$25.00

Central Avenue-Metro Blue Line Corridor TOD Implementation Project Mobility Study

TOD

Transit-Oriented Development

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
PRINCE GEORGE'S COUNTY PLANNING DEPARTMENT
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Abstract

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Section 1
Executive Summary

EXECUTIVE SUMMARY

The Central Avenue (MD 214) corridor in Prince George's County has the potential to become a center of livable neighborhoods, retail districts, and employment zones. The adopted Subregion 4 Master Plan and Sectional Map Amendment (the Subregion 4 Sector Plan) envisions that the corridor's high level of regional connectivity, particularly with its four Blue Line Metrorail stations, can help to bring new economic development, retail, and housing investment. This Corridor TOD Implementation Project looks at Central Avenue and the study area's streets, transit infrastructure, and open space as the assets on which to build a more flexible transportation framework that can support the land use and development changes envisioned. The study tests proposed land use and Complete Streets concepts on future traffic conditions. It investigates current criteria, regulatory guidance, and funding opportunities, and then proposes a series of actions that will help to bring about more affordable, comfortable, convenient, connected, and healthy transportation network. It identifies critical leadership and support roles of partner transportation agencies to fund proposed improvements, amend operating procedures, and fine-tune regulating guidance to bring about the envisioned change.

Central Avenue is the major road focus of this study. As a vital regional arterial, it provides a critical link for travel between the east side of downtown Washington, D.C. and Anacostia, identified as East Capital Street in Washington, D.C, into Prince George's County, where it connects to FedEx Field, the Capital Beltway (I495/I95) and ultimately to Anne Arundel County. The study area, running between the District of Columbia/Prince George's County, Maryland boundary at Southern Avenue east to I-495, has been widened over the years to reflect this important traffic function. Central Avenue provides six general traffic lanes and has separated space for left turning vehicles at its major intersections. Sidewalks exist along much of the corridor but are narrow, without separation from traffic lanes, and with little or no landscaping. Opportunities to safely cross the street on foot are few. Neighbors feel that access from their homes onto the highway at unsignalized intersecting streets is unsafe.

An **arterial** is a high-capacity, urban road designed to carry traffic through an area as efficiently as possible.

The disconnected street system, characteristic of post-1950 suburban development patterns, requires that the majority of trips made by residents include travel on Central Avenue. The area's lack of connectivity and few parallel routes adds considerable local traffic to that which passes through the area on its way to and from the District of Columbia, the Beltway, and points beyond.

The Washington Metropolitan Area Transit Authority's (WMATA) Blue Line Metrorail service began running parallel to Central Avenue in recent years, introducing new regional connectivity options for residents. With the exception of station access from the main roads when the Blue Line opened for service at the Capitol Heights and Addison Road stations in 1980, very little in the road network changed. Morgan Boulevard and Largo stations, which opened in 2004, were situated away from Central Avenue along county collector roads. Adjacent land use did not adequately consider walking access to and from stations and included large parking areas that invited car commuting to these suburban stations.

The approved Subregion 4 Master Plan envisions a more diverse mix of land uses and greater densities at Metro station locations along the Central Avenue corridor. It envisions a more walkable place; comfortable, convenient and affordable to residents of all ages. The Master Plan of Transportation prioritizes "Complete Streets" in its policy guidance. These plans are combined in this document to help identify ways Central Avenue and its surrounding road network can change to better serve the future travel and livability of the corridor. Creating a more connected "complete network," combined with land use and density change, will offer more route options, shorten trip lengths, and permit more trips to be made on foot or bicycle to daily destinations.

This document creates a decision-making framework and a set of priority actions that can build the places described in the sector plan for Central Avenue. As one of the county's earliest Complete Streets initiatives, the study provides a pilot analysis for broader application countywide. Changes in decision-making criteria and processes have been proposed and will need to be adopted and adapted over time to successfully create the transit-serviceable communities that recent investment in Metrorail has made possible. Suggested changes in policy, regulations, and program are discussed in this report and include a focus on the following areas:

- Reducing parking requirements for development
- Creating a transit-oriented development review checklist
- Establishing a mid-block crossing policy
- Improving street lighting
- Requiring multimodal connections in new development
- Requiring walkable block lengths
- Implementing new legislation requiring developer contributions to pedestrian and bicycle connections
- Requiring sidewalks on both sides of all new streets in TOD and urban areas
- Typing and designing new streets according to Complete Streets principles

Agency decision-makers with site plan and traffic impact study review responsibility in the Prince George's County Department of Public Works and Transportation (DPW&T); traffic engineers from the Maryland State Highway Administration (SHA); and bus planners from WMATA, will need to help advance the recommendations of this plan. They, and other agency colleagues, generously provided time to the consultant team and project management staff to meet individually and collectively to help bring ideas and identify resources on behalf of their agencies. These resources included funding, technical guidance, and administrative processes.

Recommendations include short-term projects and planning for immediate action initiated by the Sabra Wang/Toole Design Group collaboration during Phases 1 and 2 of this study. The work of this Phase 3 effort built upon Phase 1 and 2 and created an existing conditions analysis. Phase 3 investigated the long term needs and potential opportunities of proposed land use and transportation concepts. Land use, density and site location prepared under separate contract by AECOM was used to update the county's traffic model results for the Phase 3 traffic micro simulation and street connectivity planning.

Report Organization

The chapters of this report are organized according to the topic areas below. They present and summarize the results of the Phase 3 analysis conducted for the Central Avenue TOD Mobility Study area and discuss recommendations for action by the identified agency or multi-agency collaboration.

1. *Previous Planning*: Presents a general overview of the corridor study area, previous planning work conducted for the area, and the process used to develop the Phase 3 Central Avenue TOD Mobility Study.
2. *Existing Conditions*: Summary of existing demographics, land use patterns, market conditions, multimodal transportation facilities, operations, and safety in the study area.
3. *Design and Policy Review*: Recommends changes to existing transportation, land use, and development review policies and design standards to better support Complete Streets and TOD.
4. *Complete Streets Strategies*: Presents a new street type, standard cross sections, and network improvements to enhance multimodal safety and access in the study area and lay the groundwork for a future Transportation Network Functional Overlay.
5. *Future Conditions*: Evaluates transportation conditions in 2035 and the feasibility of alternative improvement strategies such as reallocating roadway space on Central Avenue.
6. *Implementation*: Identifies short- and long-term projects to begin implementing Complete Streets and TOD.

Section 2
Project Overview

PROJECT OVERVIEW

Project Scope

Phase 3 of the Central Avenue Transit-Oriented Development (TOD) Mobility Study was initiated in order to investigate needs along the corridor and prepare guidance that would assist the Prince George's County Planning Department and The Maryland-National Capital Park and Planning Commission (M-NCPPC) with implementing the approved Subregion 4 Sector Plan. The effort included an analysis of the existing transportation network including roadways, pedestrian, bicycle, and transit facilities; refinement of feasible transportation solutions; review of existing county design guidelines and policies; and tailoring of broad "Complete Streets" policies to specifically implement concepts in the study area. These recommendations are structured to support the overarching vision for the study area and the following guiding principles:

- **Complete streets and networks to support Complete Communities**. Complete streets are designed to ensure that all users are safely, comfortably, and adequately accommodated along roadways. Streets should be treated as public space available for use by pedestrians and cyclists in addition to vehicles. Complete networks also provide direct connections between destinations for pedestrians and cyclists, either through street extensions or an integrated trails network. Complete communities expand on this principle further and provide strong connections between the transportation network and surrounding land uses. Within Prince George's County, every project should contribute to a complete community that supports social, economic, and personal health, mobility, choice, and neighborhood vitality. Convenient and comfortable transit access should be implemented into all new projects, and a greater emphasis should be placed on pedestrians when street improvements are made.
- **Livability**. Ultimately, the vision for the project is to increase livability among the neighborhoods and communities on and around Central Avenue. This vision requires a progressive, integrative, and well-planned relationship between transportation and public health, housing, cultural resources, and the natural environment. Implementing a mixed-use land development plan supported by a broad range of transportation options will increase destinations that meet daily needs and would increase livability in the area.
- **Offer a range of safe, comfortable, affordable, and convenient transportation options**. The role of a multimodal network is to provide reliable, connected transportation options that are accessible to all residents. Complete network improvements could bring the entire study area within a 1 mile walk, approximately 20 minutes, from a Metrorail station. Bicycle connections to Metrorail stations, local destinations, and "low stress" bicycle facilities, such as neighborhood greenways, could make cycling more accessible and attractive as a transportation option. A collector network–a series of low- to moderate-capacity roads that move traffic from local streets to arterial roads–would manage local trips and alleviate traffic from Central Avenue.
- **Leverage rail station assets to advance livability through economic development and private sector investment**. The land use, complete street/network, and policy recommendations developed through this process can support the addition of residents, businesses, and employment on the corridor in more walkable,

bikable, transit-oriented patterns. As these areas develop, the policies developed and adopted will help guide the implementation of physical improvements to further the goals of Prince Georges County and the residents living along Central Avenue. Due to its proximity to transit, station area sites can bring new jobs to the corridor without adding the levels of traffic that more suburban locations generate. Redevelopment of the Morgan Boulevard site can help to build comfortable and safe connections between the station and nearby areas.

Study Area

The corridor is approximately four miles long and includes properties within one-half mile of Central Avenue and the four Metro Blue Line stations (Figure 1). From west to east, the Metro stations within the study corridor are: Capitol Heights, Addison Road-Seat Pleasant, Morgan Boulevard, and Largo Town Center. Largo Town Center, the final stop on the Blue Line, is situated just east of the Capital Beltway. FedEx Field, home of the Washington Redskins National Football League team, is located approximately one mile north of the Morgan Boulevard Metro station. The land within the Central Avenue corridor is under the purview of several jurisdictions, including Prince George's County, the City of Seat Pleasant, and the Town of Capitol Heights. Central Avenue/East Capitol Street Extended (MD 214) is a state road, maintained by the Maryland State Highway Administration (SHA).

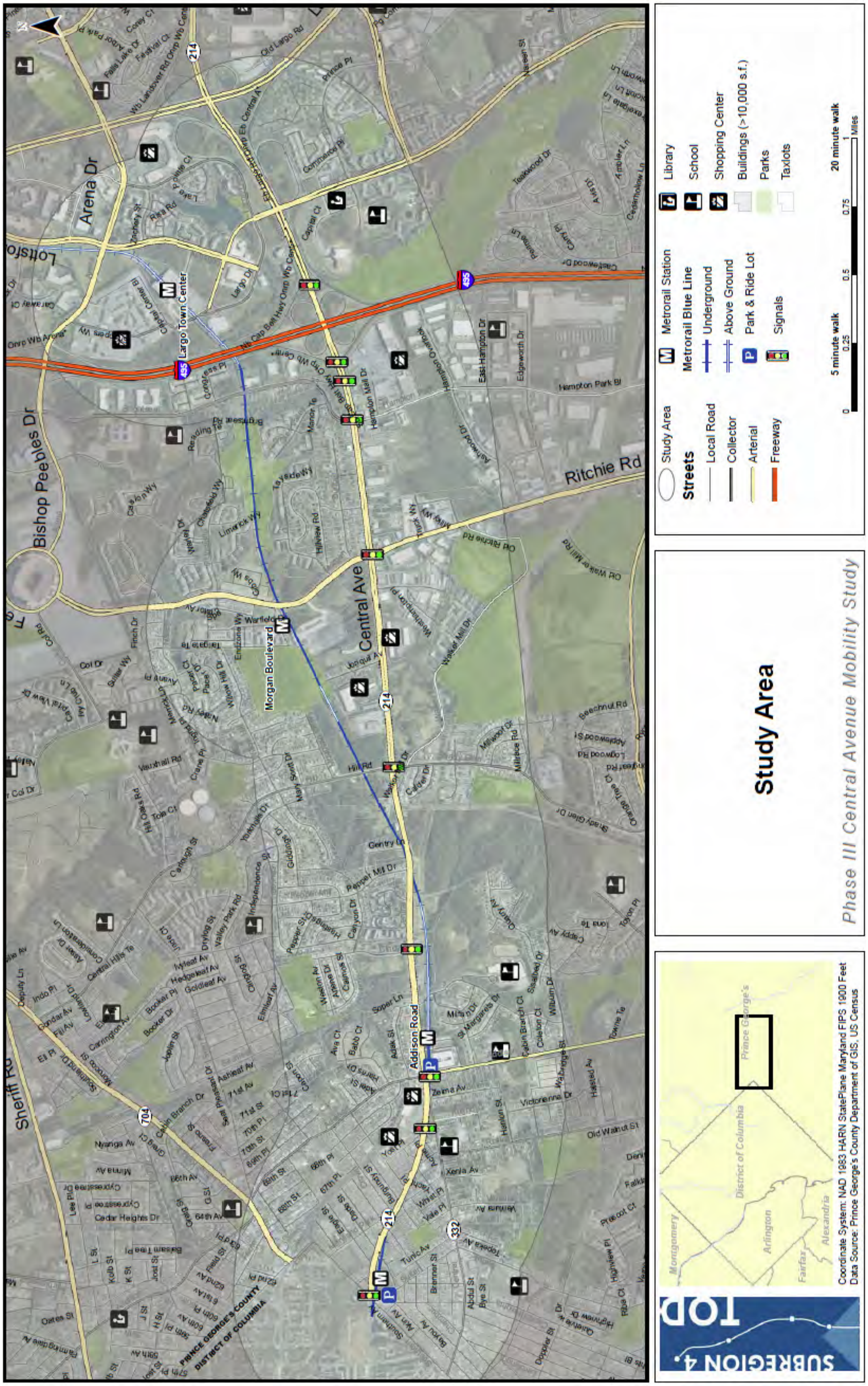


Figure 1. Study Area

Future Vision for Central Avenue

Consider the Central Avenue corridor 25 years into the future. Due to the introduction of Complete Streets policies there are many more intersecting streets and trail connections that are inviting to pedestrians and bicyclists. Less-experienced bicyclists use neighborhood greenways because they are comfortable and away from the faster traffic on Central Avenue. Younger residents travel to and from school, to area parks, and to visit friends on foot and by bike on sidewalks, in bike lanes, and along trails. Older residents enjoy trail connections for healthy recreation as well as transportation. Fewer travel lanes on Central Avenue, four instead of six, do not substantially increase motorists' travel time because there are more points of access to the road, intersections are managed with shorter cycle lengths, and speeds along the road are more consistent. More people are walking, biking, and using transit. The behavior of motorists sharing Central Avenue with bicyclists and pedestrians, each in their own dedicated space, creates a safer environment for all users. In short, Central Avenue functions more as an urban boulevard rather than an arterial roadway.

New mixed-use and transit-oriented places replace surface parking lots around Metro stations. Residential and retail development is oriented towards Central Avenue to take advantage of the increase in pedestrian activity and visibility. New residents and office workers support more retail business. Development has added employment and shopping options to existing neighborhoods, and it is all thanks to Prince Georges County's thoughtful, community-oriented approach to private investment.

Improvement in the business and economic outlook, combined with a greater number of choices of housing types available for a range of markets, helps older residents age in the communities they know and younger residents find housing in the places where they have grown up. Deep connections to the place that Central Avenue has become is evident from the physical appearance of the area, as the long-time residents of Seat Pleasant, Capital Heights, Morgan Boulevard, and Largo have engaged over the years to ensure that change brings about what is fundamentally important to community life. More work, school, and shopping trips are done locally, which helps to strengthen relationships between residents, area businesses, and neighborhood civic institutions. The positive and forward-thinking improvements in the transportation network, land use changes, and community friendly planning policies encourage growth and investment by government and transit agency partners, as well as the private sector.

The future vision for Central Avenue includes improved access to transit, comfortable walking and biking facilities, and improved crossings of Central Avenue.

Section 3
Previous Plans & Public Engagement

PREVIOUS PLANS & PUBLIC ENGAGEMENT

Connection to Previous Plans and Existing Policies

Phase 3 of the TOD Mobility Study builds upon the recommendations of the 2010 *Approved Subregion 4 Master Plan and Sectional Map Amendment (SMA)*, the 2009 *Approved Countywide Master Plan of Transportation* (MPOT), and Phases 1 and 2 of the Central Avenue TOD Mobility Study. This project will further develop and identify strategies to support and facilitate a multimodal, fully integrated transportation network throughout the Sector Plan area, including recommending Complete Streets policy and implementation strategies. The Complete Streets implementation strategies provide the basis for development of a future Transportation Network Functional Overlay that designates street types, assigns networked elements (including transit routes and truck access), and establishes the relationship of the transportation network within the plan area to surrounding communities.

Subregion 4 Master Plan

In 2010, the Prince George's County Council approved the *Subregion 4 Master Plan and Sectional Map Amendment* (SMA). The *Subregion 4 Master Plan* establishes land use and development policies to implement the goals and policy recommendations of the 2002 *Prince George's County Approved General Plan*. The General Plan designates Subregion 4 as an area located within the Developed Tier, which places special emphasis on policies that will strengthen neighborhoods, support economic development along corridors, capitalize on transportation investments, and encourage transit-supporting, mixed-use, pedestrian- oriented neighborhoods. The Subregion 4 Master Plan further highlights the General Plan's goals by recognizing that the Central Avenue-Metro Blue Line corridor presents significant transit-oriented development (TOD) and economic investment potential for the county.

Phase 3 of the TOD Mobility Study supports the *Subregion 4 Master Plan*, which envisions a fully integrated multimodal transportation system around each of the corridor's four Metro stations. Once completed, current plans for redevelopment are expected to substantially increase the 12,600 passenger trips made each day at the 4 stations. Metro's proposed goal of tripling the number of passengers who access Metrorail stations by bicycle within the next ten years will also generate increased demand for bicycle adequate facilities. Realizing these visions will require the county to overcome several constraints, including an auto-oriented development pattern, limited right-of-way, and limited funding for multimodal improvements. The Central Avenue TOD Mobility Study makes low-cost recommendations to resolve these constraints, but additional coordination with the county and SHA staff will be essential to ensure implementation of these recommendations.

COUNTY MASTER PLAN OF TRANSPORTATION

Phase 3 of the TOD Mobility Study will refine and implement the *Master Plan of Transportation*'s (MPOT) vision for TOD, Complete Streets, and a multimodal transportation network. The goal of the MPOT is to provide county residents and workers with a safe, affordable, multimodal transportation system–which includes bicycle and pedestrian facilities, bus and rail transit service, and a road network–that effectively contributes to the timely achievement of the General Plan goals for growth, development, and revitalization.

The MPOT supports TOD as compact, transit-supporting, mixed-use development that integrates land use and density, site design, parking and accessibility into a specific vision for areas within a quarter- to half-mile of transit stations. The MPOT also supports the concept of, and provides policies and strategies for, achieving Complete Streets, which is integral to achieving the goals and vision of the sector plan. Complete Streets accommodates all users of streets, roads, and highways, including pedestrians, bicyclists, transit-users, motorists, seniors, and persons with disabilities. It also provides improved choices for travelers who may want alternatives to single-occupancy vehicles.

CENTRAL AVENUE TOD MOBILITY STUDY PHASE 1 AND PHASE 2

During Phase 1 of the Central Avenue TOD Mobility Study, short-term improvements to western Central Avenue were identified. In Phase 2, the short-term improvements to western Central Avenue were refined and analyzed, and short-term improvements to eastern Central Avenue were identified. Phase 3 builds on the analysis and results of the two prior phases to develop a long-term, corridorwide strategy for the implementation of TOD and Complete Streets.

Phase 1 of the Central Avenue TOD Mobility Study, *Pedestrian and Bicycle Access and Circulation (Transportation Land use Connections Program)*, set the stage to apply Complete Streets principles to enhance pedestrian safety and improve access and mobility for pedestrians and bicyclists. Phase 1, conducted in FY 2011, reviewed pedestrian and bicycle safety and access for the Capitol Heights and Addison Road- Seat Pleasant Metro stations.

Beginning in the fourth quarter of FY 2011, Phase 2 of the Central Avenue TOD Mobility Study (a neighborhood and metro station access and streetscape improvement plan) was completed. This phase emphasized pedestrian and bicycle safety, and access for the Morgan Boulevard and Largo Metro stations, as well as the Central Avenue corridor between Hill Road/Shady Glen Drive and the Capital Beltway (1-95/1-495). Phase 2 produced preliminary recommendations for improvements at these locations, along with potential low-cost funding sources to implement the recommended improvements.

Public Involvement Process

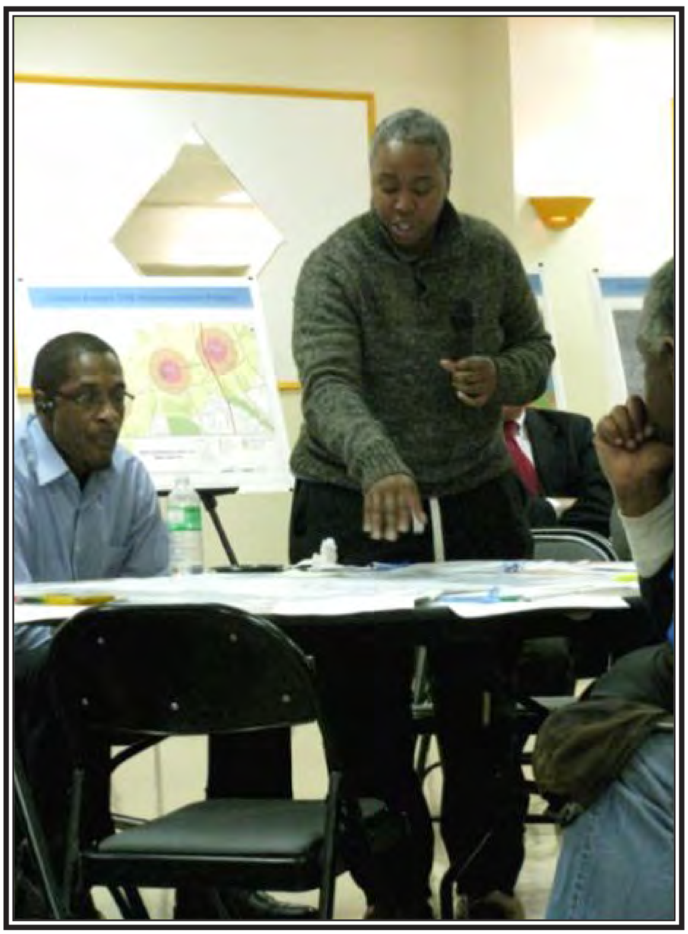
Public involvement is a key element to understanding the existing conditions and transportation needs of the corridor. The Phase 3 analysis was informed by feedback received through multiple public outreach meetings and an interactive map featured on the project website. Public meetings were held over the course of the project, focusing on a range of different issues, including:

- **Western Corridor (Southern Avenue to Hill Road) Issues**. November 29, 2011 from 6:45-9:00 p.m. at St. Margaret’s Church.
- **Eastern Corridor (Hill Road to I-495) Issues**. December 8, 2011 from 6:45-9:00 p.m. at the Sports and Learning Center.
- **Market Analysis**. April 12, 2012 from 7:00 to 9:00 p.m. at the Sports and Learning Center.
- **Existing and Future Transportation Analysis**. April 26, 2012 from 7:00 to 9:00 p.m. at the Sports and Learning Center.
- **Complete Streets Open House**. May 17, 2012 from 7:00 to 9:00 p.m. at the Sports and Learning Center.

All public meetings were held at St. Margaret's Church near the Addison Road Metrorail station and the Sports and Learning Center near the Morgan Boulevard Metrorail station. All meetings included informational presentations on the project and group discussion of public needs and expectations through mapping and table exercises.

Public agency stakeholders were also engaged throughout the project development process. Stakeholder interviews and meetings were conducted with the Prince George's County Department of Public Works and Transportation (DPW&T), Maryland State Highway Administration (SHA), Washington Metropolitan Area Transit Authority (WMATA), Maryland-National Capital Park and Planning Commission (M-NCPPC), District of Columbia Department of Transportation (DDOT), and others to identify issues and obtain agency feedback on recommendations.

A summary of the feedback received from these meetings and the project website can be found in Appendix 1. The community and agency feedback from these outreach meetings informed the analysis and recommendations for this report.



Residents shared their vision and concerns for the study area through group discussion and mapping exercises during multiple public meetings.

Section 4
Existing Conditions

EXISTING CONDITIONS

As shown in Figure 1, the study area is defined as the area within one-half mile of the Central Avenue (MD 214) corridor from the Washington, D.C. boundary to the Central Avenue/Landover Road (MD 202) intersection and includes areas within one-half mile of the four Metrorail stations on the corridor. The existing conditions analysis provides an overview of this study area, existing transportation facilities, and a safety analysis for the Central Avenue Corridor. The existing conditions analysis includes feedback received from public and agency outreach meetings and an interactive map on the project website. A summary of community comments received both from meetings and the website can be found in Appendix 1.

Land Use and Demographics

The current land use pattern along the corridor is clustered with few "mixed use" land areas, as shown in Figure 2. Retail, residential, and industrial uses are segregated. These land use patterns require residents to travel long distances to reach shopping, employment, and other destinations; as a result, they do not support access by walking, bicycling, or transit.

As shown in Figure 3, several dense residential areas along the Central Avenue corridor are priority opportunity areas to improve Metrorail station, pedestrian, and bicycle connections:

- Camden Summerfields (adjacent to the Morgan Boulevard Metrorail Station)
- Largo Town Center (east of I-495 and north of Central Avenue (MD 214))
- Carmondy Hills–Pepper Mill Village (near Hill Road/Seat Pleasant Drive)
- North Englewood (near Landover Road (MD 202)/Martin Luther King Jr. Hwy (MD 704))
- Lake Arbor (near Landover Road (MD 202)/Lake Arbor Way)

Figure 2. Land Use & Points of Interest

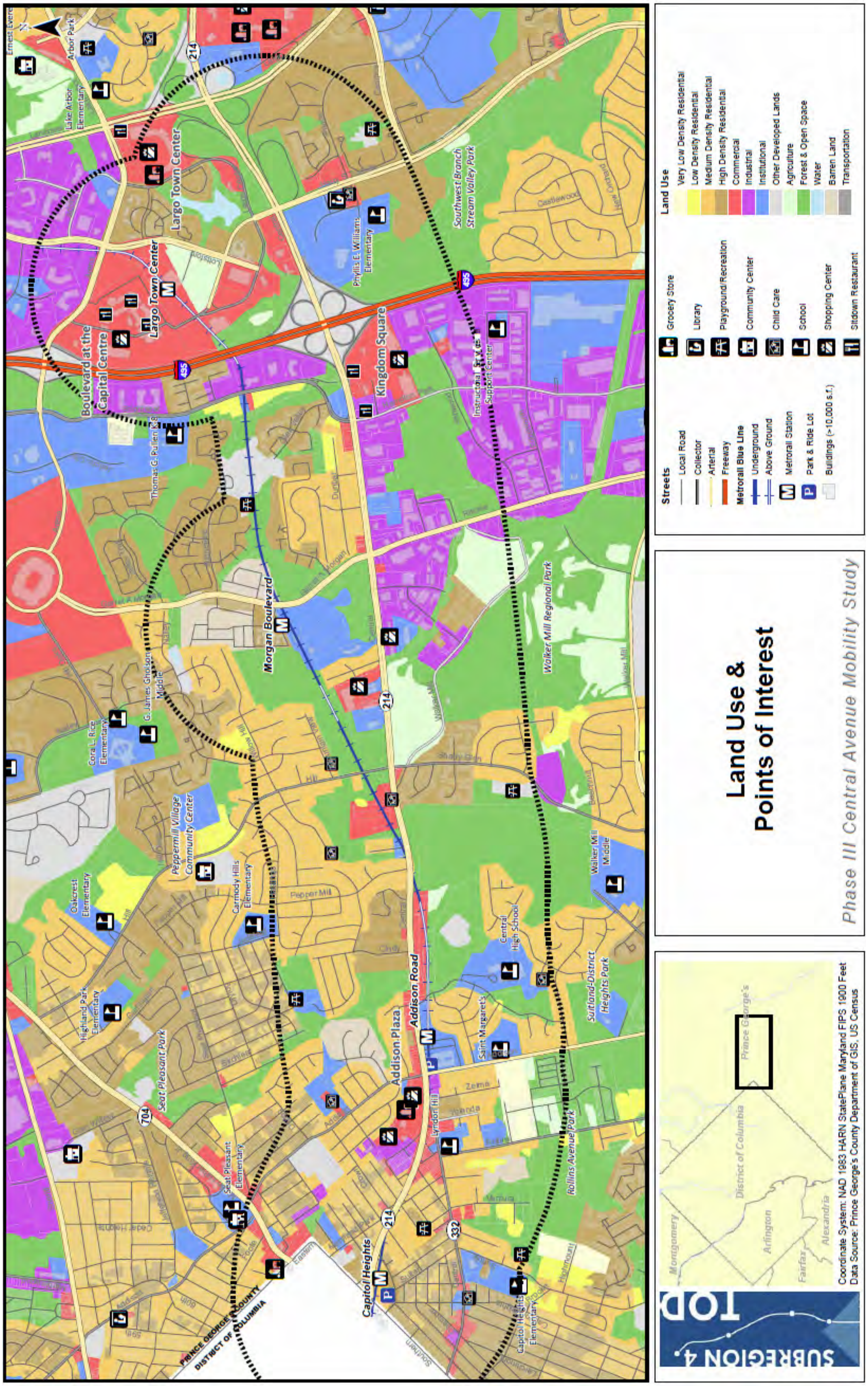
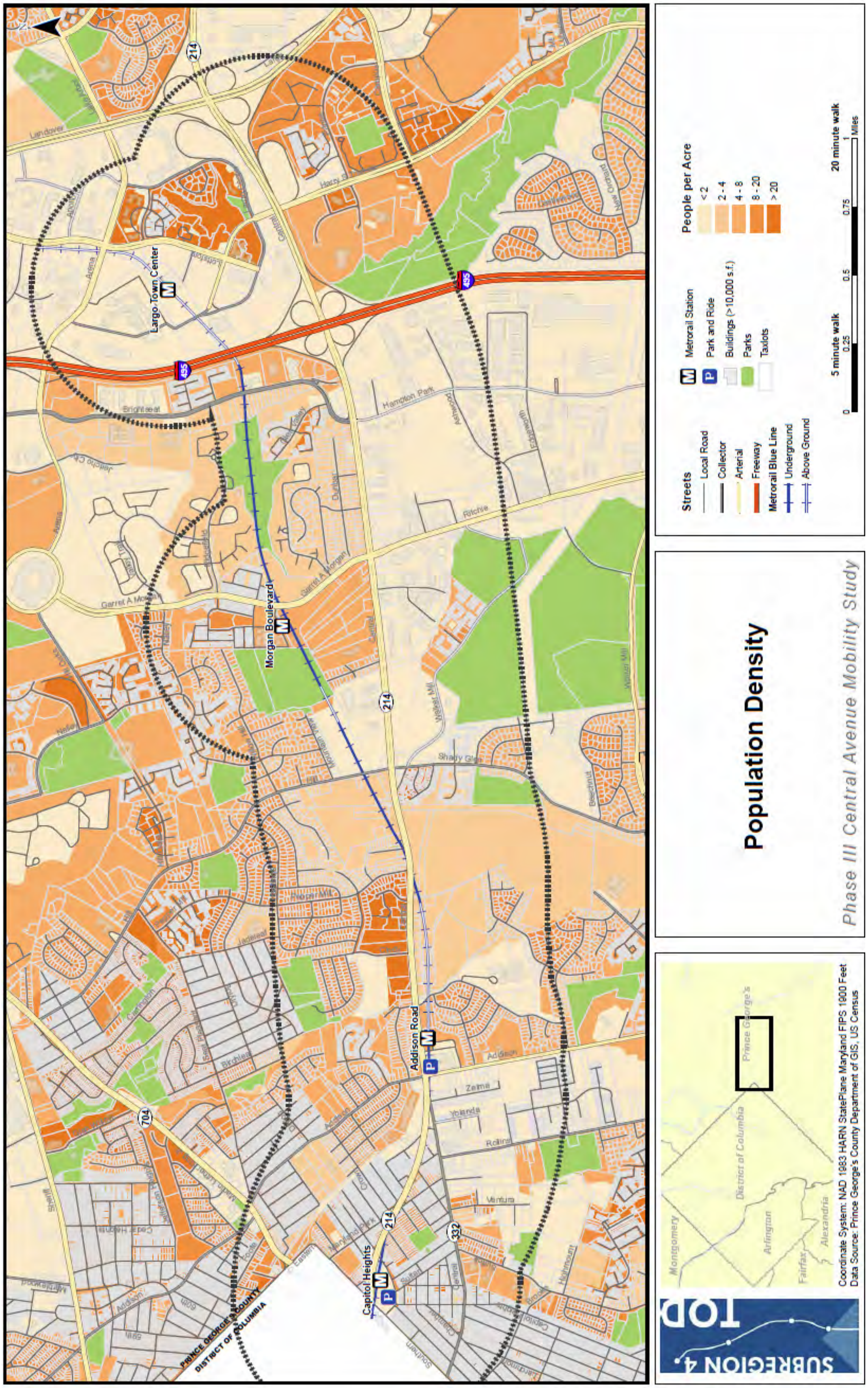


Figure 3. Population Density



Areas with high concentrations of youth (residents under 18) and senior citizens (residents over 65), as shown in Figure 4 and Figure 5, are also priority areas for improving connections to schools, transit, parks, and other community destinations. Locations with a high concentration of youth or senior residents include:

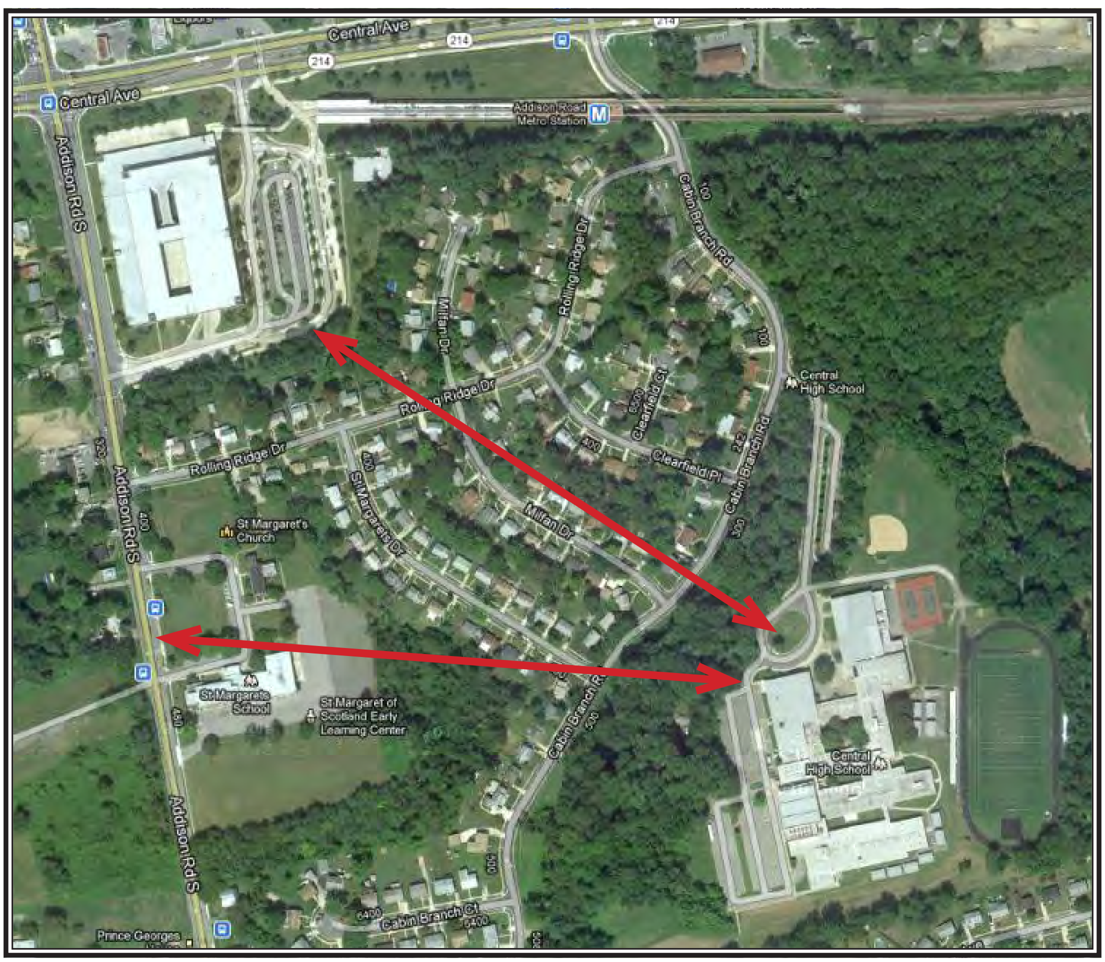
Youth Population:

- Camden Summerfields (Adjacent to the Morgan Boulevard Metrorail Station)
- Carmondy Hills–Pepper Mill Village (Near Hill Road/Seat Pleasant Drive)
- Seat Pleasant (Along Martin Luther King Jr. Highway)

Senior Citizens Population:

- Brightseat Road (Near FedEx Field)
- Walker Mill (Adjacent to Addison Road South)
- Capitol Heights (South of Old Central Avenue/MD 332)

As shown in Figure 6, the two areas with the highest employment density are located south of Central Avenue and in the Largo Town Center. These are also priority areas to connect to surrounding bus stops and the Morgan Boulevard and Largo Town Center Metrorail stations.



There are currently no direct pedestrian connections between Central High School and nearby residential areas or transit stops.

