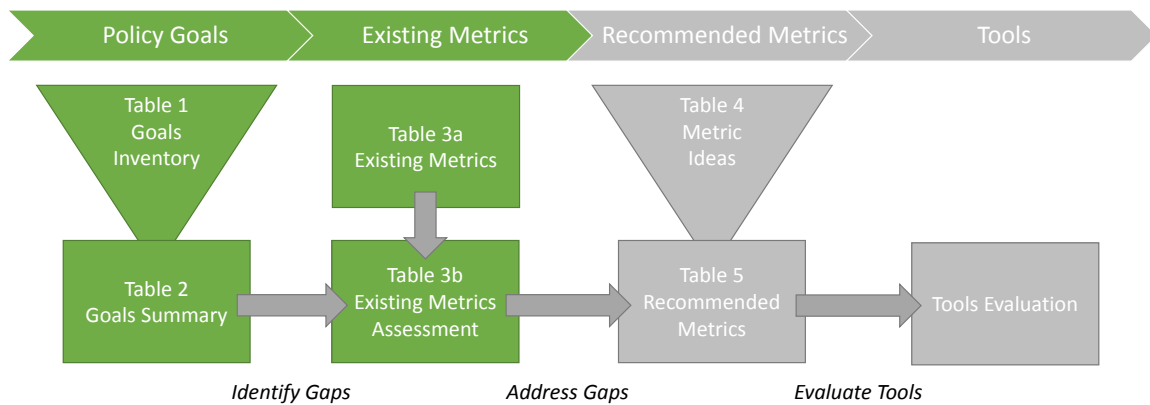


## MEMORANDUM

Date: November 9, 2015  
 To: Eric Graye, M-NCPPC  
 From: Matthew Ridgway, Nat Bottigheimer, and Alex Rixey, Fehr & Peers  
**Subject: Transportation Metrics Assessment (Revised)**

*DC15-0002*

This memo provides a preliminary assessment of the applicability of the **existing** transportation metrics used in Montgomery County. **Figure 1** illustrates how this memo fits into the overall project process of recommending transportation performance metrics and evaluating the tools necessary to calculate them. This memo includes discussion of the green portion of the process overview diagram, including an inventory of County goals, a distillation of those goals into a concise summary framework, a summary of existing transportation metrics used within the County, and an assessment of the existing metrics relative to the County's goals. A survey of ideas for potential metrics, a recommended suite of metrics that address identified gaps, and an evaluation of the tools that can be used to calculate those metrics will be included in a future memo.



*Figure 1: Metrics and Tools Assessment Process Overview Diagram*



## POLICY GOALS

**Table 1** summarizes the results of a comprehensive review of County policy documents and goals related to transportation and reflects the varied area types (urban, suburban, and rural) and transportation contexts (near Metro station, near other existing or proposed major transit, etc.). While the consultant team has organized and presented the information in Table 1 to make it legible, this table essentially recites current County policy.

**Table 2** contains interpretation and generalization of Table 1 such that it expresses a broader set of County policy goals. The goals are organized by mode (auto, transit, bicycle, and pedestrian) and by function (land use, network, function/quality, usage, and safety), as defined below:

1. **Land Use** – includes goals related to the interactions between land use and the transportation system, including notions of the location efficiency and quality of land development projects.
2. **Network** – includes goals related to the extent and connectivity of the transportation network.
3. **Function / Quality** – includes goals related to how well the elements of the network perform from an operational or experiential quality perspective.
4. **Usage** – includes goals related to the amount of travel that occurs on each of the County's modal systems.
5. **Safety** – includes goals related to the safety of the transportation system.

Additional expressions of the overall policy atmosphere related to each functional category are also included in Table 2. Table 2 forms the backbone of a comparison between current County transportation performance metrics and documented policy goals. It was developed by the consultant team and vetted with County staff. It may be worth verifying the policy direction with decision-makers.

