Moving Toward a New Transportation Policy Area Review

April 19, 2010

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Section I: Introduction

Directed by County Executive Isiah Leggett, the Montgomery County Department of Transportation (MCDOT) has spent the past six months exploring practical options for transportation policy area review. The County Executive's Core Concepts mandate that a new transportation policy area review *must*:

1. Be simple to understand and monitor
2. Balance congestion levels with approved development and needed transportation infrastructure in accordance with Approved Master Plans
3. Provide greater assurance that transportation improvements that form the basis for approval of new development actually take place
4. Encourage continued economic development while maintaining quality of life.

Building upon these Core Concepts, the MCDOT with the support of Dr. Robert M. Winick, President of Motion Maps, LLC, consulted a wide array of stakeholders, including civic leaders, the business community, developers, advocacy groups, technical experts, staff, and policy makers, for their ideas and feedback. There was widespread agreement with the County Executive that a new policy area review must:

1. Be based on Approved Master Plans
2. Be easily understood
3. Study transit and travel demand management *separately* from arterial roadways and bicycle and pedestrian improvements
4. Tie the Growth Policy firmly to the Montgomery County Capital Improvements Program (CIP), the State of Maryland Consolidated Transportation Program (CTP) and the Montgomery County Operating Budget
5. Forecast future transportation performance to identify future inadequacies that could result in the programming and construction of additional transportation projects
6. Identify solutions to the forecasted transportation inadequacies and monitor progress on development activity and on the timely provision of transportation solutions.
7. Encourage economic development
8. Reflect understanding of stakeholder feedback
9. Maintain quality of life
10. Apply additional public and private resources to timely provision of new facilities

Building upon this foundation the MCDOT has developed and the County Executive recommends the new Transportation Policy Area Review (TPAR) that is outlined in the next section.

Section II: Overview of the Proposed New Policy Area Review Process

The County Executive proposes a new Transportation Policy Area Review (TPAR) as the starting point for Council deliberations and refinements with participation from the Planning Board, Executive Branch Staff, and overall public input and deliberations. The TPAR would be applied to each Policy Area of the County, to identify inadequacies and solutions specific to each Policy Area. The basics of the proposal consist of five parts as shown in Exhibit 2.1.

Exhibit 2.1: Parts of the Proposed Transportation Policy Area Review Process

1. Establish adequacy standards for the provision of transit services, identify future transit inadequacies, and develop a set of proposed transit improvements

2. Identify roadway inadequacies and solutions an average of ten years ahead of the adoption of a given Growth Policy, using the approved forecast of development activity for the same 10-year time period.

3. Develop cost estimates for the transit and roadway solutions identified in the previous two parts, and allocate costs to each Policy Area.

4. Establish when a capital project or major transit service improvement will be programmed, and the level of public – private cost participation for each policy area.

5. Implement a monitoring and reporting mechanism to determine that the assumed development is in fact taking place in accord with the forecasts, and ensure that the supporting transportation improvements are proceeding in concert as budgeted. Recommend specific actions to ensure better balance between transportation and development activity in the target year(s).

Successful TPAR Review requires close coordination between the Planning Board and MCDOT. Forecasts of development activity and travel demand modeling are the responsibility of the Planning Board; while capital programming, project development and implementation, and roadway and transit operations are the responsibility of MCDOT. TPAR requires that the agencies work more closely together to consult one another to ensure that development activity forecasts and transportation infrastructure improvements take place in concert and not at cross purposes or independent from each other.

The Proposed TPAR Policy in a Nutshell

This summary presents a synopsis of the proposed Transportation Policy Area Review in order to facilitate the reading and understanding of this document:

1. The policy's intent is to provide guidance in the subdivision development process to ensure balance, or progress toward balance, between development activity projected ten years forward and the provision of transportation services (both transit and roads) within the same time frame.

2. To that end, the policy suggests that standards of **transportation adequacy** be established for each Policy Area in the County, for both -transit services and roadway levels of congestion. For this purpose, the proposed policy suggests all Policy Areas be classified as urban, suburban or rural.

3. A Policy Area is in adequate balance when both transit services and roadways are projected to meet the transportation adequacy standards in the ten year period.

4. If a Policy Area is projected not to meet the adequacy standards ten years from the adoption of the policy, then the County must program the transit services and/or road improvements in the Operating Budget or CIP to meet the 10-year forecast of development activity.

5. The capital transit and roadway improvements to be programmed must come from the Adopted and Approved Master Plans that cover the specific Policy Area where the inadequacy may exist.

6. The proposed improvements are to be funded through a public-private partnership, with different levels of participation, based on public policy considerations of where growth is most desirable. Growth will be allowed in all Policy Areas of the County, in accordance with their Adopted Master Plans. No moratorium is proposed anywhere, but in turn, County residents must be assured that adequate transportation improvements will be implemented in a timely manner to support the growth.

7. Suggestions for the public-private cost sharing proposal are:

    a. The private participation will be met by a TPAR payment, which may differ by Policy Area and the size of the development. Such payment is analogous to the PMAR payments under the current policy. That payment must occur prior to record plat approval, in the form of cash or through an irrevocable letter of credit,

or similar surety, due within five years from the date of the record plat approval. It may be amortized over a period of several years. All payments collected in this process must be tracked and spent in the Policy Areas where they are collected.

b. To meet the public participation component, the County must program the transit services and/or road improvements to ensure the "solutions" are in place and operational within the ten year time frame. Capital projects programmed and funded with TPAR payments be postponed only due to technical implementation issues, and cannot be eliminated.

8. Once a predetermined threshold of private payments has been collected, a capital project and/or transit service improvement must be programmed to bring the Policy Area into the adequate standard.

9. Finally, the proposed policy recommends critical monitoring and reporting of key elements of the policy. These elements include the monitoring of development activity and the programming and implementation of transit services and capital transportation projects. The policy recommends the preparation of an annual report on the trends during the prior year, and recommendations for action to ensure that the desirable balance between development activity and transportation is achieved in the 10-year period.

The details of the Policy are explained in the next sections of the report.

Section III: Details of the Proposed New Policy Area Review Process

Master Plans are intended to achieve balance between development activity and transportation infrastructure at the time of build-out. Typically, the development and infrastructure included in a Master Plan is intended to be completely constructed within a 20 to 40 year time span. One of the critical issues that faces residents, elected officials and transportation agencies is addressing the existing levels of congestion today and in the near future, rather than waiting up to 40 years or more until the planned transportation infrastructure is in place, and the desired balance between transportation and development is achieved.

Achieving balance between development activity and infrastructure, or at a minimum, consistently improving the level of imbalance, is one of the critical roles of the Growth Policy. To this end, selection of the time horizon to use in the TPAR was critical. The 10 year time horizon was selected based on the following considerations:

- Development activity forecasts for the County and the Washington Region are calculated in five year increments up to 30 years into the future (Cooperative Forecast)

- The current subdivision "pipeline" for approved housing is about seven to eight years; and the "jobs pipeline" is about 13 to 15 years.

- A typical transportation road project that adds capacity to the roadway network takes anywhere from eight to twelve years to complete, from the time it is first added to the County's Capital Improvements Program (CIP) or the Maryland Department of Transportation Consolidated Transportation Program (CTP). Major capital transit projects such as the Purple Line or the Corridor Cities Transitway (CCT) may take as long or longer.

- Capital Projects are typically programmed over a period of 6 years or more, and financed over an even longer period.

- The life expectancy of a new bus is 12 years.

The following five parts of this section describes the TPAR analysis for Transit and Roadway Adequacy using the ten year time horizon. It is noted that for purposes of the full and long-term accounting of costs and the fair allocation of the same, a longer-term time horizon is needed for that part of the proposed TPAR process.

1: Identify Transit Inadequacies and Solutions:

Exhibit 3.1 identifies the six main steps associated with identifying transit inadequacies and solutions. Please note that the term "transit" also accounts for Transportation Management Districts (TMDs) and their associated activities.

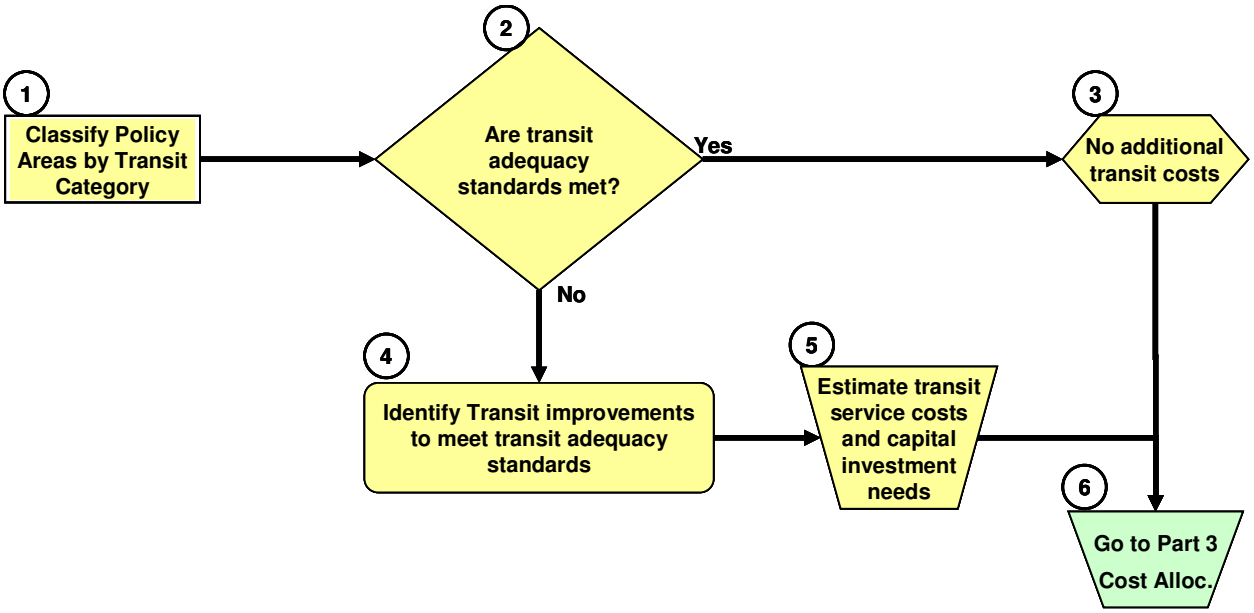


Exhibit 3.1: Identifying Transit Inadequacies and Solutions

TPAR takes into consideration the different forms of Transit Service provided or planned for in the County: Heavy Rail (Metrorail), Light Rail Transit (LRT), Bus Rapid Transit (BRT), Commuter Rail, Bus Service, and Transportation Demand Management (TDM) activities. Many of these forms of transit service are currently outside of the County's operational and financial control. Therefore, the TPAR Review is focused on the provision of Bus Service, while recognizing the importance and value of the more fixed-track forms of transit.

TPAR recommends three different categories of transit service for the County as a function of the geographic and development characteristics of each Policy Area. (A map of Policy Areas and their abbreviations is located in Appendix D of this document.) Consistent with the approach taken by the County Council in the adoption of the "Road Code", each Policy Area is classified as Urban, Suburban or Rural.

Urban Policy Areas are those Policy Areas with higher population and employment densities, measured in terms of the number of people and employees per square mile. Urban areas have Metrorail Service, extensive bus service, and/or the future Light Rail or BRT service. As the County continues to grow to higher densities, and mass transit service is expanded, more Policy Areas could be classified as Urban Areas.

Rural Policy Areas are those Policy Areas located primarily in the Agricultural Reserve of the County. These areas are characterized by very low densities.

Suburban Policy Areas are those Policy Areas not included in either the Urban or Rural categories, and have intermediate levels of population and employment density.

TPAR assesses bus transit quality of service for each of the three geographic categories by using three **service factors** to classify each Policy Area. The three service factors are outlined below:

- **Coverage of Service:** This is the percentage of a Policy Area located within a certain distance from Metrorail Station, Light Rail Station and Ride On and Metrobus service.

- **Peak Headways:** This is the weighted average of the frequency of service of the different bus routes operated by Metrobus and Ride On in the Policy Area – particularly how frequently the buses run during the weekday evening peak period. In areas where Metrorail, Light Rail or future BRT systems are provided, the averages are adjusted to reflect the presence (or future presence) of those systems.

- **Span of Service:** This is the average of the duration of time on a weekday that the bus service is being provided. For example, in an urban area, buses are expected to run for 17 hours a day or longer, such as from 5:00 AM to 10:00 PM on weekdays.

Exhibit 3.2 below shows the Transit Service standard for each factor of adequacy for the three Transit Service Area Categories.

Exhibit 3.2: Transit Quality of Service Factors Standards for Montgomery County

Factors Characterizing Bus Transit Quality of Service in Montgomery County[#]			
Transit Service Area Categories	**Coverage:** (percent of area within a 1 mile walk of Metro and/or 1/3 mile walk of bus)	**Peak Headways:** (equal to or less than ___ minutes between buses on average in Peak Hour)	**Span of Service:** (equal to or more than ____hours in duration per weekday on average)
Urban	Greater than 80%	20 minutes with Metrorail; or 15 minutes without	17 Hours
Suburban	Greater than 30%	20 minutes	14 Hours
Rural	Greater than 5%	30 minutes	6 Hours

4/12/2010

[#] = Consistent with the 2008 Montgomery County Strategic Transit Plan and based on guidance from various Master Plans and Sector Plans

Exhibit 3.3 on the next page shows the proposed classification of all existing Policy Areas by Transit Service Area and provides details regarding population, employment density, and area size used to designate each Policy Area.

TPAR requires the analysis of the transit services in each Policy Area, contrasting the services provided to the Coverage, Peak Headway, and Span standards for urban, suburban and rural areas respectively. A Policy Area is found to provide **adequate** transit service when all three service factors meet the minimum standards. When an inadequacy in any of three elements in the transit network is revealed, plans are put in place to enhance transit services with TPAR and public funds to meet or exceed the minimum standard. Exhibit 3.4 on the next page shows the general solutions to improve transit service factors to meet the standards. The number of bus routes in the Policy Area is also shown.

Exhibit 3.3: Categorization of Policy Areas by Transit Related Elements

Policy Areas Categorized based upon Type of Transit and Population and Employment Density							
	Number of Bus Routes	**Metro Rail?**	**MARC Com-muter Rail?**	**Future Light Rail?**	**Area of the Policy Area** (sq. mi.)	**Pop. Density in 2010** (person per sq. mi.)	**Emp. Density in 2010** (emp. per sq. mi.)
"Urban" Policy Areas served by Metrorail							
Silver Spring/Takoma Park	33	Y	Y	Y	10.49	8,622	4,376
North Bethesda	14	Y	Y	Y	9.25	5,216	7,430
Kensington/Wheaton	20	Y	Y		19.26	4,853	1,230
Bethesda/Chevy Chase	16	Y		Y	20.24	4,962	4,339
Rockville City	13	Y	Y	Y	13.64	4,314	5,794
Derwood	3	Y	Y		8.22	2,274	2,556
"Suburban" Policy Areas							
R&D Village	5			Y	2.38	3,076	8,764
Gaithersburg City	10		Y	Y	11.03	5,446	4,967
Fairland/White Oak	13				20.66	3,700	1,495
Germantown West	10		Y	Y	10.98	5,652	1,347
Montgomery Village/Airpark	12				9.41	5,472	1,372
Aspen Hill	10				13.05	4,644	478
Germantown East	5			Y	6.57	3,568	1,310
Cloverly	2				9.83	1,621	137
North Potomac	7				10.49	2,570	1,427
Olney	4				17.36	1,887	317
Potomac	10			Y	28.07	1,696	431
Clarksburg	2			Y	14.91	934	255
"Rural" Policy Areas							
Rural West	1		Y		132.90	157	20
Damascus	1				9.42	1,119	248
Rural East	1				117.18	289	48

Exhibit 3.4: General Solutions to Achieve Transit Adequacy

Transit Inadequacy Related to:	General Solutions to Achieve Transit Service Adequacy
Coverage	Implement more bus routes serving more areas closer to the population or employment areas within the Policy Area
Peak Headway	Add more frequent bus service during the peak periods to reduce the time between the arrival of buses (headway) serving the Policy Area
Span of Service	Increase the number of hours the bus service is provided for selected routes serving the Policy Area

Transit Adequacy Analysis also involves analysis of the Master Plan and any developer, state or County improvements planned in an area. For instance, the Purple Line, the Corridor Cities Transitway (CCT), and BRT improvements that can be constructed within the 10 year time frame could also be included as part of the solution. TDM services and requirements as well as enhanced arterial operation and monitoring in the form of improved traffic signal optimization are also always considered as transit elements that improve running time and reliability.

Exhibit 3.5 shows the results of the Transit Adequacy Analysis of the current conditions in each Policy Area. Specifically, the service factors were applied to each of the Policy Areas in the County on the basis of the March 31, 2010 bus service schedules for Ride On and Metro Bus. The highlighted areas in yellow in the Table indicate the transit service factors that are *below* the adequacy standard recommended in TPAR on that date. In order to reach the adequacy status, the types of corrective actions outlined in Exhibit 3.4 would have to be implemented by 2020 in each Policy Area.

Exhibit 3.5: Results of the Transit Service Adequacy Analysis

Transit Adequacy Analysis:	Number of Bus Routes	Coverage (Percent of area within 1 mi. rail; 1/3 of bus)	Peak Headway by Bus in PM Peak Hour (min.)	Span: Duration of Weekday Bus Service (hours)
"Urban" Policy Areas served by Metrorail				
Silver Spring/Takoma Park	33	96.0%	17.5	13.4
North Bethesda	14	87.4%	21.3	15.0
Kensington/Wheaton	20	82.0%	22.6	13.6
Bethesda/Chevy Chase	16	81.2%	17.6	13.5
Rockville City	13	79.9%	17.2	17.6
Derwood	3	70.0%	20.0	14.9
Inadequate versus the Standards shown	xx.x	**more than 80.0%**	**less than 15.0 ##**	**more than 17.0**
		## = 20.0 with Metrorail		
"Suburban" Policy Areas				
R&D Village	5	75.5%	25.0	11.7
Gaithersburg City	10	75.0%	19.3	14.6
Fairland/White Oak	13	48.2%	19.5	11.9
Germantown West	10	48.0%	21.8	15.7
Montgomery Village/Airpark	12	47.1%	19.4	14.9
Aspen Hill	10	43.7%	18.4	15.9
Germantown East	5	39.3%	21.0	13.4
Cloverly	2	30.0%	26.5	7.2
North Potomac	7	29.2%	23.6	12.3
Olney	4	26.2%	23.3	10.0
Potomac	10	22.5%	19.1	14.3
Clarksburg	2	16.4%	30.0	10.2
Inadequate versus the Standards shown	xx.x	**more than 30.0%**	**less than 20.0**	**more than 14.0**
"Rural" Policy Areas				
Rural West	1	8.4%	30.0	6.3
Damascus	1	7.4%	20.0	15.7
Rural East	1	7.4%	20.0	15.7
Inadequate versus the Standards shown	xx.x	**more than 5.0%**	**less than 30.0**	**more than 6.0**

2. **Identify Roadway Inadequacies and Solutions**

Exhibit 3.6 identifies six main steps associated with the second part of the proposed process, identifying roadway inadequacies and solutions. Please note that the term "roadway" also accounts for traffic operations, bikeways, walkways, and their associated activities.

