Appendix 4: Transportation Infrastructure

Background Conditions

Background conditions refer to factors that will affect the performance of the transportation network but are not directly related to the subject development including:

- Growth in existing traffic volumes over the study period
- Other planned, approved or current developments in the study area
- Planned improvements to the transportation network by the City in the study area

Growth in Existing Traffic Volumes

Growth in existing traffic volumes is estimated to be two percent per year for through traffic on MD 4, MD 202 and US 301 through 2018, the projected buildout date for the Upper Marlboro Town Action Plan. The growth rate is based on historical growth rates, as well as extrapolated from traffic forecasts for beyond the study year in this report as provided by SHA.

Approved Developments

Information on planned, approved and current development activity in the study area is provided by The Maryland-National Capital Park & Planning Commission (M-NCPPC). The major background developments evaluated in this study, including projected peak hour trips, are summarized in Table 4-2. It is important to note that over 2,600 residential units are planned or approved to be built within three miles of Upper Marlboro.

It should be qualified that of the new traffic volumes, the distribution of new trips through the town is estimated at only 20 percent of the total value in Table 4-1. The majority of new traffic will be served by major roadways including MD 4, MD 202, and US 301.

Background developments identified for this report include those that are in the development pipeline based on conversations with M-NCPPC and planned to be built out by 2018. The above developments are located within an approximately three-mile radius of the Town of Upper Marlboro. An area map is shown in Exhibit 4-1.

Table 4-1:
Summary of Projected Development Activity in the Vicinity of the Town of Upper Marlboro

Development	Program	Total AM Peak Hour Trips[1]	Total PM Peak Hour Trips[1]
Balmoral	• 346 Single Family Dwelling Units	260	311
Marlboro Riding Cluster	• 297 Single Family Dwelling Units	223	267
Stratford (Section 1)	• 23 Single Family Dwelling Units	17	21
Marlboro Pointe Cluster	• 108 Single Family Dwelling Units	81	97
Forest Hills	• 112 Single Family Dwelling Units	84	101
Beacon Hill Subdivision	• 48 Single Family Dwelling Units	36	43
Beech Tree	• 960 Single Family Dwelling Units	720	864
Beech Tree	• 480 Condo/Townhouse Dwelling Units	336	384
Beech Tree	• 240 Apartment (Multi-Family) Dwelling Units	125	144
Beech Tree	• 300K SF Commercial/Office (Shopping Center)[2]	303	3,600
BP Amoco Station	• 4K SF Gas Station w/ Convenience Market	328	407
Osborne Shopping Center	• 128K SF Commercial/Retail (Shopping Center)[2]	181	1,536
34 % Pass-by Discount for Commercial Developments (PM only)		-	*-1,885*
TOTAL		2,694	5,890

1 - Trip Rates derived from "Guidelines for the Analysis of the Traffic Impact of Development Proposals". September, 2002. M-NCPPC, Prince George's County Planning Department
2 - ITE Trip Generation Manual rate (ITE code 820) used for Retail/Commercial AM peak hour

