# WHITE OAK SCIENCE GATEWAY MASTER PLAN Appendix A: Transportation Background Updated March 2014



Montgomery County Planning Department M-NCPPC www.montgomeryplanning.org

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#### **Master Plan and Study Area Boundaries**

The transportation analysis for the White Oak Science Gateway Master Plan takes into account a larger study area and a smaller area defined by the Plan boundary (see Figure 1).

The study area is comprised of the traffic analysis zones (TAZ's) which are within and contiguous to the Plan boundary. The definition of the Plan area is important in that it is the first step in establishing the interface between the regional transportation model (Travel/3) and the Master Plan-specific local area model (LAM). The Plan boundary is formally established by the Planning Board during its deliberations on the Plan scope of work. The more detailed transportation analysis (using the LAM) is conducted for the area within the Plan boundary.



#### **Figure 1 Master Plan and Study Area Boundaries**

The Plan area is further divided into sub-zones (see Figure 2) that provide a basis for further delineation of the road network. It is at this level – using these sub-zones – where the local area model (LAM) is applied. The application of the model involves two major phases – the first being a replication of the existing conditions and a second being a forecast of future conditions.

#### **Existing Conditions - Master Planned Roadway Network**

There are a number of major roadways that currently serve the Master Plan area. A summary of the **currently adopted** master-planned streets and highways in the Master Plan area is provided in Table 1.



### Figure 2 Traffic Analysis Sub-Zones and Network for Local Area Model (LAM)

#### **Intersection Capacity and Roadway Traffic Volumes**

There are a number of ways to measure the quality of service provided by a transportation network. In Montgomery County, the method of measuring network performance is established by the County's Subdivision Staging Policy (formerly called the Growth Policy). This policy requires consideration of the critical lane volume at major intersections as the major component of measuring the quality of service provided by the network. Critical lane volumes (CLVs) are essentially the sum of vehicles passing through an intersection at a single point during the peak hour. The level of CLVs considered acceptable varies by Policy Area within the County. Master Plan intersections included in this analysis are located within the Fairland/White Oak Policy Area, which currently has a congestion standard of 1,475 CLV. Intersections at or above 1,475 CLV are considered to be "failing" or not within the acceptable standard for the Policy Area.

As a complement to the CLV analysis, a Highway Capacity Manual (HCM) analysis is performed at those intersection locations determined to be 1600 CLV or higher. In these instances the HCM standard is a volume-to-capacity ratio of 0.92 (i.e., 1475/1600).

Table 1 Exis	sting Street a	nd Highway	/ Classificati	ons
TUDIC I LAIC	Juling Der eet u	na mgina y	Glassificati	0115

			Master Plan of	Current Master Planned Minimum	Existing Number of Through Travel	Current Master Planned Number of Through	
Master Manned Streets	From	10	nignways No.	Right of Way (Feet)	Lanes	Travel Lanes	
Capital Beltway (J-495)	Northwest Branch Stream Valley	Prince George's County Line	F-8	300	8 - 10 - Divided		
Major Highways	Northwest Shanen Steenn Variety						
Columbia Rike (US 20)	East Randolph Road / Cherry Hill Road	Paint Branch Stream Valley	CM-10	100 - 200	6 - Divided		
	Paint Branch Stream Valley	New Hampshire Avenue (MD 650)	CM-10	200	6 - Divided		
	New Hampshire Avenue (MD 650)	Northwest Branch Stream Valley	M-10	120	6 - Divided		
New Hampshire Avenue (MD 650)	Columbia Pike (US 29)	Capital Beltway (I-495)	M-12	120	6 - Divided		
Arterials							
Cherry Hill Road	Columbia Pike (US 29)	Prince George's County Line	A-98	80	4	4-5	
Powder Mill Boad	New Hampshire Avenue (MD 650)	Prince George's County Line	A-94	80	4	4	
Lockwood Drive (MD 895)	Columbia Pike (US 29)	400 Feet West of New Hampshire Avenue (MD 650)	A-286	80	2	2	
Lockwood Drive	400 Feet West of New Hampshire Avenue (MD 650)	East Side of White Oak Shopping Center	A-286	80	2	2	
Lockwood Drive	East Side of White Oak Shopping Center	Lockwood Drive Extended	A-286	80	2	2	
Lockwood Drive Extended	Lockwood Drive	Stewart Lane	A-286	70	2	2	
Stewart Lane	Lockwood Drive Extended	Columbia Pike (US 29)	A-286	80	2	2	
Industrial Roads					_		
Industrial Parkway and Industrial Parkway Extended	Columbia Pike (US 29)	Industrial Property	1-1	80	4	4	
Prosperity Drive	Industrial Parkway	Cherry Hill Road	1-8	80	2	4	
Broad Birch Drive	Cherry Hill Road	Tech Road	1-9	80	4	4	
FDA Access Road	Cherry Hill Road	FDA Gate	I-10	80	2	2	
Tech Road	Columbia Pike (US 29)	1.600 Feet Southwest of Industrial Parkway	1-11	80	4	4	
Plum Orchard Drive	Cherry Hill Road	Broad Birch Drive	1-12	80	2	4	
Business District Streets							
Prosperity Drive	Industrial Parkway	Cherry Hill Road	B-2	80	2	4	
Old Columbia Pike	White Oak Shopping Center	Paint Branch Stream Valley	B-2	80	2	2	
Elton Road	New Hampshire Avenue (MD 650)	Prince George's County Line	B-3	80	2	4	
Hillwood Drive	Columbia Pike (US 29)	500 Feet East	B-4	80	2	4	
Primary Residential Streets							
Old Columbia Pike	Paint Branch Stream Valley	Industrial Parkway	P-2	80	2	2	
April Lane	Stewart Lane	0.3 Miles East	P-13	70	2	2	
Schindler Drive	Crest Park Drive	New Hampshire Avenue (MD 650)	P-14	70	2	2	
Cresthaven Drive	Devere Drive	New Hampshire Avenue (MD 650)	P-15	70	2	2	
12/13/11				•			
<sup>1</sup> Reflects minimum right-of-way, and may not include	le lanes for turning, parking, acceleration, decelera	tion, or other purposes auxillary to through travel.	Rights-of-way a	re considered to be n	neasured symmetrica	llybased	
<sup>2</sup> The recommended number of lanes refers to the n	umber of planned through travel lanes for each seg	ment.					
<sup>3</sup> Reflects the most representative roadway cross-se	ction.						

Existing CLVs for major intersections in the study area are shown in Table 2.

County	Intersection	AM CLV	PM CLV
MC	Old Columbia Pike & Fairland Rd	1153	1238
MC	US 29 & Fairland Rd	1480	1612
MC	US 29 & Musgrove Rd	1281	1132
MC	US 29 & University Blvd (N)	1589	1434
MC	US 29 & University Blvd (S)	1535	1680
MC	Powder Mill Rd & Cherry Hill Rd	1129	1143
PG	Powder Mill Rd & Beltsville Rd	1337	1483
PG	Fairland Rd & Briggs Chaney Rd	999	669
MC	Old Columbia Pike & Musgrove Rd	635	616
MC	Fairland Rd & Musgrove Rd	438	528
MC	Old Columbia Pike & Randolph Rd	816	857
MC	US 29 & Industrial Pkwy *	1124	1256
MC	US 29 & Stewart Ln *	1449	1508
MC	New Hampshire Ave & Mahan/Schindler *	1140	1042
MC	New Hampshire Ave & Chalmers*	1113	993
MC	New Hampshire Ave & Powder Mill *	1236	1345
MC	New Hampshire Ave & I-495 *	1019	1093
MC	Cherry Hill Rd & Broadbirch/Calverton *	1303	1524
MC	US 29 & Tech Rd *	1497	1498
MC	New Hampshire Ave & Northwest *	1073	1122
MC	Cherry Hill Rd & Prosperity*	1079	1040
MC	Cherry Hill Rd & Plum Orchard/Cloverpatch *	1317	1431
PG	Powder Mill Rd & Riggs Rd	962	1270
MC	Cherry Hill Rd & FDA Blvd *	799	763
MC	US 29 & Cherry Hill (Interchange)*	1071	865
MC	New Hampshire Ave & Lockwood Dr *	1253	1156

# Table 2 Existing Critical Lane Volumes (CLVs)

Notes: (1) \* Denotes intersection locations within the Plan area.

(2) Intersection CLVs within the Plan area that exceed the Policy Area standard are highlighted in red.

The Planning Department analysis of the existing CLVs for the major intersections located <u>within</u> the Plan area indicates that the following intersection exceeds the 1,475 CLV standard specified by policy during both the morning and afternoon peak hour of travel.

• US 29 and Tech Road

Two other intersections within the Plan area exceed the 1,475 CLV standard during the PM peak hour:

- US 29 and Stewart Lane
- Cherry Hill Road and Broadbirch Drive / Calverton Boulevard

Within Montgomery County and near – but not within - the Plan area, the US 29 intersection with Fairland Road exceeds the applicable policy area CLV standard during both the morning and afternoon peak hour. The US 29 intersection with University Boulevard at Four Corners exceeds the applicable policy area CLV standard during the afternoon peak hour. It should be noted that the US 29 intersection with University Boulevard is located within the Kensington/Wheaton policy area, which has a 1600 CLV congestion standard.

Within Prince George's County and near the Plan area, the intersection of Powder Mill Road and Beltsville Road exceeds the Montgomery County Fairland/White Oak policy area congestion standard during the afternoon peak hour. Prince George's County does not use existing or forecasted intersection CLVs as a means of determining network adequacy for master planning.

Figure 3 depicts the existing CLVs by intersection location using a CLV of 1600 as the congestion Level of Service standard. The rationale for using 1600 CLV as the congestion threshold (rather than the current 1475 CLV standard for the Fairland/White Oak policy area) stems from the Plan recommendation to raise the congestion standard to this level in recognition of the potential for high-quality BRT service in the Plan area.

There are other sources of information regarding the current performance of the road network in the Plan area. This information is briefly discussed below.

The Maryland State Highway Administration (MDSHA) web site includes Average Annual Daily Traffic (AADT) count data, level of service (LOS), and traffic trend data for US 29 (Columbia Pike), MD 650 (New Hampshire Avenue) and Randolph Road/Cherry Hill Road.

The traffic trend data for these major roadways at selected intersections are presented in Figures 4 through 14 below.



# Figure 3 Existing Intersection CLVs Using 1600 CLV as the Congestion Standard



### Figure 4 US 29 (Colesville Road) South of Industrial Parkway Average Annual Daily Traffic Volumes 2004 – 2011

Figure 5 US 29 South of MD 650 (New Hampshire Avenue) Average Annual Daily Traffic Volumes 2004 – 2011





# Figure 6 US 29 (Colesville Road) South of I-495 Average Annual Daily Traffic Volumes 2004 – 2011

Figure 7 US 29 (Colesville Road) South of MD 193 (University Boulevard) Average Annual Daily Traffic Volumes 2004 – 2011





# Figure 8 MD 650 (New Hampshire Avenue) North of Randolph Road Average Annual Daily Traffic Volumes 2004 – 2011







# Figure 10 MD 650 (New Hampshire Avenue) North of I-495 Average Annual Daily Traffic Volumes 2004 – 2011

Figure 11 MD 650 (New Hampshire Avenue) South of MD 193 (University Boulevard) Average Annual Daily Traffic Volumes 2004 – 2011





## Figure 12 Randolph Road West of MD 650 (New Hampshire Avenue) Average Annual Daily Traffic Volumes 2004 – 2011

Figure 13 Cherry Hill Road South or East of US 29 (Columbia Pike) Average Annual Daily Traffic Volumes 2004 – 2011





### Figure 14 Cherry Hill Road East of MD 212 (Powder Mill Road) Average Annual Daily Traffic Volumes 2004 – 2011

In general, the data for the corridor traffic volumes during this eight year period indicate a downward trend on New Hampshire Avenue and Randolph/Cherry Hill Roads that has not occurred on US 29. The lower volumes are thought to be primarily attributable to the recent recession and are similar to the national trend for the time period in question. Within the County, most major corridors reflect a trend similar to New Hampshire Avenue. The exceptions are I-270, I-495, and US 29 – roadways that proportionally accommodate more travel between Montgomery and neighboring counties in Maryland or Virginia and the District of Columbia.

The MDSHA web site also includes traffic count data and Level of Service (LOS) information on major intersections within the Plan area. Table 3 depicts the available information from the web site on intersection performance at key intersections within and near the Plan area. It is important to note that an intersection with a LOS of F under the SHA methodology is not necessarily equivalent to an intersection that "fails" under the County's Subdivision Staging Policy (or vice-versa).

Intersection	Count Date	AM LOS	PM LOS
US 29 at Fairland Road	06/01/2011	F	F
US 29 at Tech Road	05/24/2011	D	F
US 29 at Industrial Parkway	09/14/2006	Е	D
US 29 at Stewart Lane	02/23/2011	D	F
US 29 at Lockwood Drive	05/25/2010	Е	Е
MD 650 at Elton Road	01/19/2011	С	В
MD 650 at Powder Mill Road	01/13/2011	D	D
MD 650 at Schindler Drive/ Mahan Road	02/08/2011	В	А
MD 650 at Lockwood Drive	06/07/2011	С	С
East Randolph Road at Old Columbia Pike	03/07/2006	А	А
MD 212 at Cherry Hill Road	05/18/2010	В	С

### Table 3 MDSHA Intersection Level of Service (LOS) at Selected Locations

### US 29 (Columbia Pike) Overview

US 29 (Columbia Pike) is a six lane divided major highway that traverses the southern end of the Plan boundary (Northwest Branch) to the northern end (East Randolph/Cherry Hill Roads). Current (2010) average annual daily traffic is in the 60,000 to 65,000 range within the Plan area. The traffic volume trend along this roadway, as previously noted, is up – since 2004 an average annual increase of about 1.5%.

Within the Plan area there are full grade-separated interchanges where US 29 intersects New Hampshire Avenue and East Randolph/Cherry Hill Road. There are master planned (but not programmed) grade-separated interchanges within the Plan area at Stewart Lane and Tech Road/Industrial Parkway. The at-grade intersections at Stewart Lane and Tech Road are operating at LOS F based upon the latest available SHA count data (see Table 3 above). Beyond (but nearby) the Plan area there are existing grade-separated interchanges along US 29 to the north at Briggs Chaney Road and at the ICC. The US 29 master planned right-of -way varies between 100 and 200 feet along the segment within the Plan area. The existing applicable master plans (1997 *Fairland Master Plan* for the segment between Randolph/Cherry Hill Roads and the Paint Branch Stream Valley and 1997 *White Oak Master Plan* for the remaining segment to the south) both envision no more than six through lanes.