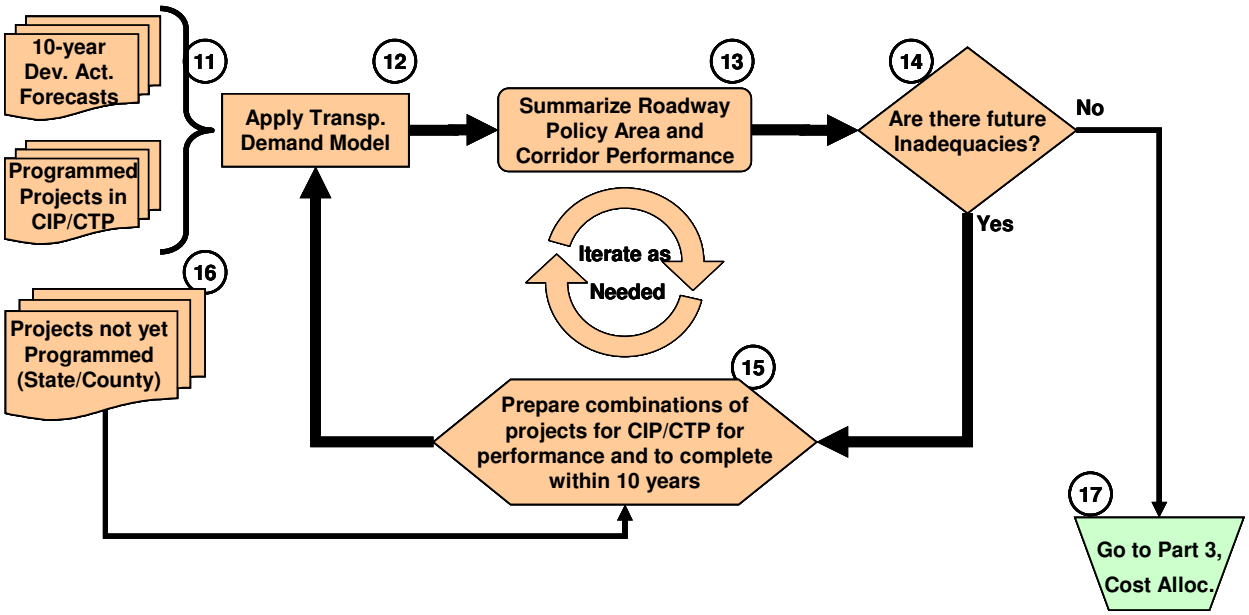


Exhibit 3.6: Identifying Roadway Inadequacies and Solutions

TPAR balances development activity and transportation infrastructure on a 10 year basis, on average, using the Regional / County Cooperative Development Forecast prepared by the Maryland National Capital Park and Planning Commission (MNCPPC) for the Metropolitan Washington Council of Governments (COG). For simplicity's sake, this is referred to as the *Cooperative Forecast*. The Cooperative Forecast projects household and employment growth in the County in five year increments to 2040. The Cooperative Forecast is updated regularly and adopted by COG for planning purposes. The current forecasts are shown in Exhibits 3.7A and 3.7B on the next page.

TPAR uses the 10-year Cooperative Forecast of development activity, and the roadway and transit capital projects *currently programmed* for completion in the 6-year County CIP and the State CTP, as the input to the existing Travel Demand Model. MCDOT Staff and consultant have worked with MNCPPC staff to refine the transportation network reflected in the model as part of the TPAR effort. Given that it is not possible to create a new model in the current fiscally constrained environment and within the existing time frame for this study, the Travel Demand Model remains the best source for assessment of the effectiveness of the transportation network in Montgomery County. The Travel Demand Model is developed by the National Capital Region Transportation Planning Board (TPB), which is staffed by COG's Department of Transportation Planning. This regional model is periodically updated and must be certified for use by the United States Department of Transportation for its approved use in the Regional Air Quality Analysis mandated by the United States Environmental Protection Agency (EPA). MCDOT asserts that the current model provides reliable results for use as a tool in the travel forecast for future transportation conditions of this analysis.

Exhibit 3.7A: Forecast of Households by Policy Area to 2040

Policy Area		Household Forecasts by Policy Area (derived from MWCOG 7.2a)							
No.	Name	2005	2010	2015	2020	2025	2030	2035	2040
1	AH	24,570	24,934	24,994	24,994	24,994	24,994	24,994	24,994
3	BCC	38,530	40,115	43,569	43,944	44,584	44,684	44,909	44,967
4	CLK	1,740	4,303	8,138	11,038	12,518	13,118	13,778	14,114
5	CLV	5,432	5,507	5,532	5,552	5,552	5,552	5,552	5,552
6	DAM	3,637	3,740	3,790	4,057	4,527	4,832	4,832	4,832
7	DER	6,027	6,173	7,295	9,205	10,515	11,845	12,903	13,255
8	FWO	27,964	28,544	28,734	28,889	28,904	28,904	28,955	29,065
10	GBG	22,538	23,108	24,736	27,114	30,710	33,183	35,525	38,529
11	GTE	7,572	8,032	8,112	8,337	9,271	9,811	10,159	10,237
13	GTW	21,411	22,405	23,629	25,349	26,779	28,409	29,407	29,491
16	KW	35,655	36,305	37,395	39,260	39,665	40,065	40,241	40,365
17	MVA	18,383	18,765	18,785	18,840	18,840	18,840	18,840	18,840
18	NB	18,580	20,153	23,367	28,462	31,234	32,810	34,825	37,045
19	NP	8,864	9,031	9,091	9,571	9,981	10,361	10,611	10,611
20	OLY	11,183	11,398	11,723	12,588	12,863	13,068	13,068	13,068
21	POT	16,781	17,316	17,756	17,836	17,836	17,836	17,836	17,953
22	RDV	3,317	3,606	4,014	4,640	5,973	9,467	10,744	10,744
23	RKV	22,485	23,688	25,656	27,037	28,627	30,102	31,602	33,102
26	SSTP	34,789	36,570	40,727	41,787	42,192	42,792	42,892	43,509
30	RurE	10,888	11,312	11,722	12,037	12,117	12,172	12,172	12,172
31	RurW	6,654	6,995	7,235	7,463	7,518	7,555	7,555	7,555
County Total		**347,000**	**362,000**	**386,000**	**408,000**	**425,200**	**440,400**	**451,400**	**460,000**

Exhibit 3.7B: Forecast of Employment by Policy Area to 2040

Policy Area		Employment Forecasts by Policy Area (derived from MWCOG 7.2a)							
No.	Name	2005	2010	2015	2020	2025	2030	2035	2040
1	AH	6,278	6,233	6,269	6,280	6,294	6,314	6,332	6,342
3	BCC	88,016	87,820	91,649	96,624	97,823	99,559	100,661	101,152
4	CLK	3,687	3,808	5,345	8,249	11,696	16,362	19,186	20,273
5	CLV	1,319	1,345	1,345	1,346	1,346	1,346	1,346	1,346
6	DAM	2,398	2,334	2,342	2,369	2,405	2,476	2,538	2,569
7	DER	21,047	21,006	21,518	22,840	24,443	26,834	28,835	29,514
8	FWO	25,747	30,891	36,570	37,116	37,652	38,679	39,355	39,674
10	GBG	51,989	54,779	60,481	70,247	80,731	87,012	93,244	101,531
11	GTE	8,559	8,603	10,965	13,028	15,280	17,745	19,401	20,147
13	GTW	14,123	14,791	15,267	18,389	21,969	27,894	31,135	32,596
16	KW	23,699	23,694	23,829	24,019	24,299	24,835	25,128	25,267
17	MVA	13,116	12,914	14,259	15,011	15,439	15,700	15,806	15,860
18	NB	69,401	68,687	74,033	78,564	83,253	89,052	93,395	95,229
19	NP	1,466	1,427	1,474	1,488	1,514	1,550	1,569	1,579
20	OLY	5,595	5,498	5,542	5,669	5,768	6,020	6,214	6,301
21	POT	12,346	12,112	14,107	14,461	14,731	14,919	14,972	14,999
22	RDV	19,885	20,833	22,169	27,002	31,420	36,835	40,552	42,066
23	RKV	76,597	79,060	85,024	91,908	98,208	100,677	103,677	106,677
26	SSTP	46,327	45,880	46,262	46,760	48,548	50,452	50,864	51,065
30	RurE	5,674	5,611	5,865	5,943	5,992	6,044	6,090	6,111
31	RurW	2,731	2,674	2,685	2,687	2,689	2,695	2,700	2,702
County Total		**500,000**	**510,000**	**547,000**	**590,000**	**631,500**	**673,000**	**703,000**	**723,000**

As part of the development of the proposed policy, MCDOT obtained from the MNCPPC a list of all future un-built roadway and bikeway projects in each County Master Plan. MCDOT together with MNCPPC then reviewed and validated the list, and classified each project as a developer or County responsibility. The list of road projects to be built or widened by the public sector is broken down by Policy Area and displayed in Appendix A.

MCDOT developed a "**Base Case"** for the transportation analysis for TPAR. To develop the base case, MCDOT combined in a model analysis the 2020 development activity from the Cooperative Forecast, and the transportation improvements programmed in the CIP and the CTP that will be operational by 2016. This Base Case model analysis projected the expected performance of the highway network in 2020 if no new capital transportation improvements are added, beyond those programmed in the CIP and CTP. Within the Base Case, summaries of the modeling results were prepared for each policy area, as well as segments of major transportation corridors. Each Policy Area was assessed for both transit and roadway adequacy.

The Base Case model analyses identified parts of each policy area and segments of major transportation corridors where the transportation network *cannot adequately* support the forecasted development. (This means that in these areas unacceptable levels of congestion will occur, unless more transportation improvements are programmed and implemented.) This process is referred to as *identifying inadequacies in the performance of the roadway network.* The base case results are then used to determine which projects in Appendix A that can be built by 2020 could be added to any given Policy Area to improve the performance of the road network in the area. The analysis of each improvement's impact considers the "network effect" of improvements added to other Policy Areas. For example, if a new project is added to the network in Germantown, it may also help relieve congestion in Clarksburg. Through this iterative process of adding specific, potential, roadway improvements, as well as different combinations thereof, it is possible to establish the combination of new roads or widenings that will bring balance to, or significantly improve the performance of, the transportation network in each Policy Area.

The latest version of the "**Highway Capacity Manual"** classifies arterial roadways into four categories, according to their role in the transportation network and their "free flow speeds". The **"Manual"** defines "free flow speed" as "… the average speed of the traffic stream when volumes are sufficiently low that drivers are not influenced by the presence of other vehicles and when intersection controls (i.e. signals or signs) are not present or are sufficiently distant as to have no effect on speed choice. As a consequence, free flow speed is typically observed along mid-block portions of the urban street system." In the absence of detailed information, the **"Manual**" recommends reliance on the posted speed limit, or the default values in the Manual. The "Manual" also recommends the operating Level of Service (LOS) for a given road segment to be measured as a percentage of the "free flow speed". Appendix B addresses these matters in more detail.

TPAR establishes an average level of congestion, or adequacy, for each Policy Area. However, each Policy Area in the County contains many road segments and many different classifications of roadways. Therefore, in order to establish an "Adequacy Standard" all road segments in the Policy Area must be "weighted" on the basis of their classification, length, traffic volumes, and forecasted operating speeds relative to the assumed "free flow speeds".

TPAR Roadway Adequacy Analysis retains the classification of each Policy Area by its level of transit service: Urban, Suburban and Rural, and using the above discussion, recommends the use of acceptable levels of roadway congestion for Urban, Suburban, and Rural Policy Areas in Exhibit 3.8

Exhibit 3.8: Standards of Acceptable Roadway Level of Service

Proposed Roadway (Arterial) Level of Service Standards	
Policy Area Categories	**Acceptable Weighted Arterial Level of Service**
Urban	Average congestion of "D/E" borderline in the peak directions
Suburban	Average congestion of Mid-"D" or less in the peak directions
Rural	Average congestion of "C/D" borderline in the peak directions

To move a Policy Area that falls below the proposed weighted LOS standard up to or above that standard, the TPAR process identifies and selects transportation roadway improvements from Appendix A to add to the CIP or CTP to reduce congestion in that policy area.

TPAR analyzed both the morning and evening peak periods of travel for each Policy Area. In every case, the PM peak presented a worse area-wide condition than the AM peak. For that reason, TPAR recommends the use of the PM peak period to establish the Adequacy of the Roadway network for each Policy Area.

1. Using the proposed methodology, the results of the Base Case scenario are shown in Exhibit 3.9, on the next page. The following notes should be used in reading the results in the Exhibit:

2. The “weighted LOS” is shown on the left column.

3. Horizontal dotted orange lines are shown to depict the adequacy standards (LOS) for the Rural, Suburban and Urban Policy Areas, from left to right.

4. The vertical blue-hatched bars show the *range* of the average of roadway speeds by direction of travel in relation to the “free flow speed”, or LOS, for each Policy Area in the PM peak period. The bottom of the bar shows the average LOS in the peak direction of travel. The top of the bar shows the average speed (LOS) in the off-peak direction. (The current PAMR uses the weighted average of the two, which would fall somewhat below the mid-point of the bar.)

5. TPAR recommends the use of the average speeds in the peak direction relative to the “free flow speed” to determine if a Policy Area meets the adequacy standard (bottom of the bar).

A review of the results depicted in the Exhibit 3.9 for the Base Case scenario indicates that several Policy Areas will fall below the adequacy standard (become more congested) by 2020, unless some new roadway or major capital transit projects are added and constructed by 2020. As shown in the Exhibit 3.9, the Policy Areas where TPAR forecasts inadequacies of the

roadway network are: Potomac, North Potomac, Germantown East, Fairland/White Oak, the Cities of Gaithersburg and Rockville, Bethesda / Chevy Chase, North Bethesda and Silver Spring / Takoma Park.

Under TPAR, in order to bring the Policy Areas to the roadway adequacy standard by 2020, additional capital roadway projects must be added in those Policy Areas, using the list of Master Planned projects in Appendix A. In the case of the Bethesda / Chevy Chase (BCC) and Silver Spring / Takoma Park Policy (SSTP) Areas there are no road projects to be added. In these areas, only transit options, such as expanded bus service, the Purple Line, Travel Demand Management, Bikeways, and other major transportation initiatives (such as BRT systems, mandatory reductions in provisions of parking, etc.) should be considered. Finally, in the case of the Potomac (POT) Policy Area, it has been the County's policy to implement a two-lane road policy, which will lead to a higher level of congestion than that of other Suburban Policy Areas.

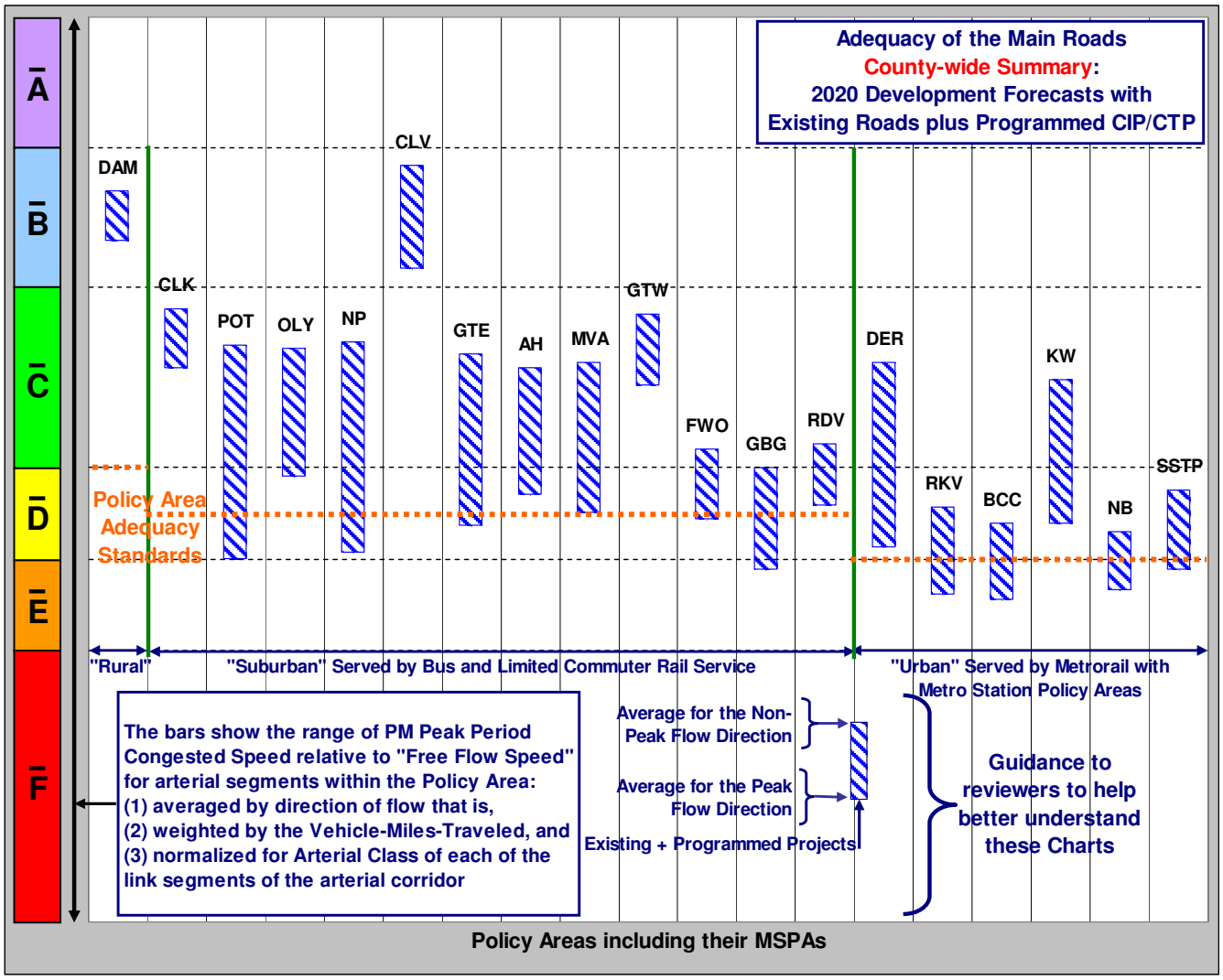


Exhibit 3.9: Base Case Scenario Results

The combined TPAR analysis for Transit and Roadway Adequacy outlined on the previous page produces a combination of additional road and transit projects and improvements which could bring all Policy Areas into balance. Each selected project must be programmed, funded and monitored to ensure completion within the established 10 year time frame.

The discussion of the next part suggests a methodology to implement the programming, funding and public-private partnerships of all the improvements.

3: Develop and Allocate Costs for the Needed Improvements

As indicated in Exhibit 3.10, the TPAR recommends implementation of a public – private cost sharing arrangement to fund projects to raise Policy Areas to transportation adequacy in the future. In developing a methodology to (a) estimate costs, (b) implement improvements, and (c) allocate costs to the public and private sectors, one must note that the implementation of solutions does not always involve the same time frames.

For example, some bus related transit improvements can be added more easily and incrementally on an annual basis than roadway improvements to meet the adequacy standard within the established time frame. This is particularly the case when service span is increased by providing bus service for more hours during the day. On the other hand, improving headways or coverage in an area typically may require the acquisition of new buses first. There is typically a 12 to 18 month delivery time from the time a bus is ordered to the time it is put into daily service. Other major capital transit projects, such as a BRT System, the Purple Line or the Corridor Cities Transitway can be as lengthy and complex as building a major road project.