**Table 1 - Summary of Master Plan and Sector Plan Transportation Goals and Recommendations**

Policy Area (# and Name) <sup>1</sup>	Congestion Standards		Mode Share Goals <sup>2</sup>			Auto					Transit			Bicycles			Pedestrian			Land Use							Source					
	Critical Lane Volume	Volume-to-Capacity	Commercial	Residential	Transportation Management Districts	Improve efficiency/ capacity of roadways	Intersection Improvements	Improve vehicular safety	Increase carpool/ rideshare	Expand street network	Improve connectivity and access	Increase ridership/ transit use	Implement Bus Rapid Transit	Improve connectivity/ expand network	Improve safety	Provide comfortable facilities	Designated as "major destination" activity centers	Improve connectivity/ expand network	Improve safety	Provide comfortable facilities	Improve ADA access	Provide mixed uses	Concentrate development	Encourage TOD opportunities	Foster environmental sustainability	Preserve existing character of area		Designated Parking Lot District	Increase parking density	Manage parking supply		
22 Rural East	1350	0.84				✓	✓			✓			✓	✓	✓		✓	✓	✓	✓		✓		✓	✓						Sandy Spring Rural Village Master Plan (2015), Burtonsville Master Plan (2012), Sandy Spring/Ashton Master Plan (1998)	
7 Damascus	1400	0.88				✓							✓			✓	✓	✓				✓	✓	✓	✓					Damascus Master Plan (2006)		
5 Clarksburg	1425	0.89				✓			✓	✓		✓	✓			✓					✓	✓	✓	✓						Clarksburg Master Plan (1994), Boyds Master Plan (1985), Ten Mile Creek Area Amendment to the Clarksburg Master Plan (2014)		
11 Gaithersburg City						✓			✓	✓	✓			✓		✓	✓	✓					✓							Gaithersburg Vicinity Master Plan (1985), Washington Grove Master Plan (2009), Montgomery Village Master Plan (Working Draft 2015), Great Senect Science Corridor Master Plan (2010)		
12 Germantown East						✓				✓	✓			✓									✓	✓	✓						Germantown Employment Area Sector Plan (2009)	
14 Germantown West																															N/A	
18 Montgomery Village/Airpark							✓					✓			✓												✓				Montgomery Village Master Plan (MVMP) Working Draft (2015)	
6 Cloverly	1450	0.91						✓	✓				✓				✓							✓	✓					Cloverly Master Plan (1997)		
20 North Potomac						✓				✓				✓			✓					✓		✓	✓					Potomac Subregion Master Plan (2002)		
21 Olney									✓	✓		✓	✓	✓	✓		✓	✓							✓	✓					Olney Master Plan (2005)	
22 Potomac							✓				✓				✓			✓					✓		✓	✓					Potomac Subregion Master Plan (2002)	
23 R&D Village																															N/A	
2 Aspen Hill	1475	0.92				✓						✓	✓			✓				✓	✓			✓	✓					Aspen Hill Master Plan (1994)		
8 Derwood										✓	✓			✓	✓	✓	✓								✓	✓				Upper Rock Creek Master Plan (2004)		
9 Fairland/Colesville						✓		✓	✓			✓	✓	✓	✓		✓	✓								✓	✓			Fairland Master Plan (1997)		
24 Rockville City	1500	0.94				✓		✓			✓		✓	✓	✓	✓	✓	✓												2002 Comprehensive Master Plan		
19 North Bethesda	1550	0.97	✓		✓	✓							✓	✓		✓	✓					✓	✓						North Bethesda/Garrett Park Master Plan (1992), Rock Spring Sector Plan (1992)			
4 Bethesda-Chevy Chase	1600	1				✓	✓			✓			✓	✓	✓	✓	✓	✓							✓					Comprehensive Amendment to the Bethesda-Chevy Chase Master Plan (1990), Westbard Sector Plan (Working Draft 2015), Chevy Chase Lake Sector Plan (2013)		
17 Kensington-Wheaton										✓	✓			✓	✓	✓	✓	✓	✓	✓											Kensington Wheaton Master Plan (1989), Kensington Sector Plan (2011), Kemp Mill Master Plan (2001), Capitol View & Vicinity Sector Plan (1982), Four Corners Master Plan (1996)	
13 Germantown Town Center							✓			✓	✓		✓	✓			✓	✓					✓							✓	Germantown Employment Area Sector Plan (2009)	
34 White Oak					✓	✓	✓	✓			✓	✓		✓	✓			✓					✓		✓						White Oak Science Gateway (2014), White Oak Master Plan (1997)	
30 Silver Spring-Takoma Park								✓			✓	✓			✓	✓	✓	✓	✓	✓							✓				Silver Spring/ Takoma Park Transportation and Circulation Report (1999), Takoma Park Master Plan (2000), Takoma/Langley Crossroads (2012), North & West Silver Spring Master Plan (2000), Long Branch Sector Plan (2013), East Silver Spring Master Plan (2000)	
3 Bethesda CBD	1800	1.13	✓		✓		✓			✓			✓	✓	✓	✓	✓			✓	✓	✓			✓		✓		Bethesda CBD Sector Plan (1994), Woodmont Triangle Amendment to the Sector Plan for the Bethesda CBD (2006)			
10 Friendship Heights CBD						✓					✓	✓		✓	✓	✓	✓	✓	✓			✓	✓							Friendship Heights Sector Plan (1998)		
29 Silver Spring CBD						✓					✓			✓	✓	✓	✓	✓	✓					✓	✓		✓	✓		Silver Spring CBD Sector Plan (2000)		
32 Wheaton CBD											✓			✓	✓	✓	✓	✓	✓							✓	✓		✓	Wheaton Central Business District and Vicinity Sector Plan (2012)		
15 Glenmont MSPA									✓			✓	✓		✓				✓	✓			✓	✓							Glenmont Sector Plan (2013)	
16 Grosvenor MSPA																															N/A	
25 Rockville Town Center MSPA																															N/A	
28 Shady Grove MSPA					✓	✓	✓				✓		✓	✓	✓							✓										Shady Grove Sector Plan (2006)
31 Twinbrook MSPA																							✓								Twinbrook Sector Plan (2009)	
33 White Flint MSPA					✓	✓	✓								✓			✓	✓	✓	✓	✓							✓	✓	White Flint Sector Plan (2010)	