The adjacent land use in the corridor includes single family (including townhouses), multifamily (both garden apartment and high-rise), and commercial (office, light industrial, retail, and other uses - hotels/institutional mainly). The setting is for the most part one that is auto oriented in context and scale and is dominated by the campus of the Federal Research Center at White Oak where the U.S. Food and Drug Administration (FDA) is located and the light industrial and office park sites near the intersection of US 29 and East Randolph/Cherry Hill Road.

#### **External Trip Making Profile**

Because US 29 is a major corridor for trips entering and exiting the County, it is important to briefly examine the characteristics and scope of these trips when reviewing even the existing conditions. The following general attributes of the trips as currently forecasted by the regional model for 2040 using the COG adopted Round 8.1 Cooperative Forecast land use data are worth noting.

About 12,000 person trips per weekday in 2040 are expected to be made between the Fairland/ White Oak Policy area to jobs in the District of Columbia. This amounts to about 1% of the total person trips originating in the County but is nevertheless the 8<sup>th</sup> highest origin/destination pair among the sub districts or policy areas.

The year 2040 projected number of home based work (person) trips from all of Howard County to jobs within all of Montgomery County is 6,400. Most of these trips will be made on either US 29 or I-95. The comparable number of home based work trips from Frederick County to jobs within Montgomery County is 38,000 (via I-270 for the most part). The comparable number of home based work trip from Fairfax County to jobs within Montgomery County is 12,800 (via I-495 for the most part).

It is important to again note that I-270 and US 29 (and I-495 to a somewhat lesser extent) are essentially the only major corridors within the County where the average annual daily traffic volumes have increased over the last seven years.

Given the function of Columbia Pike (US 29) as a major regional commuter facility linking Montgomery County with Howard County to the north and the District of Columbia to the south, it is useful to examine the composition of external traffic (i.e., traffic originating outside of the County) along this roadway. In this context, external traffic is defined as traffic originating primary in Howard County and points north during the AM peak hour. External traffic is defined as traffic primarily destined to Howard County and points north during the PM peak hour. Figure 15 depicts the current (i.e., year 2010) composition of external daily traffic traveling southbound along US 29 after crossing the bridge over the Patuxent River. Based on the analysis of data derived from the application of the Department's regional transportation model, approximately 54% of this traffic is external on US 29 just north of Cherry Hill/East Randolph Road (the northern boundary of the Plan area). The component of external traffic drops to 26% on US 29 just south of New Hampshire Avenue. On US 29 just south of the Beltway (I-495) the component of external traffic drops to approximately 9%. On US 29 at the boundary of the County with the District of Columbia the component of external traffic is estimated to be roughly 3.5%. Figure 16 depicts comparable information for the year 2040 assuming the Plan's Alternative Master Plan scenario and supporting transportation network.



# Figure 15 Composition of External Travel Along US 29 - Current Conditions



### Figure 16 Composition of External Travel Along US 29 - Year 2040

An evaluation of external traffic traveling along US 29 between MD 198 and Stewart Lane was also performed based on available **observed** MDSHA traffic count data. The observed AM and PM directional peak hour volume results are reported in Table 4. Using these results, the proportional distribution of external traffic is reported in Table 5. The evaluation shows that the proportion of external traffic at various points along US 29 varies significantly during peak hour travel times. During the AM peak hour, the percentage of external traffic traveling southbound along US 29 is 100% just north of MD 198 and drops to 51% just south of Stewart Lane. The comparable AM peak external traffic percentages in the northbound direction along US 29 range from 35% just south of Stewart Lane to 100% just north of MD 198. During the PM peak hour, the percentage of external traffic traveling southbound along US 29 is 100% just north of MD 198 and drops to 51% just south of MD 198 and drops to 33% just south of Stewart Lane. The comparable PM peak percentages in the northbound direction along US 29 range from 41% just south of Stewart Lane to 100% just north of MD 198.

Using these same data, a profile of external traffic volumes and traffic volumes originating from Montgomery County during the AM Peak hour is shown as Figure 17. The comparable directional PM peak hour external traffic volume profile is shown as Figure 18.

	AM			PM				
	Southbound Northbound Southbound N		North	nbound				
	MoCo	Non-MC	MoCo	Non-MC	MoCo	Non-MC	MoCo	Non-MC
	0	3516	0	1772	0	2217	0	3468
MD 198								
	169	3046	474	1483	179	1827	690	3040
Blackburn Rd								
	328	3042	535	1384	297	1821	779	2932
Greencastle Rd								
	611	2893	574	1239	427	1544	962	2737
Briggs Chaney Rd								
	758	2513	807	1029	645	1309	1306	2387
MD 200 (ICC)								
	826	2299	954	1000	650	1170	1481	2351
Fairland Rd								
	953	2256	804	775	784	1132	1299	1930
Musgrove Rd								
	1032	2095	1024	753	1033	1087	1617	1850
E Randolph Rd								
	840	1534	627	722	897	885	1142	1689
Tech Rd								
	940	1320	923	667	1242	797	1657	1568
Industrial Rd								
	1114	1267	1059	643	1517	776	1869	1501
Stewart La								
	1107	1134	1110	610	1372	665	2073	1468

# Table 4 US 29 External Traffic Summary – Peak Hour Volumes

	AM				PI	N		
	South	bound	North	nbound	Southbound Northbo		bound	
	MoCo	Non-MC	MoCo	Non-MC	MoCo	Non-MC	MoCo	Non-MC
	0%	100%	0%	100%	0%	100%	0%	100%
MD 198								
	5%	95%	24%	76%	9%	91%	18%	82%
Blackburn Rd								
	10%	90%	28%	72%	14%	86%	21%	79%
Greencastle Rd								
	17%	83%	32%	68%	22%	78%	26%	74%
Briggs Chaney Rd								
	23%	77%	44%	56%	33%	67%	35%	65%
MD 200 (ICC)								
	26%	74%	49%	51%	36%	64%	39%	61%
Fairland Rd								
	30%	70%	51%	49%	41%	59%	40%	60%
Musgrove Rd								
	33%	67%	58%	42%	49%	51%	47%	53%
E Randolph Rd								
	35%	65%	46%	54%	50%	50%	40%	60%
Tech Rd								
	42%	58%	58%	42%	61%	39%	51%	49%
Industrial Rd								
	47%	53%	62%	38%	66%	34%	55%	45%
Stewart La								
	49%	51%	65%	35%	67%	33%	59%	41%

# Table 5 US 29 External Traffic Summary – Peak Hour Percentages



# Figure 17 US 29 External Traffic Profile – AM Peak Hour

- -SB MoCo
- -SB Non-MC



# Figure 18 US 29 External Traffic Profile – PM Peak Hour



### **Existing Metrobus and Ride-On Service**

A map depicting the existing Metrobus and Ride-On service operating in the Plan area and its immediate vicinity is provided below in Figure 19.

Figure 19 Existing Local Bus Routes in the WOSG Plan Area and Vicinity

Overall local bus coverage is relatively extensive within the Plan area taking into account that much of the bus service is unable to circulate within or traverse through the Federal Research Center site.

Multiple routes operate over the alignments shown in the map as indicated in the summary provided in Table 6 below.

**Comment [GE1]:** Add K9 MetroExtra route to this map.

Line	Route	From	То	Via	Peak Period Headway	Notes
Greencastle - Briggs Chaney Express Line	Metrobus Z11	Greencastle Park & Ride	Silver Spring Metrorail	Columbia Pike / Colesville Road (US 29)	8 - 10 min.	Peak Period & Peak Direction Only
Greencastle - Briggs Chaney Express Line	Metrobus Z 13	Greencastle Park & Ride	Silver Spring Metrorail	Columbia Pike / Colesville Road (US 29)	14 - 30 min.	Peak Period & Off Peak Direction Only
Colesville - Ashton Line	Metrobus Z2	Montgomery General Hospital	Silver Spring Metrorail	New Hamshire Ave (MD 650) / Colesville Road (US 29)	22 - 25 min.	Peak Period Only
Calverton - Westfarm Line	Metrobus Z 6	Burtonsville Crossing / Briggs Chaney Park & Ride Lots	Silver Spring Metrorail	Columbia Pike / Lockwood Drive / Colesville Road (US 29)	20 - 30 min.	All Day Service
Fairland Line	Metrobus Z 8	Greencastle / Briggs Chaney Park & Ride	Silver Spring Metrorail	Old Columbia Pike / Columbia Pike / Lockwood Drive / Colesville Road (US 29)	10-15 min.	All Day Service with Focus on Segment Between White Oak (Stewart Lane & Old Columbia Pike)and Silver Spring Metro
Riggs Road Line	Metrobus R 2	Plum Orchard Dr. & Broadbirch Dr.	Fort Totten Metrorail	Powder Mill Road / Riggs Road (MD 212) / Prince George's Plaza	30 min.	All Day Service with Focus on 20 - 30 Minute Mid- day Service to Prince George's Plaza & NB AM Peak Period Trips
Riggs Road Line	Metrobus R 5	Plum Orchard Dr. & Broadbirch Dr.	Fort Totten Metrorail	Powder Mill Road / Riggs Road (MD 212) / Prince George's Plaza	25-45 min.	All Day Service - Most Trips NB in Afternoon
New Hampshire Ave. Maryland Line	Metrobus Route K 6	White Oak	Fort Totten Metrorail	New Hamshire Ave (MD 650)	11-21 Min.	All Day Service But Serves FRC / FDA via Mahan Road Peak Hour Peak Direction Only
College Park - White Flint Line	Metrobus Route C8	White Flint Metrorail	College Park UMD Metrorail	Randolph Road / New Hampshire Ave. (MD 650) / Adelphi Road	30 Min.	All Day Service
MetroExtra	Metrobus K9	Northwest Apartments	White Oak Transit Ctr/FDA	New Hamshire Ave (MD 650)	10 Min.	Peak Period & Peak Direction Only
Ride-On	Ride On Route 10	Twinbrook Metrorail	Hillandale	Randolph Road / Columbia Pike /New Hampshire Ave. (MD 650)	30 Min.	All Day Service
Ride-On	Ride On Route 20	Hillandale	Silver Spring Metrorail	New Hamshire Ave (MD 650) / Piney Branch Road (MD 320)	7-10 Min.	All Day Service
Ride-On	Ride On Route 21	Briggs Chaney Park & Ride	Silver Spring Metrorail	Briggs Chaney Road / Fairland Road / New Hampshire Ave. (MD 650) / Columbia Pike / Colesville Road (US 29)	30 Min.	Peak Period & Peak Direction Only
Ride-On	Ride On Route 22	Silver Spring Metrorail	FRC / FDA	New Hampshire Ave. (MD 650) / Columbia Pike / Colesville Road (US 29)	15 Min.	Service is Peak Period Only and Focus is Peak Direction
Ride-On	Ride On Route 39	Briggs Chaney Park & Ride	Glenmont Metrorail	Briggs Chaney Road / Bonifant Road / Layhill Road	30 Min.	Service is Peak Period Only and Focus is Peak Direction
UMD College Park	UM Shuttle Route 100	Burtonsville Park & Ride Lot	UMD College Park	Columbia Pike (US 29) / Cherry Hill Road / Baltimore Ave (US 1)	N/A	One AM and One PM Trip

In general, the following profile can be used to describe the more prominent existing transit service within the Plan area:

- Ride-On Route 10 operates along the segments of US 29 and New Hampshire Avenue that are either adjacent to, or within, the plan boundary. This route provides 30 minute service during weekday peak periods connecting the Plan area to the Glenmont and Twinbrook Metrorail stations to the west via Randolph Road.
- US 29 (Columbia Pike) is well served in the weekday peak period by Metrobus Routes Z11, Z6, and Z8. These routes connect the Plan area with the Silver Spring Metrorail station. The combined frequencies of all buses operating on US 29 in or near the Plan area in the peak direction during peak periods is estimated to be somewhere between 2 and 4 minutes.
- MD 650 (New Hampshire Avenue) in the Plan area is served with frequent peak period service by Metrobus Routes K6 and C8, along with Ride-On Route 22. Route K6 connects the Plan area with the Fort Totten Metrorail station and Route C8 connects White Flint with UMD College Park via Randolph Road, New Hampshire Avenue and Adelphi Road. Route 22 connects the Federal Research Campus and FDA with the Silver Spring Metrorail station and Transit Center. The recently extended K9 MetroExtra bus service operates at roughly 10 minute headways with a terminus at the White Oak Transit Center. The combined frequencies of all buses operating on New Hampshire Avenue in or near the Plan area in the peak direction during peak periods is estimated to be somewhere between 5 to 7 minutes.
- Service to and from Prince George's County from the Plan area is provided by Metrobus Route C8 as noted above and also Metrobus Routes R2 and R5 that connect the Plan area with the Fort Totten Metrorail station and Prince George's Plaza (Route R2 only) via Powder Mill Road and Riggs Road.

### **Relevant Transit Planning Efforts**

Several recent transit planning efforts are relevant to the WOSG Plan. The results of these efforts help form the basis for the development of the BRT network-related recommendations for this Plan. These transit planning efforts are briefly described below.

#### WMATA Priority Corridor Network (PCN)

WMATA's PCN is a planning strategy that looks at improvements in selected high ridership bus corridors throughout the region that can be implemented quickly and efficiently. The overall objective is to increase average bus speeds, service reliability, capacity, ridership levels, and access to the system. There are two corridors (New Hampshire Avenue and Colesville Road/Columbia Pike/US 29) within the Plan area that are included in WMATA's PCN. Recommended improvements are based upon corridor specific studies for each of the 24 corridors that comprise the PCN. Improvements are generally identified as either nearterm (1-2 years) or long term (2+ years) for purposes of implementation. Improvements of the type (dedicated lanes, etc.) generally considered in master plans fall into the long term category.

