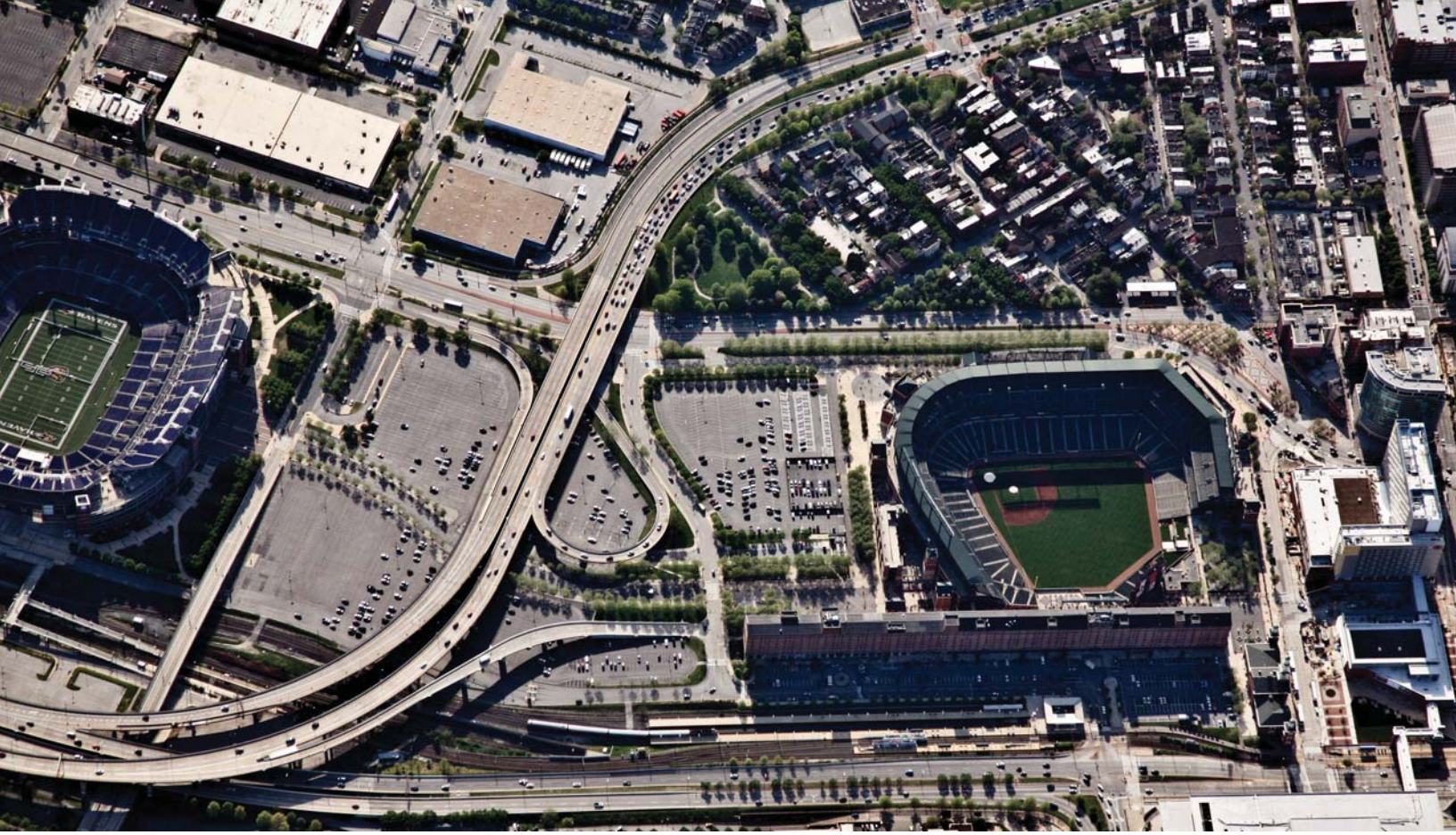


Task Report 10-2

Baltimore Regional Roadway Congestion Trends Analysis 1998 - 2008

Victor Henry, Project Manager
Edward Stylc and Brian Ryder, Authors

June 2010

Baltimore Metropolitan Council

Baltimore Regional Roadway Congestion Trends Analysis 1998 - 2008

Transportation Planning Division
Todd R. Lang, Transportation Director
Regina Aris, Assistant Director

Regina Aris, Manager, Plan & Policy Development
Dunbar Brooks, Manager, Data Development

Project Manager
Victor Henry

Authors
Edward Stylc and Brian Ryder

Data Collection Contributors
William G. Leonard
Steve Smith
Ann Edgerton
Don Walters

TASK REPORT 10-2

June 2010

Baltimore Metropolitan Council
Larry Klimovitz, Executive Director
Offices @ McHenry Row
1500 Whetstone Way, Suite 300
Baltimore, Maryland 21224

This paper is the work of the Baltimore Metropolitan Council Transportation Planning Division staff and is intended for informational use at staff level and documentation of staff work. Opinions and conclusions expressed are those of the authors and do not represent official policies of the Baltimore Metropolitan Planning Organization. Funding for this report has been provided by the U.S. Department of Transportation, the State of Maryland, and the Baltimore Metropolitan Council.

TABLE OF CONTENTS

		Page
EXECUTIVE SUMMARY		i
I.	BACKGROUND	1
II.	METHODOLOGY	1
	A. Identify Corridors	1
	B. Determine Sample Size	1
	C. Determine Collection Period	3
	D. Select Equipment	3
	E. Establish Driving Procedure	3
III.	DATA PROCESSING	3
	A. Download and Import Raw GPS Data	4
	B. GPS Database Management System	4
IV.	DATA ANALYSIS/FINDINGS	4
	A. Regional Analysis	4
	B. Corridor Analysis	8
V.	CONCLUSIONS/FUTURE DIRECTIONS	13

FIGURES

Figure 1	Monitoring Locations	2
Figure 2	Travel Speeds Collected Using GPS, Fall 1998	5
Figure 3	Travel Speeds Collected Using GPS, Fall 2002	6
Figure 4	Travel Speeds Collected Using GPS, Fall 2008	7

TABLES

Table 1	Freeways with Major Changes in Travel Speed, 1998-2008	9
Table 2	Arterials with Major Changes in Travel Speed, 1998-2008	9

APPENDICES

Appendix A Average Travel Times, 1998- 2008
Appendix B Average Travel Speeds, 1998- 2008

EXECUTIVE SUMMARY

The following is a brief comparison of the Baltimore Metropolitan Council's activities and findings in collecting and analyzing morning rush hour (7:00 a.m. to 9:00 a.m.) travel time and travel speed data in the Baltimore area in the Fall of 1998, 2002, & 2008 using Global Positioning System (GPS) and Geographic Information System (GIS) technology.

Activities

- Identified 14 of the heaviest traveled freeway and arterial corridors in the Baltimore area (10 Freeways and 4 Arterials).

- Applied GPS technology in the data collection effort.

- Collected travel time and speed data along these corridors between 7:00 a.m. to 9:00 a.m., Tuesday through Friday, from September to December of 1998, 2002 & 2008.

- Conducted seven trials on each corridor in each direction. Averaged this data to provide travel time and speeds for each corridor.

- Produced statistics and maps that depict average travel time and average travel speed on a regional and corridor specific level.

- Developed a GIS-based software application to organize process and present GPS data collected over a number of years.

Findings

- The Baltimore area has many freeways and arterials with average travel speeds at or above the route's speed limit.

- In the morning, congestion occurs at many commonly known locations such as: the Jones Falls Expressway (I-83) southbound into Baltimore City, the west side outer loop of the Beltway (I-695), the northwest inner loop of the Beltway (I-695) and the northeast outer loop of the Beltway (I-695).

