by 2.3% as higher density development continues in close proximity to jobs or activity centers. All of the above statistics are tabulated in Table A3 in the Appendix.

Network Congestion Comparisons

Congestion levels were assessed in four ways by comparing: (a) TTI indexes to measure the extent of congestion in the study area; (b) vehicle hours of delay (VHD) in the study area; (c) volume/capacity (V/C) ratios along key segments on ICC; and (d) travel time savings on local corridors.

a. Travel Time Index: Travel time index (TTI) was used as proxies to assess the extent of congestion in the study area during peak and off peak periods under the two scenarios (see Table 6): No build and Build. The construction of ICC would yield a potential reduction of 28 congested lane miles during the AM peak period and 26 lane miles during the PM peak period. The midday and nighttime time hours would have marginal changes in congested lane miles. This demonstrates that ICC would decrease congested lane miles on the major corridors of the study area, especially during peak periods.

	Uncongested		Congested		Difference	
	TTI < 1.3		TTI >= 1.3		No Build Vs. Build	
Time Period	2040 No Build	2040 Build	2040 No Build	2040 Build	Uncongested	Congested
AM Peak						
Miles	121.1	148.8	248.8	220.5	27.8	-28.3
%	33%	40%	67%	60%	8%	-8%
Midday						
Miles	262.1	267.9	95.9	89.6	5.8	-6.3
%	73%	75%	27%	25%	2%	-2%
PM Peak						
Miles	82.7	108.0	287.6	261.8	25.4	-25.8
%	22%	29%	78%	71%	7%	-7%
Nighttime						
Miles	353.1	352.6	4.9	4.9	-0.5	0.0
%	99%	99%	1%	1%	0%	0%
*Total mileage slightly differs due to access probihition during peak.						
**AM peak: 8 - 9 am; Midday peak: 12 - 1 pm; PM peak: 5 - 6 pm; and Nighttime peak: 8-9 pm						

Table 6 - 2040 Network Congestion Comparisons

b. Vehicle Hours of Delay:
Study Area: The construction of the ICC will benefit travelers in the immediate vicinity: the largest decline in vehicle hours of delay (VHD) is estimated for Montgomery County (i.e., 38,500 VHDs), followed by Prince George's County with a 12,200 VHD decrease. Overall, Maryland jurisdictions exhibit greater VHD reductions than jurisdictions farther away. Table A4 in the Appendix lists the VHD

changes throughout the MWCOG/TPB planning area.

Region: Upon establishing that the greatest congestion mitigation benefits of ICC are in its vicinity, regional benefits were assessed: ICC results in a decrease of approximately 58,000 VHDs regionally, which reflects a 1.7 percent reduction.

Time of Day: The construction of ICC would be mostly beneficial in mitigating congestion delay during the AM and PM peak periods (Table 7).

	Study Area				Regional			
			[Build] - [No Build]				[Build] - [No Build]	
Time of Day	No Build	Build	Δ	%Δ	No Build	Build	Δ	%Δ
AM Peak	154,208	141,774	-12,435	-8.1%	1,238,913	1,218,858	-20,056	-1.6%
Midday	54,277	50,976	-3,301	-6.1%	330,050	326,577	-3,473	-1.1%
PM Peak	239,851	217,583	-22,268	-9.3%	1,726,717	1,692,723	-33,994	-2.0%
Nighttime	10,170	9,946	-223	-2.2%	71,482	71,072	-410	-0.6%
Total	458,506	420,278	-38,227	-8.3%	3,367,162	3,309,230	-57,933	-1.7%

Table 7 - 2040 Vehicle Hour Delay Comparisons (Time-of-Day)

Vehicle Type: VHD comparisons between the two scenarios were undertaken by six vehicle types: single occupancy vehicles (SOVs), high occupancy vehicles (HOV^{+2}, HOV^{+3}), commercial vehicles, trucks and airport passenger vehicles. These vehicle type categories are defaults in the TPB regional travel demand model. As such, they are viewed in the context of this study as proxies of certain markets of the traveling public and they were not meant to be directly linked to any particular HPMS vehicle class.

	Study Area				Regional			
			[Build] - [No Build]				[Build] - [No Build]	
Veh. Category	No Build	Build	Δ	%Δ	No Build	Build	Δ	%Δ
SOV	294,370	271,664	-22,706	-7.7%	2,155,330	2,120,689	-34,641	-1.6%
HOV2	70,807	64,295	-6,512	-9.2%	498,596	489,036	-9,561	-1.9%
HOV3+	27,801	25,212	-2,589	-9.3%	205,009	200,587	-4,423	-2.2%
Comm. Vehicle	36,065	32,393	-3,672	-10.2%	276,098	270,620	-5,478	-2.0%
Trucks	24,860	22,766	-2,094	-8.4%	191,778	188,802	-2,977	-1.6%
Airport Passenger	4,598	3,942	-655	-14.3%	40,265	39,407	-858	-2.1%
Total	458,506	420,278	-38,227	-8.3%	3,367,162	3,309,230	-57,933	-1.7%

Table 8 - 2040 Delay Comparisons (Vehicle Category)

Table 8 exhibits the forecasted travel time savings to be realized in year 2040 by different markets of the traveling public when the ICC is fully constructed. In light of the proximity of the BWI airport to the study area, the Airport Passenger trips market segment was intentionally kept separate from the passenger car categories (i.e., SOV, HOV^{+2}, HOV^{+3}) despite the fact that in other applications it would have been integrated into the passenger trips market. In this case it was kept separate in order to demonstrate that there will be substantial travel time savings for this market segment of the traveling public.

In terms of absolute numbers the single occupancy vehicle category exhibits the greatest reduction in VHD (i.e., 22,706) as it constitutes the largest market share of the traveling population. In terms of percentage reductions, the greatest reductions are observed for Airport Passenger trips (i.e., 14.3 percent) and Commercial Vehicles (i.e., 10.2 percent) although each type represents a rather moderate market share of the traveling population (Table 8).

c. Volume/Capacity Ratio:
Volume/Capacity (V/C) ratios of ICC segments will remain below capacity levels (i.e., V/C ratios remain below 0.88 throughout). It is an indication that ICC traffic volumes will most likely flow unimpeded, and that the ICC tolls are set at appropriate levels in order to maintain uncongested traffic flows. Detailed data of V/C ratios by segments, time of day and direction are illustrated in Figure A3 in the Appendix.

d. Travel Time Savings on Local Corridors:
It is previously established that ICC is anticipated to reduce travel times in the study area. MD SHA requested that three local corridors be analyzed and the resulting travel time savings to be compared. The local corridors are: (1) MD 28 to Briggs Chaney Rd.; (2) Montrose Rd. to MD 212; (3) I-370 to MD 198 (Figure 4).

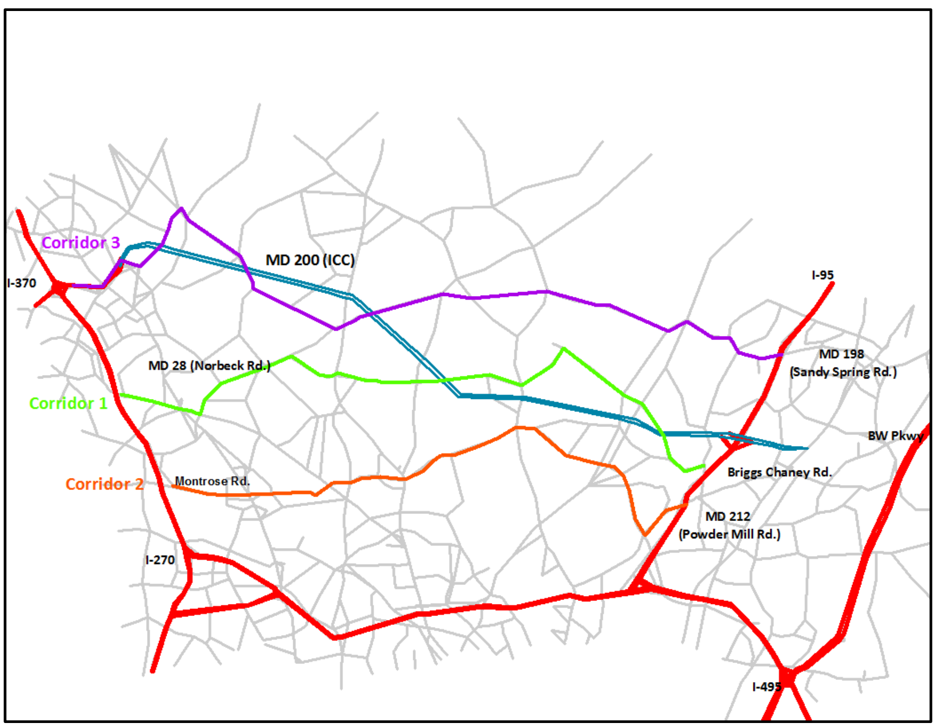


Figure 4 - Local Corridors for Travel Time Savings Comparisons

The most substantial time savings are associated with Corridor 3 as it yields an estimated 15 minutes (on average) of time savings during each of the peak periods (Table 9). On a segment-by-segment basis the most substantial time savings occur at segments with direct connection to I-270. Detailed data that support this conclusion are presented in Figure A4 in the Appendix.

			AM Travel Time			PM Travel Time		
Direction	Corridor	Distance (in miles)	NoBuild	Build	%Δ	NoBuild	Build	%Δ
EB	1: MD 28 - Briggs Chaney Rd	16.37	47	39	-17.3%	59	47	-19.6%
	2: Montrose Rd - MD 212	15.22	37	33	-11.9%	57	47	-17.4%
	3: I-370 - MD 198	19.12	55	39	-28.6%	61	45	-27.1%
WB	1: Briggs Chaney Rd - MD 28	16.37	53	45	-15.0%	52	43	-16.9%
	2: MD 212 - Montrose Rd	15.22	50	43	-12.6%	44	39	-11.6%
	3: MD 198 - I-370	19.43	57	43	-24.8%	58	43	-26.4%

Table 9 - Travels Time Savings on Local Corridors (in minutes)

Network Utilization Comparisons

The utilization levels of the roadway system were assessed in the following ways: (a) by estimating travel demand on ICC on a segment-by-segment basis (b) by identifying key entrance/exit points along ICC (c) by measuring the overall usage of ICC in terms of VMT and (d) by comparing person trips in the study area (highway and transit).

a. <u>Travel Demand on a Segment-by-Segment Basis</u>:
   Travel demand varies by segment along ICC (Figure 5). Heavier travel demands are derived for the following segments: I-370 to MD 97 (Georgia Ave.), and MD 650 (N. Hampshire Ave. to I-95). Each of these segments is anticipated to carry estimated average 38,000 – 46,000 vehicles per day per direction of travel. These segments are located close to I-370 and I-95 corridors. Single occupancy vehicles (SOV) consist of more than a half of total trips followed by commercial vehicle trips. The eastern end of ICC between I-95 and Virginia Manor Road is anticipated to carry a fraction of the forecasted traffic volumes of the other segments of ICC.

   The daily traffic volume patterns of Figure 5 follow similar patterns to AM, PM and Midday traffic volume fluctuations by segment and direction of travel (Figure A5 in the Appendix). A larger percentage of non-SOV vehicle types are forecasted for the PM Peak Period in both directions of travel than any other time period.

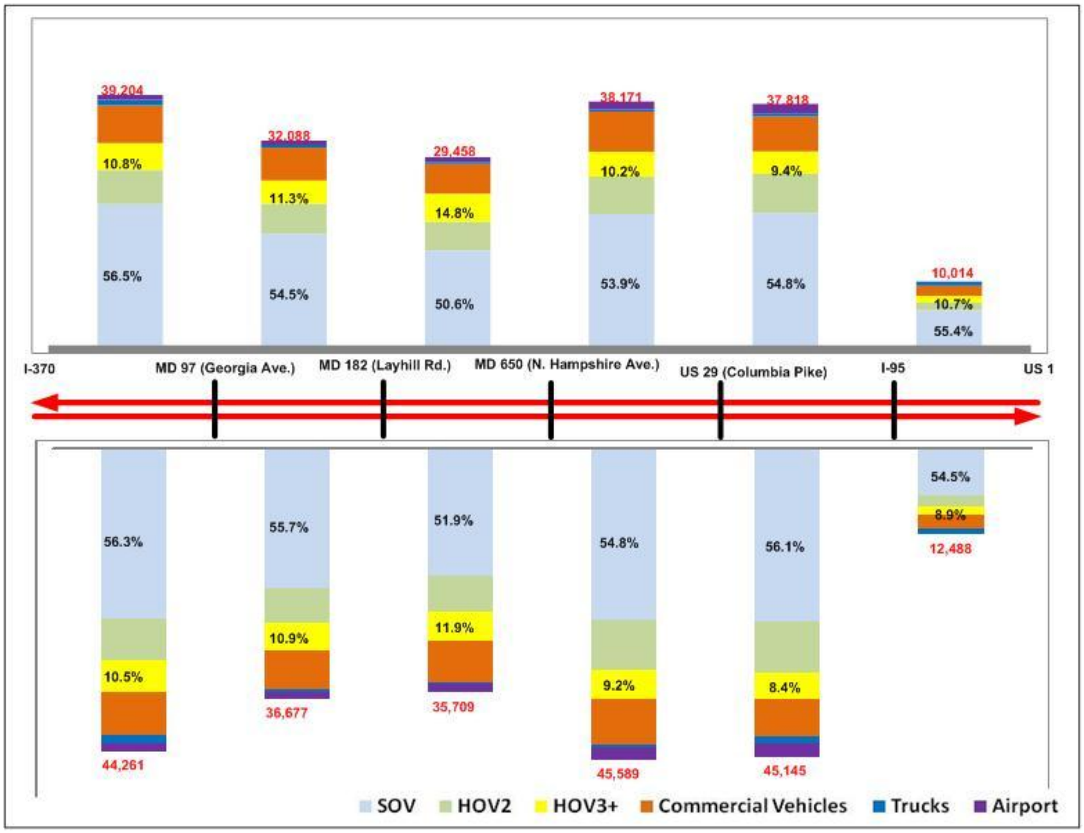


Figure 5 - Average Weekday Projections for ICC (by Segment/Direction)

ICC offers marginal congestion relief on I-495 (the Washington Beltway) (Table 10). The ICC impacts were evaluated at Screenlines 1 through 7 shown in Figure 2. The projected traffic volume differences between the "No Build" and "Build" Scenarios are nominal, which substantiates that there is no substantial shift of traffic volumes between I-495 and ICC. Table A4 in the Appendix provides a complete account of traffic volume differences at all screenlines in the study area.