Figure 4. Youth (under 18) Population Density

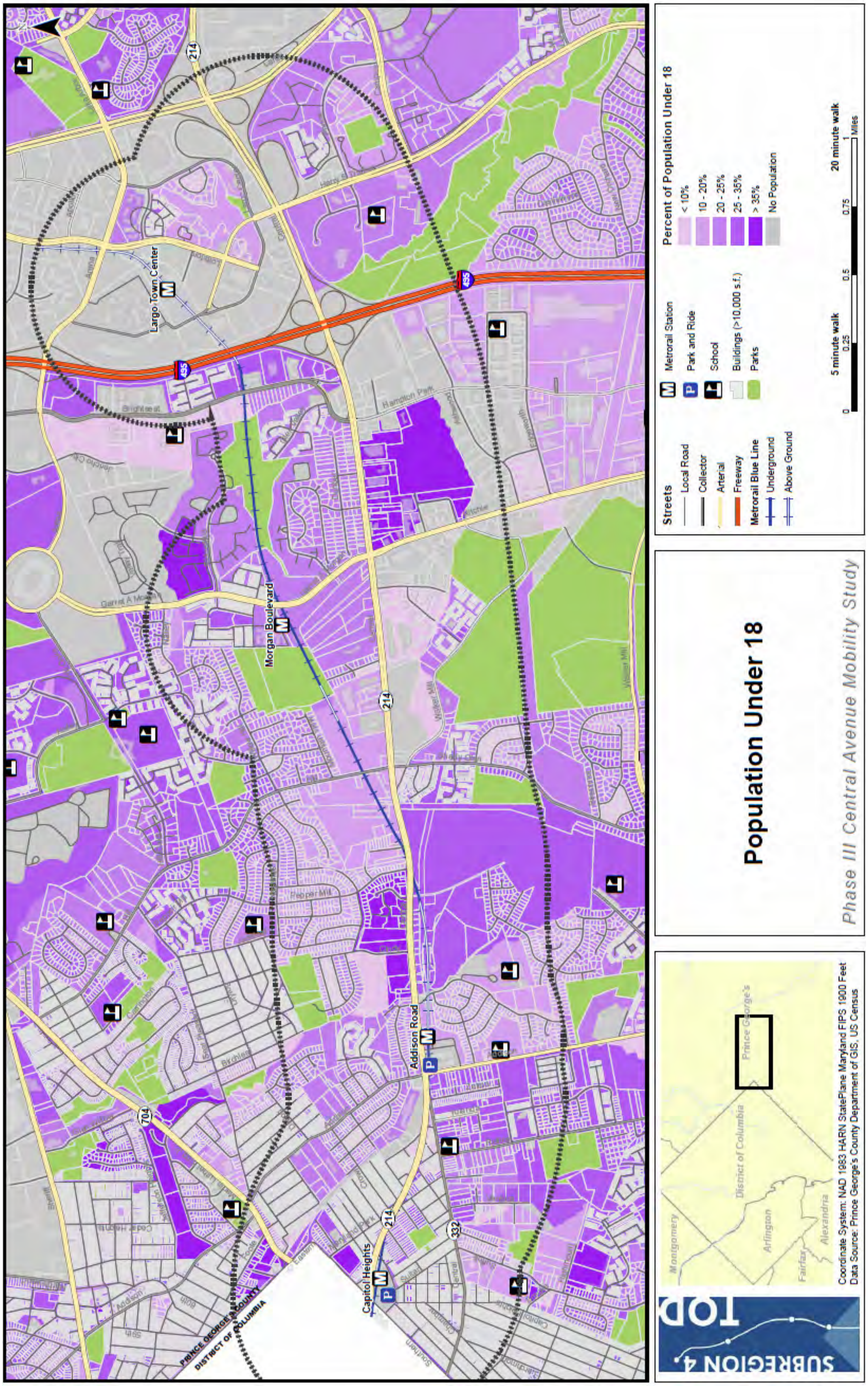


Figure 5. Senior (Over 65) Population Density

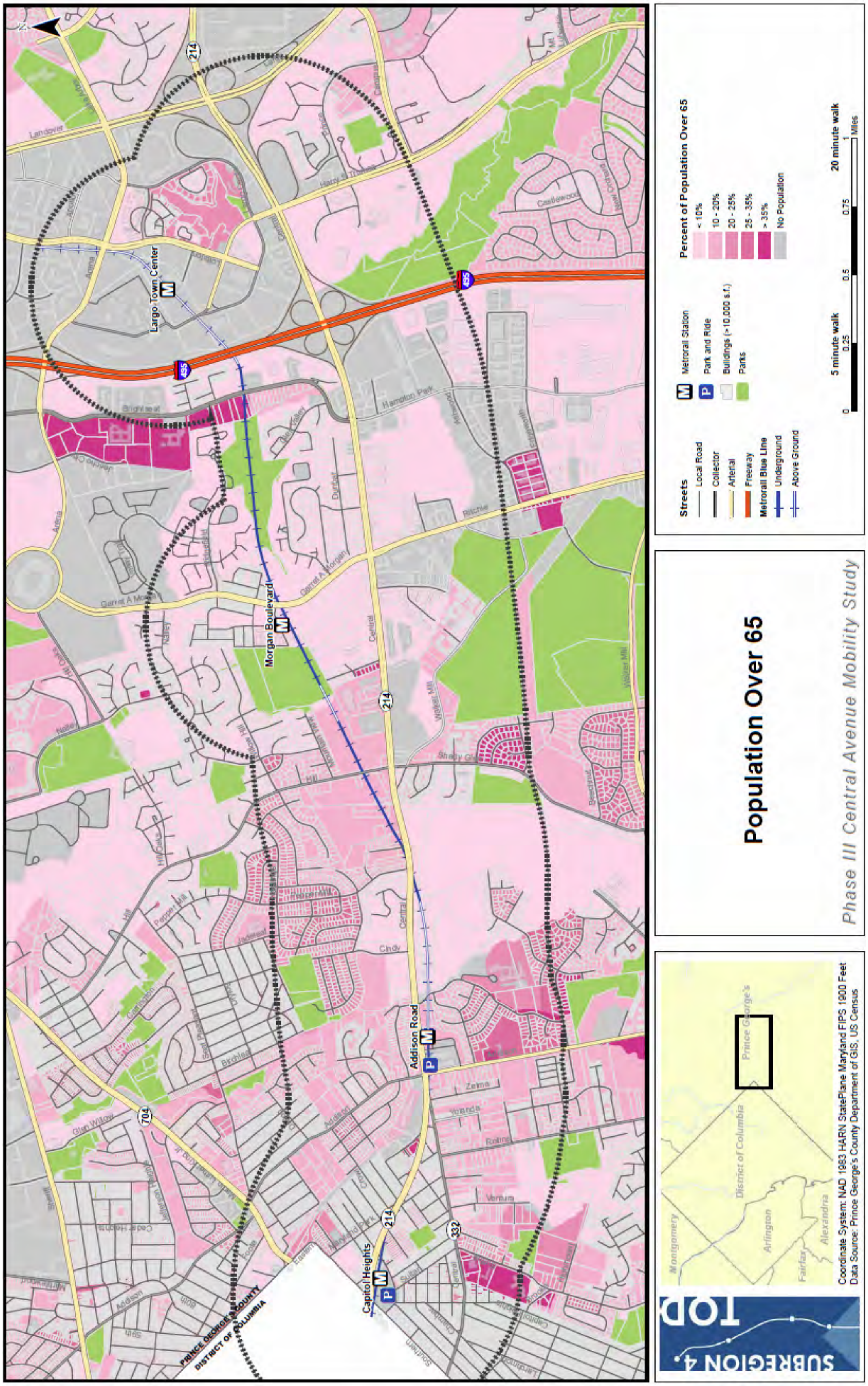
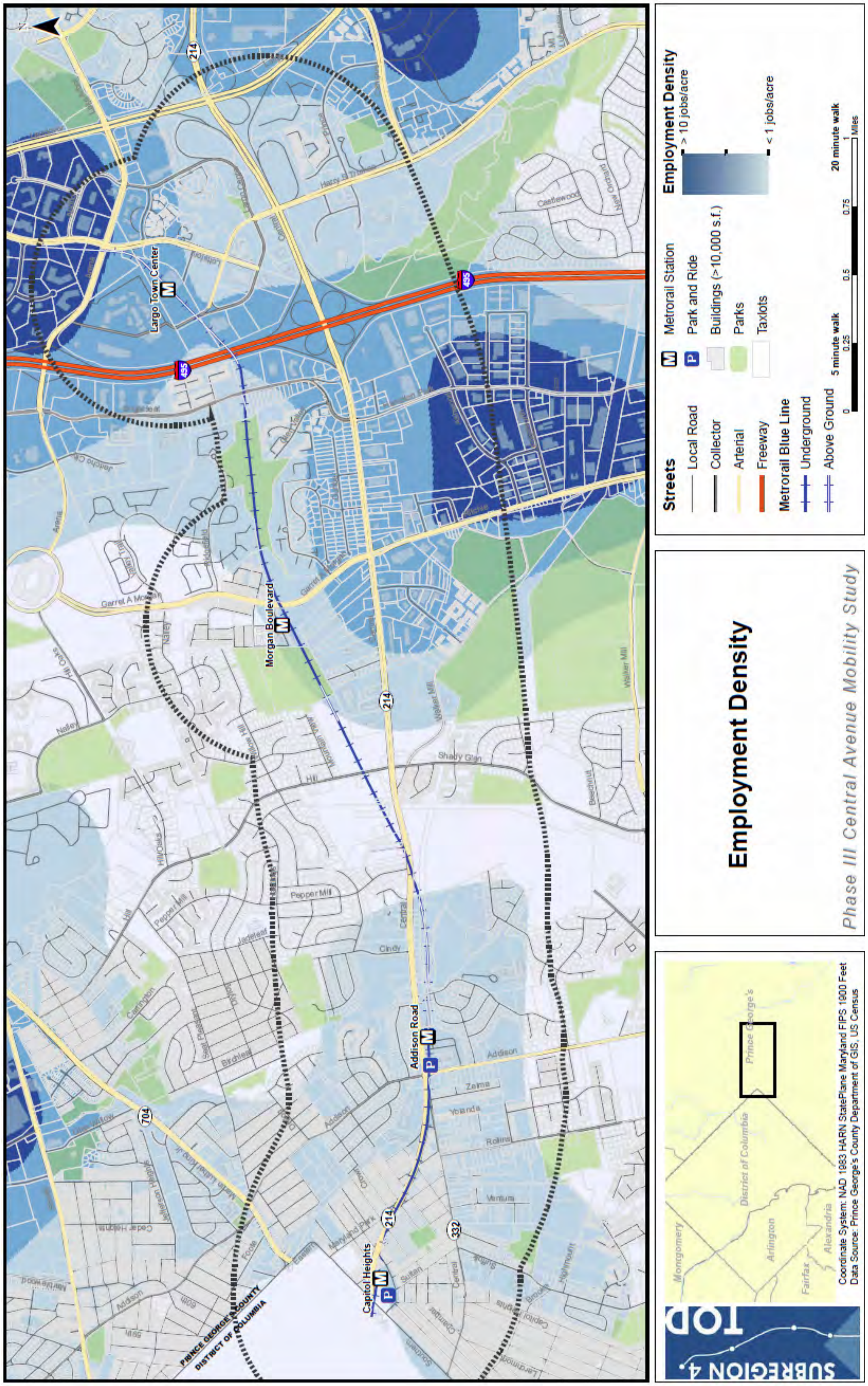


Figure 6. Employment Density



Existing Market Conditions[1]

As part of the Phase 3 work, and presented in a separate report, AECOM developed a market analysis for the Central Avenue project area. The key objectives of the market analysis study were to:

- Identify and define short and long term realistic market opportunities
- Outline the TOD development potential at each of the four stations
- Identify catalytic projects for early opportunities
- Look at infrastructure needs and alternative funding opportunities for implementation
- Identify proactive approaches to support TOD and economic growth
- Define potential marketing and branding strategies to attract TOD

The study outlines the benefits of TOD, which may include: increased access to amenities and employment, less parking demand, place-making, improved pedestrian activity, decreased emissions, compact land form, decrease in auto-dependency, increased equity for lower-income households, and increased value and marketability of nearby residential and commercial properties. Market opportunities were quantified and provided to the Kittelson Team in order to analyze traffic conditions and transportation needs for the future. The following discussion presents key findings of that study.

The Central Avenue corridor is an important gateway to Prince George’s County and has a high potential for successful TOD implementation. Weekly average weekday ridership is over 12,000 at the four transit stops in the corridor–this could be increased with the addition of residential and commercial development at and near Metro stations, especially at the Largo Metro station, which is recognized by Prince George’s County as a priority TOD site. Furthermore, several large publically owned parcels of land are close to all four Metro station locations, and the county has Transit District Overlay and Development District Overlay Zones in place to facilitate TOD.

RESIDENTIAL MARKET ANALYSIS FINDINGS

Opportunities for growth in the residential market for homeownership are derived from established, stable neighborhoods that are relatively affordable and in close proximity to employment, cultural, and entertainment opportunities. There are positive indications that the rental market is stable, as vacancy rates have declined since 2009. Negatives for the residential market are slowing, but still decreasing average sales prices for home, a decline in the total number of units sold, a high countywide foreclosure rate, and a decrease in year-over-year rent growth. Overall, the residential market has a total demand of approximately 2,000 to 2,500 total units along the corridor by 2033, with the potential for workforce and/or senior housing.

RETAIL MARKET SUMMARY FINDINGS

Opportunities for growth in the retail market are derived from the area being relatively underserved by retail, and high levels of residents’ retail spending occurs outside of the Central Avenue corridor. In particular, the area can support more restaurants, bars, and retail stores that sell electronics and sporting goods. Currently, retail space within the Boulevard at the Capital Centre is performing well. Supermarkets present a market opportunity in the area, but the market is

1 Central Avenue Market & Branding Study, AECOM, Aug 2012.

competitive and several other options are available within a ten- minute drive. A new Wal-Mart proposed for the Capitol Gateway area, just inside the District of Columbia, will have implications for other retailers in the area if it is built, but opportunities exist for synergistic retail to complement the big-box retailer. Overall, retail demand is between 175,000 – 235,000 SF over the next several years, likely grouped into two or three clusters to maximize visibility, transit and vehicular access, and proximity to residential and office development.

OFFICE MARKET

The Central Avenue corridor presents a number of opportunities for new office space, mainly predicated on the easy access to Washington, D.C. and the Beltway. The projected demand over the next 20 years lies between 180,000 and 280,000 square feet of new space. A good deal of this office space could be developed as part of a mixed-use project located near a Metro station, with the Morgan Boulevard station providing the most land and potential. Opportunities for new space include a large federal or institutional tenant such as a medical center, though competition is expected to be strong. Currently, the high amounts of vacant office space throughout Prince George's County impact demand for new space.

Connectivity and Urban Form

Most of the study area is within a 20-minute walk to a Metrorail station, if direct connections were present. Walk times are longer, however, due to poor connectivity and the cul-de-sac nature of the streets. Wide cross sections, long distances between intersections, and limited crossing locations make Central Avenue a barrier to north-south connectivity. This is evident in Figure 7 and Figure 8, which shows the difference between the potential area within a 20-minute walk of Metro stations and the actual area currently reachable within a 20-minute walk. As shown in Table 1, future connectivity improvements could increase the service area and population within a 10-minute walk of the Morgan Boulevard and Largo Town Center's stations by 500 percent.

Table 1. Potential and Existing Network Walkability

	Area (Acres) Reachable Within a 10 Minute Walk		Population Reachable Within a 10 Minute Walk	
Metro Station	Existing Network	Potential	Existing Network	Potential
Morgan Blvd.	88.0	502	476	2,716
Largo Town Center	103.1	502	558	2,716

Potential reachable population estimated based on average overall population density in the study area (5.41 residents/acre).

Figure 7. Potential Walkable Area

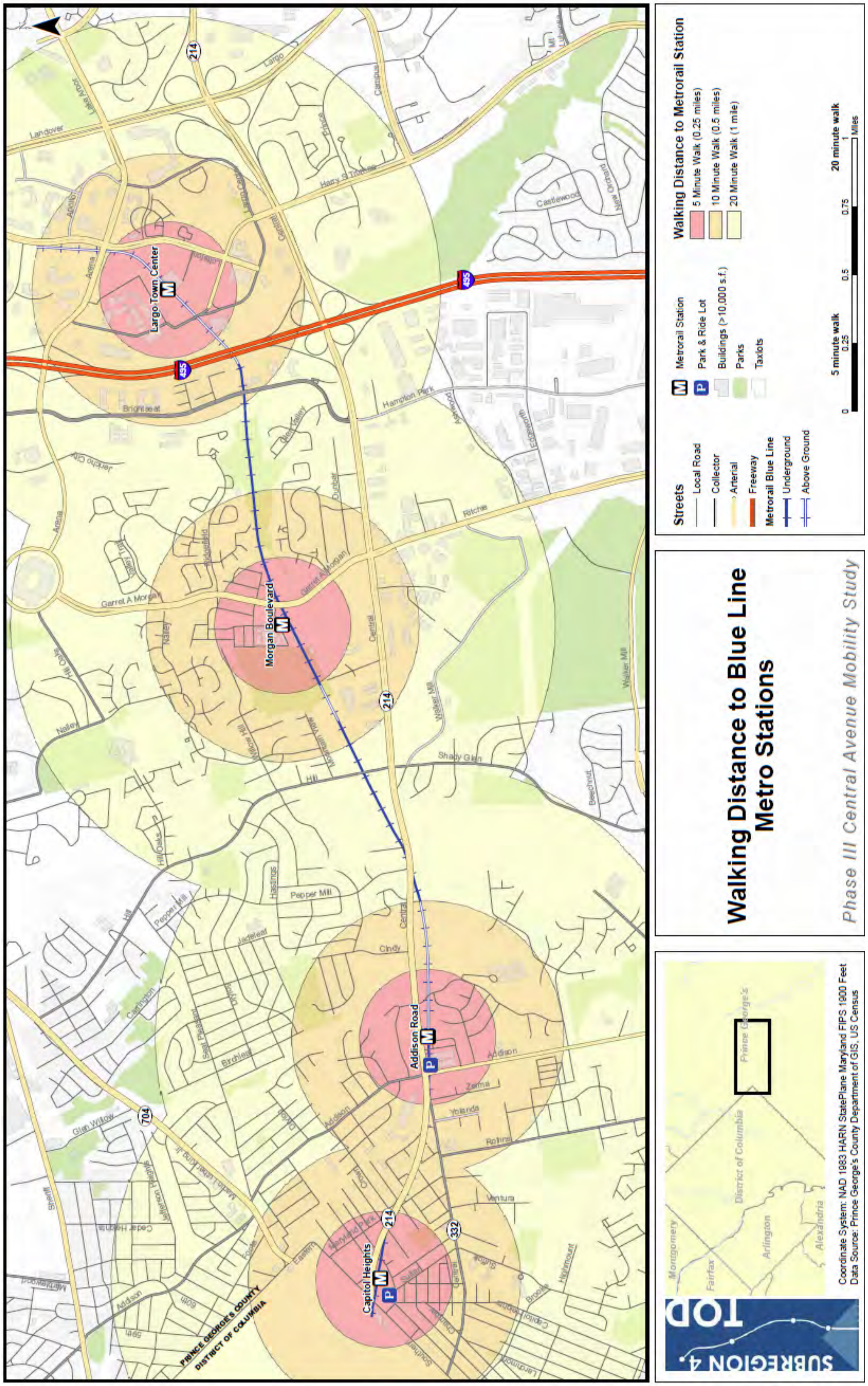
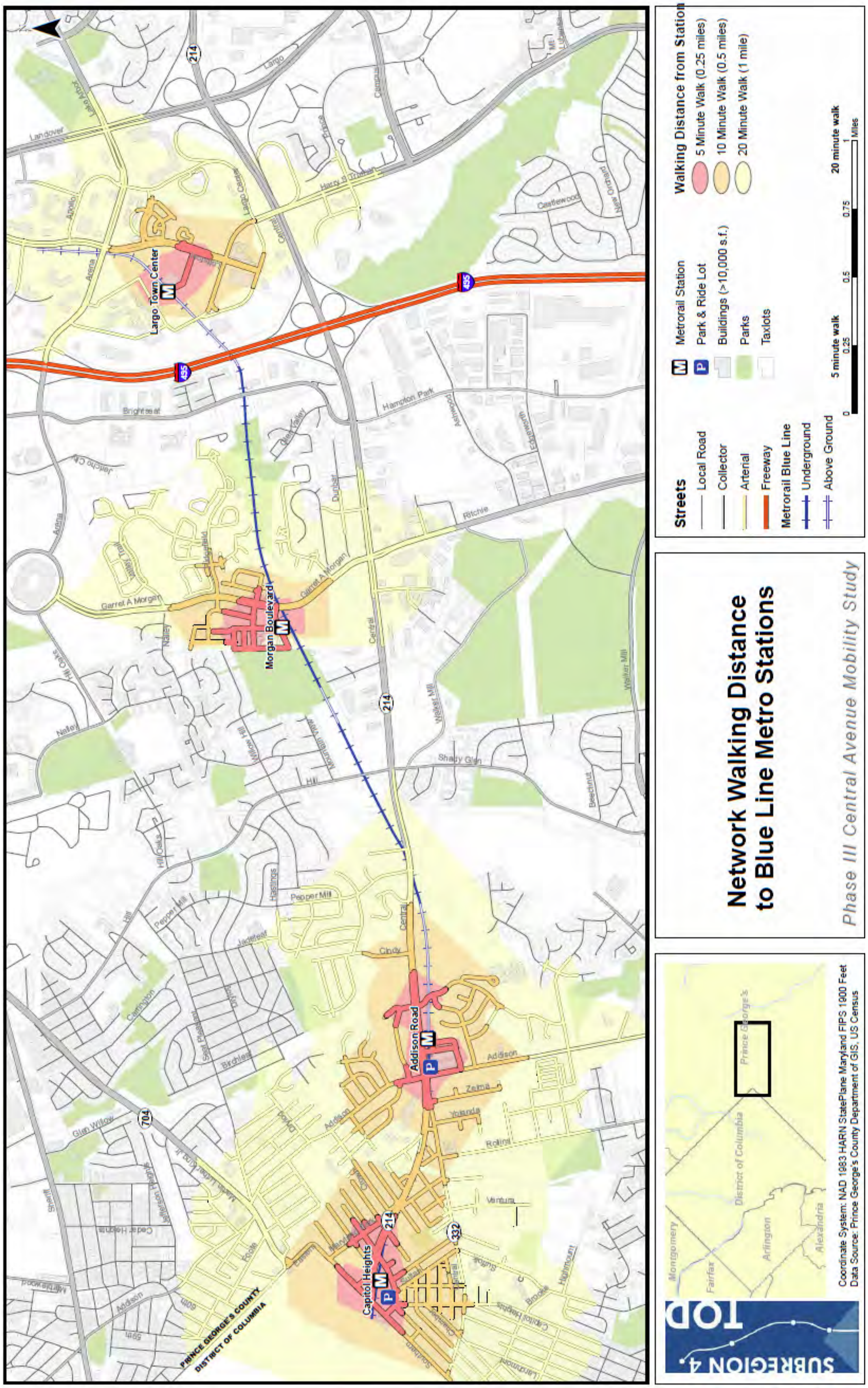


Figure 8. Existing Network Walkability



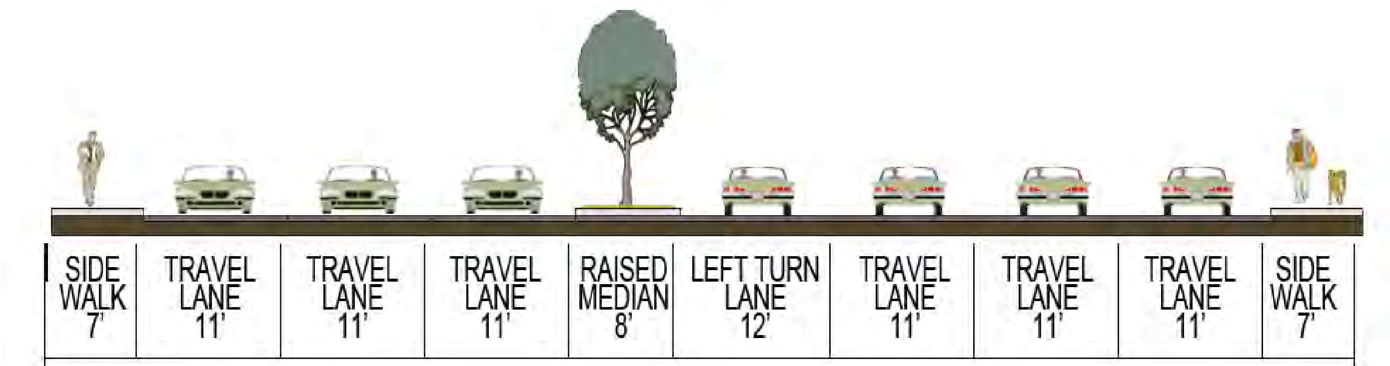
Overview of Transportation Facilities

This section describes the existing transportation network and facilities in the Central Avenue corridor and the broader project area.

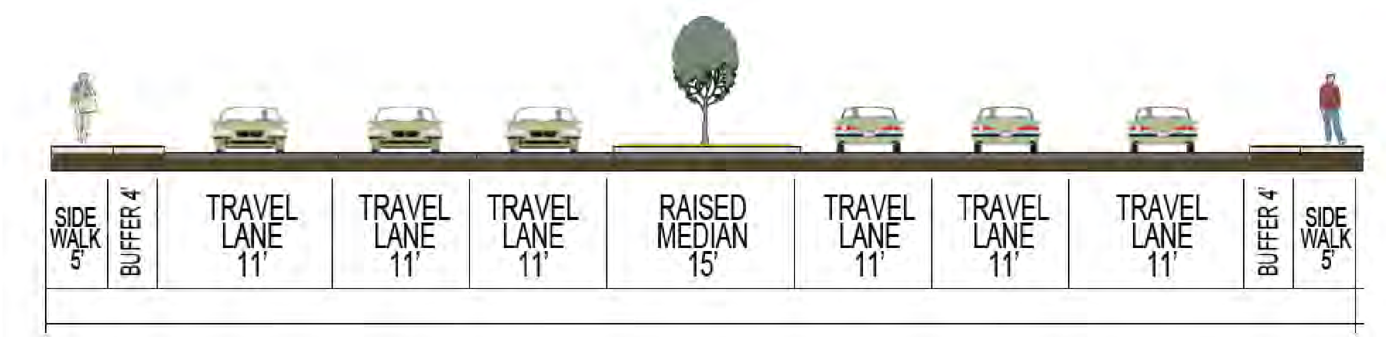
CENTRAL AVENUE CROSS-SECTION

Central Avenue is a seven-lane principal arterial from the Washington, D.C. border to the Capital Beltway, where its functional classification then transitions into an expressway. The western portion of the corridor (Southern Avenue to Cabin Branch Road) has a 100-foot right-of-way, three 11-foot travel lanes in each direction, a raised median, and 7-foot sidewalks on both sides of the street. The eastern half of the corridor has a 105-foot right-of-way, two 11-foot travel lanes and an outer 14-foot travel lane in each direction, a raised median, and 5-foot sidewalks on both sides of the road. Figure 9 illustrates the typical cross sections of Central Avenue.

Figure 9. Central Avenue Typical Cross Sections



Central Avenue – Southern Avenue to Cabin Branch Road



Central Avenue – Cabin Branch Road to Hampton Park Boulevard

PEDESTRIAN FACILITIES

Figure 10 shows the locations of existing pedestrian and bicycle facilities in the study area. Pedestrian challenges in the study area include: inadequate pedestrian facilities, poor lighting, missing crosswalks, freeway ramps, and channelized right turns along the corridor. Central Avenue has long crossings and few marked crosswalks. Pedestrians will not typically walk more than 200 feet to cross the street, and mid-block opportunities should be considered if signal spacing is over 400 feet. The closest spacing between marked crosswalks on the corridor is 480 feet and the farthest is about 4,225 feet. Pedestrian facilities are also discontinuous in the study area, and connections to key destinations and transit services are poor. Priority destinations for pedestrians include: the Metrorail stations, the commercial shopping center near Hampton Park Boulevard, FedEx Field, Largo Town Center, and several schools.

As part of the existing conditions assessment, a pedestrian level of service (LOS) analysis was completed. Figure 11 shows the results of the pedestrian LOS analysis. A high pedestrian LOS is characterized by wider sidewalks separated from vehicle travel lanes. Signalized intersections with the highest pedestrian LOS have few conflicts between pedestrians and turning vehicles (i.e., protected left-turn signal phasing) and minor street approaches with short pedestrian crossing distances.[2] The locations with the lowest pedestrian LOS–including Southern Avenue and East Capitol Extended–lack sidewalks, have sidewalks that are not separated from traffic, have high volumes on the minor approach, and/or have channelized right turns.[3]

> **Channelized lanes** are intended to improve traffic flow at intersections; they are lanes separated or dedicated to right turns. They are problematic for cyclists and pedestrians, as it makes it difficult for them to cross the street.

2 The I-495 ramp intersections received unexpectedly high LOS rankings, despite the lack of pedestrian facilities in this portion of the study area. This is due to the fact that the ramp approaches are a single lane serving a single traffic movement, which would typically indicate an intersection with a short crossing distance and predictable interactions between pedestrians and vehicles. This portion of the study area presents unique challenges not accounted for in the MMLOS methodology; as a result, engineering judgment is required.

3 The pedestrian LOS model is scaled in such a way that signalized intersections cannot score lower than a LOS D. As a result, the pedestrian LOS at intersections must be considered relative to each other with the understanding that the intersection could not score below a LOS D.

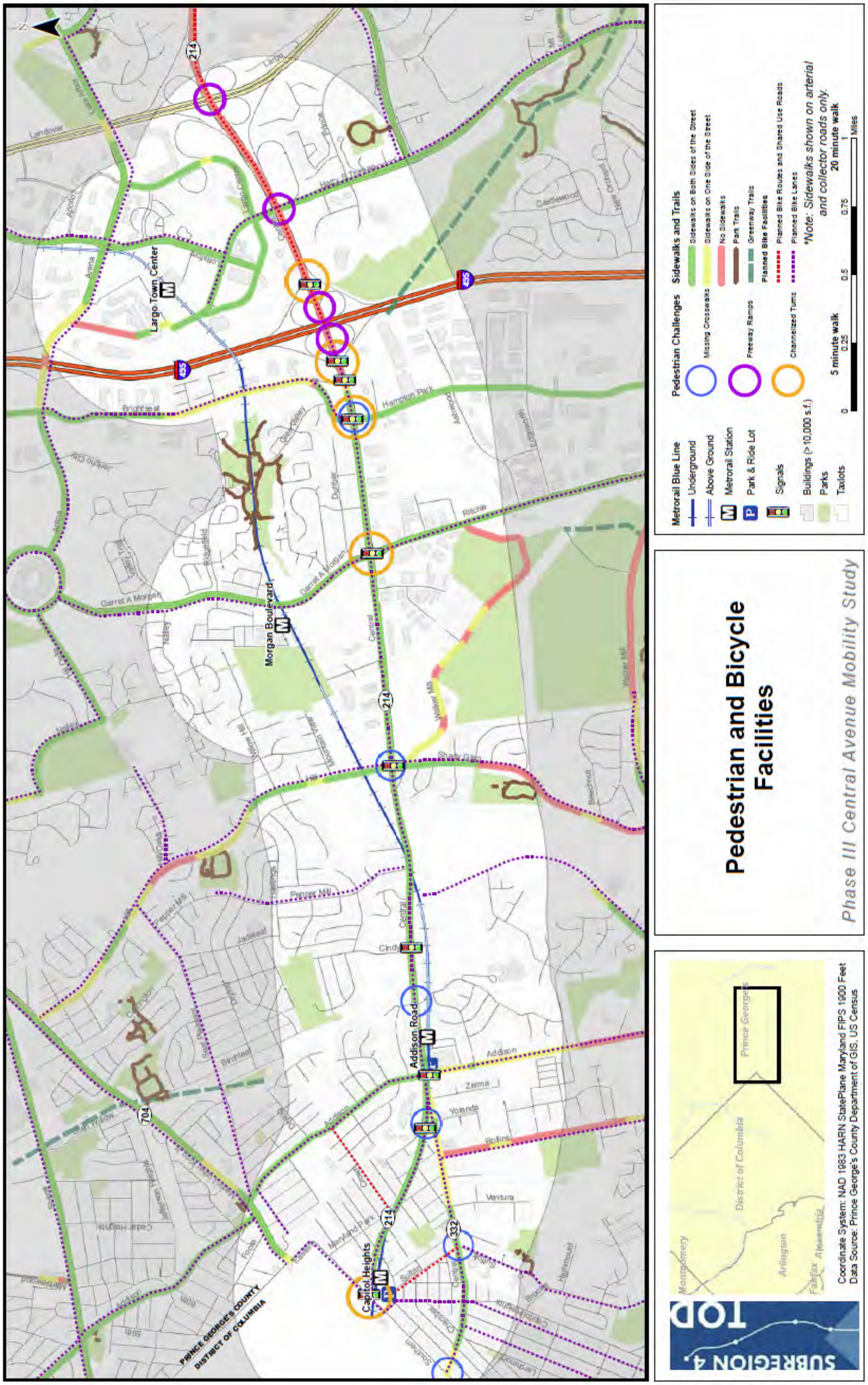


Figure 10. Pedestrian and Bicycle Facilities

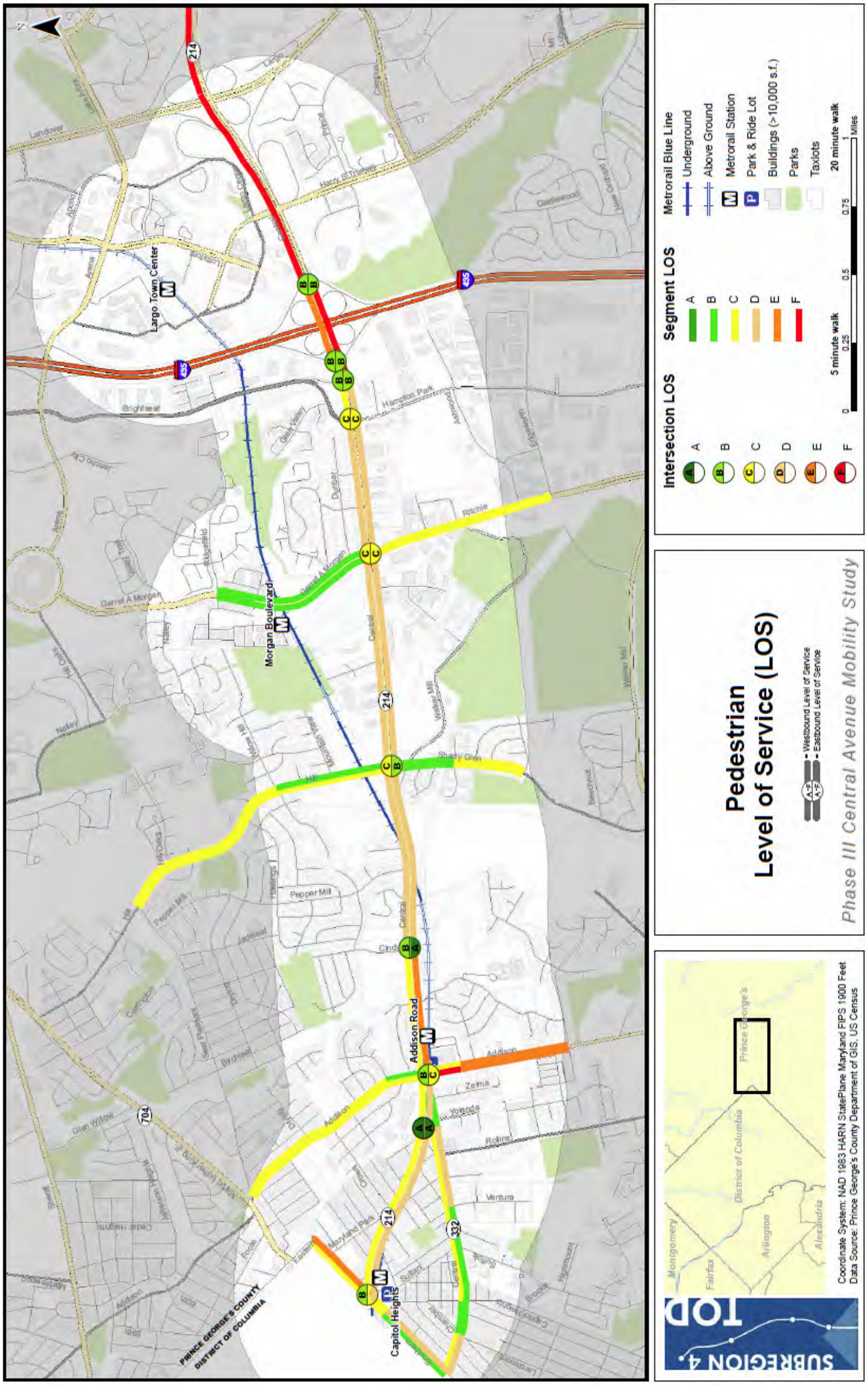


Figure 11. Pedestrian Level of Service

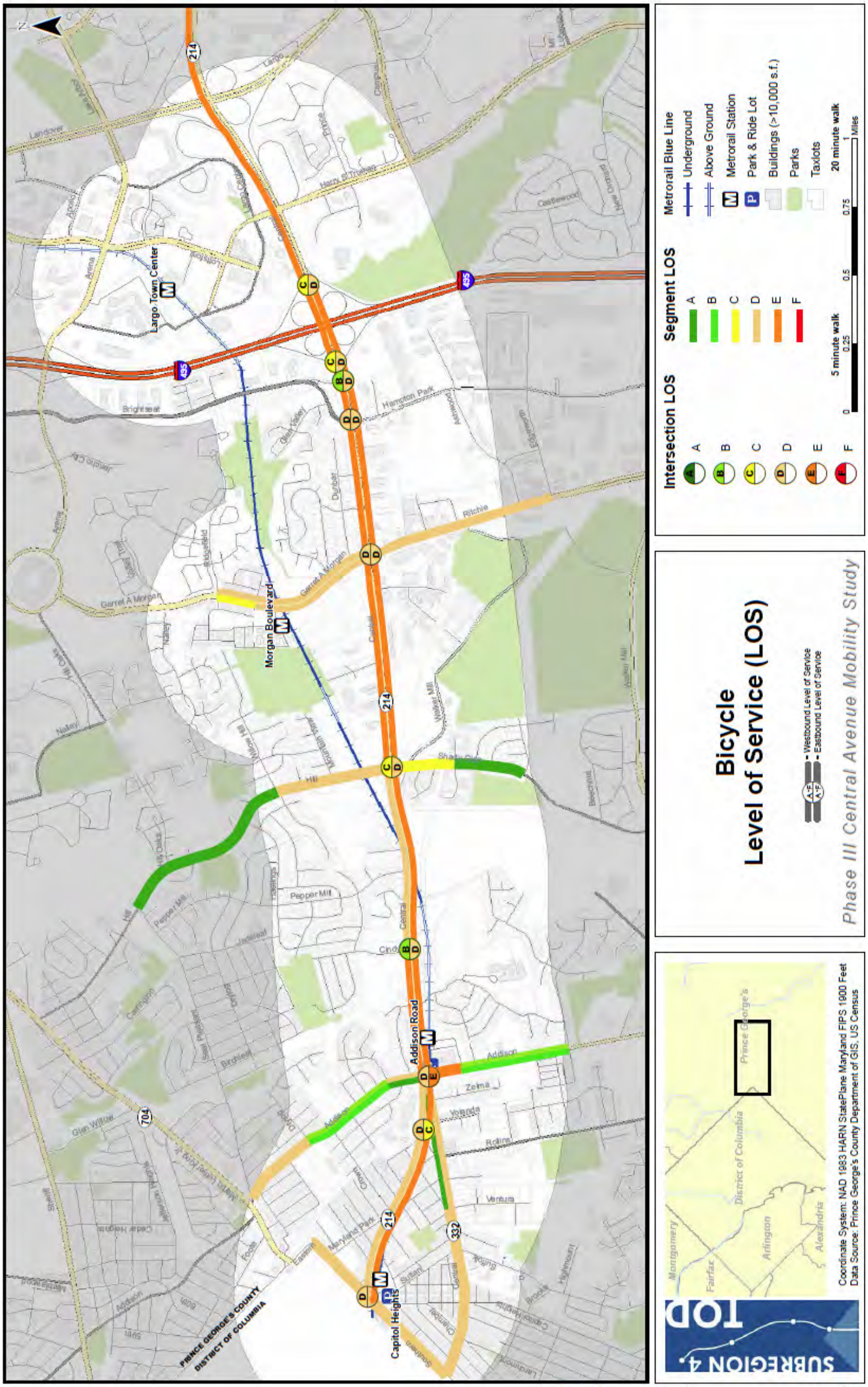
BICYCLE FACILITIES

Figure 10 shows the locations of planned bicycle facilities identified in the Prince George's County 2010 Bicycle Master Plan. Bike lanes and bike routes are not provided along the corridor. The challenges of limited bicycle facilities, lack of connectivity, high traffic speeds and volumes, and an unsupportive land use pattern result in low bicycle volumes in the study area. Substantial amounts of bicycle parking at Metro stations is left unused due to these challenges.

Figure 12 shows the results of the bicycle level of service (LOS) analysis that was conducted as part of the existing conditions analysis. Bicycle LOS is based on factors such as outside lane width, shoulder or bike lane width, traffic volume, speed, and the crossing distance at signalized intersections. Only advanced bicyclists currently travel on Central Avenue due to high traffic volumes, speed, and a lack of roadway space. Adding bike lanes may attract additional cyclists. Parallel routes to Central Avenue are also lacking, indicating that connectivity may be improved for short trips within the study area.

Improving bicycle connections to transit and providing bike racks on buses can make it easier for passengers to access stations and increse the effective service area of stations.

Figure 12. Bicycle Level of Service



TRANSIT SERVICE AND ACCESS

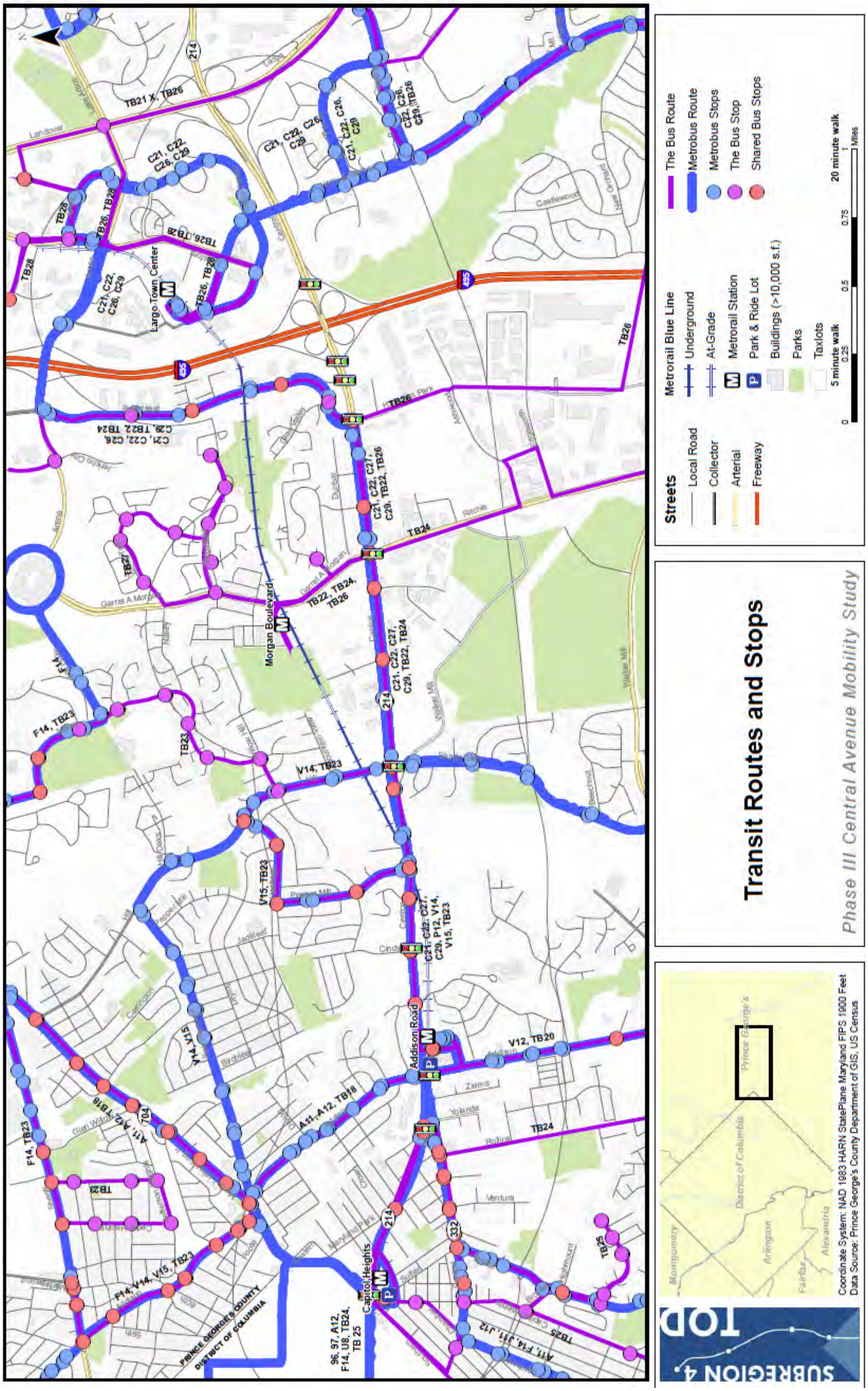
Figure 13 shows existing transit facilities in the study area. Transit services available in the study area include the Metrorail Blue Line and 16 bus transit lines operated by Metrobus and TheBus. Daily ridership ranges from 1,500 to 5,600 on each line. The transit system includes express bus routes and routes that offer service 24 hours a day on weekdays. Weekend service is available on some bus routes and the Metrorail Blue Line. Metrobus and TheBus routes travel along most of the arterial and collector roadways in the study area, with stops within a five-minute walk of the majority of residents and workers in the study area. Most of Central Avenue (MD 214) is served by three to four bus routes.

Transit LOS was calculated for arterial and collector roadways and signalized intersections served by Metrobus and/ or TheBus routes. The results of the transit LOS analysis are shown in Figure 14. Deficiencies include infrequent bus service, poor on-time performance, lack of shelters, and segments without any bus stops. Additional challenges include: bus stops located far from marked pedestrian crossings, transit stops that do not connect to surrounding areas by pedestrian facilities, unlit bus stops, and indirect routes.