- Average travel speed on freeways in the study during the morning rush hour in 1998 was 59.1 MPH compared to 59.5 MPH in 2002. In 2008 the average freeway speed dropped to 53 MPH

- Average travel speed on arterials in the study during the morning rush hour in 1998 was 46.6 MPH compared to 44.5 MPH in 2002. In 2008, it fell to 38 MPH.

- The use of GPS technology has greatly increased the accuracy of the travel speed data.

I. BACKGROUND

From 1998 to 2008, the Baltimore Metropolitan Council (BMC) collected vehicle speed data throughout the Baltimore region. For this study, BMC selected 14 corridors of various road types to analyze in 1998, 2002 & 2008 during the morning rush hour (7:00 a.m. to 9:00 a.m.). To collect the data, BMC equipped three drivers with a Global Positioning System (GPS) unit. Using their personal vehicle, the drivers collected travel time and travel speed for each corridor. Driving was conducted Tuesday through Friday from September to December of 1998, 2002 & 2008. In the morning rush hour, drivers drove each corridor seven times in each direction to obtain a proper sample. This report compares the results of these three collection years.

II. METHODOLOGY

To paint a more accurate picture of traffic speeds around the Baltimore area, BMC sought to collect average travel time and average travel speed for the heaviest traveled freeway and arterial corridors. To achieve this, 14 freeway and arterial corridors were identified, a sample size was determined, a collection period was determined, the equipment was selected, and a driving procedure was established.

A. Identify Corridors

For the 1998 and 2002 travel speed data collection, BMC identified 14 of the heaviest traveled freeway and arterial corridors in the Baltimore area. These roadways were primarily selected based on BMC staff's knowledge of metropolitan traffic patterns in the Baltimore region. Also taken into account was the roadway's proximity to population centers and employment centers, the connectivity to other major highways and the objective to achieve regional coverage. In 2008, a larger sample was collected but this report will only cover the same roadways collected in the previous two samples.

The corridors selected covered the six jurisdictions in the Baltimore area, including Anne Arundel County, Baltimore City, Baltimore County, Carroll County, Harford County and Howard County (*See Figure 1).*

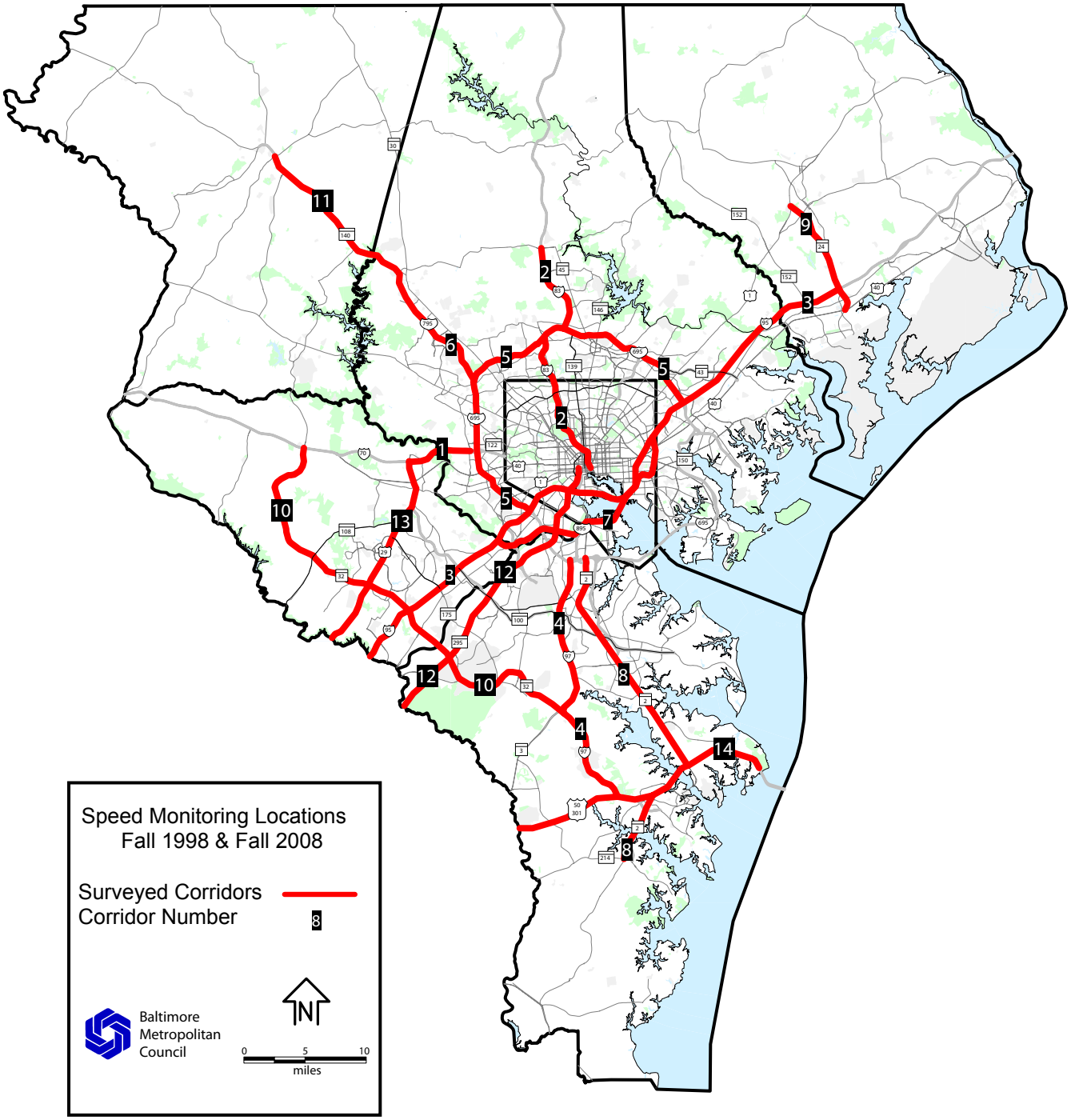
B. Determine Sample Size

To obtain a proper sample of traffic data for each corridor, a sample size was determined. The sample size was determined as the number of times a corridor must be driven in a particular direction, e.g., I-95 Northbound, to provide a valid sample. When a driver traveled the length of a corridor in one direction, it was known as a trial. BMC staff conducted research to determine the number of trials needed. The research showed that seven trials in each direction for each corridor were acceptable. In both 1998 and 2002, a total of 3,312 miles were driven along all 14 corridors. In 2008, 5,966 miles were driven due to additional roadways being added to the schedule.

FIGURE 1

Travel Speeds Collected Using GPS
Fall 1998 & Fall 2008, Morning Peak 7-9 a.m.

Monitoring Locations



C. Determine Collection Period

In order to collect an accurate and valuable data set, BMC had to determine the optimal collection period. The traffic during the collection period had to be as typical as possible, thus the part of the year, period of the week and time of day had to be taken into account. It was determined that traffic varies too much during the winter and summer months because of inclement weather and vacations, respectively. Therefore, BMC staff selected the fall months, September through December, for data collection. Driving was not done on holidays or on bad weather days. Bad weather days were defined as a day with foggy, rainy or snowy conditions. As a rule, if the drivers' windshield wipers were on constantly, data were not collected that day. On the weekly level, BMC selected Tuesday through Friday for data collection. To maximize the efficiency of staff time, BMC focused on morning rush hours, defined as 7:00 a.m. to 9:00 a.m.

D. Select Equipment

The following equipment was used to collect travel speed data. Several BMC staff members used their personal vehicles to do the driving. Each driver was equipped with a GPS unit. In 1998-2003, the GPS hardware selected for this application was a Garmin Track Pack 35 and a Battelle GPS Leader. The Garmin and Battelle units were accurate to within 15 meters, which is acceptable for BMC planning applications. The units established communication with three satellites to record second-by-second time of day and latitude/longitude records. This equipment allowed BMC staff to safely and efficiently collect travel time and travel speed data.