Screenline	No Build	Build	Δ	Rate
1	146,193	141,371	-4,822	0.97
2	261,758	258,617	-3,142	0.99
3	252,517	248,738	-3,779	0.99
4	252,517	248,738	-3,779	0.99
5	302,455	296,823	-5,632	0.98
6	243,766	240,849	-2,917	0.99
7	224,851	224,766	-85	1.00

Table 10 - ICC Impact on I-495

b. <u>Key Entrance/Exit Points</u>:

During the AM Peak Period approximately 80,000 vehicles are projected to enter the ICC corridor at its west end (i.e., MD 355 and MD 97) in order to travel eastward. Approximately, 60,000 vehicles would exit at the east end of the corridor (i.e., US 29 and I-95). Similarly, approximately 90,000 vehicles are projected to enter the corridor at its east end (i.e., I-95, US 29, MD 650) in order to travel westward. Approximately, 98,000 vehicles would exit at the west end of the corridor (i.e., MD 182, MD 97 and MD 355) (Table 11).

(A) Eastbound

Entering IC at ICC	Total	Share %	Exiting IC at ICC	Total	Share %
MD 355	37,265	30%	MD97	10,671	9%
MD 97	30,043	24%	MD 182	19,917	16%
MD 182	22,982	19%	MD 650	25,911	21%
MD 650	19,512	16%	US 29	29,414	24%
US 29	11,877	10%	I-95	31,269	25%
I-95	1,561	1%	US 1	6,059	5%
Total	123,241	100%	Total	123,241	100%

(B) Westbound

Entering IC at ICC	Total	Share %	Exiting IC at ICC	Total	Share %
US 1	10,123	8%	I-95	2,439	2%
I-95	30,645	23%	US 29	11,674	9%
US 29	30,652	23%	MD 650	19,945	15%
MD 650	27,865	21%	MD 182	23,761	18%
MD 182	19,983	15%	MD 97	31,252	24%
MD 97	12,698	10%	MD 355	42,896	33%
Total	131,967	100%	Total	131,967	100%

Table 11 - Key Entrance and Exit Points on ICC (AM Peak Period)

During the PM Peak Period approximately 140,000 vehicles are projected to enter the ICC corridor at its west end (i.e., MD 355 and MD 97) in order to travel eastward. Approximately, 130,000 vehicles would exit at the east end of the corridor (i.e., US 29 and I-95). Similarly, approximately 110,000 vehicles are projected to enter the corridor at its east end (i.e., I-95, US 29, MD 650) in order to travel westward. Approximately, 115,000 vehicles would exit at the west end of the corridor (i.e., MD 182, MD 97 and MD 355) (Table 12).

c. <u>Vehicle Miles of Travel Comparisons</u>:
Study Area versus the Region: ICC is projected to have localized impacts in the study area as the majority of VMT increases are accounted for in the immediate vicinity (i.e., primarily Montgomery County and secondarily Howard County) (Table A5 in Appendix). At the regional level, ICC does not alter the regional VMT total as it adds

approximately 50,000 VMT to a regional total of 217 million.

(A) Eastbound

Entering IC at ICC	Total	Share %	Exiting IC at ICC	Total	Share %
MD 355	56,082	30%	MD 97	16,845	9%
MD 97	42,578	23%	MD 182	27,828	15%
MD 182	37,474	20%	MD 650	38,018	20%
MD 650	29,669	16%	US 29	45,429	24%
US 29	18,398	10%	I-95	47,258	25%
I-95	3,265	2%	US 1	12,089	6%
Total	187,466	100%	Total	187,466	100%

(B) Westbound

Entering IC at ICC	Total	Share %	Exiting IC at ICC	Total	Share %
US 1	11,724	7%	I-95	3,263	2%
I-95	39,607	25%	US 29	16,463	10%
US 29	36,413	23%	MD 650	25,941	16%
MD 650	33,718	21%	MD 182	29,520	18%
MD 182	26,144	16%	MD 97	39,079	24%
MD 97	13,793	9%	MD 355	47,133	29%
Total	161,398	100%	Total	161,398	100%

Table 12 - Key Entrance and Exit Points on ICC (PM Peak Period)

Time of Day: ICC results in a four percent increase in the daily total VMT in the study area while the VMT increases during the AM and PM peak periods are approximately five percent. ICC does not have any measurable impacts on VMT in a regional context (Table 13).

	Study Area				Regional			
			[Build] - [No Build]				[Build] - [No Build]	
Time of Day	No Build	Build	Δ	%Δ	No Build	Build	Δ	%Δ
AM Peak	4,275,408	4,520,962	245,554	5.7%	41,036,302	41,182,100	145,798	0.4%
Midday	7,639,954	7,812,268	172,314	2.3%	66,608,065	66,706,769	98,704	0.1%
PM Peak	6,414,136	6,767,219	353,084	5.5%	61,219,868	61,394,786	174,919	0.3%
Nighttime	5,747,668	5,869,502	121,834	2.1%	47,619,468	47,707,075	87,606	0.2%
Total	24,077,165	24,969,952	892,787	3.7%	216,483,703	216,990,730	507,027	0.2%

Table 13 - VMT Impacts by Time-of-Day

Vehicle Type: In absolute numbers single occupant vehicles (SOV) contribute most to the VMT increase in the study area and the region since they constitute the largest market segment of the traveling market. In terms of percentage increases, HOV3+ and Commercial Vehicles – despite being smaller segments of the traveling market – exhibit larger percentage increases in 2040 in the “Build” scenario (Table 14).

	Study Area				Regional			
			[Build] - [No Build]				[Build] - [No Build]	
Vehicle Category	No Build	Build	Δ	%Δ	No Build	Build	Δ	%Δ
SOV	14,690,370	15,208,740	518,369	3.5%	126,740,240	127,061,987	321,747	0.3%
HOV2	3,898,251	3,997,427	99,176	2.5%	34,299,732	34,327,682	27,950	0.1%
HOV3+	1,757,812	1,874,296	116,483	6.6%	18,069,568	18,134,463	64,895	0.4%
Comm. Veh.	1,827,222	1,942,830	115,608	6.3%	17,870,105	17,956,845	86,740	0.5%
Trucks	1,645,275	1,676,233	30,958	1.9%	16,253,064	16,269,589	16,525	0.1%
Airport Passenger	258,235	270,427	12,192	4.7%	3,250,992	3,240,162	-10,830	-0.3%
Total	24,077,165	24,969,952	892,787	3.7%	216,483,703	216,990,730	507,027	0.2%

Table 14 - VMT Impacts by Vehicle Category

d. Person Trips Comparisons:
In the long run, ICC will not alter the total number of person trips in the study area, as the difference in person trips between the two scenarios was estimated at 3,163 person trips when the total person trips in the study area is forecasted to be around 24.5 million regardless of the scenario (Table A3 in the Appendix). Similarly, ICC will not alter the overall transit ridership in the study area as the transit ridership difference between the two scenarios was estimated at 9,706 person trips when the total transit ridership in the study area is forecasted to be around 1.5 million. The nominal transit ridership increase was attributed to the availability of express BRT bus service on ICC or the availability of local bus routes with connections to the BRT (Table A5 in the Appendix).

Six express bus routes and five local bus routes with connections to the express bus service are assumed in the modeling process. Express bus ridership is measured by comparing transit ridership change in mode choice with and without ICC in 2040. The ridership was summarized by an origin-destination matrix based on 11 travel markets in the study area. Detailed trip exchanges among the travel markets are shown in Table A7 in the Appendix.

Jobs Accessibility Comparisons

Accessibility to jobs was assessed in three ways by: (a) by how many jobs become accessible within a 45-minute highway travel and transit travel (b) by the Origins-Destinations of ICC users (c) by comparing travel time savings among travel markets in the study area and the BWI airport (d) by comparing travel costs.

a. Improved Jobs Accessibility by Highway and Transit:
Improved job accessibility was measured during the AM Peak Period by two travel modes: highway and transit. Jobs accessibility improvement is measured by how many jobs could be accessed from one Traffic Analysis Zone (TAZ) within 45 minutes of travel. Jobs accessibility is especially improved in the area north of Olney, White Oaks, Laurel, Konterra, and Shady Grove (Figures 6 and 7).

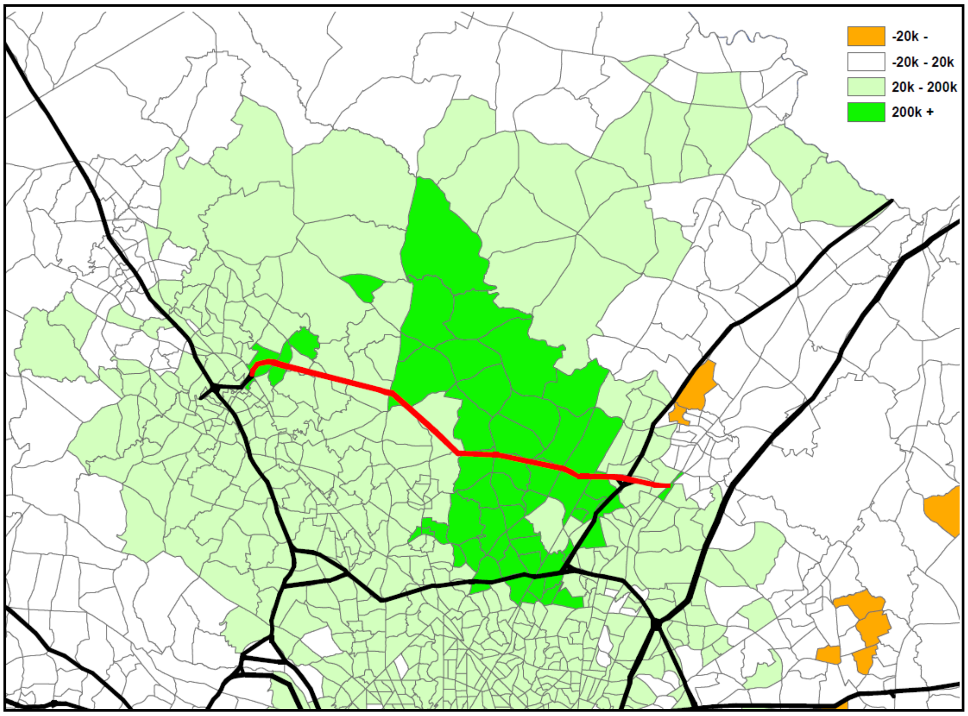


Figure 6 - Improved Jobs Accessibility (Highway)

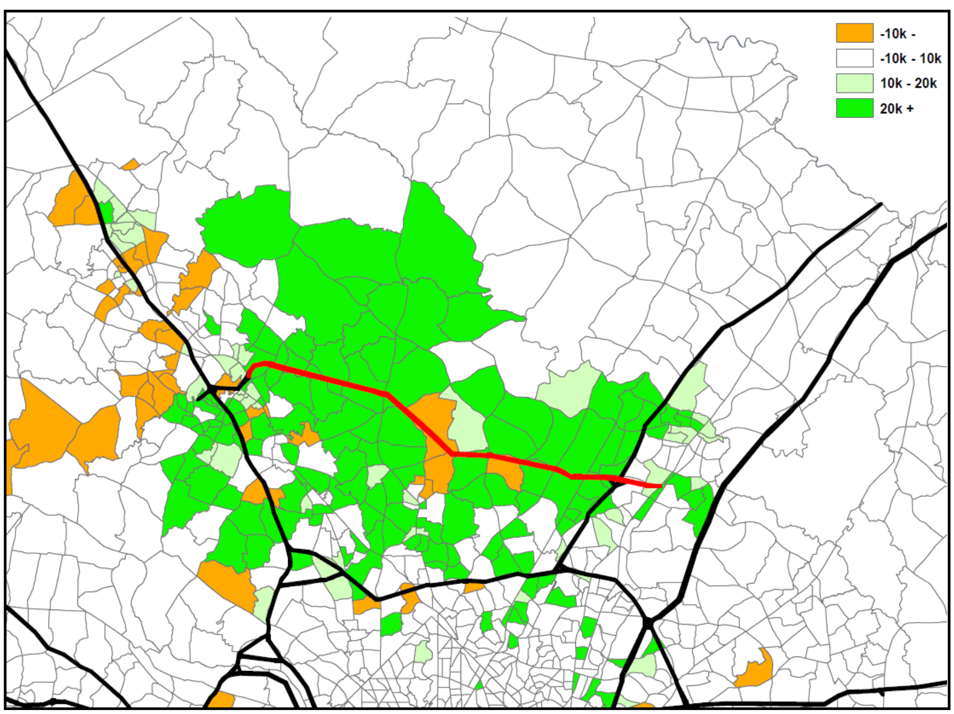


Figure 7 - Improved Jobs Accessibility (Transit)

b. <u>Origins-Destinations of ICC Users:</u>

Trip origins and destinations were assessed and it is concluded that:

- There is no clear directionality of travel during the peak periods
- There is a balanced travel demand (i.e. trip production and attraction pattern) for eastbound and westbound trip making on ICC during the peak periods;
- ICC serves as a connector of two corridors: I-270/I-370 and I-95.