Small improvements to existing facilities can potentially increase ridership and improve the user's transit experience. Stops with potential to generate high ridership that should be prioritized for improvements include:

- Capitol Heights, Addison Road, Morgan Boulevard and Largo Town Center Metrorail stations
- Bus stops near the Central Avenue (MD 214)/Addison Road intersection
- Bus stops near Kingdom Square (Southwest of the I-495 interchange) and Largo Town Center

Figure 13. Existing Transit Facilities



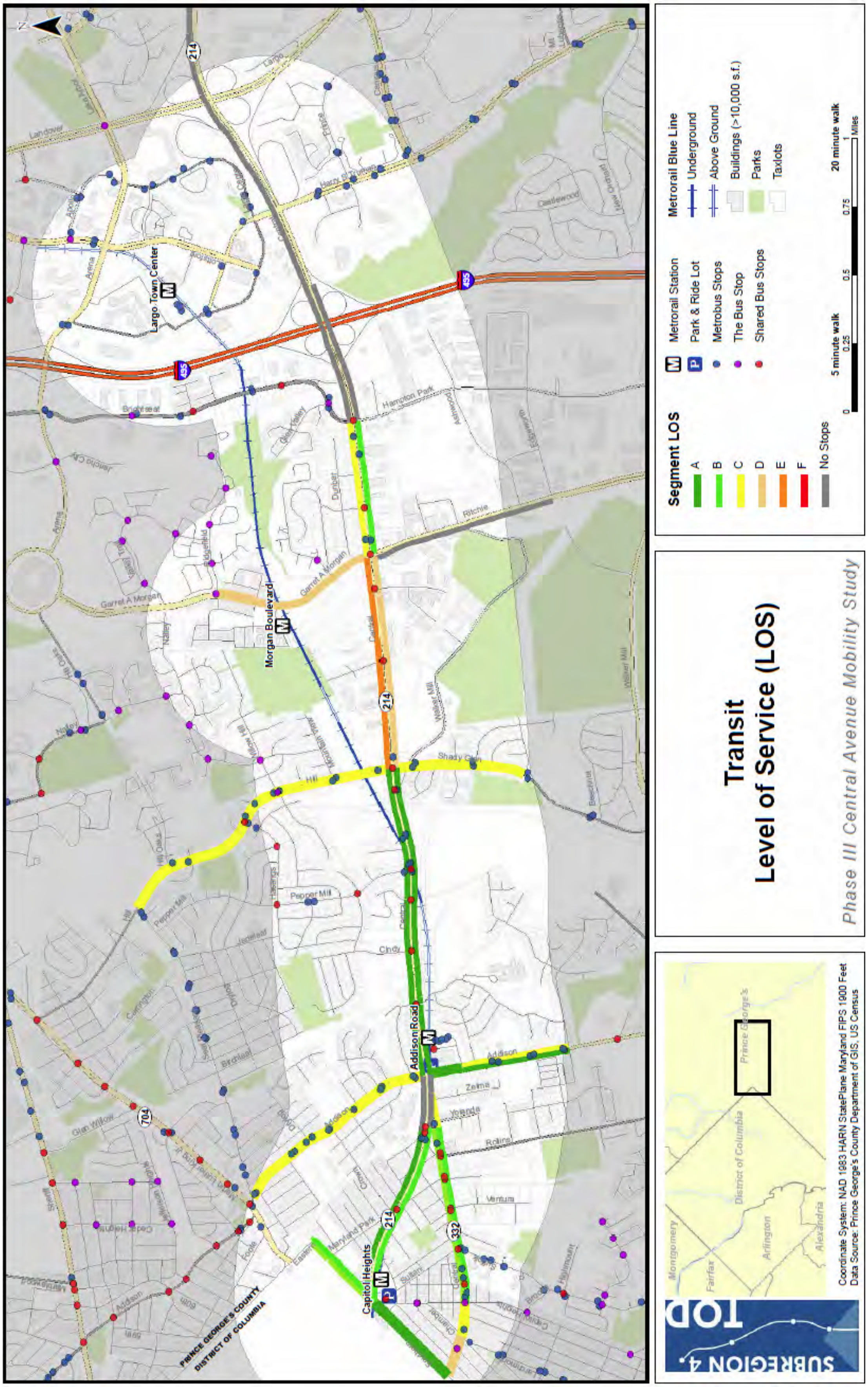


Figure 14. Transit Level of Service

TRAFFIC OPERATIONS

Figure 15 shows the functional classification of streets within the study area. Design guidance for each classification is contained in DPW&T's Specifications and Standards for Roadways and Bridges and evaluated in the "Design and Policy Review" section of this report.

As part of the existing conditions assessment, a link-level operational analysis was conducted for Central Avenue and other arterial and collector roadways in the study area[4]. The LOS segment analysis can be used to broadly evaluate the performance of the road network and help identify areas that may need improvement. Central Avenue segments, as well as cross streets on the north and south sides of Central Avenue, were analyzed for peak hour traffic delay. Figure 16 shows the LOS of key intersections and roadway segments within the study area.

A **Link-Level Operational Analysis** determines if roadways and signals provide acceptable moving levels of service during a specific period of time.

Central Avenue

Central Avenue (MD 214) is a seven-lane arterial with a landscaped median within the study area. Access to properties on the north and south side is generally restricted to right-in, right-out movements. The speed limit along Central Avenue is 30 mph between Southern Avenue and Pepper Mill Road and 40 mph east of Pepper Mill Road; however, the roadway is designed for speeds greater than those posted. The Subregion 4 TOD Implementation Project Phase II: Alternative Concepts Technical Memorandum showed that all signalized intersections on Central Avenue currently meet SHA and M-NCPPC performance standards and operate at LOS D or higher during the morning and afternoon peak periods.

For the majority of the corridor during the morning peak hour, the LOS segment methodology shows that the corridor operates at LOS C. Directional flows in the afternoon peak hour are more balanced than during the morning peak hour. Similar to the morning peak hour, during the afternoon peak the majority of segments between signalized intersections operate at LOS C. The segment near the ramp terminals performs at LOS F.

LOS is a measure used by traffic engineers to determine the traffic flow of a roadway. Level D indicates that the road is at capacity, it is highly congested, and drivers have limited freedom to maneuver.

4 A complete explanation of segment LOS may be found in the 2010 HCM in Chapter 16. The assumptions used in the analysis are detailed on page 16-26. The summary table that was used to determine the peak hour segment LOS is Exhibit 16-14 on page 16-27.The Central Avenue study area meets most of the 2010 Highway Capacity Manual (HCM) assumptions necessary to generate daily service volumes, with the exception of cycle length, weighted g/C ratio, and percent of traffic during left/right onto cross streets. It is estimated that the missing assumptions cause little effect on the overall results. The LOS segment analysis may be expected to slightly overestimate the operational performance of Central Avenue (MD 214).

Figure 15. Street Classification

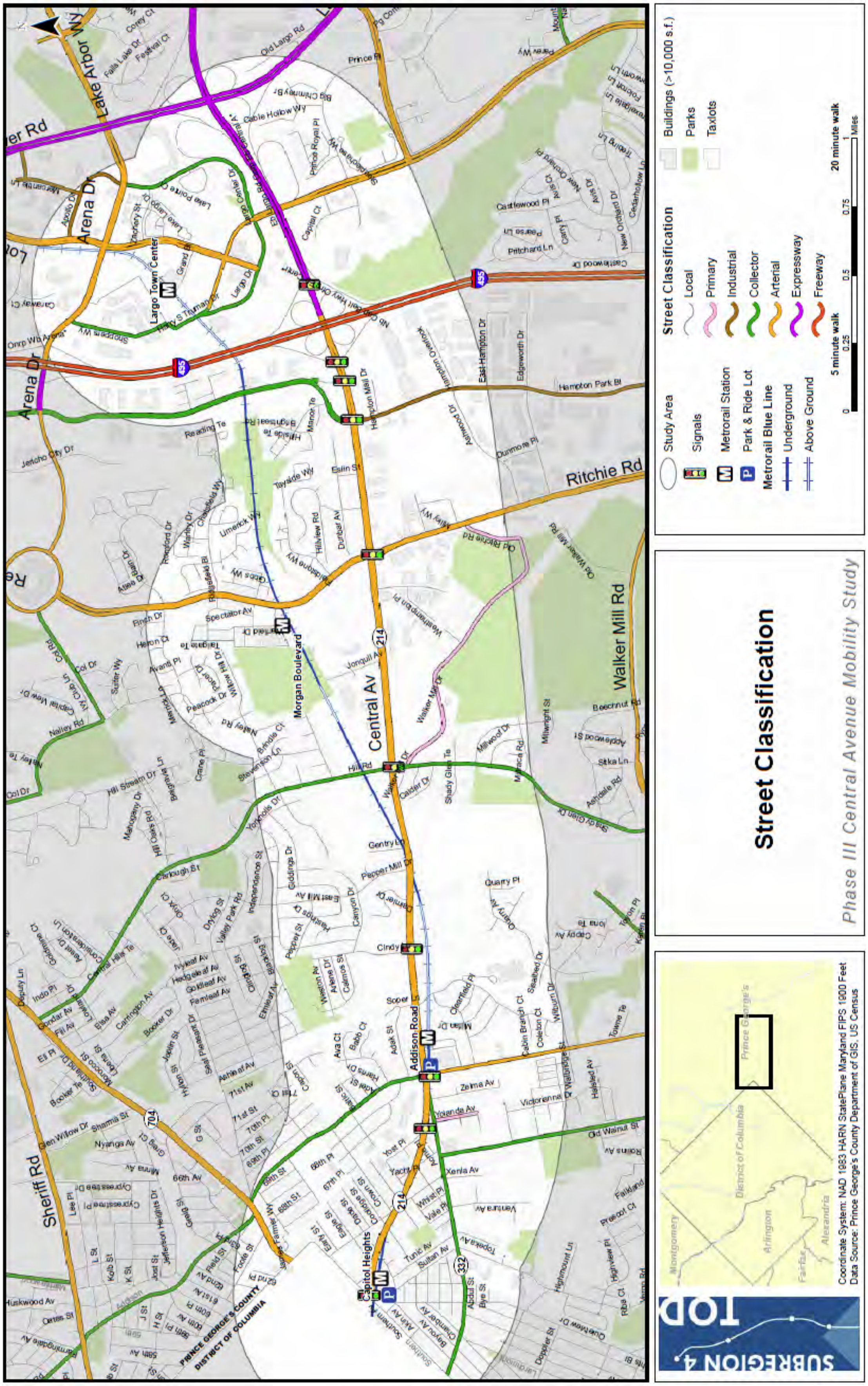
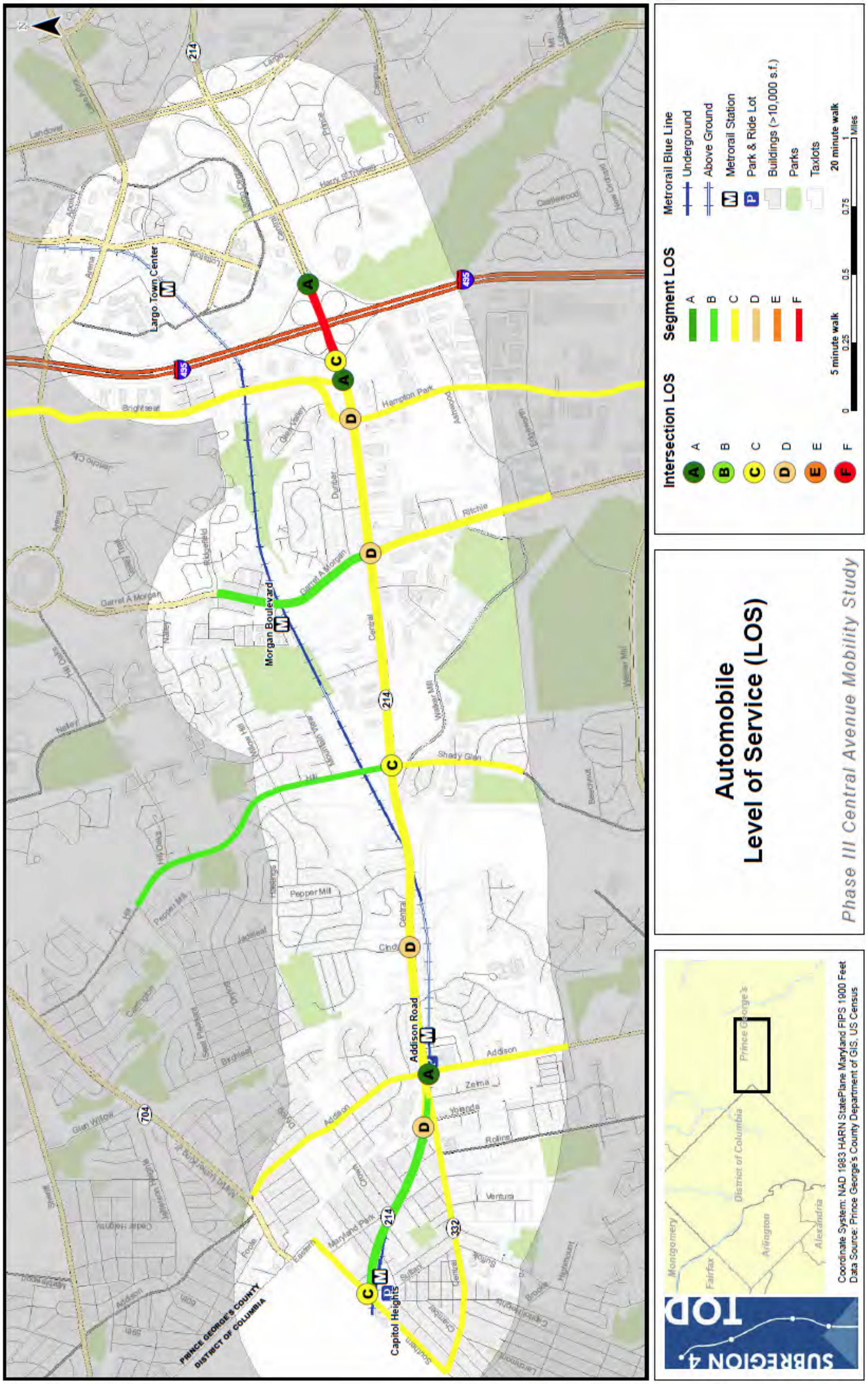


Figure 16. Intersection Operations and Link Level of Service



Cross Streets

Six major side streets cross Central Avenue in the project corridor. The cross streets range in cross-section from two to six lanes, and have speed limits between 30 and 35 miles per hour. For both the morning and afternoon peak hours, the segment LOS for the northbound and southbound intersecting street approaches ranges from LOS B to C. The directional factor for the side streets, which generally falls within a range of between 55 and 60 percent of total volume, means that side street volumes are more evenly distributed than traffic on Central Avenue.

Safety Analysis

The existing conditions analysis included a review of crash histories at study intersections along Central Avenue (MD 214) to identify crash-reduction opportunities. MDOT provided crash data for the study intersections from January 2008 through December 2010.

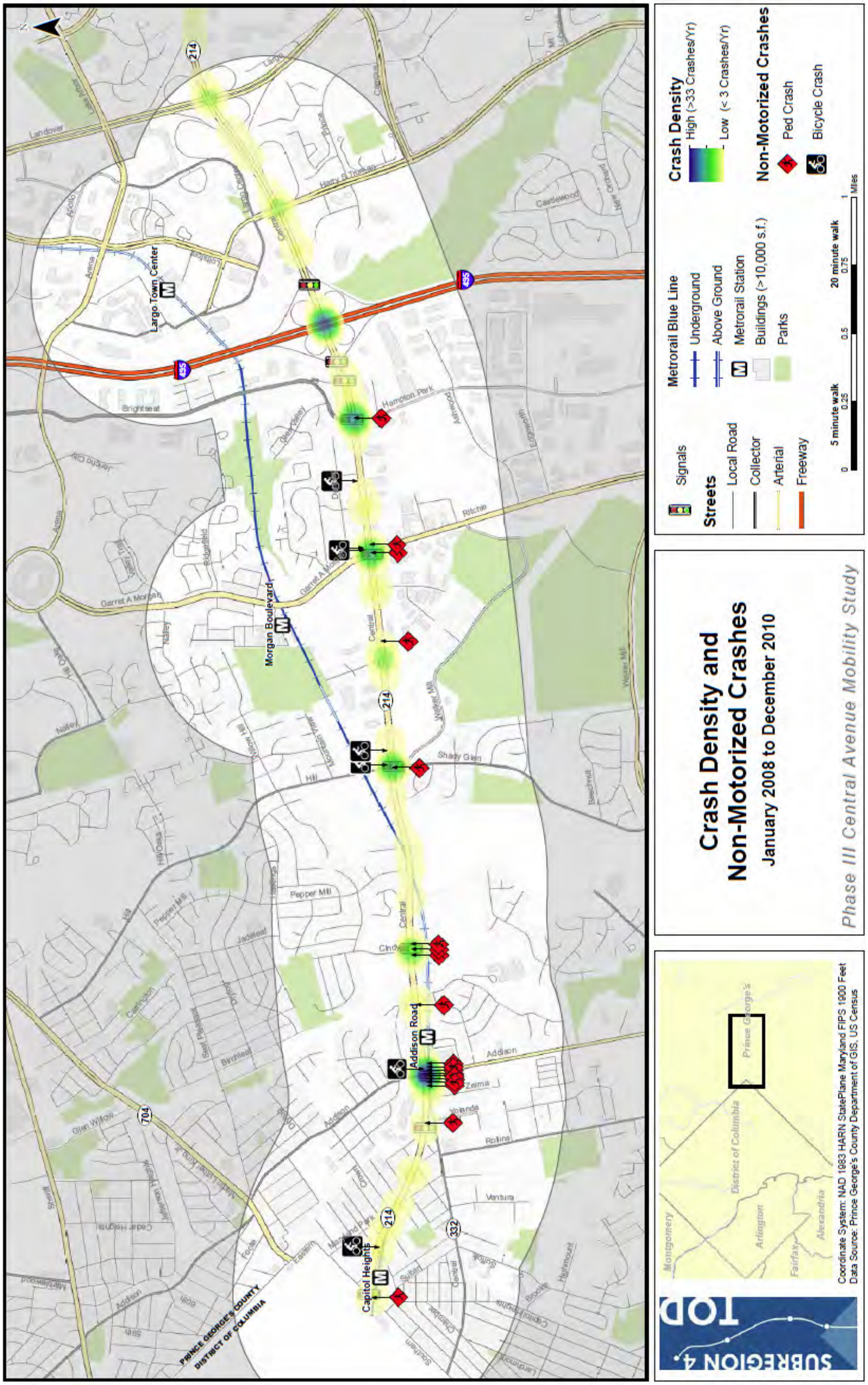
DESCRIPTIVE CRASH STATISTICS

Crashes were examined based on crash type, direction, severity, weather, roadway condition, lighting, time of day, day of week, and year. Figure 17 shows crash density along Central Avenue and identifies pedestrian and bicycle crash locations. The area along the corridor with the highest frequency of crashes for the reporting period was the Addison Road/Central Avenue intersection with 98 reported crashes, followed by the roadway segment between the I-95 on/off ramps with 77 reported crashes. There were three other intersections with more than 40 reported crashes: Hampton Park Boulevard/Central Avenue Intersection (60 crashes); Shady Glen Drive/Central Avenue Intersection (57 crashes); and Ritchie Highway/Central Avenue Intersection (46 crashes). The remaining intersections experienced 20 or fewer total reported crashes. Crash data characteristics for the five study areas with the highest frequency of crashes and information regarding the fatal crashes reported are discussed below.

Addison Road/Central Avenue

The Addison Road/Central Avenue intersection had the highest frequency of total reported crashes. There were 31 reported rear-end crashes, 21 reported head-on crashes, two reported fatal crashes, and nine reported pedestrian/bicycle crashes. The majority of the crashes occurred during night hours. Protected left-turn signal phasing and modifications to increase the level of lighting at the intersection may help reduce crashes.

Figure 17. Crash Densities Along Central Avenue



Roadway Segment between I-95 On/Off Ramps

A total of 77 crashes were reported for the roadway segment between the I-95 On/Off Ramps. There were 30 reported rear-end crashes and 20 reported fixed-object crashes. These crashes are likely related to the weaving section on Central Avenue (MD 214) between the I-95 On/Off Ramps. Modifying the lane numbers and arrangements within the section may help mitigate crashes. The percentage of injury crashes on this roadway segment was 57 percent; no fatal crashes were reported.

Hampton Park Boulevard/Central Avenue

The Hampton Park Boulevard/Central Avenue intersection recorded 60 crashes. There were no reported fatal crashes, 40 reported crashes were property damage-only crashes, 19 reported rear-end crashes, and 11 reported side-swipe crashes. The majority of crashes occurred in the eastbound direction, likely due to the right-turn only lane in the eastbound direction and five nearby driveways. Modifying lane configurations and consolidating access points may help mitigate crashes.

Shady Glen Drive/Central Avenue

The Shady Glen Drive/Central Avenue intersection experienced 57 reported crashes. The reported crashes have the following distribution: 19 rear-end, 13 head-on, and 11 angle crashes. Approximately 44 percent of the reported crashes occurred during night hours. Increasing the level of lighting may help mitigate crashes. Two fatal crashes were reported. The fatal crashes appear to be random events not indicative of a trend or pattern at the intersection.

Ritchie Highway/Central Avenue

The Ritchie Highway/Central Avenue study intersection experienced 46 reported crashes, including 18 injury crashes and one fatal crash. There were 27 reported rear-end crashes. The rear-end crashes at the intersection tended to occur in the eastbound direction, which may be related to the driveways located within the last 350 feet approaching the intersection. Consolidating these driveways may help reduce crashes. There was one reported fatal crash: a pedestrian was struck at night. Increasing lighting may help reduce crashes.

Fatal Crashes at Other Study Intersections

There were two reported fatal crashes at Maryland Park Drive. One was the result of a head-on collision and the other was a fixed-object crash. Both occurred at night. One reported fatal crash occurred at Cabin Branch Road as the result of a truck hitting a pedestrian at night. Another fatal crash occurred at West Hampton Drive as the result of two eastbound vehicles colliding.

CONTRIBUTING AND MITIGATION FACTORS

KAI analyzed the contributing factors coded in the crash data for each study intersection. Approximately 40 percent of the crashes had contributing factors related to failure to pay attention. Other prevalent contributing factors were speeding and failure to obey traffic signals. Potential mitigation factors include: increased lighting, pedestrian signals, signal-phasing changes such as protected left turns or leading pedestrian intervals, providing a right-turn lane on major approaches, increased enforcement, and installing medians on multi-lane roads.

Existing Conditions Conclusions and Recommendations

LAND USE AND URBAN FORM

Land use patterns indicate that development is currently clustered and organized in single-use patterns. Central Avenue is characterized by low-density suburban development, fostering a transportation network with low connectivity. This forces trips onto Central Avenue (MD 214) and limits the catchment area of Metrorail stations for pedestrians. It is difficult to use any mode other than a motor vehicle for local trips.

Mixed-use development zoning and land use should be encouraged. Opportunities for multimodal connections include: Central Avenue and Hill Road/Shady Glen Avenue, Central Avenue and Jonquil Avenue, Central Avenue and Brightseat Road/Hampton Park Boulevard, Harry S. Truman Drive and the Largo Town Center, trail connections at the Central Avenue/Morgan Boulevard Metrorail station, east-west trail connections to Metro stations, and trail connections to Metro stations from neighborhoods. Proposed land use policy and zoning changes are discussed in the “Design and Policy Review” section of this report. A map of all recommended network/connectivity improvements is included in the “Complete Streets Strategies” section of this report.

PEDESTRIAN FACILITIES

The analysis of the pedestrian facilities identified areas where LOS is deficient and pedestrians mobility is challenged due to roadway segment and intersection design and poor network connectivity. Low-performing intersections and roadway segments had an LOS C or lower. Segment deficiencies include: lack of adequate sidewalks, the freeway nature of the roadway, few crossing opportunities, lack of buffers between the traffic and pedestrians on Central Avenue (MD 214), and the poor connectivity of the street network. Intersection deficiencies include: pedestrian delay at unsignalized intersections, wide crossing distance, channelized right turns and freeway ramps, low light, and high traffic volumes and speeds.

Opportunities to address pedestrian challenges and improve level of service in the study area are evaluated in the “Complete Streets Strategies” and “Future Conditions” sections of this report. Specific recommendations include:

- Install a pedestrian hybrid beacon at the Addison Road Metro crossing.
- Improve signal timing on Central Avenue to reduce pedestrian delay. Cycle lengths should be reduced to 120 seconds with adequate pedestrian clearance time.
- Reduce cross-section widths and create buffers between traffic and sidewalks.

Additional opportunities include installing: full or pedestrian traffic signals with marked crosswalks, hybrid pedestrian beacons, rectangular rapid-flashing beacons, signage, signal modifications (e.g., protected left turns), and/or removing travel lanes to narrow crosswalk distances.

BICYCLE FACILITIES

The only bicycle accommodation in the study area is the bicycle parking at the Metrorail stations. Dedicated road space is not provided on any of the study area streets and parallel alternatives to Central Avenue (MD 214) that could provide low-volume/speed routes for cyclists is unavailable. Priority roadways for bicycle facility improvements include segments along Central Avenue (MD 214) and Garret A. Morgan Boulevard/Ritchie Road with LOS D or E. In these areas bike lanes or shoulder bikeways could improve bicycle LOS, rider comfort, and encourage biking for the more experienced bicyclist. Priority intersections for bicycle improvements include Central Avenue/Addison Road, Central Avenue/Garrett Morgan Boulevard, and Central Avenue/Hampton Park Boulevard where wide intersections leave cyclists vulnerable as it takes longer to cross the intersection.

Potential opportunities for improved bicycle mobility, attractive to a broader range of skill-levels, are evaluated in the “Complete Streets Strategies” and “Future Conditions” section of this report. They include reallocating road space for bicycle facilities and creating parallel routes as bicycle-friendly alternatives to Central Avenue.

TRANSIT

Transit challenges include bus routes with unreliable and infrequent service. Several streets experience poor on-time performance and service gaps exist on Central Avenue from Old Central Avenue to Addison Road and from Hampton Park Road to east of I-495. The lack of bus services here creates a transit divide between the east and west side of I-495.

Opportunities to improve transit accessibility and LOS are evaluated in the “Complete Streets Strategies” and “Future Conditions” sections of this report. Options include:

- Relocating bus stops closer to pedestrian crossings and increasing the number of stops to 4 or 5 per mile.
- Widening sidewalks near bus stops, removing obstructions near waiting areas, installing shelters, and adding or improving lighting.
- Redesigning long and circuitous bus routes into shorter, simpler ones. This can create a transit system that achieves redundancy, efficiency and routes that run parallel to each other and cover a larger area more effectively.
- Converting stations to intermodal hubs where people can transfer from rail to bus, expanding potential ridership to people that live or work near bus stops.
- Improving facilities near the Central Avenue (MD 214)/Addison Road intersection to make them more visible and more attractive to new riders.
- Creating a “transit-oriented” atmosphere in the shopping center near Kingdom Square and the Largo Town Center to make taking transit more attractive for nearby residents who would otherwise drive.

TRAFFIC

During both the morning and afternoon peak hours, all segments of Central Avenue perform at LOS C, except for the area near the I-495 ramp terminals, which performs at LOS F.[5] The six major signalized cross streets with Central Avenue operate at LOS B or LOS C. The corridor is auto-oriented, and motorized vehicles have the highest overall LOS of any of the modes for the corridor.

Opportunities to improve roadway design and connectivity are evaluated in the "Complete Streets Strategies" and "Future Conditions" sections of this report. Options include:

- Implementing parallel routes to Central Avenue (MD 214).
- Reallocating road space to accommodate active modes.
- Implementing protected left turns, improved signal phasing, and 120-second cycle lengths.
- Applying access-management strategies along Central Avenue (MD 214).

SAFETY

The priority areas for safety improvements are:

1. The Addison Road/Central Avenue intersection
2. The segment of Central Avenue between I-95 on/off ramps
3. The Hampton Park Boulevard/Central Avenue intersection
4. The Shady Glen Drive/Central Avenue intersection
5. The Ritchie Highway/Central Avenue intersection

The most prevalent contributing factor was "Failure to Give Full Attention" followed by speeding and failure to obey a traffic signal.

Potential safety mitigations include:

- Implementing protected left-turn signal phasing on Central Avenue (MD 214)
- Improvements at and on approaches to intersections
- Adjusting clearance times
- Making intersections more comfortable to pedestrians
- Installing pedestrian countdown signals
- Providing leading pedestrian interval (LPI)
- Improving weaving distance between I-95 on/off ramps

5 The eight-lane sections of Central Avenue near the I-495 interchange lie outside the HCM methodology for determining segment LOS.

Section 5
Design and Policy Review

DESIGN AND POLICY REVIEW

As part of the analysis conducted for the Central Avenue Transit-Oriented Development Implementation Project, the consultant team worked with community members, local agencies, and stakeholders to identify transportation issues and values, as well as obstacles to achieving transit-oriented development in the study area. The team also reviewed existing state and county transportation practices, policies, and guidelines to identify potential gaps or inconsistencies in supporting active transportation, transit, and complete Streets. Through this review, several key issues related to achieving transit-oriented development and complete streets were identified, including:

- Multiple zoning classifications and plans provide alternate design guidance for TOD areas without clear implementation guidance or consistent enforcement
- Needed refinements to the county's Complete Streets policy
- Challenges associated with adequate public facilities requirements
- Street design guidelines that limit or discourage network connectivity
- Excessive minimum parking requirements
- Lack of a mid-block crossing policy
- Capital and maintenance funding for sidewalks and lighting

This section presents a discussion of these key issues and offers suggested policy revisions or new approaches based on peer examples identified through a review of best practices. A summary of the policy review and case studies illustrating best practices to incorporate Complete Streets principles into development review and project development is presented in Appendix 2.

Transit-Oriented Development Zones

TRANSIT DISTRICT AND DEVELOPMENT DISTRICT OVERLAY ZONES

As shown in Figure 18, the Capitol Heights Metro Station area is designated as a Transit District Overlay Zone (TDOZ), while Addison Road, Morgan Boulevard, and Largo Town Center areas are designated Development District Overlay Zones (DDOZs). These overlays precede approval of the 2002 *Prince George's County Approved General Plan* and were intended to give direction to landowners and the county during the development review process and establish policies and standards to support mixed-use, pedestrian-friendly, transit-oriented neighborhoods. Both overlay zones were design-oriented, placing a great deal of emphasis on architectural detailing. However, administration of these overlays was difficult due to their complexity, and their application was inconsistent occasionally contradicting both the General Plan and applicable master plan and sector plan recommendations for land use centers and corridors.

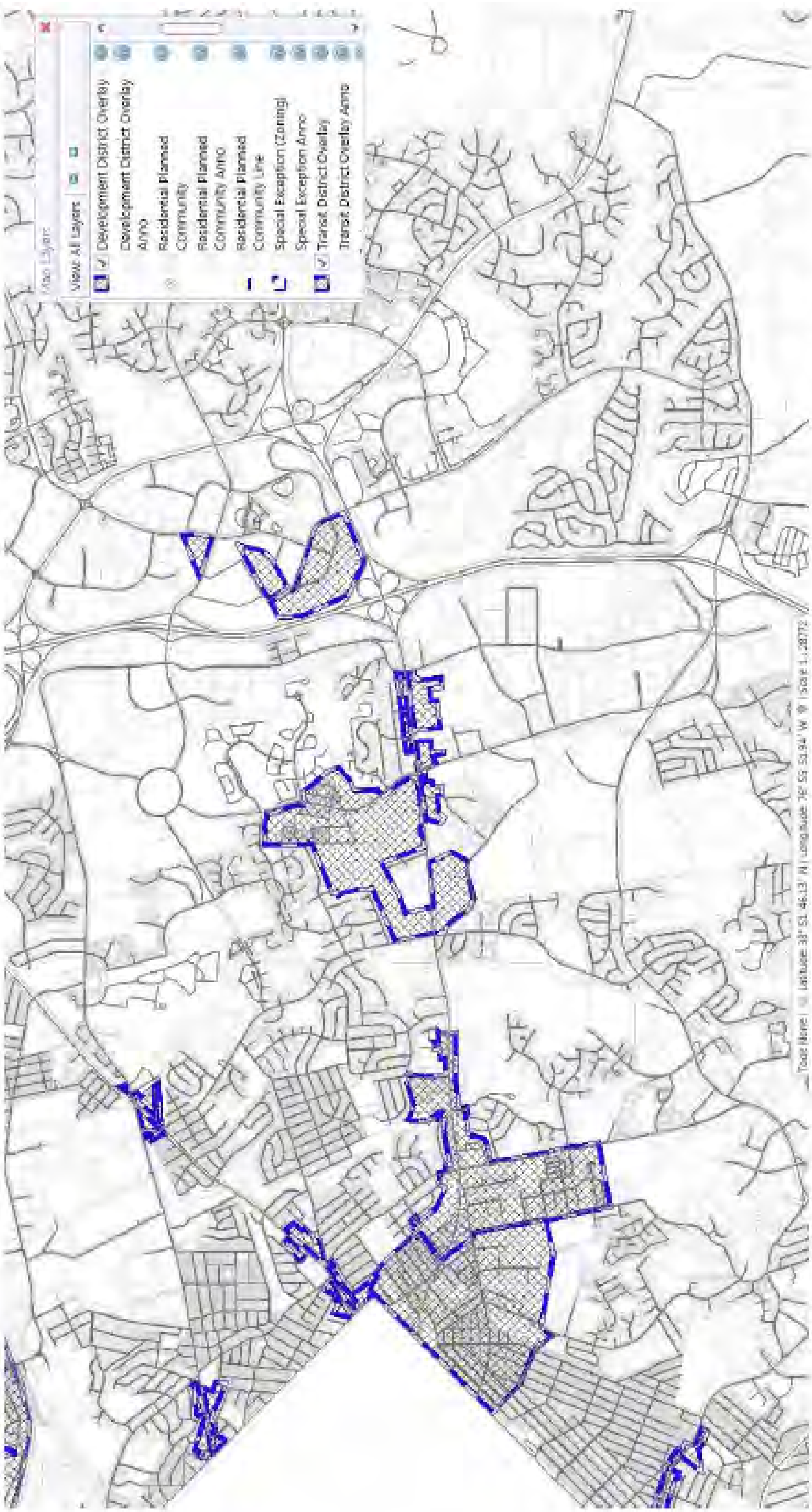
As shown in Figure 19, the 2002 *Prince George's County Approved General Plan* designates Central Avenue as a "Corridor," the Capitol Heights and Addison Road Metro stations as "Community Centers," the Morgan Boulevard Metro Station as a "Regional Center," and the Largo Town Center Metro Station as a "Metropolitan Center." Similar to TDOZs and DDOZs, centers and corridors are designated to promote more intense development and mixed uses. Table 2 shows the target development intensities within different center types. The General Plan does not define the extent of each center's core or edge, so the core is generally assumed to be the area within ¼ mile of the Metro station, while the edge is assumed to be the area ¼ to ½ mile from the station.

TABLE 2. DEVELOPMENT INTENSITY TARGETS IN CENTERS

Land Use		Metropolitan Center		Regional Center		Community Center	
		Core	Edge	Core	Edge	Core	Edge
Residential Density	Min. (DU/acre)	30	20	24	8	15	4
	Max. (DU/acre)	N/A	40	N/A	30	30	20
Nonresidential Intensity	Min. (FAR)	2.0	0.5	1.0	0.5	0.25	0.15
	Max. (FAR)	N/A	1.5	N/A	1.5	1.0	0.30
Employment Density	Employee/acre	100	N/A	50	N/A	25	N/A

Subtitle 27A: Urban Centers and Corridor Nodes Development Code of the Prince George's County Code was adopted in 2010. The Subtitle specifies development review and approval procedures and design regulations that implement the recommendations of the 2002 General Plan and ensure future transit-oriented, pedestrian-friendly, mixed-use development in selected centers and corridor nodes. This process includes development of regulating plans and functional overlays that identify the design and placement of buildings, public spaces, and streets within each center or node.

Figure 18. Transit and Development District Overlay Zones



Development District and Transit District Overlays (Source: PGAtlas.com)

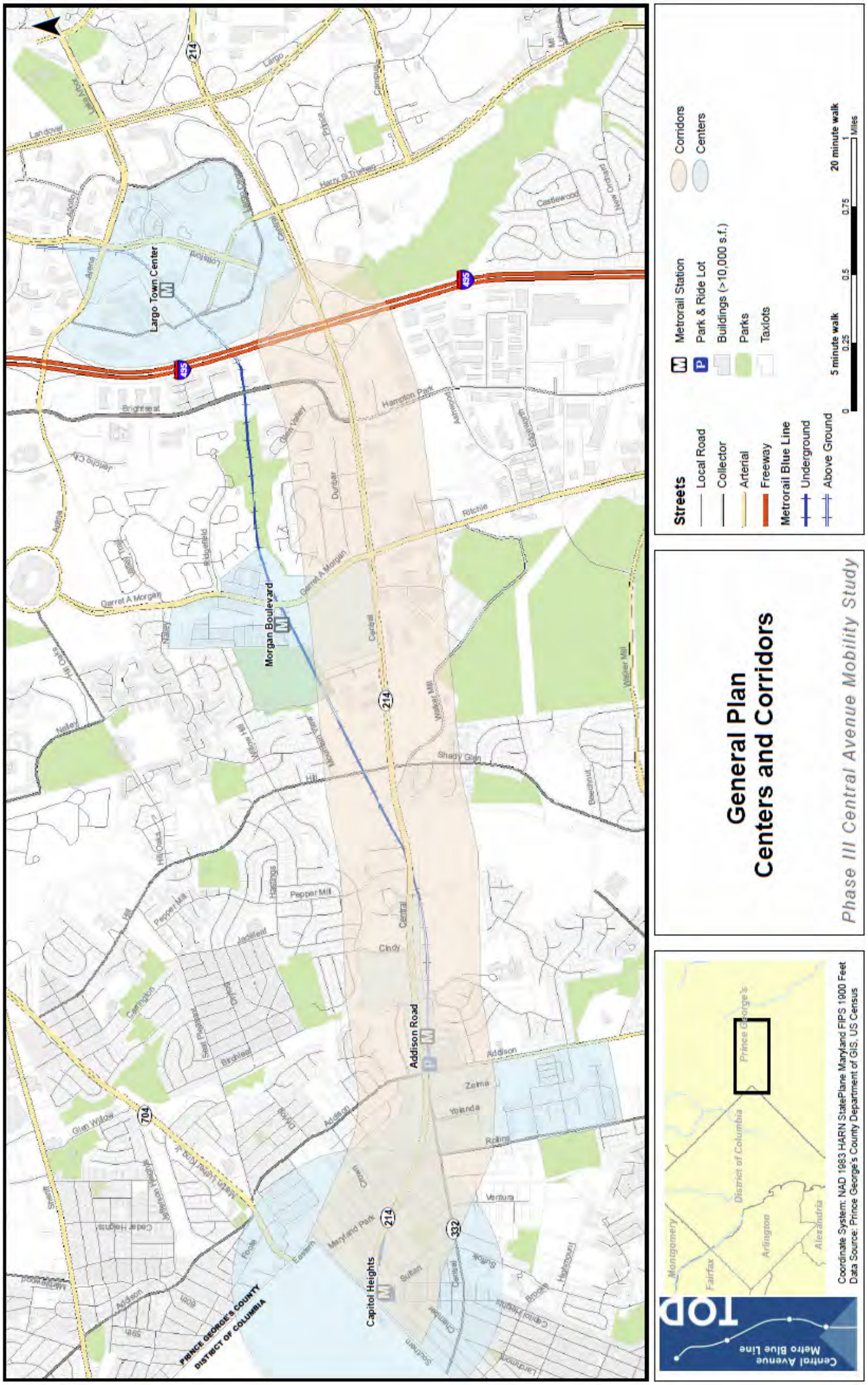


Figure 19. Centers and Corridors

Complete Streets Policies

The *Approved Countywide Master Plan of Transportation* (MPOT) identifies ten complete street principles for the county (originally developed as part of the pedestrian plan for the Prince George's Plaza Transit District) and seven Complete Streets policies, one of which is to "work with the State Highway Administration and the Prince George's County Department of Public Works and Transportation to develop a Complete Streets policy."

These principles and policies provide a starting point for a future formalized, countywide Complete Streets policy that can be developed from a policy template approved on May 16, 2012, by the National Capital Region Transportation Planning Board (TPB). The Complete Streets Policy for the National Capital Region encourages TPB member jurisdictions and agencies to adopt a Complete Streets policy that includes common elements that the TPB believes represent current best practices. The TPB defines a Complete Streets policy as a directive "that ensures the safe and adequate accommodation, in all phases of project planning, development, and operations, of all users of the transportation network, including pedestrians and transit riders of all ages and abilities, bicyclists, individuals with disabilities, motorists, freight vehicles, and emergency vehicles, in a manner appropriate to the function and context of the facility." The TPB policy includes a template for local Complete Streets policies and recommends jurisdictions follow the "ten elements of an ideal Complete Streets policy" endorsed by the National Complete Streets Coalition when developing local policies. (These ten principles differ from the principles identified in the MPOT.)

Table 3 lists the "Elements of an Ideal Complete Streets Policy" identified in the TPB approved policy and those elements currently addressed in the MPOT and where additional analysis is needed. Elements of an ideal Complete Streets policy that are not addressed in MPOT are discussed in more detail below.

Table 3. Evaluation of Complete Streets Policy Elements

TPB Recommended Policy Element	Addressed in MPOT Principles & Policy?
Includes a vision for how and why the community wants to complete its streets.	Yes
Specifies that "all users" includes pedestrians, bicyclists, and transit passengers of all ages and abilities as well as trucks, buses, and automobiles.	Yes
Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes.	Yes
Is adoptable by all agencies to cover all roads.	Yes
Applies to both new and retrofit projects, including design, planning, maintenance, and operations for the entire right-of-way.	Yes – new and retrofit No – project phases
Makes any exceptions specific and sets a clear procedure that requires high-level of approval of exceptions.	No
Directs the use of the latest and best design standards while recognizing the need for flexibility in balancing user needs.	Yes
Directs that Complete Streets solutions will complement the context of the community.	Yes
Establishes performance standards with measurable outcomes.	No
Includes specific next steps for implementation of policy, such as: • revising agency procedures and regulations to reflect policy • developing or adopting new design guidelines • offering training for staff responsible for implementing the policy • gathering data on how well streets are serving user groups	No

APPLICATION AND EXCEPTIONS

For Complete Street design principles to be enforced, Complete Streets policies should clearly state what types and phases of projects the policy applies to (e.g., new development, retrofit projects, design, operations, and maintenance) and a procedure for approving exceptions. Section 24-128.01 of the county Code specifies that new and redevelopment projects must comply with the county's Adequate Public Facilities Requirements (discussed below) for pedestrian, bicycle, and motor vehicle facilities. County policy does not yet address how Complete Streets principles should be applied to maintenance or operations.

The TPB Complete Streets policy template includes a draft list of inclusions and project-specific exemptions. DPW&T and other County staff should refine these lists as needed, identify a standard procedure for approving exemptions (e.g., senior manager review and approval), and incorporate this language into a revised, stand-alone Complete Streets policy. The Complete Streets project review checklists included in the "Complete Streets Strategies" section of this report present a recommended, easy-to-use standard procedure for evaluating project compliance with and/or exemption from Complete Streets requirements.

PERFORMANCE MEASUREMENT AND IMPLEMENTATION

Performance standards should be established to measure the impacts of Complete Streets and specific next steps should be identified to implement the policy. Common measures used to evaluate the success of transit- oriented development and the contribution of individual developments towards Complete Streets goals include:

- Mode split and volumes by mode
- Safety (e.g., crashes, fatalities, and injuries by mode)
- Level of service/comfort (e.g., pedestrian, bicycle, vehicle, and transit level of service)
- Accessibility (e.g., percent of residents/employees within ¼ mile of a Metro station and/or bikeway, number of destinations accessible within a ½ mile walk)
- Connectivity (e.g., average block length, percent of signalized intersections with marked crosswalks on all approaches, percent of intersections that are cul-de-sacs)

Many of these measures would require additional data-collection efforts to be evaluated consistently and to facilitate before and after evaluations. Accessibility and connectivity are recommended preliminary measures because they can be easily estimated using available GIS and census data. The county's Adequate Pedestrian and Bikeway Facilities Requirements (discussed below) also require the county to adopt a multimodal level-of-service measure. The multimodal level of service analysis presented in the "Existing Conditions" section of this report was developed using the 2010 Highway Capacity Manual MMLOS methodology and can serve as a baseline for future evaluations.