In 2007, new GPS equipment was purchased including 3 TravTime version 1.2 GeoLoggers from GeoStats Corporation to replace the aging Garmin and Battelle units.

E. Establish Driving Procedure

To accurately depict the average driver, BMC staff established a standardized data collection procedure. First, all drivers were to maintain the average speed of the general traffic population. This was accomplished using the 'floating car technique' in which the driver passes one car for every car that passes his or her vehicle. Second, each driver was trained to bring the vehicle up to the speed of the general traffic population before reaching the starting point of the corridor being surveyed. The drivers were also directed to maintain uniform speed until the end of the corridor, where possible. This ensured that the trial covered the corridor in its entirety. Lastly, to ensure data quality, technical staff checked the downloaded data to make sure the driver stayed on course and maintained a reasonable speed *(see Section III A.).*

III. DATA PROCESSING

The following describes the process BMC used to convert raw GPS latitude/longitude and time of day data into travel time and travel speed data. The processing required the following types of software packages: a file manager, a spreadsheet and a Geographic Information System (GIS). The conversion process involved two major steps: (a) download and import the raw GPS data into a database, and (b) use the GPS Database Management System to automatically calculate: distance, average travel time and average travel speed of each of the seven trials on each corridor.

A. Download and Import Raw GPS Data

The downloading process occurred each week from September to December for each year. Each time the drivers came into the office, the raw data on their GPS units was downloaded using the GeoLogger download utility onto a BMC desktop computer. Then each driver's GPS text file was split into individual days trials. From there the files are then imported into the ArcGIS based GPS Database Management system where quality checks on the data are performed to insure that the trial runs were driven correctly.

Once the data is verified to be accurate, the GPS Database Management System could automatically calculate average travel time and average travel speed.

B. GPS Database Management System

The GPS Database Management System is specialized software that enables BMC staff to better organize, process and present GPS travel time and travel speed data collected through the use of Global Positioning System tracking devices. This database management system was initially developed by Motion Maps, LLC of Rockville, Maryland and a version was modified to meet the particular needs and requirements of BMC. Prior to 2007 a GIS-based application that works in conjunction with the MapInfo GIS Software was utilized. That system allowed BMC staff to quickly produce maps and statistics from GPS-based travel time data for a given year on several corridors (e.g., Figures 2, 3 & 4). Not only does the GPS Database Management System improve the storage and processing of the data, it will also be used to expand the application of GPS to projects such as origin-destination studies, Congestion Management System reporting, and the validation of the Baltimore region travel demand model. In July of 2007, Motion Maps developed a similar ArcGIS based system which was implemented and adopted by BMC beginning with the Fall 2008 data collection.

IV. DATA ANALYSIS/FINDINGS

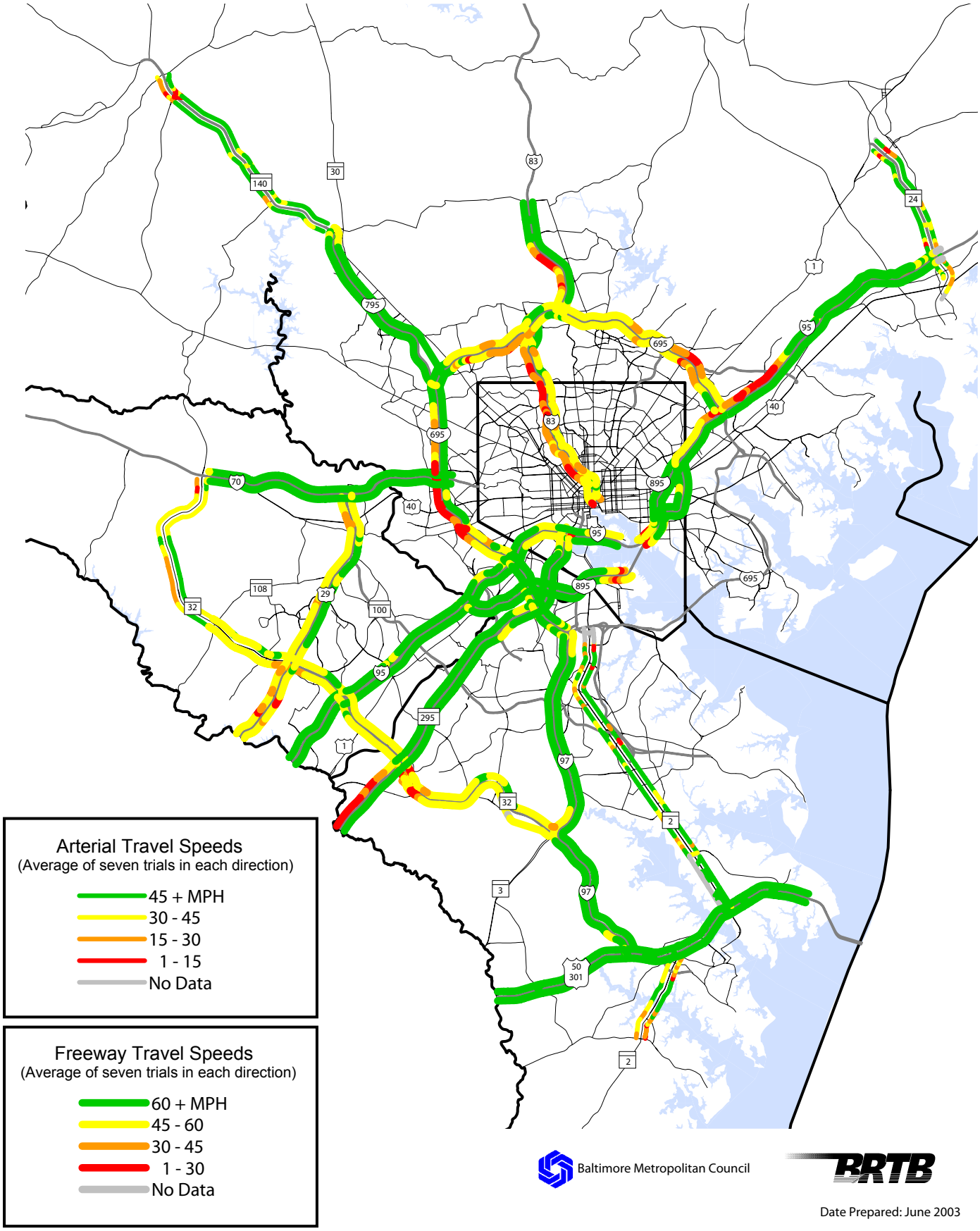
This section will describe the results of the GPS travel time and travel speed data for 1998, 2002 and 2008. The data collected over the ten years showed many familiar traffic patterns in the Baltimore area *(see Figures 2, 3, & 4).* Several congested areas were observed on the region's freeways and arterial roadways. These congested areas were caused by a variety of factors including traffic volumes exceeding roadway capacity, traffic signal timing, bottlenecks, road construction, and/or toll plazas. The characteristics of a particular corridor also affected traffic flow, including population density along the corridor, the corridor's proximity to employment centers, and/or spill-over congestion from other highway facilities. Traffic patterns are analyzed on a regional and corridor basis.

A. Regional Analysis

In the Baltimore region, freeways and arterials perform much differently. This can be attributed to the design of these types of roads. Freeways are designed for limited access, uninterrupted travel using divided directional lanes, and grade-separated interchanges. Thus, traffic patterns on freeways are uniform and relatively smooth. Arterials have many impediments to traffic flow, such as single directional lanes and at-grade intersections with traffic lights. This causes arterial traffic patterns to be much more intermittent than freeways. To study regional traffic patterns, these two types of roadways must be analyzed separately.

