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DRAFT

MEMORANDUM

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TO: Laura Hodgson, LEED AP, Montgomery County Planning Department of the Maryland-National Capital Park and Planning Commission

SUBJECT: **Transportation Analysis Methodology and Results for the MARC Rail Communities Plan**

This white paper describes the transportation analyses performed in support of the MARC Rail Communities Plan and the results of the analyses. The analyses focus on the Germantown study area because zoning allows for substantial additional development within that area. However, no public sewer and a lack of a market for substantial redevelopment in Boyds means very little growth and additional traffic is projected; therefore, minimal transportation analysis was completed for Boyds. The analyses include travel demand forecasting, evaluation of intersection operating performance, and evaluation of roadway operating performance under selected land use and transportation network alternatives. The analyses follow the process and standards set forth in Montgomery County's 2017 *Local Area Transportation Review* (LATR) *Guidelines* and 2016 Subdivision Staging Policy.

Executive Summary

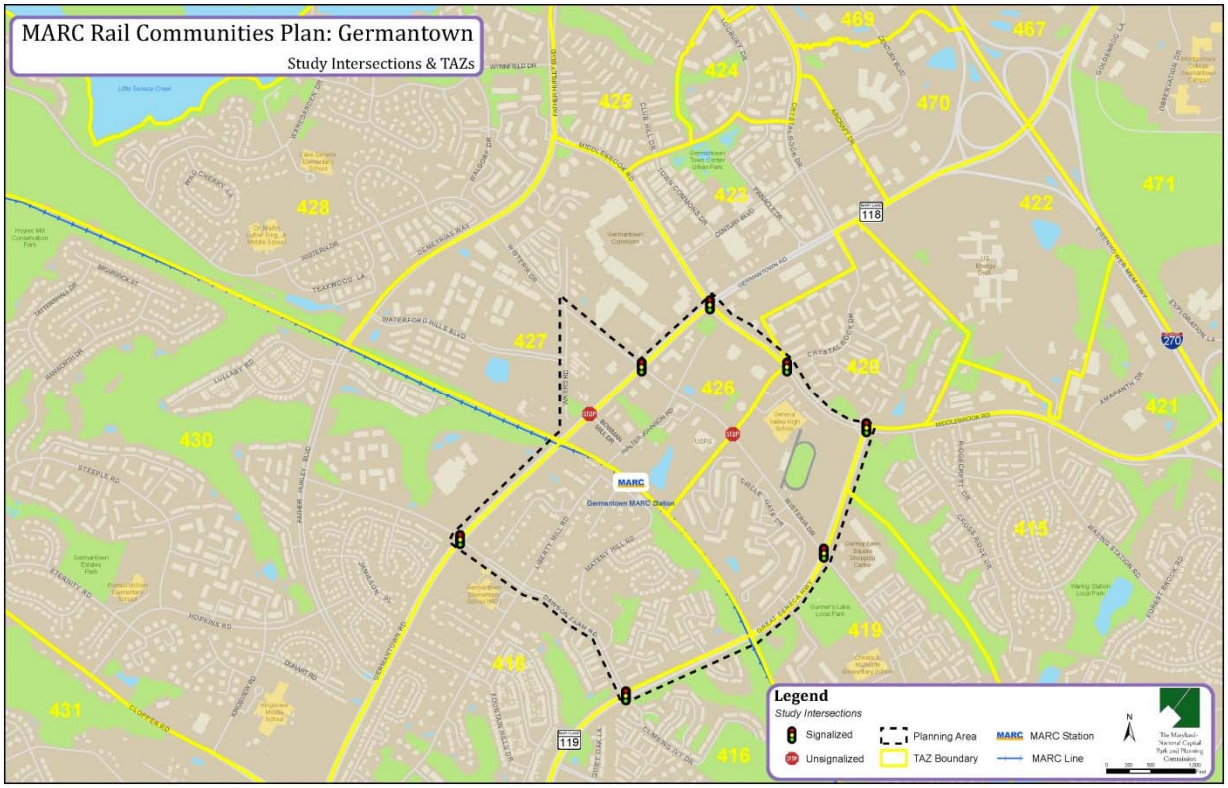
The major intersections within the planning area for the Germantown portion of the MARC Rail Communities Plan include eight existing intersections and one future intersection. The intersection capacity for all intersections was assessed using the 2000 Highway Capacity Manual (HCM) methodology and the Critical Lane Volume (CLV) methodology for three scenarios: 2015 Existing, 2040 Build Out, and 2040 Build Out with Road Diet. The 2040 Build Out with Road Diet evaluates the 2040 Build Out scenario volume with less through lanes than currently planned along two of the primary roadways through the planning area, Middlebrook Road and Great Seneca Highway (MD 119). All intersections evaluated in all three scenarios were found to be at or below the applicable congestion standards defined in Table 2 of the 2017 LATR Guidelines. Existing traffic volumes were sourced from recent transportation studies, and the future volumes were developed using results derived from the application of the Metropolitan Washington Council of Government's (MWCOG) regional travel demand model, based off an expected build out land use scenario received from Montgomery County Planning Department staff.