County staff, including DPW&T, Parks and Recreation, Board of Education, and DER, should be consulted to refine measures and methodologies and incorporate this language into a revised, stand-alone Complete Streets policy. The Complete Streets project review checklists included in the "Complete Streets Strategies" section of this report present draft recommended measures for evaluating development compliance, transit-oriented development, and Complete Streets requirements.

Adequate Public Facilities Requirements

The Adequate Public Facility Requirements (APFRs) in the Prince George's County Code are intended to ensure that developers and property owners contribute to the cost of providing new services and facilities needed as a result of new development, thereby preventing these costs from being borne by existing taxpayers. APFRs in the county currently require an intersection- or link-based study of auto capacity to determine the adequacy of transportation facilities. Existing APFRs in the county specify a minimum auto level of service (LOS) and volume to capacity (v/c) ratio standard for all study intersection and roadway links. In the study area, which is in the Developed Tier, these standards are LOS E and v/c = 1.0.

The APFRs have historically focused on auto travel and had unintended consequences, including limiting infill development in targeted growth areas, focusing transportation improvements on serving single- occupancy vehicles, and spurring development at the fringes of urbanizing areas where there is available vehicle capacity. For example, in centers where compact, high-density development is desired, once traffic levels exceed the LOS threshold established by the APFR (even if the traffic is regional through traffic not generated by local development/destinations), new development projects cannot move forward unless additional vehicle capacity is provided, which would contradict the goals for designated centers. These conflicts and unintended effects make implementation of high-density, transit-oriented development expensive and difficult within the county.

In June 2010, Kittelson & Associates, Inc. published the Alternative Adequate Public Transportation Facilities Ordinances and Review Procedures Study, which was prepared under a previous contract with M-NCPPC. This study recommended revisions to the APFRs to address these obstacles and enable high-density and transit-oriented development in center and corridors. The study outlines an implementation process for applying revised APFRs to enable transit-oriented development in centers, including:

- A revised site plan review process (see Figure 20).
- Guidance on transportation elements to include in a site plan review checklist and traffic impact study (see Table 4 – these elements have been incorporated into the checklists presented in the "Complete Streets Strategies" section of this report).
- Guidance on Traffic Impact Fee Assessments in centers.

The county has begun to implement some of the recommendations of this study through the update of the Guidelines for the Analysis of the Traffic Impact of Development Proposals, tentatively known as the Transportation Review Guidelines (discussed below).

Figure 20. Proposed Site Plan Review Process for Centers

Pre-Application Meeting & Checklist Review

Developer holds pre-application meeting with the County to review the application requirements and process, provide an overview of the proposed development, and identify likely issues that will need to be addressed.

Trip Generation Letter

Developer prepares a trip generation letter documenting the anticipated new trips to be added to the transportation system.

Propotionate Share Estimate

County identifies projects eligible for developer participation and what the percentage contribution is expected to be. County responds with an estimate of the proportionate fair share contribution that the developer would pay toward transportation adequacy (this could be facilitated by an online "fair share" calculator maintained by the County and accessed from their website)

Site Impact Assessment Report

Developer prepares a site impact assessment report that documents the appropriate and safe siting of driveways; provision of on-site pedestrian, bicycle, and transit facilities and, if required, the specific, previously establlished and adopted transportation demand management program to achieve goals established for the district.

Traffic Impact Assessment (if necessary)

Depending on the size of the proposed development, the developer may also be required to prepare a traffic impact assessment to identify the likely improvements needed (and their cost) to meet adequacy on a constrained corridor and report what percent of all trips on that corridor are from the proposed development.

The County would NOT apply LOS and v/c APFR standards for transportation facilities within a center.

Conditions for Approval

County conditions the developer to make all on-site transportation improvements, pay the proportionate share for districtwide transportation improvements and likely improvements to constrained corridors (if any), and fund or implement the agreed upon TDM program (if required).

Development Application Approval

Upon approval of the development application (or possibly the building permit application), the County collects funds from the developer and places them into the appropriate improvement fund accounts.

Construct/Implement Improvements

County (if the CIP project was placed in the budget) or a local entity such as a TDM district makes improvements to the multimodal transportation system to provide for the mobility, access, and safety needs of the area, as defined for the center or corridor.

Table 4. Elements for Inclusion in Transportation Site Plan Review and Impact Studies

Transportation Element	Description
Parking	• Number of parking spaces and parking ratio • Location and number of carpool, vanpool, and/or car-sharing spaces • Parking management strategies, including pricing and/or time restrictions • Potential shared parking opportunities
Site Access and Street Spacing	• Location of driveways and driveway spacing, including preference for lower hierarchy streets where possible • Pedestrian-friendly driveway design features • Adherence to block length standards for public streets (e.g., maximum block length of 400 feet) • Opportunities for shared access and/or driveway consolidation with adjacent properties • Access routes for all modes, including freight/deliveries
Pedestrian Connectivity	• On-site pedestrian circulation routes • Proximity of building entrances to sidewalks and transit stops • Locate pedestrian generators in close proximity to safe crossings of major streets • Connections to off-site pedestrian generators: schools, parks, libraries, commercial districts
Bicycle Accommodation	• Number of bike parking spaces and proximity of parking to entrances • Availability of long-term bike storage (e.g. lockers) for employees and residents • On-site shower and locker facilities for riders
Transit Connectivity	• Pedestrian and bicycle connections to stops • Proximity of transit stops to building entrances and safe road crossings • Adequate sidewalk space for passenger loading/unloading, waiting, and passing pedestrian traffic • Benches, shelters, or other amenities provided at high volume stops
Trip Characteristics	• Trips generated • Mode split • VMT generated (pending established methodology for calculation) • Trip length (pending established methodology for calculation) • Transportation Demand Management plan

ADEQUATE PUBLIC PEDESTRIAN AND BIKEWAY FACILITIES REQUIREMENT

On April 24, 2012, the Prince George's County Council unanimously passed CB-2-2012, adding Section 24-128.01 Adequate Public Pedestrian and Bikeway Facilities Required in County Centers and Corridors to the Prince George's County Code. This section implements several of the recommendations of the Adequate Public Facilities for Roads (APFR) Review Study and the M-NCPPC Complete Streets policy by revising the APFR to include standards for adequacy of nonmotorized transportation facilities–sidewalks, bikeways, and pathways–in centers and corridors. It also establishes requirements for developers within centers and corridors to construct on- and off-site pedestrian and bikeway facilities and other streetscape improvements as part of any development project.

Successfully implementing the new APFR will also require the following activities:

- Identify appropriate multimodal level of service or level of comfort standards and methodologies to assess design features affecting pedestrians and bicyclists. The following provisions are recommended:
    - Incorporate the recommended transportation elements, identified in Table 4 above, into the development review process and traffic impact study requirements.
    - Identify LOS standards for pedestrian and bicycle facilities that are consistent with General Plan policies for corridors and centers. Alternative adequate facilities standards to LOS should be defined.
    - Adopt the 2010 Highway Capacity Manual's multimodal level of service methodology as the preferred method of evaluating the adequacy of multimodal facilities. It is the most recent version and is consistent with the analysis conducted for the Central Avenue TOD Implementation Study.
    - Refine and incorporate the checklists presented in the "Complete Streets Strategies" section of this report as an easy-to-use implementation tool.
- Adopt amendments and revisions to the Department's General Specifications and Standards for Highway and Street Construction and the Specifications and Standards for Highway Traffic Signals to incorporate appropriate Complete Streets principles. Based on a review of the current standards, the following revisions are recommended:
    - Sidewalks are currently "required on both sides of arterial, collector, and industrial roadways with no exceptions," but the standard is much less rigid for residential streets. Since making it easier for residents to walk from their homes to destinations is a primary goal of transit-oriented development and Complete Streets, sidewalks should be required on both sides of residential streets in centers and corridors.
    - The current general specifications "support design criteria that promote minimum traffic volumes and lowest possible speeds on residential streets" and provide standard design details for multiple traffic calming features. Up-to-date guidance should also be provided for applying the range of techniques to ensure consistent, appropriate application.
    - The current general specifications state that on residential streets a "discontinuous street pattern is also desirable, provided that the maximum travel distance from the furthest residence to the nearest collector road is limited to 0.5 miles and that a motorist need not make more than three turning movements." This language is inconsistent with guidance presented earlier in the guidelines, which states that "where possible, each street should be extended to intersect another street or to be intercepted by other streets… to eliminate any need for a cul-de-sac." The language encouraging discontinuous street patterns should be replaced with a recommendation to maximize connectivity for all users and to create a network that provides alternative routes for different trip types. In areas where extending streets to enhance connectivity is not feasible, pedestrian and bicycle connections should still be made.

- Define how a rational nexus and rough proportionality will be determined for off-site pedestrian and bicycle improvements in order to reduce legal challenges when implementing the APFR. These issues are partially addressed by the limits Section 24-128.01 places on developer/property owner's financial responsibility for off-site improvements (e.g., improvements shall not exceed 5 percent of total development cost). However, the county should develop a methodology for estimating the pedestrian and bicycle "impacts" of developments so that they can ensure the mitigations they request of developers are in "rough proportion" to the stress their development puts on the system. Figure 21 illustrates a recommended process for estimating proportionate share costs of non-motorized system improvements.

Figure 21. Proportionate Share Cost Estimation Process

The process presented in Figure 21 can be conducted for individual modes, or by lumping new trips generated by all modes together. CB-2 mandates that developers pay their share to construct off-site improvements. The cost-cap in CB-2 is designed to ensure that developers are not unreasonably burdened, and the rational nexus will explain the link between the development and the recommended off-site improvements.

Network Connectivity

A major transportation challenge facing the Central Avenue corridor is the suburban nature of the existing roadway network. The area is characterized by cul-de-sac residential neighborhoods, a low-level of connectivity, and a single major arterial that serves the majority of trips in and through the study area. As discussed above, the current county roadway design standards continue to encourage a discontinuous street pattern in residential areas, making transit-oriented development difficult to achieve.

Revising existing policies and design standards to maximize connectivity for all modes supports transit- oriented development in multiple ways:

- Provides alternative routes for local and regional trips, removing traffic from Central Avenue and reducing pressure to continue expanding arterials to meet APFR requirements. Alternative parallel routes to Central

Avenue also provide more attractive, lower speed and volume routes for pedestrians and bicyclists. These routes may encourage a larger number of people to walk and bike who would not be comfortable traveling along a high-speed, high-volume arterial.

- Encourages shorter trips and carpooling. A well-connected network provides direct routes between origins and destinations, making it more convenient for residents and visitors to walk or bike to destinations. Vehicle trip lengths can also be reduced due to availability of more direct routes.
- Increases pedestrian safety. Pedestrians generally take the most direct route between destinations. Providing short (300-500 foot) blocks and a high level of connectivity makes it more likely that pedestrians will cross at intersections, as opposed to jaywalking, which may increase pedestrian safety.

Revisions to the county's street construction standards should include the establishment of a maximum block length of 500 feet in order to ensure connectivity for all modes and improve access to transit.

Parking Requirements

The Prince George's County Code establishes minimum off-street parking requirements for different land uses within the county. In comparison to similar urban areas nationwide, these standards are exceptionally high. The procedures outlined in the code for establishing reduced parking requirements in centers and select zones are also complicated and provide only a minimal reduction.

Excessive parking requirements conflict with transit-oriented development in multiple ways:

- The space that must be dedicated to parking makes it difficult to achieve transit-supportive building densities. Structured parking can minimize the footprint of parking, but would have low utilization and create a cost disincentive for developers.
- Large expanses of surface parking reduce the walkability of an area by making destinations farther apart and creating an unattractive pedestrian environment.
- Readily available parking encourages the majority of trips to continue being made by personal vehicle. In the absence of a parking pricing strategy, the incentive to walk, bike, or take transit is dramatically reduced.

The majority of jurisdictions that have successfully implemented transit-oriented development have either replaced parking minimums with parking maximums or adopted significantly reduced parking requirements for all uses within designated areas. In the study area, the 2000 Approved Sector Plan and Sectional Map for the Addison Road Metro Station and Vicinity (ARM) and the 2008 Approved Capitol Heights Transit District Development Plan and Transit District Overlay Zoning Map Amendment (CHTTP) both recommend parking maximums for station areas, but these maximums do not appear to have been applied and are not referenced in the County Code where developers look for parking guidance when developing site plans. It is recommended that the county adopt parking maximums for centers and corridors as an amendment to Subtitle 27A of the county Code. The parking maximum code used by Portland, Oregon in areas served by transit could serve as a model for the county when developing code language (see case study in Appendix 2).

Midblock Crossings

The Prince George's County DPW&T Street Construction Review Checklist currently states that midblock crossings are not permitted, effectively limiting the county's ability to improve pedestrian connectivity and support transit-oriented development in some areas. Given the long block lengths in the study area, locations of concentrated pedestrian activity, and limited crossing opportunities along Central Avenue, pedestrians are often faced with the option of jaywalking or walking far out of their way to reach a marked crossing. In most cases, pedestrians will choose to jaywalk, which creates conflicts between pedestrians and motorists who do not anticipate pedestrians in unmarked crossing locations.

Midblock crossings at select locations with high crossing demand (e.g., Metro stations, bus stops, trail crossings, and school or park entrances) can encourage pedestrians to cross at designated areas, increase safety, and make walking and transit more attractive travel options. Delay incurred by vehicle traffic at midblock crossings is frequently cited as a negative impact of midblock crossings; however, within transit-oriented areas, pedestrian level of service should be prioritized and, as shown in the "Existing Conditions" section of this report, adequate vehicle capacity is not a concern in the study area.

To provide additional flexibility to address pedestrian safety and connectivity needs, the county should adopt a midblock crossing policy that provides specific criteria for appropriate use of midblock crossings (e.g., distance from nearest signal, proximity of key destinations, traffic volume, etc.). The midblock crossing policy adopted by Washington County, Oregan could serve as a model to the county when developing this policy.

Sidewalk Funding and Maintenance

A major challenge to implementing Complete Streets policies in the study area is the need to retrofit existing streets that were constructed without sidewalks or where sidewalk widening and repair are needed. Prince George's County does not currently have a dedicated funding source for sidewalk retrofit projects or sidewalk maintenance. CB-2-2012 provides one mechanism for the county to leverage new development to complete the network and serve growing pedestrian demand. Another strategy used by some jurisdictions nationwide is to adopt code stating that adjacent property owners are responsible for maintaining all sidewalks in the public right-of-way adjacent to their property.

Policy Recommendations

COMPLETE STREETS

- Refine the TPB list of project types that are included and exempted from Complete Streets requirements.
- Refine the checklists in the "Complete Street Strategies" section of this report and implement them as a standard procedure for approving exemptions and evaluating compliance with Complete Streets principles.
- Establish performance standards to measure the impacts of Complete Streets policies. Accessibility and connectivity measures are recommended for short term adoption. MMLOS using the 2010 Highway Capacity Manual methodology is also recommended, using the analysis conducted for the Central Avenue TOD Implementation Plan as a baseline.

ADEQUATE PUBLIC FACILITIES REQUIREMENTS

- Incorporate the recommended transportation elements identified in Table 4 into the development review process and traffic impact study requirements.
  - o Identify LOS standards for pedestrian and bicycle facilities that are consistent with General Plan policies for corridors and centers. Alternative adequate facilities standards to LOS should be defined.
  - o Adopt the 2010 Highway Capacity Manual MMLOS methodology as an approved tool to evaluate the adequacy of multimodal facilities.
  - o Refine and incorporate the checklists presented in the "Complete Street Strategies" section of this report as an easy-to use implementation tool.
- Adopt amendments and revisions to the DPW&T's General Specifications and Standards for Highway and Street Construction and the Specifications and Standards for Highway Traffic Signals to incorporate appropriate Complete Streets principles.
  - o Require sidewalks on both sides of residential streets.
  - o Provide additional guidance on where traffic-calming treatments are, or are not, appropriate.
  - o Replace language encouraging discontinuous street patterns with a recommendation to maximize connectivity for all users. In areas where extending streets to enhance connectivity is not feasible, pedestrian and bicycle connection should still be made.
- Develop and adopt a methodology similar to that presented in Figure 21 to estimate the pedestrian and bicycle "impacts" of development so that mitigations requested of developers are in "rough proportion" to the stress their development puts on the system.

PARKING REQUIREMENTS

- Amend Subtitle 27A to include parking maximums for centers and corridors.

MIDBLOCK CROSSINGS

- Adopt a midblock crossing policy that allows midblock crossings in limited circumstances and provides specific criteria for appropriate use of midblock crossings (e.g., distance from nearest signal, proximity of key destinations, traffic volume, etc.). This policy should be developed with concurrence from SHA and DPW&T.

SIDEWALK FUNDING AND MAINTENANCE

- Adopt a policy requiring property owners to maintain sidewalks adjacent to their property.

Section 6
Complete Streets Strategies

COMPLETE STREETS STRATEGIES

Purpose

The purpose of this section is to outline strategies for implementing Complete Streets policies in the study area. These strategies recommended include:

- Multimodal complete street and trail typologies
- Typical sections
- Design guidelines
- Network enhancements
- Implementation checklists

Together, these strategies establish the basis for a future Transportation Network Functional Overlay (TNFO) for the study area. In coordination with a regulating plan, the TNFO will provide a mechanism for implementing transit-oriented development with concentrations of medium- to high-density and mixed uses, as well as a complete, well-connected network serving pedestrians, bicyclists, motor vehicles, and transit.

Complete Street Typology & Typical Sections

Complete Streets treat roadways as multi-purpose public space and are designed to improve access for all modes, rather than prioritizing automobile throughput. The existing roadway functional classification system, summarized in Figure 5, is based primarily on vehicle mobility, access, volumes, and speeds. As a result, roadways are frequently designed from the "inside-out," beginning with auto facilities and allocating remaining right-of-way, if any, to other modes. Successfully implementing Complete Streets will require a new roadway typology that is multimodal, considers adjacent land uses, desired streetscape elements, and encourages design from the "outside-in.” This section presents a recommended “complete street typology” for the study area, which could be adapted for application to all of Prince George’s County.[1]

The new street types are intended to inform planning decisions when altering existing streets and when reviewing new or improved streets as part of development projects. The typical sections and design guidance presented for the new street types are not intended to create strict standards or make any existing roads “non- conforming.” Instead, they provide guidance for new roadways built as part of new development or redevelopment, and identify desirable roadway elements to complement adjacent land uses when reconstructing existing roadways, as right-of-way allows. The complete street typology is consistent with the MPOT Complete Streets policy and is based upon existing DPW&T and M-NCPPC functional classification standards.

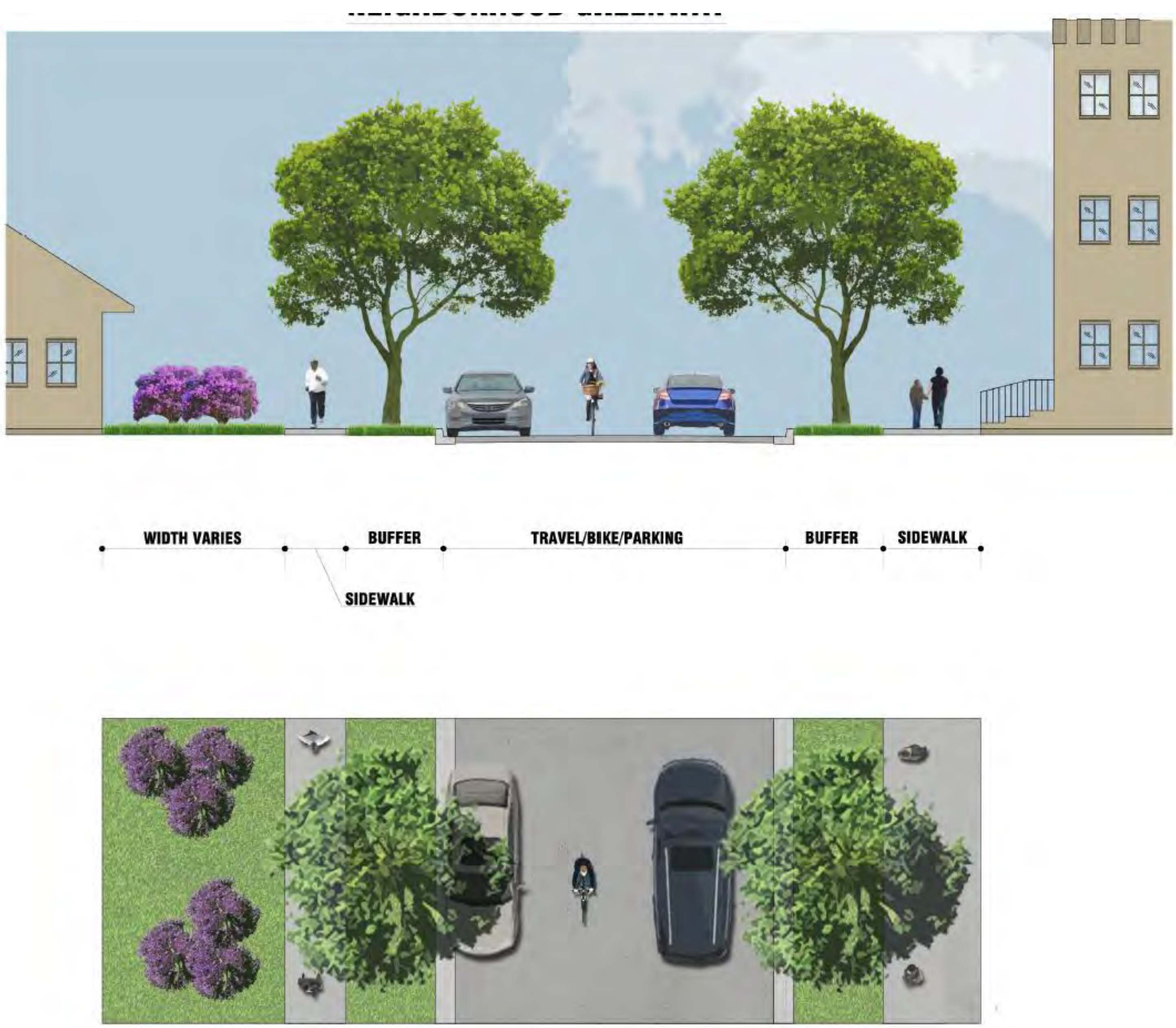
The five Complete Streets classifications described below identify the desirable roadway elements and design priorities for different land use contexts. A typical cross section is provided for each classification to show a representative example of what the implemented street type could look like. The exact combinations and widths of the individual streetscape elements should be designed to meet the specific context and apply engineering judgment.

1 Changing DPW&T standards or adopting supplementary guidance is a multi-year process, and not every planning effort should recommend different design standards.

Functional Classification	Sample of Typical Features
Arterial Road (Urban and Rural)	• 4 to 6 through-travel lanes • Median with left-turn lane • Prohibits on-street parking • Hiker/biker trails in urban areas only
Major Collector Road (Urban and Rural)	• 4 through-travel lanes • Median (may be painted) with left-turn lane • Generally prohibits on-street parking • Hiker/biker trails or bike lanes in urban areas only
Collector Road (Urban and Rural)	• Painted center line • 4 through lanes • Allows parking • Hiker/biker trails or bike lanes in urban areas only
Urban Commercial and Industrial Road	• Painted center line • 4 through lanes • Allows for frequent turning movements • Allows for parking • Requires curbed roadside and large curb radii • May include sidewalks
Primary Residential Road (Urban and Rural)	• Serves adjacent properties with clear two-way roadway • Low speeds with interruptions at intersections and driveways • Painted center line • Restricts on-street parking and turns for driveways • Urban areas only: includes sidewalks
Secondary Residential Road (Urban and Rural)	• Serves adjacent properties with clear one-lane roadway • Few parking restrictions • Urban areas only: includes sidewalks

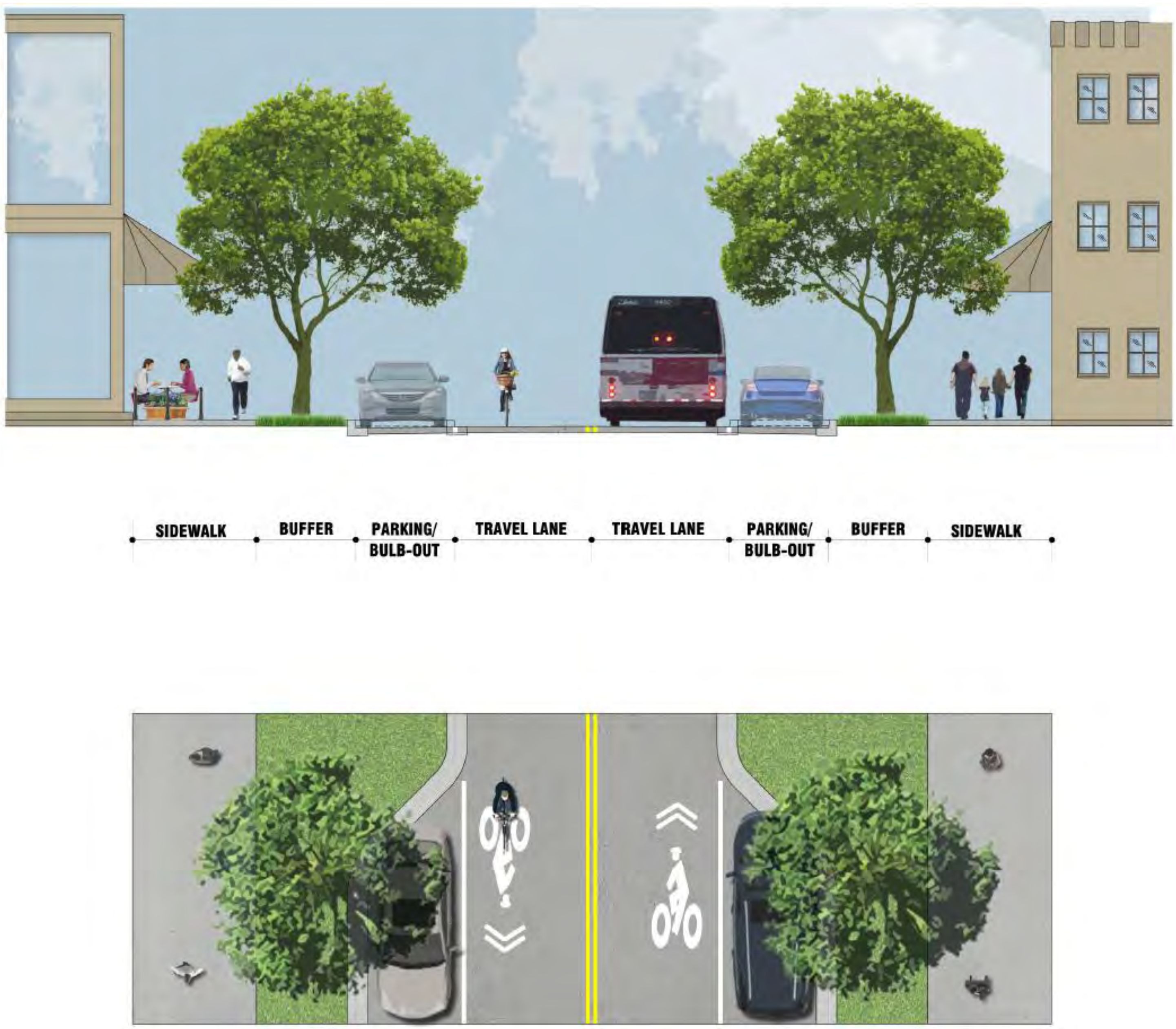
- **Neighborhood Greenways** form a grid of pedestrian- and bicycle-friendly streets along primarily residential blocks. Street widths are generally narrow and allow on-street parking. Neighborhood greenway streets include traffic-calming elements such as traffic circles, landscaped buffers, chicanes, or curb extensions in order to discourage through motor-vehicle traffic and lower vehicle speeds and volumes. As a result, neighborhood greenways are comfortable walking and bicycling routes for residents with a wide range of abilities. A typical neighborhood greenway cross section is shown in Figure 22.

Figure 22. Typical neighborhood Greenway Cross Section



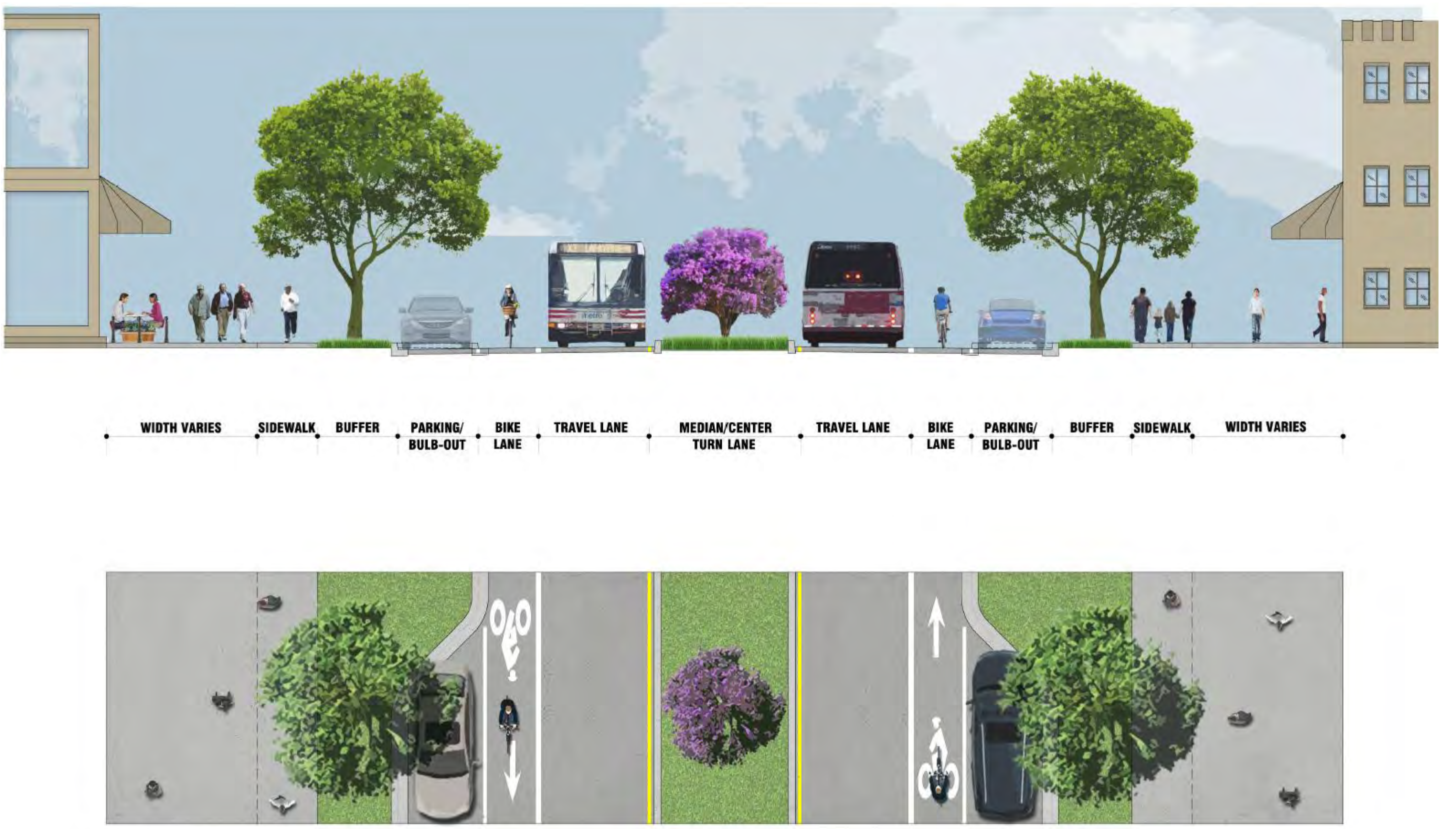
- **Neighborhood Commercial Streets** front residential and neighborhood-serving commercial uses, mixed both vertically and block-by-block. Buffer areas and sidewalks are wide to accommodate pedestrians and street furniture. Restricted curb cuts maintain the integrity of frontage space. Single lanes and on-street parking with bulb-outs (curb extensions) will slow vehicle speeds and encourage shared space with bicycles. As neighborhood hubs, these streets should be designed to facilitate community events such as farmers markets and festivals. A typical neighborhood commercial street cross section is shown in Figure 23.

Figure 23. Typical Neighborhood Commercial Cross Section



- **Avenues** form a large-scale grid of streets that provide multimodal connections between neighborhoods. They are characterized by similar surrounding land uses and streetscape features as Neighborhood Commercial streets, but have greater densities and/or higher traffic volumes that require the addition of medians, center turn lanes, and dedicated bicycle lanes. These streets form important links between neighborhoods and are often signalized where they intersect with other avenues, neighborhood boulevards, and regional boulevards. A typical Avenue cross section is shown in Figure 24.

Figure 24. Typical Avenue Cross Section

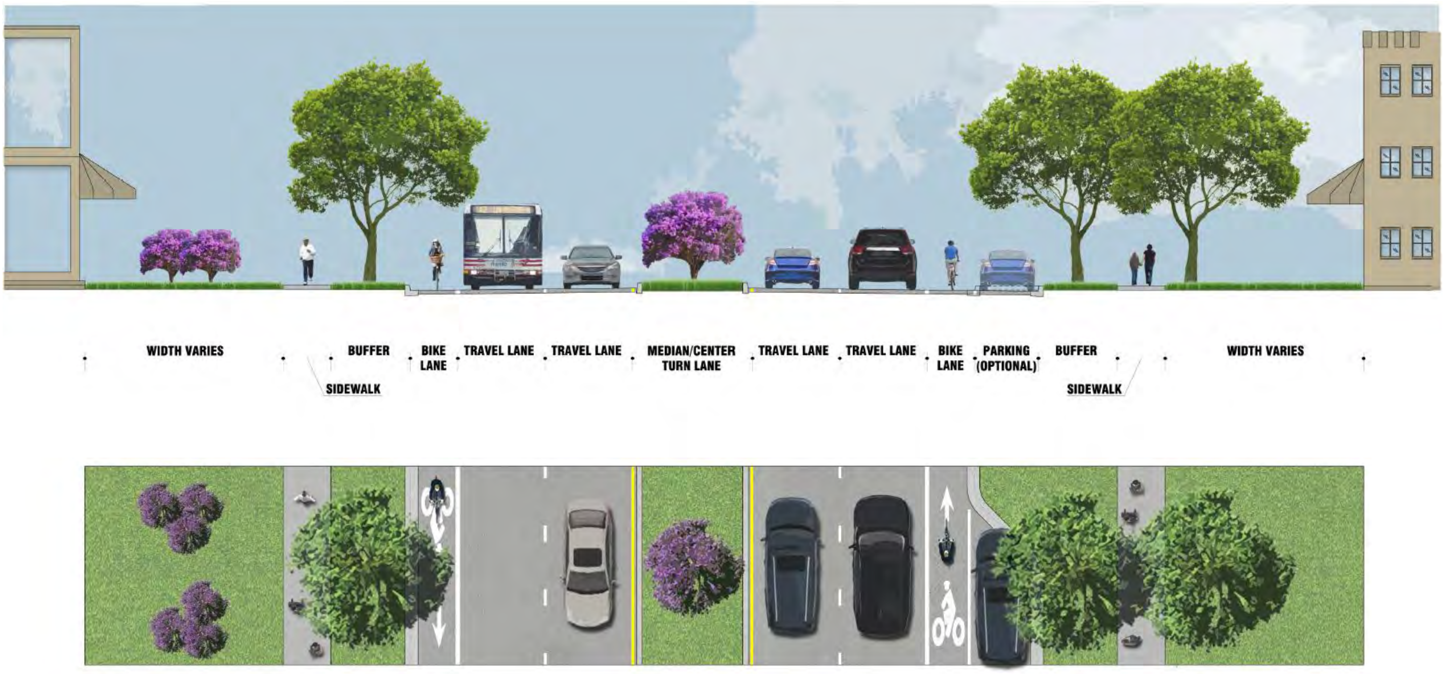


- **Industrial-Commercial Streets** serve manufacturing and large commercial uses. With low land use densities and generally low non-motorized traffic volumes, the streetscapes on these streets should soften the often intense land uses and provide on-site stormwater treatment. These streets often form important links in bicycle routes. Areas with this street type typically feature wide and frequent driveway access points. The width, length, and number of driveway access points should be limited within a multimodal context and continue to serve motor vehicle access needs. A typical industrial-commercial street cross section is shown in Figure 25.

Figure 25. Typical Industrial-Commercial Street Cross Section

- **Neighborhood Boulevards** serve mixed land use areas similar to avenues, but with higher densities and higher traffic volumes that would necessitate two lanes in each direction. Neighborhood boulevards have bicycle lanes and may have on-street parking on one or both sides depending on the immediate adjacent land use. A typical neighborhood boulevard cross section is shown in Figure 26.

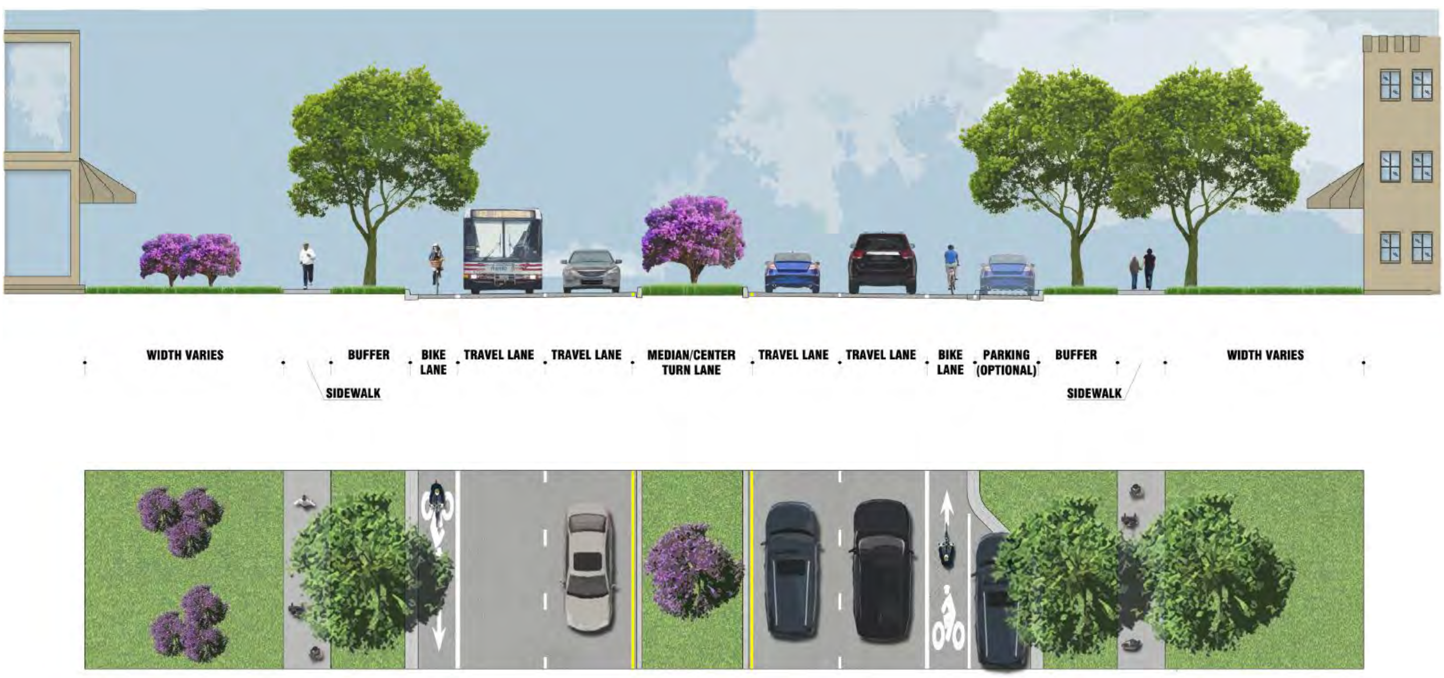
Figure 26. Typical Neighborhood Boulevard Cross Section



- **Regional Boulevards** serve regional destinations, through vehicle, and transit trips. The right-of-way accommodates the highest traffic volumes and high-capacity transit routes, and features the most widely-spaced traffic signals located only at intersections with other arterials and connectors. Both right- and left-dedicated turn lanes facilitate vehicle movements. There is generally no on- street parking, and unsignalized intersections with avenues tend to be right-in/right-out and may feature pedestrian crossing amenities such as HAWK signals. The high volumes of all users encourage separated facilities by mode, including transit priority lanes and shared-use paths for bicycles and pedestrians. The only location appropriate for this street typology in the study area is Central Ave east of Cabin Branch Road. A typical regional boulevard cross section is shown in Figure 27.

HAWK are **H**igh-Intensity **A**ctivated Cross**w**al**k** signals used to stop road traffic and allow pedestrians to cross safely. They are much more advanced than the traditional pedestrian crosswalk signals.

Figure 27. Typical Regional Boulevard Cross Section



Trail Typology

In addition to the street network, trails will provide vital links for pedestrians and bicyclists in the future study area transportation network. Trails are shared-use facilities that are separated from the roadway and may be located on access ways or easements outside of the street right-of-way. Trails serve both recreation and transportation functions and may be constructed and managed by DPW&T or Parks and Recreation. The two types of trails identified to fill local and regional gaps in the non-motorized transportation system are below:

- **Neighborhood Trails** provide connections between destinations or trail types and are generally short (less than one mile) in length. Neighborhood trails can also provide internal, non-motorized circulation networks within large developments, parks, or campuses. Minimum total width for neighborhood trails is eight feet, though ten foot or wider widths are preferable where space is available and where usage is expected to be high. Separate trail surfaces may be provided for pedestrians and bicycles, or striping may be used to distinguish areas for different users and directions of travel. If located along a roadway, neighborhood trails should be set back a minimum of two feet, with a preferred setback of five feet.
- **Regional Trails** are generally long (greater than one mile) linear trails that connect regional destinations and facilitate long-distance, non-motorized trips. These trails are primarily located outside the public right-of-way and provide a comfortable walking and biking environment with few interruptions due to intersections. Regional trails experience a fairly equal split between commuter and recreational use. Minimum total width for these trails is 12 to 14 feet, though wider widths should be provided where space is available and usage is expected to be high. Wider trails can accommodate two center bicycle lanes, each bordered by a 5 foot pedestrian lane, and 2 to 5 foot buffers on the roadway side.

Complete Network Recommendations

Taken together, the street and trail types described above establish a framework for implementing a complete network within the study area, serving transportation needs within neighborhoods, between neighborhoods, and across the corridor. Figure 28 illustrates the function characteristics of each of the new street and trail types.