1 - Policy Areas are organized by Critical Lane Volume congestion standards, which allow for higher levels of congestion in areas better served by transit (as outlined in the Subdivision Staging Review Policy).

2 - Mode share goals vary with targets related to transit, non-auto mode and carpooling. In some Sector and Master Plans, achievement of mode share goals can be tied to land development staging milestones.

**Table 2 - Summary of Montgomery County Transportation Goals\***

	Land Use**	Network	Function / Quality	Useage	Safety
Policy Atmosphere	"Enhance mobility by providing a safe and efficient transportation system offering a wide range of alternatives that serve the environmental, economic, social and land use needs of the County and provide a framework for development." (1)				
	"Achieve a wide variety of land use and development densidies consistent with the "Wedges and Corridors" pattern." (1)	"Develop an interconnected transportation system that provides choices in mode and routes of travel" (1)	"Reduce traffic delays without eroding quality of life" (1)	"Encourage non-auto travel" (4)	"Maximize safety in the use of the transportation system" (1)
Auto	Concentrate development Encourage TOD opportunities Provide mixed uses	Expand street network	Improve efficiency / capacity of roadways Improve intersections	Increase carpool Manage parking supply	Improve vehicular safety
Transit		"Provide a transit system in appropriate areas of the County that is a viable alternative to single occupancy vehicle travel" (1) Improve connectivity and access Implement BRT	"Maximize person-throughput through improved access to and efficiency of the County's transit system" (2)	Increase ridership/transit use Increase non-auto modeshare	"Increas[e] the modes of transportation that can be accomodated safely" (2)
Bicycle		"Provide pedestrians and bicyclists safe, direct and convenient means of travel" (1) "Develop an interconnected system of bikeways that serves transportation and recreational needs and accomodates a variety of skill levels." (3) Improve connectivity / expand network	Provide comfortable facilities	"Increase the number of trips made by bicycle" (3) Increase non-auto modeshare	"Provide pedestrians and bicyclists safe, direct and convenient means of travel" (1) Improve safety
Pedestrian		"Provide pedestrians and bicyclists safe, direct and convenient means of travel" (1) Improve connectivity / expand network	Provide comfortable facilities Improve ADA access	Increase non-auto modeshare	"Provide pedestrians and bicyclists safe, direct and convenient means of travel" (1) Improve safety

Notes:

\*Goals in quotes are directly from countywide plans. Other goals are simplified statements of goals from Sector and Master Plans. The documents cited express the high-level transportation policy guidance for the County.

(1) General Plan Refinement of the Goals & Objectives for Montgomery County (1993)

(2) Countywide Transit Corridors Functional Master Plan (2013)

(3) Countywide Bikeways Functional Master Plan (2005)

(4) Transportation Policy Report (2002)

\*\*Includes location efficiency and development quality



## EXISTING METRICS

**Table 3a** summarizes existing transportation metrics used within the County. Processes and reports in which the metrics are featured are shown in parentheses. **Table 3b** pivots from Tables 2 and 3a to provide an assessment of current metrics employed in the County from the perspective of the suitability of those metrics to guide decisions toward the County's policy goals; additional detail is provided in the text that follows. Metrics are assessed as good, fair, or poor based on four criteria:

1. The metric **applies to relevant goals** from the corresponding cell of Table 2;
2. The metric is **quantifiable**;
3. The metric has an **established threshold** for evaluation; and
4. The metric has few or no **adverse effects on other goals**.

The overall assessment is limited by the assessment for Criterion 1 (e.g., if 'applies to relevant goals' is only 'fair,' the overall assessment can be, at best, 'fair'); Criteria 2 through 4 provide additional information that may further influence the overall assessment. Metrics that are not widely in use, shown in italics in Table 3a, are excluded from the Table 3b assessment.