(a) Eastbound

Travel Market	Production		Travel Market	Attraction	
	Trips	% Trips		Trips	% Trips
Remaining Mont. Co	67,207	55%	External	36,637	30%
Gaithersburg Area	25,197	20%	Laurel Area	22,158	18%
Frederick Co. Area	7,903	6%	Remaining PG Co.	15,212	12%
All Others	22,934	19%	All Others	49,233	40%
Total	123,241		Total	123,241	

(b) Westbound

Travel Market	Production		Travel Market	Attraction	
	Trips	% Trips		Trips	% Trips
External	37,315	28%	Gaithersburg Area	48,112	36%
Remaining PG Co.	22,622	17%	Remaining Mont. Co	43,756	33%
Anne Arundel Co. Area	20,566	16%	Rockville Area	19,772	15%
All Others	51,463	39%	All Others	20,326	15%
Total	131,966		Total	131,966	

Table 15 - Trip Exchanges among Study Area Travel Markets (AM Peak Period)

(a) Eastbound

Travel Market	Production		Travel Market	Attraction	
	Trips	% Trips		Trips	% Trips
Remaining Mont. Co	68,020	36%	External	62,516	33%
Gaithersburg Area	57,745	31%	Remaining PG Co.	29,291	16%
Rockville Area	25,386	14%	Laurel Area	23,594	13%
All Others	36,315	19%	All Others	72,065	38%
Total	187,466		Total	187,466	

(b) Westbound

Travel Market	Production		Travel Market	Attraction	
	Trips	% Trips		Trips	% Trips
External	47,791	30%	Remaining Mont. Co	75,678	47%
Laurel Area	30,015	19%	Gaithersburg Area	41,317	26%
Remaining PG Co.	24,854	15%	Rockville Area	10,979	7%
All Others	58,739	36%	All Others	33,425	21%
Total	161,398		Total	161,398	

Table 16 - Trip Exchanges among Study Area Travel Markets (PM Peak Period)

Peak period eastbound ICC trips are mainly produced at travel markets along the I-270 corridor (i.e., Gaithersburg and Rockville); they are attracted by travel markets on the east end of the corridor such as the vicinity of I-95, Laurel, Prince George's County areas and locales further east (i.e., externals to the study area). Westbound trips have a reverse pattern to the eastbound productions/attractions. Tables 15 and 16 show the exchanges among travel markets in the study area during peak periods.

c. Travel Time Between Travel Markets:

Travel markets for this study were selected from a broad list of activity centers developed at a regional forum by Planning Directors in the MWCOG/TPB planning area under the auspices of the MWCOG Planning Directors Technical Advisory Committee, and inputs from the MD SHA staff. Since the travel markets of this study consist of groupings of abutting TAZs, a centrally-located TAZ within each grouping was considered as a representative of the group and its travel time from the central TAZ of the other groupings was considered as representative of the entire group. The travel markets of this study are shown in Figure 8.

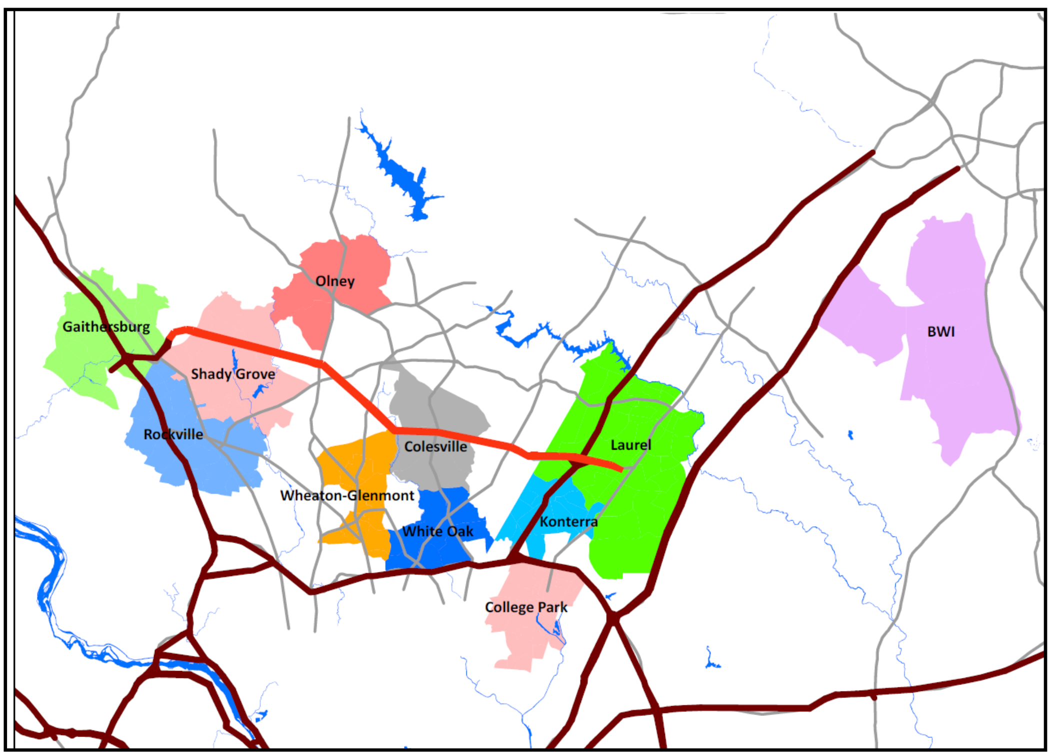


Figure 8 - Travel Markets in the Study Area

ICC has the potential to reduce travel time among travel markets in the study area (Table 17). The most notable travel time savings during the AM peak period is between Gaithersburg and Laurel (i.e., 31 minutes). Trips originating at Gaithersburg or Laurel with destinations in Colesville, White Oak, Konterra, Laurel or BWI have travel time savings potential of over 20 minutes

		DESTINATIONS										
		Gaithersburg	Rockville	Shady Grove	Olney	W-Glenmont	Colesville	White Oak	College Park	Konterra	Laurel	BWI
ORIGINS	Gaithersburg		19 / 19	17 / 17	25 / 23	41 / 29	48 / 27	54 / 35	67 / 64	58 / 34	64 / 33	93 / 67
	Rockville	9 / 9		14 / 13	25 / 23	27 / 23	34 / 24	39 / 36	56 / 51	43 / 38	53 / 30	83 / 72
	Shady Grove	17 / 16	24 / 21		13 / 12	32 / 26	38 / 27	44 / 35	65 / 59	48 / 35	52 / 40	80 / 70
	Olney	33 / 27	40 / 34	18 / 15		32 / 27	32 / 26	38 / 35	61 / 58	42 / 35	44 / 34	70 / 64
	W-Glenmont	33 / 21	28 / 24	22 / 17	13 / 14		9 / 9	13 / 14	33 / 33	18 / 16	29 / 20	62 / 55
	Colesville	44 / 21	40 / 35	32 / 21	16 / 15	13 / 12		10 / 10	33 / 32	11 / 10	22 / 14	55 / 48
	White Oak	48 / 25	43 / 38	35 / 25	20 / 19	15 / 15	7 / 7		26 / 26	11 / 11	23 / 17	56 / 52
	College Park	49 / 35	46 / 41	45 / 35	30 / 30	23 / 23	18 / 18	14 / 15		11 / 11	22 / 21	55 / 55
	Konterra	54 / 30	49 / 43	42 / 29	27 / 24	22 / 20	11 / 9	15 / 15	26 / 25		13 / 12	46 / 46
	Laurel	68 / 35	65 / 43	53 / 41	37 / 30	41 / 32	30 / 24	35 / 32	45 / 44	21 / 20		35 / 36
	BWI	137 / 113	135 / 128	122 / 115	106 / 103	113 / 110	102 / 101	107 / 108	117 / 119	93 / 96	76 / 79	

Table 17 - Travel Time Savings among Study Area Travel Markets (AM Peak Period)

In general, ICC can: (a) improve accessibility and travel reliability of trips in the study area in general, and, specifically, for the drivers travelling east and west destinations along I-270 and I-95 corridors; (b) more substantial travel time savings could be realized by long-distance travelers on ICC such as trips to the BWI airport.

d. Travel Costs:

ICC is a managed lane facility whose tolls are determined by the Maryland Transportation Authority. Since the tolls are not set in such a way as to yield free-flow travel conditions, motorists on ICC may experience varying levels of congestion. This toll setting approach is different than what applies in neighboring Virginia where tolls on the I-495 managed lanes are variable and dependent on travel demand. They are variable as travel demand fluctuates by time of day and direction of travel and they are set at such levels to ensure free-flow speeds.

The toll setting methodology used as part of the MWCOG/TPB regional travel demand model is dependent on travel demand and it emulates the Virginia toll setting approach. Being a standard feature of the TPB regional travel demand model it is inherent in all of the TPB's travel demand model applications (e.g., air quality conformity, regional transportation planning, corridor studies etc.). In this context it was used in this study despite the fact that the ICC tolls are determined by the Maryland Transportation Authority. The variability of the tolls enabled the study team to: (a) assess if tolls on ICC are set at appropriate levels to yield free-flow speeds; and (b) provide a data-based justification for potential adjustment(s) of the toll rates in order to yield free-flow travel conditions. The latter would have applied if current ICC tolls were found to be too low.

The analyses concluded that toll rates for peak and off-peak periods for year 2040 are comparable to current toll levels, which will enable ICC users to travel at free-flow speeds along the entire length of the facility, at all time periods. The highest forecasted Volume/Capacity (V/C) ratio was 0.9 for year 2040. The year 2040 peak period toll rate for the ICC segment between Georgia Avenue and I-370 was forecasted to be $1.43 (in 2010 dollars). The current toll rate for the same segment is $1.45[1]. Forecasted ICC tolls are shown in Tables A8 and A9 in the Appendix. Travel distances by segments of ICC are shown in Table A10 in the Appendix.

[1] Based on 2-axle tolls shown in the Maryland Transportation Authority web page, http://www.mdta.maryland.gov/ICC/toll_tables/Two_Axle_Rate_Card.pdf

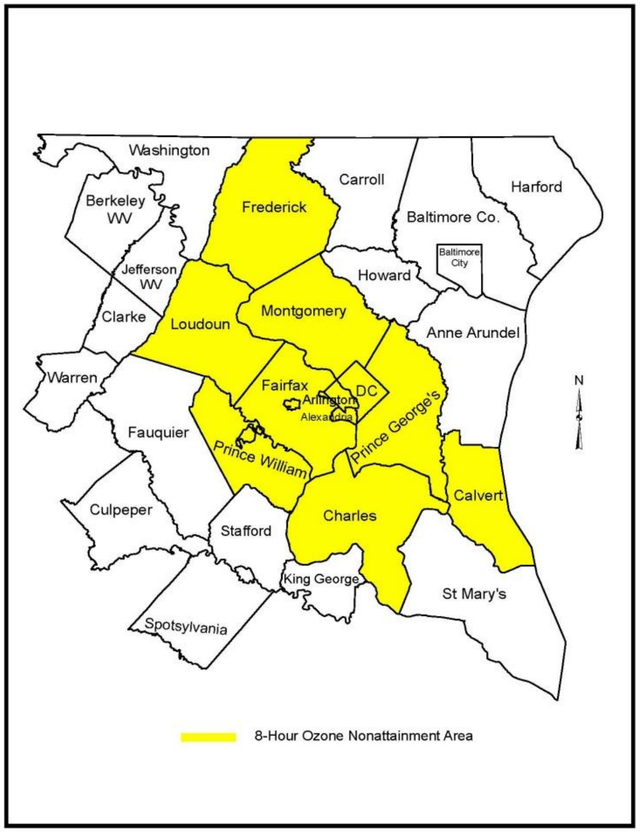
Air Quality Impacts Comparisons

The air quality impacts of the ICC in the study area and the region were assessed using the MOBILE6.2 emissions estimating model. The geographical areas analyzed for Ozone day pollutants (i.e., Volatile Organic Compounds (VOC) and NOx), Fine Particles (i.e., Direct PM2.5 and Precursor NOx), and Winter CO are shown in Figure 9. The emissions estimates for the two scenarios are shown in Table 18.