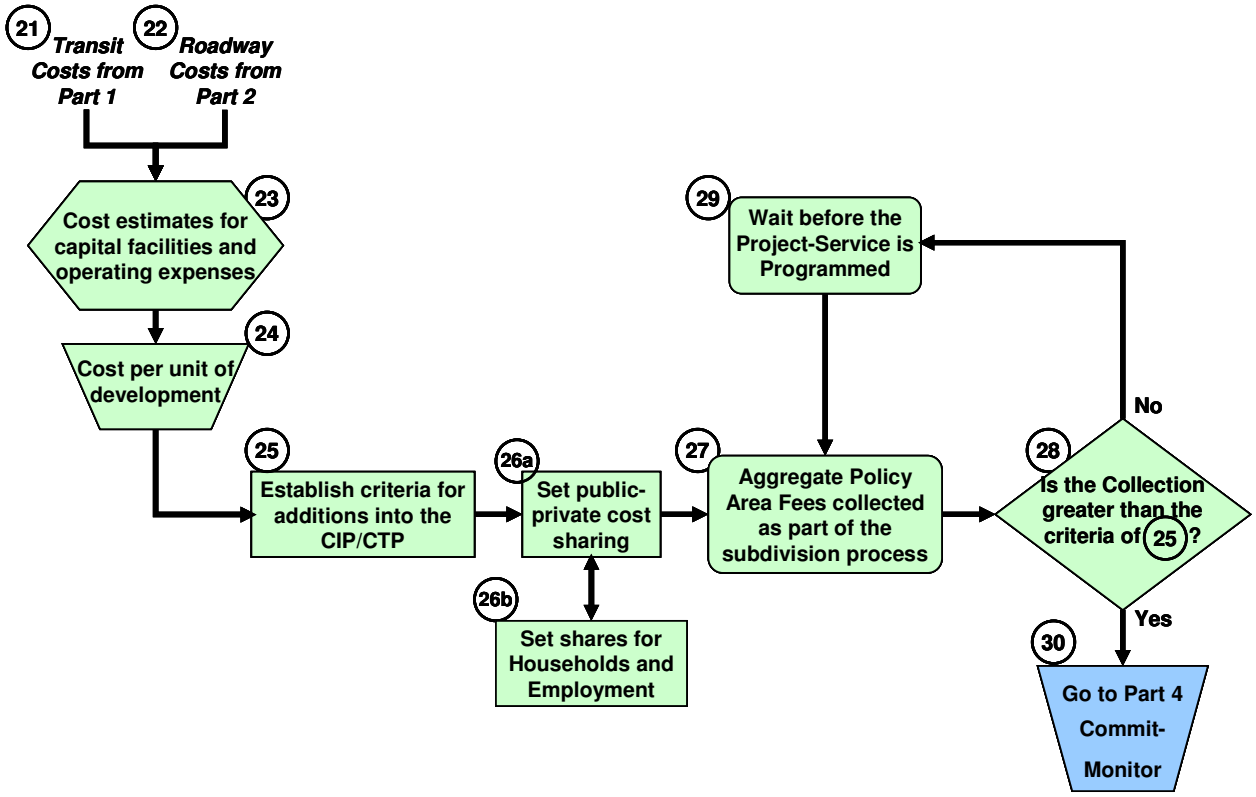


Exhibit 3.10: Develop and Allocate Costs of the Needed Improvements

Under current procedures, a road project in the County starts with Facility Planning Phases 1 and 2. The project is programmed for: (a) final design, (b) right of way acquisition and (c) construction only after completion of Phase 2 (about 35 percent engineering). Depending on the complexity of the project, this process can span up to 12 years. TPAR recommends that the existing process of developing roadways be streamlined to ensure timely completion of road projects designated as *solutions* to congestion problems. Once completed, the life expectancy of a roadway capital project will provide its basic function for a very long period of time as compared to the 12 year average life expectancy of a bus.

The allocation of cost shares between public agencies and private development indicated in Exhibit 3.10 should take into consideration the different life expectancies of the service or capital project. In the case of bus transit services needed to improve performance in the ten year period, cost estimates can be prepared and a share assigned to the increased forecast development in the next ten year period. Public shares of this type of cost are typically budgeted in the annual operating budget of the County.

However, in the case of road or a large capital transit project, an issue of fairness arises in assigning the total private share of roadway cost to the forecast development that takes place in the next ten years. Doing so would place the entire burden of the cost on the first ten years of development. Future development beyond the 10 year forecast would be able to enjoy the benefit of the capital project at no cost, receiving "free rider" benefits. If such a policy was implemented, it would act as a deterrent for building in the near future, creating a possible barrier to the sustained economic development of the County, as most developers would wait for somebody else to go first and pay the private share.

With the goal of encouraging economic development, TPAR proposes that all capital project costs associated with the construction of road capital projects in a Policy Area, as shown in Appendix A, be estimated and then prorated. With this approach, the total cost of needed projects in each Policy Area is prorated by the 30 year forecasted increase in units of development (households and jobs) in the same Policy Area. This yields a *cost per unit of development* for each Policy Area. This cost per unit of development can be more fairly allocated to all future development, not only to that development that may occur in the first ten years of the policy. It is recognized that this aspect of the proposed TPAR is the one exception to the 10-year time horizon used elsewhere in the process. The goal is to determine a more equitable private contribution while bringing an area to an adequate level of performance.

TPAR methodology gives elected officials the ability and responsibility to set a public / private cost sharing participation for each Policy Area. The level of public financing could be assessed as: (a) the same for all areas of the County, (b) separately for each policy area, (c) by geographic category (Urban, Suburban, and Rural), or (d) by assigning priorities for development to each Policy Area.

As a starting point for discussion of the public – private partnership, TPAR recommends Option (d). In particular, it is recommended that we create three different levels of priority for development: high, medium and low. In high priority policy areas, we recommend the costs of the improvements be split 2/3 public – 1/3 private. In medium priority policy areas the split is recommended at 50 - 50. For low priority policy areas for development we recommend 1/3 public – 2/3 private.

Policy Areas where elected officials want to encourage development will be identified as high priority and so on. In any case, under TPAR development can proceed, with payment, in all policy areas. In low priority areas, the private sector will carry a higher burden. It is the intent of TPAR that there will be no Policy Areas where development will be stopped outright due to inadequate area wide transportation. In response to stakeholder' feedback, TPAR recommends that when development proceeds elected officials provide a high degree of certainty and commitment to ensure that the transportation solutions to accommodate such development be implemented on a timely manner.

The decisions made in the public / private partnership to fund the transportation improvements will result in the imposition of a TPAR payment, similar in nature to those set up under the Policy Area Mobility Review (PAMR) in policy areas that require mitigation. This TPAR payment would be assessed on each unit of development in a given Policy Area and then collected as part of the Subdivision Approval Process, prior to Record Plat approval. The collection of this payment must be tracked for each Policy Area and the expenditure of the payment must be programmed in the Policy Area where the TPAR payment is collected, except when the minimum TPAR payment is collected, as discussed in the following paragraph. The TPAR cost allocation process will ensure that new development will contribute toward the transportation improvements to support it.

TPAR also proposes a maximum and minimum TPAR payment. In areas where the private burden may be too high, the payment should be not larger than the payment under PAMR, or the equivalent of about $ 11,000 per trip. At the same time, our analysis has shown that there are areas of the County where the transit and roadway adequacy standards are both met. In those areas, a minimum TPAR payment should be levied. This minimum TPAR payment can help finance transit improvements for adjacent Policy Areas where such improvements are required and where the improved bus route provides continuity of service to the area with the minimum TPAR payment. Similarly, the minimum payment could be used to supplement roadway improvements in an adjacent area, where connectivity may exist. Again, as a starting point for public discussion, TPAR recommends that the minimum TPAR Payment be set at 10 percent of the maximum payment, or the equivalent of $1,100 per trip generated by the development. These values would be adjusted every July 1, on the basis of a national or regional construction cost index.

4. Program Public Commitments

Under TPAR, once developers pay the TPAR payment, their development proceeds in accordance with the regular subdivision process. The County continues to collect the TPAR payment as more developments are approved. As part of the TPAR process, the County Government must designate the highest priority transportation improvement for each Policy Area with inadequate LOS from the list in Appendix A. When programmed, the needed improvement must be identified as a committed project in the CIP, CTP or Operating Budget and scheduled and implemented within the 10 year time frame.

As TPAR revenues are collected, they are applied to the improvement of transit service and roadway construction on a "proportional basis" to the transit and roadway cost deficiencies. The roadway component is dedicated to the highest priority improvement in the Policy Area where the development occurred. When a certain percentage of the cost of the highest priority capital project serving a given Policy Area is collected, the County programs the project or service. Exhibit 3.10 above and Exhibit 3.11 below indicate the general sequence of these activities related to the programming of public commitments. (Steps 31 – 34 below).

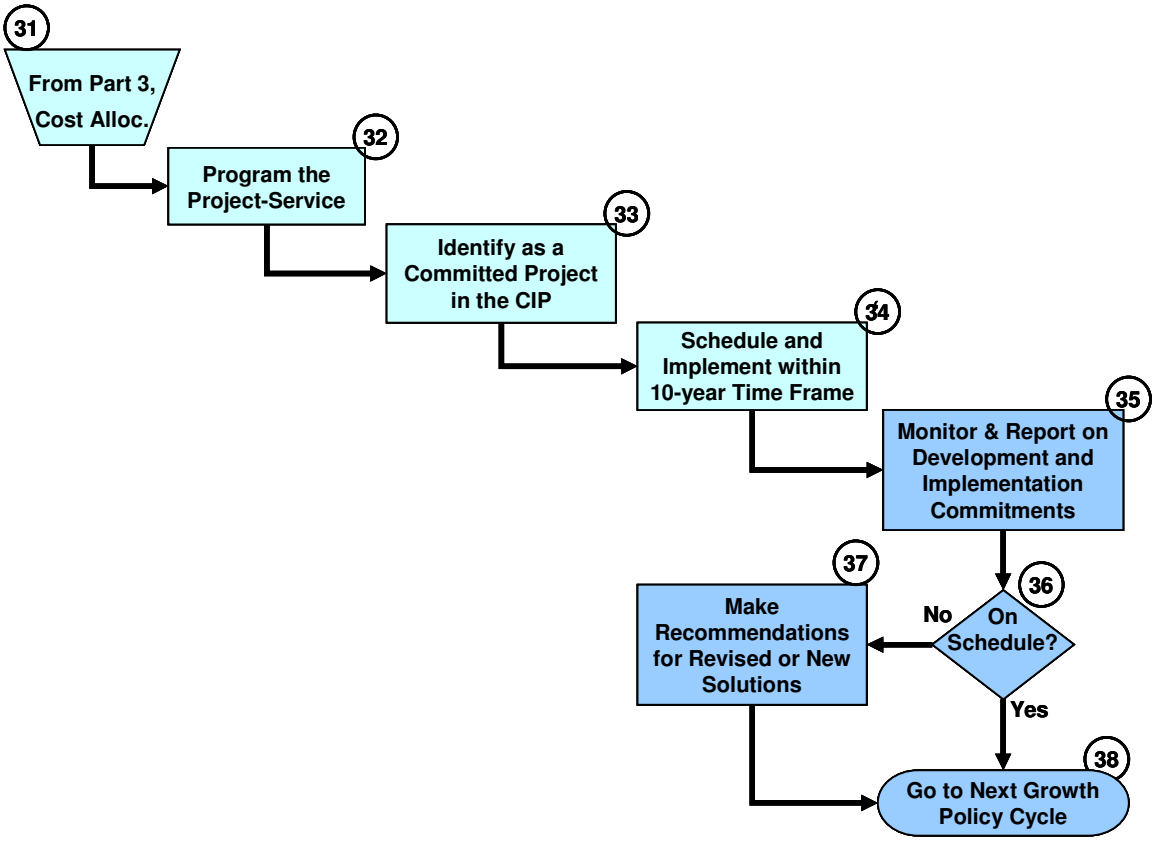


Exhibit 3.11: Programming Public Commitments – Monitor and Report Progress

Here again, elected officials can use the TPAR to guide growth by *specifying the collection level* that triggers the programming of projects in each Policy Areas. That is shown in above in Exhibit 3.10 as Step #25, "establishing criteria for additions into the CIP/CTP."

TPAR recommends the initial level to trigger programming of a capital project to be ten percent of the estimated construction cost multiplied by the selected public-private cost sharing

ratios identified as part of Step #26 in Exhibit 3.10, above in Part 3. For a typical project, the engineering design cost of a roadway project varies between eight and twelve percent. TPAR proposes ten percent as the triggering percentage for programming a project. With this recommendation, a project would be programmed when the expected private participation for the project covers the portion of the design cost attributable to the private sector.

As an example, if the cost of the highest priority road project in a Policy Area has an estimated construction cost of $10 million, and the share ratio of public-private participation for that area is 2/3 public – 1/3 private, then that capital project should be programmed when a total of $ 333,333 is collected in TPAR payments in that area ($10,000,000 * 0.1 * 0.333). No other capital project in the area would be programmed until enough TPAR payments are collected to pay for the private allocation share of the total cost of that project. After the private share for a project is collected, then additional TPAR payments are accumulated to program the second highest priority capital project, following the same procedure as for the first one.

Feedback from the stakeholder meetings indicated that a key element of the policy must be the firm commitment by elected officials that the identified capital roadway project or transit service will be implemented. There was significant agreement among stakeholders, that if development is approved, the public sector should provide the necessary infrastructure or services to serve the transportation demands imposed by that development in a timely manner.

Finally, during the Stakeholder meetings, multi-year payment options for the TPAR payments were suggested so that those who must pay the new payment have some cash flow to lessen their burden at the start of the development activity. To address this matter, TPAR suggests the following process be implemented during the Subdivision Development process:

1. Once a subdivision's preliminary plan is approved, MNCPPC must notify MCDOT and DPS of the approval date, the Policy Area where the approval occurred, the number of units or square feet of development approved, and the number of peak trips expected to be generated.

2. As a condition of record plat approval, the developer must obtain an estimate of the TPAR payment from MCDOT, then either pay the TPAR payment or produce an irrevocable letter of credit or similar surety approved by the County, assuring the payment of the TPAR payment within a maximum period of the next five years.

3. The payment or approved irrevocable letters of credit will be considered a part of the collection of the TPAR payment for purposes of programming projects or transit services.

4. MCDOT will track the revenues collected in coordination with the Departments of Finance and the OMB, and recommend programming of projects as appropriate.

5: Monitor, Report and Recommend Adjustments

TPAR proposes as a final part of the process a set of steps to better assure a balance between development activity and transportation; the monitoring of the key elements of the process, accompanied by reporting on an annual basis. Those steps are shown in Exhibit 3.11, above (steps 35-38). The monitoring and reporting is performed in the context of the 10-year time frame. The list of elements that must be monitored and possible actions to remedy any imbalance follows:

(a) Development Approvals and Permits Issued:
If the rate of growth is continuously and sufficiently higher than projected, then additional infrastructure facilities or transit services must be programmed. If the growth occurs significantly more slowly, then public sector financial commitments can be delayed.

(b) Timely Implementation of the Programmed Transportation Projects:
Once a TPAR project is programmed in the CIP or CTP its progress must be tracked and reported on a quarterly or semi-annual basis.

(c) Collection and Dedication of TPAR payments by Policy Area:
The information can be used by agency staff to alert elected officials in the timely programming of projects.

(d) Ongoing Costs of Infrastructure and Improved Transit Services:
Payments generated by each unit of development must be adjusted on a biennial basis to reflect the updated costs of the infrastructure and the provision of improved transit services. Once a project funded with TPAR Payments is programmed for design, it should remain in the CIP unless it is delayed for implementation or technical reasons.

(e) Current Non Auto Driver Mode Share (NADMS) Percentage Goals:
For those Policy Areas where the Council has approved specific NADMS goals, the monitoring report should also present the results of the progress in reaching the mode share goals for those Policy Areas.

The integrated monitoring and reporting of these elements must be a cooperative effort between the Executive Branch, the State and the MNCPPC. Specific responsibilities must be outlined for each unit of government. No one agency has sole responsibility for the different monitoring and reporting elements of TPAR.

One key element of the reporting requirement must be the analysis and recommendation of adjustment of the different components of TPAR to achieve the transportation - development activity balance. Once again, it is best for the smooth development of the County and acceptance by residents if the recommendations are the result of a joint MNCPPC – County Executive Branch effort. The continued economic development of the County and the timely provision of transit services and roadway improvements merit the cooperative efforts of all agencies involved.

Currently the MNCPPC produces a Highway Monitoring Report every two years. This type of monitoring may be used in support of TPAR, with specific adjustments that provide more consistency and continuity of effort than the present methodology. For example, the actual performance of arterials could be monitored to serve as a check on the modeled results.

Section IV: Ways that TPAR Differs from the Current PAMR Methodology

TPAR differs from the existing PAMR in many respects. TPAR:

1. Uses separate adequacy standards for transit service and roadway operations.

2. Defines transit standards in a simple, easy to understand manner, consistent with the County's Transit Strategic Plan.

3. Uses roadway congestion in the PM peak direction of travel to measure adequacy, rather than the weighted average of both directions

4. Recommends specific roadway projects and transit service additions to improve the transportation network in a Policy Area where inadequacies are found.

5. Uses a 10-year forecast of development activity as opposed to using the development "pipeline".

6. Analyzes variable transportation scenarios to serve the set forecast of development activity for the next 10 years. The current PAMR method analyzes variable amounts of development activity that could be supported by the set programmed transportation improvements of the CIP and CTP.

7. Examines the within-Policy Area roadway performance, not just the overall average for the Policy Area. TPAR presents similar information for segments on an arterial-by-arterial basis of the main arterials serving the Policy Area. Such analyses show that while the overall average for an area may be inadequate, there are still many arterial roads that operate at acceptable congestion levels.

8. Closely ties development approvals with the programming and timely implementation of transportation solutions.

9. Clearly identifies public-private cost sharing responsibilities, and ensures services are programmed and funded in the Policy Areas where development occurs.

10. Requires regular monitoring and reporting of conditions of the key elements of the policy and requires the cooperation of the Executive Branch and MNCPPC in the formulation of solutions and adjustments to the Policy when there are discrepancies between the plans and the in-the-field realities.

11. Firmly ties the Growth Policy to the CIP, CTP and the Operating Budget.

12. Provides an open, iterative process and identifies for elected officials specific transportation projects to select to ensure balance in transportation – development activity within a "rolling" ten year (on average) time frame.

13. Gives elected officials the ability and responsibility to prioritize development in certain areas of the County, while permitting growth throughout the County.

Section V: General Application of TPAR to Policy Areas and to Proposed Subdivisions

For the purpose of demonstrating the application of TPAR, MCDOT and its Consultant, with close cooperation from MNCPPC staff, analyzed the general applicability of the process on a county-wide basis. In addition, a specific focus and detailing was given to three example Policy Areas in different parts of the County: (1) Bethesda / Chevy Chase, (2) Fairland / White Oak, and (3) Germantown East. Each of these three areas had been found to be below the adequacy standards in the Base Case scenario set by the TPAR Review. The results of those examples are discussed in the next Section.

As discussed above in Section 3, Part 2 of this report, Transit Adequacy was analyzed with the assumption of current bus service by WMATA and Ride On, as well as the presence of the Metrorail and MARC Commuter Rail system. Roadway Adequacy was analyzed by applying the transportation demand forecasting model using: (1) the projected 2020 development activity, (2) the list of all improvements programmed to be operational by 2016, as well as (3) alternative sets of roadway improvement "solutions" that could be implemented by 2020.

MCDOT and its Consultant analyzed the results and determined what inadequacies would occur. In those Policy Areas where inadequacies were found, MCDOT and its Consultant then worked with MNCPPC to model a set of possible solutions that would expand the transportation network to meet the transit and roadway adequacy standards for that Policy Area by 2020. Exhibit 5.1 gives a list of road and transit projects used in the second iteration of analysis that would begin providing adequate transportation by 2020, and that demonstrates the application of the proposed methodology.