WMATA has completed a corridor specific study for New Hampshire Avenue. The study recommends the introduction during the long term of frequent limited stop express service along New Hampshire Avenue between White Oak and the Fort Totten Metrorail station via the planned Takoma Langley Transit Center (a Purple Line station). Dedicated transit lanes (possibly peak period only) are recommended on New Hampshire Avenue between I-495 and the Takoma Langley Transit Center. As a first step toward implementation, a new limited stop K9 Metro Extra service was introduced in the New Hampshire Avenue corridor immediately south of the Plan area in late 2012.

WMATA has not completed a corridor specific study of the US 29 corridor.

### Countywide Bus Rapid Transit (BRT) Study

The Montgomery County Department of Transportation (MCDOT) completed a feasibility study in July 2011 of a network of BRT corridors that also included US 29/Columbia Pike/ Colesville Road and New Hampshire Avenue. The Countywide BRT Study also included a route on Randolph Road from White Flint Metrorail to Glenmont Metrorail. The study initially examined a route on Randolph Road/Cherry Hill Road that extended east of the Glenmont Metrorail to the Prince George's County line. This segment was not carried forward to the final set of routes evaluated in the hypothetical network because of the lower (relative to other areas) population and employment densities – and resulting lower ridership forecast.

The US 29 corridor recommendation included service from the Burtonsville Park and Ride Lot to the Silver Spring Metrorail station. Eleven potential station locations were identified. The station locations within or near the Plan area included the following:

- US 29 and Fairland Road
- US 29 and Tech Road
- White Oak Transit Center
- Lockwood Drive and Oak Leaf Drive
- US 29 and Hillwood Drive

MCDOT's Countywide BRT Study was a <u>feasibility</u> study that examined the potential for a BRT network that would theoretically operate within the <u>existing</u> (i.e., not "master planned") right-of-way in each of the proposed corridors. Specific assumptions (concept level) on the typical sections and other features in the US 29 / Columbia Pike corridor within or near the Plan area included the following:

- Two way unguided median transitway (36 feet in width) from Fairland Road to Stewart Lane
- Potential queue jump opportunities (if curb lane operation)at Fairland Road and Tech Road

• Potential one way guided median transitway (15 feet in width) from Lockwood Drive to Southwood Avenue.

The New Hampshire Avenue corridor recommendation included service from the White Oak Transit Center to the Fort Totten Metrorail station. Nine potential station locations were identified. The station locations within the Plan area included the following:

- White Oak Transit Center
- New Hampshire Avenue and Schindler Drive/Mahan Road (FDA)
- New Hampshire Avenue and Powder Mill Road

Specific assumptions (concept level) on the typical sections and other features in the New Hampshire Avenue corridor within or near the Plan area included the following:

- One way unguided median transitway (25 feet) from Lockwood Drive to Ruppert Road
- One way guided median transitway (15 feet) from Ruppert Road south to plan boundary at I-495.

The Countywide BRT Study does not recommend (like the WMATA PCN Plan) dedicated transit lanes (within the existing right-of-way) between the White Oak Transit Center and the Takoma Langley Transit Center.

It should also be noted that the concept of a "Purple Line Connector" between White Oak and the Takoma Langley Transit Center along the New Hampshire Avenue corridor has been included as one of the recommend transit projects in recent joint priority letters from the County Executive and County Council to the MDOT Secretary.

The Countywide BRT Study included 2040 ridership forecasts along with assumptions related to the level of service needed to accommodate the forecasted ridership.<sup>1</sup> The US 29 /Columbia Pike/Colesville Road BRT forecast average weekday ridership was in the range of 13,700 to 17,100 – a level requiring a service frequency of about 3 to 4 minutes during peak periods. The New Hampshire Avenue BRT forecast average weekday ridership was in the range of 9,400 to 11,700 – a level requiring a service frequency of about 5 to 6 minutes during peak periods. The assumptions on service frequencies are based in part on assumptions related to bus size or capacity – in this case 60 foot long articulated buses.

<sup>&</sup>lt;sup>1</sup> The ridership forecasts are based upon assumptions for the land uses in 2040 as contained in the COG Round 8.0 Cooperative Forecasts. The land use forecasts generally reflect development anticipated through 2040 under the zoning contained in adopted master plans.

#### County Executive's Rapid Transit Task Force and Accompanying Concept Plan

The County Executive appointed a Rapid Transit Task Force in February 2011 to follow up on the work and eventual recommendations of the Countywide BRT Study. The Task Force developed a preliminary Concept Plan that included additional detail on the possible attributes or features of selected BRT corridors. This plan was largely (but not entirely) limited to what could be accomplished within the existing right-of-way – especially within the "running sections"- or sections where there are no stations or intersecting streets. There was a general acknowledgment that additional right-of-way beyond the existing right-of-way would be needed to accommodate some station locations and at some of the major intersections where dedicated left turn lanes or a queue jump should be provided.

There was also a recommendation that the Planning Department's Countywide Transit Corridors Functional Master Plan "should assume 12 to 15 additional feet along each side of a road where it was assumed the bus was operating in a dedicated (for buses) curb lane, where auto lanes were eliminated in favor of dedicated curb lane operation, or where dedicated left turn lanes are eliminated or reversible lane systems are built." About nine miles of the 105 mile network in the Concept Plan involves reversible lane systems or segments. Another five miles of the network is identified as being in Business Access Transit (or BAT) lanes – essentially a dedicated curb lane operation as described above. It therefore appears about 15% of the running way segments (i.e., excluding intersections and station locations) in the network would require an additional 12 to 15 feet in order to be implemented.

Another 60% of the network is recommended to be in a reversible one-way median guideway that is 10.5 feet wide and adjacent to 10.0 foot wide general purpose travel or turn lanes. Multiple reviewing agencies (including the Planning Department staff) have questioned the assumption that this type of typical section is workable due to the narrow lane widths. Regardless, it is reasonable to assume that considerably more than15% of the running way segments in the network documented in the Concept Plan will require right-of-way beyond that which currently exists (i.e., more than the <u>existing</u> right-of-way but not necessarily more than the <u>master planned</u> right-of-way). Again, this is on running way segments and is therefore in addition to more right-of-way beyond the existing right-of-way that will be needed at intersections and station locations.

The Concept Plan included recommendations related to three corridors within the Plan area – US 29, New Hampshire Avenue (MD 650), and Randolph Road/Cherry Hill Road. In the Concept Plan, the Randolph Road/Cherry Hill Road segment extends east of the Glenmont Metrorail to FDA Boulevard.

Specific recommendations in the Concept Plan for the <u>US 29 corridor</u> include the following:

• Service between the Silver Spring Transit Center and the Burtonsville Park and Ride Lot

- From University Boulevard (MD 193) north to New Hampshire Avenue (MD 650) remove dedicated left turn lanes and construct a single lane guideway in the median. The concept plan running section width is 74.5 feet and includes one 10.5 foot wide transitway for peak direction travel, two 10 feet lanes in each direction, and one 12 foot curb lane in each direction. A significant portion of this segment has an existing right-of-way of 95 to 105 feet. The Master Plan right-of-way along this segment is 120 feet.
- From New Hampshire Avenue north to Spencerville/Sandy Spring Road (MD 198) construct a single guideway in the median and keep the left turns lanes. The concept plan running section for this segment is the same 74.5 foot section described above. The existing right-of-way in this section varies considerably as it includes not only Columbia Pike but also parallel Old Columbia Pike and Prosperity Drive to the northern Plan area boundary at East Randolph/Cherry Hill Road. The minimum existing right-of-way is effectively about 135 feet at the bridge crossing of Paint Branch. The widest section is north of Tech Road where the existing right of may exceed 250 feet. The Master Plan right-of-way in the segment from New Hampshire Avenue to Paint Branch is 200 feet. The Master Plan right-of-way from Paint Branch north to East Randolph/Cherry Hill Road varies from 100 to 200 feet.
- From Tech Road north to Sandy Spring Road (MD 198) it would be possible to initially construct a double guideway in the median.
- Station platforms or areas at the following locations:
  - University Boulevard (south of Plan area)
  - $\circ \quad \mbox{Columbia Pike at Oak Leaf Drive}$
  - Columbia Pike and Stewart Lane
  - Columbia Pike and Industrial Parkway
  - Briggs Chaney Road (north of Plan area)

The Concept Plan recommends that the BRT service stay on Columbia Pike and not detour onto Lockwood Drive. The Countywide BRT study recommends a routing along Lockwood Drive and a station at the White Oak Transit Center located on Lockwood Drive near White Oak Shopping Center.

Specific recommendations in the Concept Plan for the <u>New Hampshire Avenue corridor</u> include the following:

Overall, service would be provided between the Takoma Langley Transit Center and the ICC with an acknowledgement that the corridor could be extended to the University of Maryland in College Park via Adelphi Road.

• From Adelphi Road north to Lockwood Drive operate in either mixed traffic in the curb lane or consider repurposing an existing general purpose lane and operate in a Business Access Transit (BAT) lane. The Concept Plan running section width is 80

feet and includes two 12 foot wide BAT lanes, two 10 feet general purpose lanes in each direction, and a 16 foot median that can accommodate a 10 foot left turn lane. A significant portion of this segment has an existing estimated right-of-way of 100 to 160 feet. The more narrow section is between Powder Mill Road and Chalmers Road. The Master Plan right-of-way along this segment (and all of New Hampshire Avenue within the Plan area) is 120 feet.

• From Lockwood Drive to Heartfields Drive/Quaint Acres Drive, operate in mixed traffic. The segment of New Hampshire Avenue north of US 29 is outside the Plan area. The recommendation for operation in mixed traffic is due to constraints at the interchange at US 29 (Columbia Pike).

The segment of New Hampshire Avenue within the Plan area presents a challenge for accommodating any type of bus priority treatment in the near term due to the constrained existing right-of-way south of Chalmers Road, the interchanges at I-495 and US 29, traffic volumes along the segment (45,000 to 55,000 AADT), and the adjacent mix of commercial and single family residences. Redevelopment of the Hillandale Shopping Center and National Labor College sites, however, present a long term option for obtaining additional right-of-way at this station area.

Station platforms or areas at the following locations:

- Adelphi Road (south of the Plan area)
- Hillandale Shopping Center at Powder Mill Road
- Schindler Road/Mahan Road at FDA entrance
- Lockwood Drive (not necessarily at existing Transit Center)
- Randolph Road (north of the Plan area)

Specific recommendations in the Concept Plan for the Randolph Road/Cherry Hill Road <u>corridor</u> include the following:

- Service between the Park and Ride Lot at Rockville Pike (MD 355) and Montrose Parkway and FDA Boulevard at Cherry Hill Road.
- Service provided via a single lane guideway in the median for what is essentially the entire corridor.
- From Rockville Pike to Nebel Street the concept plan running section width is 74.5 feet and includes one 10.5 foot wide transitway for peak direction travel, two 10 feet lanes in each direction, and one 12 foot curb lane in each direction. This short segment has an existing right-of-way of 95 to 105 feet. The Master Plan right-of-way along this segment is 100 feet.

### Countywide Transit Corridors Functional Master Plan (CTCFMP)

This Plan is an update of the County Master Plan of Highways and was adopted by the County Council in November 2013. The focus of the Plan is on identifying the master plan

minimum right-of-way necessary to implement BRT in selected corridors. The Plan identifies right-of-way and concept design treatment of three (3) corridors which could support BRT service in the WOSG Master Plan area: (1) Columbia Pike (US 29); New Hampshire Avenue (MD 650) and Randolph Road.

# Technical Approach for Recommendations Pertaining to BRT for the White Oak Science Gateway Master Plan

The first step of Staff's approach to address this issue was to advance the work of the prior BRT studies by identifying segments within each corridor where exclusive or dedicated lanes might be provided without resulting in significant impact to properties adjacent to the respective roadways. The second step was to then develop a reasonable estimate of the average speed of the BRT service operating in each corridor and compare that speed to the speed assumed in the CTCFMP Study and the BRT speed used in the Department's regional travel forecasting model, Travel/3.

The approach also used information derived from three primary technical reports to inform the preliminary recommendations pertaining to BRT for the White Oak Science Gateway Master Plan:

- Network and Methodology Report (December 2011)
- BRT Corridor Function Assessment (DRAFT) (March 29, 2012)
- BRT Typical Sections Update (Final Draft) (April 18, 2012)

These technical reports, along with the prior studies noted above form the basis for arriving at the preliminary recommendations for BRT for the White Oak Science Gateway Plan for the three corridors under consideration - US 29, New Hampshire Avenue, and Randolph Road/Cherry Hill Road.

More specifically, these sources help identify the individual corridor characteristics (all three being "commuter corridors" characterized by significantly more travel in the peak direction) and also helps in arriving at a "default" right-of-way section (in this case 120 feet) that establishes the minimum envelope required to provide one (new) exclusive or dedicated lane for travel in the peak direction with three existing travel lanes in each direction for general purpose travel.

The specific preliminary recommendations resulting from this approach for each corridor are presented in tables 7 through 9. A summary narrative follows each table.

### Table 7 US 29 BRT Corridor

Roadway	From	То	MP ROW	Existing ROW	Recommended	Distance (Mi.)	Avg. Speed	Min.
US 29	Burtonsville P&R	Randolph Rd / Cherry Hill Rd	100 - 200	175 - 225	Reversible Median	3.8	20	11
US 29	Randolph Rd / Cherry Hill Rd	Paint Branch Stream Valley	100 - 200	130 - 280	Reversible Median	1.2	24	3
US 29	Paint Branch Stream Valley	Lockwood Drive	200	130 - 280	Reversible Median	0.5	22	1
Lockwood Drive	US 29	US 29	70 - 80	70 - 85	Mixed Traffic	1.3	12	7
US 29	Lockwood Drive	NW Branch Stream Valley	120	95 - 135	Mixed Traffic	0.3	14	1
US 29	NW Branch Stream Valley	University Blvd	120	95 - 120	Mixed Traffic	0.9	14	4
US 29	University Blvd.	Sligo Creek Parkway	120	95 - 110	Mixed Traffic	1.0	14	4
US 29	Sligo Creek Parkway	Spring Street	120	90 - 100	Dedicated Existing Lane	0.7	20	2
US 29	Spring Street	Fenton Street	120	90 - 95	Dedicated Existing Lane	0.1	18	0
US 29	Fenton Street	Georgia Ave	100	80 - 90	Dedicated Existing Lane	0.1	18	0
US 29	Georgia Ave	SSTC	124	105 - 115	Dedicated Existing Lane	0.3	16	1
					Total	10.0	17	35
					Mixed Traffic	3.4		
					Reversible Median	5.5		
					Dedicated Existing Lane	1.1		

The above configuration for the US 29 corridor has an estimated average speed of 17 mph – compared to 19 mph in the CTCFMP Study and 21 mph in the regional model. The difference in speeds is relatively minor and therefore the potential to attract riders should be similar to the potential reflected in the model forecast results.