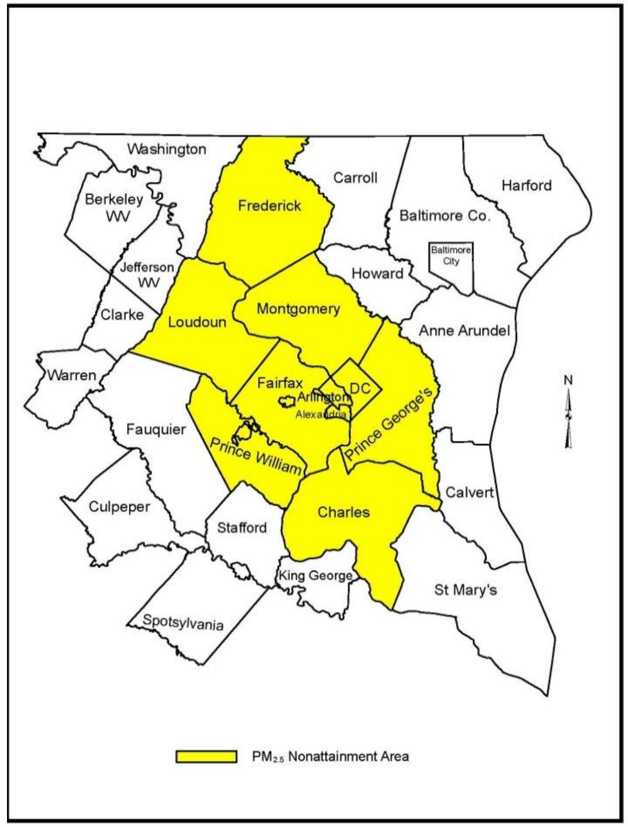
With respect to Ozone pollutants (i.e., VOC and NOx) modest increases of 0.028 t/d and 0.163 t/d respectively are projected for Montgomery County. They reflect increases of 0.5% for VOC and 3.3% for NOx. The emissions differences between the two scenarios are negligible for the remaining counties in southern Maryland.

With respect to Fine Particle pollutants (i.e., Direct PM2.5 and Precursor NOx) moderate increases of 3.8 t/y and 64.6 t/y respectively are projected for Montgomery County. They reflect increases of 2.9% for Direct PM2.5 and 3.6% for Precursor NOx respectively. The emissions differences between the two scenarios are negligible for the remaining counties in southern Maryland.

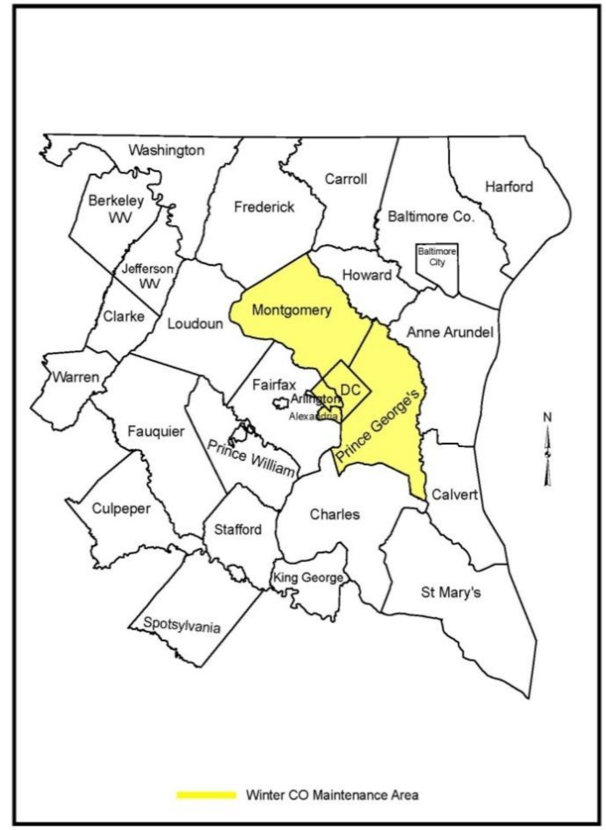
Greenhouse Gas (GHG) emissions reflect a group of pollutants, which depending on the definition, they represent either atmospheric carbon dioxide (CO2), or total CO2 equivalent, which includes CO2, methane (CH4) and nitrous oxide (N2O). Moderate increases in CO2 are projected for Montgomery County due to the construction of ICC, an increase that is equal to 236,000 t/y or a 4% increase comparatively to the No Build scenario. The emissions differences between the two scenarios are negligible for the remaining counties in southern Maryland.



Ozone Non-Attainment Area



Fine Particles Non-Attainment Area



Winter CO Maintenance Area

Figure 9 - Non Attainment Areas for Different Criteria Pollutants

8-HourOzone (VOC) Regional Emissions Comparisons (tons/day)

Jurisdiction	2040 No Build	2040 Build	[2040 Build] - [2040 No Build]	
			Δ	%Δ
Mont. Co.	5.43	5.46	0.028	0.5%
PG's Co.	5.56	5.53	-0.023	-0.4%
Fred. Co.	2.34	2.33	-0.007	-0.3%
Calvert Co.	0.54	0.54	0.000	0.0%
Charles Co.	1.03	1.03	0.000	0.0%
D.C.	3.43	3.41	-0.020	-0.6%
Other VA Jurs.	14.49	14.49	-0.007	0.0%
Regional Total	32.816	32.787	-0.029	-0.1%

8-Hour Ozone (NOx) Regional Emissions Comparisons (tons/day)

Jurisdiction	2040 No Build	2040 Build	[2040 Build] - [2040 No Build]	
			Δ	%Δ
Mont. Co.	4.90	5.06	0.163	3.3%
PG's Co.	5.60	5.60	-0.004	-0.1%
Fred. Co.	2.59	2.58	-0.006	-0.2%
Calvert Co.	0.50	0.50	0.001	0.2%
Charles Co.	0.89	0.89	0.000	0.0%
D.C.	2.70	2.69	-0.015	-0.6%
Other VA Jurs.	14.50	14.50	-0.003	0.0%
Regional Total	31.674	31.810	0.136	0.4%

Fine Particle (Direct PM2.5) Regional Emissions Comparisons (tons/year)

Jurisdiction	2040 No Build	2040 Build	[2040 Build] - [2040 No Build]	
			Δ	%Δ
Mont. Co.	130.8	134.7	3.8	2.9%
PG's Co.	141.7	141.7	0.0	0.0%
Fred. Co.	67.2	67.0	-0.2	-0.4%
Charles Co.	23.1	23.1	0.0	0.0%
D.C.	60.8	60.1	-0.6	-1.0%
Other VA Jurs.	331.8	331.8	0.0	0.0%
Regional Total	755.5	758.4	2.9	0.4%

Fine Particle (Precursor NOx) Regional Emissions Comparisons (tons/year)

Jurisdiction	2040 No Build	2040 Build	[2040 Build] - [2040 No Build]	
			Δ	%Δ
Mont. Co.	1,792.1	1,856.6	64.6	3.6%
PG's Co.	2,053.9	2,053.3	-0.5	0.0%
Fred. Co.	967.5	965.2	-2.3	-0.2%
Charles Co.	324.2	324.2	0.0	0.0%
D.C.	980.0	974.7	-5.3	-0.5%
Other VA Jurs.	5,445.4	5,443.9	-1.6	0.0%
Regional Total	11,563.0	11,617.9	54.9	0.5%

GHG Regional Emissions Comparisons (tons/year) *

Jurisdiction	2040 No Build	2040 Build	[2040 Build] - [2040 No Build]	
			Δ	%Δ
Mont. Co.	5,848,860	6,084,601	235,741	4.0%
PG's Co.	6,347,892	6,344,862	-3,029	0.0%
Fred. Co.	2,998,803	2,991,567	-7,235	-0.2%
Charles Co.	1,033,396	1,033,396	0	0.0%
Calvert Co.	594,804	595,408	604	0.1%
D.C.	2,690,424	2,676,216	-14,208	-0.5%
Other VA Jurs.	14863141.56	14,857,760	-5,382	0.0%
Total	34,377,320	34,583,810	206,490	0.6%

*includes CO2, Methane (CH4) and Nitro Oxide (N2O).

Table 18 - Air Quality Impacts Comparisons

CONCLUSIONS

The long term (Year 2040) impacts of ICC were modeled by comparing two scenarios: No Build and Build scenarios. After validating the MWCOG/TPB regional travel demand model on year 2010 data, travel forecasts were developed across a broad range of performance measures. The analyses focused on estimating differences between the two scenarios in four broad categories: (a) Congestion Mitigation (b) Network Utilization (c) Jobs accessibility and Travel Costs (d) Regional Air Quality Impacts. In parallel, a comparison of the operational conditions in the study area was undertaken before the first phase of ICC was constructed and after it was opened to traffic.

The travel indicators assessed as part of this study converge to the same conclusion: MD 200 Intercounty Connector (ICC) yields substantial benefits in its immediate vicinity (i.e., study area) by reducing spatial and temporal congestion, by providing a connecting corridor between I-270, I-95 and the BWI airport further away, by increasing the number of accessible jobs by highway and transit modes at competitive toll rates. All of these benefits are achieved at the cost of nominally increased criteria pollutant and GHG emissions in the region. The beneficial effects of ICC, however, dissipate with distance from the facility. Key study findings are as follows:

Network Congestion Comparisons:

1. Volume/Capacity are forecast to remain at 0.88 or below, indicating that traffic will most likely flow unimpeded at all times
2. ICC will decrease congested lane-miles in the study area based on Travel Time Index; the congestion relief is projected to be more noticeable during peak periods
3. Neighboring MD jurisdictions will experience the most congestion relief is indicated by decreases of vehicle hours of delay (VHD) as opposed to jurisdictions further away which will experience marginal reductions in VHD. Montgomery County will benefit mots with a 38,500 VHD reduction, followed by Prince George’s County with a 12,200 VHD reduction. VHD reductions are more prominent during peak periods,

for single occupancy vehicles and percentage-wise for trucks and BWI airport-destined vehicles
4. ICC will yield travel times reductions on local streets and or corridors; among three parallel corridors to ICC investigated for travel time savings the northernmost yielded the most significant travel time savings

Network Utilization Comparisons:

1. The construction of ICC is projected to have localized impacts in the study area as most of the resulting VMT increase is limited to Montgomery County. Regionally VMT will increase by a marginal 0.2%
2. Two ICC segments carry most of daily travel flows: a section between I-370 and MD 97 (Georgia Avenue) and a section between MD 650 (N. Hampshire Avenue) and I-95
3. Single occupancy vehicles comprise about half of total daily trips on ICC followed by commercial trips; HOV3+ trips comprise less than 10%. The segment between I-95 and US 1 carries the least traffic volumes (i.e., 25-33% of the daily total)
4. During peak periods approximately half of eastbound ICC traffic enters at the MD 355 and MD 97 interchanges and exits at I-95 and US 29; the westbound traffic has a reverse travel pattern
5. The construction of the ICC will not significantly change the total number of person trips in the study area; premium bus rapid transit (BRT) service will marginally increase transit ridership in the study area.

Jobs Accessibility Comparisons:

1. The construction of ICC improves jobs accessibility in the study area, especially in the core between I-270 and I-95; subareas with significantly improved accessibility are Olney North, White Oaks, Laurel, Konterra, and Shady Grove
2. Projected tolls to ensure free-flow conditions ICC tolls are at comparable levels to present time; modeled peak period tolls were estimated at $1.43 while current toll is $1.45 for a motorist traveling between MD 97(Georgia Avenue) and I-370.

Air Quality Impacts Comparisons

The construction of ICC yields nominal increases in criteria pollutant emissions in the study area and the region. In terms of Ozone Volatile Organic Compounds (VOC) there is no measurable change in the levels of VOC between the two scenarios; a nominal increase in Montgomery County is balanced by nominal decreases in Prince George's and Frederick Counties. In terms of Ozone NOx there is a nominal increase of 0.163 t/d in Montgomery County and nominal decreases in Prince George's, Frederick, Calvert, and Charles Counties. In terms of Fine Particles, there are increases of 3.8 t/y of Direct PM2.5 and 64.6 t/y in Precursor NOx in Montgomery County and nominal decreases in Frederick County. Montgomery County shows a small increase in annual CO_2 emissions equal to 236,000 tons or a four percent.