The assessment of existing transportation metrics summarized in Table 3b and described in detail below is organized by the five functional categories of goals included in Tables 2 and 3:

1. **Land Use** – "Achieve a wide variety of land use and development densities consistent with the 'Wedges and Corridors' pattern"<sup>1</sup>
2. **Network** – "Develop an interconnected transportation system that provides choices in mode and routes of travel"<sup>2</sup>
3. **Function / Quality** – "Reduce traffic delays without eroding quality of life;"<sup>3</sup> "Maximize person-throughput;"<sup>4</sup> and provide comfortable facilities
4. **Usage** – "Encourage [sustainable] non-auto travel"<sup>5</sup>
5. **Safety** – "Maximize safety in the use of the transportation system"<sup>6</sup>

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<sup>1</sup> General Plan Refinement of the Goals & Objectives for Montgomery County (1993).

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Countywide Transit Corridors Functional Master Plan (2013)

<sup>5</sup> Transportation Policy Report (2002). Sustainable travel is an implied goal of the Report.

<sup>6</sup> General Plan Refinement of the Goals & Objectives for Montgomery County (1993).

**Table 3a - Summary of Existing Montgomery County Transportation Metrics**

	Land use	Network	Function	Usage	Safety
Auto	Varying CLV and area-wide LOS standards by area	<i>Connectivity Index</i>	Congested speeds (TPAR) Travel Time Index (MAR) HCM LOS (LATR/MCDOT) CLV (LATR)	Counts (LATR/MCDOT) Non-Auto Mode Share Vehicle Miles Traveled (MAR) <i>Person Throughput</i>	<i>Crash data</i>
Transit	None	Coverage (TPAR) <i>Connectivity Index</i>	Peak headway (TPAR) Span of Service (TPAR) Transit headways (MAR)	Non-Auto Mode Share Transit Ridership Counts (MAR) <i>Person Throughput</i>	None
Bicycles	None	Facility Inventory (LATR) <i>Connectivity Index</i>	Facility Inventory (LATR)	Counts (LATR/MCDOT) Non-Auto Mode Share <i>Person Throughput</i>	<i>Crash data</i>
Pedestrian	None	Facility Inventory (LATR) <i>Connectivity Index</i>	Facility Inventory (LATR)	Counts (LATR/MCDOT) Non-Auto Mode Share <i>Person Throughput</i>	<i>Crash data</i>

Notes:

*Italics* designate metrics not widely or regularly used in the County.

TPAR – Transportation Policy Area Review

LATR – Local Area Transportation Review

MAR – Mobility Assessment Report

MCDOT – Montgomery County Department of Transportation

**Table 3b - Assessment of Existing Montgomery County Transportation Metrics**

	Land use*	Network	Function	Useage	Safety
Auto	- Varying CLV and area-wide LOS standards by area	None	- Congested speeds (TPAR) - Travel Time Index (MAR) - HCM LOS (LATR/MCDOT) - CLV (LATR)	- Counts (LATR) - Non-Auto Driver Mode Share (NADMS) - Vehicle Miles Traveled (MAR)	None
Transit	None	- Coverage (TPAR)	- Peak headway (TPAR) - Transit headways (MAR) - Span of Service (TPAR)	- Non-Auto Driver Mode Share (NADMS) - Transit Ridership Counts	None
Bicycles	None	- Facility Inventory (LATR)	- Facility Inventory (LATR)	- Counts (LATR) - Non-Auto Driver Mode Share (NADMS)	None
Pedestrian	None	- Facility Inventory (LATR)	- Facility Inventory (LATR)	- Counts (LATR) - Non-Auto Driver Mode Share (NADMS)	None

\*Location efficiency and development quality

Assessment of Metric Applicability to Goals: **Good** **Fair** **Poor**

Assessment criteria include: 1) Applicability of the metrics to identified goals; 2) Quantifiable metric; 3) Established threshold; 4) Limited adverse effects on other goals.



## 1. LAND USE

### **Auto Metric – Varying Critical Lane Volume (CLV) and Area-Wide Level of Service (LOS) Standards by Area**

<b>Preliminary Assessment</b>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Good	Good	Good	Fair	<b>Good</b>

Critical Lane Volume (CLV) measures intersection performance at a particular time and place. The Local Area Transportation Review’s (LATR) application of differential thresholds for the maximum acceptable critical lane volume by Policy Area acknowledges the wide variety of land use and development densities in the County.

By allowing for higher levels of congestion in dense, mixed-use areas that are better served by transit, the LATR reduces barriers to development in higher-CLV standard areas, supporting the land use goals of concentrating development, encouraging Transit Oriented Development opportunities and supporting mixed-use development.