Exhibit 4-1: Area Map

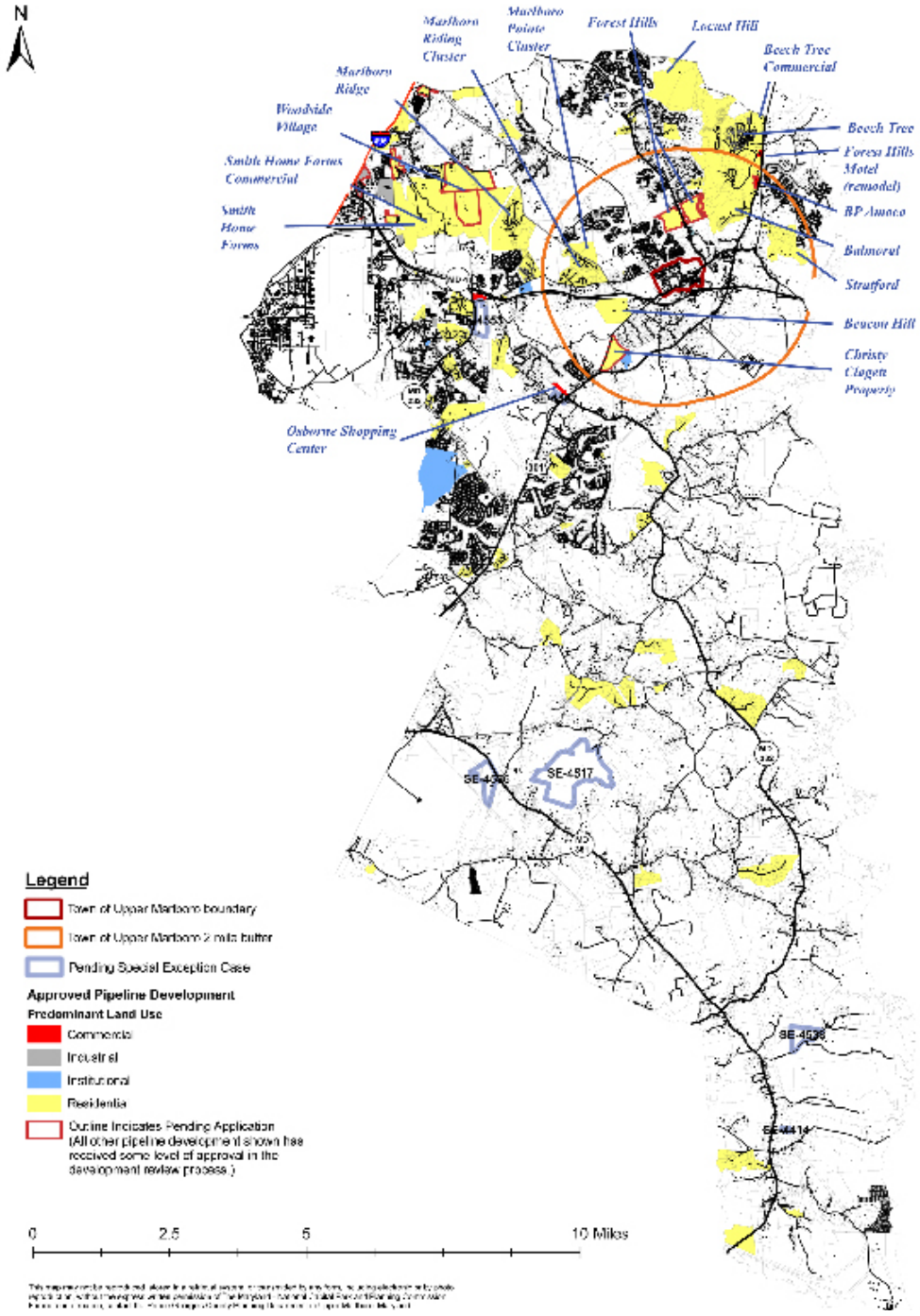


TABLE 4-2:

Summary of Background Intersection Capacity Analysis – Existing PM (Background PM)