FIGURE 2

Travel Speeds Collected Using GPS
Fall 1998, Morning Peak 7-9 a.m.
Freeways and Arterials

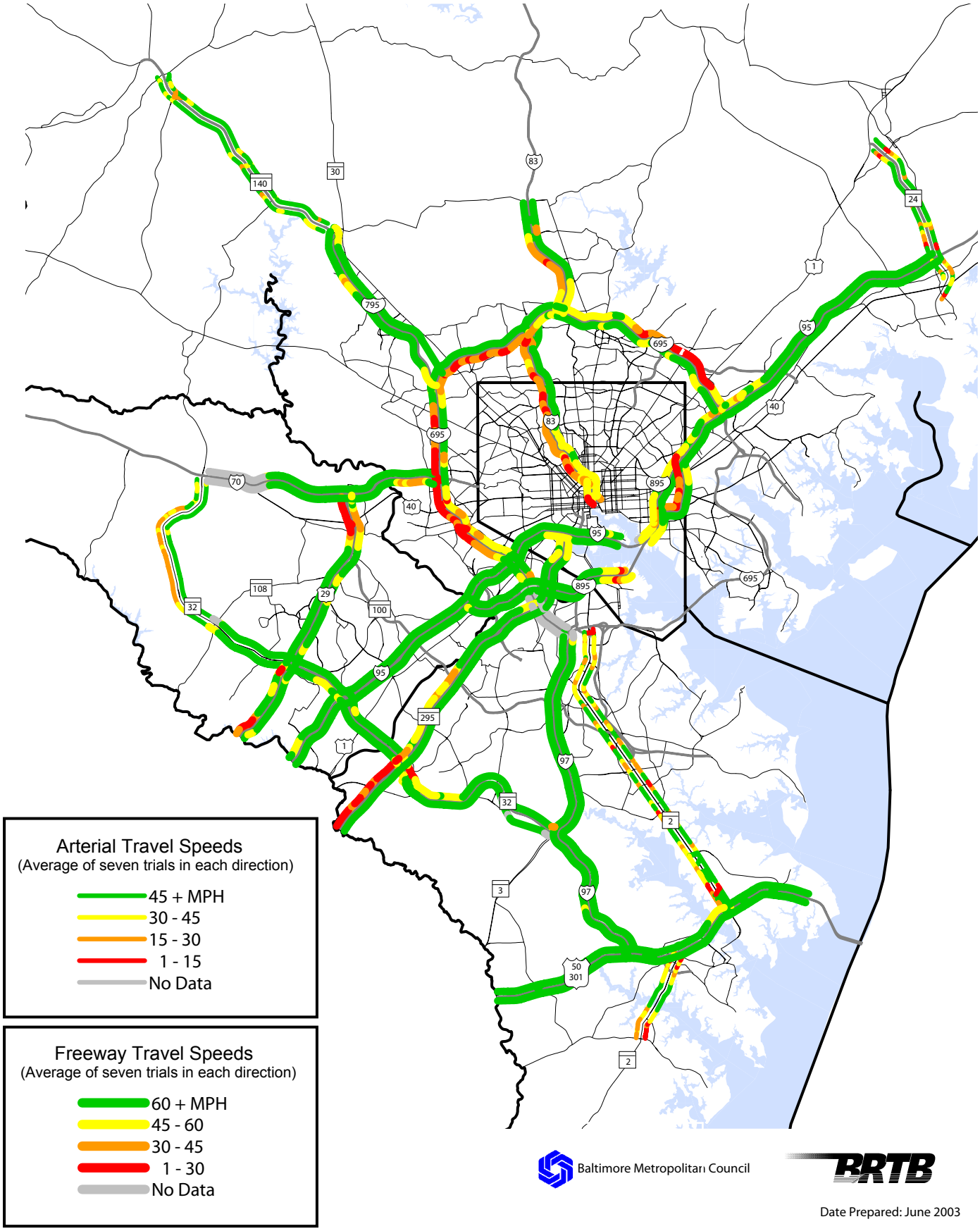


Date Prepared: June 2003

FIGURE 3

Travel Speeds Collected Using GPS
Fall 2002, Morning Peak 7-9 a.m.

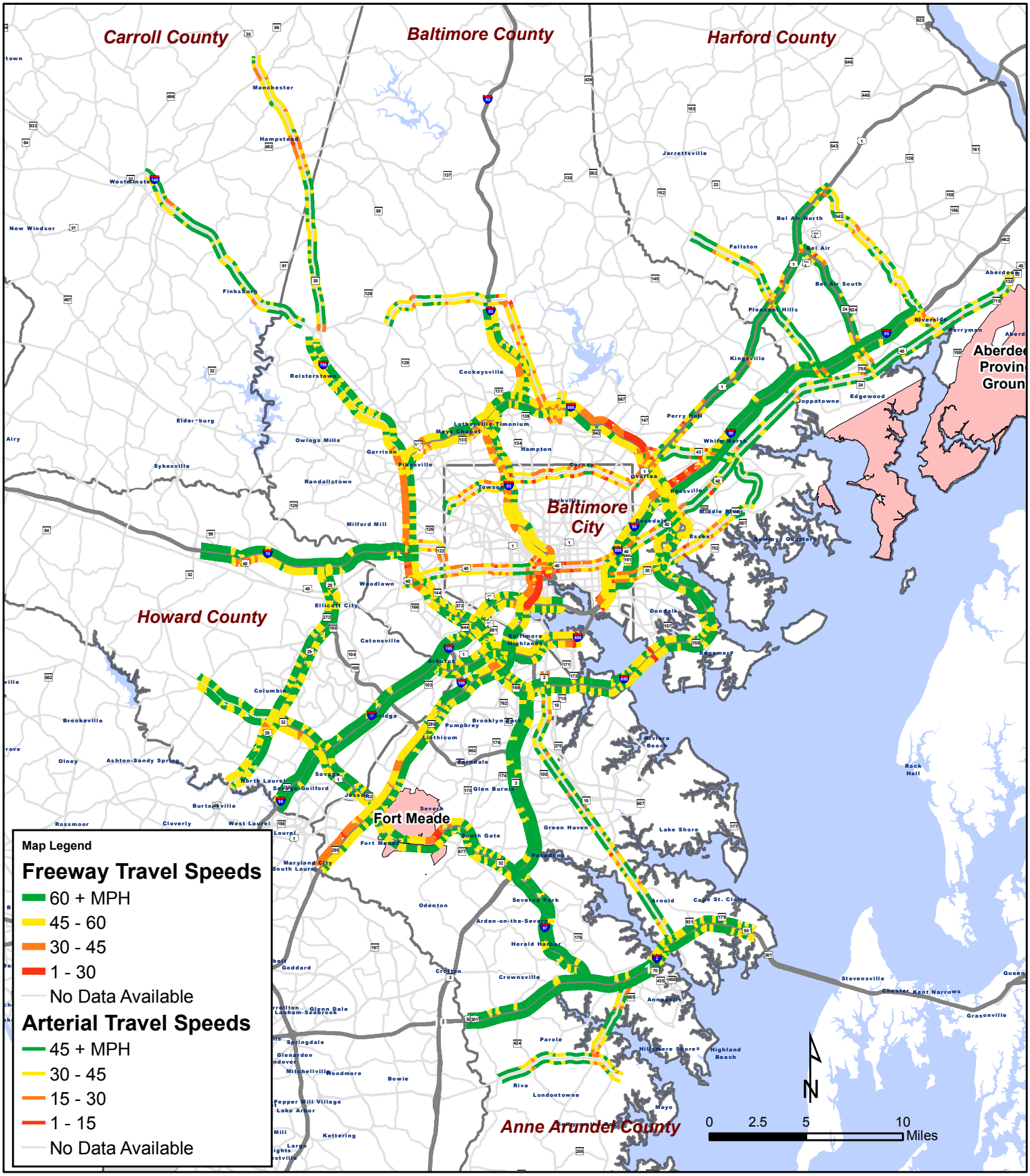
Freeways and Arterials



Date Prepared: June 2003

FIGURE 4

Travel Speeds Collected Using GPS
Fall 2008, Morning Peak 7-9am
Freeways and Arterials