The concept corridor profile in the table above for US 29 would result in new pavement within the existing right-of-way in the segment from the Burtonsville Park and Ride Lot to Lockwood Drive. BRT buses would operate in dedicated (existing lanes) from Sligo Creek Parkway to the Silver Spring Transit Center – likely during peak period (in the peak direction) only. No right-of-way beyond the existing right-of-way would be required except at station locations and intersections. This (and the following) concept profile(s) should be viewed as representative examples developed for the purpose of determining whether it would be possible to introduce BRT along the entire corridor that would achieve the desired average speed without resulting in significant impacts on adjoining parcels. Any actual implementation of the concept would be profile being implemented in any one, combination, or all segments.

Roadway	From	То	MP ROW	Existing ROW	Recommended	Distance (Mi.)	Avg. Speed	Min.
Lockwood Drive	White Oak Transit Center	NH Avenue	80	70 - 85	Mixed Traffic	0.1	10	1
NH Avenue	Lockwood Drive	Mahan Road	120	125 - 140	Mixed Traffic	0.6	14	3
NH Avenue	Mahan Road	I - 495	120	105 - 115	Mixed Traffic	1.2	14	5
NH Avenue	I - 495	Oakview Drive	150	150 - 160	Reversible Median	0.3	16	1
NH Avenue	Oakview Drive	County Line	150	130 - 140	Reversible Median	0.6	18	2
NH Avenue	County Line	Takoma Langley Transit Center	120	110 - 140	Reversible Median	1.3	20	4
NH Avenue	Takoma Langley Transit Center	East West Highway	100	100 - 140	Reversible Median	1.0	20	3
NH Avenue	East West Highway	Eastern Avenue	120	100 - 140	Reversible Median	0.8	18	3
Eastern Avenue	NH Avenue	Riggs Road	70	60	Mixed Traffic	0.4	12	2
Riggs Road	Eastern Avenue	1st Place NE	80	80	Mixed Traffic	0.6	12	3
1st Place NE	Riggs Road	Fort Totten Metrorail	70	70	Mixed Traffic	0.5	12	3
					Total	7.4	16	29
					Mixed Traffic	3.4		
					Reversible Median	4.0		

### **Table 8 New Hampshire Avenue BRT Corridor**

The above configuration for the New Hampshire Avenue corridor has an estimated average speed of 16 mph – compared to 12 mph in the CTCFMP Study and 19 mph in the regional model. The concept corridor profile in the New Hampshire Avenue table above would require additional right-of-way of up to an estimated 20 feet in some segments (outside of the Plan area) from the Takoma Langley Transit Center south to Eastern Avenue – excluding any additional right-of-way that may be required at station locations and intersections.

### **Table 9 Randolph Road BRT Corridor**

Roadway	From	То	MP ROW	Existing ROW	Recommended	Distance (Mi.)	Avg. Speed	Min.
Randolph Road	MD 355 Rockville Pike	Rock Creek	100	80 - 100	Mixed Traffic	1.3	12	7
Randolph Road	Rock Creek	Judson Road	120	95 - 110	Reversible Median	2.3	18	8
Randolph Road	Judson Road	400' W of Glenallan Ave.	140	120	Reversible Median	0.4	8	3
Randolph Road	400 ' W of Glenallan Ave.	Fairland Road	120	110 - 145	Reversible Median	3.1	22	8
Randolph Road	Fairland Road	US 29	80	70 - 80	Mixed Traffic	3.3	16	12
					Total	10.4	16	38
					Mixed Traffic	4.6		
					Reversible Median	5.8		

The above configuration for the Randolph Road corridor has an estimated average speed of 16 mph – compared to 14 mph in the CTCFMP Study and 24 mph in the regional model. The concept corridor profile in the Randolph Road table above would require additional right-of-way (beyond the existing right-of-way) of up to an estimated 10 to 25 feet between Rock Creek and Judson Road and between a point just west of Glenallan Avenue to Fairland Road (both segments are outside of the Plan area) – excluding any additional right-of-way that may be required at station locations and intersections.

### **Summary BRT Network Recommendations**

The preliminary recommendation for the BRT Network to serve the White Oak Science Gateway Master Plan area consists of the following corridors largely within Montgomery County:

- US 29
- New Hampshire Avenue
- Randolph Road

Two other corridors complete the concept network and are largely within Prince George's County and are consistent with current Prince George's County concept level planning for a network of high capacity transit corridors:

- North White Oak/Cherry Hill Road Center to Konterra/Muirkirk MARC Station via Powder Mill Road/Ammendale Road
- Hillandale Center to Greenbelt Metro via I-495

A map depicting the BRT network is presented in Figure 20.

### **Other Transit Service**

It is envisioned that the BRT network would be complemented by additional local, circulator and express service provided by Metrobus, Ride-On, Prince George's County "The Bus", and MTA Commuter Service. In addition, these conventional providers could be joined by potential contracted local, circulator and/or shuttle service for specific markets and centers of higher density to assist in achieving non-auto driver mode share targets.


### Figure 20 Bus Rapid Transit Conceptual Alignments and Station Locations

#### **Pedestrian Network - Existing Conditions**

The current sidewalk inventory completed for the Master Plan area is presented in Figure 21. General observations related to the current network taken from the information provided in this figure include the following:

- There is an established sidewalk network in and around the commercial areas.
- There are gaps to connecting the commercial core along Columbia Pike in particular.
- The majority of the areas where single family residences are located do not have sidewalks.

A more detailed examination or inventory of the existing sidewalk network in the WOSG Master Plan Centers is provided below.

### Figure 21 Plan Area Sidewalk Inventory



Hillandale Community

- Lack of sidewalk along north side of Powder Mill Road from Green Forest Drive to the County Border.
- Lack of buffer between the road and sidewalk on south side of Powder Mill Road from New Hampshire Avenue to County border.
- No buffer along both sides of New Hampshire between Powder Mill Road and Cresthaven Drive/Fire & Rescue Station 12.
- No buffer along west side of New Hampshire Avenue between Cresthaven Drive and Ruppert Road.
- Limited buffer along both sides of New Hampshire Avenue between Lockwood Drive and US 29.

White Oak Center

- Lack of buffer along sidewalk from Burnt Mills Road to Prelude Road (US 29).
- Lack of buffer along Old Columbia Pike between Stewart Lane and New Hampshire Avenue.

Life Sciences/FDA Village Center

• Limited buffer along South side of Tech Road from Old Columbia Pike to Broadbirch Drive.

Burnt Mills Shopping Center

- Lack of buffer along sidewalk south of Burnt Mills Shopping Center (US 29).
- Lack of buffer along sidewalk at US 29 and Northwest Branch.
- Lack of buffer along sidewalk from Lockwood to Burnt Mills Road (US 29).

### **Transit-Oriented Development and Density**

There is a considerable amount of existing and evolving research on station area densities, pedestrian accessibility and connectivity, transit mode share, and other issues related to transit-oriented development (TOD). The Planning Department has reviewed available current material on this issue. One good representation is from Reconnecting America and the Center for Transit Oriented Development (see Figure 22). The matrix depicts how TOD can vary in size, scale, and context. For White Oak, the transportation analysis assumed a range of densities. The results (described below) indicated that a balance of the land use and transportation could be achieved at a point where the <u>net</u> density for the commercial sites within the mixed use activity centers would be in the FAR 1 to 2 range.



### Figure 22 Characteristics of Mixed-Use Transit-Oriented Development

Planning, Reconnecting America and the Center for Transit-Oriented Development, February 2008, page 13.

It is important to support the higher densities with improvements to pedestrian connectivity and access as well as enhancements to the street grid where possible.

Another way of analyzing density around transit stations is to examine the station context and how it relates to other stations – both existing and planned - around the three fixed transitways (the existing Metrorail Red Line, the planned Purple Line, and the Corridor Cities Transitway). Figures 23 and 24 present estimates of job and housing densities within ½ mile of the existing Metrorail and proposed CCT and Purple Line stations for the years 2010 and 2040. The densities are gross densities – i.e., this information represents an estimate that considers the total area (including land devoted to streets, parks, etc.) in the traffic zones within the half-mile radius of the station location. <sup>2</sup>

<sup>&</sup>lt;sup>2</sup> The densities are arrived at by creating a ½ mile GIS buffer around each station and dividing the jobs and households in the applicable Traffic Analysis Zone (s) by the area of the TAZ(s) that falls within the ½ mile buffer. The total jobs and households forecast for the applicable TAZ's are adjusted (reduced) by a percentage equal to the amount of the area of the TAZ that is outside of the ½ mile buffer. As a result, the chart is more accurately characterized as an <u>estimate</u> of the gross densities within ½ mile of the transit stations. One general "rule of thumb" is that minimum gross densities of around 7-10 households per acre and 25-50 jobs per acre are needed to support frequent high quality transit service – e.g. LRT or BRT.

### Figure 23 Transit Station Area Employment Densities



### **Figure 24 Transit Station Area Household Densities**



The following observations can be made regarding the densities along the corridors:

- As would be expected, there is an increase in the station area densities from 2010 to 2040. This is especially the case at some of the stations north of the beltway.
- Densities at stations in 2040 continue to vary along each transitway.
- In general, the station densities in White Oak would be expected to be less on average than those on the Purple Line, CCT and Red Line due to the area being further from the CBD's in the County and the DC core area.

Another way of examining station area density is to look at jobs and household density together to see the extent to which stations begin to fall into different groups or types.

Figures 25 and 26 present a scatter plot representing the job and household density for each station. Figure 25 depicts all of the stations and Figure 26 includes those stations that are lower in density.

As noted before, TOD comes in different sizes. All three transit lines are comprised of station settings that vary both in density and the mix of uses. A transit line can be "viable" without all of the stations meeting what are generally accepted guidelines for minimum density thresholds necessary to support transit. The key is to have enough stations that exceed the minimum thresholds to make up the difference – in effect balancing the transit supportive density requirements with the station area context and community vision.

The scatter plot is based upon traffic zones and is therefore a rough estimate of the density within a half mile of the respective stations. Nevertheless, it is clear that about half of the "neighborhood" stations fall below five households per gross acre and all of the "neighborhood" stations are below the 25-50 jobs per acre minimum threshold.

The scatter plot charts also depict how the densities change (increase) based upon the land use scenarios tested in various master planning efforts now underway. In the case of the White Oak Science Gateway Master Plan, the most significant change in density is within the  $\frac{1}{2}$  mile radius around the Percontee/Site 2 station area (see Figure 24).



### Figure 25 Transit Station Area Land Use Densities - All Stations





A summary of the land use/transportation scenarios evaluated during Plan development is presented in Table 10. Key differences among the scenarios include the following:

- The "Base Future Year" scenario represents the anticipated development profile in 2040 under the existing adopted master plans. The increase in development, relative to the "Existing Conditions" scenario, is largely commercial about 4.5 million additional square feet.
- The "Alternative" Master Plan scenario represents a significant change essentially doubling the amount of existing commercial space and residential units relative to the "Base Future Year" scenario.

### Table 10 Summary of Land Use/Transportation Scenarios

Scenario Name	Description	Commercial SF	Residential DU	Transportation assumptions	LU/T Balance?
2010 Existing Development	Existing Development	11,187,298	7,118	Existing network No additional interchanges No BRT No OCP Bridge	
2040 Base Future Year	2040 COG Round 8 Adjusted	15,854,064	7,598	Existing network No additional interchanges No BRT No OCP Bridge	NO
2040 Base Future Year with interchanges	2040 COG Round 8 Adjusted	15,854,064	7,598	Existing network + additional interchanges No BRT No OCP Bridge	NO
High Alternative Land Use Scenario	Traffic Model (High) Development	25,434,851	15,688	Existing network No additional interchanges No BRT No OCP Bridge	NO
High Alternative Land Use Scenario with interchanges and BRT	Traffic Model (High) Development	25,434,851	15,688	Existing network + additional interchanges + BRT + OCP Bridge	NO

White Oak Science Gateway Master Plan Land Use/Transportation Scenarios

Additional Interchanges = US 29 @ Fairland & @ Musgrove (2012 CTP project SHA-M-10) US 29 @ Tech/Industrial (part of 2012 CTP project SHA-M-11) US 29 @ Stewart Ln (part of 2012 CTP project SHA-M-11) US 29 @ Blackburn (part of 2012 CTP project SHA-M-11)

US 29 @ Greencastle (part of 2012 CTP project SHA-M-11)

#### **Non-Auto Driver Mode Share (NADMS) Assumptions**

There is a considerable amount of recent research supporting the fact that well designed TOD generates fewer auto trips and higher rates of trip-making by transit, walking, and biking. This is especially the case in TOD settings with a mix of land uses, high quality transit within walking distance, well connected and pleasant pedestrian and bike facilities, a strong regional transit system, and a vibrant CBD core.

More recent research findings related to non-auto driver mode share (NADMS) in TOD settings is presented below.

From the Transit Cooperative Research Program (TCRP Report 128)

- TOD transit mode share for commuter trips can vary from 5% to near 50%.
- Findings are similar for non-work trips.
- The wide range of percentages is because mode share is heavily influenced by relative travel times with automobiles and extensiveness of transit service which can vary by region.
- Transit share of journey to work trips in 16 selected TOD locations in the DC region averaged 30% in 2000. The walk / bike share accounted for an additional 14% a total non-auto driver mode share for work trip by TOD residents of 44%.

From the WMATA 2005 Development Related Ridership Survey:

- Transit mode share for all trips for high rise residents located inside the beltway, not within the DC CBD, and within ½ mile of a Metrorail station was 49%. The walk /bike share accounted for an additional 14% of all trips made on a typical weekday.
- Transit mode share for work trips by employees whose work location was inside the beltway, not within the DC CBD, and within ½ mile of a Metrorail station was 30%. The walk/bike share accounted for an additional 6% of the total work trips made.