Exhibit 5.1: Road and Transit Projects Considered in the Road Adequacy Analysis

Transportation Facility Name	Improvement Type and/or Limits	Policy Area	Comments To be Noted
FY10 AGP Proj.	In CTP and CIP for const. by FY14 plus 3 following projects by FY16		to count 6 years In Approved CTP
Interchange	MD097 (Ga. Ave) at Randolph Rd	**KW**	In Approved CIP
Montrose Pkwy	East; MD355 to MD586 (Veirs Mill Rd)	**NB**	In Approved CIP
Chapman Ave	Extd; Randolph Rd to Old Gtwn Rd	**NB**	In Approved CIP
Projects that could be Available by 2020			
Purple Line	New Carrollton to Bethesda	**Co-Wide**	
TDM Activities	BCC, SSTP, NB, and DER;/ new in FWO, KW	**Co-Wide**	improved monitoring & programs
Observation Dr	Roberts Tavern to West Old Baltimore Rd	**CLK**	2 lanes each way
MD355 (Frederick Rd)	Brink Rd to Little Seneca Pky	**CLK**	widen to 2 Lanes each way
Mid-Co. Hwy	Shady Grove Rd to MD200 Intercounty. Conn.	**DER**	widen to 2 Lanes each way
Interchange	US029 (Columbia Pk) at Fairland/Musgrove Rd	**FWO**	
MD117 (Clopper Rd)	I-270 to Longdraft reconstruction	**GBG**	improve median/ turn lanes
Mid-Co. Hwy	MD027 to Middlebrook Rd (limited extent)	**GTE**	2 lanes each way (design 3)
Observation Dr	W. Old Baltimore Rd to I-4 (revised extent)	**GTE**	2 lanes each way
I-4 Overpass	Road bridge over I-270	**GTE**	
MD355 (Frederick Rd)	MD027 (Ridge Rd) to Brink Rd	**GTE**	widen to 2 Lanes each way
Century Blvd	I-4 to Existing Century Blvd	**GTW**	
I-4 Overpass	Road bridge over I-270	**GTW**	
Goshen Rd	Girard St to Warfield Rd	**MVA**	widen to 4 lane divided
Twinbrook Pkwy	MD355 (Rockville Pike) to Ardennes Ave	**NB**	widen to 3 Lanes each way
MD117 (Clopper Rd)	Watkins Mill Rd to Game Preserve Rd	**NP**	widen to 2 Lanes each way

Similar to the current PAMR, the TPAR analysis to examine the adequacy of the future roadway network relative to the future amount of development activity can be analytically addressed using only one approach. This involves assuming a scenario of development and improvements and then using the Travel Demand Model to analyze the combination to generate results. The model does not work "backwards" to find an optimum network. TPAR carries out an iterative process to hone-in on a workable combination of transportation improvements to support a given a set amount of development activity.

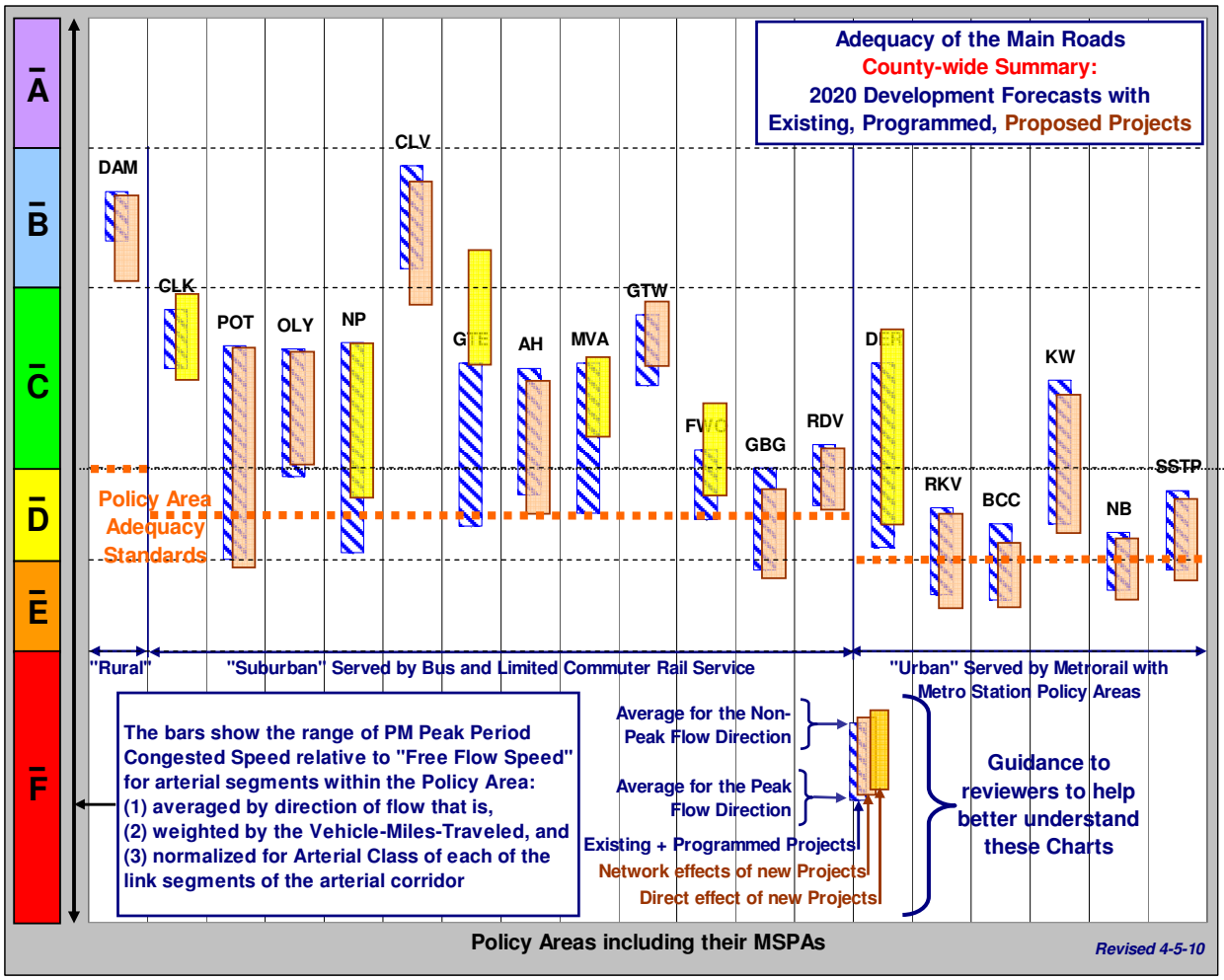


Exhibit 5.2: County-wide Results of the First Iteration of Additional Roadway Projects

Exhibit 5.2 presents the results of the Roadway Adequacy Analysis for the Base Case (first iteration) and Solutions (second iteration). The Base Case (first iteration shown by the blue-hatched bars) reflects the transportation projects currently programmed in the CIP and CTP for each Policy Area that can be completed by 2016 against the 2020 Cooperative Forecast of development activities. The second iteration examined those projects that could be *added* to the CIP or CTP and be implemented by 2020. Exhibit 5.2 also displays the results of the second iteration, *the solutions*, shown by the opaque tan and yellow bars. The yellow bars show the congestion levels for Policy Areas where improvements were assumed in the second iteration while the tan shaded bars show the results for the other Policy Areas where no additional improvements were assumed.

The observation that the tan bars are usually different from the blue-hatched bars of the Base Case indicates the "network effects" that improvements in nearby areas can have on congestion levels in an area where no improvement was assumed.

The results of the second iteration in Exhibit 5.2 show that in five Policy Areas where combinations of improvements are assumed, the congestion levels would likewise improve from inadequate or almost inadequate to adequate. Reading from left to right these include, (1) North Potomac (NP), (2) Germantown East (GTE), (3) Montgomery Village / Airpark (MVA), (4) Fairland / White Oak (FWO), and (5) Derwood (DER). Two of those Policy Areas are discussed in some detail in the next Section of this Report – Fairland / White Oak, and Germantown East.

The next Section is intended to help in demonstrating that the overall TPAR process can be applied County-wide as well as on and Policy Area-by-Policy Area basis. It will require resources and time beyond those available to this study, as well as the active involvement and participation of other responsible agencies and their staffs to fully implement the proposed TRAR process for the first time.

Application of TPAR to a new Subdivision Development

To facilitate understanding from the perspective of the development community, and to initiate discussions on a possible process, we present the following outline of the TPAR Process for developers:

1. Developer identifies the Policy Area of the proposed development at the Preliminary Plan stage, the nature and quantification of the proposed development, and expected peak trip generation of the proposed subdivision.
2. Planning Board approves the development, with whatever modifications if any, and transmits to the Departments of Permitting Services and Transportation the relevant information of the approval, including:
    a. Approval number
    b. Location of the Policy Area
    c. Approved number of housing units or square feet of development
    d. Expected number of peak trips generated by the development.
3. Developer notifies MCDOT of the information in 2, and the number of units or square feet of development to be submitted for approval in a given record plat, *prior to the approval of the record plat.* (Note: a subdivision may be broken down into several record plats during its implementation).
4. MCDOT estimates the TPAR payment associated with the record plat, and provides identification of the account where monies should be recorded.
5. Developer either pays the TPAR payment or posts an irrevocable letter of credit for the payment. If the latter, the five-year time period for payment starts. At this point, the developer has met his/her obligations under TPAR and can proceed with the next steps in the subdivision process.
6. MCDOT records the information and maintains the running totals of collection per Policy Area, and the breakdown for transit and roadway improvements. Information to be readily available to the public.

7. Are roadway or transit improvements ready for programming? If so, MC DOT requests formal programming of the improvements
8. MCDOT maintains and tracks letter of credit collections and deadlines.
9. MCDOT / MNCPPC Monitor and Report

Section VI presented next in this Report illustrates examples of the proposed process being applied to three example Policy Areas. In each of the three example areas, the TPAR analyses showed initial inadequacies in the Base Case for the transit and roadway systems.

Section VI: TPAR Examples for Three Sample Policy Areas

1. Bethesda Chevy Chase Policy Area

A. Forecast of Development Activity:

The Bethesda Chevy Chase Policy Area is forecasted to grow by about 3,829 households and 8,804 jobs between 2010 and 2020, as shown in Exhibit 6.1A:

Exhibit 6.1A: Development Forecasts for the Bethesda / Chevy Chase Policy Area

Forecast of Development Activity in Montgomery County between 2010 and 2020 by Example Policy Area based on Summaries from MWCOG and MNCPPC								
Policy Area (including their MSPAs)	Forecast of Growth in Households				Forecast of Growth in Emploment			
	2010 House-holds	Growth 2010 to to 2020	Percent Growth by Area	Percent of County Growth	2010 Employ-ment	Growth 2010 to to 2020	Percent Growth by Area	Percent of County Growth
Bethesda / Chevy Chase	40,115	3,829	9.5%	8.3%	87,820	8,804	10.0%	11.0%

B. Transit Adequacy Analysis:

The Transit Adequacy Analysis for the Bethesda / Chevy Chase Policy Area is displayed in Exhibit 6.1B. The Bethesda / Chevy Chase Policy Area includes three Metrorail Stations: Bethesda, Friendship Heights, and Medical Center, The area also includes two future stations on the Purple Line, one near Connecticut Avenue, Chevy Chase Lake Drive and Newdale Road, and another located at Elm Street and Woodmont Avenue.

Exhibit 6.1B: Transit Adequacy Analysis for the Bethesda / Chevy Chase Policy Area

Transit Adequacy Analysis:				
	Number of Bus Routes	**Coverage** (Percent of area within 1 mi. rail; 1/3 of bus)	**Peak Headway** by Bus in PM Peak Hour (min.)	**Span**: Duration of Weekday Bus Service (hours)
"Urban" Policy Areas served by Metrorail				
Bethesda / Chevy Chase	**16**	**81.2%**	**17.6**	**13.5**
Inadequate versus the Standards shown	**xx.x**	**more than 80.0%**	**less than 15.0 ##**	**more than 17.0**
		## = 20.0 with Metrorail		

Results of the Transit Adequacy Analysis shown in Exhibit 6.1B above are expressed in three ways: coverage, peak headway, and span of service.

- **Coverage of Service:**
  81.2% of the Bethesda / Chevy Chase Policy Area is located within 1 mile of a Metrorail station or 1/3 of a mile of one of the 16 bus routes servicing the area. The standard for Coverage for an urban area is 80.0%. Therefore transit coverage in the Bethesda / Chevy Chase Policy Area is adequate.

- **Peak Headways:**
  Buses on average operate every 17.6 minutes during the weekday evening peak period in the Bethesda / Chevy Chase Policy Area. In areas like Bethesda / Chevy Chase where Metrorail, Light Rail Transit or future BRT systems are provided, the standard for Peak Headways is 20 minutes or less. Thus the peak headways for the Bethesda / Chevy Chase are adequate.

- **Span of Service:**
  Exhibit 6.1B indicates that the current duration of weekday bus service on the average is inadequate in Bethesda / Chevy Chase. The current average value of span is 13.5 hours per day and the urban standard is 17.0 hours per day on average for all of the routes. A considerable number of additional bus-hours per day will need to be programmed to enable the 16 routes to collectively increase their average duration of service from 13.5 hours per day to be at least 17.0 hours per day. That will be an operating budget consideration in the short term. The more intense use of the bus fleet may in the mid-to-long term require earlier purchase of replacement buses through the CIP to sustain the span standard.

The Master Planned improvement of the Purple Line LRT has reached a stage of project planning approval where implementation of that major transit project could be accomplished by 2020. As discussed more below, the Purple Line can be anticipated to help improve the performance of the overall transportation network. In addition, increased TMD activities and requirements, and proactive improvements to traffic signal optimization and monitoring will help make more efficient use of the existing transportation network for bus operations and traffic flow. Directly accounting for the effects of such management and operational improvements is beyond the current state-of-the-practice in the region-wide travel demand modeling of the type used in this overall TPAR analysis. It is difficult to quantify the benefits of such improvements.

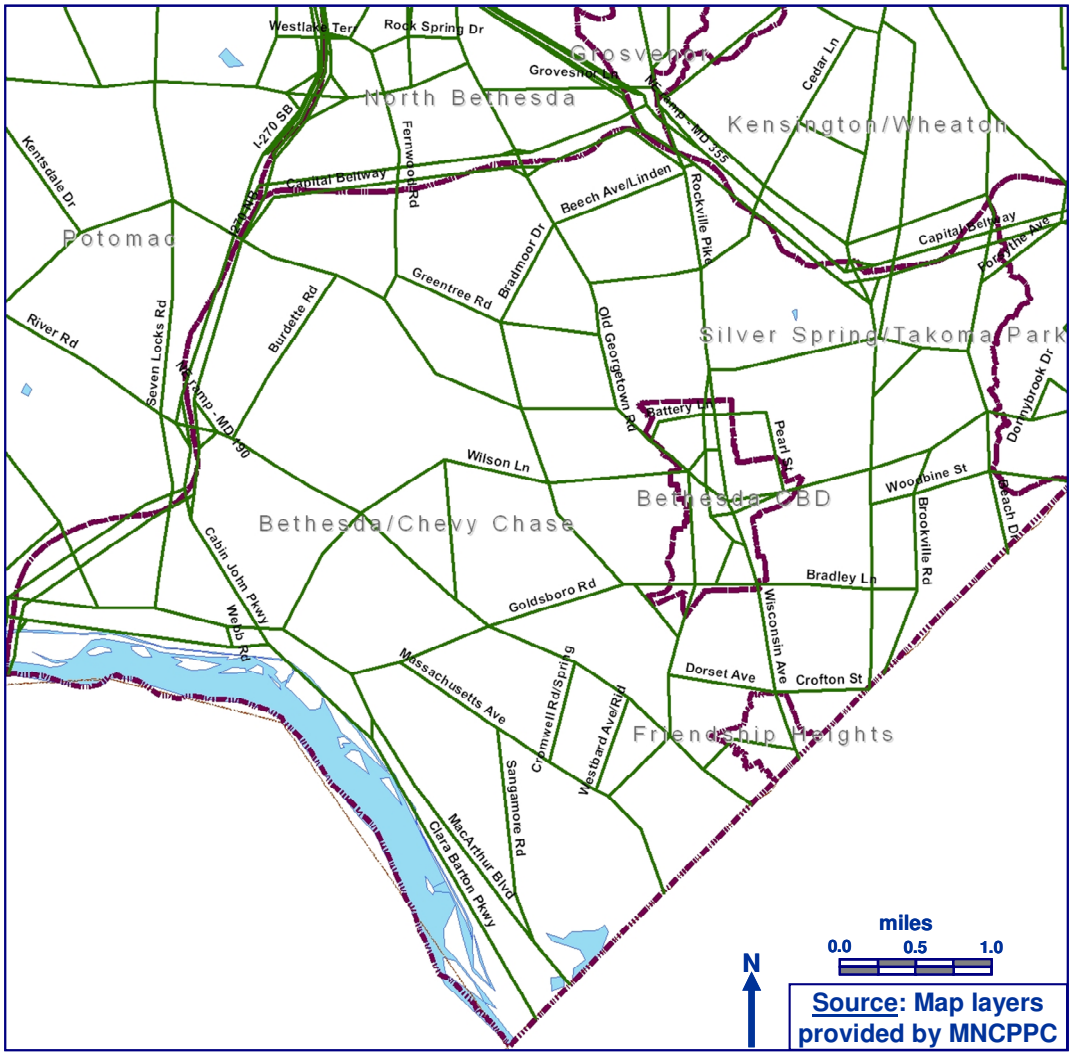


Exhibit 6.1C: Network of Roads Modeled in the Bethesda / Chevy Chase Policy Area

C. Roadway Adequacy Analysis

For the Roadway Adequacy Analysis, the Bethesda / Chevy Chase Policy Area is analyzed by link within segments of arterials where each link has been assigned an "arterial class" that reflects the "free flow speed" of that link. There are four variations of arterial class used that range from a minor arterial with slower free flow speeds to a major arterial with higher free flow speeds. The particular set of arterials modeled in the Roadway Adequacy Analysis in the Bethesda / Chevy Chase Policy Area is schematically shown in Exhibit 6.1C, above. The reader should also note that the Roadway Adequacy Analysis does not include local streets, minor collector-distributor roads, and even some of the minor arterials. Such streets and roads carry low volumes of traffic and it is beyond the state-of-the-practice to model the use of them.

Base Case Results: The Base Case results of the Roadway Adequacy Analysis for the Bethesda / Chevy Chase roadways are represented by the "blue-hatched" bars shown in Exhibit 6.1D. This Exhibit disaggregates the overall performance of the arterials within the Bethesda / Chevy Chase Policy Area to display them on an arterial-by-arterial basis for the year 2020 development activity. There are no CIP/CTP roadway improvements programmed in the area for 2016.