Intersection	Highway Capacity Analysis			Critical Lane Volume		
	Delay (secs /veh.)	V/C Ratio	Level of Service	Critical Lane Volume	V/C Ratio	Level of Service
MD 725 (Old Marlboro Pk) at Ritchie Marlboro Rd[1]	17.8 (18.2)	0.69 (0.71)	B (B)	1,090 (1,106)	0.68 (0.69)	B (B)
MD 725 (Old Marlboro Pk) at Brown Station Rd[1]	15.2 (15.5)	0.31 (0.33)	B (B)	491 (516)	0.31 (0.32)	A (A)
MD 725 (Old Marlboro Pk) at John Rogers Blvd[1]	19.1 (19.4)	0.44 (0.45)	B (B)	625 (650)	0.39 (0.41)	A (A)
MD 725 (Old Marlboro Pk) at Rectory La[2]	16.1 (16.5)	0.05 (0.05)	C (C)	641 (656)	0.40 (0.41)	A (A)
MD 725 (Old Marlboro Pk & Main St) at Old Crain Hwy[2]	9.1 (9.3)	0.13 (0.19)	A (A)	805 (983)	0.50 (0.61)	A (A)
Elm St at Governor Oden Bowie Dr[2]	24.3 (26.3)	0.65 (0.68)	C (D)	832 (857)	0.52 (0.54)	A (A)
MD 725 (Main St) at Elm St and MD 717 (Water St)[1]	10.1 (10.2)	0.54 (0.61)	B (B)	829 (987)	0.52 (0.62)	A (A)
MD 717 (Water St) at Judges Dr[2]	99.4 (127.3)	1.11 (1.21)	F (F)	811 (833)	0.51 (0.52)	A (A)
MD 717 (Water St) at WB MD 4 Ramps[2]	32.9 (33.8)	0.83 (0.87)	D (D)	993 (1,015)	0.62 (0.63)	A (B)
MD 717 (Water St) at EB MD 4 Ramps[2]	>500 (>500)	3.91 (4.35)	F (F)	1,571 (1,615)	0.98 (1.01)	E (F)
Pratt St at Judges Dr[2]	11.2 (12.2)	0.14 (0.18)	B (B)	349 (451)	0.22 (0.28)	A (A)
MD 725 (Main St & Marlboro Pk) at Governor Oden Bowie Dr[1]	12.7 (15.0)	0.50 (0.64)	B (B)	774 (999)	0.48 (0.62)	A (A)
MD 725 (Marlboro Pk) at MD 202 (Largo Rd)[1]	25.0 (33.0)	0.72 (0.84)	C (C)	1,193 (1,422)	0.75 (0.89)	C (D)
MD 725 (Marlboro Pk) at US 301[1]	33.4 (73.3)	0.86 (1.04)	C (E)	1,374 (1,656)	0.86 (1.03)	D (F)

1- Existing Signalized Intersection
2- Stop-controlled Intersection. Level of Service, Delay, and V/C for critical movement only - (HCM)

BACKGROUND INTERSECTION AND LEVEL OF SERVICE

A capacity analysis was performed for the background conditions. The results of the capacity analysis are summarized in Table 4-2 detailed capacity.

The results of the background conditions capacity analysis indicate that with growth in existing traffic volumes, as well as additional traffic from background developments, one signalized intersection in the study area will deteriorate to level of service E—Marlboro Pike at US 301 (PM peak hour). Additionally, two stop-controlled intersections will continue to fail—Water Street at Judges Drive (PM peak

hour) and Water Street at the EB MD 4 ramps (PM peak hour). All other intersections will continue to operate at a level of service D or better.

Future Conditions

Proposed Development and Final Consensus Plan

The Town Action Plan for the Town of Upper Marlboro is proposing a multiphased development program which includes approximately 134 single-family dwelling units, 49 apartment/condo dwelling units, 60,000 square feet of retail/commercial space, and 95,000 square feet of general and civic office space. The final consensus plan also includes improved parking facilities, enhanced streetscapes, pedestrian circulation, and various other improvements which are addressed in detail below.

Projected Site Traffic Volumes

Projecting the number of new vehicular trips generated by a proposed development is the most critical aspect of assessing traffic impact. The objective of a trip generation analysis is to forecast the number of new trips that will begin or end at a proposed land use. A primary source for data on vehicular trip generation is the Trip Generation Handbook published by the Institute of Transportation Engineers. The handbook compiles data from numerous studies of trip rates at hundreds of specific types of land uses such as recreational, residential, commercial, office, institutional, and industrial throughout the country. The data is sorted by various time periods such as morning and evening peak hour and plotted against independent variables for specific land uses such as square feet of commercial space, number of hotel rooms, number of dwelling units, etc. The data is presented in chart format with weighted averages, and fitted curve linear regression equations, where enough data is available.