The planning area for the Boyds portion of the MARC Rail Communities Plan includes two intersections. The intersection capacity was assessed using the 2000 HCM methodology and the CLV methodology for two scenarios: 2015 Existing and 2040 With Annual Growth. In the 2040 scenario, one intersection was found to be below the applicable congestion standard referenced above and one intersection was found to be above the threshold. Maryland State Highway Administration (MD SHA) is aware of the congestion

at the southern intersection and is planning to install a traffic signal at both intersections due to their proximity. Using the traffic signal parameters noted in the MD SHA study, both intersections signalized operate below the applicable vehicle delay standards defined in Table 2 of the 2017 LATR Guidelines. Existing traffic volumes were sourced from a recent MD SHA study, and the future volumes were calculated using the average annual growth rate computed from volumes within the MD SHA study.

Germantown Study Area

The Germantown MARC Rail Community planning area, shown in map below by the black dashed line, is generally bounded by Germantown Road (MD 118), Middlebrook Road, Great Seneca Highway (MD 119), and Dawson Farm Road, except for the triangular area north of Germantown Road. Eight major study intersections were analyzed for transportation adequacy, plus a future intersection included in the future analyses scenarios. The new intersection connects Waters Road and Bowman Mill Drive at Germantown Road and is expected to be signalized in the future 2040 Build Out scenario. The primary roadways through the planning area are: Germantown Road, Middlebrook Road, Crystal Rock Drive, Great Seneca Highway, and Wisteria Drive.



Germantown Travel Demand Forecasting Process

Updating Land Use in the Travel Demand Model with Expected Level of Build Out

A variety of land use forecasts/concepts were received from Montgomery County Planning Department staff encompassing various levels of buildout. The land use data was aggregated by traffic analysis zone (TAZ) into the following categories: residential (number of households), residential (population), non-

residential (square feet of office, retail, industrial, or other), and employment (number of jobs by office, retail, industrial, or other).

A comparison of the proposed land use forecasts received from the Montgomery County Planning Department and the MWCOG regional travel demand model input data showed significant differences, including additional development in the Planning Department's Master Plan forecast because that forecast includes moderate to high build out of zoning while the MWCOG forecast includes what development the area is likely to capture based on market trends. To revise the MWCOG model to be consistent with the land use forecasts of the Master Plan, a subarea forecasting process based upon the MWCOG 2.3.57a regional travel demand forecasting model and Round 8.4 Cooperative Forecasts was used. The MWCOG regional travel demand model is developed at the level of detail needed to support the evaluation of the regional Constrained Long Range Plan and air quality analysis. In support of the subarea forecasting process, more detailed transportation networks and TAZs are often incorporated into this tool to capture the local traffic patterns for subarea/corridor studies. This change was necessary for the Germantown MARC Rail Communities Plan study area. The post mode choice assignment approach used was developed to add the desired level of detail to the transportation network and mimic the previous Planning Department transportation model subarea process used for similar studies (e.g., Travel/3, used for the White Flint Sector Plan Update). Steps taken to revise the travel demand model included the following.

- The 2015 and 2040 MWCOG 2.3.57a travel forecasting model networks and TAZ land use files were used as a foundation.
- The 2015 and 2040 network details (TAZ boundary splits) within the Germantown Study "impact area," which include the MARC Rail Communities Study Area and surrounding TAZs, were transferred from the recently developed MNCPPC Travel/4 travel forecasting model.
- Additional network detail was added including splitting MWCOG TAZs to create sub TAZs. Spilt TAZs included numbers 418, 420, 426, and 427.

This process ensures that the results are consistent with the adopted regional model but also allows for additional network and zone detail within the Germantown Study Area.