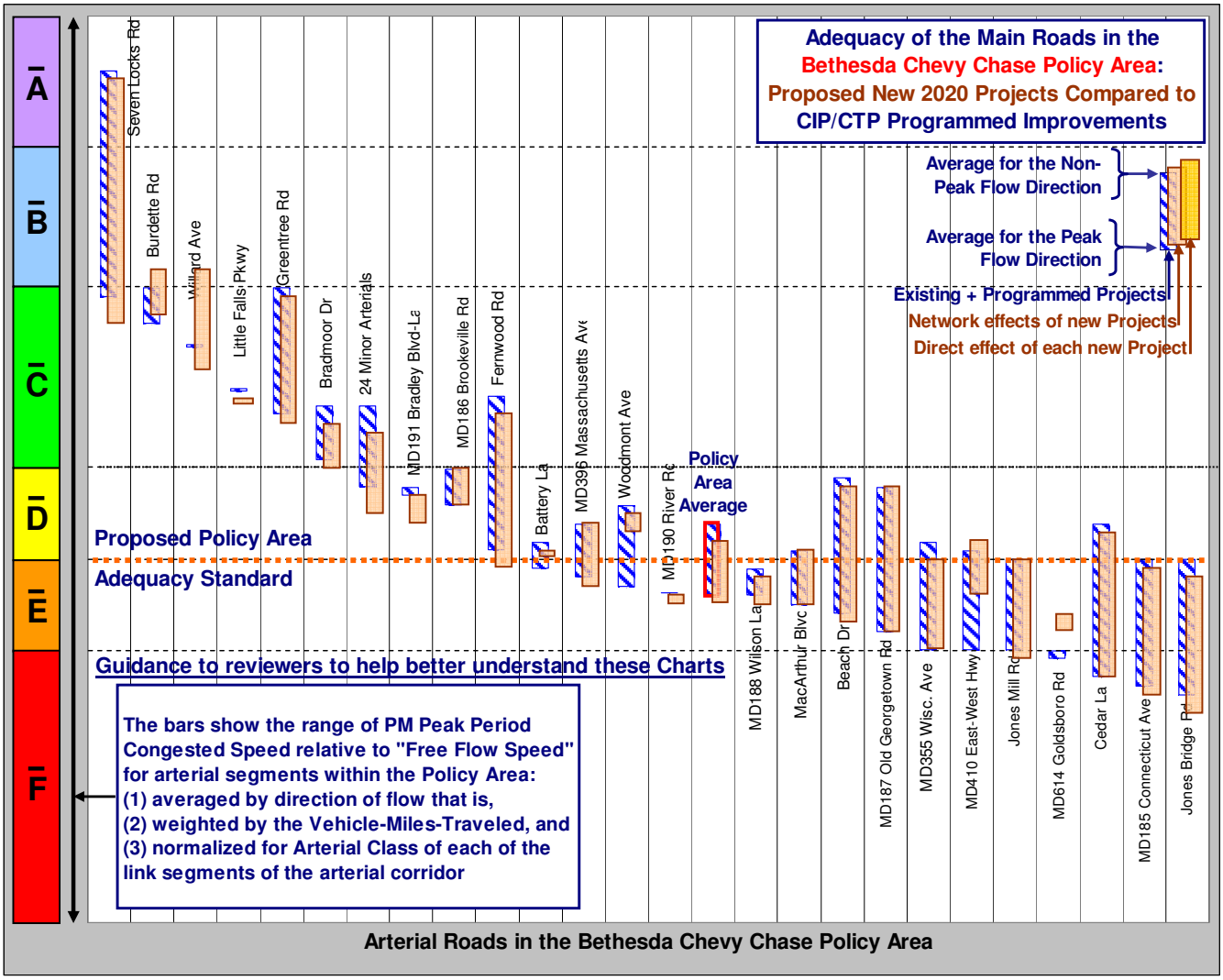


Exhibit 6.1D: Roadway Adequacy Results for the Bethesda / Chevy Chase Policy Area

Exhibit 6.1D specifically displays the average roadway Level of Service for each of the arterial segments within the BCC area shown in Exhibit 6.1C by the name of the roadway. Exhibit 6.1D also shows the weighted average congestion level for the Policy Area for all of the analyzed roads in the Policy Area as so indicated in the Exhibit by the bar bordered in red. The Policy Area average is the same set of values shown above in Exhibit 5.2, where again the average for this Policy Area is more congested than the TPAR standard for an Urban Policy Area, as indicated by the dashed and bolded horizontal line across Exhibit 6.1D.

The reader can look at Exhibit 6.1D to determine how well most of the main arterial roadways in the BCC Policy Area are estimated to be performing in the peak and non-peak directions for the time period of the TPAR analysis. The forecasts on this Exhibit will give the reader a sense of the future relative level of congestion on each named road. Please note that while some 25 roads segments are individually named, another 24 short arterial segments were grouped and there combined estimated congestion levels are shown as the seventh bar from the left side of the Exhibit. Collectively their performance would be less congested than the average for the overall Policy Area.

Exhibit 6.1D shows that the Base Case Policy Area average in the peak directions of travel falls within the average LOS E range. TPAR proposes additional improvements to the transportation network to bring the Policy Area closer to adequacy (LOS "D/E"). Reading from right to the left in Exhibit 6.1D, peak direction congestion for the Base Case scenario would be worst on Jones Bridge Road, Connecticut Avenue, Cedar Lane, and Goldsboro Road, each of which is estimated to operate at Level of Service F. Other roadways that are estimated in the Base Case to operate more congested than the LOS "D/E" standard in the BCC Policy Area include: Jones Mill Road, East-West Highway, Wisconsin Avenue, Old Georgetown, Beach Drive, MacArthur Boulevard, Wilson Lane, River Road, Woodmont Avenue, Massachusetts Avenue, and Battery Lane.

Results of Proposed Transportation Solutions (Iteration #2): Similar to Exhibit 5.2 shown in the proceeding section, the TPAR solutions for the Bethesda / Chevy Chase Policy Area are depicted by the tan shaded opaque bars. The Purple Line is assumed to be available by 2020 in this scenario. The tan opaque bars relative to the Base Case blue-hatched bars give a general indication of the effect that TPAR might have on the arterial roadways in the BCC area. These "network effects" include the likely lessening of congestion on MD 410 (East West Highway), Woodmont Avenue, and Goldsboro Road as indicated by the location of bottom of the tan bar relative to the blue-hatched bar.

From a methodological perspective, this type of Exhibit summarizing the TPAR analysis provides a high degree of "transparency" to and summary of the results of the TPAR modeling analysis. This is much more information on the future performance of the roads than provided under the current PAMR, where one number representing the overall Policy Area average is given. The TPAR information is also presented in a manner that can be easily explained and understood.

In this example of the Bethesda / Chevy Chase Policy Area, a review of the Master Plan showed that there are no improvements to major arterials that can be constructed by 2020 to bring the area into balance. It is noted however, that the Base Realignment and Closing (BRAC) improvements for the Naval Hospital Expansion, include a MD 355 Pedestrian Crossing, as well as intersection and pedestrian improvements. While the BRAC improvements will help to maximize the efficiency of the existing network in Bethesda / Chevy Chase, directly accounting for the effects of such localized improvements is beyond the current state-of-the-practice in the region-wide modeling of the type used in the TPAR analysis. (NOTE: the addition of a southbound lane from the Capital Beltway to Jones Bridge Road, which may be implemented by SHA as part of the BRAC improvements, is likely to have an effect on the operations of Connecticut Avenue, but was not modeled as part of the current effort.) When options to improve the roadway network over the next 10 years do not exist, transit improvements and enhancements as well proactive traffic signal improvements must be undertaken to increase the functioning of the network in this policy area. Exhibit 6.1D can also be used as a guide in focusing on which roadways should receive such operational enhancements.

This reliance on transit improvements/ enhancements and efforts to maximize the use of the existing system reinforces the philosophy articulated in the recently adopted White Flint Sector Plan. This Smart Growth approach allows areas with transit stations to accommodate a higher level of congestion, while the area is monitored to track impacts on existing and future residents. The monitoring will also include identification of further improvements to the transportation efforts for consideration in the County and State budget process.

D. Summary of Solutions

Transportation improvements proposed for the Bethesda / Chevy Chase Policy Area are listed below:

Transit

1. Construct Purple Line LRT Improvements
2. Increase the hours of bus service provided throughout the day on weekdays by a total of 112 hours per day on the routes serving the Policy Area.

Transportation Management Districts: Expand TMD Services and requirements

Pedestrian and Bikeways:

1. Extend the Bethesda Trolley Trail

2. Construct selected missing links of sidewalks and bikeways.

Proactive Traffic Operations and Monitoring: Optimize and monitor signal timing focusing on the more congested corridors

Roadway Projects: Provide an additional southbound lane on Connecticut Avenue from I-495 to Jones Bridge Road, proposed as part of the improvements associated with BRAC, and include it in the next iteration of analysis.

2. Fairland / White Oak Policy Area

A. Forecast of Development Activity:

The Fairland / White Oak Policy Area is forecasted to grow by about 345 households and 6,225 jobs between 2010 and 2020, as shown in Exhibit 6.2A:

Exhibit 6.2A: Development Forecasts for the Fairland / White Oak Policy Area

Forecast of Development Activity in Montgomery County between 2010 and 2020 by Example Policy Area based on Summaries from MWCOG and MNCPPC								
Policy Area (including their MSPAs)	Forecast of Growth in Households				Forecast of Growth in Emploment			
	2010 House-holds	Growth 2010 to to 2020	Percent Growth by Area	Percent of County Growth	2010 Employ-ment	Growth 2010 to to 2020	Percent Growth by Area	Percent of County Growth
Fairland / White Oak	28,544	345	1.2%	0.8%	30,891	6,225	20.2%	7.8%

B. Transit Adequacy Analysis

The Transit Adequacy Analysis for the area is displayed in Exhibit 6.2B below. The Policy Area is analyzed by transit coverage, peak headway, and span.

Coverage of Service:
48.2% of the Fairland / White Oak Policy Area is located within one mile of Metrorail Stations or 1/3 of a mile of bus service. The Coverage of Service standard for a suburban area is to be greater than 30%. The current Coverage of Service value for the Fairland / White Oak Policy Area exceeds the standard.

Peak Headways:
Buses on average are operated every 19.5 minutes during the weekday evening peak period for the 16 routes serving the FWO Policy Area. The Peak Headway standard for a suburban area is 20 minutes or less. Thus the peak headway average for the Fairland / White Oak Policy Area is just adequate relative to the proposed standard.

Span:
Exhibit 6.2B indicates that the duration of weekday bus hours (listed as span) should be increased to meet the standard for a suburban area. The span in Fairland /White Oak is currently 11.9 hours on average each weekday, and the standard for a suburban area is an average duration of 14.0 hours or more per weekday. Approximately 56 bus-hours of additional service should programmed and added to the Fairland /White Oak Policy Area to expand transit services there to a level that meets the proposed standard for a suburban area.

The establishment of a TMD Service Area in Fairland / White Oak is also recommended, as are optimization and monitoring of signal timing. These types of improvements will improve the performance of the transportation network. However, directly accounting for the effects of a TMD and optimization of signal timing is beyond the current state-of-the-practice in the region-wide modeling used in this TPAR analysis

Exhibit 6.2B: Transit Adequacy Analysis for the Fairland / White Oak Policy Area

Transit Adequacy Analysis:				
	Number of Bus Routes	**Coverage** (Percent of area within 1 mi. rail; 1/3 of bus)	**Peak Headway** by Bus in PM Peak Hour (min.)	**Span**: Duration of Weekday Bus Service (hours)
"Suburban" Policy Areas				
Fairland / White Oak	13	48.2%	19.5	11.9
Inadequate versus the Standards shown	xx.x	**more than 30.0%**	**less than 20.0**	**more than 14.0**

C. Roadway Adequacy Analysis

For the Roadway Adequacy Analysis, the Fairland / White Oak Policy Area is analyzed by link within segments of arterials where each link has been assigned an "arterial class" that reflects the "free flow speed" of that link. There are four variations of arterial class used that range from a minor arterial (Broadbirch Road, for example) with slower free flow speeds to a major arterial such as US 29 (Columbia Pike) with higher free flow speeds. The particular set of arterials used in the Roadway Adequacy Analysis in the Fairland / White Oak Policy Area is schematically shown in Exhibit 6.2C. The reader should note that the Roadway Adequacy Analysis does not address local streets, minor collector-distributor roads, and even some minor arterials. Such streets and roads have low traffic volumes and it is beyond the state-of-the-practice to model their use.

The three existing interchanges of US 29 can be seen as well as the one under construction at MD 200 (the ICC) and a planned one at Fairland Road/Musgrove Road, which is proposed for 2020. That will result in about a three mile stretch with Freeway characteristics.

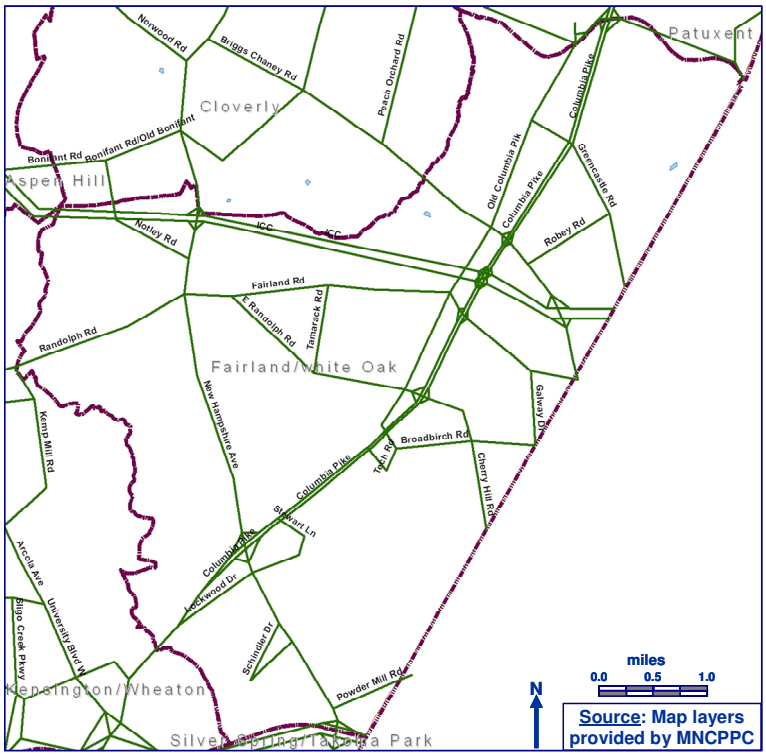


Exhibit 6.2C: Network of Roads Modeled in the Fairland / White Oak Policy Area

Base Case Results: The Base Case Results of the Roadway Adequacy Analysis for the Fairland / White Oak Policy Area are presented in Exhibit 6.2D in the blue-hatched bars. The exhibit disaggregates the performance of the arterials within the Fairland / White Oak Policy Area to an arterial-by-arterial basis. Specifically, the Exhibit displays the average Level of Service for each of the named arterial segments within the FWO area, as well show the Policy Area average. The reader can look at this Exhibit to determine how well each arterial would perform in the peak and non-peak directions. Please note while 8 arterial roads segments are individually named, that another 10 short arterial segments were grouped and are shown as the fifth bar from the left side of the exhibit.

Exhibit 6.2D shows that the Policy Area average is below the midpoint of LOS D for the Base Case Scenario, necessitating roadway improvements to the transportation network to bring the Policy Area closer to adequacy. Adequacy for a suburban area such as Fairland / White Oak is being set as the midpoint of the average LOS D. The congestion in the Base Case is worst on MD 650 (New Hampshire Avenue), US 29 (Columbia Pike), and Greencastle Road, where for each the average peak direction congestion level is more congested than the midpoint of LOS D.

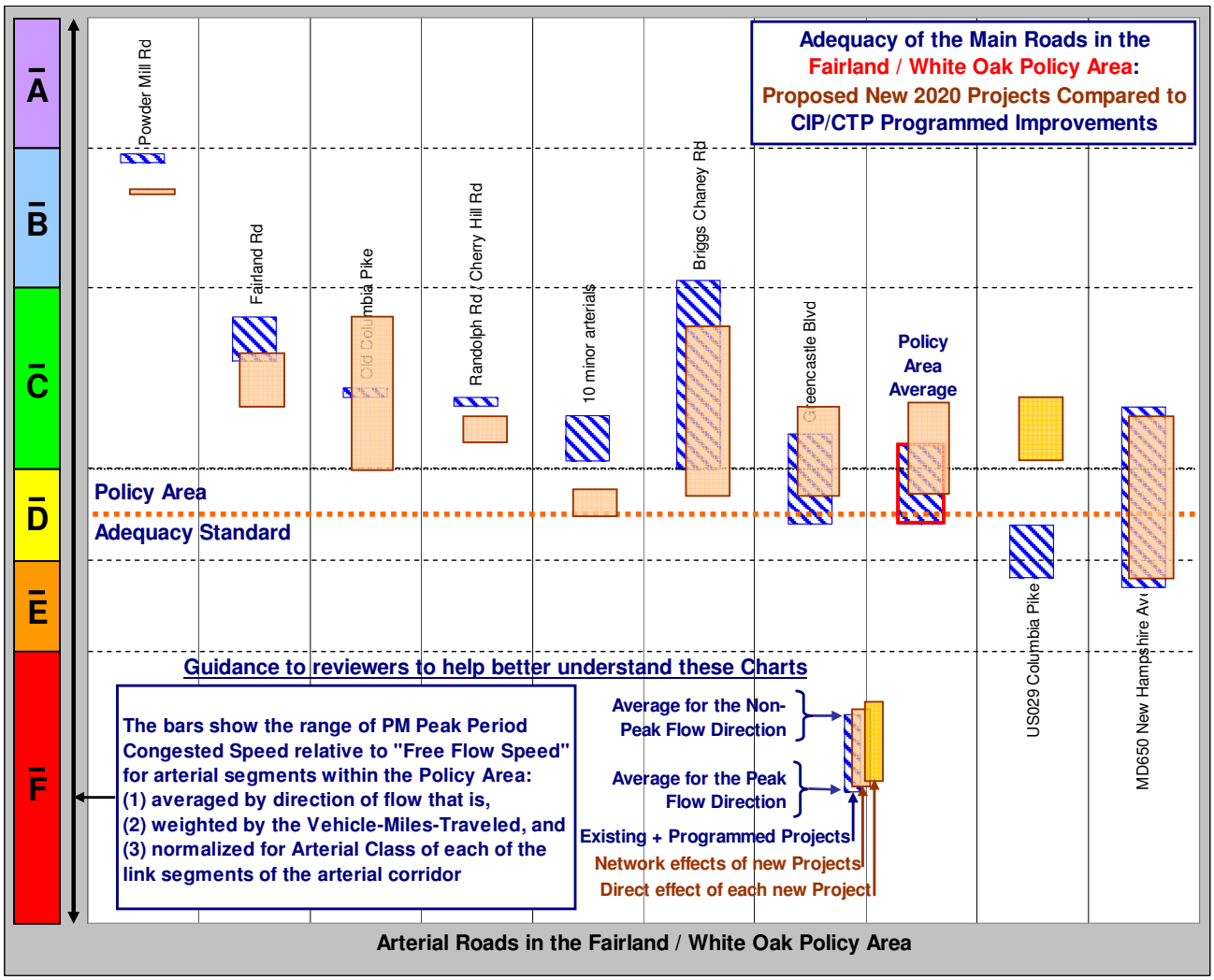


Exhibit 6.2D: Roadway Adequacy Results for the Fairland / White Oak Policy Area

Results of the Proposed Solutions (Iteration #2): The results of the TPAR analysis are depicted by the tan shaded opaque bars. In this example of the Fairland / White Oak Policy Area, a review of the Master Plan for Fairland and the surrounding Policy Areas showed that there is one roadway improvement, the construction of the interchange at US 29 and Fairland / Musgrove Roads that could be constructed by 2020. As indicated by the relative positions of the bottom of the tan bar to the blue-hatched bar for the Base Case, that one project change in the Policy Area would bring the overall Policy Area average to have an adequate level of congestion. It would also allow US 29 (Columbia Pike) itself to operate at an acceptable overall average congestion level.

Exhibit 6.2D also shows that MD 650 (New Hampshire Avenue) and Greencastle Road would have somewhat improved traffic conditions due to "network effects" of shifting traffic patterns that would result from the one improvement to US 29. However since congestion levels on MD 650 are still shown to be more congested than the Policy Area standard, improvements directly serving that corridor are recommended. Targeted transit improvements and enhancements as well as proactive traffic signal optimization can be undertaken to increase the functioning of the network in this Policy Area.

D. Summary of Solutions

Proposed transportation improvements for the Fairland / White Oak Policy Area are listed below:

Transit

1. Add 56 bus-hours per day to the existing bus service to increase the transit span.
2. Establish a TMD Service Area initially focusing on the White Oak employment area, including the Food and Drug Administration campus, and later covering other employment concentrations in the Policy Area.

Pedestrian and Bikeways: Add bikeway improvements from the Master Plan of bikeways and complete missing sidewalk links in the arterial system.

Proactive Traffic Operations and Monitoring: Optimize and monitor signal timing, with a particular focus on the MD 650 corridor.

Roadway / Bridge Projects:

Construct the planned interchange at US 29 and Fairland / Musgrove Roads.

(NOTE: The programming and construction of contract "D" of the ICC by 2020 – i.e. build C/D lanes along I-95 north of Briggs Chaney Road – could have an effect on the performance of the roadway system. This possible programming may alter the need for this Interchange by 2020.)