The Transportation Policy Area Review (TPAR) also conducts a roadway adequacy test based on vehicle miles traveled (VMT) and, converted to a forecasted travel speed during peak travel periods and directions and compared against uncongested free flow speeds. Varied standards are applied for Urban, Suburban, and Rural policy areas. Urban areas must reach at least 40 percent of free flow speeds (Level of Service D/E), Suburban areas must reach at least 45 percent of free flow speeds (Level of Service D), and Rural areas must reach at least 50 percent of free flow speeds (Level of Service C/D).

To the extent that mitigating intersection traffic impacts identified by these metrics requires added auto capacity, the metrics have the potential to conflict with the goal of reducing traffic delays “without eroding quality of life” by increasing pedestrian and bicycle crossing distances and delays and inducing additional auto travel.





### Transit, Bicycle and Pedestrian Metrics

<i>Preliminary Assessment</i>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
—	—	—	—	<b>Poor</b>

The review of existing transportation analysis practice did not identify any land use-related metrics that address transit, bicycle, and pedestrian travel. Metrics that reflect the effects of land use decisions on transit, bicycle and pedestrian travel could support related goals.

## 2. NETWORK

### Auto Metrics

<i>Preliminary Assessment</i>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
—	—	—	—	<b>Poor</b>

The review of existing transportation analysis practice did not identify any network-related metrics that would assess the goal of expanding the street network to “develop an interconnected transportation system that provides choices in mode and routes of travel.”<sup>7</sup> Metrics that evaluate the density and connectedness of the street grid could support related goals.

### Transit Metric – Coverage

<i>Preliminary Assessment</i>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Good	Good	Good	Good	<b>Good</b>

<sup>7</sup> General Plan Refinement of the Goals & Objectives for Montgomery County (1993).



The Transportation Policy Area Review (TPAR) assesses the adequacy of transit network coverage in part using the percentage of the total “transit-supportive area” (>3 residential units per acre or > 4 jobs per acre) of a Policy Area that is within ¼-mile of a bus stop or ½-mile of a transit station. Depending on the characteristics of the Policy Area, this transit coverage metric must represent between 5% (Rural) and 80% (Urban with Metrorail) of the transit-supportive area.

This metric provides a good high-level measure of the extent and accessibility of transit and a method of measuring progress on the goal of providing a transit system in appropriate areas of the County and improving connectivity and access. This metric would also reflect improvements (or reductions) in transit coverage related to the implementation of BRT.

**Bicycle and Pedestrian Metrics – Facility Inventory**

<i>Preliminary Assessment</i>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Fair	Poor	Poor	Good	<b>Poor</b>

The LATR Pedestrian and Bicycle Impact Statement includes an inventory of:

- “any capital or operating modifications required to maximize safe pedestrian and bicyclist access to the site and surrounding area
- inventory map of existing and proposed sidewalks, off-road shared-use paths, and bikeways near the site noting whether these facilities are generally consistent with the County’s Road Code design standards for sidewalk, path, landscape panel width, and street trees  
 ...
- pedestrian and bicycle accommodations at nearby intersections, including crosswalks, countdown pedestrian signals (CPS), push buttons, median refuges, and ADA-compliant ramps and accessible pedestrian signals (APS)  
 ...
- existing street lighting and additional lighting needs in the vicinity of the site”<sup>8</sup>

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<sup>8</sup> Local Area Transportation Review and Transportation Policy Area Review Guidelines (2013).



Although this inventory may call attention to deficiencies in the bicycle and pedestrian networks, it does not provide a quantitative assessment of network quality or completeness; nor does it establish a standard for performance, both essential to assessing whether the pedestrian and bicycle networks are meeting the goals of: providing “pedestrians and bicyclists safe, direct, and convenient means of travel;”<sup>9</sup> developing “an interconnected system of bikeways that serves transportation and recreational needs and accommodates a variety of skill levels;”<sup>10</sup> and improving connectivity / expanding the network.

### 3. FUNCTION

#### **Auto Metrics – Congested Speeds / Travel Time Index**

<i>Preliminary Assessment</i>				
<b>Applies to Relevant Goals</b>	<b>Quantifiable</b>	<b>Established Threshold</b>	<b>No Adverse Effects on Other Goals</b>	<b>Overall Assessment</b>
<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Fair</b>	<b>Good</b>

Transportation Policy Area Review (TPAR) measures roadway adequacy by forecasting travel speed on arterial roads in peak travel directions compared to uncongested, free flow speed. Adequacy standards for the ratio range from 40% in Urban Policy Areas to 50% in Rural Policy Areas. If roadways in the policy area are inadequate, the TPAR requires the applicant to either fully mitigate the incremental traffic impact of the subdivision through added capacity, implementing a trip reduction program, or by making a Transportation Mitigation Payment.<sup>11</sup> Travel Time Index (TTI), a similar metric, is also applied in the Mobility Assessment Report (MAR). TTI is also calculated as a ratio of congested speeds to free flow travel speed.