In addition to the research findings noted above, the 2005 Montgomery County Census Update includes the following information related to County residents:

• Nearly twenty two percent of the residents of the Fairland Planning Area commute to work in some manner other than as a driver of a single-occupant auto. The comparable percentages are 32% and 25% for residents of the Kemp Mill/Four Corners and Colesville/White Oak Planning Area, respectively. The comparable percentage for residents of the Silver Spring and Takoma Park Planning Areas are higher – both at 43%.

For employees within Transportation Management Districts (TMD) within the County, the most recent surveys indicate the following:

The non-auto driver mode share for employees in the Bethesda Chevy Chase TMD is 36%. This is higher than White Flint (26%) and Wheaton (a relatively small survey sample indicating 30%) but less than Silver Spring (48%).

The Plan's NADMS goals are largely based on a gradient of NADMS, as shown in Table 11 below, which is highest in the urban, down-County planning areas and lower farther from the region's urban core.

Area	Master Plan Goal (Employees)	Master Plan Goal (Residents)		
Germantown	25%	n/a		
WOSG Master Plan	25%-30%*	25%-30%*		
Great Seneca Science Center	30%	n/a		
Bethesda	37%	n/a		
Silver Spring	50%	n/a		
White Flint	50%	51%		

### **Table 11 Non-Auto Driver Mode Share Goals**

\*Applies to the three mix-used Centers as described in the WOSG Master Plan area. The goal is 30% in the Life Sciences/FDA Village Center and 25% in the Hillandale and White Oak Centers for employees and residents.

### **Transportation Policy Area Review (TPAR)**

Since the early 1980s, every master plan has considered the balance between land use and transportation using an assessment of area-wide conditions forecast for the plan's end-state conditions. TPAR is the current measure of area-wide transportation adequacy, introduced into the County Subdivision Staging Policy in 2012. It is similar in nature to the Policy Area Transportation Review measure that was an element of the Growth Policy from 2007 to 2012.

TPAR is used to implement the Adequate Public Facilities Ordinance (APFO) to forecast conditions by considering the County's ten year forecast of development and transportation system improvements for which funding is anticipated during the next ten years.

TPAR continues the County's long-standing policy that higher levels of roadway congestion are appropriate in areas with higher quality transit service. This provides multi-modal equity across the County and promotes the development of pedestrian-oriented, rather than auto-oriented, improvements in Metro Station Policy Areas.

This Plan's Alternative <u>Master Plan Scenario</u> assumed a significantly higher level of development based on the land use contemplated in the Plan vision for the three major centers at White Oak/FDA, Hillandale, and North White Oak/Cherry Hill. It included all of the grade-separated interchanges and road improvements assumed in the 2040 scenario with the addition of rebuilding the Old Columbia Pike bridge over the Paint Branch that parallels US 29. This scenario also assumed a BRT network.

This Plan is within the Fairland/White Oak Policy Area, which covers most of the eastern County, and the traffic modeling analysis also included an estimation of roadway adequacy for the policy area using the Transportation Policy Area Review (TPAR) methodology. Land use and transportation infrastructure is forecasted to be out of balance in the Fairland/White Oak Policy Area at build-out of the alternative Master Plan scenario as measured by the Subdivision Staging Policy's TPAR roadway adequacy test. The TPAR test evaluates the forecasted speed of travel of each arterial road within the policy area in its peak direction of travel (as derived from the regional transportation demand model) against uncongested, "free flow" speed, and weight-averages the results of all arterials in a policy area by vehicle miles of travel (VMT). The ratio of forecasted speed to uncongested speed is consistent with the type of analysis recommended by the Transportation Research Board's *Highway Capacity Manual (HCM*).

A proposed amendment to the Subdivision Staging Policy would establish the TPAR roadway adequacy standard for the Fairland/White Oak Policy Area to be a minimum 42.5 percent ratio of forecast speed to uncongested speed (mid-point between of Level of Service "D" and "D/E"). A ratio that is lower than this standard would be considered inadequate. For the Fairland/White Oak Policy Area, a TPAR analysis was performed assuming that the level of development in the Plan area reaches the build-out amounts in the Alternative Master Plan scenario (see Figure 27). This analysis assumed the implementation of a BRT network to serve the Plan area and the achievement of a 30 percent non-auto driver mode share (NADMS) for workers in the Plan area. The analysis also assumed that the unbuilt, master-planned interchanges are constructed along US 29 and the bridge over Old Columbia Pike is rebuilt and opened to traffic. These recommendations are supportive of approaching area-wide land use-transportation balance in the Fairland/White Oak Policy Area. However, the resulting policy area ratio of 38 percent of forecast speed relative to uncongested speed is well below the proposed minimum 42.5 percent policy area adequacy standard.

When analyzing whether a policy area is in balance for master planned land use and transportation, County policy explicitly excludes traffic associated with limited access freeways (i.e., interstate highways such as I-495, I-270, and I-370, as well as the Intercounty Connector (MD 200)) from the area-wide transportation test largely in recognition of the high proportion of through and regional trips on these roads. The corridor is also only one of three (I-495 and I-270 being the others) in the County that has seen an overall increase in Average Annual Daily Traffic (AADT) during the past seven years. This suggests that the corridor currently functions in a manner similar to I-495 and I-270 in that it has a higher percentage of through trips with longer than average trip length along the segment of US 29 within the Fairland/White Oak area.

The TPAR analysis performed in support of this Plan evaluated results assuming all traffic forecasted to travel along US 29 between New Hampshire Avenue and MD 198 is excluded from the calculation process. A rationale for excluding this segment of US 29 from the analysis is in recognition that a significant amount of US 29 traffic is regional through travel, similar to the character of traffic on I-270 or I-495. As a result of this test, the TPAR analysis estimates the ratio of forecast speed to uncongested speed in the Fairland/White Oak policy area to be 42 percent, which is a significant improvement relative to the 38 percent ratio that included all US 29 traffic (see Figures 27 and 28, respectively). The resultant 42 percent policy area ratio of forecast speed to uncongested speed is sufficiently close enough to the proposed minimum 42.5 percent policy area roadway adequacy

standard to achieve roadway adequacy in the area. This finding recognizes the long-range planning horizon of the Plan and the fact that full build-out of the Plan is unlikely.

It should be noted that if US 29 were to be considered a limited access highway in the context of TPAR and traffic on US 29 is excluded accordingly, the Local Area Transportation Review element of the County's Adequate Public Facilities Ordinance (APFO) would still apply to future development proposals in the Fairland/White Oak Policy Area.

At least three key factors contribute to the forecasted area-wide level-of-service conditions in the Fairland/White Oak Policy Area described above:

- Regional traffic, primarily from nearby Howard and adjacent Prince George's Counties, over which the County has little control, contributes significantly to traffic congestion in the area.
- Options to significantly expand local or regional roadway capacity are limited, due largely to existing development and environmental constraints.
- Travel within the Plan area represents a sub-set of the amount of travel in the Fairland/White Oak Policy Area. In general, Plan recommendations designed to be supportive of achieving adequate travel conditions in the Plan area (e.g., the achievement of aggressive non-auto driver mode share goals and the realization of transit-oriented development densities) are not applicable to the greater Fairland/White Oak Policy Area.



### Figure 27 Countywide TPAR Analysis Results

The TPAR Roadway Adequacy Analysis retains and accepts the classification of each Policy Area by its level of transit service: Urban (with Metrorail), Transitional Transit Corridor<sup>3</sup>, Suburban and Rural. TPAR specifies the following acceptable levels of average roadway congestion levels in the peak traffic directions within each Policy Area, where the Adequacy Standard differs for Urban, Transitional Transit Corridor, Suburban, and Rural Policy Areas, as shown in the following table.

<sup>&</sup>lt;sup>3</sup> This category is to be considered for adoption by the County Council as an amendment to the Subdivision Staging Policy.

### Table 12 Standards of Acceptable Roadway Average Level of Service (LOS)

Roadway (Arterial) Level of Service Standards						
Policy Area Categories	Acceptable Average Arterial Level of Service					
Urban with Metrorail	Average congestion of "D/E" borderline in the peak flow directions					
Transitional Transit Corridor	Average congestion mid-way between "D/E" borderline and Mid-"D" or less in the peak flow directions					
Suburban	Average congestion of Mid-"D" or less in the peak flow directions					
Rural	Average congestion of "C/D" borderline in the peak flow directions					

The following notes should be used in support of interpreting the results provided in Figures 27 and 28.

- The vertical "aqua blue/green-hatched" bars show the **range** of the average of roadway speeds by direction of travel in relation to the "free flow speed", or level of service (LOS), for each Policy Area in the PM peak period.
- The bottom of the bar shows the average speed LOS in the peak direction of travel. The top of the bar shows the average speed LOS in the non-peak direction.
- The measurement scale weighted average LOS, A through F, is shown on the left side of the chart.
- Each policy area is shown by an abbreviation of its name as described below: • Damascus - DAM Clarksburg - CLK Potomac - POT Olney - OLY North Potomac - NP Cloverly - CLV Germantown East - GTE Aspen Hill - AH Montgomery Village/Airpark - MVA Germantown West - GTW Fairland/White Oak - FWO Gaithersburg - GBG R& D Village - RDV Derwood/Shady Grove - DER Rockville - RKV Bethesda/Chevy Chase - BCC Kensington/Wheaton - KW North Bethesda - NB Silver Spring/Takoma Park - SSTP

Horizontal dotted orange lines are shown to depict the roadway adequacy standards (LOS) for the Rural, Suburban and Urban with Metrorail Policy Areas, from left to right, which graphically corresponds to the Standards of Adequacy depicted in the table above. The roadway adequacy standard for the proposed Transitional Transit Corridor category is depicted by the horizontal red dotted line.



### Figure 28 Countywide TPAR Analysis Results Excluding US 29 Traffic

### Local Area Transportation Review (LATR)

As previously noted, the intersection analysis conducted in support of this Plan applies the Critical Lane Volume (CLV) methodology as described in the Department's Local Area Transportation Review (LATR)/Transportation Policy Area Review (TPAR) Guidelines. The CLV values are converted to a volume-to-capacity measurement, or V/C ratio, by dividing the current or forecasted CLV values by the applicable policy area intersection congestion standard.

As depicted in Figure 29 and shown in Table 12, the County's Subdivision Staging Policy establishes acceptable levels of congestion for different policy areas based on the degree to which alternative modes of transportation are available. In rural policy areas, where few alternatives to auto transport exist, the congestion standard is 1,350 CLV (which equates to the middle range of LOS D). In Metro Station Policy Areas, where multiple alternatives to

auto transport are provided, the congestion standard is 1,800. Currently, intersections in the White Oak Science Gateway Plan area, which is located within the Fairland/White Oak Policy Area, have a congestion standard of 1,475 CLV. Other Policy Areas with the same CLV standard are Aspen Hill and Derwood.



### Figure 29 Intersection Congestion Standards by Policy Area

#### **Table 13 Intersection Congestion Standards by Policy Area**

CLV Congestion Standards	Policy Area
1800	Central Business Districts/Metro Station Locations: Bethesda, Silver Spring, Friendship Heights, Wheaton, Glenmont, White Flint, Grosvenor, Shady Grove, Twinbrook, Rockville Town Center
1600	Bethesda/Chevy Chase, Silver Spring/Takoma Park, Kensington/Wheaton, Germantown Town Center
1550	North Bethesda
1500	Rockville City
1475	Fairland/White Oak, Aspen Hill, Derwood
1450	Cloverly, Olney, Potomac, North Potomac, R&D Village
1425	Clarksburg, Germantown West, Germantown East, Montgomery Village/Airpark, Gaithersburg City
1400	Damascus
1350	Rural East, Rural West

Table 14 summarizes the results of the Local Area Model (LAM) analysis for the major intersections both within the Plan area and within the larger Master Plan study area for the Alternative Master Plan scenario. These results are also depicted graphically in Figure 30. When viewing this figure, level of service for the intersections evaluated is reflected by color-coded dots. The left half of the dot represents morning peak hour conditions. The right half of the dot represents evening peak hour conditions.

The numbers displayed in the table are the CLV-based volume/capacity ratios (or V/C) and are derived by dividing the CLV by 1600 (not 1475, the current Fairland/White Oak Policy Area CLV standard). The use of the higher CLV is consistent with the County's policy of accepting greater levels of roadway congestion in areas where high quality transit options (such as Bus Rapid Transit) are available or anticipated. The Plan's vision is for the mix and intensity of development in the area to change significantly and the 1600 CLV is more representative of areas in the County that are characterized by multiple activity centers with a mix of land uses and more options to use transit. Policy Areas in the County with a current CLV standard of 1600 include Bethesda/Chevy Chase, Kensington/Wheaton (which includes Four Corners), Silver Spring/Takoma Park, and Germantown Town Center.

The V/C ratios reported in Table 14 also assume a number of infrastructure improvements (as noted in the table) that are not programmed or funded. The planned, but unprogrammed, grade-separated interchanges along US 29 and the BRT network are important (but not the only) elements of these infrastructure improvements.