3. Germantown East Policy Area

A. Forecast of Development Activity:
The Germantown East Policy Area is forecasted to grow by 305 households and 4,425 jobs between 2010 and 2020, as shown in Exhibit 6.3A:

Exhibit 6.3A: Development Forecasts for the Germantown East Policy Area

Forecast of Development Activity in Montgomery County between 2010 and 2020 by Example Policy Area based on Summaries from MWCOG and MNCPPC								
Policy Area (including their MSPAs)	Forecast of Growth in Households				Forecast of Growth in Emploment			
	2010 House-holds	Growth 2010 to to 2020	Percent Growth by Area	Percent of County Growth	2010 Employ-ment	Growth 2010 to to 2020	Percent Growth by Area	Percent of County Growth
Germantown East	8,032	305	3.8%	0.7%	8,603	4,425	51.4%	5.5%

B. Transit Adequacy Analysis:

Results of the Transit Adequacy Analysis for the Germantown East area are displayed in Exhibit 6.3B that expresses adequacy in three ways: coverage, peak headway, and span:

- **Coverage**: Approximately 39% of the area is covered by transit service, which is adequate. The Coverage of Service Standard for a Suburban Policy Area is greater than 30%. The Germantown East Policy Area exceeds this standard.

- **Peak Headway**: The headway in Germantown East is currently 21.0 minutes and the standard for a suburban area is less than 20.0 minutes. Thus the intervals between buses in the peak hour on average should be shortened to meet the standard for a suburban area. That could be accomplished by adding one bus to one route in the weekday peak period.

- **Span**: Exhibit 6.2B shows that the duration of bus-hours per weekday should be increased from 13.4 to at least 14 bus-hours per weekday, which is the standard for a Suburban area. This can be accomplished by adding a total of 6 bus-hours per day.

The Master Plan and transit service plans for the Germantown East Policy Area anticipate the future availability of the Corridor Cities Transitway (CCT). However, given the current status of project planning for the CCT it is highly unlikely that segments of it to directly serve the Germantown East Policy Area can be completed by 2020. Optimization of the traffic signal system and monitoring will help to make greater use of the existing transportation network.

Exhibit 6.3B: Transit Adequacy Analysis for the Germantown East Policy Area

Transit Adequacy Analysis:				
	Number of Bus Routes	**Coverage** (Percent of area within 1 mi. rail; 1/3 of bus)	**Peak Headway** by Bus in PM Peak Hour (min.)	**Span**: Duration of Weekday Bus Service (hours)
"Suburban" Policy Areas				
Germantown East	5	39.3%	21.0	13.4
Inadequate versus the Standards shown	xx.x	**more than 30.0%**	**less than 20.0**	**more than 14.0**

C. Roadway Adequacy Analysis

For the Roadway Adequacy Analysis, the Germantown East Policy Area is analyzed by link within segments of arterials where each link has been assigned an "arterial class" that reflects the "free flow speed" of that link. There are four variations of arterial class used that range from a minor arterial with slower free flow speeds to a major arterial with higher free flow speeds.

The particular set of arterials used in the Roadway Adequacy Analysis in the Germantown East Policy Area is shown in Exhibit 6.3C. The reader should note that the modeling for the Roadway Adequacy Analysis does not include local streets and minor collector-distributor roads that carry relatively low volumes of traffic that are beyond the state-of-the-practice to model.

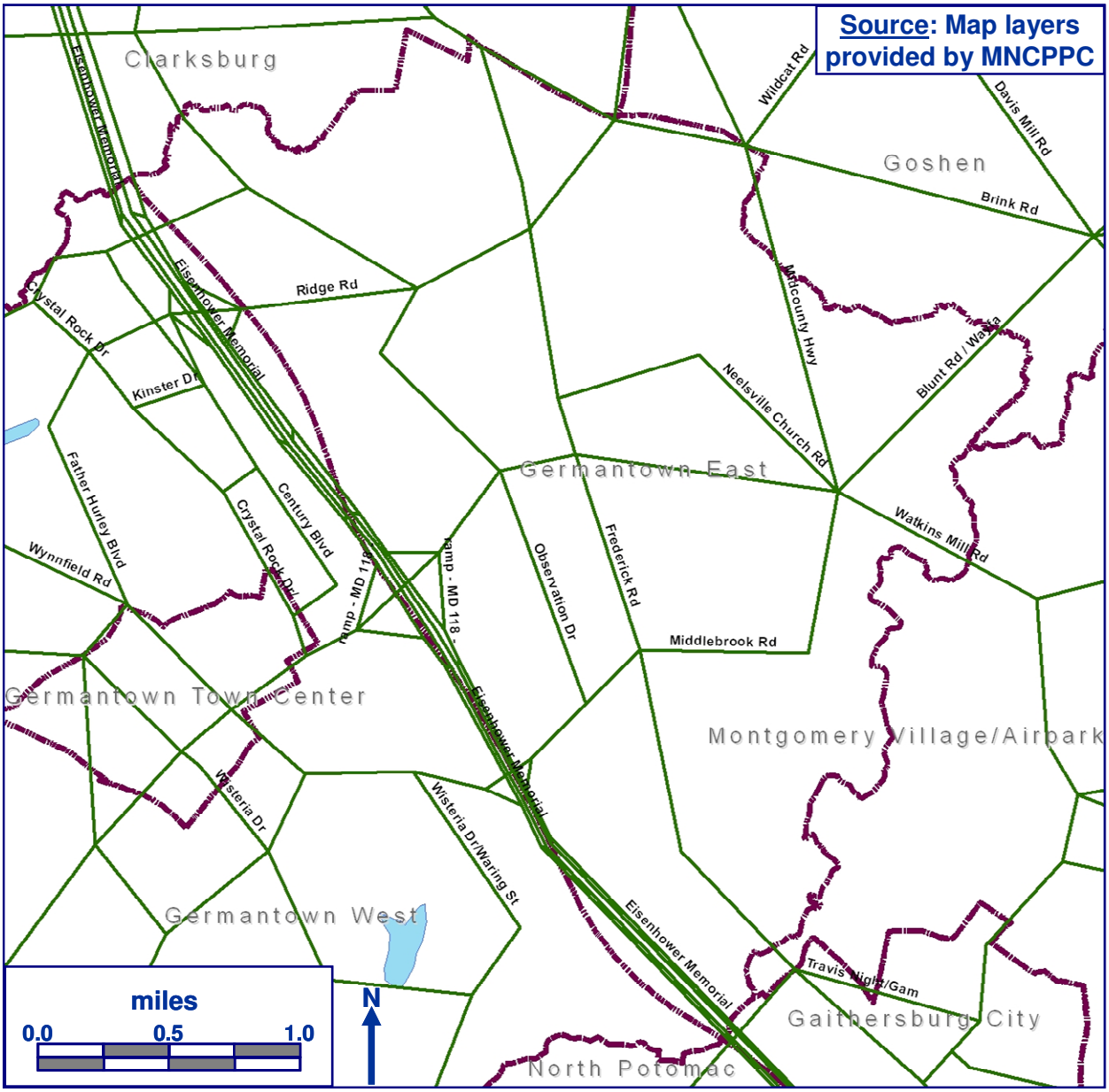


Exhibit 6.3C: Network of Roads Modeled in the Germantown East Policy Area

Base Case Results:

Analysis of the Germantown East Policy Area is presented in Exhibit 6.3D, which disaggregates the performance of the arterials within the Germantown East Policy Area to an arterial-by-arterial basis. Specifically, the Exhibit displays the level of service for each of the named arterial segments within the GTE area, as well as a Policy Area average. The reader can look at this Exhibit to determine how well each arterial is expected to perform in the peak and non-peak directions. The forecasts from this Exhibit should give the reader a sense of the relative level of the 2020 congestion on each road named.

Eight segments of arterial roads are shown for the Base Case (Iteration #1) as indicated by the blue-hatched bars. Two of those arterial segments, MD 27 (Ridge Road) and MD 355 (Frederick Road) would experience congestion levels more congested than the standard for this "Suburban" Policy Area, while a third, Brink Road would be at the standard. Overall the Policy Area average level of congestion would be just somewhat better than the standard of the mid-point of LOS D in the peak directions of travel. Thus it was considered prudent to examine potential additional road projects that could improve the area-wide average congestion level. This was done as a second iteration using the modeling system.

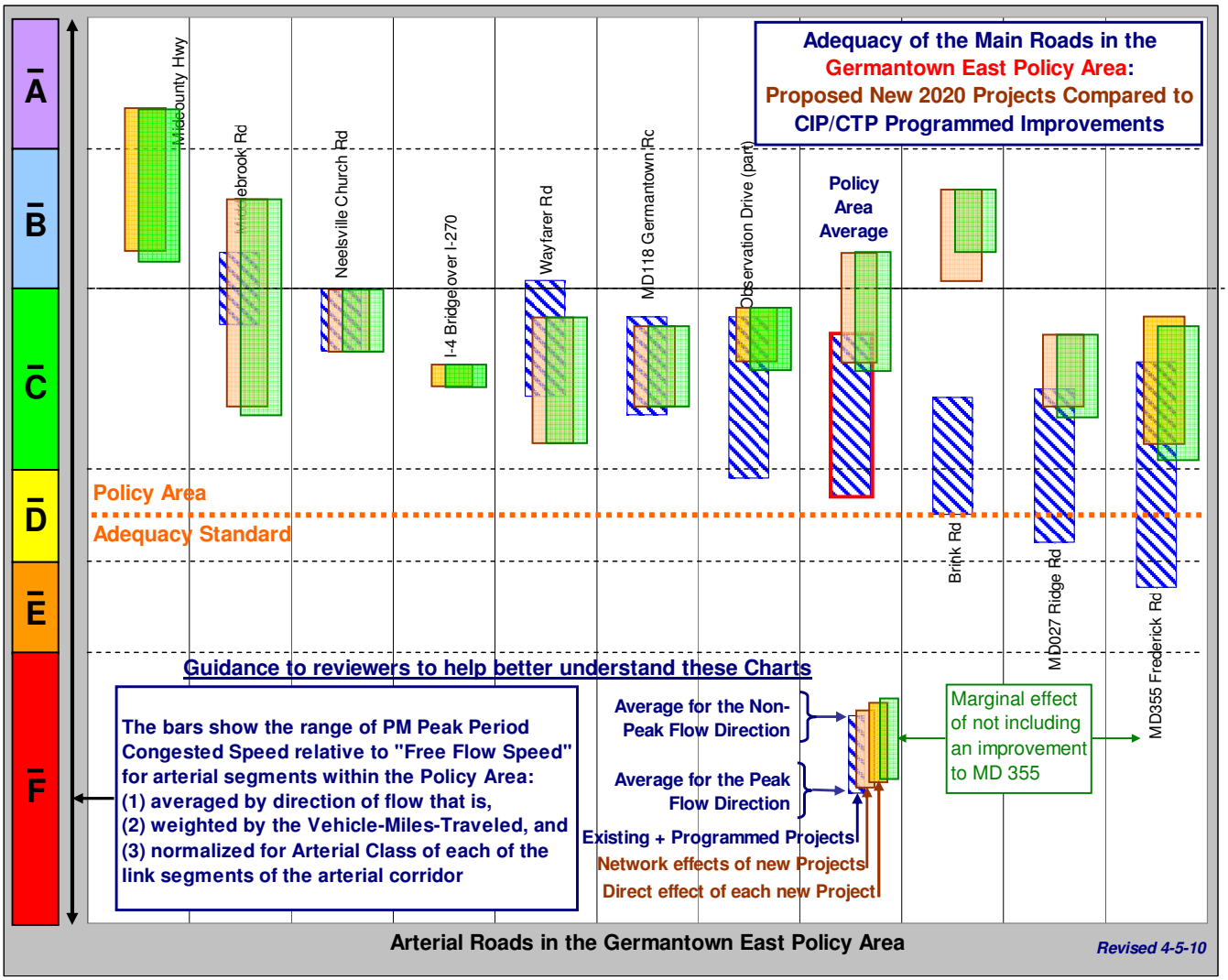


Exhibit 6.3D: Selected Arterial Roads in the Germantown East Policy Area

Proposed Roadway Solutions (Iteration #2) **and Results**:

In the case of the Germantown East Policy Area, a review of the Master Plans for Germantown and the surrounding Policy Areas showed that there are several improvements to arterial roadways that can be constructed by 2020 to improve the area-wide average Level of Service for GTE. These improvements are listed a follows:

- Midcounty Highway: Construct 2 lanes each way from MD 27 to Middlebrook Road (more lanes could be constructed at a later time). This project is currently in the CIP under Facility Planning – Transportation.

- Observation Drive: Construct 2 lanes each way from West Old Baltimore Road in Clarksburg to the I-4 Bridge over I-270. This project is also currently in the CIP under Facility Planning – Transportation.

- I-4 Overpass: Construct a road bridge over I-270 connecting to Germantown West, by linking Observation Drive to Century Boulevard – Crystal Rock Drive. This project is also included in the CIP under Facility Planning – Transportation.

- MD 355: Widen to 2 lanes each way from MD 27 / Ridge Road to Brink Rd and then to Little Seneca Parkway in Clarksburg as a logical interim terminus. (Note: This project is not included in either the County's CIP or the State's CTP. As one more test of the proposed methodology, this potential improvement was removed from the modeling analysis for Iteration #3, discussed below.)

Results of the second iteration using the Travel Demand modeling system are also presented in Exhibit 6.3D in a manner similar to Exhibit 5.2. The results of adding these roadways are shown by the tan shaded opaque bars or the yellow shaded opaque bars. The yellow shaded bars are used for those segments that had a direct improvement, which from left to right were Midcounty Highway, I-4 Bridge over I-270, Observation Drive, and MD 355 (Frederick Rd). The tan shaded bars show the combined "network effects" of those four projects on the named arterials. For example Middlebrook Road (second from the left) would be more congested in the peak direction and less congested in the non-peak direction. For two of the arterial corridors, Midcounty Highway and the I-4 Bridge are new projects where there are no Base Case conditions. Observation Drive is partially constructed today.

Looking at the results of Iteration #2 from the perspective of the average for the whole Policy Area, it is seen in Exhibit 6.3D that the combined affect of these four projects would be a very significant lessening of congestion – about one full Level of Service on the average, from LOS "D" close to the standard, to a low LOS "C". That raises the question that perhaps Iteration #2 assumed too many improvements, beyond the roadways needed to serve additional development activity in GTE between 2010 and 2020. That led to an examination of a third iteration as described next. The next iteration was also performed to illustrate and validate the proposed methodology.

Proposed Roadway Solutions (Iteration #3) **and Results**:

For Iteration 3, MCDOT assumed that the potential improvement to MD 355 (Frederick Rd identified as the fourth bullet in the list above) could be postponed to a later time period. The three remaining improvements, all in the current Approved CIP under Facility Planning – Transportation, would give sufficient results in terms of the congestions levels in the GTE Policy Area.

Exhibit 6.3D presents the results of Iteration 3 as the "green-shaded" opaque bars. As a whole, the Policy Area becomes slightly more congested than under Iteration 2. However, it is still much less congested than the Base Case shown by the blue-hatched bars, and still operating at an adequate level of performance.

For the MD 355 corridor itself –the one removed for analysis purposes- there is a similar observation. In essence the "network effects" of the parallel improvements of Midcounty Highway and Observation drive are sufficient for purposes of roadway adequacy in GTE. It can also be noted that the congestion levels on Midcounty Highway and Observation Drive would be somewhat more congested but each would remain adequate.

One conclusion of this third iteration is that the potential improvement to MD 355 could indeed be omitted from the proposed 2020 set of improvements and postponed to a later time. A second conclusion for the proposed TPAR methodology is that the TPAR Roadway Adequacy Analysis can be sensitive to relatively small changes to the proposed network of roadway improvements. This is good to know for further review and discussion purposes of the overall proposed New Policy Area Transportation Review process.

D. Summary of the Proposed Solutions

Proposed transportation improvements for the GTE Policy Area are listed below:

Transit
1. Add one additional peak period bus
2. Add 6 bus hours of service per day to the existing bus routes.

Pedestrian and Bikeways: Investigate and add bikeways proposed in the Master Plan of Bikeways and construct missing links which are not part of existing subdivision approval conditions.

Proactive Traffic Operations and Monitoring: Optimize and monitor signal timing

Roadway / Bridge Projects:
1. Midcounty Highway: Construct 2 lanes each way from MD 27 to Middlebrook Road (more lanes could be constructed at a later time)
2. Observation Drive: Construct 2 lanes each way from West Old Baltimore Road in Clarksburg to the I-4 Bridge over I-270
3. I-4 Overpass: Construct a road bridge over I-270 connecting to Germantown West.

Section VII: Next Steps

The main goal of this study was to propose a new Transportation Policy Area Review process that would satisfy the County Executive's Core Concepts and specific objectives stated in Section 1 above. The TPAR review and analysis outlined in this report achieves that goal. The goal of this *report* was to sufficiently demonstrate that such a process could be implemented and be effective in moving toward a new simpler and transparent TPAR. We believe that we have accomplished that, within the time and resource constraints given.

Setting up and defining a full set of balanced-results for all policy areas and the detailed cost estimate for all transit improvements and roadway construction involved in such a process is better left to a later effort once the proposal has been fully reviewed, considered, and adopted by the County Council with the advice of the Planning Board and the numerous and diverse set of interested stakeholders.

<u>TPAR Follow-Up Recommendations</u>:
To successfully implement TPAR, the following goals must be achieved:

1. Closer cooperation and interaction between the Executive Branch and MNCPPC regarding the development of the Cooperative Forecast

2. Closer cooperation between the Executive Branch and MNCPPC regarding the refinement of the transportation network analyzed in the Travel Demand Model.

3. Development of a Traffic Signal Monitoring and Optimization Program including an additional Traffic Engineering Position, software acquisition, and data acquisition.

4. Stronger process linkage between TPAR review and development and review of the CIP and CTP by the County Executive, the Planning Board and the County Council.

5. Increases in the mission and staffing to:

    a. Monitor, report, and provide recommendations to elected officials to ensure closer coordination between development and implementation of transportation solutions.

    b. Identify and implement transportation improvements that cannot be modeled with current technology (TDM, bikeways, sidewalks, etc.)

    c. Increase the focus on optimizing the existing signal network and explore ways to use the signal system to improve operations and reliability of the bus system.

    d. Undertake a financial analysis to explore the County's long term ability to support infrastructure, and evaluate the level of public / private partnership for each Policy Area.

Appendix A: List of Unbuilt Master Plan Projects

Appendix A lists all un-built Master Planned transportation projects by Policy Area. The projects listed provide transportation network capacity that can be modeled for future inclusion into the Transportation Model. The list was originally provided by MNCPPC, then reviewed and reduced to those projects that would be considered for TPAR funding in each Policy Area. Local projects that would mostly serve local subdivisions are excluded, as those links would have to be built by developers in order to provide access to their subdivisions. However, projects in which there may be possibilities for County participation are listed.

MCDOT will further review and validate Appendix A before undertaking the costing of all the projects and determining the costs per unit of development in cooperation with MNCPPC, the State of Maryland, and MCDOT Transportation Engineering Staff. It is expected that this task will be accomplished between the time of transmittal of the Proposed TPAR and the start of formal discussions by the County Council. For projects that span more than one Policy Area, the cost of the project for each Policy Area will be provided.