Baltimore Metropolitan Council

Date Prepared: February 2009

Freeways

- **Patterns**

In 1998, 2002, & 2008, freeways in the Baltimore area experienced the heaviest congestion into and around Baltimore City during the morning rush hour. As a result, Baltimore County experiences traffic delay on the Baltimore Beltway (I-695) and facilities that connect the Beltway with outlying areas such as I-795 (Owings Mills and Carroll County), I-83 (Northern Baltimore County and Pennsylvania) and I-95 North (White Marsh and Harford County), *See Figure 2, 3, & 4.* This type of congestion is mainly caused by high traffic volume, a result of how the Beltway collects much of the region's traffic. Overall, travel speeds on much of the area's freeways are at or above their posted speed limit *(indicated in green on Figure 2 & 3)*.

- **Average Travel Speeds**

The average travel speed for all 10 surveyed freeways in the region during the morning rush hour was 59.1 MPH in 1998 compared to 59.5 MPH in 2002. This shows that the average travel speed over a five year period remained nearly unchanged *(Corridor level average travel speeds can be found in Section IV, B and Appendix B.)* By 2008, the average speed on these freeways dropped to 52 MPH.

Arterials

- **Patterns**

Traffic patterns on arterial roadways tended to vary because of their design (i.e., traffic lights and urban areas). As a result, the arterials sampled in the region experience much congestion as they traverse towns and other urban settings (*see Figure 2, 3, & 4).*

- **Average Travel Speeds**

The average travel speed for the four arterial corridors during the morning rush hour was 46.6 MPH in 1998 compared to 44.5 MPH in 2002.[1] This shows a slight decrease in the overall travel speed on the sampled arterial corridors. In 2008, the sampled corridor speeds had dropped to 38 MPH.

B. Corridor Analysis

On a corridor level, the following list of specific locations around the Baltimore area shows major changes in travel speed *(see Tables 1 & 2).* Possible causes for these changes are explained on the following pages. *(A full chart of the entire corridor average travel times and average travel speeds can be found in Appendices A & B.)*

[1] *Note: This is only comparing four arterial corridors and does not necessary represent all arterial corridors in the Baltimore area.*

Table 1: Freeways with Major Changes in Travel Speed, 1998, 2002, 2008

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL SPEED (MPH) 1998	AVERAGE TRAVEL SPEED (MPH) 2002	AVERAGE TRAVEL SPEED (MPH) 2008	CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2002		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 2002-2008		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2008	
I-95 JFK Hwy.	Southbound	MD 24 to I-695 NE (White Marsh)	12.78	65	66	48	↑	+1	↓	-18	↓	-17
I-795	Southbound	MD 140 to I-695	8.82	64	62	51	↓	-2	↓	-11	↓	-13
I-895	Southbound	I-95 NE (East Baltimore) to Harbor Tunnel	4.86	62	59	52	↓	-3	↓	-7	↓	-10
I-695 Beltway	Outerloop	I-95 NE (White Marsh) to I-795	16.71	51	50	42	↓	-1	↓	-8	↓	-9
MD 295 B/W Pkwy.	Southbound	I-95 to Prince George's-Howard County Line	18.13	57	50	48	↓	-7	↓	-2	↓	-9

Table 2: Arterials with Major Changes in Travel Speed, 1998, 2002, 2008

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL SPEED (MPH) 1998	AVERAGE TRAVEL SPEED (MPH) 2002	AVERAGE TRAVEL SPEED (MPH) 2008	CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2002		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 2002-2008		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2008	
MD 2 Ritchie Hwy.	Northbound	MD 214 to College Parkway	10.67	51	38	38	↓	-13	No Change	0	↓	-13
MD 24	Northbound	US 40 to US 1	6.37	47	44	35	↓	-3	↓	-9	↓	-12
MD 2 Ritchie Hwy.	Northbound	College Parkway to I-695	12.56	47	40	37	↓	-7	↓	-3	↓	-10
MD 2 Ritchie Hwy.	Southbound	I-695 to College Parkway	12.56	45	40	37	↓	-5	↓	-3	↓	-8
MD 24	Southbound	US 1 to US 40	6.37	47	44	40	↓	-3	↓	-4	↓	-7

Freeways

1. I-95 (JFK Hwy) from MD-24 Southbound to I-695 NE (White Marsh)

- Average Travel Speed, 1998: 65 MPH
- Average Travel Speed, 2008: 48 MPH
- Change: **- 17 MPH**
- Possible Cause: In July 2005, the Maryland Transportation Authority (MdTA) received federal approval to construct Express Toll Lanes (ETLs) on the most congested portion of I-95 north of Baltimore City. This 8-mile segment stretches from the I-895 (N) split in east Baltimore City, to north of MD 43 in White Marsh, Baltimore County. Known during planning studies as "JFK-Section 100," the I-95 Express Toll Lanes Project will ease congestion and increase safety by making improvements to I-95, reconstructing bridges and interchanges, and adding ETLs. Construction began in 2006.[2] Annual average daily traffic has increased from 151,725 in 2002 to 157,742 in 2008.[3] Approaching the construction zone near I-695, the length of this congested zone varied widely; the primary bottleneck appeared to be the merge with traffic from I-695 onto southbound I-95 (just south of the interchange). Construction did not originally cause this congestion, which has been found since the survey program began in 1999.[3]

2. I-795 Southbound from MD-140 to I-695 Beltway

- Average Travel Speed, 1998: 64 MPH
- Average Travel Speed, 2008: 51 MPH
- Change: **- 13 MPH**
- Possible Cause: The decrease in travel speed on I-795 over ten years is likely due to a an estimated 20% increase in population in Carroll County, of which I-795 serves as a main commuter route.[4] Annual average daily traffic has increased from 86,959 in 1998 vehicles to 108,458 in 2008.[5] This congestion appeared to form at the southbound I-695 merge; congestion approaching the MD 26 interchange extended back toward the I-795 interchange on some days but not others. On I-795, left-lane vehicles were usually able to bypass most of the delay.[6]

3. I-895 Southbound from I-95 NE (East Baltimore) to Harbor Tunnel

- Average Travel Speed, 1998: 62 MPH
- Average Travel Speed, 2008: 52 MPH
- Change: **- 10 MPH**
- Possible Cause: Annual average daily traffic on this segment has increased from 41,000 vehicles per day in 1998 to 50,980 in 2008.[5] Despite the observed 10 MPH decrease in speed, traffic still flows at or around the posted speed limit of 55 MPH on this 4.86 mile segment which provides an alternative to I-95 in Baltimore City. From Lombard St. to the Harbor Tunnel entrance is where most of the congestion is observed; the results of drivers entering the tunnel with narrowing shoulders being the probable factor.[6]

---

[2] *http://www.i-95expresstolllanes.com/project_overview/*
[3] *Source: Major Highway Performance Ratings and Bottleneck Inventory –Maryland – Spring 2008 – Skycomp, Inc*
[4] *Source U.S. Census Bureau: State and County QuickFacts, Revised April 22, 2010*
[5] *Source: Maryland Traffic Volume Maps by County, 1998, 2002, 2008--Maryland State Highway Administration-Maryland Department of Transportation.*
[6] *Source: Major Highway Performance Ratings and Bottleneck Inventory –Maryland – Spring 2008 – Skycomp, Inc*