## Table 14 Intersection Analysis - Alternative Master Plan Scenario with Planned US29 interchanges and Full Complement of Additional Un-programmed Improvements

				Scenario 4E1
		Year:		2040
		Land Use:	High (	25 million sf) with 25% NADMS
		BRT:		Yes
		Bridge:		Yes
		Interchanges:		Yes
		Tech Rd Ext:		Yes
		Plum Orchard Ext:		Yes
		Road A (N/S):		Yes
		Road B (E/W):		
		Intersection Improvements:		Yes
County	ID	Intersection	AM	PM
Montgomery	286	Old Columbia Pike & Fairland Rd	0.83	0.95
Montgomery	998	Old Columbia Pike & Musgrove Rd	0.84	1.13
Montgomery	281	Old Columbia Pike & Randolph Rd	0.55	0.66
Montgomery	289	US 29 & Fairland Rd	0.58	0.48
Montgomery	290	US 29 & Musgrove Rd	0.32	0.57
Montgomery	817	US 29 & Cherry Hill (Interchange)	0.72	0.73
Montgomery	589	US 29 & Tech Rd	0.63	0.88
Montgomery	292	US 29 & Industrial Pkwy	0.59	0.81
Montgomery	293	US 29 & Stewart Ln	0.14	0.19
Montgomery	331	US 29 & University Blvd (N)	1.13	1.12
Montgomery	332	US 29 & University Blvd (S)	1.17	1.25
Montgomery	997	New Hampshire Ave & Lockwood Dr	0.74	0.92
Montgomery	607	New Hampshire Ave & Northwest	0.96	0.88
Montgomery	296	New Hampshire Ave & Mahan/Schindler	0.84	0.99
Montgomery	297	New Hampshire Ave & Chalmers	0.80	0.84
Montgomery	298	New Hampshire Ave & Powder Mill	1.06	1.15
Montgomery	299	New Hampshire Ave & I-495	0.78	0.76
Montgomery	686	Cherry Hill Rd & Prosperity	0.41	0.57
Montgomery	996	Cherry Hill Rd & Road A	0.76	0.77
Montgomery	402	Cherry Hill Rd & Broadbirch/Calverton	0.88	0.97
Montgomery	717	Cherry Hill Rd & Plum Orchard/Cloverpatch	0.72	0.93
Montgomery	815	Cherry Hill Rd & FDA Blvd	0.85	0.91
Montgomery	999	Fairland Rd & Musgrove Rd	0.43	0.66
Prince Georges	814	Fairland Rd & Briggs Chaney Rd	1.11	0.80
Prince Georges	812	Powder Mill Rd & Cherry Hill Rd	1.40	1.32
Prince Georges	813	Powder Mill Rd & Beltsville Rd	1.11	1.10
Prince Georges	811	Powder Mill Rd & Riggs Rd	0.98	1.23



Figure 30 Intersection Analysis – Alternative Master Plan Scenario with Planned US 29 Interchanges and Full Complement of Additional Un-programmed Improvements

Table 15 and Figure 31 provide a comparable set of LAM results for the Alternative Master Plan Scenario, with planned US 29 interchanges, reopening the Old Columbia Pike bridge over the Paint Branch, extending Industrial Parkway to FDA Boulevard, and with BRT on US 29, New Hampshire Avenue, and Randolph Road.

_			Scena	rio 3D				
		Year:	20	40				
		Land Use:	High (25 mi	llion sq. ft.)				
		BRT:	Yes					
		Bridge: Yes						
		Interchanges:	Y	es				
		Tech Rd Ext:	Y	es				
		Plum Orchard Ext:						
		Road A (N/S):						
		Road B (E/W):						
		Intersection Improvements:						
County	ID	Intersection	AM	PM				
Montgomery	286	Old Columbia Pike & Fairland Rd	0.83	0.95				
Montgomery	998	Old Columbia Pike & Musgrove Rd	0.84	1.13				
Montgomery	281	Old Columbia Pike & Randolph Rd	0.57	0.68				
Montgomery	289	US 29 & Fairland Rd	0.58	0.48				
Montgomery	290	US 29 & Musgrove Rd	0.32	0.57				
Montgomery	817	US 29 & Cherry Hill (Interchange)	0.75	0.75				
Montgomery	589	US 29 & Tech Rd 0.61 0.9						
Montgomery	292	US 29 & Industrial Pkwy 0.72 0.74						
Montgomery	293	US 29 & Stewart Ln 0.16 0.2						
Montgomery	331	US 29 & University Blvd (N)	1.13	1.12				
Montgomery	332	US 29 & University Blvd (S)	1.17	1.25				
Montgomery	997	New Hampshire Ave & Lockwood Dr	0.79	0.99				
Montgomery	607	New Hampshire Ave & Northwest	0.97	0.88				
Montgomery	296	New Hampshire Ave & Mahan/Schindler	0.85	1.11				
Montgomery	297	New Hampshire Ave & Chalmers	0.80	0.84				
Montgomery	298	New Hampshire Ave & Powder Mill	1.31	1.50				
Montgomery	299	New Hampshire Ave & I-495	0.81	0.77				
Montgomery	686	Cherry Hill Rd & Prosperity	0.86	0.89				
Montgomery	996	Cherry Hill Rd & Road A						
Montgomery	402	Cherry Hill Rd & Broadbirch/Calverton	0.85	1.18				
Montgomery	717	Cherry Hill Rd & Plum Orchard/Cloverpatch	0.89	1.28				
Montgomery	815	Cherry Hill Rd & FDA Blvd	1.00	1.35				
Montgomery	999	Fairland Rd & Musgrove Rd	0.43	0.66				
Prince Georges	814	Fairland Rd & Briggs Chaney Rd	1.11	0.80				
Prince Georges	812	Powder Mill Rd & Cherry Hill Rd	1.40	1.32				
Prince Georges	813	Powder Mill Rd & Beltsville Rd	1.11	1.10				
Prince Georges	811	Powder Mill Rd & Riggs Rd	0.98	1.25				

# Table 15 Intersection Analysis - Alternative Master Plan Scenario with US 29Interchanges and Selected Un-programmed Improvements



Figure 31 Intersection Analysis – Alternative Master Plan Scenario with US 29 interchanges and Selected Un-programmed Improvements

Key findings of the analysis of intersection performance assuming the Alternative Master Plan Development Scenario with the <u>full complement</u> of un-programmed improvements (see Table 11), including planned US 29 grade-separated interchanges, reopening the Old Columbia Pike bridge over the Paint Branch, extending Industrial Parkway to FDA Boulevard, selected geometric intersection improvements, and BRT on US 29, New Hampshire Avenue, and Randolph Road.

Within the Plan area, the intersection of New Hampshire Avenue and Powder Mill Road is projected to operate above the Plan recommended standard of 1600 CLV.

Outside of the Plan area, but within the Montgomery County portion of the Master Plan study area, the following intersections are forecasted to operate above 1600 CLV:

- Old Columbia Pike and Musgrove Road
- US 29 and University Boulevard

Outside of the Plan area and within the Prince George's County portion of the study area the following intersections are forecasted to operate above 1600 CLV:

- Powder Mill Road and Cherry Hill Road
- Fairland Road and Briggs Chaney Road
- Powder Mill Road and Beltsville Road
- Powder Mill Road and Riggs Road

Key findings of the analysis of intersection performance assuming the Alternative Master Plan Development Scenario with a <u>selected subset</u> of un-programmed improvements (see Table 12) including planned US 29 grade-separated interchanges, BRT on US 29, New Hampshire Avenue, and Randolph Road, reopening the Old Columbia Pike bridge over the Paint Branch, and an extension of Industrial Parkway to FDA Boulevard shows the following:

Within the Plan area, the following intersections are projected to operate above the recommended standard of 1600 CLV:

- New Hampshire Avenue and Powder Mill Road
- New Hampshire Avenue and Mahan Road/Schindler Lane
- Cherry Hill Road and Broadbirch Drive/Calverton Boulevard
- Cherry Hill Road and Plum Orchard Drive/Cloverpatch Drive
- Cherry Hill Road and FDA Boulevard

Outside of the Plan area, but within the Montgomery County portion of the Master Plan study area, the following intersections are forecasted to operate above 1600 CLV:

- Old Columbia Pike and Musgrove Road
- US 29 and University Boulevard

Outside of the Plan area and within the Prince George's County portion of the study area the following intersections are forecasted to operate above 1600 CLV:

- Powder Mill Road and Cherry Hill Road
- Fairland Road and Briggs Chaney Road
- Powder Mill Road and Beltsville Road
- Powder Mill Road and Riggs Road

Another important finding of the analysis is that there are intersections outside of the Plan area that can reasonably be expected to exceed a CLV of 1600 regardless of whether the Plan vision is attained in the future. Figures 32 and 33 depict the CLVs for these key intersections over the range of the land use alternatives considered.



### Figure 32 Powder Mill Road and Cherry Hill Road Intersection Performance

### **Figure 33 US 29 and University Boulevard Intersection Performance**



### US 29 and University Blvd (S)

As a complement to the analysis of intersection congestion using the CLV methodology, the traffic analysis performed in support of this Plan also applied the Highway Capacity Manual (HCM) methodology as described in the Department's LATR/TPAR Guidelines. In this context, the policy area CLV standards are converted to a HCM-based volume-to-capacity equivalent measurement, or V/C ratio, by dividing the CLV standards established in the County's Subdivision Staging Policy by 1600 CLV which is the theoretical threshold for intersection capacity. This equivalency, for all policy areas in the County, is depicted in Table 16

## Table 16 LATR Intersection Congestion Standards—Critical Lane Volume and HCM Volume-to-Capacity Equivalencies

		volume to capacity	
policy area	critical lane volume standard	equivalent	
Rural East	1 350	0.84	
Rural West	1,350	0.84	
Damascus	1,400	0.88	
Clarksburg			
Gaithersburg City			
Germantown East	1,425	0.89	
Germantown West			
Montgomery Village/Airpark			
Cloverly			
North Potomac			
Olney	1,450	0.91	
Potomac			
R&D Village			
Aspen Hill			
Derwood	1,475	0.92	
Fairland/White Oak			
Rockville City	1,500	0.94	
North Bethesda	1,550	0.97	
Bethesda-Chevy Chase			
Germantown Town Center	1 600	1.0	
Kensington-Wheaton	1,000	1.0	
Silver Spring-Takoma Park			
Bethesda CBD			
Silver Spring CBD			
Wheaton CBD			
Friendship Heights CBD			
Glenmont MSPA	1 800	1 1 2	
Grosvenor MSPA	1,000	1.13	
Rockville Town Center MSPA			
Shady Grove MSPA			
Twinbrook MSPA			
White Flint MSPA			

These standards for congestion in each policy area are based on critical lane volume measurements and volume-to-capacity equivalencies based on data in the Highway Capacity Manual.

Using the HCM methodology, intersection performance was evaluated within the Plan study area in the context of four (4) land use/transportation network scenarios. Each of these scenarios is briefly described below.

### **Scenario 1: Existing Conditions**

• Includes all existing development and existing transportation network

### Scenario 2: 2040 Adopted Master Plan and Approved Land Use

- Includes all existing development, pipeline, and some additional development based on existing zoning
- Extends Industrial Pkwy through Site 2 to connect to FDA Blvd
- Includes US 29 recommended interchanges
  - IN PLAN AREA: Stewart Ln\*, Industrial Pkwy/Tech Rd
  - OUTSIDE PLAN AREA: Musgrove Rd\*, Fairland Rd\*, Greencastle Rd\*, Blackburn Rd\*

\*Currently in State FY 13-18 Consolidated Transportation Program

### Scenario 3: 2040 Proposed Land Use and Master Plan Transportation Improvements

- Same improvements as Scenario 2 plus ...
  - Reopening Old Columbia Pike bridge over the Paint Branch to traffic
  - BRT network (along US 29, MD 650 and Randolph/Cherry Hill Rd)
  - New local roads in the Life Sciences/FDA Village Center
  - Selected intersection geometric improvements
- Higher levels of development in Master Plan Centers
  - White Oak
  - Hillandale
  - Life Sciences/FDA Village

## Scenario 4: 2040 Proposed Land Use and Master Plan with Additional Transportation Improvements

• Addresses specific capacity needs from Scenario 3 with additional improvements determined using the HCM methodology.

The intersection locations evaluated using the HCM analysis methodology are depicted in the map shown as Figure 34.

### Figure 34 Intersection Locations Evaluated Using the HCM Methodology



A summary of the HCM analysis results for the existing conditions scenario is reported in Table 17 and depicted visually in Figure 35. For comparison purposes, the summary of the relevant CLV results is provided as well. Consistent with the Plan's recommendation for BRT in the area, the HCM-based v/c ratio threshold is 1.0 which is equivalent to 1600 CLV. Using this methodology, all of the intersections evaluated perform at an adequate level of service. It should be noted that existing conditions at the southern intersection at US 29 and MD 193 exhibit a v/c ratio of 1.0 which is the threshold for adequate intersection level of service conditions in the area.

### **Table 17 Intersection HCM Analysis Summary – Existing Conditions**

Existing Land Use AM (PM)									
	C	ritical Lane Volun	1e		HCM				
Intersection	CLV	Level of Service V/C Ratio		Delay (sec)	Level of Service	V/C Ratio			
Cherry Hill Rd at Broadbirch Dr/Calverton Blvd	1303 (1524)	D (E)	0.81 (0.95)	31.6 (44.3)	C (D)	0.87 (0.95)			
MD 650 at Mahan Rd/Schindler Dr	1140 (989)	B (A)	0.71 (0.62)	12.3 (18.0)	B (B)	0.67 (0.58)			
Old Columbia Pike at Fairland Rd	1153 (1238)	C (C)	0.72 (0.77)	22.7 (37.1)	C (D)	0.82 (0.82)			
MD 650 at Powder Mill Rd	1229 (1322)	C (D)	0.77 (0.83)	72.6 (70.8)	E (E)	0.83 (0.82)			
Old Columbia Pike at Musgrove Rd <sup>1</sup>	642 (616)	A (A)	0.40 (0.41)	N/A because unsignalized intersection					
MD 650 at Lockwood Dr	1135 (1156)	B (C)	0.71 (0.72)	37.0 (40.4)	D (D)	0.71 (0.66)			
Powder Mill Rd at Riggs Rd <sup>2</sup>	821 (1270)	A (C)	0.51 (0.79)	39.0 (35.5)	D (D)	0.53 (0.84)			
Powder Mill Rd at Cherry Hill Rd <sup>2</sup>	1129 (1143)	B (B)	0.71 (0.71)	43.1 (47.8)	D (D)	0.79 (0.79)			
Fairland Rd at Briggs Chaney Rd <sup>2</sup>	901 (669)	A (A)	0.56 (0.42)	15.1 (14.6)	B (B)	0.57 (0.46)			
Powder Mill Rd at Beltsville Rd <sup>2</sup>	999 (966)	A (A)	0.62 (0.60)	28.4 (30.9)	C (C)	0.62 (0.61)			
US 29 at MD 193 (north)	1589 (1434)	E (D)	0.99 (0.90)	31.0 (33.6)	C (C)	0.95 (0.85)			
US 29 at MD 193 (south)	1535 (1680)	E (F)	0.96 (1.05)	26.7 (48.6)	C (D)	0.91 (1.00)			

1 - Unsignalized intersection, HCM performance measures are for critical stop-controlled movement only 2 - Intersection falls within the Master Plan Study Area and outside of Montgomery County

Shading indicates intersection in plan area

Shading indicates intersection outside of Montgomery County

### Figure 35 Intersection HCM Analysis - Existing Conditions



## **Existing Conditions**

A summary of the HCM analysis results for the adopted master plan scenario is reported in Table 18 and depicted visually in Figure 36. For comparison purposes, the summary of the relevant CLV results is provided as well. Using the HCM methodology, the following intersections are projected to perform at an inadequate level of service:

- Powder Mill Road at Riggs Road
   AM and PM
- Powder Mill Road at Cherry Hill Road AM and PM
- MD 650 and Powder Mill Road PM
- Fairland Road at Briggs Chaney Road AM
- US 29 at MD 193 (North) AM and PM
- US 29 at MD 193 (South) AM and PM

### Table 18 Intersection HCM Analysis Summary - Adopted Master Plan

2040 Adopted Master Plan Plus Approved Land Use AM (PM)									
	Crit	tical Lane Vol	ıme		HCM				
Intersection	CLV	Level of Service	V/C Ratio Delay (sec)		Level of Service	V/C Ratio			
Cherry Hill Rd at Broadbirch Dr/Calverton Blvd	1082 (1314)	B (D)	0.68 (0.82)	20.0 (24.0)	C (C)	0.70 (0.79)			
MD 650 at Mahan Rd/Schindler Dr	1247 (1231)	C (C)	0.78 (0.77)	12.5 (19.3)	B (B)	0.70 (0.72)			
Old Columbia Pike at Fairland Rd	1300 (1450)	C (D)	0.81 (0.91)	28.1 (46.7)	C (D)	0.95 (0.98)			
MD 650 at Powder Mill Rd	1389 (1722)	D (F)	0.87 (1.08)	61.6 (99.3)	E (F)	0.91 (1.06)			
Old Columbia Pike at Musgrove Rd <sup>1</sup>	1725 (1600)	F (F)	1.08 (1.00)	N	/A because unsignalized int	ersection			
MD 650 at Lockwood Dr	1043 (1337)	B (D)	0.65 (0.84)	34.0 (46.8)	C (D)	0.68 (0.81)			
Powder Mill Rd at Riggs Rd <sup>2</sup>	1275 (1575)	C (E)	0.80 (0.98)	42.4 (70.3)	D (E)	0.84 (1.10)			
Powder Mill Rd at Cherry Hill Rd <sup>2</sup>	2263 (2088)	F (F)	1.41 (1.31)	219.5 (173.5)	F (F)	1.52 (1.40)			
Fairland Rd at Briggs Chaney Rd <sup>2</sup>	1725 (1225)	F (C)	1.08 (0.77)	96.1 (37.0)	F (D)	1.22 (0.84)			
Powder Mill Rd at Beltsville Rd <sup>2</sup>	1448 (1232)	D (C)	0.91 (0.77)	55.4 (49.0)	E (D)	0.96 (0.91)			
US 29 at MD 193 (north)	1800 (1778)	F (F)	1.13 (1.11)	61.8 (43.4)	E (D)	1.07 (1.05)			
US 29 at MD 193 (south)	1841 (1976)	F (F)	1.15 (1.24)	62.0 (97.4)	E (F)	1.10 (1.18)			

1 - Unsignalized intersection, HCM performance measures are for critical stop-controlled movement only

2 - Intersection falls within the Master Plan Study Area and outside of Montgomery County

Shading indicates intersection in plan area

Shading indicates intersection outside of Montgomery County

### Figure 36 Intersection HCM Analysis Summary - Adopted Master Plan



### Adopted Master Plan + 2040 Approved Land Use

A summary of the HCM analysis results for the Alternative Master Plan scenario is reported in Table 19 and visually depicted in Figure 37. For comparison purposes, the summary of the relevant CLV results is provided as well. Using the HCM methodology, the following intersections are projected to perform at an inadequate level of service:

- Powder Mill Road at Riggs Road
   AM and PM
- Powder Mill Road at Cherry Hill Road AM and PM
- Fairland Road at Briggs Chaney Road AM
- US 29 at MD 193 (North) AM and PM
- US 29 at MD 193 (South) AM and PM

2040 Proposed Land Use and Master Plan Transportation Improvements									
		AM (PM)							
	C	ritical Lane Volun	1e		HCM				
Intersection	CLV Level of Service V/C Ratio		Delay (sec)	Level of Service	V/C Ratio				
Cherry Hill Rd at Broadbirch Dr/Calverton Blvd	1879 (2198)	F (F)	1.17 (1.37)	80.7 (155.7)	F (F)	1.36 (1.66)			
MD 650 at Mahan Rd/Schindler Dr	1342 (1596)	D (F)	0.84 (1.00)	18.2 (45.3)	B (D)	0.77 (0.99)			
Old Columbia Pike at Fairland Rd	1325 (1525)	D (E)	0.83 (0.95)	27.3 (49.2)	C (D)	0.93 (0.96)			
MD 650 at Powder Mill Rd	1838 (2043)	F (F)	1.15 (1.28)	154.7 (210.6)	F (F)	1.24 (1.42)			
Old Columbia Pike at Musgrove Rd <sup>1</sup>	1750 (1800)	F (F)	1.09 (1.13)	N/A because unsignalized intersection					
MD 650 at Lockwood Dr	1209 (1551)	C (E)	0.76 (0.97)	38.7 (49.5)	D (D)	0.76 (0.92)			
Powder Mill Rd at Riggs Rd <sup>2</sup>	1575 (1975)	E (F)	0.98 (1.23)	58.1 (169.6)	E (F)	1.05 (1.37)			
Powder Mill Rd at Cherry Hill Rd <sup>2</sup>	2239 (2115)	F (F)	1.40 (1.32)	215.0 (182.4)	F (F)	1.50 (1.40)			
Fairland Rd at Briggs Chaney Rd <sup>2</sup>	1775 (1275)	F (C)	1.11 (0.80)	105.8 (41.6)	F (D)	1.22 (0.97)			
Powder Mill Rd at Beltsville Rd <sup>2</sup>	1472 (1338)	E (D)	0.92 (0.84)	62.9 (54.3)	E (D)	0.98 (0.96)			
US 29 at MD 193 (north)	1815 (1793)	F (F)	1.13 (1.12)	65.8 (70.1)	E (E)	1.08 (1.06)			
US 29 at MD 193 (south)	1865 (2000)	F (F)	1.17 (1.25)	75.3 (104.0)	E (F)	1.13 (1.19)			

### Table 19 Intersection HCM Analysis Summary - Alternative Master Plan

Thresholds are set at CLV of 1600 and v/c of 1.00. Values that exceed these thresholds are bolded.

1 - Unsignalized intersection, HCM performance measures are for critical stop-controlled movement only

2 - Intersection falls within the Master Plan Study Area and outside of Montgomery County

Shading indicates intersection in plan area

Shading indicates intersection outside of Montgomery County

### Figure 37 Intersection HCM Analysis Summary – Alternative Master Plan



12 US 29 at MD 193 (south)

## 2040 Proposed Land Use & Master Plan



A summary of the HCM analysis results for the alternative master plan scenario with additional HCM-based intersection improvements is reported in Table 20 and visually depicted in Figure 38. For comparison purposes, the summary of the relevant CLV results is provided as well. With the notable exception of the intersections located at US 29/MD 193 (for which no effective improvements beyond grade separation would be effective), all intersections are projected to perform at an adequate level of service using this methodology.

### Table 20 Intersection HCM Analysis Summary - Proposed Master Plan with **Additional Improvements**

2040 Proposed Land Use Master Planned and Additional Improvements								
	Critical Lane Volume			нсм			Improvements	
Intersection	CLV	Level of Service	V/C Ratio	Delay (sec)	Level of Service	V/C Ratio	Recommended Alternative	
Cherry Hill Rd at Broadbirch Dr/Calverton Blvd	1372 (1460)	D (E)	0.86 (0.91)	47.0 (67.9)	D (E)	0.93 (0.98)	Added EBL and EBT lane (Broadbirch Dr.) Changed WBR to WBTR lane (Calverton Blvd) AddedNBL turn lane (Cherry Hill Rd) Added SBR Lane (Cherry Hill Rd)	
MD 650 at Powder Mill Rd	1759 (1757)	F (F)	1.10 (1.10)	62.2 (62.8)	E (E)	1.00 (0.97)	Remove E/W Split Phase Added EBL turn lane (Holly Hall) Added WBR turn lane (Powder Mill) Added SBL turn lane (MD 650) Added NBR turn lane (MD 650)	
Old Columbia Pike at Musgrove Rd	1075 (1350)	B (D)	0.67 (0.84)	28.8 (47.8)	C (D)	0.75 (0.89)	Added Signal Added SBL turn lane Added WBR lane	
Powder Mill Rd at Riggs Rd <sup>2</sup>	1176 (1468)	C (E)	0.73 (0.92)	42.9 (39.2)	D (D)	0.77 (0.97)	Added 2nd EBL turn lane	
Powder Mill Rd at Cherry Hill Rd <sup>2</sup>	1433 (1487)	D (E)	0.90 (0.93)	51.4 (55.6)	D (E)	0.94 (0.97)	Added 2nd and 3rd SBL turn lanes Added 2nd WBL turn lane Restripe for WB free right turn lane Added NB free right turn lane	
Fairland Rd at Briggs Chaney Rd <sup>2</sup>	1400 (1025)	D (B)	0.88 (0.64)	39.6 (22.1)	D (C)	0.99 (0.81)	dynamic lane use - AM EB LT + R	

Thresholds are set at CLV of 1600 and v/c of 1.00. Values that exceed these thresholds are bolded. 2 - Intersection falls within the Master Plan area and outside of Montgomery County Shading indicates intersection in plan area Shading indicates intersection outside of Montgomery County

Figure 38 Intersection HCM Analysis Summary – Alternative Master Plan with Additional Improvements

### 2040 Proposed Land Use & Master Plan with



Figure 39 Alternative Master Plan with Supplemental Intersection Improvements – Cherry Hill Road and Broadbirch Drive



Figure 40 Alternative Master Plan with Supplemental Intersection Improvements – New Hampshire Ave. (MD 650) and Powder Mill Road (MD 212)



Figure 41 Alternative Master Plan with Supplemental Intersection Improvements – Musgrove Road and Old Columbia Pike



Figure 42 Alternative Master Plan with Supplemental Intersection Improvements – Cherry Hill Road and Powder Mill Road



Figure 43 Alternative Master Plan with Supplemental Intersection Improvements – Powder Mill Road and Riggs Road



### **Corridor Analysis**

The corridor analysis applies HCM-based criteria using travel performance metrics (i.e., speed, travel time and delay) in order to evaluate arterial mobility in the area. This analysis employed the Synchro/SimTraffic tool to evaluate these metrics and used MDSHA calibrated model files as a reference to build future year scenarios. In this context, the following segments of Columbia Pike (US 29) and New Hampshire Avenue (MD 650) were evaluated:

- Columbia Pike (US 29), between Stewart Lane and University Boulevard (MD 193)
- New Hampshire Avenue (MD 650), between Lockwood Drive and Elton Road

The results the analysis of the Columbia Pike (US 29) segment for the existing, Adopted Master Plan and Alternative Master Plan scenarios are summarized in Figure 44. A similar set of results for the New Hampshire Avenue segment are summarized in Figure 45. It should be noted that the MD 650 analysis also includes a scenario reflecting the Alternative Master Plan with supplemental improvements. This reflects the impact of additional improvements at the MD 650/Powder Mill Road intersection.

The US 29 arterial mobility analysis (Figure 44) shows that the land use density and mix associated with the proposed Plan would result in travel times and speeds which are roughly 25% better relative to the adopted Plan for the selected roadway segment. This is largely due the attraction of US 29 commuter traffic to the new employment center reflected in the proposed Plan over the Silver Spring CBD or downtown Washington, DC.

The MD 650 arterial mobility analysis (Figure 45) shows that Plan-proposed intersection improvements would maintain speeds and travel times equal to or better than existing conditions.

### Figure 44 Columbia Pike (US 29) Arterial Mobility





6.4

57

US 29 Arterial Mobility Traffic Simulation Analysis



1.9

1.6

1.8






## Figure 45 New Hampshire Avenue (MD 650) Arterial Mobility















## **Cordon Line Analysis**

The cordon line analysis measures total traffic volumes entering or leaving an area.

Table 22 compares existing and forecast traffic volumes at the studied cordon line. In general, the cordon line serves as the boundary between the WOSG Master Plan area, where land uses are proposed to change as a result of this Plan, and elsewhere in the County, which is subject to other plans and/or is otherwise not forecast to change development densities as a result of this Plan.

At the cordon line, the total traffic volume is forecasted to increase by about 8 percent, from 347,400 vehicles per day to 377,200 vehicles per day. The heaviest volumes are forecasted to occur on Columbia Pike (US 29), ranging between 64,400 to 67,000 vehicles per day.

# **Table 21 Master Plan Cordon Line Traffic Volumes**

#### 2010 Conditions - Observed Peak Hour Totals

			AM Peak Ho	bur		PM Peak Ho	ur
Location	ADT	Inbound	Outbound	Total	Inbound	Outbound	Total
101 US29 north of Randolph Rd	59200	3081	1478	4559	1710	3588	5298
102 Calverton Blvd north of Gracefield Rd	15800	956	386	1342	521	829	1350
103 Power Mill Rd north of Cherry Hill Rd	25100	1656	751	2407	1023	1183	2206
104 Cherry Hill Rd east of Powder Mill Rd	21100	962	1197	2159	962	1111	2073
105 Riggs Rd south of Powder Mill Rd	16100	574	566	1140	998	619	1617
106 New Hampshire Ave (MD 650) south of Powder Mill Rd	55500	1545	3150	4695	2523	2366	4889
107 Columbia Pike (US 29) north of Southwood Ave	75200	1908	3439	5347	3656	2230	5886
108 New Hampshire Ave (MD 650) north of Jackson Rd	40800	2242	1216	3458	1135	2226	3361
109 Randolph Rd west of Serpentine Way	28200	996	1165	2161	1566	1066	2632
110 Old Columbia Pike north of Randolph Rd	10400	658	290	948	342	483	825
TOTAL	347400	14578	13638	28216	14436	15701	30137

#### 2040 Conditions - Scenario 3 - High - Peak Hour Totals

		AM Peak Hour PM			PM Peak Ho	'M Peak Hour	
Location	ADT	Inbound	Outbound	Total	Inbound	Outbound	Total
101 US29 north of Randolph Rd	64400	2929	1786	4716	2078	3933	6010
102 Calverton Blvd north of Gracefield Rd	9800	524	265	788	362	521	883
103 Power Mill Rd north of Cherry Hill Rd	34500	1990	1129	3119	1562	1651	3213
104 Cherry Hill Rd east of Powder Mill Rd	37000	1433	2201	3634	1851	1930	3780
105 Riggs Rd south of Powder Mill Rd	17900	538	672	1210	1183	671	1854
106 New Hampshire Ave (MD 650) south of Powder Mill Rd	60000	1400	3580	4980	2927	2456	5383
107 Columbia Pike (US 29) north of Southwood Ave	67000	1408	3228	4636	3464	1905	5368
108 New Hampshire Ave (MD 650) north of Jackson Rd	43700	2105	1434	3539	1364	2405	3769
109 Randolph Rd west of Serpentine Way	32500	976	1405	2381	1931	1205	3135
110 Old Columbia Pike north of Randolph Rd	10400	574	324	898	382	487	869
TOTAL	377200	13876	16023	29899	17104	17161	34265

It is important to note that a key characteristic of the travel patterns in and around the Plan area is the high percentage of through traffic. This is especially the case on US 29, Powder Mill Road and Cherry Hill Road. The transportation analysis suggests that the land use changes inherent in the plan vision will reduce the overall percentage of through trips entering and exiting the Plan area but the total number of trips will increase – due to growth both outside and inside of the Plan area. The relationship among internal, internal/external (or "in/out"), and through trip making for various scenarios during the evening peak hour is shown in Figure 46.