Modeled Scenarios

Three scenarios were analyzed for Germantown: 2015 Existing, 2040 Build Out, and 2040 Build Out with Road Diet. The 2015 Existing scenario represents existing conditions today; 2015 data was used because it was less than one year old at the start of the Master Plan process. The 2040 Build Out scenario models what the expected level of build out would be based on the proposed zoning and analysis of Germantown's development patterns over time. Full build out assumed a 22 percent density bonus for maximum contribution of moderately priced dwelling units (MPDUs) within the study area. As it is unlikely every residential property will provide 15 percent MPDUs for the density bonus, the 2040 Build Out scenario models approximately 95 percent build out of the residential development under the proposed zoning. The 2040 Build Out scenario models approximately 100 percent build out of the non-residential proposed zoning. The 2040 Build Out scenario also assumed the 2009 Germantown Master Plan recommendation of four through lanes on Wisteria Drive, whereas now there are only two through lanes in certain sections. The 2040 Build Out with Road Diet scenario evaluates the same traffic volumes generated from the 2040 Build Out scenario with the lane adjustments noted above for Wisteria Drive,

but analyzes Middlebrook Road with four through lanes instead of the existing six lanes and Great Seneca Highway as four lanes instead of the prior master plan's six lanes. This reduction in lanes for Middlebrook Road and Great Seneca Highway constitute the Road Diet recommended as part of the MARC Rail Communities Plan.

The 2040 land use concept that the future traffic volume is based on is shown in the table below.

Sub TAZ	Households	Population	Jobs			
			Office	*Retail*	*Industrial*	*Other*
4271	259	542	0	39	0	0
4272/4273	1215	2899	1365	855	257	70
4201	0	0	0	0	0	503
4202	1235	2665	0	0	0	0
4203	999	2316	199	2	0	0
4261	175	419	1641	113	0	0
4262	272	675	302	60	27	25
4181	434	1333	7	0	0	2
4182	776	2166	0	158	0	139
Total	**5,365**	**13,015**	**3,514**	**1,227**	**284**	**739**

Developing Future Average Daily Traffic

With a revised travel demand model, a 2015 subarea forecast for average daily traffic (ADT) was prepared and validated and a 2040 subarea forecast for ADT based on the expected level of build out was prepared.

The model output ADT figures were refined using factoring methods outlined in the NCHRP Report 765[1]. A combination of the ratio and difference method was used. These methods require field ADT figures and model derived base year ADT figures. Historical ADT counts along the primary roadways within the planning area (Germantown Road, Great Seneca Highway, Middlebrook Road, and Wisteria Drive) were sourced from MD SHA's Internet-Traffic Monitoring System (I-TMS). A baseline of the *difference* and *ratio* of field ADT figures to model-produced ADT was established. The model produced future volumes were adjusted by 1) the baseline difference, and 2) the baseline ratio. The two adjusted future volumes were averaged to create smoothed out volumes, less affected by extremes that may result from the travel demand modeling process. The table below illustrates the process.

Segment	Base Year Field ADT	Base Year Model ADT	Base Year Difference	Base Year Ratio	Horizon Year ADT	Horizon Year Adjusted Difference	Horizon Year Adjusted Ratio	Horizon Year Average
A	*1,000*	*1,200*	*=1,200-1,000*	*=1,200/1,000*	*20,000*	*=20,000+200*	*=20,000*1.2*	*=(20,200+24,000)/2*
A	**1,000**	**1,200**	**200**	**1.2**	**20,000**	**20,200**	**24,000**	**22,100**

[1] TRB. NCHRP Report 765 *Analytical Travel Forecasting Approaches for Project-Level Planning and Design.* 2014.

Note: An updated build out land use forecast was shared by Planning Department staff in June of 2017. The updated land use forecast was compared to the 2016 land use forecast used to develop the 2040 average daily traffic volume, revealing either no change or a reduction in buildout. Therefore, the previously developed average daily traffic and turning movement volumes were not revised. To be conservative, all traffic analysis was conducted based on the higher build out land use yield from the fall 2016 scenario.

Developing Future Intersection Turning Movement Counts

Existing turning movement counts for the morning and evening peak hours were primarily sourced from the Seneca Valley High School Traffic Impact Study and collected in March and April of 2015. The turning movement counts for two study intersections were sourced from the Planning Department's Intersection Analysis online application and dated May of 2016. (A data summary table is appended.)

The average annual growth rate, calculated from the change in existing ADT to 2040 forecasted ADT, was applied to the existing intersection volumes to achieve the 2040 forecasted intersection volumes. A network wide average annual growth rate of 0.47% was applied. The 2040 network turning movement counts were balanced to smooth out significant changes in volumes between intersections, and rounded to the nearest multiplier of five.