APPENDIX

LIST OF FIGURES

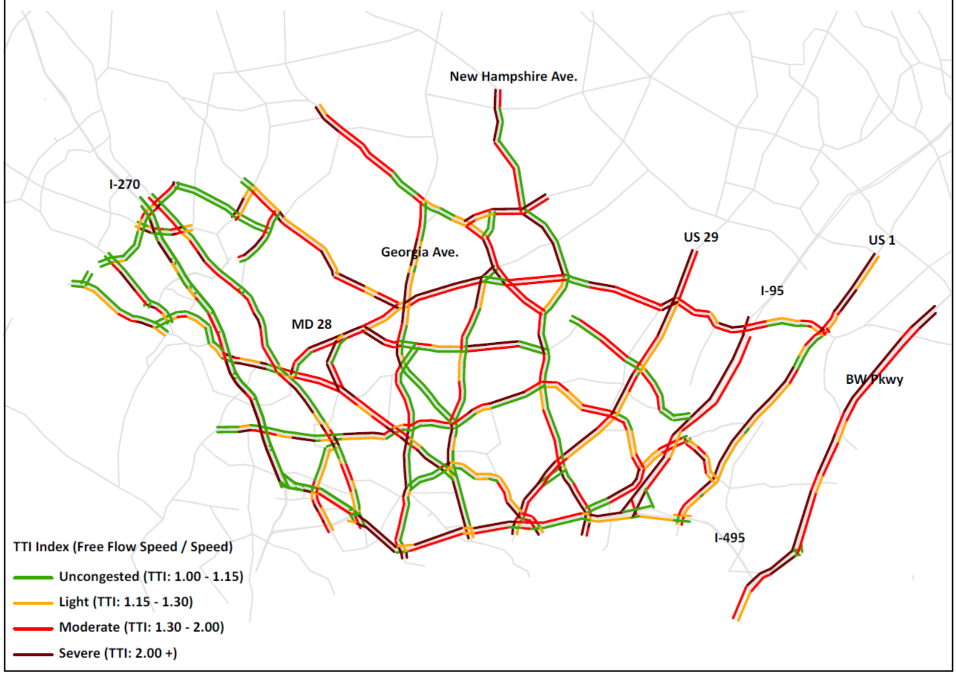
LIST OF TABLES

Screenline 1	Observed	Estimated	Est/Obs
I-495 Spur	138,832	134,123	0.97
Montrose Rd	54,860	50,312	0.92
Great Falls Rd	10,004	15,756	1.57
W Montgomery ave	28,092	28,264	1.01
I-370	83,812	39,923	0.48
W Diamond Ave	10,964	19,133	1.75
Montgomery Village Ave	84,292	77,888	0.92
Middlebrook Rd	31,542	36,765	1.17
Germantown Rd	30,842	26,057	0.84
Total	**473,240**	**428,221**	**0.90**
Screenline 2			
I-495	253,340	242,991	0.96
Veirs Mill Rd	42,180	49,715	1.18
Randolph Rd	32,140	55,702	1.73
Olney Laytonsville Rd	36,480	47,044	1.29
Total	**364,140**	**395,452**	**1.09**
Screenline 3			
I-495	246,920	234,197	0.95
Forest Glen Rd	14,260	5,520	0.39
University Blvd	30,760	47,893	1.56
Ashton Rd	13,712	31,844	2.32
Brighton Dam Rd	6,072	19,697	3.24
Total	**311,724**	**339,150**	**1.09**
Screenline 4			
I-495	246,920	234,197	0.95
University Blvd	40,980	65,793	1.61
New Hampshire Ave	45,412	59,406	1.31
Spencerville Rd	37,542	38,110	1.02
Scaggsville Rd	19,310	17,184	0.89
MD 32	78,530	46,948	0.60
Total	**468,694**	**461,638**	**0.98**
Screenline 5			
I-495	258,080	285,242	1.11
Cherry Hill Rd	22,532	16,761	0.74
Sandy Spring Rd	49,242	59,114	1.20
Scaggsville Rd	23,160	32,656	1.41
MD 32	105,880	68,394	0.65
Patuxent Pkwy	69,802	61,181	0.88
Total	**528,696**	**523,348**	**0.99**
Screenline 6			
I-495	240,892	219,239	0.91
Powder Mill Rd	21,142	13,680	0.65
Contee Rd	15,402	9,973	0.65
Gorman Ave	42,874	42,342	0.99
MD 32	84,390	52,805	0.63
Patuxent Pkwy	51,282	55,463	1.08
Total	**455,982**	**393,504**	**0.86**
Screenline 7			
I-495	234,812	199,427	0.85
Laurel Bowie Rd	60,250	48,234	0.80
Laurel Fort Meade Rd	41,264	51,378	1.25
Total	**336,326**	**299,039**	**0.89**

Screenline 8	Observed	Estimated	Est/Obs
I-270	282,360	312,009	1.11
Old Georgetown Rd	45,252	50,634	1.12
Rockville Pike	59,232	57,119	0.96
Connecticut Ave	47,990	60,104	1.25
Seminary Rd	7,252	9,487	1.31
Georgia Ave	87,020	77,426	0.89
Sligo Creek Pkwy	9,112	4,655	0.51
Colesville Rd	66,640	87,771	1.32
University Blvd E	38,580	69,994	1.81
New Hampshire Ave	59,100	87,047	1.47
Riggs Rd	18,182	24,664	1.36
I-95	199,920	236,518	1.18
Baltimore Ave	45,610	63,344	1.39
Cherrywood Ln	10,372	6,974	0.67
Kenilworth Ave	36,152	40,386	1.12
Greenbelt Rd	52,600	39,066	0.74
BW Pkwy	118,282	95,457	0.81
Total	**1,183,656**	**1,322,656**	**1.12**
Screenline 9			
I-270	278,072	306,668	1.10
E Jefferson St	24,142	16,337	0.68
Powder Mill Rd	31,552	29,097	0.92
I-95	199,920	236,518	1.18
Total	**533,686**	**588,619**	**1.10**
Screenline 10			
I-270	237,160	231,704	0.98
Shady Grove Rd	57,060	41,816	0.73
Redland Rd	10,982	5,118	0.47
Georgia Ave	44,730	57,199	1.28
Norbeck Rd	26,212	32,764	1.25
Layhill Rd	12,102	27,641	2.28
New Hampshire Ave	37,780	58,419	1.55
Columbia Pike	62,630	100,618	1.61
I-95	195,000	233,790	1.20
Baltimore Ave	34,580	57,671	1.67
BW Pkwy	96,442	82,627	0.86
Total	**814,678**	**929,368**	**1.14**
Screenline 11			
I-270	167,220	193,299	1.16
Frederick Rd	33,432	38,899	1.16
Woodfield Rd	12,452	15,963	1.28
Laytonsville Rd	8,720	20,934	2.40
Damascus Rd	2,940	4,260	1.45
Clarksville Pike	15,760	26,882	1.71
Pindell School Rd	4,252	6,649	1.56
Sanner Rd	4,000	7,253	1.81
Columbia Pike	75,600	92,673	1.23
I-95	198,752	245,361	1.23
Washington Blvd N	41,640	53,518	1.29
BW Pkwy	91,012	95,848	1.05
Total	**655,780**	**801,540**	**1.22**

Table A1 - Model Validation: Detailed Screenline Comparison

Model Validation



INRIX Data

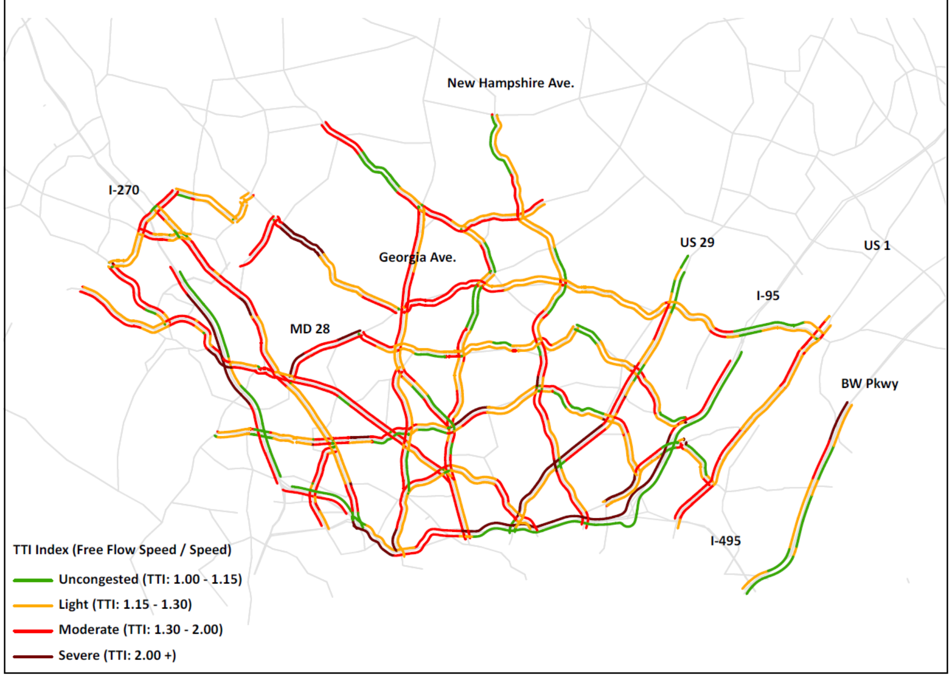
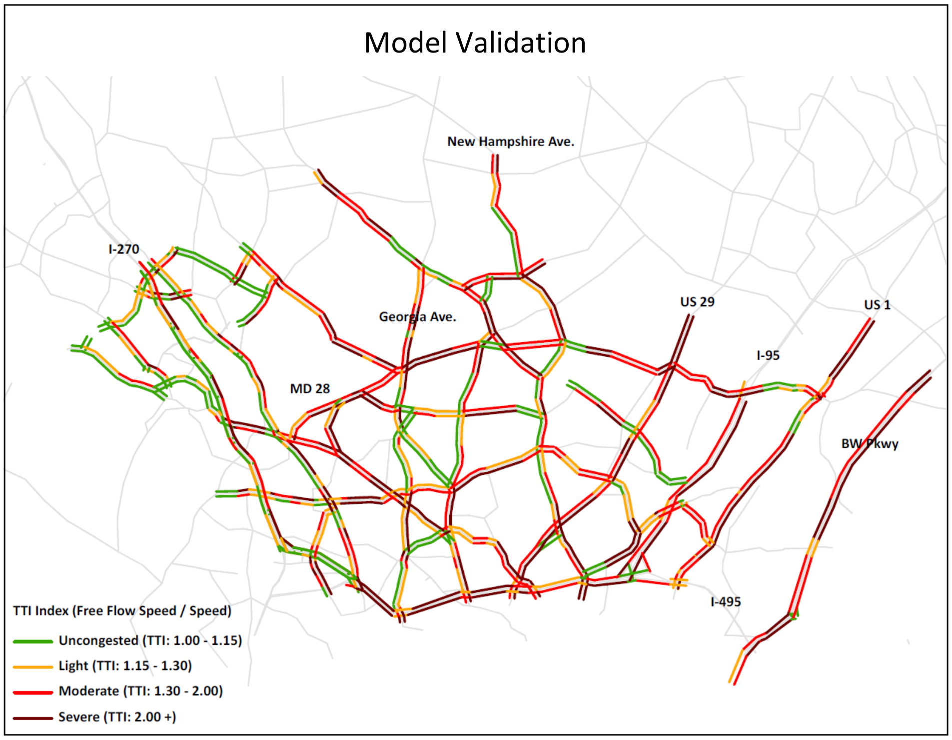