# Figure 46 Changing Trip Profile with the Plan Vision

# **Recommended Master Plan Roadway Network**

The Plan recommends the following roadway improvements to support the proposed level of development contemplated in the Alternative Master Plan scenario (see Table 22 and Figure 47):

Roadway improvements within the Plan boundaries:

- Old Columbia Pike bridge over the Paint Branch rebuilt and open to vehicular traffic
- Grade-separated interchange at US 29 and Stewart Lane
- Grade-separated interchange at US 29 and Industrial Parkway/Tech Road

Roadway improvements outside the Plan boundaries:

- Grade-separated interchange at US 29 and Musgrove Road
- Grade-separated interchange at US 29 and Fairland Road
- Grade-separated interchange at US 29 and Greencastle Road
- Grade-separated interchange at US 29 and Blackburn Road

Internal Road Network:

- Extend Industrial Parkway through Site 2/Percontee to connect with FDA Boulevard and designate as a Business District Street.
- Reclassify roads in the North White Oak/Cherry Hill Road area from Industrial Roads to Business District Streets.
- Provide additional vehicular connections in the North White Oak/Cherry Hill Road area if redevelopment occurs.

# **Table 22 Street and Highway Classifications**

			Master Plan of	Minimum	Number of	
Master Planned			Highways	Right of	Through Travel	Design
Streets	From	To	Number	Way (Feet)4	Lanes <sup>5</sup>	Standard
Freeways			-			
Capital Beltway	Northwest Branch	Prince George's	F-8	300	8-10 - Divided	N/A
(I-495)	Stream Valley	County Line				
Major Highways	•	•				
Columbia Pike	East Randolph	Paint Branch	CM-10	100 - 200	6 - Divided	2008.08
(US 29)	Road/Cherry Hill	Stream Valley				modified
	Road		<b>CT</b> ( 10			
	Paint Branch Stream	New Hampshire	CM-10	200	6 - Divided	2008.08
	Valley	Avenue (MD 650)	M 10	100	( D' I I	modified
	New Hampshire	Northwest Branch	M-10	122	6 - Divided	2008.08 modified
Now Homeshiro	Columbia Dilea (US	Conital Paltway (I	M 12	120 1206	6 Divided	2008.01
Avenue (MD 650)	29)	(1- 195)	IVI-12	120-150	0 - Divided	2008.01 modified
Arterials	23)	495)				mounted
Cherry Hill Road	Columbia Pike (US	Prince George's	A-98	80	4	2004.01
chefty fill floud	29)	County Line		00		200 1101
Powder Mill Road	New Hampshire	Prince George's	A-94	80-90	4	2004.03
	Avenue (MD 650)	County Line				
Lockwood Drive	Columbia Pike (US	400 Feet West of	A-286	80	2	2004.20
(MD 895)	29)	New Hampshire				
		Avenue (MD 650)				
Lockwood Drive	400 Feet West of New	West Side of White	A-286	90	2	2004.04
	Hampshire Avenue	Oak Shopping				
	(MD 650)	Center				
Lockwood Drive	West Side of White	Lockwood Drive	A-286	90	2	2004.04
La alarra d Dairra	Uak Snopping Center	Extended Starsont Lana	1 296	00	2	2004.04
Evtended	Lockwood Drive	Stewart Lane	A-280	90	2	2004.04
Stewart Lane	Lockwood Drive	Columbia Pike (US	A-286	90	2	2004.04
Stewart Lane	Extended	29)	A-200	,0	2	2004.04
Industrial Roads	Lintended	=>)	Existing /			
			Proposed			
Industrial Parkway	Columbia Pike (US	Industrial Property	Î-1/B-1	100	4	2005.03
and Industrial	29)					modified
Parkway Extended						
Broadbirch Drive	Cherry Hill Road	Tech Road	I-9/B-9	100	4	2005.03
						modified
Tech Road	Columbia Pike (US	1,600 Feet	I-11/B-11	100	4	2005.03 -
	29)	Southwest of				2005.03
N O L ID		Industrial Parkway	L 10/D 10	90	2	modified
Plum Orchard Drive	Cherry Hill Road	Broadbirch Drive	I-12/B-12	80	2	2005.02
Business District Str	note					moumeu
Prosperity Drive	Industrial Parkway	Cherry Hill Road	B_2	80	2	2005.03
Tiospenty Drive	industrial I arkway	Chefry Hill Road	D-2	00	2	modified
Old Columbia Pike	White Oak Shopping	Paint Branch	B-2	80	2	2005.01
one containone i inc	Center	Stream Valley	52	00	-	modified
Elton Road	New Hampshire	Avenel Gardens	B-3	80	2	2005.02
	Avenue (MD 650)	Lane	-			
Hillwood Drive	Columbia Pike (US	500 Feet East	B-4	80	2	2005.02
	29)					
FDA Boulevard	Cherry Hill Road	FDA Gate	B-10	100	4	2005.03
Proposed Road	Plum Orchard Drive	FDA Boulevard	B-5 <sup>4</sup>	70	2	2005.02
Proposed Road	Plum Orchard Court	Whitehorn Court	B-6	70	2	2005.02

<sup>4</sup> Reflects minimum right-of-way, and may not include lanes for turning, parking, acceleration, deceleration, or other purposes auxiliary to through travel. Right-of-way are considered to be measured symmetrically based upon roadway right-of-way centerline. <sup>5</sup> The recommended number of lanes refers to the number of planned through travel lanes for each segment. <sup>6</sup> New Hampshire Ave Right-of-Way: 130 feet from Lockwood Drive to Oaklawn Drive; 120-130 feet from Oaklawn Drive to Powder Mill Road; 130

feet from Powder Mill Road to I-495

Master Planned Streets	From	То	Master Plan of Highways Number	Minimum Right of Way (Feet) <sup>4</sup>	Number of Through Travel Lanes <sup>5</sup>	Design Standard	
	Extended (B-6)						
Proposed Road	Cherry Hill Road	Plum Orchard Court Extended (B-6)	B-7	70	2	2005.02	
Primary Residential Streets							
Old Columbia Pike	Paint Branch Stream Valley	Industrial Parkway	P-2	84	2	2003.09	
April Lane	Stewart Lane	0.3 Miles East	P-13	70	2	2003.12	
Schindler Drive	Crest Park Drive	New Hampshire Avenue	P-14	70	2	2003.12	
Cresthaven Drive	Devere Drive	New Hampshire Avenue	P-15	70	2	2003.12	
Elton Road	Avenel Gardens Lane	Montgomery-Prince George's County	P-16	70	2	2003.12	

<sup>1</sup> The portion of Proposed Road B-5 from Plum Orchard Drive to the property line between the Washington Adventist Hospital site and the Percontee property is approved as a private street on Washington Adventist Hospital's Site Plan Number 820080210.

# Figure 47 Street and Highway Classification Map



In addition to the roadway network recommendations described above, as well as the BRT network and bikeway facilities discussed previously, selected intersection improvements will likely be required to bring several intersections within the 1600 CLV standard that is recommended for the Plan area. The possible improvements involve additional turn lanes and in the case of New Hampshire Avenue and Powder Mill Road, could involve a re-configuration of the intersection at the time of the redevelopment of either the National Labor College site and/or the Hillandale Shopping Center. The intersections in question include the following:

- New Hampshire Avenue and Powder Mill Road
- New Hampshire Avenue and Mahan Road/Schindler Lane
- Cherry Hill Road and Broadbirch Drive/Calverton Boulevard
- Cherry Hill Road and Plum Orchard Drive/Cloverpatch Drive
- Cherry Hill Road and FDA Boulevard

# **Travel Demand Forecasting Process and Assumptions**

The travel demand forecasting process uses three levels of analysis. The Department's regional travel demand forecasting model, TRAVEL/3, is used to develop forecast travel demand results for weekday travel and evening peak periods.

TRAVEL/3 is a four-step model, consisting of:

- Trip generation: the number of person trips that are generated by given types and densities of land uses within each TAZ.
- Trip distribution: how many person trips generated by each TAZ will travel to each of the other TAZs within the metropolitan area.
- Mode split: which mode of travel the person trips will use, including single-occupant auto, multiple-occupant auto, transit, or a non-motorized mode such as walking or bicycling.
- Traffic assignment: the roadways that will be used for vehicular travel between TAZs.

The TRAVEL/3 model incorporates land use and transportation assumptions for the metropolitan Washington region, using the same algorithms as applied by the Metropolitan Washington Council of Governments (MWCOG) for air quality conformity analysis. Figure 47 shows the relationship of Montgomery County in the regional travel demand network, featuring the coding of street network characteristics to reflect the general level of adjacent development density.

## Figure 48 Travel Forecasting Network



TRAVEL/3 provides system-level results that are used directly to obtain forecasts for the County's Transportation Policy Area Review. These system-level results are also used as inputs to the finer grain analytic tools described below.

The second level of analysis consists of post processing techniques applied to the TRAVEL/3 forecasts, as described in NCHRP Report 255. These techniques include refining the morning and evening peak hour forecasts to reflect a finer grain of land use and network assumptions than included in the regional model, such as the location of local streets and localized travel demand management assumptions. The NCHRP 255 analyses are used to produce the cordon line analyses.

The third level of analysis includes intersection congestion, using the Critical Lane Volume (CLV) and Highway Capacity Manual (HCM) methodologies described in the Department's *Transportation Policy Area Review / Local Area Transportation Review Guidelines* (TPAR/LATR).

#### **Travel/3 Forecasting Assumptions**

The White Oak Science Gateway Plan forecasts assumed the following parameters:

- A 2040 horizon year. This is currently the most distant horizon year for which forecast land use and transportation system development is available.
- Regional growth per the MWCOG Cooperative Forecasting Process, using the most current round of Cooperative Forecasts.

- For the Washington region, the Round 8.1 forecasts include an increase from 4.0 million jobs and 2.5 million households in 2010 to 5.6 million jobs and 3.3 million households in 2040.
- For Montgomery County, the Round 8.1 forecasts include an increase from 510,000 employees and 361,000 households in 2010 to 737,000 employees and 461,000 households in 2040.
- Transportation improvements in the region's Constrained Long Range Plan (CLRP), a fiscally constrained transportation network. Notable projects assumed to be in place for the build-out of the White Oak Science Gateway Plan include:
  - elimination of the WMATA turn-back at Grosvenor
  - the Purple Line between Bethesda and New Carrollton
  - the Montrose Parkway, including an interchange at Rockville Pike
  - the Intercounty Connector (MD 200) between I-370 and US Route 1
  - HOV lanes on I-95 between the ICC and MD 198
  - express toll lanes on I-270 from I-370 to the city of Frederick

# **Local Area Modeling Process and Assumptions**

The Department's Local Area Modeling (LAM) process uses NCHRP Report 255 techniques to convert the TRAVEL/3 system level forecasts to intersection-level forecasts. The LAM process is then used as a pivot-point technique to reflect changes to the localized land use or transportation network, providing both cordon line and network analysis results.

The TRAVEL/3 model represents the White Oak Science Gateway Plan study area as six transportation analysis zones (TAZs). The White Oak Science Gateway LAM disaggregates the area within the plan overlapping these six TAZs into fifteen subzones based on block groupings separated by major roads within the Plan area boundary.

The LAM process uses trip generation rates that are customized to reflect both existing conditions and future changes, considering both the land use types and changes in travel behavior. Table 23 shows the trip generation rates used in the LAM.

# Table 23 Local Area Model Peak Hour Trip Generation Land Use Units A

Land Use	Units	AM	PM
Office	1000 Square Feet	1.30	1.20
Retail	1000 Square Feet	1.00	3.00
Industrial	1000 Square Feet	1.00	1.00
Other Commercial	1000 Square Feet	1.00	1.00
Single Family residential	Dwelling unit	0.48	0.83
Multi-family residential (Garden apartment)	Dwelling unit	0.44	0.48

These trip generation rates reflect a combination of Local Area Transportation Review rates for development similar to that envisioned for the WOSG area and were calibrated to match the observed traffic counts, considering the amount of through traffic in the roadway network so that the LAM volumes at the network cordon line are within two percent of observed count data for both morning and evening peak hours.

The trip generation rates shown in Table 23 are generally lower than those found in the Institute of Transportation Engineers (ITE) trip generation report, particularly for commercial land uses. The rates reflect the fact that ITE rates for most commercial locations do not have the transit availability and usage anticipated to be found in the WOSG area once the recommended BRT network and stations are constructed and the system is operational. The difference for residential uses is not quite as high because ITE multifamily trip generation rates do reflect the fact that most multifamily housing units have, almost by definition, sufficient density to support transit service. Finally, the retail trip generation rates in the WOSG zones also incorporate a discount for pass-by and diverted-link trips. In addition to the lower trip generation rates, an additional trip reduction factor was applied to reflect a total Non-Auto Driver Mode Share of approximately 25% for work trips entering and leaving the boundary of the Plan area. A similar trip reduction factor was applied for work trips made by residents within the plan boundary in those sub-zones identified for redevelopment. The trip reduction factor was applied to reflect that an estimated 25% of those home based work trips would be made by transit, walking, or biking.