Figure 28. Recommended Street Types and Functional Characteristics

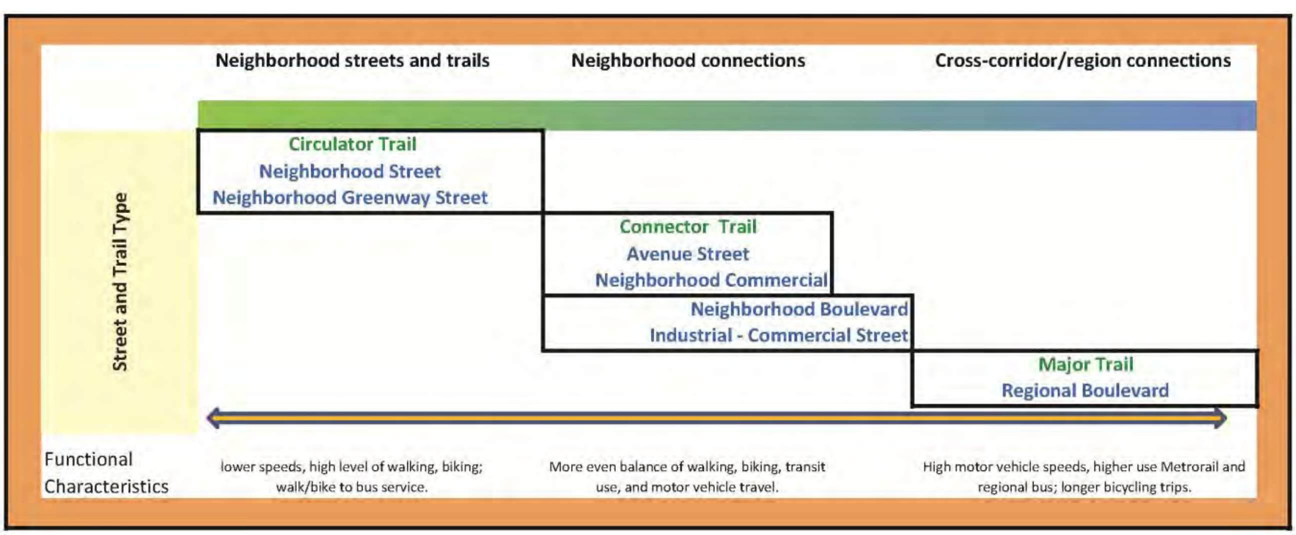


Figure 29 shows the proposed application of the new street and trail types to the existing transportation network. The map also shows the locations of proposed new street and trail connections to increase connectivity for all modes and develop a complete network. The future multimodal network is recommended in order to improve overall safety, mobility, and access within the corridor.

Constraints of the existing transportation network are evident when looking at existing and potential walking access to Metrorail stations, illustrated in Figures 7 and 8. Future development, particularly TOD adjacent to each of the stations, presents an opportunity to improve access for all modes with several key transportation network elements:

- New walking and bicycling facilities along existing streets
- New streets and trails providing circulation within and connections between developments
- New trails that connect neighborhoods directly to Metrorail stations and/or the regional trail network

The proposed network map is intended to illustrate conceptual future connections and does not represent precise alignments. Proposed street and trail types are intended to provide general guidance on future multimodal facility function and cross section. Detailed design elements (e.g., crossing treatments, lighting, and landscaping) are discussed in more detail below and should be selected to suit individual contexts using engineering judgment.

Complete Street Design Treatments

The street and trail types discussed above provide a general overview of the future function and cross section of facilities. In order to integrate these facilities with surrounding land uses and create a safe, comfortable network for users, detailed design treatments will need to be selected and incorporated into the design of streets. Table 5 presents an overview of traffic calming, pedestrian, and bicycle treatments that support implementation of Complete Streets and TOD. Specific design treatments should be selected to suit individual contexts using engineering judgment.

Figure 29. Proposed Future Network

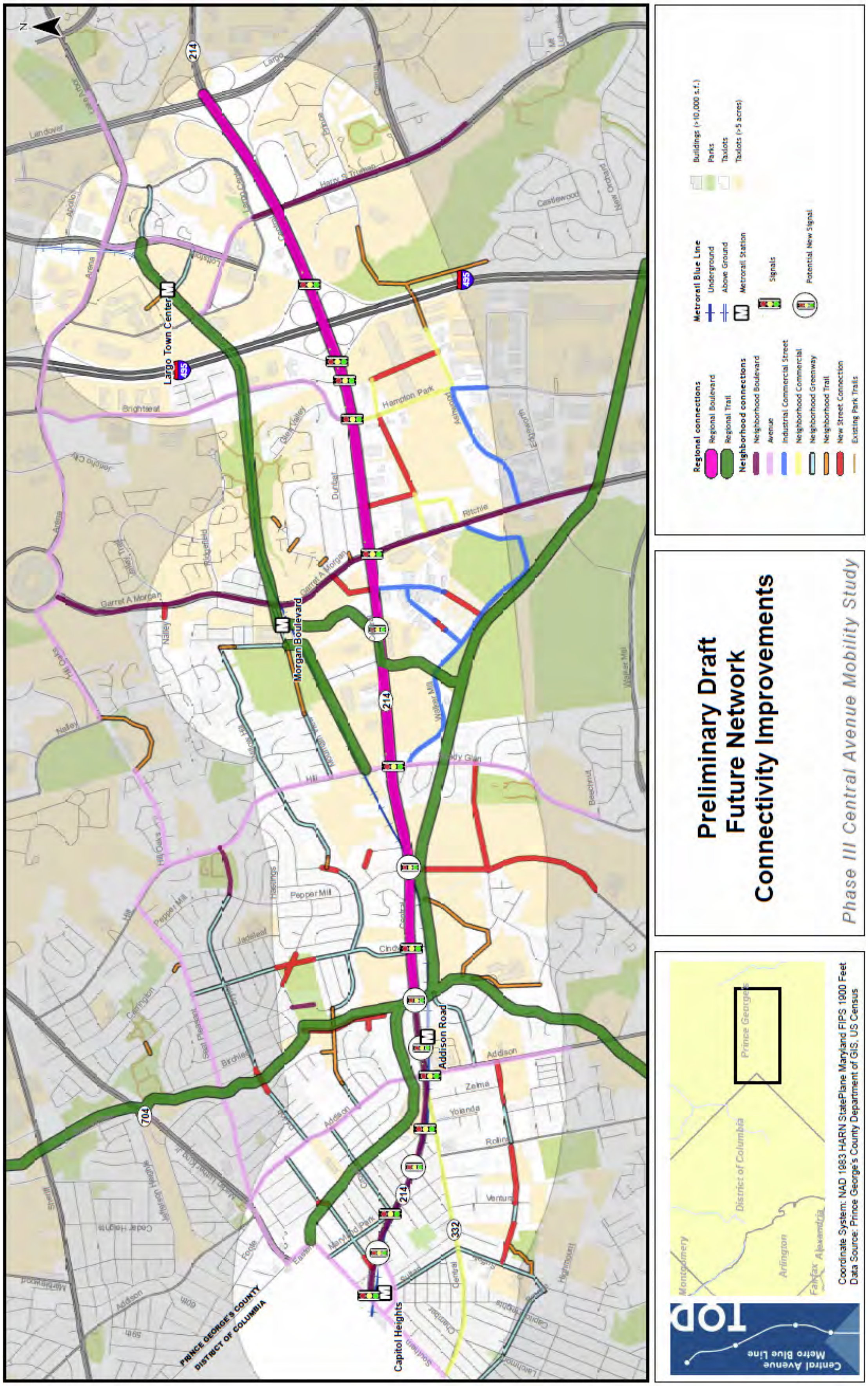


Table 5. Overview of Complete Street Design Treatments

Treatment	Description	Advantages	Disadvantages
Traffic Calming Treatments			
Reduced Curb Radii	Reconstructing a street corner with a smaller radius to reduce vehicle turning speeds.	• Forces sharper turn by right-turning motorists. • Improves safety of pedestrians by reducing crossing width and slowing motorists. • Reduces speed of right-turning motorists.	• Space may not be available. • Can be expensive. • Can make access more difficult for buses and large trucks.
Narrow Travel Lanes	Restriping of existing travel lanes to reduce width.	• Slows traffic. • Provides more space for bicyclists and possible bicycle lanes.	• Possible increase in vehicle-vehicle crashes.
On-Street Parking	Full-time parking provided adjacent to the curb or just beyond a buffered bicycle zone (protected bicycle lanes).	• Increases safety by placing a physical barrier between moving vehicles and pedestrians. • Reduces the speed of traffic traveling adjacent to the parked vehicles. • Provides parking.	• Can be dangerous for bicyclists riding in door zone. • Ineffective at reducing speeds if travel lane is very wide. • Reduces sight lines for motorists entering the street from driveways.
Rumble Strips	Pavement surface treatments intended to cause drivers to experience vehicle vibrations signaling the drivers to slow down. Best used with other traffic calming treatments.	• Reduces speeds. • Low cost.	• Vibration noise created may be inappropriate in residential areas. • Perceived more as a warning to slow down than a physical measure that forces slower speeds. • Less effective over time. • Can create a hazard for cyclists.
Speed Humps	Speed humps are wide, rounded, mountable obstructions installed on the pavement surface across travel lanes, intended to cause vehicles to slow.	• Inexpensive. • Very effective in slowing travel speeds. • Easily navigated by bicyclists.	• May be considered loud or noisy to nearby residents. • Forces emergency vehicles to slow down. • Inappropriate on streets with bus traffic due to rider comfort & reduced travel speeds. • Creates a high-speed traffic hazard.

Treatment	Description	Advantages	Disadvantages
Speed Tables	Speed tables are similar to speed humps except they have a flat-top. Generally wider than speed humps, gentler on vehicles, and generally used on higher order roads than bumps or humps because they allow a smoother ride and higher speeds.	• Slows traffic. • Smoother ride than humps and bumps. • Not as effective in reducing speeds as humps and bumps. • More applicable for higher order roads (collectors). • Compatible with bicycle use, particularly on low-volume streets.	• Higher design speed. • Can be expensive if used with textured materials. • May be considered loud or noisy to nearby residents.
Chicane	A series of fixed objects, usually extensions of the curb, which alter a straight roadway into a zigzag or serpentine path to slow vehicles. Can also be created by alternating on-street parking between sides of street.	• Reduces speeds of motorists. • Easily negotiated by larger vehicles such as buses, trucks, and fire trucks. • Noise is not as common as with speed humps or rumble strips. • Potential to increase trees, landscaping and water runoff treatment.	• Reduces on-street space for parking. • Maneuvering can be difficult for larger vehicles such as buses, trucks, and fire trucks. • Potential for motorist collision with the physical chicane. • Needs landscape maintenance.
Choker	Narrowing of a street, often mid-block, and sometimes near an intersection. May be done with curb extensions, landscaping or edge islands in the street. They can form safe crossings if marked as crosswalks. Chokers can leave the street section with two narrow lanes or be taken down to one lane, thus requiring approaching drivers to yield to one another.	• Reduces speeds and volumes of motorists. • Shortens crossing distances for pedestrians if used at mid-block crossings. • Provides pedestrian refuge area. • Can reduce traffic volumes.	• Potential for motorist collision with the physical choker. • Reduces on-street space for parking. • Compatible with bicycling only when specified space is provided. • Design challenges if used on narrow streets without on-street parking. • May divert traffic to alternate streets.

Treatment	Description	Advantages	Disadvantages
Raised Intersection	The entire area of an intersection is raised above normal pavement surface level to reduce vehicle speed through the intersection and provide a better view of pedestrians and motorists in the intersection.	• Reduces speeds through intersections. • Reduces red light running at high speeds. • Calms two streets at once where collisions are • most prevalent.	• Potential drainage issues. • Less effective in reducing speeds than humps, tables, • or raised crosswalks. • Expensive.
Intersection Safety Enhancements			
Prohibit Right-Turns on Red	Mounted sign eliminates the right of motorists to make a right turn at a red light. Can be used full-time or under restricted time intervals.	• Reduces conflicts between motorists and pedestrians.	• Reduces time motorists have to make a right turn. • Potential vehicle queuing.
Signal Timing Modification	Adjustments of existing signal timings to more readily accommodate all modes. Couldinclude reducing the amount of green time to decrease the amount of time pedestrians wait at signals.	• Improves conditions for pedestrians. • Improves overall safety of intersection.	• Improving conditions for one mode is often done at the expense of others (e.g., giving more green time to pedestrians often means motorists receive less green time).
Leading Pedestrian Interval	Pedestrians are given advance time to begin crossing at the crosswalk before conflicting vehicles start moving.	• Puts pedestrians well into the crosswalk and more visible before vehicles begin moving into the crossing zone. • Improves pedestrian safety.	• Reduces green time for conflicting vehicle movements. • Can add to delays at highly congested intersections.
Push Button Retrofit	Signs above the pedestrian push-button that indicate direction of crossing. "Confirm" press buttons acknowledge activation through a light or sound after called by a pedestrian.	• Confirm press buttons have been shown to increase the number of pedestrians using the push-button. • Pedestrians more likely to wait for the Walk phase signal.	• Expense of implementing comprehensively.

Treatment	Description	Advantages	Disadvantages
Pedestrian Countdown Signal	Walk/Don't Walk pedestrian signals with countdown signal informing pedestrians of the time remaining to cross the street.	• Fewer pedestrians cross the street late in the countdown as compared to signal heads with only the Flashing-Don't-Walk light.	• Expense of implementing comprehensively.
Protected Left-Turn	Allows left-turning vehicles a protected movement (i.e., no conflicting movements), generally involving the installation of a left-turn arrow.	• Removes conflicts between left-turning vehicles and oncoming, through-movement vehicles. • Improves left-turning operations.	• Less green time for through and right-turn movements. • Less green time for pedestrian crossings.
Reduce or Add Lane; Modify Existing Geometry	Modify the existing intersection geometry to respond to conditions including reducing pedestrian crossing exposure to traffic, adding or eliminating a traffic movement, creating space for the type and level of pedestrian activity, reducing speed of turning vehicles.	• Improve safety or capacity according to situation. • Increase or decrease user delay according to situation.	• Lack of right of way and/or physical space. • High cost and long timeframe.
Roundabout	Raised circular island intersection treatment where all entries are yield controlled, circulating vehicles have the right of way, and pedestrian access is allowed only across the roundabout legs.	• Yield control reduces wait times, thus getting traffic more steadily through the intersection. • Reduces the severity of crashes relative to signalized intersections. • Reduces conflict points compared to a signalized intersection.	• Requires substantial right of way for construction • Pedestrians are not provided with a protected signal phase where all traffic is stopped; rely on driver courtesy and respect for pedestrian right-of-way in the crosswalk. • High cost.

Treatment	Description	Advantages	Disadvantages
Pedestrian Crossing Treatments			
In-Street "Yield for Pedestrian" Sign	Signs placed in the middle of crosswalks to increase driver awareness of pedestrians and the legal responsibility to yield right-of-way to pedestrians in crosswalk.	• Increases the number of motorists that yield to pedestrians in the crosswalk. • Reinforces the right of pedestrian in the carriage-way.	• If used too often, motorists have a tendency to ignore the signs.
High-Visibility Crosswalk	Clear, reflective roadway markings and accompanying devices at intersections and priority pedestrian links, located only where motorists should expect pedestrians with sufficient sight distance and reaction time with prevailing travel speeds.	• Warns motorists of potential for pedestrians. • Designates a preferred location for pedestrians. • Maryland law requires motorists to yield to pedestrians in or near the vehicle's path in marked crosswalks.	• Most effective with other traffic control (signals, stop signs) or physical treatments (bulb outs) that help to reinforce crosswalks and support reduced vehicle speeds. • Motorists may ignore.
Raised Crosswalk	A pedestrian crossing area raised above street grade to give motorists and pedestrians a better view of the crossing area. A raised crosswalk is essentially a speed table marked and signed for pedestrian crossing.	• Provides better view for pedestrians and motorists. • Slows motorists travel speeds. • Broad application on both arterial & collector streets.	• Can be difficult to navigate for large trucks, buses, and snow plows.
Bulb-out/Curb Extension	An extension of the curb or the sidewalk into the street (in the form of a bulb), usually at an intersection, that narrows the vehicle path, inhibits fast turns, and shortens the crossing distance for pedestrians.	• Shortens crossing distances for pedestrians. • Reduces motorist turning speeds. • Increases visibility for both motorists and pedestrians. • Enables permanent parking. • Enables tree and landscape planting, & water runoff treatment.	• Can only be used on streets with unrestricted on- street parking. • Physical barrier can be exposed to traffic. • Greater cost and time to install than high-visibility crosswalks.

Treatment	Description	Advantages	Disadvantages
Raised Median Island/ Pedestrian Refuge Area	Signs with a pedestrian-activated “strobe- light” flashing pattern that attracts attention and notifies motorists that pedestrians are crossing.	• Typically increases motorists yielding behavior. • Pedestrians may not activate flashing light.	• Motorists may not understand flashing lights.
Pedestrian Hybrid Signal (HAWK)	Pedestrian-activated signal, unlit when not in use, begins with a yellow light alerting drivers to slow, and then a solid red light requires drivers to stop while pedestrians have the right-of-way to cross the street.	• A very high rate of motorists yielding to pedestrians. • Drivers experience less delay at hybrid signals compared to other signalized intersections.	• Expensive compared to other crossing treatments. • Requires pedestrian activation.
Bicycle Accommodations			
Wayfinding	Signs directing pedestrians and bicyclists towards destinations in and routes through the area, typically including distance and average walk/cycle times.	• Eases navigation for residents and visitors by bicycle. • Provides guidance to destinations from streets and along multi-use trails. • Offers another indication to motorists of the presences of bicycles.	• Maintenance and vandalism.
Bicycle Sharrows	A shared-lane marking, or sharrow, is a pavement marking used where space does not allow for a bike lane typically indicating that bicycles have equal right to the travel lane. Sharrows remind motorists of the presence of bicycles and indicate to cyclists where to safely ride within the roadway.	• Reduces wrong-way and sidewalk riding. • Improves cyclists positioning in the roadway. • Informs motorists of presence of bicyclists. • Marks streets without adequate space for bike lanes.	• Pavement marking maintenance. • Not as protected as a bike lane.

Treatment	Description	Advantages	Disadvantages
Bike Lanes	The area of roadway designated for non-motorized bicycle use, separated from vehicles by pavement markings.	• Improves safety and comfort by increasing the visibility and awareness of cyclists. • Designates carriage-way space for bicyclists.	• May still conflict with motorists. • Motorists may illegally park in bike lane.
Bike Box	Marked area in front of the stop bar at a signalized intersection that allows cyclists to correctly position themselves for turning movements during the red signal phase by pulling ahead of the queue.	• Decreases conflicts and crashes between cars and bicycles. • Separates bicycles from cars at the intersection.	• Extensive public education required. • Pavement marking maintenance and costs.
Bicycle Boulevard/ Neighborhood Greenway	Low volume and low speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments.	• Converts well-connected streets prone to cut-through traffic to streets well-suited for bicycle transportation. • Allows through movements for cyclists while discouraging similar through trips by non-local motorized traffic. • Creates a comfortable, low-volume, low-speed space for bicyclists and pedestrians.	• Some treatments more expensive than others. • In areas with few alternative routes, reduces those that can relieve traffic during peak travel times.
Cycle Track/ Protected Bike Lane	An exclusive bike facility physically separated from vehicle travel lanes, parking lanes, and sidewalks. Can be one-way, two-way, at street level, at sidewalk level, or at an intermediate level.	• Buffer provides higher level of safety than bike lanes. • Reduces risk of "dooring" compared to a bike lane. • Attractive to a wider spectrum of the public than bike lanes.	• Potential conflicts at intersections. • Can be expensive. • Requires more space than bike lane

Treatment	Description	Advantages	Disadvantages
Shared-Use Pathway/ Sidepath	Paved pathways parallel to but away from the carriage-way and out of the path of turning vehicles designed with space adequate for safe use by both pedestrians and bicyclists. Appropriate for roads parallel to rail track, waterway or other conditions with infrequent cross traffic.	• Separates bicyclists from vehicle traffic. • Combination of pedestrians and bicyclists requires less space than separate facilities for each.	• Needs adequate space to accommodate buffer from street and width to allow the passing of bicyclists and pedestrians. • Bicycle and pedestrian conflicts.
Bicycle Parking	Devices and/or areas that allow secure bicycle parking, often located at areas of high bicycle and pedestrian traffic such as office and industrial areas, shopping centers, schools, and multi-use trails. Can be provided on a curb extension or in on-street parking spaces.	• Provides a secure location to store and lock bicycles. • Locations are generally very close to and visible from the point of interest. • Relatively inexpensive and easy installation. • Encourages community bicycle use.	• Requires space in potentially busy area. • May remove an on-street parking space.

Complete Street Checklist

A Complete Streets Checklist is a useful tool for evaluating how each travel mode has been considered and accommodated in the process of planning or designing projects that are within or that impact the public right-of-way. The checklist approach also provides a simple means for assuring that the new adequate pedestrian and bicycle facilities requirements are incorporated into the design review process.

The draft 2012 Prince George's County *Transportation Review Guidelines* include draft checklists for evaluating trip and parking credits for which a proposed development is eligible. The checklist presented below suggests potential revisions to these checklists and additional questions that could be added in order to make the checklists applicable to other projects such as scheduled repaving/restriping, or capital improvement projects.

The checklist included below is based on the draft 2012 Prince George's County *Transportation Review Guidelines*, approved MPOT Complete Streets principles, and the Complete Streets design and policy recommendations for Prince George's County discussed in the "Policy and Design Review" section of this report. The checklist is based on several assumptions about implementing Complete Streets and TOD:

- Street and trail types are part of a transportation-land use relationship inherent in all development projects, especially TOD. No project is a silo. Roadway reconstruction affects existing and prospective land uses, and those land uses influence the roadway cross-section.
- All projects, regardless of scope or owner (public/private), will contribute to creating the complete network. A complete network emerges with each roadway or development project, especially when attention is given to how a project fits into the network vision.
- Over time, a complete network will be established.
- Travel within the corridor can be shifted from primarily motor vehicle to a significant proportion of walking, bicycling, and transit trips. Loosely based on the "build it and they will come" theory, improvements to walking, biking, and transit transportation make these modes more attractive and possible to use.

The checklist addresses the following aspects of each project:

- **General Information** includes the type of project, land use, and project scope.
- **Site Context and Opportunities** addresses the surrounding land uses, destinations, and transportation facilities.
- **Complete Streets Assessment** evaluates the project design in relation to the "four D's"–density, diversity, design, and destinations–and its ability to support TOD and Complete Streets.

In order for the checklist to effectively influence roadway and site design, it should be used by public agencies in all stages of project development, including development review, permit approval, street project design, planning, and maintenance processes.

Complete Streets Project Review Checklist

GENERAL PROJECT INFORMATION

1. Project Name ________________________________ **2. Design Completion (%)**________

3. Project Area (precise street limits and scope)________________________________

4. Project Type: ☐ Roadway Maintenance ______ ☐ Capital Improvement Project ☐ Private Development

5. Project Description ________________________________

6. Dates Started/Anticipated to Start: Planning __/__/____ Preliminary Design __/__/____ Final Design __/__/____ Construction __/__/____

7. Lead Agency or Entity: ________________________________

8. Primary Contact: ________________________________

9. Partner Agencies or Entities: ________________________________

SITE CONTEXT & OPPORTUNITIES

10. Street Type: Identify the classification of the street(s) impacted by the project using the Proposed Complete Street Network map.

____

11. **Land Use & Character:** Describe the character of the project area, including predominant land uses, densities, and any historic districts or special zoning districts present. Describe the compatibility of the proposed design with these characteristics.

____

____

12. **Trip Generators & Attractors:** List any major sites, destinations, and trip generators within one half mile of the project area, including: transit stops with service frequency of at least 20 minutes during peak periods; public facilities (e.g., schools, libraries, parks, or post offices); recreational community, or cultural facilities; retail centers greater than 20,000 sf GFA; employment centers greater than 40,000 sf GFA; and existing sidewalks, paths, bike lanes, or cycle tracks. Describe how the proposed design provides connections to these sites.

____

____

13. Travel Patterns & Conditions: Describe existing and desired future walking, bicycling, transit, motor vehicle, and freight conditions within the project area. Describe how the proposed design addresses these conditions, including volumes, safety, comfort, connectivity, and quality of the street environment.

____

____

14. **Opportunities**: Identify opportunities to address safety, mobility, and access within the larger corridor.

Safety	Mobility (within the corridor)	Access to rail and bus service
Example: Road project will install signal at intersection with companion bus stops.	*Example: Re-striping project will stripe bike lanes.*	*Example: Development project will install bus shelter and lighting or project trail access to Metrorail station.*

COMPLETE STREETS ASSESSMENT

Pedestrian Facilities - Does the proposed design:

15. Provide adequate clear sidewalk widths along street frontages? (See Complete Street Typology guidelines, minimum 5 feet of clear sidewalk width required per ADA) ☐ Yes ☐ No
16. Provide recommended buffer widths between pedestrians and traffic? (See Complete Street Typology guidelines) ☐ Yes ☐ No
17. Include pedestrian facilities and designated crossings that provide direct connections to destinations identified in Question #12? ☐ Yes ☐ No
18. Provide pedestrian facilities for internal site circulation (e.g., walkways along and between buildings, walkways through parking lots to buildings, designated crossings of drive aisles)? ☐ Yes ☐ No
19. Provide walkway lighting that meets or exceeds County standards? ☐ Yes ☐ No
20. Minimize vehicle intrusions into the pedestrian zone (e.g., driveways, lay-by lanes)? ☐ Yes ☐ No
21. Provide designated pedestrian crossing opportunities every 300-500'? ☐ Yes ☐ No
22. Provide ADA compliant curb ramps where required and/or appropriate? ☐ Yes ☐ No

Bicycle Facilities - Does the proposed design:

23. Include bicycle facilities that provide direct connections to destinations identified in Question #12? ☐ Yes ☐ No
24. Include bicycle facilities identified in adopted plans and/or recommended bicycle facilities based on frontage street types? (See Complete Street Typology guidelines) ☐ Yes ☐ No
25. Provide adequate bicycle parking per County Code requirements? ☐ Yes ☐ No

Transit Facilities - Does the proposed design:

26. Include transit enhancements (e.g. bus shelter, bus or intermodal transfer stop, park-and-ride facility, bus stop pad or pull-out, direct cash contribution to transit service costs, other transit service or system enhancements/amenities that serve the subject property) or propose to defray the cost of transit enhancements on-site or within one half mile of the site? ☐ Yes ☐ No
    a. If yes, are proposed transit enhancements connected to the site by adequate pedestrian facilities? ☐ Yes ☐ No
27. Provide lighting at on-site transit stops that meets or exceeds County standards? ☐ Yes ☐ No
28. Provide ADA compliant landing pads at on-site transit stops? ☐ Yes ☐ No
29. Provide a space for passengers to wait for, board, and alight transit vehicles that are separate from the walkway at on-site stops? ☐ Yes ☐ No

Parking Facilities - Does the proposed design:

30. Minimize off-street parking in comparison with Subtitle 27? ☐ Yes ☐ No
31. Incorporate shared parking? ☐ Yes ☐ No
32. Screen parking from the street (e.g., place it behind the building it serves, "wrap" it with commercial or residential space)? ☐ Yes ☐ No
33. Utilize structured parking for more than 75 percent of on-site parking? ☐ Yes ☐ No
34. Include a parking pricing strategy to control parking demand? ☐ Yes ☐ No

Urban Design - Does the proposed design:

35. Include streets and trails that create a connected, grid system (as opposed to cul-de-sacs)? ☐ Yes ☐ No
36. Include doors and street level windows that face the street and/or public parks and plazas? ☐ Yes ☐ No
37. Include buildings that come all the way to the street or build-to line? ☐ Yes ☐ No
38. Arrange retail, restaurant, and service uses to create an average of less than 150 feet between main entrances? ☐ Yes ☐ No
39. Minimize auto-oriented uses such as drive-in or drive-up facilities? ☐ Yes ☐ No
40. Achieve densities at or within ten percent of the maximum permitted density (if a Euclidean zone) or the density recommended by a master plan, sector plan, or general plan designation? ☐ Yes ☐ No
41. Convert low-intensity uses such as surface parking or single-story buildings to denser uses? ☐ Yes ☐ No
42. Include a mix of uses that will attract people throughout the day and week? ☐ Yes ☐ No
43. Include convenience uses (e.g., newsstands, coffee shops, daycare, dry cleaners) for surrounding residents, commercial tenants, and transit patrons within walking distance (one-half mile)? ☐ Yes ☐ No
44. Incorporate vertical mixed-use? ☐ Yes ☐ No

Section 7
Future Conditions

FUTURE CONDITIONS

This chapter describes the alternatives analysis and identification of preferred concepts to accommodate the future vision for the Central Avenue corridor. Four alternatives were considered for the year of 2035, including a baseline "no-build" scenario from which the other three "build" alternatives were developed. The three build alternatives are as follows:

1. Central Avenue "Road Diet" between Southern Ave NE and Cabin Branch Road
2. Transit-Oriented Development (TOD) at the Morgan Boulevard Metro Station area
3. Pedestrian and bicycle connectivity around Largo Town Center

Each of the three scenarios above is presented as an alternative collection of transportation improvements in response to future changes in land use. The three "Build alternatives" were tested as they represent Complete Streets concept ideas proposed by this study and because they apply to specific conditions in the study area. For example, true transit-oriented, rather than transit-adjacent, development is proposed for the Morgan Boulevard station area, and a reduced general traffic lane with designated bicycle accommodation section, or a "road diet," is proposed for the western end of the corridor.

The analysis presented in this chapter is designed to show how the future changes in land use, anticipated due to the location of four Metrorail stations, can–and should–be supported by transit-oriented street design and connectivity. Increased land use density, transportation mode diversity, and Complete Streets design elements have the potential to impact the appearance and operations of Central Avenue, as well as other arterials in the corridor. This chapter discusses how the regional travel demand model was used to provide an understanding of more detailed corridor intersection operations using Synchro–a signal timing software used to perform capacity analysis for signalized intersections. Results were used to evaluate concepts that are proposed in this study, particularly a significant number of new street connections that have not been modeled but are recognized as elements of project implementation.

Background

Central Avenue (MD 214) was built and developed first as a rural and then as a suburban arterial from Washington, D.C. to Prince George's County. Development during the prior 50 years was oriented in typical fashion toward traditional suburban land use and zoning patterns predicated on easy access to uncongested roadways and low-density retail properties with adequate parking. During the development period of Central Avenue corridor, transit accessibility, pedestrian and bicycle networks, and trip reducing opportunities, such as compact/mixed-use developments, were not prioritized.

The extension of WMATA's Blue Line to Largo Town Center during the last ten years has brought about an opportunity for the Central Avenue corridor to support higher levels of activity and higher concentrations of land use without causing major traffic impacts on the road system. Experience and research[1] has shown that for a typical suburban arterial to efficiently support transit-adjacent neighborhoods, it must become part of a more connected road network that invites pedestrian and bicycle travel. The road itself must be easier to cross and provide more opportunities for safe crossing. Long-standing safety concerns dating back to the initial opening of the Addison Road Metrorail Station are evidence of the inconsistency between the arterial's single mode (auto) design and its multimode (transit, pedestrian, auto) function.

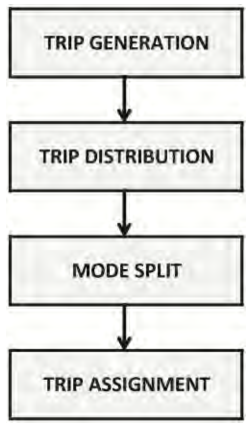
1 Ewing, Reed and Robert Cervero. Travel and the Built Environment: A Synthesis. Transportation Research Record, 1780: 87-144. 2001.

It has been proposed that Central Avenue, from the Capitol Heights Metro Station to the Addison Road Metro Station, operate as a neighborhood boulevard, a major road that provides designated space for bicycles and pedestrians and promotes compatible travel speeds. Morgan Boulevard, the major road leading to the Morgan Boulevard Station and FedEx Field, has also been proposed as a neighborhood boulevard with fewer general traffic lanes.

Applying the 4-Step Model

The future alternatives were developed by incorporating and applying the traditional 4-step transportation modeling process, which is shown and described in Figure 30.

Figure 30. 4-Step Model



For each of the Transportation Analysis Zones (TAZ) in the computer-based transportation demand model, the household and employment data generates a certain number of trips. In the second step, these trips are distributed throughout the network based on the strength of the attraction between trip generators (e.g., residences) and trip attractors (e.g., places of employment) in the model. The mode split step determines the number of trips for each available mode in the model– transit, single occupant vehicle, and high occupant vehicle (HOV 2 and HOV 3+). The county model (like many others) does not produce mode share for pedestrian or bicycling trips. The final step, trip assignment, places the trip flows onto the transit and road network.

Future transportation network improvements, which include changes in vehicle and transit infrastructure as well as alterations to transit services schedules, were incorporated into the travel-demand model by County staff. The following transportation improvements in the study area, which are included in the county's long- range fiscally-constrained transportation plan, are part of the future year model:

- Addition of an eastbound right-turn lane at the intersection of Central Avenue and Addison Road.
- Modification of southbound Hill Road to a five-lane approach that includes two left-turn lanes, a shared left-through lane, a through lane, and a right-turn-only lane.
- Modification of northbound Shady Glen to include two left-turn lanes, a through lane, and a shared through-right lane.
- Modification of westbound Central Avenue to include two left-turn lanes, two through lanes, and a shared through-right lane.

- Modification of northbound Ritchie Road to a five-lane approach that includes two left-turn lanes, a shared left-through lane, a through lane, and a right-turn-only lane.

Prince George's County modeling staff ran the travel demand model and provided the outputs and results for use in the development of the future alternatives for the TOD Mobility project. The county model is calibrated and validated based on the recent land use, household, employment, and transportation network data. The data sources used to develop the travel demand model are described in Appendix 3. The methodology used to translate travel demand model output data into baseline roadway traffic volumes used established engineering principles and techniques. Future alternatives were developed by combining the travel demand model results with market study data and proposed land use scenarios developed by AECOM. The future scenario development methodology is described in Appendix 3.

TRIP GENERATION

The project study area in the Prince George's County's travel-demand model is comprised of 46 Transportation Analysis Zones (TAZ), and each of these zones contains the household and employment data used to produce and attract trips. The household and employment data in the model is shown in Table 6, and comes from MWCOG regional data and Prince George's County community master plans. The growth rates in households and employment shown is the average across the entire area and may differ from TAZ to TAZ based upon characteristics of individual TAZs.

Table 6. Household and Employment Data

Model Input	Year 2011	Year 2035	Annual Growth
Households	15,400	34,400	3.08%
Jobs	15,300	32,800	2.84%

Trip generation for the future conditions models consisted of the following:

No-Build Scenario

The No-Build scenario, which functions as the baseline for future conditions, used the model results after standardized application of the National Cooperative Highway Research Program (NCHRP) 255 traffic volume development processes, and included minimal volume balancing between intersections.

Build Scenario #1: Road Diet

The results of the market survey data presented a very different picture of residential and employment growth in the study corridor as compared to the assumptions that produced the travel demand results for the No-Build alternative. Table 7 contrasts the market-based analysis with the outputs from the county's travel demand model.

Table 7. Household Comparison Between Travel Demand Model and Market Study

Forecasting Tool	Forecasted Household unit growth to 2035	Total Growth Expected
Travel Demand Model	19,000	123%
Market Study	2,000-2,500	13 – 16%
Road Diet Analysis	12,500	81%

In the road diet alternative, one-third of growth assumed in the travel model was projected not to occur. This is a highly conservative estimate relative to the results of the market study. The reduced growth assumptions have the following effects on traffic volumes at the intersections of Central Avenue/Southern Boulevard (near the Capitol Heights Metro station) and Central Avenue/Addison Road (near the Addison Road Metro station), and are shown in Table 8.

Table 8. Build Scenario #1: Road Diet Trip Generation Modifications

Metro Station Analysis Area	Model Household Growth (2011-2035)	Road Diet Household Growth (estimated)	New model trips generated		Final Road Diet trips (reduction from model)	
			A.M. Peak Hour	P.M. Peak Hour	A.M. Peak Hour	P.M. Peak Hour
Capitol Heights	1,481	987	730	610	487 (-243)	407 (-203)
Addison Road	1,716	1,144	539	494	360 (-179)	329 (-165)

Build Scenario #2: Morgan Boulevard TOD

The trip generation methodology for this alternative was based on the county's preferred alternative for the Morgan Boulevard Station area, referred to as Mixed-Use Concept A. The trip generation methodology proceeded as follows:

1. Trip generation was determined for the existing 2011 land uses using the eighth edition of the Institute of Traffic Engineers Trip Generation Manual.
2. 2011-2035 natural growth in the TAZ (not including the TOD concept) was determined by comparing existing traffic volumes to the no-build traffic volumes.
3. Trip generation for the preferred alternative was determined using the eighth edition of the Institute of Traffic Engineers Trip Generation Manual.
4. Total year 2035 trips were calculated by combining the existing trips, the natural 2011-2035 growth, and the trips generated by the preferred alternative development.

Table 9. Build Scenario #2: Morgan Boulevard TOD Trip Generation

Time Period	Existing Trip Generation (2011)	Travel Demand Model Growth (2011-2035)	TOD Trip Generation	Total Trips (2035)
A.M. Peak Hour	1,472	525	1,257	3,254
P.M. Peak Hour	1,546	961	2,133	4,640

Build Scenario #3: Largo Town Center

The lack of additional analysis showing specific land use changes within the Largo Town Center required the team to assume no differences in the projections of the county's travel demand model. For this alternative, the land use was assumed to remain the same as the no-build model. This method allows for all the forecasted natural growth to occur, but would also include full-build of the currently vacant land in Largo Town Center based on existing zoning.

TRIP DISTRIBUTION

The county's travel demand model produced the trip distribution matrix, which shows the total number of trips produced and attracted to each TAZ in the model. The trip distribution matrix for the no-build alternative was assumed to remain constant for the three build alternatives.

MODE SPLIT

Mode split is typically an output of the travel demand model. The mode split results are generated based on several independent variables in the travel demand model. Among the most common factors are: residential density, household income, number of vehicles in a household, distance from the Central Business District (CBD), and availability of transit.

No-Build Scenario

As the future baseline condition by definition, the volumes produced by the no-build model incorporate the output mode split from the travel demand model.

Build Scenario #1: Central Avenue Road Diet

Improvements to the pedestrian, bicycle, and trail infrastructure as part of the road diet alternative, in conjunction with future development that would be more favorable to non-automobile trips, provides an opportunity to reduce future vehicular trips. Data from the 2010 American Community Survey[2] shows that for Prince George's County, two percent of workers 16 years and older either walked or bicycled to work. Based on this data, and assuming a conservative approach that there would be no increase in non-motorized mode share in the future, two percent of traffic was removed from the intersections of Central Avenue/Southern Boulevard and Central Avenue/Addison Road.

Build Scenario #2: Morgan Boulevard TOD

Total year 2035 trips generated by the TOD development at the Morgan Boulevard Metro station were factored using mode-split trip data by trip purpose from the travel-demand model. These data were used to account for walking, bicycling, transit, and carpooling trips. The traffic generated from the TOD were reduced based on pedestrian, bicycle, HOV 2+, HOV 3+, and transit mode share to determine the final number of vehicle trips in the A.M. and P.M. peak hours, as shown in Table 10.

Table 10. Build Scenario #2: Morgan Boulevard TOD Mode Split Reductions

Time Period	TOD Trip Generation	Work trips	Non-work trips	Transit Work Trips (15%)	Transit Non-Work Trips (5%)	Carpool Work Trips (5%)	Carpool Non-Work Trips (10%)	Ped/Bike Trips – all purposes (2%)	Final Auto Trips
A.M. Peak Hour	1,257	542	715	-81	-36	-27	-72	-25	1,016
P.M. Peak Hour	2,133	500	1,633	-75	-82	-25	-163	-43	1,745

2 http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_1YR_B08301&prodType=table).

Build Scenario #3: Largo Town Center

No mode share reductions were taken for Largo Town Center. Given the uncertainty of what future transportation improvements and land use changes would be, it was assumed that a conservative approach would be most appropriate in evaluating the suggested roadway changes.[3]

TRIP ASSIGNMENT

The fourth and final step of the modeling process takes the trips and assigns them to the roadway network.

No-Build Scenario

The trip assignment produced by the travel demand model was used for this scenario without modification.

Build Scenario #1: Road Diet

An examination of the proposed future roadway network near Southern Boulevard area south of Central Avenue suggests that travel patterns are likely to change. Proposed roadway connections that lie south of and parallel to Central Avenue, specifically the alignment that connects various sections of Cumberland Street and Brooke Road, would provide northbound traffic with alternate routes to travel towards Washington, D.C. The new route choices help disperse traffic and reduce "point-loading" at Central Avenue/Southern Avenue SE.

The proposed traffic signal at Central Avenue/Davey Street creates an opportunity for vehicle traffic originating from areas east of Chamber Ave/Larchmont Ave and destined towards Washington, D.C. to avoid the congestion on Southern Ave by using Davey Avenue to make a left-turn onto Central Avenue. Therefore, for northbound through volumes on Southern Avenue, it is assumed that a small percentage would divert to take advantage of the less-congested traffic conditions on Davey Avenue. These vehicles were routed onto Davey Street, and then proceed through the Central Avenue/Southern Avenue intersection as westbound through traffic.

The proposed new east-west street connections that would run from Addison Road west to Rollins Avenue and Suffolk Ave., would allow some of the traffic to reach Central Avenue without traveling north on Addison Road. Proposed traffic signals at Central Avenue/Davey Road and at Central Avenue/Cabin Branch Road would make it easier for vehicles to access Central Avenue from these locations and reduce congestion at the Central Avenue/Addison Road intersection. The improvement in network connectivity via additional route choices and new traffic signals would enable vehicles to seek the less congested routes.

Build Scenario #2: Morgan Boulevard TOD

This scenario focused on development at a specific and single location. Therefore, there were no adjustments needed during the trip assignment step.

Build Scenario #3: Largo Town Center

Without any changes to the land use pattern other than what was provided by the travel demand model, this scenario did not require any modifications during the trip assignment step.

3 A study of Largo Town Center market and land use is currently underway, so was unavailable for this analysis.

No-Build Scenario

The final volumes developed through the 4-step modeling process, the NCHRP 255 procedures, and final post-processing and volume balancing were entered into the Synchro 8 traffic modeling software. The Synchro model contained the transportation network improvements assumed to occur by the year 2035. The no-build lane configurations for the study area are shown in Figure 31. The Synchro model was then used to evaluate traffic operations during the A.M. and P.M. peak hours, which are summarized in Table 11 and Table 12.