Figure A1 - Model Validation: Network Congestion AM Peak Hour 8:00-9:00 AM



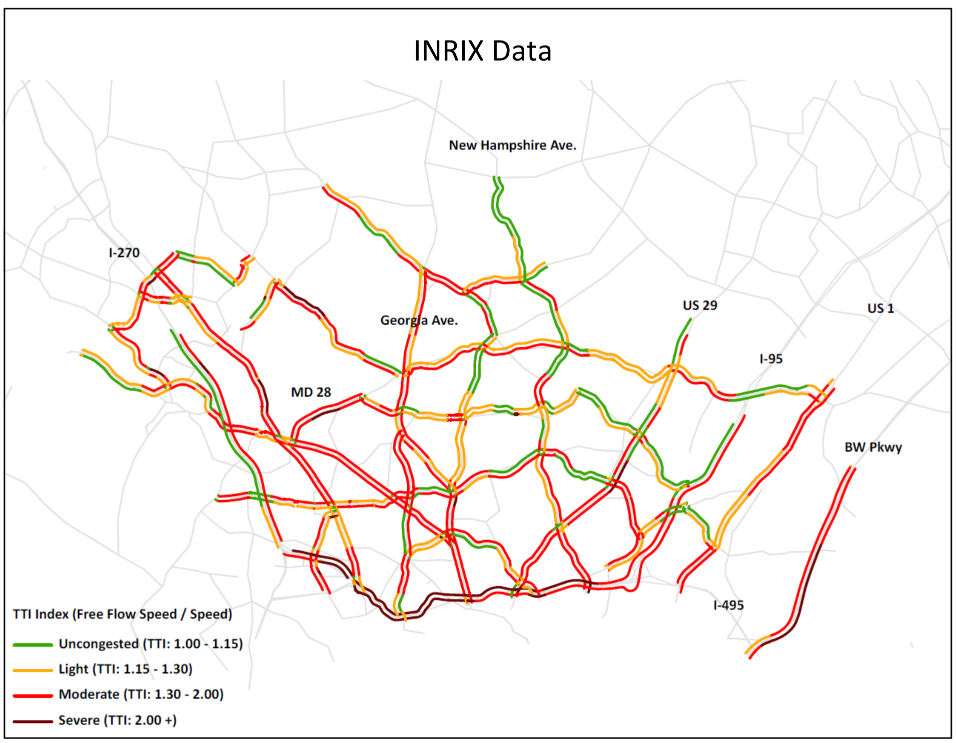


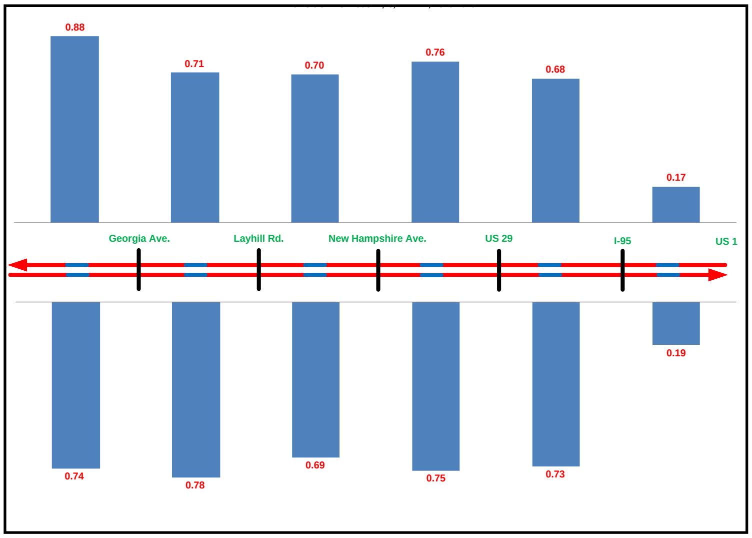
Figure A2 - Model Validation: Network Congestion PM Peak Hour 5:00-6:00 PM

Model Stage	2010_Validation	2040 Scenarios		Growth [2010 to 2040 No Build]		[2040 Build] - [2040 No Build]	
		No Build	Build	Δ	%Δ	Δ	%Δ
Land Use							
Households	2,486,943	3,362,449	3,362,449	875,506	35.2%	0	0.0%
Jobs	3,921,510	5,456,960	5,456,960	1,535,450	39.2%	0	0.0%
HH Population	6,481,887	8,457,053	8,457,053	1,975,166	30.5%	0	0.0%
HH & GQ Population	6,624,765	8,618,547	8,618,547	1,993,782	30.1%	0	0.0%
Mode Choice							
HBW person	3,814,963	5,078,172	5,077,380	1,263,209	33.1%	-792	0.0%
HBS person	3,076,814	3,949,950	3,949,599	873,136	28.4%	-351	0.0%
HBO person	7,107,603	9,104,695	9,103,613	1,997,092	28.1%	-1,082	0.0%
NHW person	1,660,780	2,198,313	2,198,030	537,533	32.4%	-283	0.0%
NHO person	3,154,820	4,128,478	4,127,823	973,658	30.9%	-655	0.0%
ALL person	18,814,980	24,459,607	24,456,444	5,644,627	30.0%	-3,163	0.0%
HBW_Transit	771,643	1,049,750	1,052,787	278,107	36.0%	3,037	0.3%
HBS_Transit	25,814	30,959	31,929	5,145	19.9%	970	3.1%
HBO_Transit	203,610	259,276	262,750	55,666	27.3%	3,474	1.3%
NHW_Transit	101,798	165,081	166,621	63,283	62.2%	1,540	0.9%
NHO_Transit	42,060	62,937	63,623	20,877	49.6%	686	1.1%
All_Transit	1,144,924	1,568,004	1,577,710	423,080	37.0%	9,706	0.6%
HBW_Transit %	20.23	20.67	20.73	0.44	-	0.06	-
HBS_Transit %	0.84	0.78	0.81	-0.06	-	0.03	-
HBO_Transit %	2.86	2.85	2.89	-0.01	-	0.04	-
NHW_Transit %	6.13	7.51	7.58	1.38	-	0.07	-
NHO_Transit %	1.33	1.52	1.54	0.19	-	0.02	-
ALL_Transit %	6.09	6.41	6.45	0.32	-	0.04	-
MetroOnly	518,942	743,590	742,163	224,648	43.3%	-1,427	-0.2%
Bus_Metro	222,408	266,805	268,124	44,397	20.0%	1,319	0.5%
Comm_Rail	19,189	37,244	37,509	18,055	94.1%	265	0.7%
Bus_Only	384,385	520,365	529,913	135,980	35.4%	9,548	1.8%
ALL_Auto person	17,670,055	22,891,603	22,878,735	5,221,548	29.6%	-12,868	-0.1%
ALL_Auto driver	13,595,267	17,360,375	17,347,642	3,765,108	27.7%	-12,733	-0.1%
Total_Vehicle_Trips	16,459,248	21,217,241	21,204,464	4,757,993	28.9%	-12,777	-0.1%
Total_VMT	**163,861,358**	**216,483,703**	**216,990,730**	**52,622,345**	**32.1%**	**507,027**	**0.2%**
Freeway	63,225,453	85,660,305	86,842,485	22,434,852	35.5%	1,182,180	1.4%
Major Arterial	57,817,730	70,429,976	70,083,739	12,612,246	21.8%	-346,237	-0.5%
Minor Arterial	20,552,107	29,266,721	29,091,115	8,714,614	42.4%	-175,606	-0.6%
Collector	10,951,990	16,039,552	15,935,772	5,087,562	46.5%	-103,780	-0.6%
Expressway	9,492,815	12,887,901	12,854,885	3,395,086	35.8%	-33,016	-0.3%
Ramp	1,821,263	2,199,249	2,182,733	377,986	20.8%	-16,516	-0.8%
VMT/Capita	24.73	25.12	25.18	0.39	1.6%	0.06	0.2%
VMT/HH	65.89	64.38	64.53	-1.51	-2.3%	0.15	0.2%
VMT/Trip	9.96	10.2	10.23	0.24	2.4%	0.03	0.3%

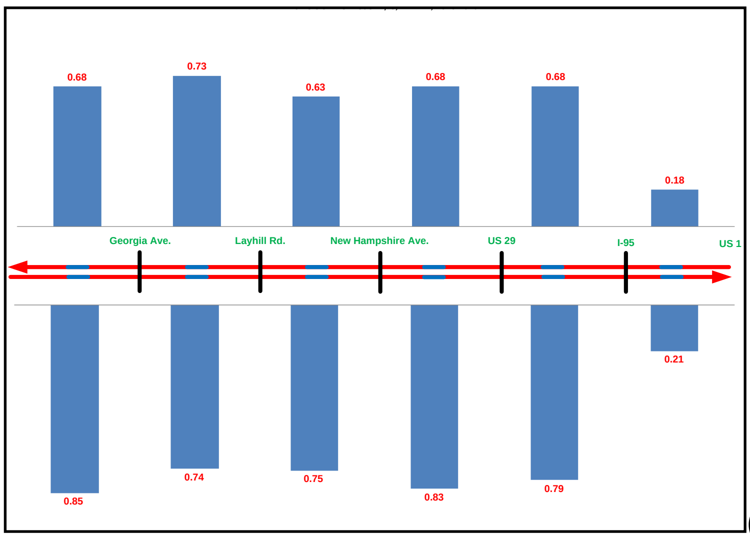
Table A2 - Year 2040 Network Utilization Statistics

			[2040 Build] - [No Build]	
Jurisdiction	**2040 No Build**	**2040 Build**	**Difference**	**% Difference**
District of Columbia	264,569	258,012	-6,557	-2.5%
Montgomery Co., MD	502,679	464,240	-38,439	-7.6%
Prince George's Co., MD	444,635	432,391	-12,244	-2.8%
Arlington Co., VA	66,938	66,207	-731	-1.1%
City of Alexandria, VA	57,399	56,443	-956	-1.7%
Fairfax Co., VA	409,212	409,457	245	0.1%
Loudoun Co., VA	191,776	190,790	-986	-0.5%
Prince William Co., VA	208,928	208,481	-447	-0.2%
Frederick Co., MD	168,220	166,731	-1,489	-0.9%
Howard Co., MD	258,134	257,399	-735	-0.3%
Anne Arundel Co., MD	343,392	346,976	3,584	1.0%
Charles Co., MD	61,061	61,236	175	0.3%
Carroll Co., MD	81,224	81,065	-159	-0.2%
Calvert Co., MD	16,516	16,547	31	0.2%
St. Mary's Co., MD	32,478	32,584	106	0.3%
King George Co., VA	7,210	7,191	-19	-0.3%
City of Fredericksburg, VA	21,861	21,981	120	0.5%
Stafford Co., VA	91,326	91,805	479	0.5%
Spotsylvania Co., VA	28,661	28,734	73	0.3%
Fauquier Co., VA	63,127	63,186	59	0.1%
Clarke Co., VA	30,545	30,470	-75	-0.2%
Jefferson Co., WVA	17,274	17,305	31	0.2%
MSA				
DC	264,569	258,012	-6,557	-2.5%
VA	1,025,579	1,023,183	-2,396	-0.2%
MD	1,193,111	1,141,145	-51,966	-4.4%
MSA Total	2,483,259	2,422,340	-60,919	-2.5%
Total	3,367,165	3,309,231	-57,934	-1.7%

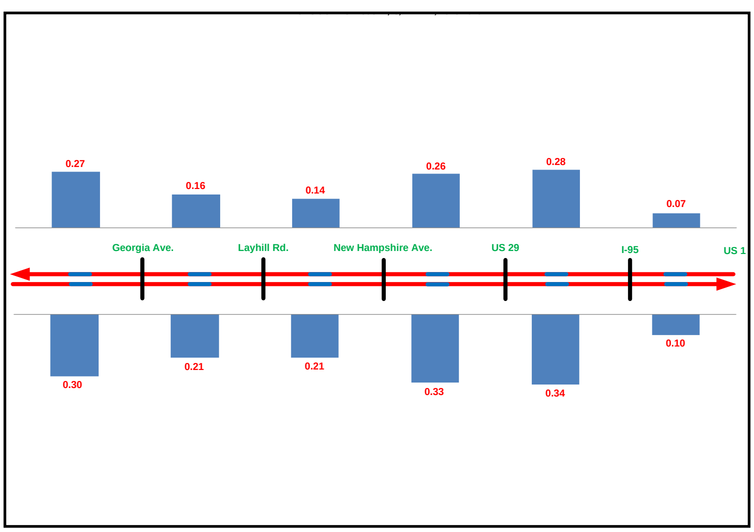
Table A3 - Year 2040 Regional VHD Comparison