Menu of Master Planned Transportation Improvements -- Sorted by Policy Area, Mode, and Improvement Type -- Not Programmed by 2016

Policy Area(s)	Project Name	Implementation	Limits	Improvement Type	Facility Type
CLK,GTE,GTW,GBG,RDV,DER,	Corridor Cities Transitway (Proposed)	State	Shady Grove to Clarksburg	T	LRT
BCC,SSTP	Purple Line Transitway (Proposed)	State	Bethesda to New Carrollton	T	LRT
NB,POT	North Bethesda Transitway (Proposed)	State	Grosvenor Metro to Montgomery Mall	T	LRT
OLY,AH,KW	Georgia Avenue Busway (Proposed)	State	Glenmont to Olney	T	BRT
POT,BCC,NB,KW,SSTP,FWO	Capital Beltway	State	American Legion Bridge to Woodrow	R	1
GTE,MVA,GBG	Midcounty Hwy (Proposed)	County	Montgomery Village Av to MD 27	R	2
AH	MD097 Georgia Ave & MD028 Norbeck Rd	State	Interchange	R	1
AH	MD028 Norbeck Rd	State	MD 97 to MD 182	R	2
AH	MD182 Layhill Rd	State	ICC to Norwood Rd	R	2
AH	Aspen Hill Rd	County	MD 586 to MD 185	R	3
BCC	MD 355 & Cedar Ln	State	Interchange	R	1
BCC	River Rd	State	DC Line to I-495	R	2
BCC	Bradley Blv	State	MD 614 to I-495	R	3
BCC	Goldsboro Rd	State	MD 396 to MD 191	R	3
BCC	Massachusetts Ave	State	Sangamore Rd to MD 614	R	3
CLK	I 270 & New Cut Rd	State	Interchange	R	1
CLK	MD027 Ridge Rd	State/Dev (MD 355 to Skylark Rd)	Brink Rd to Skylark Rd	R	2
CLK	MD121 Clarksburg Rd	State/Dev (Broadway Av to I-	Top Tidge Dr to Chrisman Hill Dr	R	2
CLK	MD121 Clarksburg Rd Relocated	State/Dev (West Old Baltimore Rd to	West Old Baltimore Rd to I-270	R	2
CLK	MD355 Frederick Rd	State/Dev	Brink Rd to Cool Brook Ln	R	2
CLK	MD355 Frederick Rd Relocated	State	Cool Brook Ln to Snowden Farm Pkwy	R	2
CLK	A-304 (Proposed)	County/Dev (MD 121 to Newcut Rd		R	3
CLK	A-307 (Proposed)	County/Dev		R	3
CLK	Observation Dr Extended	County/Dev	Little Seneca Cr to Roberts Tavern Dr	R	2
CLK	Hyattstown Bypass (Proposed)	State	MD 355 to MD 355	R	3
CLK	New Cut Rd Extended	County/Dev (Broadway Ave to	West Old Baltimore Rd to MD 27	R	2
CLK	Snowden Farm Pkwy (Proposed)	County/Dev (MD 27 to Clarksburg Rd)	MD 27 to Clarksburg Rd	R	2
CLK	Snowden Farm Pkwy (Proposed)	County/Dev	Clarksburg Rd to MD 355	R	2
CLK	Brink Rd	County/Dev	MD 355 to MD 27	R	3
CLK	Shawnee La	County/Dev (Gateway Center	Gateway Center Dr to MD 355	R	3
CLK	Stringtown Rd	County/Dev (Overlook Park Dr	Clarks Crossing Dr to Snowden Farm Pkwy	R	3

Menu of Master Planned Transportation Improvements -- Sorted by Policy Area, Mode, and Improvement Type -- Not Programmed by 2016

Policy Area(s)	Project Name	Implementation	Limits	Improvement Type	Facility Type
CLV	Norwood Rd	County	MD 650 to MD 182	R	3
CLV	MD 028 Norbeck Rd	State	MD182 to Peach Orchard Rd	R	2
CLV	Thompson Rd Extended	County	Rainbow Dr to Thompson Dr	R	3
DAM	NONE				
DER	MD355 Frederick Rd & Gude Dr	State	Interchange	R	1
DER	ICC & Mid-County Hwy	State	Interchange	R	1
DER	Metro Access Crabbs Branch Wy	County/Dev	Interchange	R	1
DER	Crabbs Branch Way Extended	County/Dev	Shady Grove Rd to Amity Dr	R	3
FWO	US 29 & Blackburn Dr	State	Interchange	R	1
FWO	US 29 & Fairland	State	Interchange	R	1
FWO	US 29 & Greencastle Rd	State	Interchange	R	1
FWO	US 29 & Musgrove Rd	State	Interchange	R	1
FWO	US 29 & Stewart Dr	State	Interchange	R	1
FWO	US 29 & Tech Rd	State	Interchange	R	1
FWO	MD 028 Norbeck Rd	State	Peach Orchard Rd to PG Line	R	2
FWO	Briggs Chaney Rd	County	ICC to PG Line	R	3
FWO	Burtonsville Blv	State/Dev	MD 198 to Dustin Rd	R	3
FWO	Calverton Blv	County	Cherry Hill Rd to PG Line	R	3
FWO	Fairland Rd	County	MD 650 to PG Line	R	3
FWO	Greencastle Rd	County	Robey Rd to PG Line	R	3
GBG	I 270 and Watkins Mill Rd	County/State/Dev	Interchange	R	1
GBG,NP	MD117 West Diamond Ave	State	Seneca Creek St Pk to Muddy Branch Rd	R	2
GBG,NP	MD124 Montgomery Village Ave	State	MD 28 to Longdraft Rd	R	2
GBG,NP	Muddy Branch Rd	County	MD 28 to MD 117	R	2
GBG,NP	Longdraft Rd	County	MD 124 to MD 117	R	3
GBG	Oakmont Ave Extended	County	Oakmont Av to Washington Grove Ln	R	3
GBG	Oden'hal Ave	County	Lost Knife Rd to Summit Av	R	3

Menu of Master Planned Transportation Improvements -- Sorted by Policy Area, Mode, and Improvement Type -- Not Programmed by 2016

Policy Area(s)	Project Name	Implementation	Limits	Improvement Type	Facility Type
GTE	MD027 & MD355	State	Interchange	R	1
GTE	MD027 & Observation Dr	State	Interchange	R	1
GTE	MD118 & MD355	State	Interchange	R	1
GTE	MD118 & Mid County Hwy	State	Interchange	R	1
GTE	MD355 & Middlebrook Rd	State	Interchange	R	1
GTE	Shakespeare Dr	County/Dev	Watkins Mill Rd to MD 355	R	3
GTE	Watkins Mill Rd	County	Midcounty Hwy to Midcounty Hwy	R	3
GTE	Dorsey Mill Rd	County	Bridge over I-270	R	3
GTW	MD117 Clopper Rd	State	Seneca Creek St Pk to east of MD 121	R	2
GTW	MD119 Great Seneca Hwy	State	Longdraft Rd to Middlebrook Rd	R	2
GTW	Father Hurley Blv	County	Wisteria Dr to Crystal Rock Dr	R	2
GTW	Crystal Rock Dr Extended	Dev (Kinster Dr to Dorsey Mill Rd)	Kinster Dr to Dorsey Mill Rd	R	3
GTW	Dorsey Mill Rd	County/Dev	Bridge over I-270	R	3
GTW	Observation Dr Extended	County	Waters Discovery Ln to Little Seneca Cr	R	3
KW	MD586 Veirs Mill Rd & Randolph Rd	State	Interchange	R	1
KW	MD586 Veirs Mill Rd	State	Twinbrook Pkwy to Randolph Rd	R	2
KW	Capitol View Ave Relocated	State/Dev	Edgewood Rd to Stoneybrook Dr	R	3
MVA	MD115 Muncaster Mill Rd	State	Redland Rd to MD 124	R	2
MVA	MD124 Woodfield Rd	State	Emory Grove Rd to Warfield Rd	R	2
MVA	MD124 Montgomery Village Av	State	Russell Av to Midcounty Hwy	R	2
MVA	Goshen Rd Widening	County	Oden'hal Rd to Warfield Rd	R	2
MVA	Snouffer School Rd	County/Dev	MD 124 to Goshen Rd	R	3
MVA	Wightman Rd	County	Goshen Rd to Brink Rd	R	3
NB	Montrose Pkw (Proposed)	State	Maple Av to Parklawn Dr	R	2
NB	Montrose Pkw (Proposed)	County	Parklawn Dr to MD 586	R	2
NB	Old Georgetown Rd	County	MD 355 to Nebel St	R	2
NB	Twinbrook Pkw	County	Chapman Av to Ardennes Av	R	3
NB	Woodglen Dr Extended	County/Dev	Nicholson Ln to Marinelli Rd	R	3

Menu of Master Planned Transportation Improvements -- Sorted by Policy Area, Mode, and Improvement Type -- Not Programmed by 2016

Policy Area(s)	Project Name	Implementation	Limits	Improvement Type	Facility Type
OLY	MD097 Brookeville Byp (Proposed)	State	Goldmine Rd to Georgia Av	R	2
OLY	MD097 Georgia Ave	State	MD 108 to Prince Phillip Dr	R	2
OLY	MD028 Norbeck Rd	State	MD 97 to MD 182	R	2
OLY	MD108 Olney-Laytonsville Rd	State	Muncaster Rd to Olney Mill Rd	R	2
POT	MD189 Falls Rd Relocated	State	Democracy Blvd to Rockville Line	R	2
POT	MD190 River Rd Relocated	State	Riverwood Dr To River Oaks Ln	R	2
POT	Montrose Rd Extended	County	MD 189 to Falls Rd Relocated	R	3
POT	Montrose Rd	County	Seven Locks Rd to I-270	R	3
POT	Westlake Dr	County	Westlake Ter to Tuckerman Ln	R	3
RDV	MD028 Key West Ave & MD119 Great Seneca Hwy	State	Interchange	R	1
RDV	Sam Eig Hwy & Fields/Diamondback Dr	State/County	Interchange	R	1
RDV	Sam Eig Hwy & MD119 Great Seneca Hwy	State	Interchange	R	1
RDV	Shady Grove Rd & MD028 Darnestown Rd	State	Interchange	R	1
RDV	Darnestown Rd Relocated	County	Darnestown Rd to Great Seneca Hwy	R	2
RDV	MD119 Great Seneca Hwy Relocated	County/State	Darnestown Rd to Sam Eig Hwy	R	2
SSTP	Lyttonsville Rd	County	Grubb Rd to Lyttonsville Pl	R	3
SSTP	Seminary Rd	County/Dev	MD 192 to MD 97	R	3
RKV,GBG,GTE, GTE,CLK	I-270 ***(HOV and Widening)***	State	I-370 to Frederick Co Line	R	1
RURW	MD118 Germantown Rd	State	MD 28 to MD 117	R	2
RURW	Whites Ferry Rd Relocated	County	Partnership Rd to west of Partnership Rd	R	3

Appendix B: Measuring and Communicating Arterial Level of Service

Two critical aspects of the Roadway Adequacy Analysis are first how to most appropriately measure the performance of the arterial roadways and second how to most effectively communicate that to an audience consisting of decision makers, interested stakeholders, and other professionals who may not have been trained as a Transportation Engineer. This Appendix is a brief documentation of the approach that has been taken to accomplish these two critical aspects of this TPAR Proposal.

Reliance on Approved Professional Methods and Measurement Approaches

As noted in Section III, Part 2, page 13 of the Report, the latest version of the "**Highway Capacity Manual**" classifies arterial roadways into four categories, according to their role in the transportation network and their "free flow speeds". For some context, the "**Manual**" is prepared by the Highway Capacity and Quality of Service Committee of the Transportation Research Board, an affiliated organization of the National Academy of Sciences. This Committee of volunteers is an international one and the **Manual** is the professional approach and standard applied worldwide. The first version of the Manual was prepared in 1950 and periodic updates have been prepared about once a decade. The current version was published in 2000 and the Committee has been working on the next update, which is scheduled to be released later in 2010.

Returning to the substance of the applicability to TPAR, the **"Manual"** defines "free flow speed" as:

> "… the average speed of the traffic stream when volumes are sufficiently low that drivers are not influenced by the presence of other vehicles and when intersection controls (i.e. signals or signs) are not present or are sufficiently distant as to have no effect on speed choice. As a consequence, free flow speed is typically observed along mid-block portions of the urban street system."

In the absence of detailed information, the **Manual** recommends reliance on the posted speed limit, or the default values in the **Manual**. The **Manual** also recommends the operating Level of Service (LOS) for a given road segment be measured as a percentage of the "free flow speed". As an example, if the free flow speed is 40 miles per hour (mph) and the traffic conditions have a speed of 20 mph, then the arterial would be operating at 50% of the free flow speed. The main focus of the **Manual** in using such speed measures is that they are an aspect of characterizing the capacities of different classes of arterials and that information can be used in the design of roadways. There is a lesser concern as to how those measures are used in planning, regulatory, or growth management applications that uses assumed or forecast future conditions.

Application of this Measurement Approach to the TPAR Proposal

TPAR deals with an average level of congestion for Roadway Adequacy for each Policy Area for future conditions using results from a Travel Demand Forecasting model. One of the modeling results is an estimate of the congested peak period speed by direction of travel for roadway links that are included in the model. The direction of travel for a linked-pair with the higher or peak traffic volume will have the slower more congested speed link speed. The modeling system also has an estimate of the free flow speed by direction for each link in the network being analyzed. Thus an estimate of the percent a future link speed is of the free flow speed can be calculated for each link, by peak and non-peak direction, from the modeling results.

The following discussion outlines and documents the particular methods and techniques that have been used to adapt and apply this approach and measurement standards from the **Manual** to the TPAR Roadway Adequacy Analysis. Exhibit B.1 has been the starting point of the adaptation and application. The information content in the top part of Exhibit B-1 comes directly from the **Manual**, as referenced. The uses of colors in the top and bottom part and the calculation of percentages in the bottom part have been done for TPAR. That has been done as part of providing ways to effectively communicate these concepts to the audiences of TPAR.

Basic Source: Highway Capacity Manual (2000) Exhibit 15-2 Urban Street LOS by Class

Urban Street Class	I	II	III	IV
Range of Free Flow Speeds	55 to 45 mph	45 to 35 mph	35 to 30 mph	35 to 25 mph
Typical Free Flow Speed	50 mph	40 mph	35 mph	30 mph
Level of Service	Average Travel Speed (mph)			
A	> 42	> 35	> 30	> 25
B	34 42	28 35	24 30	19 25
C	27 34	22 28	18 24	13 19
D	21 27	17 22	14 18	9 13
E	16 21	13 17	10 14	7 9
F	=< 16	=< 13	=< 10	=< 7

Level of Service	Average Speed Relative to the Typical Free Flow Speed (as a percent)			
A	> 84%	> 88%	> 86%	> 83%
B	68% 84%	70% 88%	69% 86%	63% 83%
C	54% 68%	55% 70%	51% 69%	43% 63%
D	42% 54%	43% 55%	40% 51%	30% 43%
E	32% 42%	33% 43%	29% 40%	23% 30%
F	=< 32%	=< 33%	=< 29%	=< 23%

Exhibit B.1: Classification of Arterials with Variation in Free Flow Speed

The first three rows of the top part of Exhibit B.1 indicate that the **Manual** has defined four classes of urban streets based primarily upon their range of free flow speed. The typical free flow speed for each class is also given. The next six rows provide one row for each Level of Service (LOS) category where each LOS is characterized by a range of operating speeds. It needs to be emphasized that these are link speeds that incorporate delays at traffic signals. Thus for a person traveling at between 24 and 30 mph on a Class III arterial that has a typical free flow speed of 35 mph they would be experiencing LOS B conditions on average over the link they are using. For short distances within the link they may experience slower speeds and more congested conditions for some of the time they are on that link, for example needing to stop for a traffic signal, a pedestrian crossing, or a stop sign for a crossing roadway. Links in this context, as in the TPAR analysis are many blocks long perhaps with a few signals or other traffic control devices that can slow or interrupt the traffic flow.

Scanning across any one of the six LOS rows shows that the range of speed (in the top part) or the percentages (in the bottom part) are similar but not the same. That is because it has been the collective and long standing experience of the Committee preparing the **Manual** that people's perception of the quality of performance of an arterial roadway does not simply depend upon their average speed of travel but also their expectations for that particular roadway class

and many other conditions. This aspect is still an on-going aspect of research by the Committee. To begin adapting this approach from the **Manual** we have prepared Exhibit B.2 that takes the percentages and other information from Exhibit B.1 and has transformed that into the graph of Exhibit B.2.

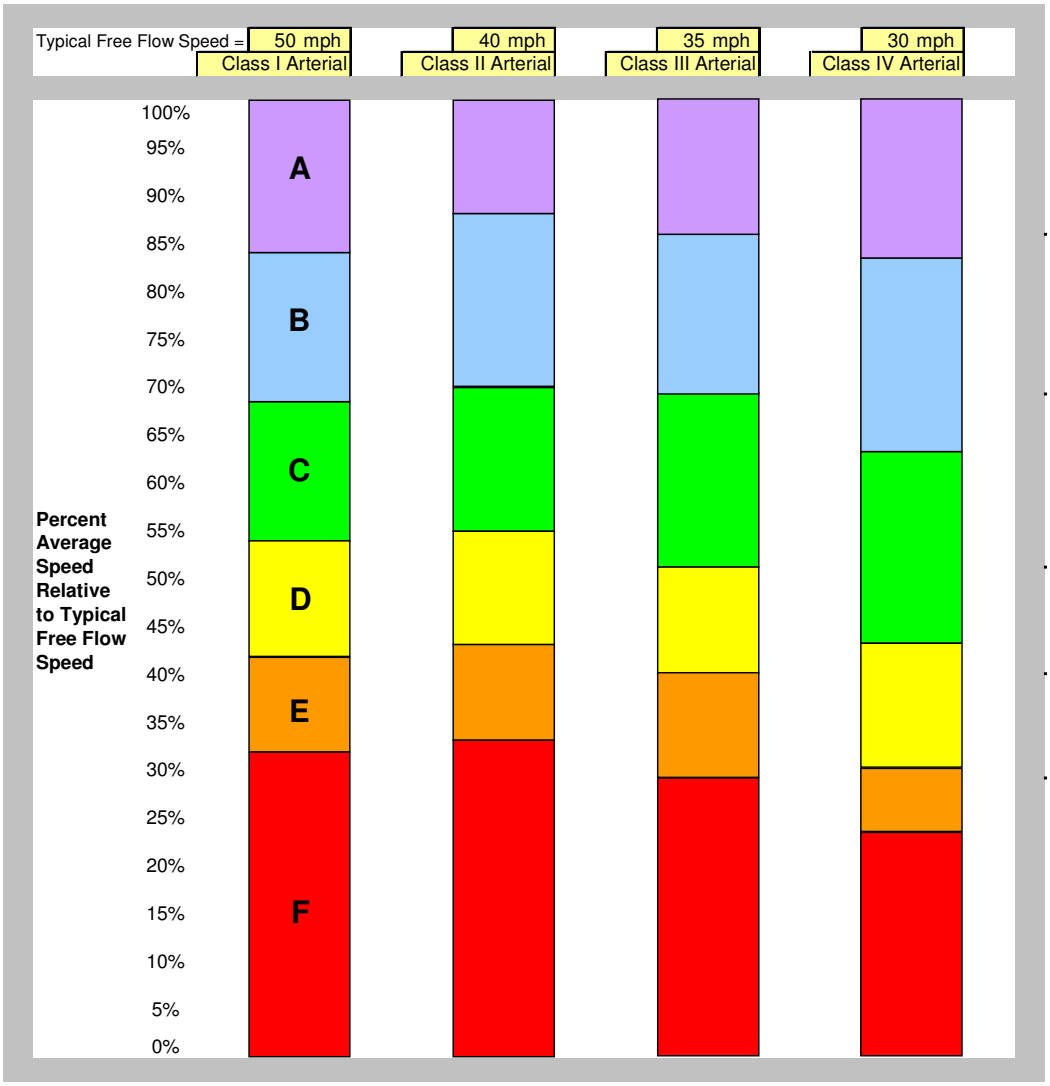


Exhibit B.2: Variation of LOS Speed Ranges by Roads of Different Arterial Class

It is important to note that the information presented in Exhibit B.2 is no more or anything less in substance than the information that is already part of the **Manual**. We have formatted that information in a different manner to better communicate it to the TPAR audiences and to help in illustrating how that information is being adapted to the TPAR Roadway Adequacy Analysis. The observation about Exhibit B.1 that the speed ranges for each LOS category for each Arterial Class are similar but not the same is easily observed in Exhibit B.2 by scanning across the graphic. That has not been a concern to the Committee that developed the **Manual**, nor should it necessarily be a concern of TPAR. However, to obtain average LOS estimates for different combinations and proportions of Arterial Classes found in each of the Policy Areas requires a way to average speeds from roads of different Arterial Classes, which is discussed next.