4. I-695 Outerloop from I-95 NE (White Marsh) to I-795

- Average Travel Speed, 1998: 51 MPH
- Average Travel Speed, 2008: 42 MPH
- Change: **- 9 MPH**
- Possible Cause: This segment of freeway connects the White Marsh area with Towson. Much of this traffic is heading towards the employment centers of Towson, Lutherville/Timonium and Hunt Valley. Causes of this congestion include westbound White Marsh Boulevard (MD 43) traffic entering the outer loop of the Beltway (I-695). This merge causes large backups on both White Marsh Boulevard and the Beltway. White Marsh Boulevard traffic merging onto the Beltway is complicated by traffic exiting the Beltway onto the Harford Road exit. This longstanding bottleneck also includes merging and weaving traffic at each of the interchanges between US-1 and Providence Rd; the lane drop (4 lanes to 3) before Perring Parkway; and the sharp curve / downhill / ramp merge combination at MD-567 (Cromwell Bridge Rd). Conditions improve west of Providence Rd, although during some observations, minor westbound delays at 40-50 mph persisted to York Rd.[7]

5. MD-295 B/W Pkwy Southbound from I-95 to P.G.-Howard County Line

- Average Travel Speed, 1998: 57 MPH
- Average Travel Speed, 2008: 48 MPH
- Change: **- 9 MPH**
- Possible Cause: This section of the Baltimore/Washington Parkway provides a direct link between Anne Arundel County and the rest of the Baltimore area with Washington, DC. I-95 stops short of Washington at I-495, the Capital Beltway. This causes many commuters to choose MD 295 over I-95 even though I-95 has more capacity. (Average travel speed on I-95 southbound from Baltimore to the Howard/Prince George's County Line was 64 MPH in 1998 and 69 MPH in 2002). The change in travel speeds on MD 295 from 1998 to 2002 can be attributed to an interchange reconstruction project just south of the Anne Arundel/Prince George's County Line. In 1999, the U.S. National Park Service (which operates part of the parkway) began a total reconstruction of the parkway interchange with MD 197. The construction involved re-routing parkway traffic onto a detour road. The project was completed in late December 2002 (after BMC's data collection). In addition, more commuters are using this route. In 1998 the annual average daily traffic was 59,100 in 2002; it was handling 84,650 vehicles and 84,541 in 2008.[8]

---

[7] *Source: Major Highway Performance Ratings and Bottleneck Inventory –Maryland – Spring 2008 – Skycomp, Inc*

[8] *Source: Maryland Traffic Volume Maps by County, 1998 and 2008--Maryland State Highway Administration-Maryland Department of Transportation*

Arterials

1. MD 2 Northbound from MD-214 to College Parkway

- Average Travel Speed, 1998: 51 MPH
- Average Travel Speed, 2008: 38 MPH
- Change: **- 13 MPH**
- Possible Cause: Annual average daily traffic on the northern section of this corridor actually decreased from 48,246 vehicles in 1998 to 46,540 in 2008 due to more traffic choosing the alternate I-97 route. However, the central portion of this segment runs directly through the city of Annapolis and shares a portion of its path with US-50. In 1998 the annual average daily traffic was 42,225 vehicles at its intersection with Aris T. Allen Blvd in Annapolis. That area has seen increases in retail and residential development with the construction of the mixed use Annapolis Town Centre on the former site of the Parole Plaza Shopping Centre. By 2008, AADT had significantly increased to 53,220 vehicles.[9]

2. MD 24 Northbound from US 40 to US-1

- Average Travel Speed, 1998: 47 MPH
- Average Travel Speed, 2008: 35 MPH
- Change: **- 12 MPH**
- Possible Cause: This corridor connects the growing Bel Air area to I-95. For instance, U.S. Census figures show that the Bel Air Census Designated Place (CDP) has grown from 50,161 residents in 1990 to 75,580 in 2000.[10] Though increasing congestion is apparent, MD 24 had been handling the population growth and resulting travel demand well with only a 3 MPH drop in speed from 1998 to 2002 (44 MPH). However a major widening project began in 2007 with Phase 2 due for completion in 2010.[11] Speeds are now a full 12 MPH below what was recorded in 1998 with most of the congestion occurring between MD-924 and the I-95 interchange.

3. MD 2 (Ritchie Highway) Northbound between College Parkway and I-695

- Average Travel Speed NB 1998: 47 MPH
- Average Travel Speed NB 2008: 37 MPH
- Change: **- 10 MPH**
- Possible Cause: Ritchie Highway contains many traffic lights and retail outlets continue to expand especially in the area of Glen Burnie which includes a major portion of this segment. This growth coupled with the road's design (32 traffic signals) and limited capacity (4 lanes throughout the segment and some 6 lanes sections) have led to a decrease in travel speeds over ten years. Traffic volume has only increased marginally in the area from 42,243 AADT in 1998 to 43,928 in 2008[9] in part due to the opening of I-97 in Anne Arundel County. North of Magothy Bridge Rd, congestion was exacerbated by weaving associated with the MD 10 entrance ramp.[12]

---

[9] *Source: Maryland Traffic Volume Maps by County, 1998 and 2008--Maryland State Highway Administration-Maryland Department of Transportation.*
[10] *Source: United States Census Bureau, 1990 & 2000.*
[11] http://www.mdta.maryland.gov/I95section200/linked_files/Display_board/june_2007/MD24_MD924.pdf
[12] *Source: Major Highway Performance Ratings and Bottleneck Inventory –Maryland – Spring 2008 – Skycomp,Inc*

4. MD 2 (Ritchie Highway) Southbound between I-695 and College Parkway

- Average Travel Speed SB 1998: 45 MPH
- Average Travel Speed SB 2008: 37 MPH
- Change: **- 8 MPH**
- Possible Cause: See #3 MD-2 Northbound from College Parkway to I-695

5. MD-24 Southbound from US-1 to US-40

- Average Travel Speed, 1998: 47 MPH
- Average Travel Speed, 2008: 40 MPH
- Change: **- 7 MPH**
- Possible Cause: See #2 MD-24 Northbound from US-40 to US-1

V. CONCLUSIONS/FUTURE DIRECTIONS

The GPS highway speed data from 1998 and 2008 showed many similar traffic patterns within the Baltimore area. The patterns in the data suggest that, in the short term, congestion is predictable. Over the long term, now having collected GPS data in the region for over 10 years, it's obvious that new roads and increasing lanes on existing roads only hold off the inevitable increases in congestion.

The public could benefit from such data by being able to see a clear picture of where congestion occurs. This could aid in their decisions of what route to take for their commute or where in the region to live and work. In addition, the public's knowledge of congested routes may help in their choice of mode of transportation for trip making.

Since 1998, BMC has realized the value in collecting travel times and travel speeds using GPS. The BMC will continue to use this technology along with the GPS Database Management System to study the changes in travel patterns across the Baltimore metropolitan area. With private sector data becoming more readily available for most freeways in the region, BMC has begun to focus GPS collection efforts on more arterial and collector routes. These efforts provide data that had not previously been available to provide validation to BMC's travel demand model. Future studies will also utilize GPS to show what effect the Base Realignment and Closure Act will have on traffic in the region.