Germantown Intersection Analysis

According to the 2017 LATR Guidelines, the nine study area intersections fall in two separate policy areas, each with their own intersection congestion standard; Germantown West or Germantown Town Center. For study simplification and consistency, all study intersections were assessed using the critical lane volume method (CLV) and the 2000 Highway Capacity Manual method (HCM). A Synchro (version 9) model was built using existing signal timings and balanced existing traffic volumes. Signal timings were sourced from the Germantown Pedestrian Initiative study dated April 2016. The intersection capacity was assessed and compared to the congestion standard for three scenarios of two time periods each: 1) 2015 Existing AM and PM, 2) 2040 Build Out AM and PM, and 3) 2040 Build Out with Road Diet AM and PM. The relevant congestion standard varies for each study area intersection between a CLV of 1425 and 1500 and between 51 and 80 seconds of delay per vehicle.

2015 Existing Scenario

When evaluating existing volumes, the overall intersection CLV and delay values do not exceed the congestion standards. The intersection of Middlebrook Road and Great Seneca Highway reaches the policy standard threshold for delay at 51 seconds for the AM peak hour only.

2040 Build Out Scenario

The future scenario accounted for 2040 traffic volumes and a new intersection at Germantown Road and Waters/Bowman Mill Roads. Side street volume was estimated based on surrounding land use. The overall intersection CLV and delay values would not exceed the applicable policy area congestion standards for all study area intersections. The intersection of Middlebrook Road and Great Seneca Highway has a 2040 morning intersection delay of 49 seconds, just two seconds below the applicable congestion standard.

2040 Build Out with Road Diet Scenario

This future scenario also accounted for 2040 traffic volumes and a new intersection at Germantown Road and Waters/Bowman Mill Roads. The Road Diets described in the table below were tested in this scenario. Specifics regarding the lane use assumed at each study area intersection under the future cross-section scenario are appended.

Roadway	2015 Existing Cross Section	2040 Future Scenarios Cross Section
Middlebrook Road	A divided six-lane section with a raised, concrete median	*Reduction in travel lanes (Road Diet):* A divided four-lane section with widened raised median for turn lanes and trees
Wisteria Drive	Generally, two travel lanes with a center two-way-left-turn lane expanding to two through lanes at the intersection approaches	*Number of Lanes per 2009 Master Plan:* A consistent divided four-lane section with a center median for left turn lanes
Great Seneca Highway	A divided four-lane section with at-grade median	*Maintain Existing Number of Lanes:* Maintain existing divided four-lane section instead of increasing to six-lane section per 2009 Master Plan

Under 2040 Build Out with Road Diet scenario, the overall intersection capacity for all study intersections are below the CLV and delay congestion standards.

The table below summaries the CLV and HCM intersection capacity results across the scenarios.

Plan Area	Location ID	E-W Road	N-S Road	Standard		Capacity Results: Existing 2016 AM	Existing 2016 PM	Future 2040 AM	Future 2040 PM	Future 2040 Cross Section AM	Future 2040 Cross Section PM	2040 Configuration (if different than existing)
Germantown MARC Rail Community	1	Middlebrook Rd	MD 118 (Germantown Rd)	*1500*	CLV	A (865)	A (944)	A (997)	B (1075)	A (997)	C (1197)	WB: L | L | T | T+R (Reduced by one through lane)[1]
				63	Synchro	D (41.6)	D (47.2)	D (47.8)	D (49.4)	D (44.2)	E (57.2)	
	2	Wisteria Dr	MD 118 (Germantown Rd)	*1500*	CLV	A (713)	A (985)	A (802)	C (1218)	B (802)	A (1218)	
				63	Synchro	D (38.5)	D (40.8)	D (39.5)	D (47.5)	D (43.3)	D (52.8)	
	3	Dawson Farm Rd	MD 118 (Germantown Rd)	*1425*	CLV	A (526)	A (590)	A (635)	A (722)	A (635)	A (722)	
				51	Synchro	B (19.8)	C (23.0)	C (21.1)	C (26.6)	C (21.1)	C (26.6)	
	4	Middlebrook Rd	Crystal Rock Dr	*1500*	CLV	A (786)	A (760)	A (898)	A (886)	B (1042)	B (1122)	EB: L | T | T+R / WB: L | T | T+R (Reduced by one through lane)[1] Minor signal timing adjustments (Optimized spilts)
				63	Synchro	C (29.7)	B (14.2)	C (23.7)	B (15.1)	C (24.7)	C (22.5)	
	5	Wisteria Dr	Crystal Rock Dr	*1500*	CLV	A (395)	A (578)	A (519)	A (737)	A (448)	A (503)	WB & EB: L | T | T+R (Added a through lane and revised lane sharing) Note: Two Way Stop Controlled Intersection; average intersection
				63	Synchro	A (<10.0)	A (<10.0)	A (<10.0)	A (<10.0)	A (<10.0)	A (<20.0)	
	6	Middlebrook Rd	MD 119 (Great Seneca Hwy)	*1425*	CLV	B (1052)	A (867)	C (1178)	A (983)	D (1347)	B (1088)	EB: U | T | T | R (Removed third through lane)[1] Add northbound right turn permited-overlap phase
				51	Synchro	D (51.0)	C (32.2)	D (49.5)	C (30.9)	D (35.6)	C (24.8)	
	7	Wisteria Dr	MD 119 (Great Seneca Hwy)	*1425*	CLV	A (723)	A (719)	A (868)	A (983)	B (1026)	B (1059)	EB: L | T | R / WB: L | T+R (Reduced by one through lane)[1]
				51	Synchro	C (27.4)	C (26.6)	C (28.7)	C (28.3)	C (28.3)	C (29.1)	
	8	Dawson Farm Rd	MD 119 (Great Seneca Hwy)	*1425*	CLV	A (565)	A (768)	A (701)	A (931)	A (701)	A (931)	
				51	Synchro	B (15.6)	B (14.0)	B (19.4)	B (18.3)	B (18.7)	B (19.0)	
	9	Waters Rd / Bowman Mill Dr	MD 118 (Germantown Rd)	*1500*	CLV	N/A	N/A	A (888)	C (1198)	A (888)	C (1198)	New Signalized Intersection
				63	Synchro	N/A	N/A	C (33.5)	E (57.6)	C (32.6)	D (52.2)	