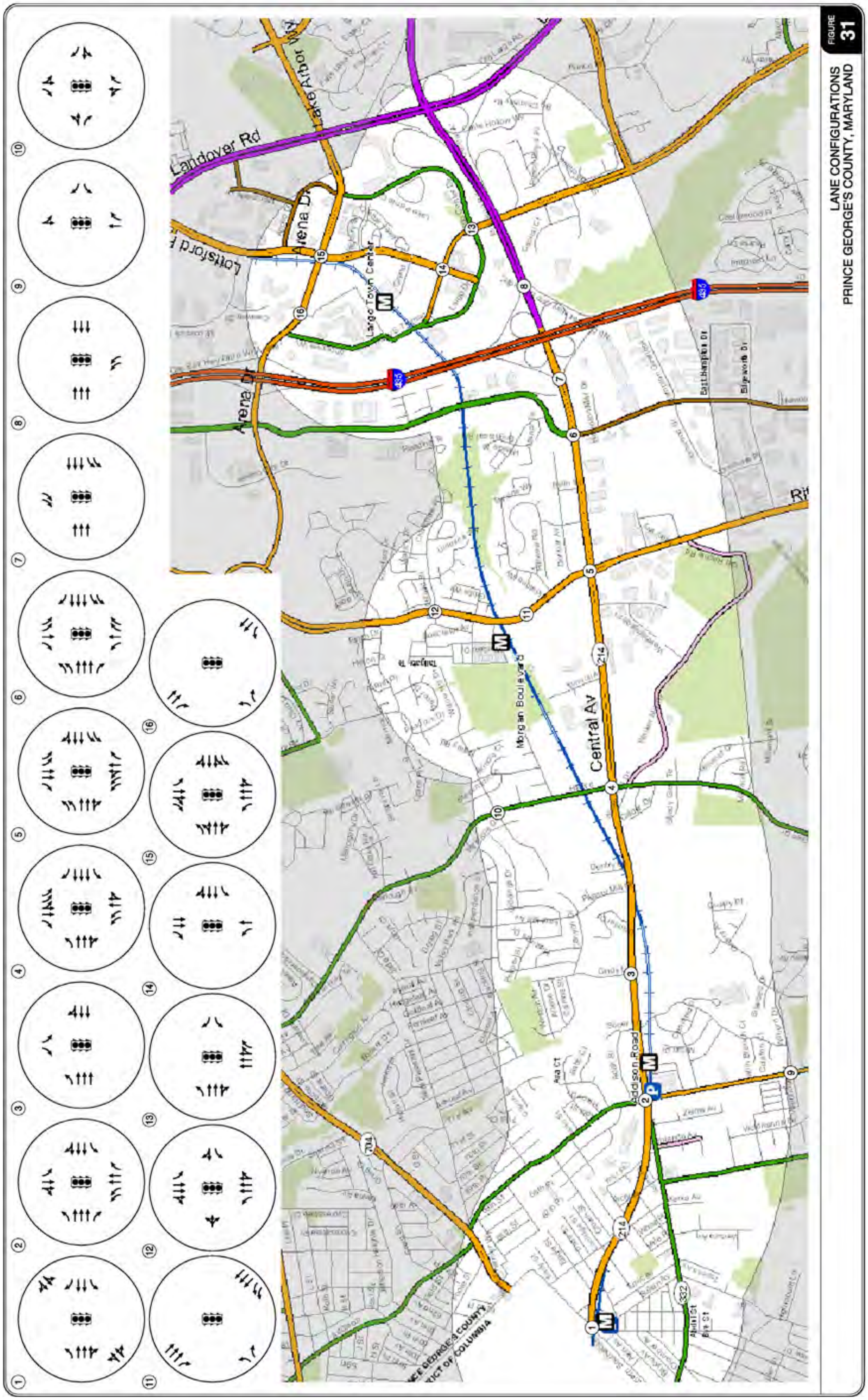
Table 11. Comparison Between 2011 Existing Conditions and 2035 No-Build Results–A.M. Peak

A.M. Peak	2011 Existing			2035 No-Build		
Central Avenue at:	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Southern Ave SE	C	27.3	0.74	F	> 80	> 1.00
Addison Rd	C	26.5	0.66	D	51.4	0.86
Cindy Ln	A	7.4	0.49	A	7.7	0.64
Hill Rd/Shady Glen Dr	C	28.7	0.63	C	28.7	0.69
Morgan Boulevard/Ritchie Rd	C	32.9	0.59	D	41.7	0.78
Hampton Park Blvd/Brightseat Rd	D	41.1	0.60	D	51.0	0.84
I-95 SB Ramp	D	41.4	0.69	C	33.1	0.71
I-95 NB Ramp	A	9.9	0.64	B	10.9	0.80

Table 12. Comparison Between 2011 Existing Conditions and 2035 No-Build Results–P.M. Peak

P.M. Peak	2011 Existing			2035 No-Build		
Central Avenue at:	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Southern Ave SE	C	22.2	0.61	C	29.6	0.82
Addison Rd	D	38.5	0.81	F	> 80	0.89
Cindy Ln	A	4.9	0.46	A	6.3	0.54
Hill Rd/Shady Glen Dr	C	25.1	0.65	C	32.6	0.73
Morgan Boulevard/Ritchie Rd	D	48.8	0.79	D	48.9	0.83
Hampton Park Blvd/Brightseat Rd	D	39.7	0.80	F	> 80	0.93
I-95 SB Ramp	C	24.1	0.76	C	32.2	0.78
I-95 NB Ramp	A	6.8	0.64	A	9.3	0.60

Figure 31. No-Build Lane Configuration



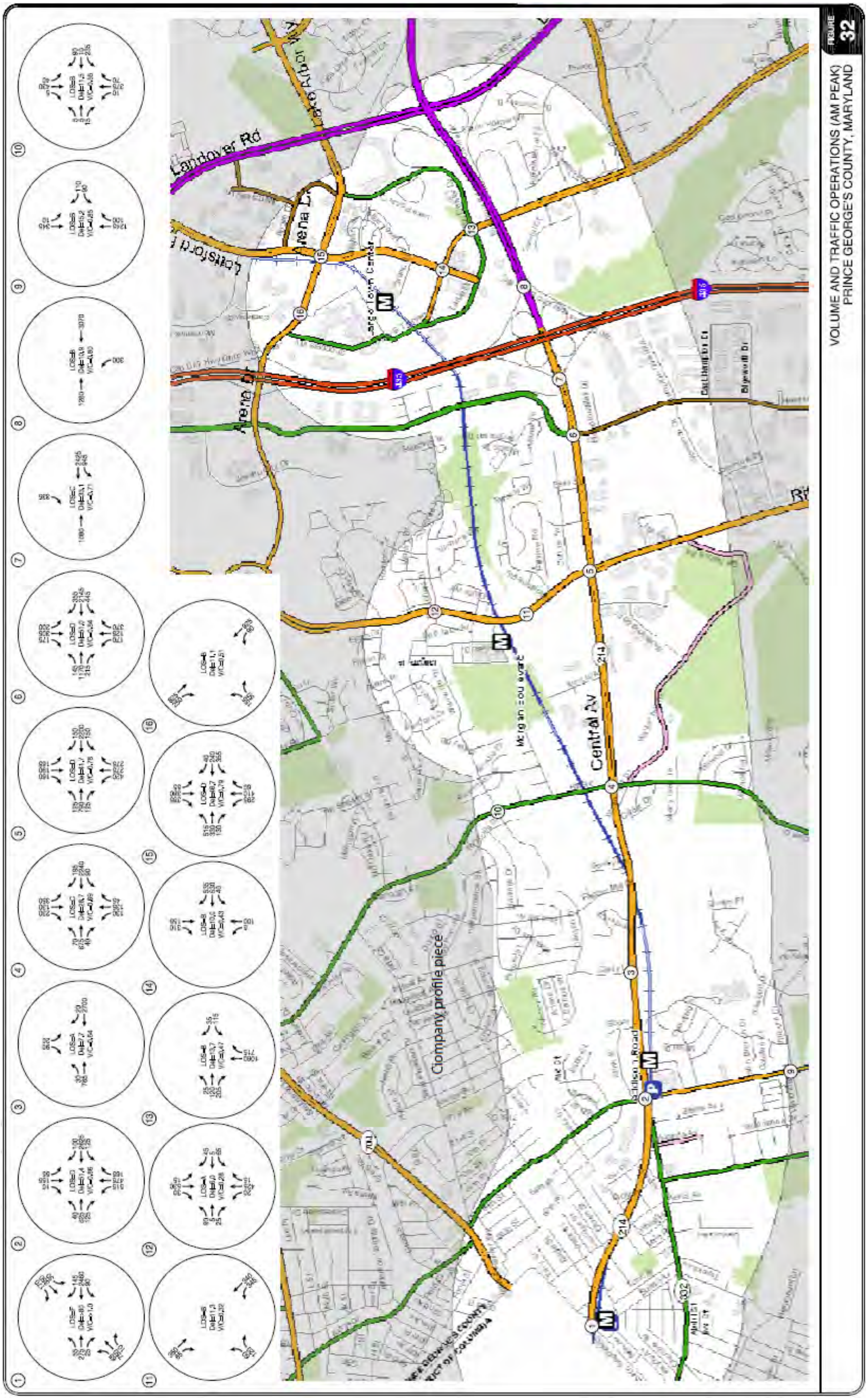
The results for the A.M. peak hour show that, for all the intersections above, with one exception, the increased traffic volumes in the 2035 no-build scenario produce operations that degrade from those in existing conditions. The exception is for results at the I-95 southbound ramp terminal. For this intersection, the increased volume contributes to an increase in the volume-to-capacity ratio, but the LOS and delay at the intersection improves. The improvement stems from signal timing optimization at the ramp terminal. For all the intersections shown in Table 11, with the exception of Central Avenue/Southern Ave SE, which operates at LOS F, the intersections meet or exceed the Prince George's County's operational standard of LOS E for signalized intersections in urban areas.

Overall, the results for the P.M. peak hour are similar to the A.M. peak hour. The increased volume in the year 2035 no-build scenario leads to degraded intersection operations at all of the above intersections. All intersections perform at or better than the urban signalized intersection standard of LOS E except for Addison Road and Brightseat Road. All of the operational results for the above intersections may be seen in Figure 32 and Figure 33, and the complete traffic output for the no-build scenario, including 95th percentile queuing results, is contained in Appendix 4.

NO-BUILD CONCLUSIONS

Household and employment growth in the study area that is reflected in the travel demand model relies on the assumption that consistent and rapid growth is going to occur along the Central Avenue corridor. Based on the results of the market study, these growth rates seem to be quite accelerated, even though they reflect the maximum build-out of all the adopted community master plans. If less growth occurs, future intersection operations, which already meet the county's intersection standards, would perform even better than what is shown above. This would also be the case in the scenario where all the forecasted household and employment growth occurs, but growth in single-occupant-vehicle trips does not increase as fast as trips are generated. In either event, based on the results for the intersections on Central Avenue, the conclusion is that the existing roadway capacity is sufficient to accommodate all of the projected growth in the year 2035.

Figure 32. No-Build Operational Results – A.M. Peak Hour



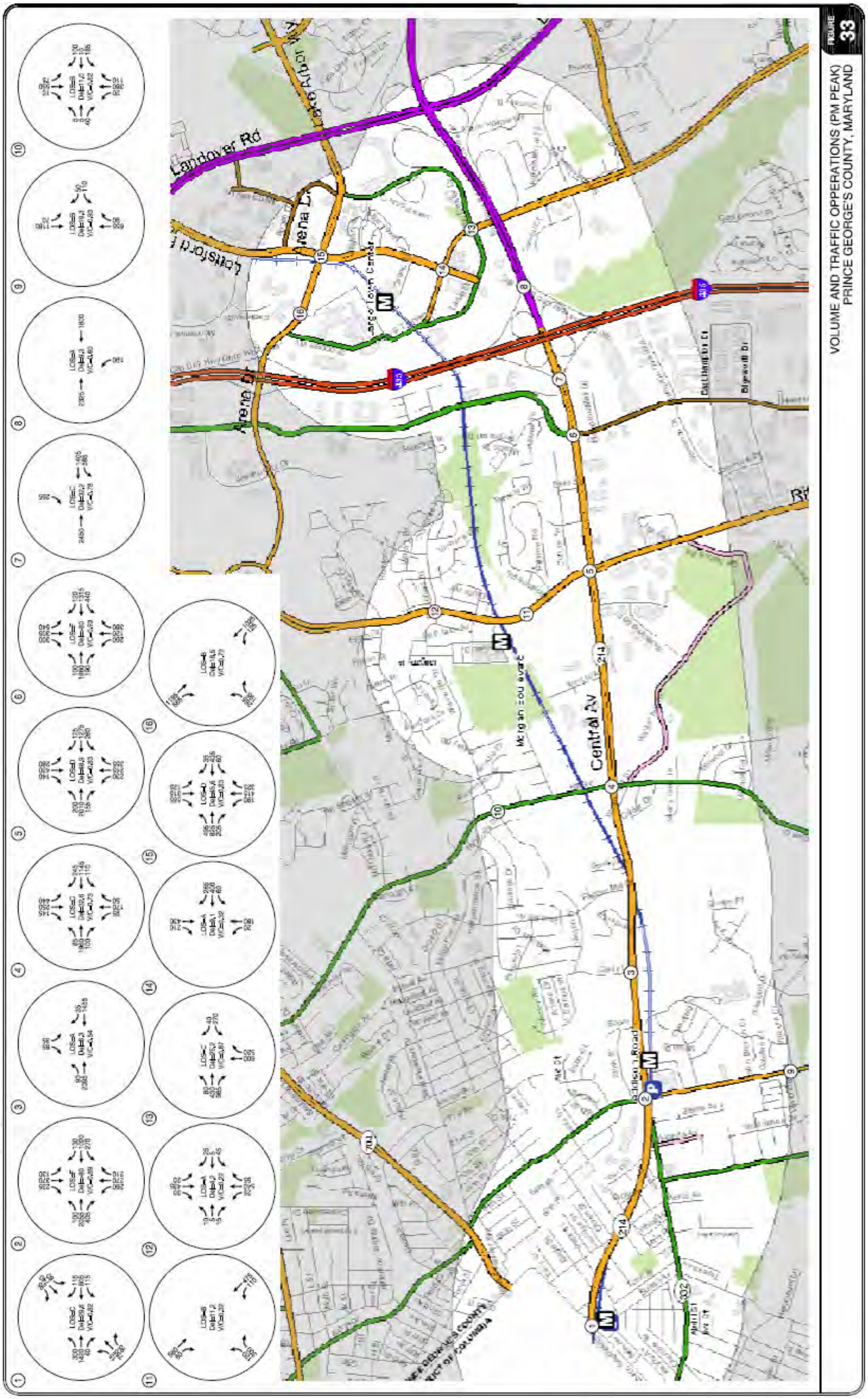


Figure 33. No-Build Operational Results – P.M. Peak Hour

Build Scenario #1: Central Avenue Road Diet Results

"Road Diet" is a term used to describe reducing the number of motor vehicle travel lanes on a road in order to accommodate facilities for public transit and active transportation modes. The benefits of the road diet are varied and can include improving the character of the road, reducing traffic speeds, improving safety, increasing pedestrian and bicycling trips, creating space for landscaping and streetscape improvements, reducing vehicle miles traveled, increasing on-street parking, and encouraging a vibrant residential and business environment. Potential negative impacts of a road diet can include increased traffic congestion during peak hours and increased travel on parallel or alternate routes.

This alternative tests the ability of Central Avenue, between Southern Avenue and Cabin Branch Road, to accommodate future traffic with a reduction from a seven-lane to a five-lane cross section. The road diet would effectively remove one lane of traffic in each direction on Central Avenue for a distance of approximately 1.1 miles. The road diet alternative modeling included the following changes to the transportation network, as shown in Figure 34:

- At Southern Ave, the eastbound through lane was removed, the westbound right-turn storage was increased, and the signal cycle length and phase splits were optimized.
- At Davey Road, the eastbound and westbound through lanes were removed, and a traffic signal was installed.
- At Addison Road, the eastbound and westbound through lanes were removed, and the signal cycle length and phase splits were optimized.
- At the entrance to the Addison Metro Station on Central Avenue, the eastbound and westbound through lanes were removed, and the intersection was signalized.
- At Cabin Branch Road, the eastbound and westbound through lanes were removed, and a traffic signal was installed.

For this section of Central Avenue, the two travel lanes can be repurposed for several alternate uses, including a transitway, bus pullouts, bus queue jumps, buffered bicycle lanes, larger sidewalks, on-street parking, or a combination of these and other transportation improvements.

Figure 34. Road Diet Lane Configurations

The analysis assumed that:

- The Central Avenue/Addison Road signal cycle remains 150 seconds long in the A.M. peak hour.
- To accommodate the higher volumes in the P.M. peak hour, the cycle length was increased to 180 seconds.
- Yellow and red clearance times were reduced to allow for greater vehicle throughput and to balance out the effect of eliminating one lane in each direction.
- Shortening of the roadway cross-section on Central Avenue allows pedestrian clearance times to be reduced.
- Signals between Southern Avenue and Cabin Branch Road were coordinated.

The signal phasing at the intersection was changed from northbound/southbound split phasing to left-turn protected. This intersection now operates with eight phases. There is an imbalance between the two northbound left turns and the single southbound left-turn lane. It appears possible to operate the left-turn phases concurrently if the median on the east leg of the intersection would be partially removed to allow the southbound left-turning vehicle paths to not overlap with the northbound left-turning vehicles. The reduced cross-section would make the median unnecessary to accommodate pedestrian movements across Central Avenue.

Three additional intersections are part of the Central Avenue road diet analysis area. They would be located at:

- Davey Road
- Addison Metro Station Entrance
- Cabin Branch Road

All three intersections are not currently signalized, and were analyzed as signalized intersections as part of this alternative. There are several benefits to adding traffic signals at these locations as part of the road diet scenario.

- As the area urbanizes and density increases, additional signals at intersections would help to slow traffic and provide additional locations for pedestrians to cross Central Avenue.
- New signals can make it easier to access retail development along Central Avenue.
- Signalizing the intersection at Davey Road would make it easier to access the Capitol Heights Metro station, and provides a nearby alternative to the congested Central Avenue/Southern Avenue intersection.
- Coordinating signal progression would maintain vehicle throughput in the corridor.
- A full signal at the intersection of Central Avenue/Addison Metro Station entrance would enhance pedestrian and vehicular access to and from the Metro station.

Results for all intersections analyzed for this alternative may be seen below in Table 13 and Table 14. Figure 35 and Figure 36 contain the HCM results and traffic volumes for the alternative. Complete HCM report outputs from Synchro, including 95th percentile queuing results, can be found in Appendix 5.

Table 13. Comparison Between 2035 No-Build and 2035 Road Diet Results–A.M. Peak

P.M. Peak	2035 No-Build			2035 Road Diet		
Central Avenue at:	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Southern Avenue SE	F	> 80	>1.00	E	75.2	> 1.00
Davey Road[1]				A	10.3	0.83
Addison Road	D	51.4	0.86	E	66.9	0.97
Addison Road Metro Station Entrance[1]				D	51.7	1.00
Cabin Branch Road[1]				C	30.8	0.96

[1]Unsignalized in the No-Build scenario

Table 14. Comparison Between 2035 No-Build and 2035 Road Diet Results–P.M. Peak

P.M. Peak	2035 No-Build			2035 Road Diet		
Central Avenue at:	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Southern Avenue SE	C	22.2	0.61	D	39.8	0.98
Davey Road1				B	13.3	0.70
Addison Road	D	38.5	0.81	E	73.6	> 1.00
Addison Road Metro Station Entrance1				C	29.3	0.94
Cabin Branch Road1				B	11.6	0.82

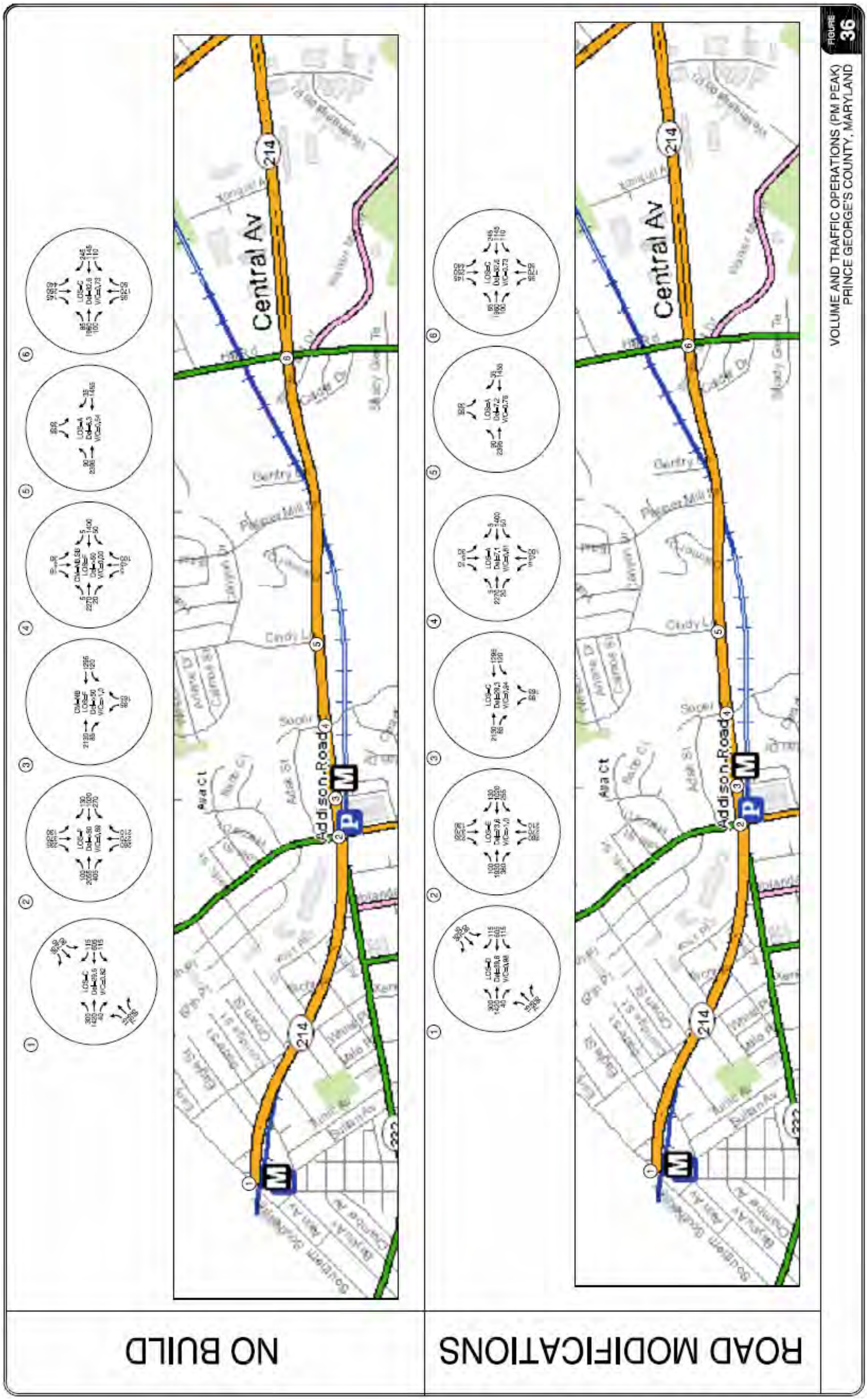
[1]Unsignalized in the No-Build scenario

ROAD DIET CONCLUSIONS

Based on the operational results, which were derived from the county’s travel demand model, post- processing, pedestrian/bicycle mode share, and data from the market study, as well as the addition of three new traffic signals and alterations to existing timing settings, it appears that a road diet along Central Avenue would meet the Prince George's County operational standards for the A.M. and P.M. peak hours. While assumptions about growth and signal operations can vary, the analysis shows that a road diet along Central Avenue would meet standards while providing many other community, land use and livability benefits.

Figure 35. Road Diet HCM Results – A.M.

Figure 36. Road Diet HCM Results – P.M. Peak



Build Scenario #2: Morgan Blvd TOD

The second Build alternative examined the future traffic operations of, and potential roadway modifications needed, near the Morgan Boulevard Metro Station to support a planned transit-oriented development. This section discusses this alternative, provides the results of the operational analysis, and assesses potential opportunities for roadway modifications that more effectively support transit-oriented development than current conditions.

Morgan Boulevard is currently an eight-lane arterial roadway providing access to the Morgan Boulevard Metro Station, several housing developments, and FedEx field. The study area for this analysis roughly includes the area north of Central Avenue, south of FedEx Field, east of Hill Road, and west of Brightseat Road. Today, the area's primary land uses are residential housing units (single-family detached, townhouse, and apartment), a small amount of retail, and a middle school. Morgan Boulevard Metro Station is a key transportation feature and includes a large park-and-ride lot.

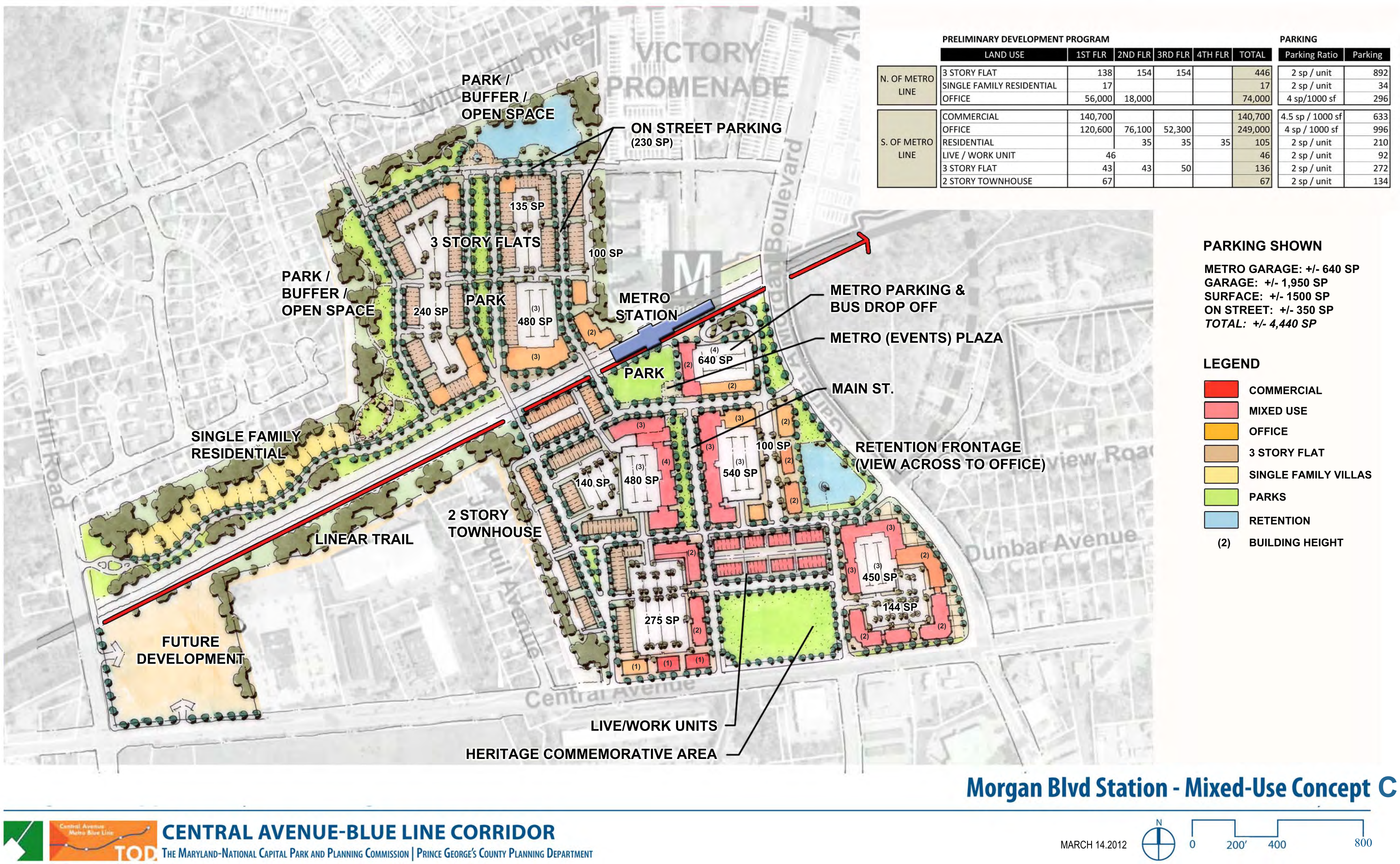
The county's preferred alternative for the future analysis is the "Mixed Use Concept A." A rendering of the concept may be seen in Figure 8. The land uses as part of the preferred alternative provided the inputs into the 4-step modeling process was previously described. After the volumes were produced through the modeling process, a single post-processing modification was applied. The reason for the post-processing step was to normalize the results of the hand-adjusted trip generation and mode split steps with the travel demand model results to fully account for the effects of the TOD alternative, and adjust the year 2035 model volumes for use in Synchro. Appendix 6 contains the spreadsheet calculations for all the analysis steps.

Table 10 shows a comparison of the adjusted southbound volumes at Central Avenue/Hill Road and at Central Avenue/Morgan Boulevard based on the Morgan Boulevard TOD scenario and the no-build volumes from the model. The percent reduction from the no-build to the TOD model is shown in red and in parentheses.

Table 15. Comparison of No-Build and Morgan Boulevard TOD southbound approach volumes, 2035

Intersection	2035 No-Build		2035 Morgan Boulevard TOD	
	A.M. Peak Hour	P.M. Peak Hour	A.M. Peak Hour	P.M. Peak Hour
Central Avenue/Morgan Boulevard	515	850	482 (-6.4%)	823 (-3.2%)
Central Avenue/Hill Road	710	835	687 (-3.2%)	798 (-4.4%)

Figure 37. AECOM Morgan Boulevard Development Scenario: Mixed Use Concept 'A' Alternative



	LAND USE	1ST FLR	2ND FLR	3RD FLR	4TH FLR	TOTAL	Parking Ratio	Parking
N. OF METRO LINE	3 STORY FLAT	138	154	154		446	2 sp / unit	892
	SINGLE FAMILY RESIDENTIAL	17				17	2 sp / unit	34
	OFFICE	56,000	18,000			74,000	4 sp/1000 sf	296
S. OF METRO LINE	COMMERCIAL	140,700				140,700	4.5 sp / 1000 sf	633
	OFFICE	120,600	76,100	52,300		249,000	4 sp / 1000 sf	996
	RESIDENTIAL		35	35	35	105	2 sp / unit	210
	LIVE / WORK UNIT	46				46	2 sp / unit	92
	3 STORY FLAT	43	43	50		136	2 sp / unit	272
	2 STORY TOWNHOUSE	67				67	2 sp / unit	134

Synchro was used to build traffic models to analyze the No-Build and Morgan Boulevard TOD scenarios at the intersection level. The intersections analyzed in the model are listed below:

- Hill Road/Willow Hill Road
- Central Avenue/Hill Road
- Central Avenue/Morgan Boulevard
- Metro Entrance/Morgan Boulevard
- Ridgefield Boulevard/Morgan Boulevard

The Morgan Boulevard TOD Synchro model reduced southbound volumes on Morgan Boulevard and Hill Road based on the adjustments shown in Table 10. The adjusted volumes for Central Avenue/Hill Road and Central Avenue/Morgan Boulevard were balanced with the other study intersections along Hill Road and Morgan Boulevard in Synchro. The Morgan Boulevard TOD Synchro model removed a through lane in each direction on Morgan Boulevard and optimized the signal timing. The removal of the through lane could provide additional roadway space for bicycle lanes, a transitway, or transit-specific priority infrastructure such as queue jumps or bus pullouts. The new lane configurations for the study area may be seen in Figure 9.

The HCM calculations were used in Synchro to analyze the volume-to-capacity (v/c) ratio and level of service for each of the intersections. Figure 10 and Figure 11 show a comparison of the lane configurations and A.M. and P.M. operations for the no-build and Morgan Boulevard TOD scenarios. Complete HCM report outputs from Synchro, including 95th percentile queuing results, can be found in Appendix 6.

Figure 38. No-Build and Morgan Boulevard TOD Scenario-Lane Configurations

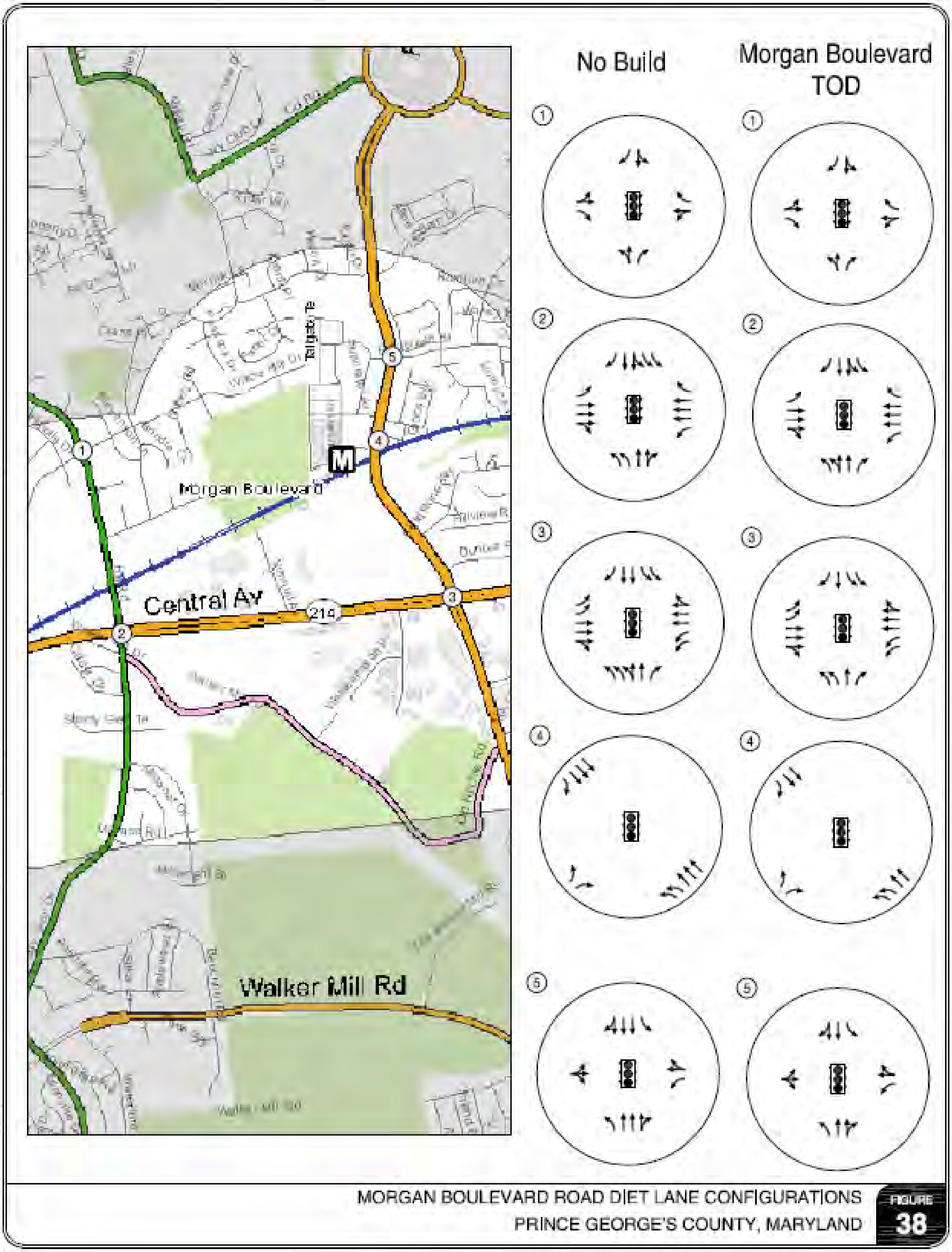


Figure 39. No-Build and Morgan Boulevard TOD Scenario – A.M. Peak Hour

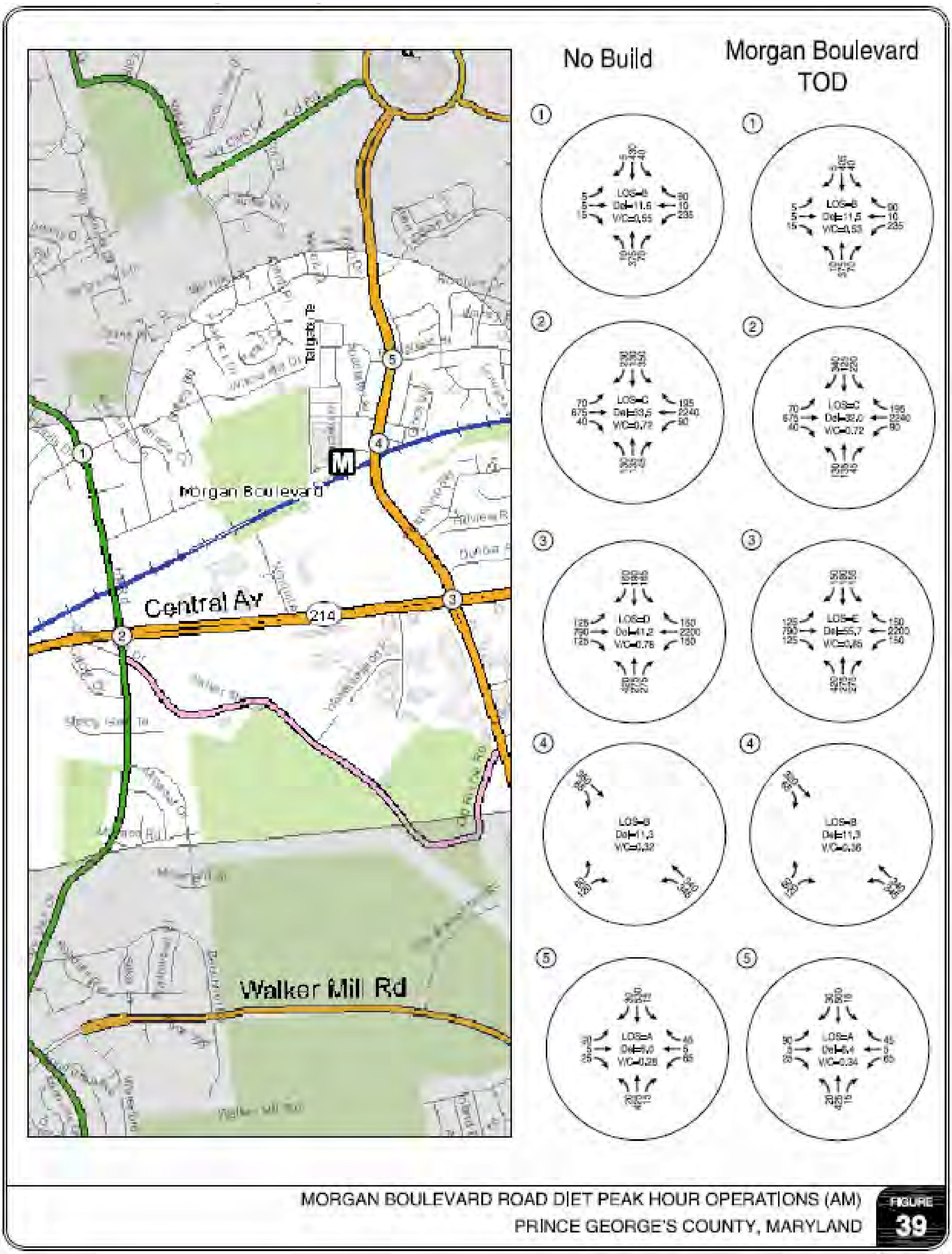
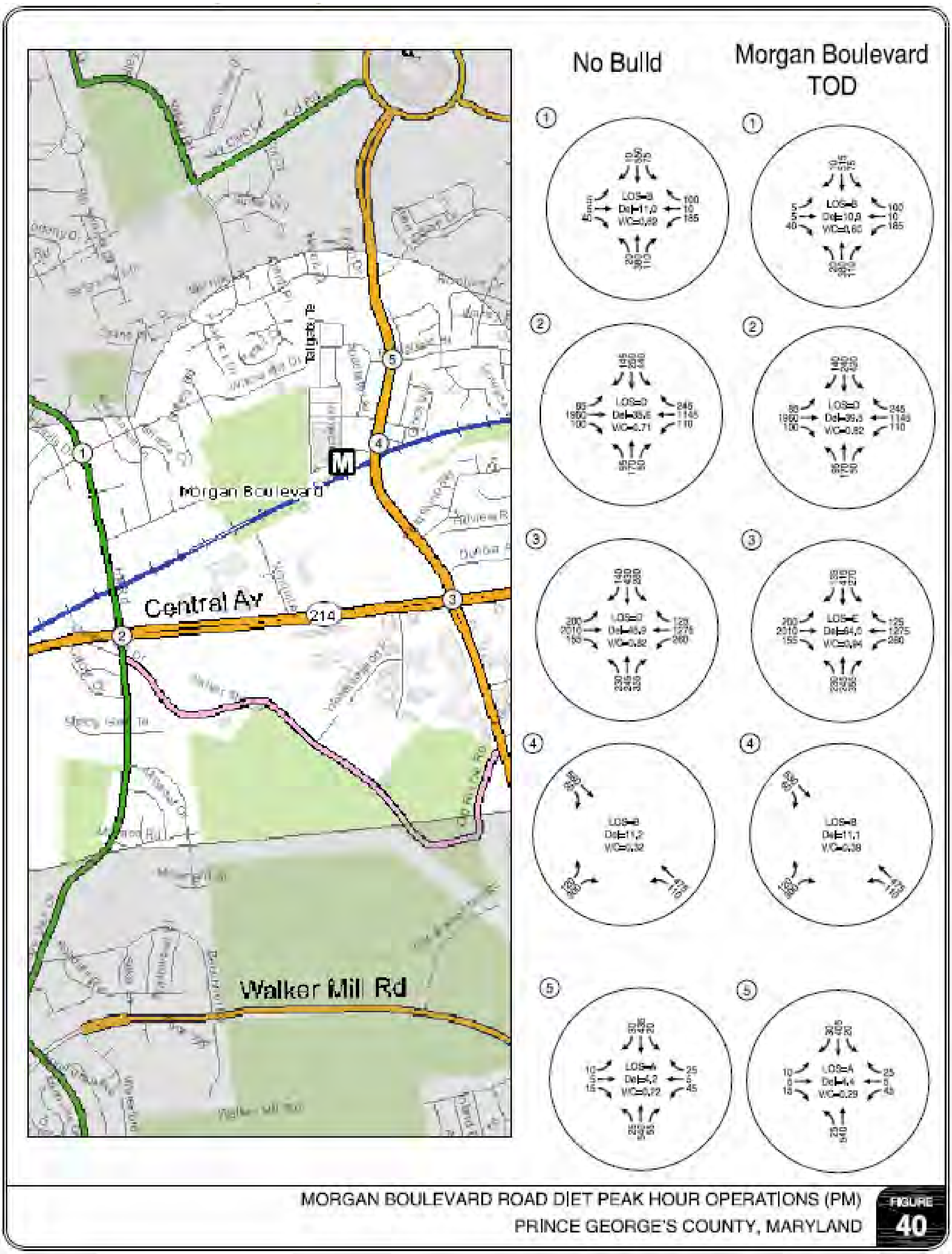


Figure 40. No-Build and Morgan Boulevard TOD Scenario – P.M. Operations



MORGAN BOULEVARD CONCLUSIONS

The following are the results and conclusions for the Morgan Boulevard TOD analysis:

- The county's model predicts trip generation based on the maximum possible build-out for the area.
- Market-based economic projections for development suggest that the study area will grow slower than the travel demand model suggests.
- Traffic volumes projected based on trip-generation methods for the Morgan Boulevard TOD alternative indicate that traffic volumes are expected to be modestly lower than the model projections for maximum build-out.
- Morgan Boulevard has substantial extra capacity and would operate acceptably with the removal of a lane in each direction and still accommodate traffic volumes in 2035.
- All study intersections would operate at a LOS E or better and have a v/c ratio below 1.0.
- All study intersections meet the urban signalized intersection standards for Prince George's County.
- The lane-reduction treatment on Morgan Boulevard would not produce failing results at any of the study intersection.