Appendix A: Average Travel Times by Corridor, 1998 - 2008

Average Travel Times by Corridor, 1998, 2002, 2008

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL TIME (min:sec) 1998	AVERAGE TRAVEL TIME (min:sec) 2002	AVERAGE TRAVEL TIME (min:sec) 2008	CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 1998-2002		CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 2002-2008		CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 1998-2008	
I-70	Westbound	I-695 to US 29	4.66	4:14	3:59	4:13	↑	-:15	↓	+:14	no change	:01
I-70	Eastbound	US 29 to I-695	4.66	4:10	4:44	4:20	↓	+:34	↑	-:24	↓	+:10
I-83 Jones Falls Expwy.	Northbound	Fayette Street to I-695	9.7	10:59	9.42	10:25	↑	-1:17	↓	+:43	↑	-:34
I-83 Jones Falls Expwy.	Southbound	I-695 to Fayette Street	9.7	15:44	15:44	15:20	no change	:00	↑	-:24	↑	-:24
I-83 Harrisburg Expwy.	Northbound	I-695 to Shawan Rd	5.87	5:11	5:41	6:09	↓	+:30	↓	+:28	↓	+:58
I-83 Harrisburg Expwy.	Southbound	Shawan Rd to I-695	5.87	7:20	7:11	7:35	↑	-:09	↓	+:24	↓	+:15
I-95	Northbound	Howard/Prince George's County Line to I-695	14.29	12:48	12:15	13:06	↑	-:33	↓	+:51	↓	+:18
I-95	Southbound	I-695 to Howard/Prince George's County Line	14.29	13:24	12:26	13:24	↑	-:58	↓	+:58	no change	:00
I-95 City Segment	Northbound	I-695 SW (Arbutus) to Ft. McHenry Tunnel	5.78	5:53	5:47	6:01	↑	-:06	↓	+:14	↓	+:08
I-95 City Segment	Southbound	Ft. McHenry Tunnel to I-695 SW (Arbutus)	5.78	5:47	5:20	6:18	↑	-:27	↓	+:58	↓	-:31
I-95 City Segment	Northbound	Ft. McHenry Tunnel to I-695 NE (White Marsh)	7.89	7:46	7:31	8:09	↑	-:15	↓	+:38	↓	+:23
I-95 City Segment	Southbound	I-695 NE (White Marsh) to Ft. McHenry Tunnel	7.89	9:06	11:50	10:39	↓	+2:44	↑	-1:11	↓	+1:33
I-95 John F. Kennedy Hwy.	Northbound	I-695 NE (White Marsh) to MD 24	12.78	11:26	11:07	11:35	↑	-:19	↓	+:28	↓	+:09
I-95 John F. Kennedy Hwy.	Southbound	MD 24 to I-695 NE (White Marsh)	12.78	11:48	11:37	15:51	↑	-:11	↓	+4:14	↓	+4:03

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL TIME (min:sec) 1998	AVERAGE TRAVEL TIME (min:sec) 2002	AVERAGE TRAVEL TIME (min:sec) 2008	CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 1998-2002		CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 2002-2008		CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 1998-2008	
I-97	Northbound	US 50/301 to MD 32/MD 3	7.37	6:48	6:19	6:44	↑	-:29	↓	+:25	↑	-:04
I-97	Southbound	MD 32/MD 3 to US 50/301	7.37	6:55	6:25	6:50	↑	-:30	↓	+:25	↑	-:05
I-695 Beltway	Innerloop	I-95 SW (Arbutus) to I-795	10.26	10:05	11:11	11:04	↓	+1:06	↑	-:07	↓	+:59
I-695 Beltway	Outerloop	I-795 to I-95 SW (Arbutus)	10.26	16:12	19:52	17:52	↓	+3:40	↑	-2:00	↓	+1:40
I-695 Beltway	Innerloop	I-795 to I-95 NE (White Marsh)	16.71	20:03	19:17	21:43	↑	-:46	↓	+2:26	↓	+1:40
I-695 Beltway	Outerloop	I-95 NE (White Marsh) to I-795	16.71	19:40	20:03	23:21	↓	+:23	↓	+3:18	↓	+3:41
I-795	Northbound	I-695 to MD 140	8.82	8:08	8:01	8:39	↑	-:07	↓	+:38	↓	+:31
I-795	Southbound	MD 140 to I-695	8.82	8:16	8:32	10:08	↓	+:16	↓	+1:36	↓	+1:52
I-895	Northbound	I-95 SW (Elkridge) to Harbor Tunnel	8:54	8:32	8:24	9:12	↑	-:08	↓	+0:48	↓	+0:40
I-895	Southbound	Harbor Tunnel to I-95 SW (Elkridge)	8:54	8:24	8:24	9:23	no change	:00	↓	+:59	↓	+:59
I-895	Northbound	Harbor Tunnel to I-95 NE (East Baltimore)	4.86	4:42	4:34	4:56	↑	-:08	↓	-:22	↓	+:14
I-895	Southbound	I-95 NE (East Baltimore) to Harbor Tunnel	4.86	4:42	4:56	5:05	↓	+:14	↓	+:09	↓	+:23
MD 2 Ritchie Hwy.	Northbound	MD 214 to College Parkway	10.67	12:33	16:51	17:03	↓	+4:18	↓	+0:12	↓	+4:30
MD 2 Ritchie Hwy.	Southbound	College Parkway to MD 214	10.67	15:14	14:14	17:19	↑	-1:00	↓	+3:05	↓	+2:05
MD 2 Ritchie Hwy.	Northbound	College Parkway to I-695	12.56	16:02	18:50	20:05	↓	+2:48	↓	+1:15	↓	+4:03
MD 2 Ritchie Hwy.	Southbound	I-695 to College Parkway	12.56	16:45	18:50	20:30	↓	+2:05	↓	+1:40	↓	+3:45

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL TIME (min:sec) 1998	AVERAGE TRAVEL TIME (min:sec) 2002	AVERAGE TRAVEL TIME (min:sec) 2008	CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 1998-2002		CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 2002-2008		CHANGE IN AVERAGE TRAVEL TIMES (min:sec) 1998-2008	
MD 24	Northbound	US 40 to US 1	6.37	8:08	8:41	11:25	↓	+:33	↓	+2:44	↓	+3:17
MD 24	Southbound	US 1 to US 40	6.37	8:08	8:41	10:05	↓	+:33	↓	+1:24	↓	+1:57
MD 32 Sykesville Rd.	Northbound	MD 108 to I-70	8.94	11:40	9:45	10:33	↑	-1:55	↓	+:48	↑	-1:07
MD 32 Sykesville Rd.	Southbound	I-70 to MD 108	8.94	12:46	15:47	13:35	↓	+3:01	↑	+2:12	↓	+:49
MD 32 Patuxent Frwy.	Westbound	I-97 to MD 108	20.97	22:28	19:58	23:26	↑	-2:30	↓	+3:28	↓	+:58
MD 32 Patuxent Frwy.	Eastbound	MD 108 to I-97	20.97	24:12	19:22	22:16	↑	-4:50	↓	+2:54	↑	-1:56
MD 140	Westbound	I-795 to MD 27	11.2	13:26	12:41	15:44	↑	-:46	↓	+3:03	↓	+2:18
MD 140	Eastbound	MD 27 to I-795	11.2	13:43	12:55	16:59	↑	-:47	↓	+4:04	↓	+3:16
MD 295 B/W Pkwy.	Northbound	Prince George's-Howard County Line to I-95	18.13	17:00	16:44	18:40	↑	-:16	↓	+1:56	↓	+1:40
MD 295 B/W Pkwy.	Southbound	I-95 to Prince George's-Howard County Line	18.13	19:05	21:46	22:40	↓	+2:41	↓	+0:54	↓	+3:35
US 29	Northbound	Howard-Montgomery Line to I-70	13.07	13:46	12:52	12:43	↑	-:54	↑	-:09	↑	-1:03
US 29	Southbound	I-70 to Howard-Montgomery Line	13.07	15:23	17:03	13:16	↓	+1:40	↑	-3:47	↑	-2:07
US 50 / US 301	Westbound	Bay Bridge Toll Plaza to A.A./P.G. Co Line	17.17	15:23	15:23	15:26	no change	:00	↓	+:03	↓	+:03
US 50 / US 301	Eastbound	A.A./P.G. Co Line to Bay Bridge Toll Plaza	17.17	15:09	15:23	16:08	↓	+:14	↓	+:45	↓	+:59