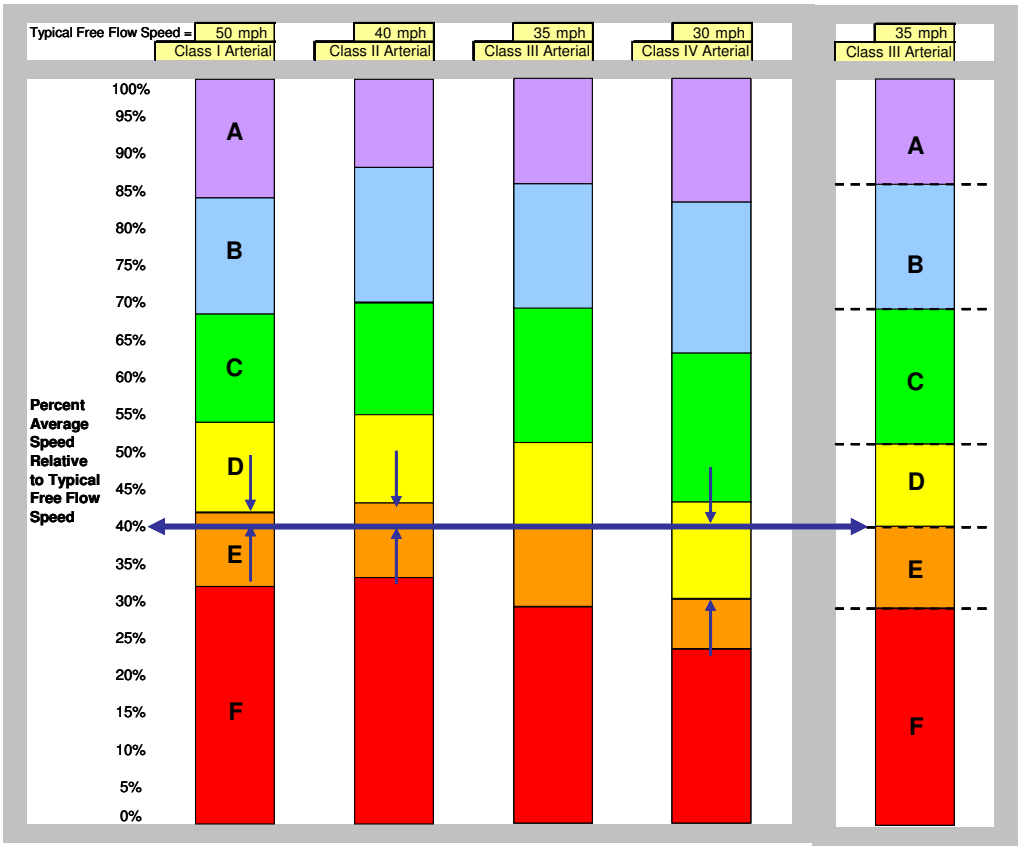


Exhibit B.3: Normalization of LOS Speed Ranges for Roads of Different Arterial Class

A new column is added to Exhibit B.2 to illustrate the fairly standard mathematical and statistical method of "normalization" that is used in many applications in circumstances similar to the one being addressed here. The process of normalizing similar but different things first require choosing one as the base or typical condition to which the others will be related – in this instance we have chosen Arterial Class III as the base for normalization. In this case the bar that is on the right side of Exhibit B.3 is the same as that of Arterial Class III. Such arterial roads are typical arterial of County and a good number of State Highways.

From a computational perspective the normalization picked the value of the boundary between LOS D and LOS E for Arterial Class III as the value to normalize to. Thus no changes in the averaging process are made to Class III Arterials while different changes were made to the three other classes when averaging. For example as illustrated by the space between the heads of the blue arrows for Arterial Class I the values for such arterials were "factored-down" by the proportional distance between the two arrowheads with Class II having an assumed value of 1.00. Class II arterials were like-wise factored down by a somewhat larger amount as the relative spacing between its arrowheads is somewhat larger. On the other hand for Class IV Arterials, they needed to be "factored-up" by about 1/3 to normalize them to the Class III Arterials. While to many people this may sound like complicated mathematics it is a fairly routine and standard computational method that was applicable in this instance and was carried out within a spreadsheet context.

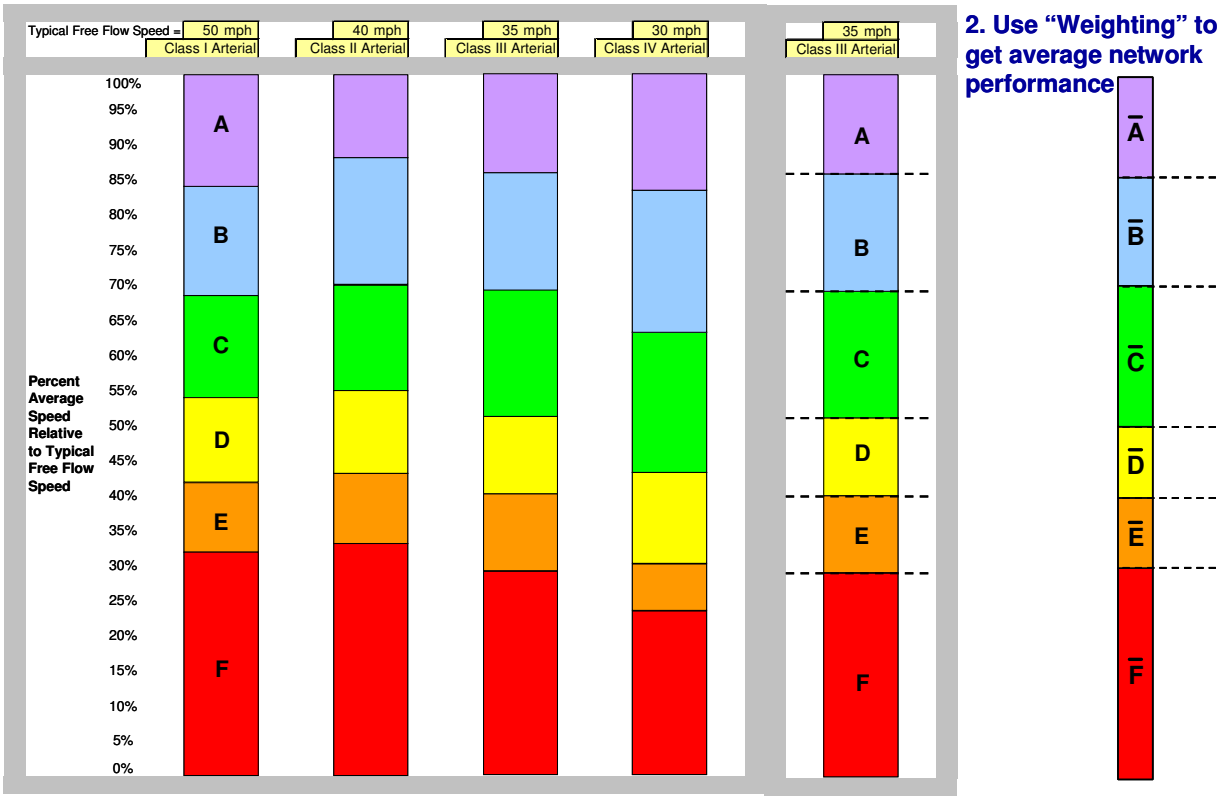


Exhibit B.4: Using a Volume-Weighted Average to get Overall Policy Area Performance

The **Manual** provides little if any guidance on how to effectively combine diverse classes of roadways with largely varying quantities of traffic into a measure of overall network performance serving an area. The TPAR proposal requires such a method. The current Policy Area Transportation Review method has as one of its component parts on the roadway side a method for doing so that is derived from regional Travel Demand Model applications and standard professional practices. An important part of those methods is to account for the different **quantity** of use of different roadways when combining them to get an overall measure of the **quality** of performance of the network or system.

As a simple example consider two network systems each with two roads. In System A one road is a relatively a two-lane low volume but highly congested road while the second road is a multi-lane relatively high volume but not very congested road. In system B the situation is reverse with the first road being a very congested multi-lane road with high volumes and the second road is a two lane with low volumes and little congestion. To people who live in or travel through those areas, System A would be perceived as being much less congested than System B. That is because users intuitively put more weight to the more traveled and more congested conditions because more of them would experience the congestion.

Exhibit B.4 is meant to illustrate that the proposed TPAR method is to weight the averaging of the **quality** of different roadways (the relative speeds) by first "weighting" them by the **quantity** of use of each (the volume of use in the peak period by direction). Each Policy Area in the County contains many road segments and many different classifications of roadways and in order to establish an Roadway Adequacy Measure all road segments in the Policy Area are "weighted" on the basis of their classification, length, traffic volumes and forecasted operating speeds relative to the assumed "free flow speeds".

The graphic on the right side of Exhibit B.4 is intended to denote the results of such a weighted averaging process. As such the mathematical notation for averaging (a bar over the quantity or variable) is shown. That is the same graphic element that is shown on the left side of Exhibit B.5 and each of the similar Exhibits used in this TPAR Report. This Appendix thus shows how the concepts of measuring arterial congestion on a roadway-by-roadway base have been adapted to get an overall measure of Policy Area Performance. It can be easy in the throws of discussion and decision making to forget about this important aspect of these summary Exhibits.

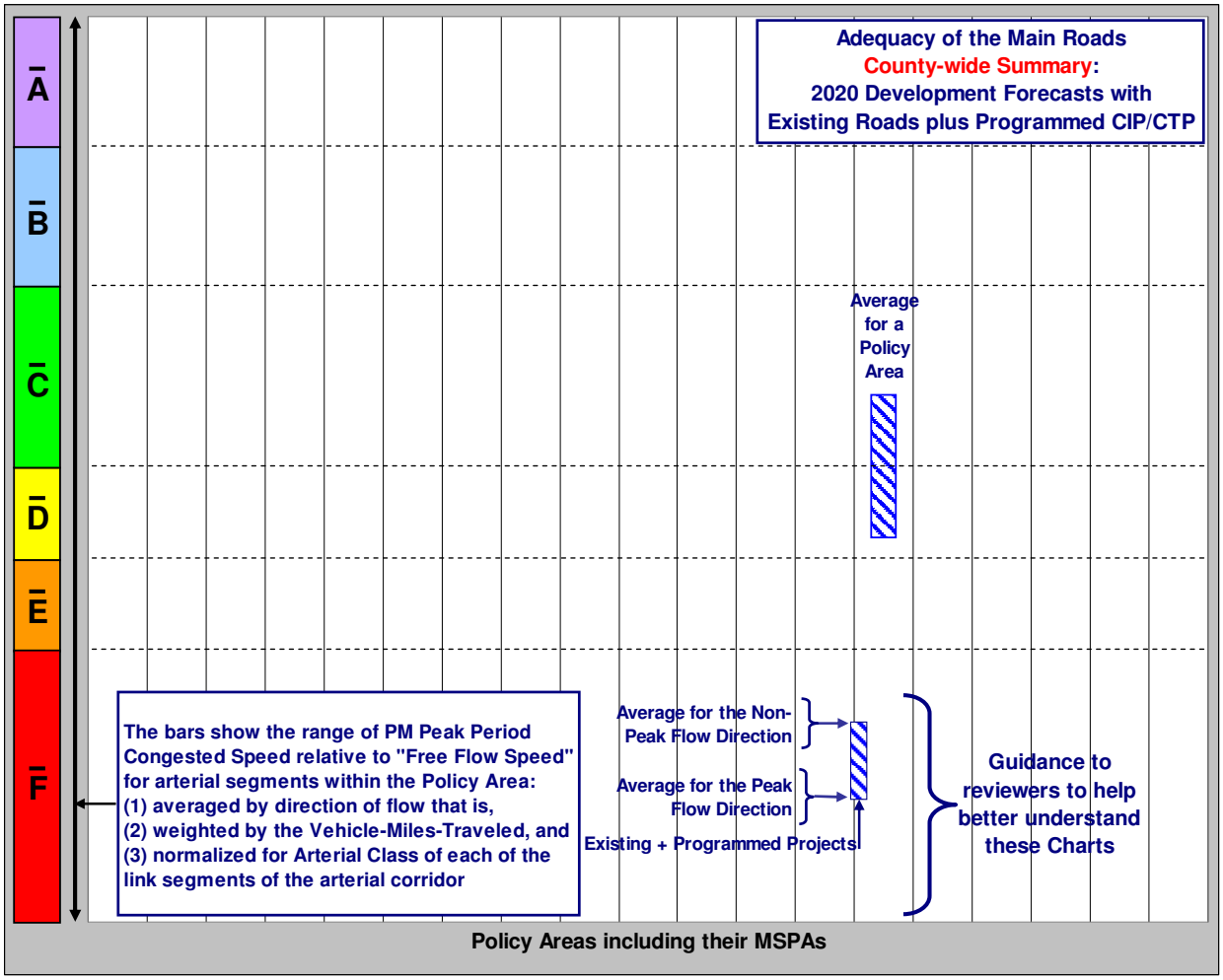


Exhibit B.5: Indication of a Volume-Weighted Average of Policy Area Level of Service

In summary, this Appendix has provided information on two critical aspects of the Roadway Adequacy Analysis: (1) how to most appropriately measure the performance of the arterial roadways, and (2) how to effectively communicate that to an audience consisting of decision makers, interested stakeholders, and other professionals who may not have been trained as Transportation Engineers. We believe that this Appendix has accomplished those dual and diverse objectives.

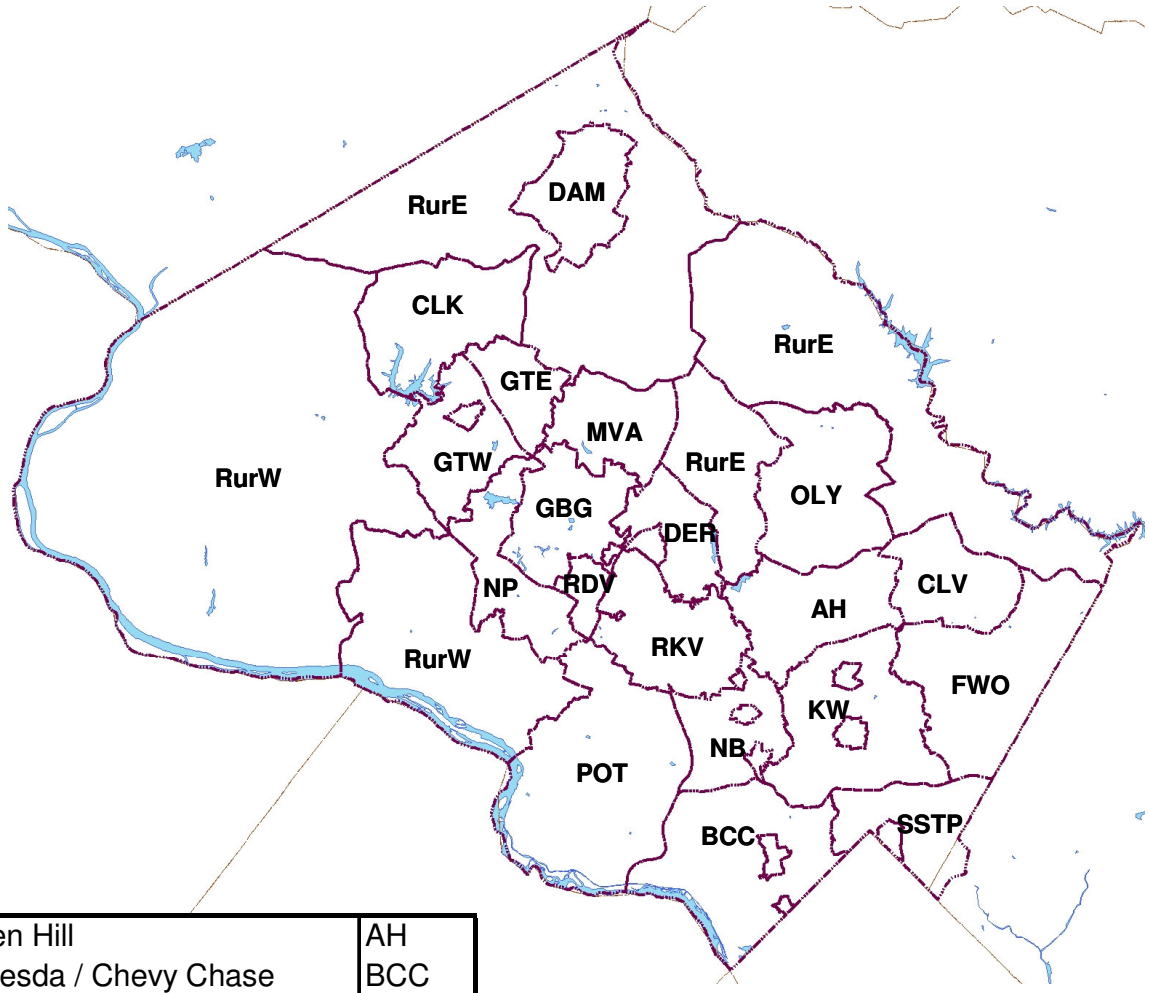
Appendix C: Stakeholders Invited to Participate

The Team wishes to acknowledge and express thanks for the time given and the useful comments provided by the following individuals:

Lon	Anderson	AAA
Marilyn	Balcombe	Gaithersburg-Germantown Chamber of Commerce
Frank	Bossong	Rodgers and Associates
Max	Bronstein	Strathmore / Bel Pre Civic Association
Cheryl	Cort	Coalition for Smarter Growth
Heather	Dlhopolsky	Bethesda – Chevy Chase Chamber of Commerce
Steve	Elmendorf	Linowes and Blocher
Lisa	Fadden	Montgomery County Chamber of Commerce
Lyn	Fantle	Clarksburg Town Center Advisory Committee
Natalie	Goldberg	Garrett Park Estates / White Flint Park Citizens Association
Craig	Hedberg	ITS Inc.
Kathy	Hulley	Clarksburg Civic Association
Jim	Humphrey	Montgomery Civic Federation
Dick	Kauffinger	Montgomery Civic Association
Steve	Kaufman	Linowes and Blocher
Arnold	Kohn	Tower Companies
Raquel	Montenegro	Maryland National Capital Building Industry Association
Christine	Norris	Northeast Development Group
Ed	Papazian	Kimley-Horn
Rich	Parsons	Parsons and Associates
Sam	Raker	Transportation Policy Report Committee
Jane	Redicker	Greater Silver Spring Chamber of Commerce
Steve	Robins	Lerch, Early and Brewer
Ben	Ross	Action Committee for Transit
Harry	Sanders	Purple Line Advisory Committee
Stan	Schiff	Transportation Policy Report Committee
Steve	Silverman	Montgomery County Office of Economic Development
Nancy	Soreng	League of Women Voters
Bob	Spalding	Miller and Smith
Emil	Wolanin	MCDOT Traffic Engineering
Robert	Wulf	BF Saul
Jim	Young	Marriott Corporation

Elected Officials Consulted
Council President and Member of the PHED Committee Ms. Nancy Floreen
Councilmember Marc Elrich, Member PHED Committee
Councilmember Mike Knapp, Chair, PHED Committee

Appendix D: Map of Policy Areas and Abbreviations



Aspen Hill	AH
Bethesda / Chevy Chase	BCC
Clarksburg	CLK
Cloverly	CLV
Damascus	DAM
Derwood	DER
Fairland / White Oak	FWO
Gaithersburg	GBG
Germantown East	GTE
Germantown West	GTW
Kensington Wheaton	KW
Montgomery Village / Airpark	MVA
North Bethesda	NB
North Potomac	NP
Olney	OLY
Potomac	POT
R&D Village	RDV
Rockville	RKV
Silver Spring / Takoma Park	SSTP
Rural East	RurE
Rural West	RurW

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Other Supporting Staff:

Greg Leck, MCDOT Traffic Engineering and Operations
Phil McLaughlin, MCDOT Division of Transit Services
Emil Wolanin, Chief, MCDOT Division of Traffic Engineering

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Dan Hardy MNCCPC Transportation Planning
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Yetta McDaniel, MNCPPC Transportation Planning