Several site-specific factors can reduce the number of new personal vehicular trips generated by a new development or land use. These include (1) the availability of alternative modes of transportation such as sidewalks, bicycle facilities, and public transportation; (2) the effect of pass-by traffic, which includes vehicles already on the roadway network making an intermediate stop on the way from an origin to a primary trip destination without a route diversion, and (3) the effect of internally captured trips composed of traffic originating and destined for different land uses within the same development that do not travel on the external public roadway network. An example of an internal trip would be a trip from an office building to a restaurant or from a hotel to an office building within the same development. Graphical illustrations of pass-by traffic and internal captured trips are shown in Exhibits 4-2 and 4-3.

Exhibit 4-2:
Illustration of Pass-By Traffic

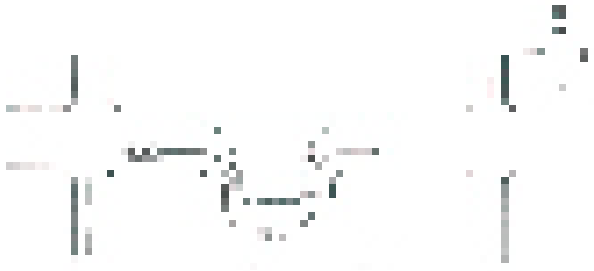


Exhibit 4-3:
Illustration of Internal Capture Traffic

Using the ITE Trip Generation Manual, 7th Edition (2003), peak-hour trip generation rates were determined based on the future land uses. The average number of vehicle trip ends and percentage of entering and exiting volumes were calculated. Land use categories 210–Residential: Single-Family, 220–Residential: Apartment, 710–Office Use (Civic and General), and 820–Retail/Commercial were selected and evaluated. It is worth noting that trips were assigned to quadrants (NE, NW, SE, SW) where Main Street and Water/Elm Streets serve as the quadrant boundaries.

Rates for pass-by trips are based on guidelines in the Trip Generation Handbook. Based on these factors, a 34 percent pass-by rate (PM only) was applied to the retail/commercial uses. Additionally, a pedestrian, transit, and internal capture trip rate of ten percent was applied to all the proposed uses. The projected trip generation is summarized in Table 4-3.

The proposed development is projected to generate, after applying applicable trip reduction factors, a total of 8,509 new daily vehicular trips, of which 388 will occur during the morning peak hour and 696 will occur during the evening peak hour.

Future Traffic Volumes

Future year 2018 traffic volumes were obtained by adding the existing traffic volumes + growth in the existing traffic volumes + traffic generated by other developments in the study area + the new traffic generated by the new development. The total year 2018 future PM peak-hour level of service—based on future traffic volumes—is shown in Exhibit 4-4.

Future Intersection Capacity and Level of Service

A capacity analysis was performed for year 2018 future conditions. Initially, the network was tested with all future traffic volumes and without any proposed roadway improvements. The results of the capacity analysis are summarized in Table 4-4.

The results of the future conditions intersection capacity analysis indicate that with the addition of traffic from the proposed developments and without any improvements to the transportation network, one signalized intersection in the study area will operate at a level of service E—Marlboro Pike at US 301 (AM and PM peak hours). Additionally, two stop-controlled intersections will experience failing conditions—Water Street at Judges Drive (PM peak hour) and Water Street at the EB MD 4 ramps (PM peak hours). Lastly, one stop-controlled intersection will operate at a level of service E—Water Street at the WB MD 4 ramps (PM peak hour). All other intersections will continue to perform at a level of service D or better.

Table 4-3:
Summary of Proposed Land Uses and Trip Generation AM (PM)