Based on the findings, it is recommended that the county consider removing a lane in each direction on Morgan Boulevard. Removing a lane in each direction provides the opportunity to allocate roadway space to accommodate other modes (walking, biking, transit, etc.) while still allowing the roadway to operate acceptably for vehicles. This roadway space could be reallocated to support alternative modes of transit and create a more walkable, bikeable, and/or transit-friendly street.

Build Scenario #3: Largo Town Center Results

The third build alternative examined was a high-level concept analysis at the Largo Town Center, which lies east of I-495, north of Central Avenue (MD 214), west of Landover Road (MD 202) and south of Arena Drive. This area contains a mix of land uses, including a large retail shopping center, a number of business parks, and residential developments, one of which is clustered around a small lake.

Largo Town Center is well-served by a number of transportation facilities. It is adjacent to I-495, which provides access to a series of large arterials within the study area via the interchanges at Arena Drive and Central Avenue (MD 214). Largo Town Center can also be reached via a number of connections to Landover Road to the east, by Lottsford Road to the north, and from Harry S Truman Drive to the south. WMATA's Blue Line terminates at Largo Town Center Metro Station, which contains a park-n-ride facility with over 2,300 parking spaces. Many of the residential developments, while walking distance to the Metro station, require out-of-direction travel to reach it. The sidewalk system is well-developed, but distances between the different land uses make the area less walkable than it could be. There are few bicycle and trail facilities that would make non-motorized travel safer and more attractive as an alternate mode of transportation.

Several large, undeveloped parcels in Largo Town Center provide opportunities for transit-oriented development. WMATA owns two parcels adjacent to the Metro station that total almost 25 acres. Three other parcels, totaling almost 30 acres, are also adjacent to and lie to the east and north of the station. Two other developable parcels are located in the study area, and they total approximately 28 acres combined.

The Largo Town Center alternative would seek to implement elements of the Complete Streets policies, discussed earlier in this report, with a goal to improve overall network connectivity. Connecting residential parcels together and providing new ways to access the arterial network would encourage residents to walk or bicycle to the Largo Town Center Metro station, shopping, and to work. Removing travel a lane in each direction on the arterial network allows the roadway space to be repurposed for bike lanes, wider sidewalks, on-street parking, or transit infrastructure improvements such as dedicated bus lanes, queue jumps, or bus- transit signal priority.

The following four intersections were analyzed as part of the alternative, with the modifications at each location noted. A diagram showing the reconfigured proposed intersections, contrasted with the No-Build, may be seen in Figure 41.

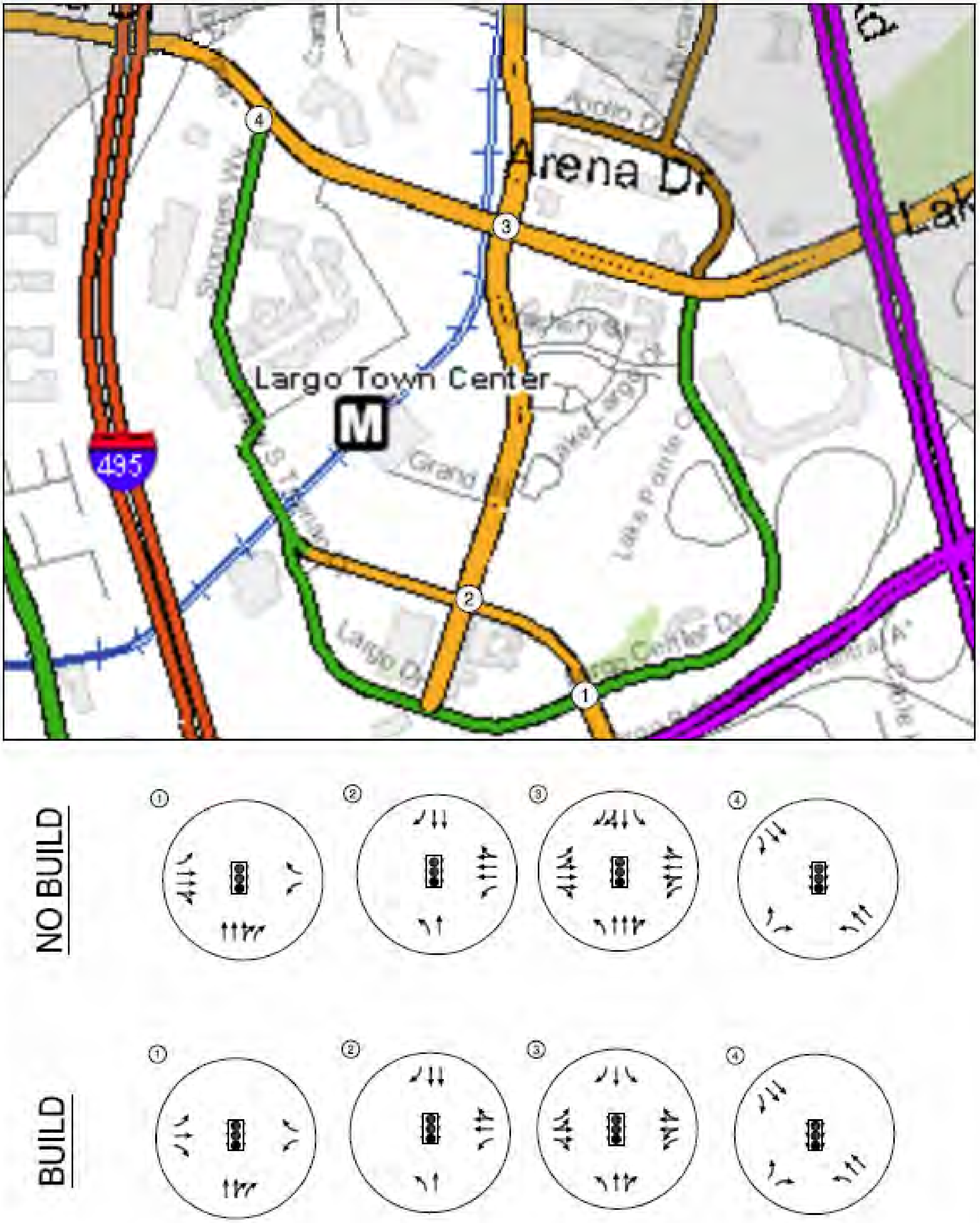
- Arena Drive/Shoppers Way:
    - No changes made to the network at this location.
- Arena Drive/Lottsford Road:
    - Alter the southbound approach to include a left-turn, through lane, and right-turn lane.
    - Alter the eastbound approach to include a left-turn lane, a shared left-through lane, and a shared through-right lane.
    - Alter the northbound approach to include a left-turn lane, a through lane, and a shared through-right lane.
    - Alter the westbound approach to include a left-turn lane, a shared left-through lane, and a shared through-right lane.
- Harry S Truman Drive/Lottsford Road:
    - Alter the westbound approach to include a left-turn lane, a through lane, and a shared through-right lane.
- Harry S Truman Drive/Largo Town Center Drive
    - Alter the eastbound approach to include a left-turn lane, a through lane, and a right-turn lane.
    - Alter the northbound approach to include a through lane, a shared through-right lane, and a right-turn lane.

Preliminary examination of the roadway network showed that it might be possible for these locations (and for the connecting roads) to meet or exceed the county's standard of LOS E for signalized intersection operations. Further confirmation was necessary and Synchro was used to complete the analysis.

LARGO TOWN CENTER CONCLUSIONS

The Synchro model was produced by utilizing the existing traffic volumes created from the No-Build results from the travel-demand model and subsequent post-processing and network balancing. Changes to the transportation network were made. Signal cycles were adjusted as needed, and optimized to maintain progression and coordination with neighboring

Figure 41. No-Build and Largo Town Center Scenario-Land Configurations



LARGO TOWN CENTER LANE CONFIGURATIONS
PRINCE GEORGE'S COUNTY, MARYLAND
FIGURE 41

intersections. Pedestrian clearance times were reduced due to the reduced cross-sections at the reconfigured intersections. Lane assignments were altered as needed to benefit vehicular movements based on future forecasted turning movements.

Table 16 and Table 17 provide the results of the Synchro analysis for the four intersections analyzed in the study area. The results of the Synchro analysis shows that with the lane reductions and intersection modifications, all four study intersections degrade from the No-Build scenario to the Largo Town Center scenario. This is to be expected, however, because vehicle capacity was removed in all cases, with the exception of the intersection of Shoppers Way/Arena Drive. Despite the reduction in capacity, all four intersections continue to perform at, or in excess of, the county's standard of LOS E or better for signalized intersections. This is the case even though the No-Build volumes were not reduced as in the case with the other two Build scenarios. Full results may be seen in Figure 42 and Figure 43. Complete HCM report outputs from Synchro, including 95th percentile queuing results, can be found in Appendix 7.

Table 16. Comparison Between 2035 No-Build and 2035 Largo Town Center Results–A.M. Peak

A.M. Peak	2035 No-Build			2035 Largo Town Center		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Harry S Truman Dr/Largo Town Center Dr	B	13.7	0.47	B	16.4	0.61
Lottsford Rd/Harry S Truman Dr	B	10.0	0.43	B	10.8	0.49
Lottsford Rd/Arena Dr	D	46.7	0.79	E	78.2	0.92
Shoppers Way/Arena Dr	B	11.1	0.51	B	11.1	0.51

Table 17. Comparison Between 2035 No-Build and 2035 Largo Town Center–P.M. Peak

P.M. Peak	2035 No-Build			2035 Largo Town Center		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Harry S Truman Dr/Largo Town Center Dr	C	25.2	0.67	C	31.2	0.87
Lottsford Rd/Harry S Truman Dr	A	9.1	0.32	A	9.8	0.38
Lottsford Rd/Arena Dr	D	45.6	0.83	E	67.0	0.96
Shoppers Way/Arena Dr	B	18.5	0.72	B	18.5	0.72

Were the vacant properties to be developed as mixed-use, transit-oriented, or less intensely than the future travel-demand model predicts, the impact of the lane reduction on the nearby roadways would have less impact. In either case, the analysis shows that there currently is, and will continue to be, an abundance of capacity in Largo Town Center, given the currently planned growth.

Figure 42. No-Build and Largo Town Center Scenario – A.M. Operations

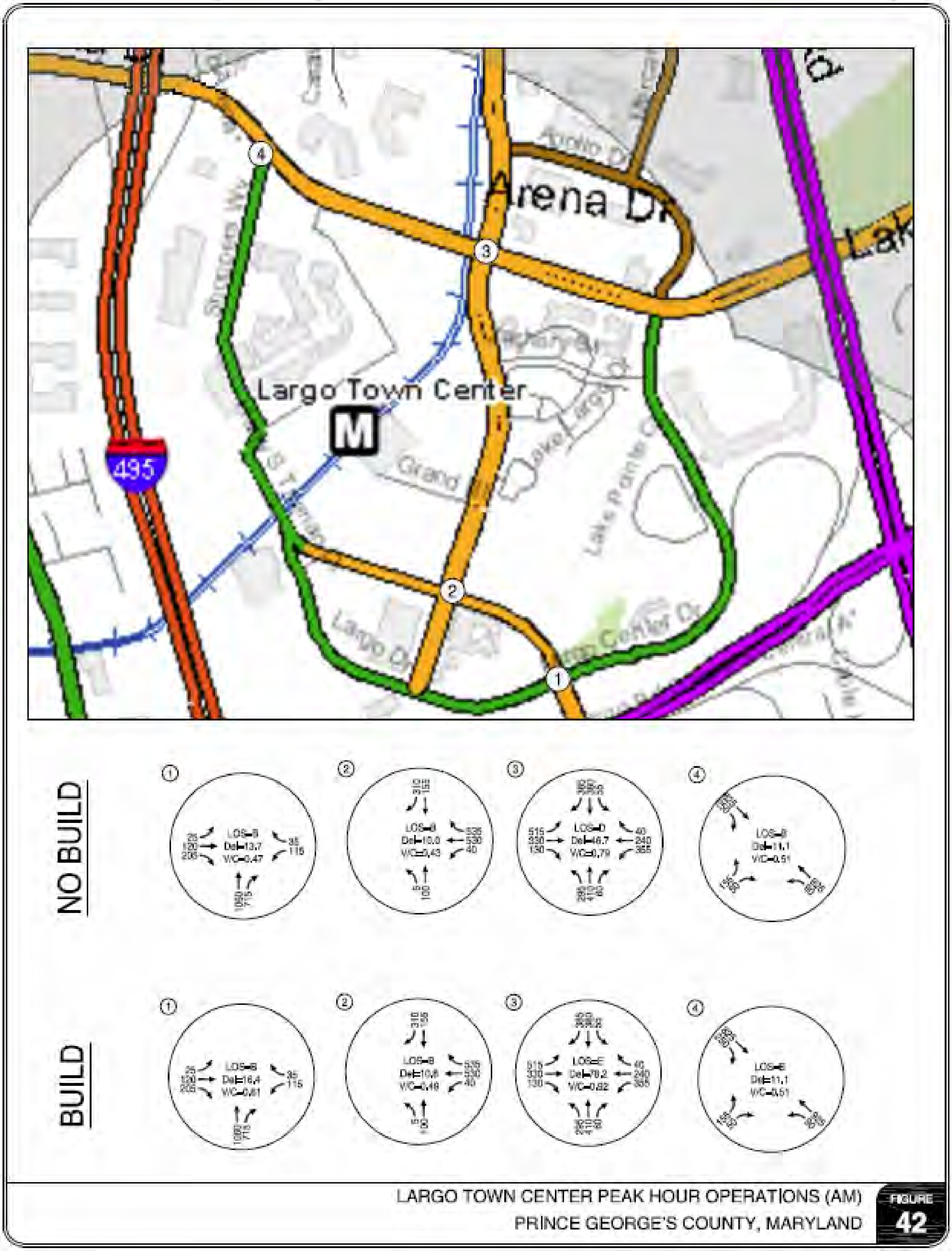
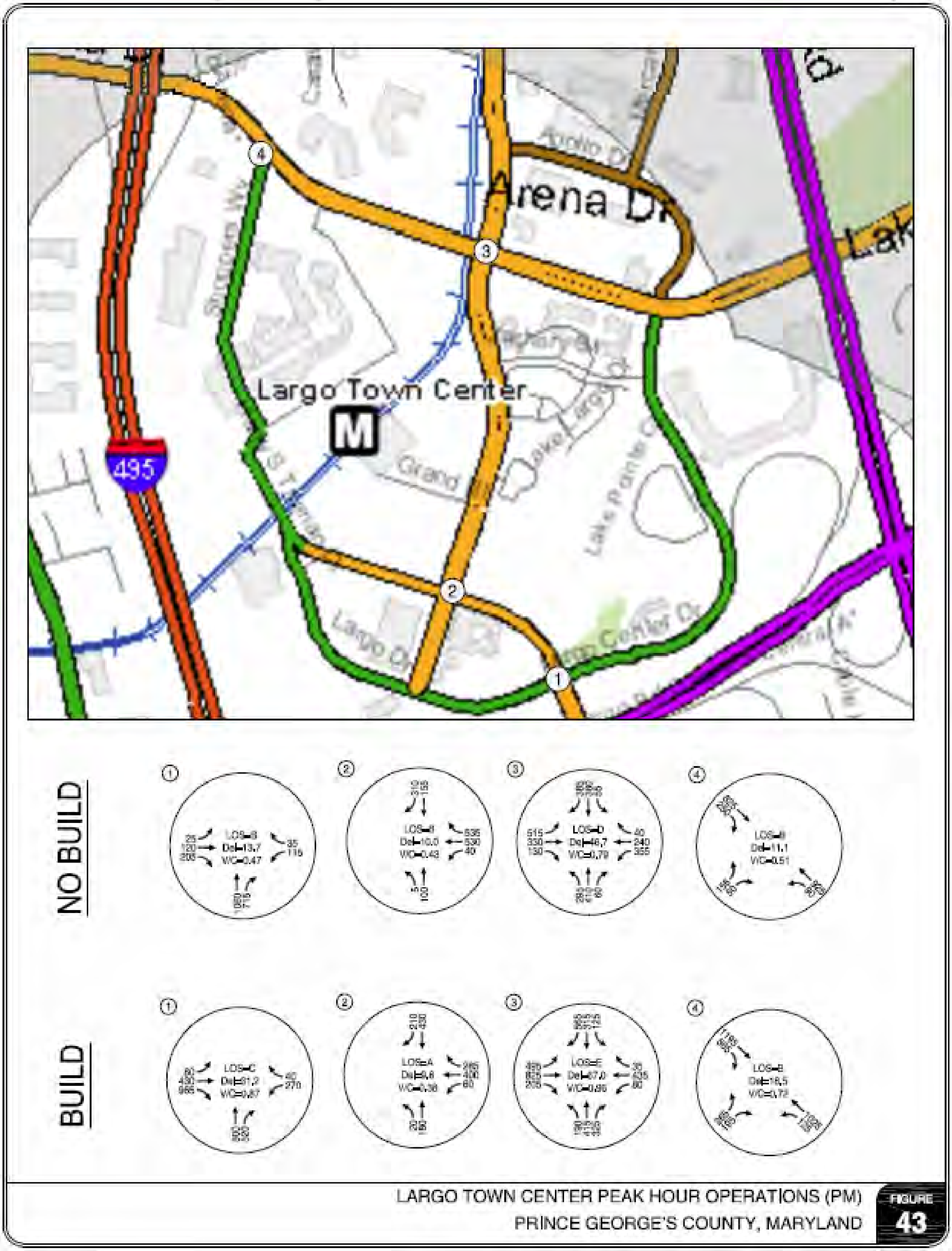


Figure 43. No-Build and Largo Town Center Scenario – P.M. Operations



The following non-motorized transportation improvements are recommended for Largo Town Center in conjunction with the roadway changes above. These improvements would be helpful in implementing Complete Street policies, improving network connectivity, and increasing transit, bicycling, and walking in the study area. Not all improvements are necessary and they may be implemented in phases as development occurs and money becomes available.

Pedestrian improvements:

- Add a traffic signal and/or crosswalk at the intersection of Largo Town Center Drive and the entrance to the residential development across from the ramp to MD 214.
- Extend the sidewalk from the Largo Town Center Metro Station to the intersection of Lottsford Road and Zachery St.
- Add crosswalks from the residential developments east of Lottsford Road to the vacant parcels on the west side of Lottsford Road.
- Provide more access points from the residential developments east of Lottsford Road onto Lottsford Road.
- Add a crosswalk on the north side of Lottsford Road at Grand Boulevard.
- Add a crosswalk at the intersection of Arena Drive and Shoppers Way.
- Create a more direct connection from Lottsford Road to the back side of the Capital Center shopping center.

Bicycle improvements:

- Create a bike boulevard from the intersection of Arena Drive/Lottsford Road to Harry S Truman Drive/Lottsford Road and then south across Central Avenue.
- Improve bicycle parking at the Largo Town Center, the Capital Center shopping mall, and at the shopping center in the southeast quadrant of Arena Drive/Largo Town Center.

The plan proposes a combination of pedestrian, bicycle, and roadway repurposing (potentially creating a better-functioning transit network), and support of new connections with new development or redevelopment. The modeled analysis of Largo Town Center applied to other parts of the corridor suggests that new connections permit the existing network of streets to operate at much higher levels of efficiency and reinforce the urban boulevard concepts for Central Ave and Morgan Boulevard.

Section 8
Implementation

IMPLEMENTATION

Short-Term Projects

The Central Avenue Phase 3 work resulted in the identification of short-term projects that can be implemented in the next 12 to 36 months. These projects arose from extensive field work, analysis, and public input at a series of public engagement meetings. Each of these projects is described in this document in a single page. These one-page descriptions present the project simply and with key highlights. Figure 44 shows the location of each project with a map key reference. A legend includes the name for each project and each 'one-pager' includes this Map Key.

These projects were selected and justified through a process that included field visits, public input, stakeholder agency review, and a planning level feasibility and constructability analysis. Planning level traffic analysis was completed for several projects, primarily for the purpose of determining if the recommended traffic signal or road diet is warranted. Appendix 8 includes traffic analysis results for the Davey Street Road Diet project. Appendix 9 includes planning level cost estimates for short-term projects.

Overall, the short-term projects can be characterized as:

- Offering immediate solutions to priority community-identified needs. The Subregion 4 Transit- Oriented Development Implementation Project has placed a high value on public input and on being responsive to that input.
- Can be built quicker because they are relatively inexpensive and fit within existing public right-of-way (ROW). Transforming the transportation network can take time and be costly. Working within the existing Central Avenue public ROW to make substantial progress towards building a multimodal network is a critical tactic.
- Can introduce changes to existing policy as pilot initiatives that can be tested and help to remove administrative barriers. The Central Avenue Phase 3 project proposes an approach to the transportation land use connection that builds on Complete Streets, Complete Network, and Complete Community principles. These require a change in policy and practices – a process that can take time. The short-term projects identified here use existing policy in a way that supports the longer term vision for Central Avenue.

The one-page sheets that follow this introduction provide additional information on each project. These projects are ready to move towards implementation. The next steps for each are identified in Table 18.

Table 18. Short-Term Project Next Steps

Project	Next Steps
S-1. Fully Operational Signal at Entrance to Addison Road Metrorail Station	• SHA to complete review of analysis.
S-2. Fully Operational Signal at Cabin Branch Road	• Review decision by SHA not to pursue the traffic signal.
S-3. Central High School Sidepath and School Entrance Improvements	• Develop a strategy for shortening the distance between signalized pedestrian crossings, especially near the Metrorail station.
S-5. Central Avenue Corridorwide Bus Stop Improvements	• Work with county DPW&T and Prince George's County Public Schools to assess field conditions and develop plan to make improvements.
S-6. Davey Street Road Diet	• Determine availability of funds in WMATA's FY 2013 CIP budget for pedestrian and bicycle transit access improvements. • Use existing field work and recommendations completed in 2011 as basis for improvements. • Complete field engineering site visits for road diet.
S-7. Central Avenue connector Trail Feasibility Study and Implementation Plan	• Develop strategy for a grant application from the MDOT Bikeways Program Grant and the WMATA FY 2013 CIP budget for pedestrian and bicycle transit access improvements. • Determine other funding sources for the feasibility study, such as the Council of Governments TLC program.
S-8. Watts Branch Trail Connection	• Coordinate with DC DOT. • Design connection in FY 2013. • Apply for MDOT Bikeways grant in spring 2013 to build connection.
S-9. Maryland Park Drive Conversion to Neighborhood Greenway	• Continue to work with community groups to reach a consensus. • Develop an implementation plan that includes a timeline and funding source. • Identify early action items that can be completed through a Better Blocks approach.
S-10. Southern Avenue-East Capitol Street Gateway into Prince George's County	• Coordinate with DC DOT.

*Note to reader: Project S4 is missing from the project list and map. This project was removed as a short-term project. The remaining projects were not re-numbered in order to preserve the number for these projects established in prior work.

Figure 44. Short Term Projects

Project Name

Fully Operational Signal at Entrance to Addison Road Metrorail Station

Map Key **S1**

Responsible Agency
Maryland State Highway Administration

Key Supporting Agencies
Prince George's County Department of Public Works & Transportation
Washington Metropolitan Area Transit Authority

Project Description
This project will address safety, mobility, and access needs at the entrance to the Addison Road Metro Station on Central Avenue about 500 feet east of Addison Road. The recommendation is to install a fully operational signal that includes a pedestrian walk cycle to accommodate the heavy pedestrian flow (see Supporting Analysis below) across Central Avenue at that location. Few motorists yield to pedestrians in the current marked crosswalk. The improvements will also include a countdown pedestrian signal, high visibility crosswalk striping, and stop bars. The recommended changes would ensure this location meets FHWA best practices for installation of marked crosswalks on arterials.

This location is a high priority for the community.

It was also the location of a pedestrian fatality in the last several years.

Benefits:

√ Reduces the risk of pedestrian crashes by creating time and space for pedestrians to cross the roadway.

√ Ensures the marked crosswalk meets FHWA best practices.

Supporting Analysis
Traffic counts – location meets warrants for full signal: 161 pedestrians crossing MD 214 during the pedestrian peak hour, which exceeds the minimum of 133 pedestrians per hour needed to meet 2009 Manual of Uniform Traffic Control Devices (MUTCD) signal warrants.

Crash data*- as many as 75 crashes between Addison Road and the Metro station entrance, many involving pedestrians and bicyclists. Crashes at this location that are especially risky for pedestrians include motorists who are speeding and driving under the influence; and nighttime crashes that occur on wet pavement.

Estimated Cost:
$100,000

ROW Required:
None

Potential Funding Resources:
- Maryland SHA funds 76 and 78
- WMATA pedestrian and bicycle funds

Project Name

Fully Operational Signal at Cabin Branch Road

Map Key **S2**

Responsible Agency
Maryland State Highway Administration

Key Supporting Agencies
Prince George's County Department of Public Works & Transportation
Washington Metropolitan Area Transit Authority

Project Description

This project will address safety, mobility, and access needs at the intersection of Central Avenue and Cabin Branch Road. Install a traffic signal that includes a pedestrian walk cycle at the intersection at Cabin Branch Road and Central Avenue. This signal will also address left turn needs on Central Avenue. Complementary improvements include high visibility crosswalk striping and stop bars. This signal is part of a series of crossing improvements near the Addison Road Metro Station.

Benefits:

- √ Creates a second protected pedestrian crossing for Metrorail station access and uses the bus stops along Central Avenue.
- √ Provides a safer crossing for students and staff traveling to Central High School.

Photo 1. Pedestrians use this intersection to cross Central Avenue when traveling to and from the Metrorail station and Central High School.

Supporting Analysis

This location meets warrants for a signal (meets Warrant 2 and Warrant 3, Condition B). MD SHA is not inclined to support a signal because there are no line of sight issues, nor are there delays for motor vehicles turning left from Cabin Branch Road/Soper Lane onto Central Avenue.

Crash data – Up to 40 pedestrian crashes in the intersection vicinity, including a fatality.

Estimated Cost:
$125,000

ROW Required:
None

Potential Funding Resources:
SHA – Fund 78, Fund 79, SRTS, Fund 84, TEP

Project Name

Central High School Sidepath and School Entrance Improvements

Map Key S3

Responsible Agency
Prince George's County Department of Public Works & Transportation

Key Supporting Agencies
Prince George's County Public Schools

Project Description

This project will address safety and mobility needs along Cabin Branch Road and at the high school entrance for students traveling to and from school. Install a sidepath on the east side of Cabin Branch Road between Central Avenue and the Central High School entrance. Install geometric and striping features at the school entrance, such as curb extensions, high visibility crosswalks, and a rectangular rapid flash beacon. This project is related to the full traffic signal proposals for the intersection of Cabin Branch Road and Central Avenue. Prince George's County Public Schools owns the property on the east side of Cabin Branch Road. The school entrance currently lacks crosswalks and other pedestrian crossing features.

<u>Benefits:</u>

√ Improve crossing conditions for all travelers (students, faculty, staff, and visitors) when entering or leaving the school.

√ Improved walking conditions to the school along Cabin Branch Road for students living to the east.

Photo 1. Central High School entrance, looking north along Cabin Branch Road.


Photo 2. A curb extension and high visibility crosswalk such as these are recommended for the school entrance.

Supporting Analysis

<u>Intersection Operations:</u>
The high school entrance is the sole access point to the school for motorized traffic and one of a handful for non-motorized traffic. The high usage rate of this entrance, and the fact that it accommodates all modes, creates potential conflicts between motor vehicles and walkers/bicyclists. No traffic controls or pedestrian crossing facilities are present to organize and support travel in and out of the school campus.

Estimated Cost:
$255,000

ROW — None

Potential Funding Resources:

- Prince George's County Public Schools — Capital Improvement Program
- Prince George's County Department of Public Works & Transportation — Capital Improvement Program
- Maryland SHA — Fund 78,79,84; TEP

Project Name

Central Avenue Corridorwide Bus Stop Improvements

Map Key **S5**

Responsible Agency
Prince George's County Department of Public Works & Transportation

Key Supporting Agencies
Washington Metropolitan Area Transit Authority
Maryland State Highway Administration

Project Description

This project will address safety and mobility needs, and will increase the overall quality of bust stops along Central Avenue by addressing poorly maintained and equipped bus stops. Specific improvements include installing ADA-compliant landing/waiting areas that are adjacent to, but not part of, the sidewalk; installing shelters and lighting at each stop; and establishing a more proactive maintenance program to reduce vegetation encroachment. In addition, some stops will be relocated in response to proposed changes resulting from the *Central Avenue Line Metrobus Study* and to provide preferable crossing locations between companion stops.

The responsibility for bus stop improvements, including on-going maintenance, is spread among several agencies, including the Maryland SHA, the Prince George's County Department of Public Works & Transportation, and WMATA.

Benefits:

√ Bus stops are better able to provide safe and comfortable points of access to/from Metrobus and TheBus service.

√ Bus stops would encourage ridership increases and reduce motor vehicle volumes on Central Avenue.

Photo 1. Typical bus stop along Central Avenue can be enhanced with a shelter and trash can.

Supporting Analysis

Crashes along Central Avenue are concentrated near intersections, which are where bus stops are located. Community survey results suggest that area residents and workers would more likely ride the bus if bus stops were located closer to their homes or places of employment.

Estimated Cost:
$12,000 to $20,000 per stop

ROW Required:
Varies by location.

Potential Funding Resources:

- WMATA – Federal Livability Grant (WMATA has applied for this grant. If awarded, 35 stops in Prince George's County can be upgraded).
- Prince George's County CIP

Project Name

Davey Street Road Diet

Map Key **S6**

Responsible Agency
Prince George's County Department of Public Works & Transportation

Key Supporting Agencies
WMATA (North Side Only)
SHA (Central Ave)
DDOT (Southern Ave)

Project Description

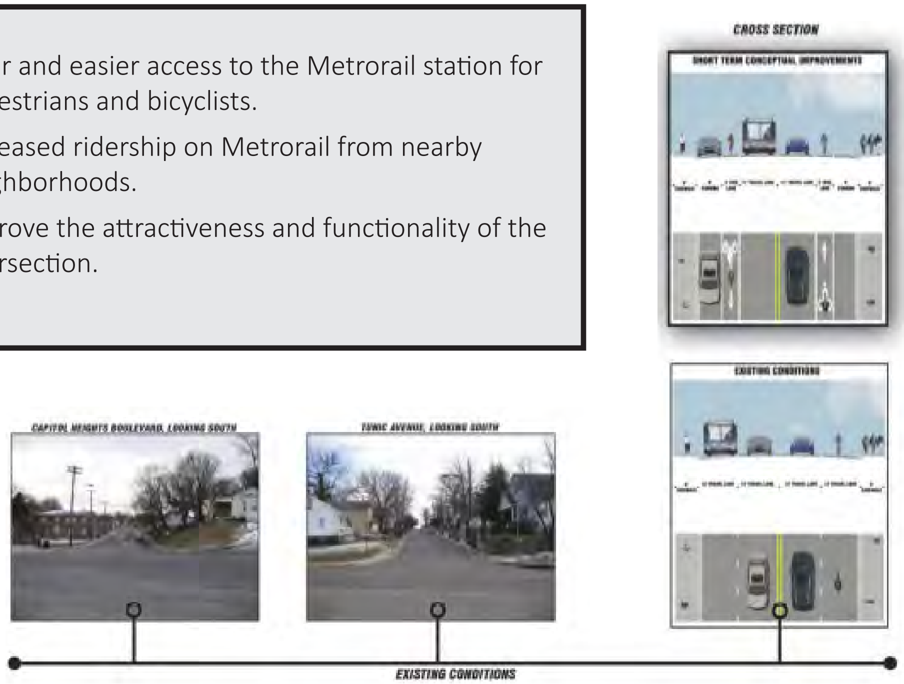
This project will address safety and access needs by establishing safer places for pedestrians and bicyclists to travel to and from the Capitol Heights Metro Station along Davey Street between Central Avenue and Southern Avenue. The road diet will improve the attractiveness and multimodal functionality of the street. This project would better organize the existing roadway cross-section and include a total of two motor vehicle travel lanes, two bike lanes, on-street parking, updated sidewalks and curb ramps that meet ADA guidelines, and improved pedestrian crossing conditions with curb extensions, curve radius reductions, and high visibility crosswalks.

Benefits:

√ Safer and easier access to the Metrorail station for pedestrians and bicyclists.

√ Increased ridership on Metrorail from nearby neighborhoods.

√ Improve the attractiveness and functionality of the intersection.



Supporting Analysis

Preliminary study indicates that a road diet would have little or no impact on traffic operations during the morning and afternoon peak hours.

Estimated Cost:
$689,000

ROW Required:
None

Potential Funding Resources:

- WMATA – Access to transit CIP funds can be used for the north side of the roadway.
- DPW&T – for the remaining improvements.

Project Name

Central Avenue Connector Trail Feasibility Study and Implementation Plan

Map Key **S7**

Responsible Agency

Prince George's County Department of Public Works & Transportation

Key Supporting Agencies

Prince George's County Department of Parks & Recreation
Washington Metropolitan Area Transit Authority
District of Columbia Department of Transportation

Project Description

This project will support safety, mobility, and access improvements along the corridor by completing a feasibility study for a trail that provides east-west connections for pedestrians and bicyclists to Metro stations and other destinations. The trail would travel between the Capitol Heights and Largo Town Center Metro Stations, using a combination of WMATA right-of-way, neighborhood streets, existing trails, and planned trails. The feasibility study would include an implementation plan for short-term and long-term projects. The study would help determine preferred and alternate alignment of connector trails, identify short-term projects for implementation within 36 months, and develop a strategy for implementing long-term projects, including opportunities created by anticipated redevelopment and public CIP projects.

Benefits:

- √ As it is completed, the connector trail will provide alternate travel routes for pedestrians and bicyclists, offering a level of intra-corridor mobility that does not exist today.
- √ Similar trail networks have been shown to substantially increase walking and bicycling trips.

Supporting Analysis

Roadway crossings would be evaluated within the feasibility study and lead to recommendations that incorporate best practices policies for geometric design, safety, and traffic control.

Estimated Cost:

$50,000 to $75,000

ROW Required:

A mix of land ownership, including public land, WMATA land, and some private ownership.

Potential Funding Resources:

- MDOT Bikeways Grant Program
- WMATA – Access to transit CIP funds

Project Name

Watts Branch Trail Connection

Map Key **S8**

Responsible Agency
Prince George's County Department of Public Works & Transportation

Key Supporting Agencies
District of Columbia Department of Transportation
Prince George's County Department of Parks & Recreation

Project Description

This project extends the Watts Branch Trail from its current terminus at 61st Street NE and Banks Place NE in the district of Columbia into Prince George's county via Maryland Park Drive, establishing a connection to the trail from the north side of 63rd Street NE. The project addresses mobility and access needs in the corridor.

Reducing the number of turning movements at Banks/63rd/Southern/eastern/Maryland Park will create more predictability for all modes. The project also recaptures roadway space for pedestrian and bicycle pathways, and improves pedestrian and bicycle crossing facilities as part of the process to determine appropriate traffic controls at the intersection. It also connects with new sidewalks or on-road bicycle treatments resulting from, or in anticipation of, the conversion of Maryland Park Drive to a Neighborhood Greenway street.

<u>Benefits:</u>

- √ Trail access between Prince George's County and the District of Columbia.
- √ Builds one of the initial portions of the larger Watts Branch Trail project related to the Central Avenue Connector Trail.
- √ Connects with the Maryland Park Road Neighborhood Greenway conversion.

Photo 1. The trail connection can establish a visible crossing when entering Prince George's County and connect with Maryland Park Drive.

Supporting Analysis

<u>Intersection Operations:</u>
Geometric changes include capturing two slip lanes and their adjacent channelization islands for non-motorized transportation.

Estimated Cost:
$261,000

ROW Required:
None

Potential Funding Resources:

- Prince George's County Parks and Recreation
- District of Columbia Department of Transportation
- MDOT Bikeway Grant program

Project Name

Maryland Park Conversion to Neighborhood Greenway

Map Key

Responsible Agency
Prince George's County Department of Public Works & Transportation

Key Supporting Agencies
Prince George's County Department of Housing and Community Development

Project Description

Safety and mobility needs will be addressed by converting Maryland Park Drive to a "neighborhood greenway" in order to manage motor vehicle traffic and improve walking and biking conditions. Meetings with adjacent and nearby neighbors and property owners to gain consensus on managing current and anticipated travel/traffic, and physical changes to the roadway and adjacent right-of-way are underway and on-going.

The area has bee studied previously by the Prince George's County Department of public Works & Transportation. The current work provides a more comprehensive approach.

Neighborhood greenways serve travel within primarily residential neighborhoods. As such, the street width is narrower and allows on-street parking. It includes elements such as traffic circles, landscaped buffers/chicanes/curb extensions, and bikeways to discourage through motor vehicle traffic, resulting in lower vehicle speeds and volumes. Buffer areas are generally fully landscaped.

<u>Benefits:</u>

- √ This project is part of the Watts Branch Trail project and completes an important gap in the trail network.
- √ As a Neighborhood Greenway, Maryland Park Drive would offer a multimodal connection from adjacent neighborhoods to Central Avenue, increase safety, and reduce or eliminate cut-through traffic.

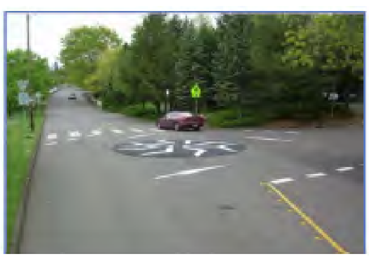


Photo 3. Potential improvement: Low-profile traffic circle.

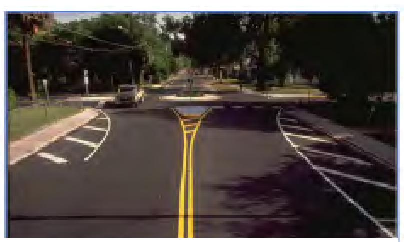


Photo 2. Potential improvement: Street narrowed with pavement marking and center median.

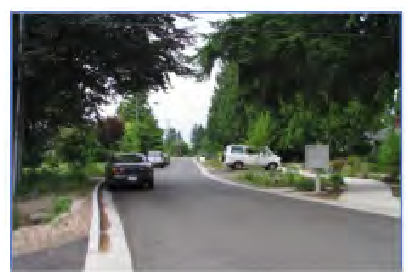


Photo 1. Potential improvement: Street narrowed using green streets element.

Supporting Analysis

<u>Intersection Operations</u>: Evaluate roadway traffic operations and multimodal level of service (MMLOS) on Maryland Park Drive before and after improvements are made. Address access needs at Southern Avenue NE and Central Avenue.

<u>Safety</u>: Using existing crash data, evaluate existing safety problems along Maryland Park Drive and at nearby intersections. Use predictive methods to evaluate roadway safety after changes are implemented.

Estimated Cost:
$164,000

ROW Required:
None

Potential Funding Resources:

- To be determined.

Project Name

Southern Avenue – East Capitol Street Gateway into Prince George's County

Map Key S10

Responsible Agency
Maryland State Highway Administration
District of Columbia Department of Transportation

Key Supporting Agencies
Prince George's County Department of Public Works & Transportation
Washington Metropolitan Area Transit Authority

Project Description

This project will address safety, mobility, and access needs at the intersection of Southern Avenue and East Capitol Street (which is entirely within the District of Columbia to plan, design, fund, and implement), and streetscape and gateway improvements on streets in Prince George's County, adjacent to the intersection.

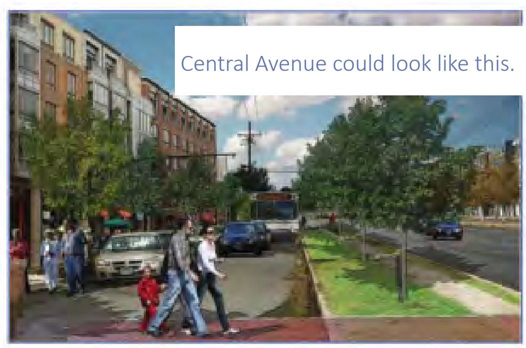
East Capitol Street looking west into the District of Columbia.

The planned Walmart (in the district of Columbia on the northwest corner) is anticipated to generate additional pedestrian traffic at the intersection and to create an opportunity to establish an attractive and safe gateway to Prince George's County. Recommendations are aimed at improving conditions for pedestrians crossing Southern Avenue at East Capitol Street, travelling to and from the Capitol Heights Metro Station. Streetscape improvements include a continuation of the look and feel of East Capitol Street in the District of Columbia with trees and other greenspace, benches, pedestrian-oriented lighting, narrower lanes, and on-street parking. See photos to the right.

East Capitol Street extended looking east into Prince George's County.

<u>Benefits:</u>

- √ Streetscaping and gateway features provide welcome to Prince George's County.
- √ Intersection is better configured and equipped to serve existing and increasing pedestrian traffic.
- √ New sidewalks and crosswalks on the northeast corner, so pedestrians do not have to walk in the roadway or along an unpaved path.



Central Avenue could look like this.

Supporting Analysis

<u>Intersection Operations</u>: Number of crashes between January 2008 and December 2010* range between 6 and 9.

**Crash data provided by the Maryland SHA*

Estimated Cost:
$445,000 (pedestrian crossing improvements only)

ROW:
Existing right-of-way is within the District of Columbia.

Potential Funding Resources:

- Dependent upon the District of Columbia

Long-Term Projects

Achieving the long-term vision for Central Avenue will require a significant effort from many partner agencies, including DPW&T, M-NCPPC, SHA, and others. In addition to the short-term projects discussed above, this report identifies multiple long-term strategies to achieve transit-oriented development and complete streets along the corridor. These strategies range from capital projects that change the way Central Avenue and surrounding streets look and operate to policy changes that will enable and promote the type of development needed to support the transit oriented development and a vibrant local economy.