(a) AM Peak

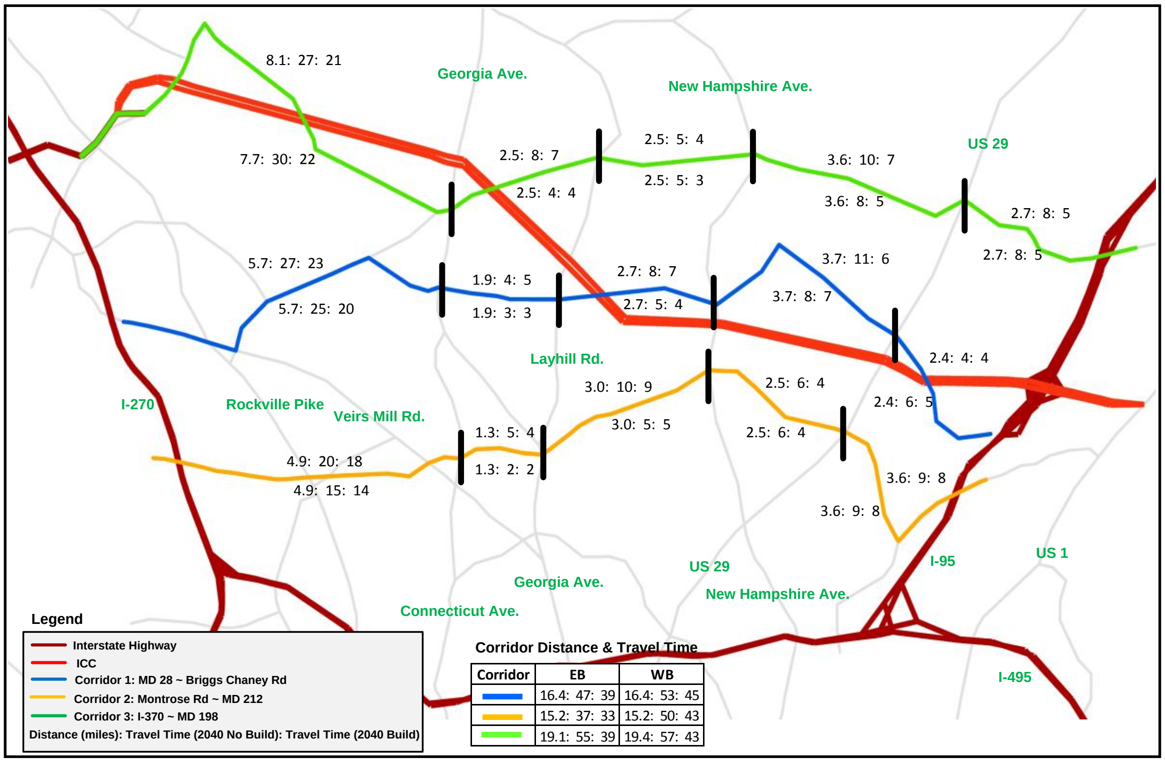


(b) PM Peak

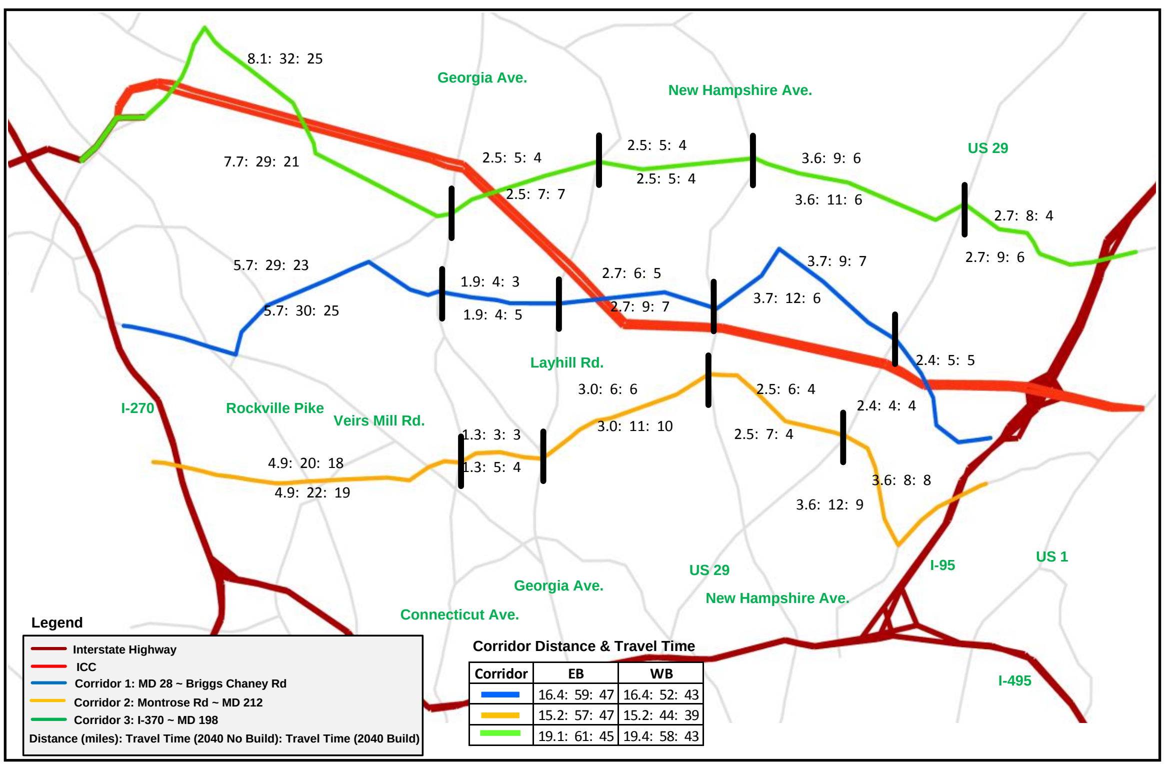


(c) Midday

Figure A3 - Mid-Point V/C Ratios by Direction

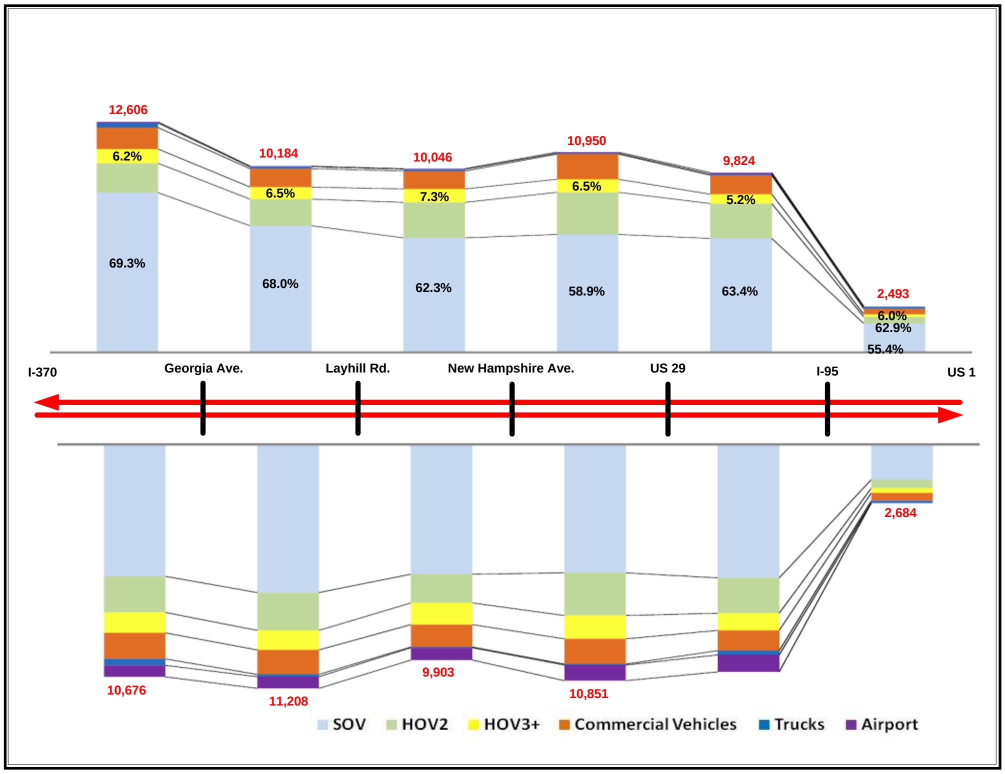


(a) AM Peak (6 – 9 am)

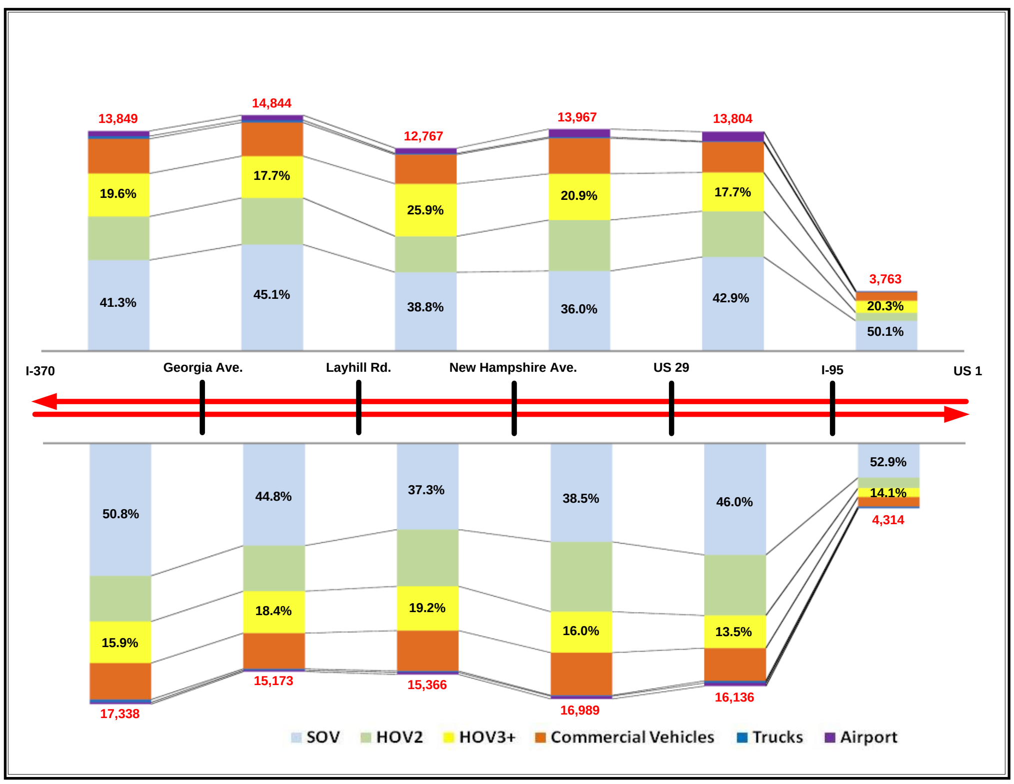


(b) PM Peak (3 – 7 pm)

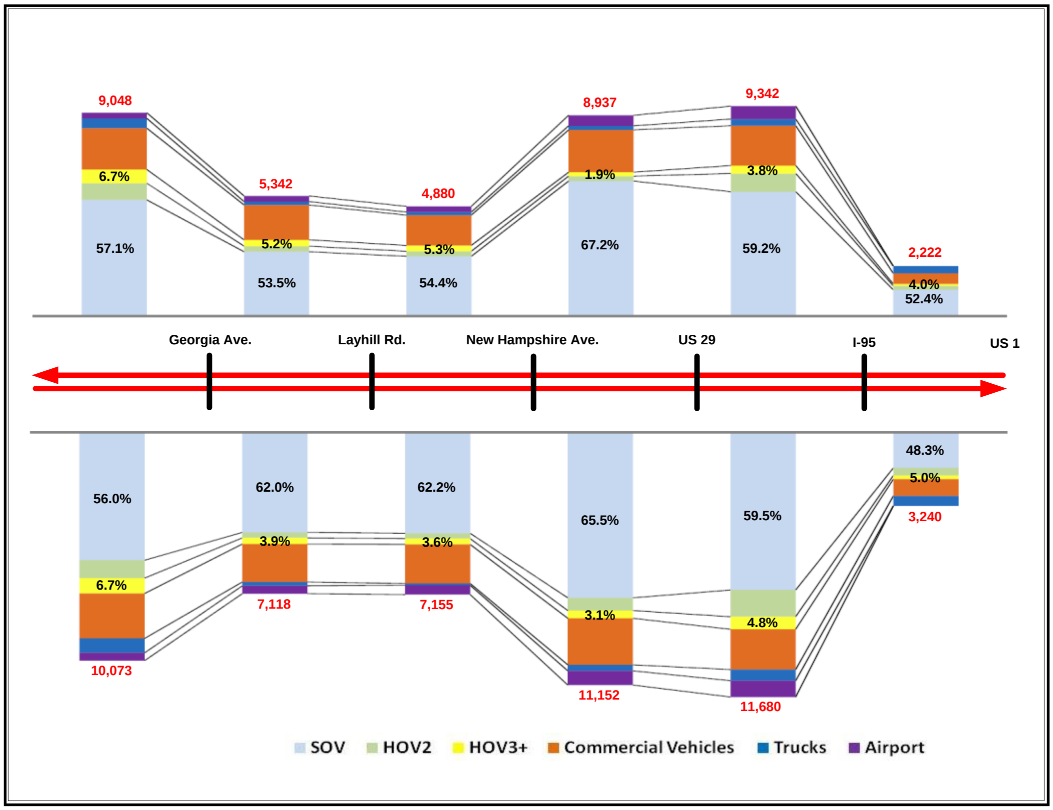
Figure A4 - 2040 Travel Times in Local Corridors



(a) AM Peak



(b) PM Peak



(c) Midday

Figure A5 - 2040 ICC Volumes by Time Period (3–7 PM)

Screenline	Direction	Location	No Build	Build	Build - No Build	Build / No Build
1	North-South	East of I-270	743,916	761,004	17,087	1.02
2	North-South	West of Connecticutt Ave	653,629	711,287	57,658	1.09
3	North-South	East of Georgia Ave	600,448	649,058	48,610	1.08
4	North-South	West of Columbia Pike	741,801	784,724	42,923	1.06
5	North-South	West of I-95	834,907	862,035	27,128	1.03
6	North-South	West of Baltimore Ave	614,498	615,437	939	1.00
7	North-South	West of BW Pkwy	663,646	664,515	869	1.00
8	East-West	North of Beltway	1,580,646	1,561,484	-19,162	0.99
9	East-West	South of ICC	1,449,270	1,431,365	-17,904	0.99
10	East-West	Between Beltway and ICC	1,439,954	1,535,339	95,385	1.07
11	East-West	North of ICC	1,244,269	1,251,152	6,883	1.01
Total			10,566,983	10,827,400	260,417	1.02