Appendix B: Average Travel Speeds by Corridor, 1998 & 2008

Average Travel Speeds by Corridor, 1998, 2002, 2008

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL SPEED (MPH) 1998	AVERAGE TRAVEL SPEED (MPH) 2002	AVERAGE TRAVEL SPEED (MPH) 2008	CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2002		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 2002-2008		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2008	
I-70	Westbound	I-695 to US 29	4.66	66	70	66	↑	+4	↓	-4	no change	0
I-70	Eastbound	US 29 to I-695	4.66	67	59	64	↓	-8	↑	+5	↓	-3
I-83 Jones Falls Expwy.	Northbound	Fayette Street to I-695	9.7	53	60	56	↑	+7	↓	-4	↑	+3
I-83 Jones Falls Expwy.	Southbound	I-695 to Fayette Street	9.7	37	37	39	no change	0	↑	+2	↑	+2
I-83 Harrisburg Expwy.	Northbound	I-695 to Shawan Rd	5.87	68	62	57	↓	-6	↓	-5	↓	-5
I-83 Harrisburg Expwy.	Southbound	Shawan Rd to I-695	5.87	48	49	47	↑	+1	↓	-2	↓	-2
I-95	Northbound	Howard/Prince George's County Line to I-695	14.29	67	70	65	↑	+3	↓	-5	↓	-5
I-95	Southbound	I-695 to Howard/Prince George's County Line	14.29	64	69	64	↑	+5	↓	-5	no change	0
I-95 City Segment	Northbound	I-695 SW (Arbutus) to Ft. McHenry Tunnel	5.78	59	60	52	↑	+1	↓	-8	↓	-7
I-95 City Segment	Southbound	Ft. McHenry Tunnel to I-695 SW (Arbutus)	5.78	60	65	55	↑	+5	↓	-10	↓	-5
I-95 City Segment	Northbound	Ft. McHenry Tunnel to I-695 NE (White Marsh)	7.89	61	63	58	↑	+2	↓	-5	↓	-3
I-95 City Segment	Southbound	I-695 NE (White Marsh) to Ft. McHenry Tunnel	7.89	52	40	44	↓	-12	↑	+4	↓	-8
I-95 John F. Kennedy Hwy.	Northbound	I-695 NE (White Marsh) to MD 24	12.78	67	69	66	↑	+2	↓	-3	↓	-1
I-95 John F. Kennedy Hwy.	Southbound	MD 24 to I-695 NE (White Marsh)	12.78	65	66	48	↑	+1	↓	-18	↓	-17

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL SPEED (MPH) 1998	AVERAGE TRAVEL SPEED (MPH) 2002	AVERAGE TRAVEL SPEED (MPH) 2008	CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2002		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 2002-2008		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2008	
I-97	Northbound	US 50/301 to MD 32/MD 3	7.37	65	70	65	↑	+5	↓	-5	no change	0
I-97	Southbound	MD 32/MD 3 to US 50/301	7.37	64	69	63	↑	+5	↓	-6	↓	-1
I-695 Beltway	Innerloop	I-95 SW (Arbutus) to I-795	10.26	61	55	56	↓	-6	↑	+1	↓	-5
I-695 Beltway	Outerloop	I-795 to I-95 SW (Arbutus)	10.26	38	31	34	↓	-7	↑	+3	↓	-4
I-695 Beltway	Innerloop	I-795 to I-95 NE (White Marsh)	16.71	50	52	45	↑	+2	↓	-7	↓	-5
I-695 Beltway	Outerloop	I-95 NE (White Marsh) to I-795	16.71	51	50	42	↓	-1	↓	-8	↓	-9
I-795	Northbound	I-695 to MD 140	8.82	65	66	59	↑	+1	↓	-7	↓	-6
I-795	Southbound	MD 140 to I-695	8.82	64	62	51	↓	-2	↓	-11	↓	-13
I-895	Northbound	I-95 SW (Elkridge) to Harbor Tunnel	8:54	60	61	54	↑	+1	↓	-7	↓	-6
I-895	Southbound	Harbor Tunnel to I-95 SW (Elkridge)	8:54	61	61	53	no change	0	↓	-8	↓	-8
I-895	Northbound	Harbor Tunnel to I-95 NE (East Baltimore)	4.86	62	64	59	↑	+2	↓	-5	↓	-3
I-895	Southbound	I-95 NE (East Baltimore) to Harbor Tunnel	4.86	62	59	52	↓	-3	↓	-7	↓	-10
MD 2 Ritchie Hwy.	Northbound	MD 214 to College Parkway	10.67	51	38	38	↓	-13	No Change	0	↓	-13
MD 2 Ritchie Hwy.	Southbound	College Parkway to MD 214	10.67	42	45	37	↑	+3	↓	-8	↓	-5
MD 2 Ritchie Hwy.	Northbound	College Parkway to I-695	12.56	47	40	37	↓	-7	↓	-3	↓	-10
MD 2 Ritchie Hwy.	Southbound	I-695 to College Parkway	12.56	45	40	37	↓	-5	↓	-3	↓	-8

ROUTE	DIRECTION	LIMITS	DISTANCE (miles)	AVERAGE TRAVEL SPEED (MPH) 1998	AVERAGE TRAVEL SPEED (MPH) 2002	AVERAGE TRAVEL SPEED (MPH) 2008	CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2002		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 2002-2008		CHANGE IN AVERAGE TRAVEL SPEED (MPH) 1998-2008	
MD 24	Northbound	US 40 to US 1	6.37	47	44	35	↓	-3	↓	-9	↓	-12
MD 24	Southbound	US 1 to US 40	6.37	47	44	40	↓	-3	↓	-4	↓	-7
MD 32 Sykesville Rd.	Northbound	MD 108 to I-70	8.94	46	55	48	↑	+9	↓	-7	↑	+2
MD 32 Sykesville Rd.	Southbound	I-70 to MD 108	8.94	42	34	37	↓	-8	↓	+3	↓	-5
MD 32 Patuxent Frwy.	Westbound	I-97 to MD 108	20.97	56	63	54	↑	+7	↓	-9	↓	-2
MD 32 Patuxent Frwy.	Eastbound	MD 108 to I-97	20.97	52	65	57	↑	+13	↓	-8	↑	+5
MD 140	Westbound	I-795 to MD 27	11.2	50	53	43	↑	+3	↓	-10	↓	-7
MD 140	Eastbound	MD 27 to I-795	11.2	41	46	38	↑	+5	↓	-8	↓	-3
MD 295 B/W Pkwy.	Northbound	Prince George's-Howard County Line to I-95	18.13	64	65	58	↑	+1	↓	-7	↓	-6
MD 295 B/W Pkwy.	Southbound	I-95 to Prince George's-Howard County Line	18.13	57	50	48	↓	-7	↓	-2	↓	-9
US 29	Northbound	Howard-Montgomery Line to I-70	13.07	57	61	62	↑	+4	↑	+1	↑	+5
US 29	Southbound	I-70 to Howard-Montgomery Line	13.07	51	46	57	↓	-5	↑	+11	↑	+6
US 50 / US 301	Westbound	Bay Bridge Toll Plaza to A.A./P.G. Co Line	17.17	67	67	62	no change	0	↓	-5	↓	-5
US 50 / US 301	Eastbound	A.A./P.G. Co Line to Bay Bridge Toll Plaza	17.17	68	67	65	↓	-1	↓	-2	↓	-3