The peak period represents the highest levels of congestion, ensuring that this metric identifies poor-performing conditions, but the metric could be improved by expanding the time period of analysis to better understand performance in off-peak and weekend conditions relative to the peak.

This metric provides a good high-level assessment of roadway congestion by Policy Area, addressing the goals of reducing traffic delays, improving efficiency and capacity of roadways, and

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<sup>9</sup> General Plan Refinement of the Goals & Objectives for Montgomery County (1993).

<sup>10</sup> Countywide Bikeways Functional Master Plan (2005).

<sup>11</sup> Local Area Transportation Review and Transportation Policy Area Review Guidelines (2013), p. 30.



improving intersections. However, mitigating traffic impacts through added auto capacity has the potential to conflict with the goal of reducing traffic delays “without eroding quality of life” and inducing additional auto travel. This transportation metric should be considered in the context of all other transportation metrics when making transportation and land use development decisions. This metric can also create a high degree of uncertainty for developers as required mitigation and associated costs are not clearly defined until a detailed analysis has been conducted.

The use of free-flow speeds to determine roadway adequacy presents the potential for adverse effects on other goals related to safety and multimodal accessibility. Expanding roadway capacity to maintain free flow conditions during peak travel periods creates roadways that encourage drivers to exceed the posted speed during off-peak hours. The potential for these adverse effects could be reduced by using policy-based target speeds that are appropriate to the local land use and built environment context, rather than free-flow speeds, for determining roadway adequacy, allowing engineers and planners to design roads that encourage travel at these target speeds. County Code already requires target speeds in Urban areas to be set at a maximum of 25 miles per hour.

Finally, this metric will tend to result in operational improvements in the area immediately surrounding a new development, channeling developing impact fees into operational improvements that are not strategic. The mitigation process directs mitigation payments toward local Policy Area improvements instead of applying them toward strategic major capital improvements that have greater potential to increase overall County mobility. For example, increasing intersection capacity by adding a turn pocket might improve traffic operations near a project site or even within a Policy Area, but could have adverse effects on other areas of the County by inducing additional vehicle travel.

**Auto Metrics – Critical Lane Volume (CLV) and Highway Capacity Manual (HCM) Level of Service (LOS)**

<i>Preliminary Assessment</i>				
<b>Applies to Relevant Goals</b>	<b>Quantifiable</b>	<b>Established Threshold</b>	<b>No Adverse Effects on Other Goals</b>	<b>Overall Assessment</b>
Fair	Good	Good	Fair	Fair

LATR measures congestion levels at individual intersections using an initial CLV screening, to determine intersections that are nearing unstable conditions (>1,600 CLV). Intersections surpassing



this threshold are then evaluated using the Highway Capacity Manual (HCM) volume/capacity methodology, with thresholds that vary by Policy Area. Developments that exceed congestion standards must reduce trips or improve local intersections to return operational performance to the standard.

Other mitigation measures are possible in lieu of physical roadway improvements. For example, sidewalks, bike paths, and other non-automobile facilities may be provided; in varying congestion standard contexts, varying trip credits are provided per 100 linear feet of sidewalk or bike path or the cost of constructing non-automobile facilities will be credited at a rate of \$12,000 per trip, subject to approval by the Planning Board. Nevertheless, the primacy of CLV and HCM analysis at the local (LATR) level places emphasis on maintaining the performance of the automobile network without similar support for the performance of other modes. The mitigation process directs mitigation payments toward local Policy Area improvements instead of applying them toward major capital improvements that have greater potential to increase overall County mobility.

The CLV and HCM LOS metrics provide a good indication of vehicular congestion at selected intersections near a development project. The local nature of this review ties improvements to the scale and location of new development. While this provides a convenient nexus, it focuses roadway improvements on local intersection projects that have the potential to “erode quality of life” by increasing turning speeds and pedestrian crossing distances and encouraging additional vehicular travel that can degrade performance for all modes both locally and in other parts of the County. The focus on local mitigations also makes it challenging to fund larger-scale projects that could improve transportation conditions in the county and address other goals such as reducing traffic delays without eroding quality of life, providing a transit system that is a viable alternative to single occupancy vehicle travel and providing pedestrians and bicyclists safe, direct, and convenient means of travel.