Land Use	Variable	Total Daily Trips[1]	Avg. New Vehicle Trips[1]	Entering[1,2]		Exiting[1,2]	
				Rate	Vehicles	Rate	Vehicles
Residential – Single-Family Dwelling Units	134 Dwelling Units	1,206	101 (121)	0.15 (0.59)	20 (79)	0.60 (0.31)	80 (42)
Residential – Apartment/condo Dwelling Units	49 Dwelling Units	319	25 (29)	0.10 (0.39)	5 (19)	0.42 (0.21)	21 (10)
Office – General and Civic	95K SF	1,330	190 (176)	1.80 (0.35)	171 (33)	0.20 (1.50)	19 (143)
Retail/Commercial (820)	60 K SF	6,600	115 (720)	61% (6.00)	70 (360)	39% (6.00)	45 (360)
Sub-Total Raw New Trips		9,455	431 (1,046)	-	266 (491)	-	165 (554)
Less 34% Pass-by Discount (PM only)		-	*- (-245)*	-	*- (-122)*	-	*- (-122)*
Less 10% Pedestrian, Transit & Internal Capture Discount		*-945*	*-43 (-105)*	-	*-27 (-49)*	-	*-16 (-55)*
TOTAL NET EXTERNAL TRIPS		8,509	388 (696)	--	240 (320)	--	148 (376)

1 - Trip Rates derived from "Guidelines for the Analysis of the Traffic Impact of Development Proposals". September, 2002. M-NCPPC, Prince George's County Planning Department
2 - ITE Trip Generation Manual rate (ITE code 820) used for Retail/Commercial AM peak hour

Table 4-4:
Summary of Future Intersection Capacity Analysis without Roadway Improvements – Background PM (Future PM)

Intersection	Highway Capacity Analysis			Critical Lane Volume		
	Delay (secs /veh.)	V/C Ratio	Level of Service	Critical Lane Volume	V/C Ratio	Level of Service
MD 725 (Old Marlboro Pk) at Ritchie Marlboro Rd[1]	18.2 (18.5)	0.71 (0.72)	B (B)	1,106 (1,117)	0.69 (0.70)	B (B)
MD 725 (Old Marlboro Pk) at Brown Station Rd[1]	15.5 (15.9)	0.33 (0.35)	B (B)	516 (542)	0.32 (0.34)	A (A)
MD 725 (Old Marlboro Pk) at John Rogers Blvd[1]	19.4 (20.0)	0.45 (0.48)	B (C)	650 (694)	0.41 (0.43)	A (A)
MD 725 (Old Marlboro Pk) at Rectory La[2]	16.5 (17.6)	0.05 (0.06)	C (C)	656 (688)	0.41 (0.43)	A (A)
MD 725 (Old Marlboro Pk & Main St) at Old Crain Hwy[2]	9.3 (9.5)	0.19 (0.21)	A (A)	983 (1,080)	0.61 (0.68)	A (B)
Elm St at Governor Oden Bowie Dr[2]	26.3 (30.7)	0.68 (0.74)	D (D)	857 (903)	0.54 (0.56)	A (A)
MD 725 (Main St) at Elm St and MD 717 (Water St)[1]	10.2 (11.9)	0.61 (0.64)	B (B)	987 (1,048)	0.62 (0.66)	A (B)
MD 717 (Water St) at Judges Dr[2]	127.3 (237.3)	1.21 (1.56)	F (F)	833 (917)	0.52 (0.57)	A (A)
MD 717 (Water St) at WB MD 4 Ramps[2]	33.8 (43.6)	0.87 (1.04)	D (E)	1,015 (1,071)	0.63 (0.67)	B (B)
MD 717 (Water St) at EB MD 4 Ramps[2]	>500 (>500)	4.35 (6.58)	F (F)	1,615 (1,746)	1.01 (1.09)	F (F)
Pratt St at Judges Dr[2]	12.2 (12.8)	0.18 (0.21)	B (B)	451 (495)	0.28 (0.31)	A (A)
MD 725 (Main St & Marlboro Pk) at Governor Oden Bowie Dr[1]	15.0 (17.9)	0.64 (0.72)	B (B)	999 (1,121)	0.62 (0.70)	A (B)
MD 725 (Marlboro Pk) at MD 202 (Largo Rd)[1]	33.0 (38.2)	0.84 (0.91)	C (D)	1,422 (1,513)	0.89 (0.95)	D (E)
MD 725 (Marlboro Pk) at US 301[1]	73.3 (77.1)	1.04 (1.05)	E (E)	1,656 (1,680)	1.03 (1.05)	F (F)