[1] *The road diet analysis reflects a reduction in the existing number of travel lanes; otherwise a road diet anlaysis reflects NOT the construction of additional lanes as noted in the Master Plan*

Boyds Analysis Summary

The Boyds MARC Rail Community planning area generally extends to Little Seneca Lake on the north, almost to Ganley Road on the west, near the intersection of White Ground Road and Hoyles Mill Road on the south, and about 3,500 feet east of Clarksburg Road along the railroad tracks. There are two major study intersections in the planning area including Barnesville Road (MD 117) at Clarksburg Road (MD 121), the northern intersection, and Clopper Road (MD 117) at Clarksburg Road (MD 121), the southern intersection.

While the proposed zoning in Boyds would allow some redevelopment, no public sewer and a lack of a market for substantial redevelopment in Boyds means very little growth and additional traffic is projected. Therefore, no land use forecasts were developed by Planning Department staff for Boyds and no transportation modeling was necessary.

Boyds Intersection Data

Existing turning movement counts for the morning and evening peak hours were obtained from the MD SHA memo documenting the design request package to signalize the intersection of MD 117 (Clopper Road / Clarksburg Road) and Clopper Road and collected in September and December of 2014.

The average annual growth rate was calculated from the change in existing 2015 volumes to 2035 forecasted volumes from the MD SHA study, and that growth rate was applied for another five years to achieve 2040 forecasted intersection volumes. The 2040 network turning movement counts were balanced to smooth out significant changes in volumes between intersections, and rounded to the nearest multiplier of five.

Boyds Intersection Analysis

The two study area intersections are located within the Rural East policy area where the congestion standard is 1350 critical lane volume and 41 seconds of delay per vehicle. Both study intersections were assessed using the CLV method and the 2000 HCM method. A Synchro (version 9) model was built using signal parameters from a 2015 MD SHA study and balanced existing traffic volumes. The intersection capacity was assessed and compared to the congestion standard for two scenarios of two time periods each: 1) existing 2015 AM and PM, 2) future 2040 AM and PM.

When evaluating existing volumes, the overall intersection CLV and delay values do not exceed the policy area congestion standards. Using 2040 projected future volumes, the northern intersection is projected to operate below the applicable CLV congestion standard, but the southern intersection is projected to operate above the applicable CLV congestion standard using a conservative analysis that did not discount right turns on red that were permitted. MD SHA is aware of the congestion at the southern intersection and is planning to install a traffic signal at both intersections due to their proximity. Using the traffic signal parameters noted in the MD SHA study, both intersections evaluated as signalized intersections would operate below the applicable CLV and vehicle delay standards defined in Table 2 of the 2017 LATR Guidelines.

The table below summaries the CLV and HCM intersection capacity results across the scenarios.

[BOYDS SUMMARY TABLE FORTHCOMING IN NEXT DRAFT]

<u>Appended</u>

1. *Data Summary Table*
2. *Cross Sections & Lane Use Changes under the Future Scenario*
3. *Critical Lane Volume Worksheets*
4. *HCM Reports*