**Transit Metric – Headways**

<i>Preliminary Assessment</i>				
<b>Applies to Relevant Goals</b>	<b>Quantifiable</b>	<b>Established Threshold</b>	<b>No Adverse Effects on Other Goals</b>	<b>Overall Assessment</b>
Fair	Good	Good	Good	Fair



TPAR also assesses the adequacy of transit network coverage in part using average peak headways of buses within the Policy Area. Depending on the characteristics of the Policy Area, peak headways must be less than 14 minutes (Urban), 20 minutes (Suburban) or 30 minutes (Rural). The Mobility Assessment Report (MAR) includes peak headways for the County’s Ride On service as well as average daily headways for Metrobus service.

This metric addresses the goal of improving access to the County’s transit system by reporting on the frequency at which users have access to the transit system. However, the metric does not address whether transit travels to the destinations to which people want to travel or whether transit travel is competitive with auto travel from a time and cost perspective.

Because the majority of travel happens outside of peak periods,<sup>12</sup> transit must also serve off-peak trips to become a true viable alternative to the single occupancy vehicle. In order to be “a viable alternative to single occupancy vehicle travel” the metric could assess the adequacy of daily transit service.

**Transit Metric – Span of Service**

<i>Preliminary Assessment</i>				
<b>Applies to Relevant Goals</b>	<b>Quantifiable</b>	<b>Established Threshold</b>	<b>No Adverse Effects on Other Goals</b>	<b>Overall Assessment</b>
<b>Fair</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Fair</b>

The third and final TPAR assessment of transit adequacy is based on the duration of weekday bus service. Depending on the characteristics of the Policy Area, duration of weekday bus service must exceed 17 hours (Urban), 14 hours (Suburban) or 4 hours (Rural).

This metric addresses the goal of improving the “access to ... the County’s transit system” by indicating the times of day during which users have access to the system. However, nearly 30 percent of travel occurs on weekends,<sup>13</sup> so transit must also serve weekend trips to become “a

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<sup>12</sup> U.S. Department of Transportation Federal Highway Administration. “Summary of Travel Trends – 2009 National Household Travel Survey.” Available: <http://nhts.ornl.gov/2009/pub/stt.pdf>.

<sup>13</sup> Ibid.



viable alternative to single occupancy vehicle travel.” This metric could assess weekend service as well as weekday service.

**Bicycle and Pedestrian Metrics – Facility Inventory**

<b>Preliminary Assessment</b>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Fair	Poor	Poor	Good	<b>Poor</b>

Please see description under the “Network” section, above.

Although this inventory may call attention to low-quality pedestrian and bicycle facilities that do not meet the County’s Road Code design standards, it does not provide a quantitative assessment of network quality or completeness, nor does it establish a standard for performance, both essential to assessing whether the pedestrian and bicycle networks are meeting the goals of developing an interconnected system of bikeways that serves transportation and recreational needs and accommodates a variety of skill levels, providing comfortable facilities, and improving ADA access.

**4. USAGE**

**Auto, Transit, Bicycle, and Pedestrian Metric – Non-Auto Driver Mode Share (NADMS)**

<b>Preliminary Assessment</b>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Fair	Fair	Good	Good	<b>Fair</b>

The County employs Non-Auto Driver Mode Share (NADMS) thresholds as part of biennial monitoring for Sector and Master plans. NADMS is the percent of work trips via transit, walking, biking, or carpooling during peak travel periods on a typical weekday. In some Sector and Master Plans, the NADMS triggers must be met before a stage of development can begin. Some NADMS triggers may differentiate between residents and workers, but do not further differentiate among modes; for example, the July 2015 Biennial Master Plan Monitoring Report includes data on the NADMS for employees and residents in the White Flint Sector Plan, while the NADMS for the Great



Seneca Science Corridor Master Plan is reported as a combined percent of trips via transit, walking, biking, or carpooling for commuters only; the Shady Grove Sector Plan, also included in the Biennial Monitoring Report, does not include a NADMS or other mode share goal.

The current structure of reporting on NADMS allows an assessment of the high-level goal of encouraging non-auto travel. However, it does not provide information to assess the contributions of and progress toward individual modal goals, such as increasing transit use and the number of trips made by bicycle.





### Auto, Bicycle, and Pedestrian Metrics – Counts

<b>Preliminary Assessment</b>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Good	Fair	Poor	Good	Fair

As part of the LATR process, the applicant collects and summarizes intersection turning movement counts for automobiles and bicycles as well as pedestrian volumes across each leg of the intersection. Montgomery County maintains an online database of these intersection-level counts (<http://mcatlas.org/traffic/>), which also includes counts contributed from MDSHA projects. As of the April 2014 Mobility Assessment Report (MAR), this database includes counts for 627 of the County's signalized intersections. Pedestrian counts are available at 262 signalized intersections, including 91 of the 172 signalized intersections in Urban areas. Bicycle counts are available at 25 Urban intersections.