1 - Existing Signalized Intersection
2 - Stop-controlled Intersection. Level of Service, Delay, and V/C for critical movement only - (HCM)

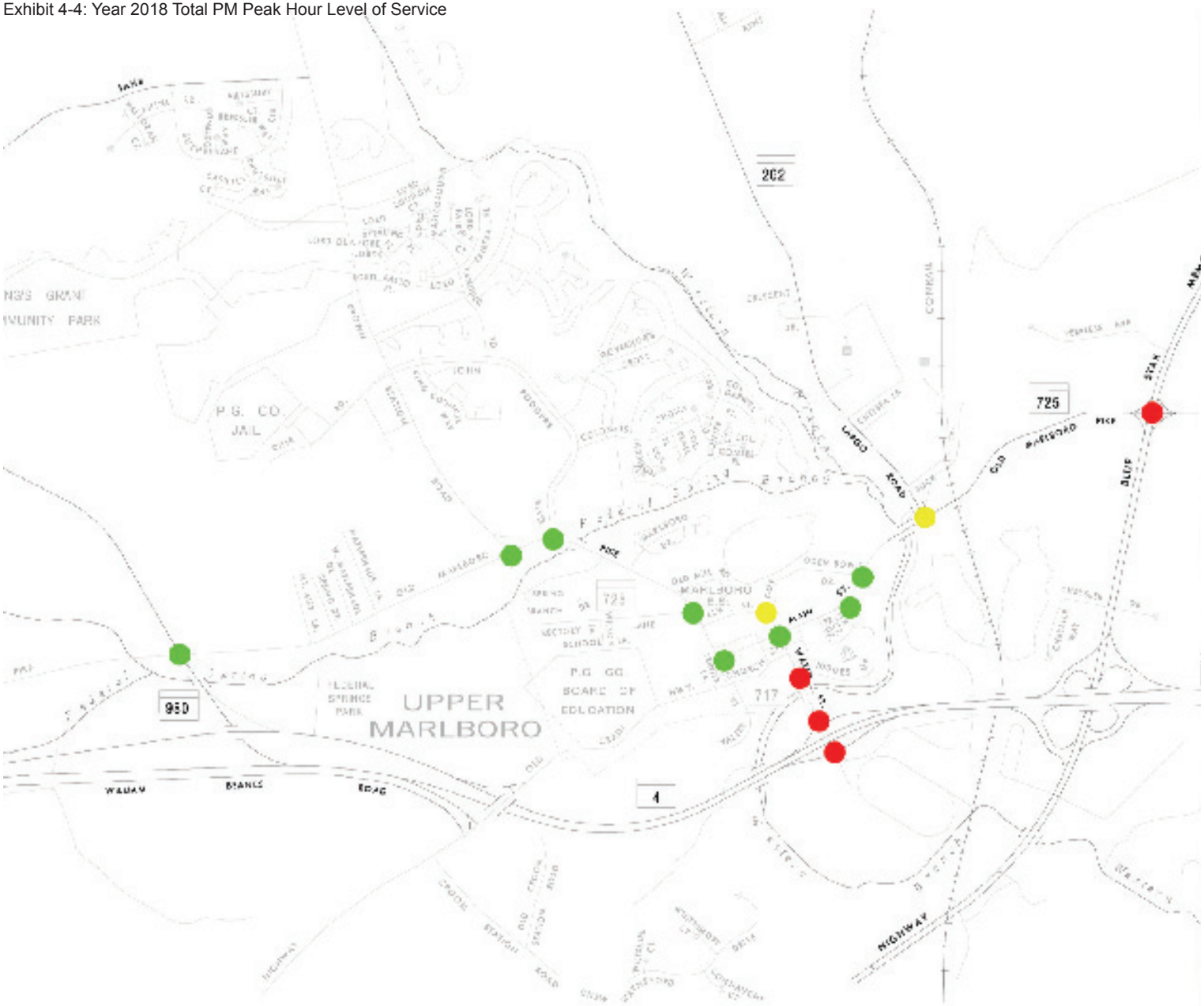
Future Parking Analysis

A future parking analysis was developed based on the proposed development program and the current zoning requirements. The future parking requirements were calculated based on Prince George's County's Zoning Ordinance and were compared to the Institute of Transportation Engineer's Parking Generation demand estimates. The results of the analysis are shown in Table 4-5 and indicate that 913 new parking spaces will be required without any shared parking arrangements. A discussion of shared parking concepts is provided below in the Recommendations section.