Table A4 - 2040 Screenline Performance in the ICC Study: 2040 No Build Vs. Build

			[2040 Build] - [No Build]	
Jurisdiction	**2040 No Build**	**2040 Build**	**Difference**	**% Difference**
District of Columbia	10,627,173	10,569,237	-57,936	-0.5%
Montgomery Co., MD	26,223,118	27,007,730	784,612	3.0%
Prince George's Co., MD	28,213,747	28,198,345	-15,402	-0.1%
Arlington Co., VA	4,846,730	4,840,202	-6,528	-0.1%
City of Alexandria, VA	2,652,824	2,648,911	-3,913	-0.1%
Fairfax Co., VA	34,092,342	34,094,854	2,512	0.0%
Loudoun Co., VA	10,622,764	10,617,536	-5,228	0.0%
Prince William Co., VA	13,689,085	13,683,661	-5,424	0.0%
Frederick Co., MD	13,304,987	13,271,961	-33,026	-0.2%
Howard Co., MD	14,980,898	14,837,442	-143,456	-1.0%
Anne Arundel Co., MD	18,983,285	18,991,491	8,206	0.0%
Charles Co., MD	4,499,887	4,499,189	-698	0.0%
Carroll Co., MD	5,609,276	5,593,135	-16,141	-0.3%
Calvert Co., MD	2,571,695	2,574,281	2,586	0.1%
St. Mary's Co., MD	2,938,006	2,938,962	956	0.0%
King George Co., VA	1,311,634	1,312,351	717	0.1%
City of Fredericksburg, VA	1,224,654	1,223,555	-1,099	-0.1%
Stafford Co., VA	6,898,561	6,894,750	-3,811	-0.1%
Spotsylvania Co., VA	3,823,607	3,823,737	130	0.0%
Fauquier Co., VA	5,532,898	5,534,376	1,478	0.0%
Clarke Co., VA	1,604,887	1,605,066	179	0.0%
Jefferson Co., WVA	2,231,646	2,229,959	-1,687	-0.1%
MSA				
DC	10,627,173	10,569,237	-57,936	-0.5%
VA	72,802,306	72,779,914	-22,392	0.0%
MD	74,813,434	75,551,506	738,072	1.0%
MSA Total	158,242,913	158,900,657	657,744	0.4%
Total	216,483,704	216,990,731	507,027	0.2%

Table A5 - Year 2040 Regional VMT Comparison

	Destinations																			
	Anne Arundel Co.	BWI	Charles+Howard Co's	Colesville	College Park	District of Columbia	Frederick	Gaithersburg	Konterra	Laurel	Olney	Rockville	Shady Grove	Wheaton-Glenmont	White Oak	Rem. Montgomery Co.	Rem. PG Co.	Rem. MD Jurs.	All Virginia	TOTAL
Anne Arundel Co.	44	17	16	0	14	536	0	0	61	1	0	1	0	1	1	22	57	0	33	**804**
BWI	26	10	26	0	2	5	0	0	12	0	0	1	0	0	0	11	4	0	0	**97**
Carroll Co + Howard Co	22	8	826	1	41	808	0	7	132	4	0	33	5	7	14	511	47	0	113	**2,579**
Colesville	0	0	1	39	46	162	0	6	15	11	2	84	11	102	102	608	36	0	13	**1,238**
College Park	2	0	3	9	1,229	1,187	0	23	135	104	1	89	13	92	122	1,045	2,653	0	142	**6,849**
District of Columbia	0	0	11	6	1,639	154,076	0	160	37	28	2	449	41	188	202	11,002	5,017	1	8,309	**181,168**
Frederick	0	0	0	0	1	2	2,537	152	0	0	1	124	81	4	1	224	0	0	29	**3,156**
Gaithersburg	0	0	0	1	13	140	0	3,937	1	0	4	2,862	1,051	47	5	4,992	9	0	580	**13,642**
Konterra	1	0	1	9	182	113	0	3	47	43	0	22	3	21	37	232	205	0	16	**935**
Laurel	80	4	119	3	185	188	0	9	1,183	61	0	45	7	18	28	448	352	0	29	**2,759**
Olney	0	0	0	2	13	18	0	36	1	0	9	78	29	26	6	183	5	0	5	**411**
Rockville	0	0	1	11	54	361	0	1,711	6	3	4	3,691	853	318	45	6,125	54	0	241	**13,478**
Shady Grove	0	0	0	2	20	93	0	1,369	2	1	6	1,718	392	77	9	1,748	15	0	64	**5,516**
Wheaton-Glenmont	0	0	1	66	157	620	0	87	18	13	13	802	126	623	193	4,006	172	0	69	**6,966**
White Oak	0	0	4	59	181	559	0	21	28	24	2	174	23	287	119	2,034	218	0	44	**3,777**
Rem. Montgomery Co.	3	0	33	185	1,253	9,842	1	7,096	221	86	53	8,114	1,660	2,694	1,091	38,896	1,745	0	3,312	**76,285**
Rem. PG Co.	13	0	14	20	5,057	21,214	0	55	419	264	2	286	37	312	365	5,479	20,175	2	1,396	**55,110**
Rem. MD Jurs.	2	0	1	0	3	9,142	0	0	0	0	0	0	0	0	3	63	241	1,446	509	**11,410**
All Virginia	0	0	13	0	36	20,088	0	154	5	2	0	69	14	5	7	1,090	42	12	112,653	**134,190**
TOTAL	**193**	**39**	**1,070**	**413**	**10,126**	**219,154**	**2,538**	**14,826**	**2,323**	**645**	**99**	**18,642**	**4,346**	**4,822**	**2,350**	**78,719**	**31,047**	**1,461**	**127,557**	**520,370**

Table A6 – Transit Trips between Travel Markets in 2040 No Build

Destinations

Origins	Anne Arundel Co.	BWI	Charles+Howard Co's	Colesville	College Park	District of Columbia	Frederick	Gaithersburg	Konterra	Laurel	Olney	Rockville	Shady Grove	Wheaton-Glenmont	White Oak	Rem. PG Co.	Rem. Montgomery Co.	Rem. MD Jurs.	All Virginia	TOTAL
Anne Arundel Co.	0	0	1	0	0	8	0	2	1	7	0	5	2	0	0	-1	6	0	0	**31**
BWI	0	0	0	0	0	0	0	0	0	-1	0	1	0	0	0	0	0	0	0	**0**
Carroll Co + Howard Co	0	0	38	2	0	-7	0	29	6	63	1	31	16	2	2	2	56	0	0	**241**
Colesville	1	0	7	4	2	-17	0	23	8	70	1	24	14	16	-1	4	49	0	0	**205**
College Park	0	0	4	2	5	-11	0	-3	**110**	**175**	0	2	-1	1	11	5	**105**	0	0	**405**
District of Columbia	0	0	2	0	10	22	0	13	-1	48	0	8	1	0	-1	1	0	0	-10	**93**
Frederick	0	0	4	0	0	0	4	4	1	5	0	-6	-4	1	0	0	-2	0	4	**11**
Gaithersburg	0	0	4	2	3	6	0	**372**	3	26	2	**145**	22	15	4	4	**612**	0	-3	**1,217**
Konterra	1	0	6	5	**109**	-5	0	9	15	**336**	0	12	5	3	3	55	61	0	0	**615**
Laurel	1	0	24	11	77	25	0	39	**129**	**1,291**	3	93	34	16	15	**106**	**278**	0	10	**2,152**
Olney	0	0	3	1	-2	-3	0	25	1	18	-1	11	10	-2	-1	1	9	0	-1	**69**
Rockville	0	0	4	2	3	2	0	**155**	2	37	2	-31	30	10	1	5	**121**	0	-4	**339**
Shady Grove	0	0	4	3	0	-1	0	59	2	28	3	36	45	15	1	2	**149**	0	-1	**345**
Wheaton-Glenmont	0	0	4	8	-6	-37	0	61	3	46	-1	34	33	5	-5	-4	86	0	-3	**224**
White Oak	1	0	5	3	0	-18	0	6	4	51	0	4	2	-1	-3	7	34	0	2	**97**
Rem. Montgomery Co.	8	0	64	47	48	**-115**	0	**657**	70	**660**	3	**244**	**206**	22	32	77	**1,137**	0	-3	**3,157**
Rem. PG Co.	1	0	8	2	-5	-44	0	-1	39	**271**	0	13	2	0	26	22	88	0	-4	**418**
Rem. MD Jurs.	0	0	0	0	0	-12	0	0	0	1	0	0	0	0	0	-1	-1	1	-1	**-13**
All Virginia	0	0	1	0	0	26	0	-1	-2	11	0	-1	-2	0	0	1	0	0	-92	**-59**
TOTAL	**13**	**0**	**183**	**92**	**244**	**-181**	**4**	**1,449**	**391**	**3,143**	**13**	**625**	**415**	**103**	**84**	**286**	**2,788**	**1**	**-106**	**9,547**

***Cells when (Bus ridership increase) > 100 trips are displayed in green; (Bus ridership decrease) < -100 trips in red**

Table A7 - Impacts of ICC on 2040 Transit Trips: 2040 No Build Vs. Build

		TO						
		I-370	Georgia Ave. (MD 97)	Layhill Rd. (MD 182)	New Hampshire Ave. (MD650)	Columbia Pike (US 29)	I-95	US 1
FROM	I-370	NA	$ 1.34	$ 1.91	$ 2.57	$ 3.21	$ 3.80	$ 4.24
	Georgia Ave. (MD 97)	$ 1.43	NA	$ 0.57	$ 1.22	$ 1.87	$ 2.45	$ 2.90
	Layhill Rd. (MD 182)	$ 1.98	$ 0.55	NA	$ 0.66	$ 1.30	$ 1.89	$ 2.34
	New Hampshire Ave. (MD650)	$ 2.63	$ 1.20	$ 0.66	NA	$ 0.64	$ 1.23	$ 1.68
	Columbia Pike (US 29)	$ 3.27	$ 1.84	$ 1.29	$ 0.64	NA	$ 0.59	$ 1.03
	I-95	$ 3.96	$ 2.53	$ 1.98	$ 1.32	$ 0.69	NA	$ 0.45
	US 1	$ 4.29	$ 2.86	$ 2.31	$ 1.66	$ 1.02	$ 0.33	NA

Table A8- ICC Tolls in AM and PM Peak Periods in 2040 (in 2010 dollars)

		TO						
		I-370	Georgia Ave. (MD 97)	Layhill Rd. (MD 182)	New Hampshire Ave. (MD650)	Columbia Pike (US 29)	I-95	US 1
FROM	I-370	NA	$ 1.02	$ 1.45	$ 1.95	$ 2.44	$ 2.88	$ 3.23
	Georgia Ave. (MD 97)	$ 1.09	NA	$ 0.43	$ 0.93	$ 1.42	$ 1.86	$ 2.20
	Layhill Rd. (MD 182)	$ 1.50	$ 0.42	NA	$ 0.50	$ 0.99	$ 1.43	$ 1.77
	New Hampshire Ave. (MD650)	$ 2.00	$ 0.92	$ 0.50	NA	$ 0.49	$ 0.93	$ 1.27
	Columbia Pike (US 29)	$ 2.48	$ 1.40	$ 0.98	$ 0.48	NA	$ 0.44	$ 0.79
	I-95	$ 3.01	$ 1.92	$ 1.51	$ 1.01	$ 0.52	NA	$ 0.34
	US 1	$ 3.26	$ 2.17	$ 1.76	$ 1.26	$ 0.78	$ 0.25	NA

Table A9 - ICC Tolls in Midday and Night Time Periods in 2040 (in 2010 dollars)

		TO						
		I-370	Georgia Ave. (MD 97)	Layhill Rd. (MD 182)	New Hampshire Ave. (MD650)	Columbia Pike (US 29)	I-95	US 1
FROM	I-370	0.00	5.47	7.77	10.45	13.06	15.44	17.27
	Georgia Ave. (MD 97)	5.81	0.00	2.30	4.98	7.59	9.97	11.80
	Layhill Rd. (MD 182)	8.04	2.23	0.00	2.68	5.29	7.67	9.50
	New Hampshire Ave. (MD650)	10.71	4.90	2.67	0.00	2.61	4.99	6.82
	Columbia Pike (US 29)	13.30	7.49	5.26	2.59	0.00	2.38	4.21
	I-95	16.10	10.29	8.06	5.39	2.80	0.00	1.83
	US 1	17.45	11.64	9.41	6.74	4.15	1.35	0.00

Table A10 - Distance between ICC Segments (in miles)