The County has also recently begun collecting continuous pedestrian and bicycle counts using automatic counters at two locations along the Capital Crescent Trail. Finally, 51 existing Capital bikeshare locations within the County provide an additional source of data on the number and timing of bikeshare bike checkouts and returns.

Tracking auto, bicycle, and pedestrian volumes in the MAR is a good way to determine whether the County is making progress toward its goals of encouraging non-auto travel and increasing the number of trips made by bicycle. However, since most intersection-level data are collected only as part of the development review process, it is difficult to acquire comparable data at regular intervals; seasonal variations in pedestrian and bicyclist activity can make it difficult to compare volumes over time without a consistent count program. The lack of an established threshold of the desired level of travel for the bicycle and pedestrian modes also makes it difficult to assess whether or not the County's goal is being achieved. This is a common problem across the U.S. as active transportation mode share data is unavailable from nearly all data sources and the sources that have such data, such as the National Household Travel Survey, generally have small sample sizes.



**Auto Metric – Vehicle Miles Traveled (VMT)**

<b>Preliminary Assessment</b>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Good	Good	Poor	Good	<b>Good</b>

The Mobility Assessment Report (MAR) includes reporting on the number of Vehicle Miles Traveled (VMT) on State Highways in the County as well as the year-over-year percent change in VMT within the County, State, and Nation. National data derive from the Federal Highway Administration’s Office of Policy Information, while State and County-specific data derive from the Maryland Department of Transportation’s Mobility Report; the County data reflect VMT on State highways within Montgomery County, but do not capture vehicular travel on all roads.

This metric provides a high-level indication of the total amount of automobile travel within the County and allows the County to track changes in travel trends over time. Additional County-level data could support a better understanding of the types of facilities where most travel within the County occurs.

Normalizing the VMT to other variables like population or tripmaking could also make the metric more informative for policy decisions. For example, VMT could increase because of changes in traveler behavior (e.g., additional tripmaking, longer trip lengths, shifts from other modes, etc.) as well as changes in the population; if large numbers of people move out of the county, the metric could indicate a reduction even if the residents who remain drive significantly more. Dividing VMT by population results in VMT per capita, which still reflects traveler behavior while controlling for the population level. Person Trips per VMT provides an indication of how many trips can be accomplished for a given amount of vehicle travel. This metric would capture the beneficial effects of shifts to carpooling, transit, bicycling and walking as well as reduced auto trip lengths.

The County does not have an established threshold or goal for VMT.



### Transit Metric – Ridership

<i>Preliminary Assessment</i>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
Good	Good	Fair	Good	<b>Good</b>

The Mobility Assessment Report (MAR) includes average ridership on Ride On, Metrobus, and Metrorail services.

This metric directly addresses the goals of encouraging non-auto travel and increasing transit ridership. Although the County has a goal of increasing transit ridership, which can be tracked using this metric, it does not have a specific threshold for ridership levels.

## 5. SAFETY

### Auto, Transit, Bicycle, and Pedestrian Metrics

<i>Preliminary Assessment</i>				
Applies to Relevant Goals	Quantifiable	Established Threshold	No Adverse Effects on Other Goals	<b>Overall Assessment</b>
—	—	—	—	<b>Poor</b>

The review of existing transportation analysis practice did not identify any regularly evaluated safety-related metrics that address auto, transit, bicycle, and pedestrian travel. The 2015 Biennial Master Plan Monitoring Report includes collision data compiled by the Maryland State Highway Administration Office of Traffic and Safety on state highways in the Sector and Master Plan areas. Basic summary statistics on collisions along US 29 were also reported in materials for the US 29 South Corridor Advisory Committee; however these data are not analyzed or interpreted on a regular basis and no established threshold or specific goal for collision reduction could be identified. Regular review and analysis of collision data, normalized for levels of exposure, could help support the goal to “maximize safety in the use of the transportation system.”<sup>14</sup>

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<sup>14</sup> General Plan Refinement of the Goals & Objectives for Montgomery County (1993).



## NEXT STEPS

The summary of gaps between the transportation metrics used in existing practice and the County's transportation policy goals, expressed in Table 3b, will inform recommendations for a suite of transportation metrics that align with the County's goals. The ability to compute these metrics will then serve as the basis for recommending and evaluating transportation analysis tools to the County.