Utilities Research and Analysis

In the course of the public planning and review process for this study, the residents of Upper Marlboro expressed interest in relocating the town's overhead utility wires underground. The main reason for the utility relocation was aesthetics. Other reasons which are typically

Exhibit 4-4: Year 2018 Total PM Peak Hour Level of Service



common of such a venture are (1) reduced maintenance, (2) safety and community health, and (3) economic development.

Several aspects of utility relocation must be considered prior to relocating utilities underground, which include:

- Need for a geological and utility analysis
- Coordination necessary among multiple utility owners
- Construction of new underground infrastructure
- Traffic disruption to dig up streets and properties
- Susceptibility to corrosion, rodents, tree roots, and accidental impact during future construction projects
- Underground lines have fewer power outages (less than half of overhead lines) but outages last longer than overhead lines (about 1.6 times longer)
- Maryland utilities report that underground cables become unreliable after 15 to 20 years and reach the end of their lifespan after 25 to 35 years

The costs of relocating overhead utilities underground include1:

- PEPCO utility undergrounding costs are currently $346/foot or $1.83 million/mile plus an additional 25 percent relocating for other utility lines. The estimated cost for relocating only the utility lines along Main and Water Streets will be approximately $1.65 million.
- There is an additional end-user cost to connect each property to the new underground conduit that will range from $500 to $2,000 per building.
- Local electric utility rates are likely to increase 80 to 125 percent to help offset the costs of burial.
- Total Cost = (Cost of relocating electric utility wires underground + cost of relocating "other" utility wires + customer-borne connection costs).

TABLE 4-5:
Future Parking Supply Analysis

Land Use (Variable)	Development Intensity (000's SF)	Zoning Requirement	ITE Parking 50th (85th) percentile demand	Variable Multiplier	Number of Required Spaces	Peak Parking Period
Office (1000 SF)[1]	95	3.25 spaces / 1K SF[2]	2.84 (3.44) spaces / 1K SF	3.25	309	weekday - daytime
Residential - Single Fam. Detached Housing (Dwelling Units)	134	2.0 spaces / D.U.	1.83 (2.14) vehicles / D.U.	2	268	weekday - evening
Residential - Apartment (Dwelling Units)	49	2.0 spaces / D.U.	1.20 (1.46) spaces / D.U.	2	98	weekday - evening
Retail (1000 SF)[1]	60	4.0 spaces / 1K SF	2.65 (3.35) spaces / 1K SF	4	238	weekday - evening
Subtotal Raw Parking					913	

1– *Source: Prince George's County Zoning Regulations Article 27-568 Off-Street Parking Requirements*
2– *Represents average of parking requirements for above and below 2,000 SF threshold*

Additional options other than complete utility relocation underground to reduce overall costs include:

- Relocation of utility wires to run along the rear of buildings or through alleyways
- Reduction of utility wires, i.e.. consolidation of utility lines along one side of the roadway on a single pole and wrapping wires to create the appearance of only one cable line

To go about relocating overhead utility lines it is important to keep in mind that the costs of relocation could potentially be reduced through a variety of government resources for such a project. Table 4-6 lists sources of funding for utility relocation. Additional planning items for relocation of utilities include:

- Timing the project with other utility work to be performed in the area to reduce cost and traffic disruption
- Consolidating high voltage lines and burying only low voltage lines
- Placing only feeder lines underground and hiding main lines along one side of the roadway
- PEPCO has no known program for municipalities to relocate utilities underground and does not provide funding

TABLE 4-6:

Source of Funding for Relocating Overhead Utilities1

	Type	Must utility relocation be part of another project?	Matching Amount	Typical Award Amount	Controlling Agency
Federal	Federal Highway Fund State Allocations	Yes	None	Varies depending on the project	Federal Highway Administration
	Transportation Enhancement Funds	Yes	80% Federal; 20% Local	$100,000 - $500,000 +	State DOT
	Metropolitan Planning Organization (MPO) Grants	Yes	Contact state DOT for details	Varies depending upon MPO size and project	MPO via state DOT
	Community Development Block Grants (CDBG)	Yes	Contact local governing agency that administers CDBGs for details	Varies depending on amount awarded to locale	Dept. of Housing and Urban Development (HUD)
	Metropolitan Transportation Improvement Program (MTIP)	Yes	Contact state DOT for details	Varies depending on amount awarded to locale	State DOT
State	State Highway Funds	Yes	None	Varies depending size and project	State DOT
	Community Improvement Grants	Yes	Varies by state	Less than $100,000	State dept. of community and economic development, or dept. of housing and development
	Economic Development Grants	Yes	Varies by state; usually 80% state, 20% local	Less than $100,000	State dept. of community and economic development, or dept. of housing and development
Local	Bonds and Tax Assessments	No	None	Varies	Municipality or county
	In-Kind Donations	No	None	Typically less than $250,000	Municipality or county
	Sponsor Recognition	No	None	Typically less than $50,000	Municipality or county
	Special Districts	No	None	Less than 5% above normal fees	Municipality or county
	Special Assessments	No	None	Depends on the district's type, size, and demographics	State public utilities commission, municipality or county
	Right-of-Way Fees	No	None	Varies by state. Current estimates place fees at land than 50% of their true value	Municipality or state public utilities commission

1 - Source: "Power to the People: Strategies for Reducing the Visual Impact of Overhead Utilities" by Scenic America

Summary

The following summary of findings is based on the analysis and observations presented in the report:

- Under existing conditions, two intersections are operating at a failing level of service in the PM peak hour—MD 717 (Water Street) at Judges Drive and MD 717 (Water Street) at EB MD 4 ramps. All other intersections and peak hours are currently operating at a level of service D or better.
- Existing parking supply includes 120 public on-street spaces, 1,200 public off-street spaces, 1,400 private/permit off-street spaces, and 1,000 satellite spaces.
- The highest accident locations in the study area are MD 725 at Ritchie Marlboro Road (13 accidents) and US 301 at MD 725 (12 accidents). Only one pedestrian accident was noted—MD 725 at Governor Oden Bowie Drive.
- Strengths of existing infrastructure include accessibility to the town via several major highways (US 301, MD 4, and MD 202), transit connections to Metrorail stations, and a walkable downtown core.
- Weaknesses include missing links in the pedestrian network, lack of bicycle facilities, lack of parking management, and lack of special event traffic management.
- There are several planned, approved, or current developments in the study area that are projected to add 2,506 AM and 3,730 PM peak-hour trips to the roadway network; however, only 20 percent of new traffic is predicted to use local roadways in the town.
- Under background conditions, one signalized intersection in the study area will deteriorate to level of service E—Marlboro Pike at US 301 (PM peak hour). Additionally, two stop-controlled intersections will continue to fail—Water Street at Judges Drive (PM peak hour) and Water Street at the EB MD 4 ramps (PM peak hour). All other intersections will continue to operate at a level of service D or better.
- A full buildout of the consensus Town Action Plan is projected to generate, after applying applicable trip reduction factors, a total of 8,509 new daily vehicular trips, of which 388 will occur during the morning peak hour and 696 will occur during the evening peak hour.
- With the addition of future development-generated traffic, one signalized intersection in the study area will operate at a level of service E—Marlboro Pike at US 301 (AM and PM peak hours). Additionally, two stop-controlled intersections will experience failing conditions—Water Street at Judges Drive (PM peak hour) and Water Street at the EB MD 4 ramps (PM peak hours). Lastly, one stop-controlled intersection will operate at a level of service E—Water Street at the WB MD 4 ramps (PM peak hour). All other intersections will continue to perform at a level of service D or better.