Successful implementation of these strategies will require strong partnerships between local jurisdictions, public agencies, and the private sector; no one entity has the authority or resources to achieve the long-term vision on its own. Table 19 lists the long-term implementation strategies identified in this report and the agencies responsible for implementing them. Many of these tasks will require collaboration with other partner agencies in order to be successful.

Table 19. Long-Term Implementation Strategies and Agency Responsibilities

Strategy	Next Steps	Responsible Agencies
Capital Projects		
Traffic signals	• Refine timing and phasing of signals installed as short-term improvements at Addison Road Metro and Cabin Branch Road. • Continue to refine signal timing and coordination to reduce pedestrian delay, pedestrian/vehicle conflicts, and provide adequate clearance time. • Conduct signal warrant analyses for high crossing demand locations (e.g. Maryland Park Drive, Jonquil Avenue) • Install pedestrian countdown signals.	• SHA, DPW&T
"Road diet" on Central Avenue	• Refine existing modeling and analysis and evaluate cross section alternatives. • Identify streetscape guidelines and maintenance partnerships. • Complete field engineering site visits for road diet.	• SHA, DPW&T, DDOT
Connectivity improvements	• Implement street and trail connections identified in future network map to establish alternate/parallel routes to Central Avenue for all modes	• DPW&T, M-NCPPC, SHA
Regional trail connections	• Complete construction of Central Avenue Connector Trail, Watts Branch Trail, and Central High School Trails. • Begin planning and design for additional trail connection identified in the future network connections map.	• M-NCPPC, DPW&T, SHA, P&R, DCDOT, School District
Street lighting	• Identify priority locations for street lighting improvements (e.g. transit stops, high crash locations, multi-use paths) • Identify funding and maintenance partnerships	• DPW&T, SHA, WMATA

Strategy	Next Steps	Responsible Agencies
Transit stop improvements	• Continue short-term bus stop improvements program • Identify funding and maintenance partnerships to improve sidewalks near bus stops and install shelters and lighting. • Coordinate with developers to incorporate visible, high-quality transit stops into new development	• WMATA, DPW&T, SHA
Sidewalk maintenance	• Identify funding and maintenance partnerships for ongoing sidewalk maintenance. • Potentially revise County code to establish sidewalk maintenance as responsibility of adjacent property owner.	• DPW&T, SHA
Bicycle facility improvements	• Refine and adopt bicycle network (e.g., bike lanes, trails, neighborhood greenways) identified in future network map. • Enforce bicycle parking requirements in new development.	• DPW&T, SHA
Operations and Management Strategies		
Refine, adopt, and implement TOD checklist	• Refine and adopt TOD checklist. • Incorporate TOD checklist revisions into County Transportation Review Guidelines. • Train staff on checklist implementation for development review, capital improvements, and maintenance projects.	• DPW&T, SHA, developers
Implement Adequate Pedestrian and Bicycle Facilities Ordinance	• Develop methodology. • Train staff on implementation. • Require multimodal connections in conjunction with all new development.	• DPW&T, SHA, developers
Transit service improvements	• Improve transit service reliability. • Evaluate opportunities to increase directness of bus routes.	• WMATA
Access management	• Revise County code and Transportation Review Guidelines to encourage shared access strategies. • Identify opportunity locations to consolidate existing driveways and curb cuts to improve pedestrian and vehicle safety.	• DPW&T, SHA
FedEx Field Green Travel Options	• Coordinate with NFL and FedEx Field management to encourage walking, biking, transit, carpooling, and other "green travel options for games and other events.	• NFL, FedEX Field management, DPW&T, WMATA
Policy Strategies		
Parking maximums	• Revise County code to establish parking maximums for developments within 0.5 miles of rail or high frequency transit	• DPW&T, developers

Strategy	Next Steps	Responsible Agencies
Mid-block crossing policy	• Develop process for evaluating benefits and risks of midblock crossing locations • Adopt policy documenting midblock crossing evaluation and approval process • Identify priority locations for midblock crossing improvements (e.g., rail or bus stations, schools, trail crossings)	• DPW&T, SHA, WMATA
Connectivity and block length requirements	• Revise County design standards to encourage a connected street network. • Revise County Code to establish recommended maximum block lengths to maintain walkability.	• DPW&T
Sidewalk requirements	• Revise County design standards to require sidewalks on both sides of all new streets in TOD and urban areas	• DPW&T
Complete Streets policy	• Develop and adopt Complete Streets policy based on TPB template. • Refine and adopt Complete Street and trail typology and typical sections. • Refine and adopt future network map. • Refine and adopt complete streets design "toolkit" to streamline design approval/exception process.	• DPW&T, SHA, M-NCPPC

Appendix 1
Public Involvement Summary

CENTRAL AVENUE TOD IMPLEMENTATION PROJECT
Consolidated Project Participation Plan
(September 28, 2011) Revised by M-NCPPC October 13, 2011

AECOM TASKS	SABRA WANG TASKS	KITTELSON TASKS	OUTREACH PER TASK	SCHEDULE	RESPONSIBLE PARTY(IES)
1A. Initial Station Area and Corridor Assessment	***1. Technical Analysis: Traffic Analysis***	***1.Project Scoping & Kick-off***	Design and establish standards for a project website, Facebook page, and format for other informational materials	Sept - Oct 2011	**AECOM**: design of website **RHI**: design of Facebook page **All:** Identification of other info materials needed *(see attached list of potential items)* **M-NCPPC** to host and maintain sites
1B. Background and Data Review	***1. Technical Analysis: Traffic Analysis (cont)***	***2. Background Review & Coordination***	Announce project on website, Facebook, etc.	Oct 2011	**All** teams submit introductory info (project intro, schedule, outreach approach, etc.)to M-NCPPC webmaster to post
			County to compile major outreach findings from earlier studies by area (lessons learned)	Oct 2011	**M-NCPPC** project staff
			Define role of, and appoint, Project Advisory Committee (PAC)	Oct 2011	**M-NCPPC** to discuss with teams; **M-NCPPC** to invite participants
			Hold initial PAC meeting	Oct 2011 **Nov 15th**	**M-NCPPC** staff to host; key team members to attend

AECOM TASKS	SABRA WANG TASKS	KITTELSON TASKS	OUTREACH PER TASK	SCHEDULE	RESPONSIBLE PARTY(IES)
			Conduct initial stakeholder meetings	Oct 2011	Each team to work with **M-NCPPC** project staff to identify stakeholder groups; produce a separate stakeholder schedule/who is responsible for each meeting; announce meeting dates to all teams so that they can participate as appropriate
1C. Corridor-wide Market Assessment; ***1D. Economic Development Strategies***	***1. Technical Analysis: Crash Analysis***	***3. Existing Conditions Analysis***	Hold additional key stakeholder meetings to identify issues, opportunities and potential recommendations	Oct - Nov 2011	As needed by each team
			Design and post on-line survey/mapping exercise to identify physical points of concern in corridor and new visions for corridor	Oct 2011	**Kittelson** to lead effort with input from others
			Plan and conduct PAC walking tour	Oct 2011	**Kittelson** to lead; others to participate as necessary
			Hold 2 public meetings (E and W sections of corridor): ▪ Education/info ▪ Findings to date ▪ Public input on existing conditions and ideas to be considered ▪ Post findings on website and Facebook	Nov 2011 **West** Nov 29th **East** Dec 8th **back up date** Dec 6th	**AECOM** and **Kittelson** to jointly collaborate with M-NCPPC project staff to plan these sessions; teams to provide input for postings to M-NCPPC staff (*Note: content emphasis might differ at each meetings based on extent of previous work in that area to date*)
2A. Identify Catalytic Projects;	***Technical Analysis: Multimodal LOS;***	***4. Complete Streets Policies + Sections;***	PAC meeting to review findings to date and help develop catalytic projects	Jan 2012 **West**	**M-NCPPC** staff to organize meetings; **AECOM** and **Kittelson/SWA** to prepare content

AECOM TASKS	SABRA WANG TASKS	KITTELSON TASKS	OUTREACH PER TASK	SCHEDULE	RESPONSIBLE PARTY(IES)
2B. Draft Access and Circulation Plan	***Recommendations and Cost Estimates***	***5. Transport. Network Functional Overlay;*** ***6. Alternatives Analysis + Preferred Concept***	and alternative concepts (Note: could be 1 or 2 sessions based on level of content for each session)	**Jan 12th** **East** **Jan 19th**	for, present at, and elicit feedback on findings in order to move on to next tasks
			Regular Website/Facebook postings	Dec 2011 – May 2012	**M-NCPPC** webmaster with input from teams
			Hold 2 Public Meetings (E and W sections of corridor) in workshop format to define/map stations development sites and scenarios, and provide input on complete street alternatives leading to a preferred concept	Feb - Mar 2012 **West** **March 6th** **East** **March 8th**	**AECOM** and **Kittelson** to jointly collaborate with M-NCPPC project staff to plan these sessions
3A. Financial Feasibility; ***3B. Implementation Strategies;*** ***3C. Draft and Final Priorities and Strategy Report***	***(work completed)***	***7. Implementation***	PAC meeting(s) to review draft implementation recommendations	Apr 2012 **Apr 5th**	**AECOM** and **Kittelson** to jointly collaborate with M-NCPPC project staff to prepare for session(s)
			Key stakeholder review meetings to review recommendations	Apr 2012	Each team to identify stakeholder group meetings needed
			Two public meetings (E + W) to review and comment on recommendations. (An Open House format with presentation might be useful for this session)	Apr – May 2012 **West** May 1st **East (if not joint)** May 8th	**AECOM** and **Kittelson** to jointly collaborate with M-NCPPC project staff to prepare for session
			Planning Board and Elected Official Briefings	Jun 2012	**AECOM** and **Kittelson** to jointly collaborate with M-NCPPC project staff to prepare for briefings

CENTRAL AVENUE BLUE LINE CORRIDOR IMPLEMENTATION

Public Meeting #1: Eastern Communities
December 8th, 2011 from 6:45 to 8:45 pm
Prince George's County Sports and Learning Complex

Part 1. Introductions and General Orientation ***6:45 – 7:30 pm***

- SIGN IN AND BROWSE EXHIBIT STATIONS
- WELCOME AND INTRODUCTIONS
- DESCRIPTION OF TONIGHT'S SESSION/INTRO TO INITIAL DISCUSSION
- INITIAL TABLE DISCUSSION (10 minutes)
    - *Introduce yourself to the people at your table and describe:*
        - Why have you come? What brought you to the meeting?
        - Where you live (place a dot & your first name in this location)?
        - How long have you lived in this area (write # next to dot)?
        - How you usually travel around this area: on foot, by car, by bike (show of hands)?
- MNCPPC PROJECT OVERVIEW
    - Sub-region 4 Master Plan Status and key recommendations
    - Implementing the Plan
- TABLE #2 DISCUSSION (5 minutes)
    - *Have you been previously involved in the Subregion 4 planning process (show of hands)?*
    - *What are the 2 most important outcomes that you would like to see from this implementation effort (note on the table map)?*

Part 2. Complete Streets and This Corridor: Presentation ***7:30 – 7:50 pm***

- PRESENTATION: PART 1
    - *What are Complete Streets?*
- PRESENTATION: PART 2
    - *Key Issues & Opportunities in this Corridor*

Part 3. Role Playing Exercise: Focus on Corridor Experience ***7:50 – 8:30 pm***

- INTRODUCTION OF TABLE EXERCISE #3
- COMPLETE STREETS FROM A MODE/USER PERSPECTIVE

  (*Pick one of the "role cards" at your table. For the role you have chosen, answer the questions below. Then, be prepared to discuss your responses to the questions . Think about how you use the corridor today AND how you might want to use it in the future as the plan is implemented.)*
  - ***Imagine that you are a <u>pedestrian</u> in this area:***
    1. *A*s a pedestrian here, what are your *3 major concerns*?
    2. Which are these streets are you most *comfortable* and *uncomfortable* walking on and why? (green marker)
    3. Which *intersections* in the area need to be improved? (red marker)
  - ***Now, imagine that you are a <u>motorist or freight/truck delivery person</u> in this area:***
    1. As a driver, do you feel it is *easy or difficult to get through* this area?
    2. As a driver, which *intersections* in the area need to be improved?
    3. As a delivery person, is it *easy or difficult to make deliveries* here?
  - ***Now, imagine that you are a <u>Metro-rider</u> in this area:***
    1. Which *station would you prefer to use* and why?
    2. How *easy is it to get to this station* from where you live? Would you walk, take the bus or drive? If you walk, which route would you take?
  - ***Now, imagine that you are a <u>bus rider</u> in this area:***
    1. What do you *like most and least* about taking the bus in this area?
    2. Which bus stop are you *likely to use* from your house? Is this convenient?
  - ***Imagine that you are a <u>biker</u> in this area?***
    1. Is this an *easy area to bike* in (Yes/No)? Why do you say that?
    2. What streets do you feel *comfortable/uncomfortable* biking on?

Part 4. Recap and Next Steps ***8:30 – 8:45 pm***

- REPORTING BACK AND COMMENTING
  - One representative from each table will summarize the major results of the role-playing exercise and state any preferences for the opportunity areas
  - Any other questions or comments?
- NEXT STEPS

KITTELSON MAPS

COMMENTS FOR "CENTRAL AVENUE TRANSIT-ORIENTED DEVELOPMENT (TOD) IMPLEMENTATION PROJECT"

← Back to the map

1.

Added December 14 2011

Bike lane on Harry Truman Drive

2.

Added December 14 2011

Harry Truman Drive needs better access management

3.

Added December 14 2011

Areas east of Largo road need better bike connections to the metro.

4.

Added December 14 2011

Parking in The Largo Town Center Metro lot is full by 8am

5.

Added December 14 2011

Need High quality employment areas in the project area.

12/14/11 **Central Avenue Transit-Oriented Development (TOD) Implementation Proje…**

6. 

Added December 14 2011

Higher retail needed in the study area

7. 

Added December 14 2011

Potential bus rerouting? The busses are running but there are no riders.

8. 

Added December 14 2011

There should be retail along with the housing (mixed use) along Morgan Boulevard, people walking along Garret Morgan Boulevard to FedEX field are money walking by!

9. 

Added December 14 2011

When will recommended projects be implemented?

10. 

Added December 14 2011

Pedestrians do not feel safe along the trail/sidewalk connections behind the metro station

11.

Added December 14 2011

Night safety is a problem for pedestrians

12.

Added December 14 2011

Median/refuge missing

13.

Added December 14 2011

I want this project to include economic development and revitalization in the area

14.

Added December 14 2011

Safe pedestrian walkways along Central Avenue, improve sidewalks

15.

Added December 14 2011

What are you proposing for this project? This is not clear to alot of people

16.

Added December 14 2011

better retail needs.

17.


Added December 14 2011

remove blight

18.


Added December 14 2011

Great corridor for truck delivery drivers, convenient at the expense of other users (light industrial corridor).

19.


Added December 14 2011

Good auto freight access.

20.


Added December 14 2011

More diversity for housing options

21.


Added December 14 2011

lighting for pedestrians is a problem throughout the corridor

22.


Added December 14 2011

existing trails not used or maintained

23.

Added December 14 2011

Metro seems to be the center piece of the effort; not the people

24.

Added December 14 2011

Neighborhood concerned with new connections to back of homes

25.

Added December 14 2011

Maintain trees

26.

Added December 14 2011

Bike lanes on Morgan Boulevard

27.

Added December 14 2011

need reinvestment

28.

Added December 14 2011

Bike connection between neighborhoods and Largo town center and metros

29.

Added December 14 2011

neighborhood needs connection to the Morgan Boulevard Station

30.

Added December 14 2011

reinvest in developed areas

31.

Added December 14 2011

crossing central ave, not enough time and not safe

32.

Added December 14 2011

Starbucks and sit down restaurants

33.

Added December 14 2011

Community development?

34.

Added December 14 2011

Better crossing needed

35. 

Added December 14 2011

development and connections accross park are needed

36. 

Added December 14 2011

No metrobus service to Morgan boulevard

37. 

Added December 14 2011

need sign to slow down

38. 

Added December 14 2011

New temp lights with generators placed in areas

39. 

Added December 14 2011

Dangerous

40. 

Added December 14 2011

High speed

41.

Added December 14 2011

Speed of traffic coming at corner

42.

Added December 14 2011

minimize ped conflicts with signal timing

43.

Added December 14 2011

consistent speed management needed

44.

Added December 14 2011

Town homes access issues

45.

Added December 14 2011

tough right turns because sight lines are poor

46.

Added December 14 2011

Sight lines when permitted left turns are poor.

47.

Added December 14 2011

sudden lane drop

48.

Added December 14 2011

Existing traffic calming

49.

Added December 14 2011

poor lighting

50.

Added December 14 2011

connect yolanda ave to central ave?

51.

Added December 14 2011

Add sidewalks on addison...poor lighting

52.

Added December 14 2011

Ped crossing needed here

53.

Added December 14 2011

Confusing intersection

54. 

Added December 14 2011

Midblock crossing

55. 

Added December 14 2011

Bike lanes

56. 

Added December 14 2011

better streetscape and maintenance

57. 

Added December 14 2011

Bike lanes

58. 

Added December 14 2011

Neighborhoods are better walking with less trafficand with sidewalks

59. 

Added December 14 2011

Planned shopping center

60. 

Added December 14 2011

Neighborhoods are hilly, Capital Avenue is the most direct

61. 

Added December 14 2011

Building here that is potentially being renovated

62. 

Added December 14 2011

existing school bus stop

63. 

Added December 14 2011

existing speed bumps

64. 

Added December 14 2011

No walking on Central

65. Added December 14 2011

Wider sidewalks and school bus stops needed on Central

66. Added December 14 2011

Rolling Ridge drive can be a bypass of Addison/Central

67. Added December 14 2011

Add signal

68. Added December 14 2011

Raised crosswalk or bridge

69. Added December 14 2011

need to slow down cars, lots of pedestrians

70. Added December 14 2011

Existing bus stops no bus stops

71. Added December 14 2011

Need to locate bus stops at intersections, hard to see sidewlakers

72. Added December 14 2011

Sidewalks on Addison and better lighting and drainage

73. Added December 14 2011

Potential to widen addison with new development

74. Added December 14 2011

New connection to Karen Boulevard

75. Added December 14 2011

Congested intersection

76. Added December 14 2011

    Make 1 way?

77. Added December 14 2011

    Pedestrian bridge? Tunnel?

78. Added December 14 2011

    bigger median Island needed

79. Added December 14 2011

    Connection to bus stop?

80. Added December 14 2011

    Bikes on Addison (Maine Route)

81. Added December 14 2011

    Signal timing changes (congestion on Addison)

82. Added December 14 2011

    New connectiuon between Yolanda and Addison Road

83. Added December 14 2011

    Right turn from old Central to Central is a problem for pedestrians.

84. Added December 14 2011

    East Capitol street has alot of intersection and no turn lanes.

85. Added December 14 2011

    Sight distance problem due to Hill

86. Added December 14 2011

More local desitinations for people to walk to.

87. Added December 14 2011

connect Karen Blvd to Peppermill Drive

88. Added December 14 2011

Ped or traffic signal needed

89. Added December 14 2011

Right turn conflicts.

90. Added December 14 2011

people are speeding and changing lanes

91. Added December 14 2011

Ped signal at addison crosswalk needs improvement

92. Added December 14 2011

No left turn signals

93. Added December 14 2011

Policy discussion on maintenance of streetscape and other improvements

94. Added December 14 2011

Need for sidewalks on Addison road and not just in front of the new development. There are also right-of-way issues.

95. Added December 14 2011

Corridor wide way-findings and identification signage

96. 

Added December 14 2011

Rollins Avenue has no space for walking, poor lighting, no sidewalks, potetial widening of road. There are new townhouses but lack connectivity.

97. 

Added December 14 2011

Dead end streets are a potential problem for safety vehicles: Bulgar Street, Bolsan Street, Uline Street

98. 

Added December 14 2011

Useless traffic signal at crown street and Central Avenue

99. 

Added December 14 2011

Better Street signage

100. 

Added December 14 2011

Any further development proposed?

101. 

Added December 14 2011

Retiming durring peak periods

102. 

Added December 14 2011

Better Bike Storage

103. 

Added December 14 2011

Retiming durring the peak periods.

104. 

Added December 14 2011

Set speed limits to be consistent

105. 

Added December 14 2011

Retiming durring peak periods

106. 

Added December 14 2011

Poor signage

107\. Added December 14 2011

Need a left turn light

108\. Added December 14 2011

Vehicles passbyon the right at Walker Mill and Addison.

109\. Added December 14 2011

Red light runners

110\. Added December 14 2011

Cars driving too fast

111\. Added December 14 2011

Cars driving too fast.

112\. Added December 14 2011

Need to improve-lighting and downhill grade are a problem

113\. Added December 14 2011

rear end accidents concern for left turners at Addison Rd./Wilburn Drive.

114\. Added December 14 2011

signal coordination along East Capitol street for traffic calming

115\. Added December 14 2011

NO Sidewalks

116\. Added December 14 2011

The street suddenly changes from two lanes to one lane travelling southbound, there needs to be warning signs.

117\. Added November 18 2011

Hard to cross the street here. Cars never stop!

Central Avenue Stakeholder Interview Summaries

Prince George's County Parks and Recreation

OVERVIEW OF PROJECT

- There are opportunities for trails to be a part of the new transportation network in the corridor, providing routes for pedestrians and bicyclists other than Central Avenue itself. This project includes short- and long-term opportunities that will support anticipated TOD development. The team reviewed preliminary design concepts for several Opportunity Areas:
    - Maryland Park Avenue connection to the Watts Branch Trail
    - Central Avenue Connector Trail to the Morgan Boulevard and Largo Town Center Metrorail stations
- Several trails projects within the corridor may benefit from work on the implementation plan, including:
    - land acquisition for the Chesapeake Beach Rail-Trail
    - construction of segments of the Cabin Branch Stream Valley Trail
    - other neighborhood trail connections

KEY ISSUES

- DPR preference for a trails network that serves destinations. Top priority is to provide access to recreation facilities and parks.
- DPR supports designating trails for transportation, because the maintenance then falls to others, such as public works, SHA or private property owners. Need to establish an MOU with the agency that has maintenance responsibilities.
- As trails are used and considered part of the transportation system, portions need to be lighted. This will require developing a set of criteria to determine when and where lighting and other safety features are needed. Examples of trails with lighting include the trail to the West Hyattsville Metrorail station, the trail to National Harbor, and the trail connecting UMD student housing in University Park to the campus.
- Trail crossings of major roads such as Central Avenue, Southern Avenue, Arena Drive, and Morgan Boulevard need to be addressed in Opportunity Area concept plans.

- More information is needed on the proposed consolidated Parks and Recreation offices complex on the M-NCPPC property near the Morgan Boulevard Metrorail station.

FOLLOW-UP, RELEVANCE TO THE PROJECT

- Chuck Kines or Eileen Navaro can provide long range travel forecasting.
- Better understand inter-agency requirements, needs and opportunities when designating a trail for transportation.
- Address the need for trail lighting
  - See if lighting CIP project can be used for trails, not just for recreation facilities.
  - Develop/recommend criteria to determine where to light trails. Current process is location-specific and does not use an established set of criteria. Toole Design Group has established a recommended set of criteria, based on research of existing trails that are lighted and work on the W&OD Trail in Virginia.
- Revise design concepts for Opportunity Areas to include trails crossings.

District Department of Transportation (DDOT) and District of Columbia Office of Planning (DCOP)

EAST CAPITOL STREET PEDESTRIAN SAFETY STUDY

- DDOT is currently performing an East Capitol Street pedestrian safety study from Minnesota Avenue to the District line. The study will be finished in April of this year (approximately). See the project website for additional information: http://www.kls-eng.com/EastCapitolStreet/.
- The preferred alternative is to implement full-time parking along the entire corridor, which would result in two through lanes and bike lanes in both directions. The cross section dimensions will be:
    - 10' inside lane
    - 11' outside lane
    - 5' bike lane
    - 8' parking lane
- The project will also add several pedestrian signals and/or HAWK signals.
- Looking at curb extensions on East Capitol at several location to lock it into 2 lanes in each direction.
- DDOT analysis showed that historical traffic trends on the corridor are negative, with ADT approximately 5,000 lower than it was 10 years ago.
- Capacity analysis generally shows that the corridor works adequately with a road diet. The critical intersection is Benning/East Capitol which requires reconfiguration, but otherwise operations look good. Benning/East Capitol also needs to accommodate streetcar, which complicates things.
- DDOT standard is LOS D, but this standard was applied only to existing conditions and not 2037 (2037 model shows everything failing regardless of the option chosen). DDOT's primary criteria is that changes do not degrade operations from current conditions.
- DDOT/DCOP would welcome M-NCPPC assessing the potential for a road diet on East Capitol Extended/Central Avenue. This would hopefully assist in changing the built environment and would also encourage drivers heading into the District to slow down due to the perception of coming into a denser, more urban environment. Buildings closer to the street will help to convey the vision for the corridor that the District would like to see.

CAPITOL HEIGHTS WAL-MART

- Current plan for Wal-Mart has all access from East Capitol Street. There will be no access from Southern Avenue. Primary access point will be via a new signal on 58th Avenue.

- DDOT is not currently looking at major changes to Southern Avenue/East Capitol, although they recognize the need for pedestrian improvements.
- The development will include some satellite retail, but not street-fronting. Early renderings show the development from the street as "looking similar to a school".
- Development is "by-right" and does not require any zoning changes. As a result, DDOT is limited in the amount of improvements that they can condition on the developer.
- Primary pedestrian route to the Wal-Mart from the Metro is being planned, including need for pedestrian access improvements (bulb-outs, etc.)
- DDOT has asked Wal-Mart to look into an underpass of Southern Avenue/East Capitol Street, but this is considered unlikely.
- Improvements from Wal-Mart may include Far Northeast Livability Study recommendations.

GENERAL

- DDOT has no specific criteria for road diets. However, they actively seek opportunities to use road diets to (1) slow vehicles based on impact to pedestrian safety and (2) provide bike accommodations.
- DC recently completed a TOD plan, and would be interested in knowing any M-NCPPC plans for Capitol Heights
    - Park & Planning has designated Capitol Heights as a Community Center.
    - DCOP will provide additional information on the TOD Plan to M-NCPPC.
- DDOT is generally fine with 10' travel lane, but prefers 11' next to bike lanes when there is a transit route. Typical lane width of 10' always preferred for interior lanes.
- Given the difficulty of accommodating bikes comfortably on Central Avenue, DDOT suggested the potential for the Central Avenue project team to consider a wide side-path instead of bike lanes.

Department of Public Works and Transportation (DPW&T)

MULTIMODAL IMPROVEMENT OPPORTUNITIES

- DPW&T is interested in working with M-NCPPC and SHA on a long-term access management approach.
- DPW&T noted that the section of Walker Mill Road abutting Walker Mill Regional Park was improved with bike lanes and sidewalks recently. The project team will field-check to ensure that this is reflected accurately in our maps.
- DPW&T is open to providing bus stop improvements, but would generally ask for joint cost-sharing with another entity (e.g., transit agency, developer).
- TheBus has a shelter contract, and where there is high demand will work with the contractor to install shelters. DPW&T noted that The Bus has had difficulties in the past obtaining access permits from SHA.
    - DPW&T suggested that this project could be an opportunity to smooth the process of getting permits from SHA to place shelters.
- DPW&T policy is for continuous lighting on all county roads, but SHA only lights intersections. DPW&T is very interested in having some type of lighting on Central Avenue at non-intersection locations.
- On Maryland Park Drive there has been a back and forth related to speed bumps. Divided opinion for neighbors on the same street. DPW&T is generally very open to a range of traffic calming mechanisms, and has a neighborhood traffic management program to deal with requests.
- DPW&T is increasingly looking to connect bike facilities wherever possible. They see parallel bike routes to Central Avenue as a priority.
- Issue of sidewalks on state routes has been an issue for DPW&T. DPW&T does not have resources to maintain them with the current capital budget. DPW&T is happy to maintain any new sidewalk on County roads.
- The County recently received a Safe Routes to School grant and3 of the 5 schools are in the general area: Oak Crest, Highland Park and Gray. DPW&T is making improvements to sidewalk connections in the vicinity of these schools.

DEVELOPMENT REVIEW

- In general, several large developments along the corridor are currently installed. Several of these would be required to make significant frontage improvements.
- Additional coordination is needed between M-NCPPC, SHA and DPW&T on development projects that are in the pipeline.
- DPW&T is open to using agreements with community organizations to maintain streetscaping. There will be development on this corridor, and this is likely to be an issue.
    - Good idea to seek HOA/BID arrangement to assist in maintenance needs
- DPW&T noted the need to be realistic about approaching funding and implementation, and identify needed legislation to make it happen.
    - M-NCPPC is currently working with DHCD to designate the corridor as a sustainable community. Hopefully has the potential for funding eligibility.
- Developers talk to DPW&T and SHA before they buy property and want to find out what they are going to be required to construct. The standard response from SHA and DPW&T needs to reflect the outcomes of this study so that it is communicated to developers early-on. Needs to be a hard link between DPW&T, SHA and M-NCPPC when a developer comes to talk to the County.

SITE SPECIFIC IMPROVEMENTS

What does Central Avenue project team need to do to justify these type of improvements?

- Traffic counts at a minimum and show operations
- Need to show that there is no deterioration of operations as a result.
- Provide basic information to DPW&T and let them comment

Maryland Park Drive

- Some hesitation with closing Maryland Park Drive. Need to see numbers on how traffic would re-route, and how that would affect operations.
- Meetings with the community show that there are 2 factions, with some concerned about direct access and other concerned with traffic volume/speed. Would want to review proposals in more detail.

Addison Road Metro

- DPW&T will review Phase 2 suggestions in more detail and provide comments.

Maryland State Highway Administration (SHA) and Maryland Department of Transportation (MDOT)

Access Management

- The consulting team wants to address the needs of MD SHA in terms of Access Management along the corridor
- The State cannot close existing driveways without financial compensation. Only when a site plan is submitted for a change in land use does the State have a 'free' opportunity to close access points.
    - SHA formerly had a capital fund to purchase access control from willing sellers. They are still developing the access management plan for this but no money is available for purchases anymore.
- To implement a long-term access management plan, requiring specific frontage improvements/ dedication, the District, Regional Planning and Access Management would need to be involved.
- The consulting team wants to find a process for implementing access management strategies for when they have a better handle on the typical cross section. However, since a typical cross section has not been decided on it is difficult for SHA to say what will be needed.

Future Cross-Section Alternatives

- DDOT will implement a permanent road dies along East Capitol Street from Minnesota Avenue to Prince George's County Line
- A future roadway cross-section/ right-of-way envelope was discussed. SHA would like to review the travel forecasting technical analysis and proposed geometry.
- The County would need to produce a sectional plan amendment as well as an updated County priority letter with Central Avenue moved near the top to initiate a formal Project Planning study.

Potential Example Locations

- **MD 64**
- **MD 510**
- **MD 201-**from MD 450 to MD 410-Part of the communities and safety program
- **MD 4** - Forrestville Road to MD 458- attempting to change the principal arterial functional classification, added midblock crossing and channelized pedestrians, residential on one side of the corridor and commercial on the other.

Potential Funding

- Kate Sylvester identifies that the Maryland Bikeways Program can potentially fund some of the bicycle improvements on local roads. The program plans to fund $4 million per year for 2013 and 2014.

- MDOT has a new bikeway improvement program that can fund bike facilities on both State and local roadways, which will be a competitive pool of up to $4 million per year.

Lighting and Transit Shelters

- SHA does not construct continuous lighting on roadways but requires warrants for roadway lighting along certain segments.
- SHA will construct continuous roadway and ped lighting as part of a project only if the County contributes funding and agrees to maintain it.
- DPWT's current policy is to continuously light all County roadways, while SHA's policy is to provide lighting only at intersections. DPWT has requested continuous lighting along Central Avenue

ADA Retrofit Fund

- SHA has a GIS database for ADA compliance needs.
- SHA has issued a design guideline as part of the "Access to Transit Program" for bus stop landings. The guidelines are based on speed and volumes of the busses.

Short-term improvements

- **Signal timing/ phasing** improvements (cycle lengths, advanced WALKs, protected left-turns) should be sent by the County through the District Office for discussion with the Office of Traffic
- Short-term **access management** changes not related to driveway closures (e.g. side street or median closures) need technical analysis to identify operational impact of diverted vehicle traffic volumes, and this should be sent by the County to SHA Access Management
- The County can **widen the sidewalk** along Central Avenue at any time, provided there is available right-of-way, they fund it, they submit plans for SHA review and obtain permits.
- The SHA's policy on **enhanced and/ or continuous lighting** is that it needs to be supported by a photometric analysis and warranted based on safety needs. The County can build and maintain additional lighting (vehicle or pedestrian scale) along MD 214 assuming they pay for it, provide the technical analysis andobtain the required permits.
- **ADA deficiencies** – this request should go through the Office of Highway Development (Lisa Choplin) which maintains a GIS database of ADA deficiencies and has several separate funds (including an access to transit improvements).
- **Improved mid-block pedestrian crossings** (signing, crosswalks, flashing beacons, pedestrian signals) should be sent to the District
  - **Enhanced crosswalk treatments** such as synthesized colored asphalt are approved by SHA and can be implemented pending approval from the District.
  - **Colored lanes for bicycles and/ or off-peak restrictions for bus and bicycle may be considered**
  - **New traffic signals –** send completed warrant analysis to District 3
  - Safety improvements such as additional crash cushions or revised lane assignment through the I-95 interchange should be requested to the District.

Washington Metropolitan Area Transit Authority (WMATA)

PEDESTRIAN ACCESS TO METRORAIL

- Project team summarized several potential projects along corridor, including significant changes at Davey Street. Most of the crossings are unmarked, roadway narrowing to add sidewalks and slow traffic. Also discussed the intersection of Davey/Southern Avenue.
    - Analysis should consider current pedestrian access to the station? Priority should be on locations with largest potential for improvement.
    - Pedestrian safety is a good motivation for identifying projects as well.
- WMATA supports improved access and safety for pedestrians, and WMATA has created implementation plans and projects to fund highest priority improvements. WMATA typically does not fund improvements outside of their property.
- Bike/Ped Plan identified $28M of needs and only $6M of funding. Metro is looking for local jurisdictions to take the lead on funding projects.
- WMATA is making crosswalk curb cut improvements at 5 stations currently. Our stations are not in the current 5. Recently built a sidewalk at Largo Town Center. Main criteria are high ridership, short-distance park-and-riders, and other factors that indicate high cost-effectiveness.
- Exploring mechanism to provide funding off Metro property, but haven't done this. Have not explored cost-sharing with other implementing agencies in detail yet for off-site pedestrian improvements. Currently there isn't a formal process for cost-sharing agreements.
- FTA allows use of federal money for bike/ped improvements, but there is no specific federal money for this purpose.

BUS STOP ACCESS IMPROVEMENTS

- Inaccessible bus stops are a key priority for WMATA Board
- WMATA recently received a $1.2M FTA New Freedom capital grant is to improve ADA access to fixed route bus stops. Need to show that it will increase disabled use of the bus system. Money set aside to identify prioritized locations. Estimated $20-25k per bus stop.

- Don't have detailed stop level bus ridership, but currently working on that using Automatic Passenger Counter data.

CAPITOL HEIGHTS/WAL-MART

- WMATA has not heard a lot of desire for a pedestrian tunnel, and doesn't see it as likely. The cost would be at least $15M cost.
- WMATA has no particular criteria/policy on new station entrances. It depends on available funding. In addition, it would need to be designed in a way that it is very easy to police. WMATA would be unlikely to take on policing of a new tunnel unless the design minimized safety risks.

MORGAN BOULEVARD

- WMATA feels that there is a great opportunity for TOD at Morgan Boulevard using WMATA and M-NCPPC land. This is a high impact opportunity.
- Fiscal impact analysis of Cameron Crossing development would be useful. Residential may be beneficial to the County tax revenues.
- Trail connections:
    - WMATA would not build a trail near Morgan Boulevard until a TOD takes place, because WMATA would not want to constrain future development opportunities.
    - WMATA is not opposed to a trail on top of Metro alignment, but it would need a lot of feasibility analysis.

CLOSE-OUT

- WMATA would like to think about complete networks more than just complete streets. Buses and bikes do not always need to be on the same street.
- WMATA suggested that many jurisdictions have great transit ideas, but then ask others fund them, and that doesn't work. Host jurisdiction needs to dedicate their money to demonstrate their own commitment.
- WMATA suggested that one way of analyzing pedestrian and bicycle improvements is through cost-effectiveness. Recognizing that DPW&T is resource constrained, pedestrian and bicycle improvements may be significantly cheaper than accommodating the vehicle trips that would otherwise occur.

Appendix 2
Policy and Standards Review

CENTRAL AVENUE-METRO BLUE LINE CORRIDOR (TOD) IMPLEMENTATION PROJECT

Complete Streets Policy and Issues Summary

Specifications and Standards for Roadways and Bridges (DPW&T)

- "New roadway construction or reconstruction shall result in roadways that are safe and that promote mobility for auto, pedestrian, bicycle, public transit, and all other elements of the traveling public."
- "Where possible, each street should be extended to intersect another street or to be intercepted by other streets...to eliminate any need for a cul-de-sac."
- "...sidewalk construction is required on both sides of arterial, collector, and industrial roadways with no exceptions." The standard is much less rigid for residential streets, and is tied primarily to length of cul-de-sacs.
- "The Department supports design criteria that promote minimum traffic volumes and lowest possible speeds on residential streets."
  - Includes standard design details for multiple traffic calming features, including speed humps, raised crosswalks, neighborhood traffic circles, speed reducing islands, pedestrian crosswalk islands, chokers, diverters, semi-diverters, and intersection tables.
  - States that a "**discontinuous street patter is also desirable**, provided that the maximum travel distance from the furthest residence to the nearest collector road is limited to 0.5 miles and that a motorist need not make more than three turning movements"
- "Shelters shall be installed adjacent to those established County transit and Metrobus stop locations where County transit planners and project engineers deem such construction feasible and cost effective."

County Zoning Code Subtitle 27 (Prince George's County)

- "Adequate roads will be available to serve development and all traffic it will generate, or an adopted and approved Master Plan shows those roads, which have their construction scheduled and one hundred percent (100%) funded in the current adopted County Capital Improvement Program, State Consolidated Transportation Program, or Federal Highway Administration Program; and the generated traffic will be accommodated by roads and intersections in the development's traffic study area, so that they will operate at adequate levels of service, as defined in the General Plan and the Guidelines for Analysis of Traffic Impact of Development Proposals."
- Minimum parking requirements are excessive and procedures for establishing reduced parking requirements in select zones are complicated.
- Limited allowance for mixed use residential/commercial buildings, increased residential density, or increased FARs, even near Metro stations.
- Driveway requirements for residential developments and parking lots limit the feasibility of access management/consolidation.

Prince George's County Planning Department
The Maryland-National Capital Park and Planning Commission (M-NCPPC)

CENTRAL AVENUE-METRO BLUE LINE CORRIDOR (TOD) IMPLEMENTATION PROJECT

Transportation Review Guidelines (Prince George's County Planning Department)

- Draft guidelines, currently under Planning Department senior review, include a Transit-Oriented Development Checklist

Street Construction Review Checklist (DPW&T)

- Midblock crossings are not permitted

Potential Policy Recommendations for TNFO

- Eliminate minimum parking requirements for development in TOD areas. Consider maximum parking ratios.
- Complete development of the TOD checklist to allow relaxed traffic impact requirements in TOD areas.
- Establish a mid-block crossing policy that discourages mid-block crossing in general, but provides specific criteria for appropriate use (e.g., distance from nearest signal, proximity of key destinations, traffic volume, etc.)
- Require subdivision layout to **maximize** connectivity and a complete network, rather than prioritize a discontinuous pattern.
- Establish maximum block lengths to ensure connectivity and improve access to transit.
- Establish policy for implementing CB-2 and identifying appropriate pedestrian and bicycle improvements for developer contribution.
  - Establish "rational nexus"
- Require sidewalks on both sides of all new streets in TOD & urban areas
- Require dedication of all streets & trails (including buffers and sidewalks) as public ROW based on Complete Streets typology and network
- Design new streets following the Complete Streets typology and Complete Streets principles.
  - Design streets from the outside-in, starting with desired land use and non-motorized modes
  - Sufficient buffer to support healthy trees is essential
  - Focus on intersections
  - Avoid private streets serving as parking lot access lanes.

Prince George's County Planning Department
The Maryland-National Capital Park and Planning Commission (M-NCPPC)

CENTRAL AVENUE-METRO BLUE LINE CORRIDOR (TOD) IMPLEMENTATION PROJECT

Complete Streets Case Studies

Arlington, VA – Transportation Demand Management and Site Plan Review

- Arlington's Transportation Demand Management (TDM) Program for Site Plan Development coordinates site plan development with commuter and transit services.
- The 1990 TDM Policy outlines a matrix of voluntary TDM strategies based on the site's land-use and transportation categories. Matrix is used in site review and negotiation with the County to identify a final set of TDM strategies are written into the approved Site Plan Conditions and Transportation Management Plan (TMP).
- Developers must implement their TMP and prepare a TDM report before approval of the first Certificate of Occupancy and submit an updated TDM Report each year.

Portland, OR – Maximum Parking Requirements

- No minimum parking requirement for sites located less than 500 feet from a street with 20-minute peak hour transit service. The application requirement to request this exception is a map identifying the site and a copy of transit schedules for routes within 500 feet of the site.
- Vehicle parking substitutions allowed for tree preservation, bicycle parking, and transit-supportive plazas.
- Minimum carpool parking requirements for office, industrial, and institutional uses.
- Maximum parking requirements for all uses .

Portland Bureau of Transportation's "Green Transportation Hierarchy"

San Francisco Metropolitan Transportation Commission Transportation for Livable Communities Program

- Housing Incentive Program (HIP) provides federal transportation funding to communities that successfully promote high-density housing and mixed-use developments in transit station areas.
- Links transportation funding and land use planning. Local governments must adopt a transit-supportive station area plan that achieves established housing densities within 0.5 miles of stations in order to receive funding.
- MTC anticipates that this will lead ultimately to the construction of an additional 42,000 units of transit-oriented housing.
- Station area plans must also address pedestrian-friendly design standards, local circulation, and TOD-supportive parking policies.

Prince George's County Planning Department
The Maryland-National Capital Park and Planning Commission (M-NCPPC)

Appendix 3
Transportation Modeling Methodology and NCHRP 225 Results

MODELING DATA SOURCES

The principal tool used to develop travel forecasts for future scenarios was the Prince George's County travel demand model. This model uses the TransCAD software package and was originally a subset of the model used by Metropolitan Washington Council of Governments (MWCOG). Over the years, M-NCPPC's Transportation Planning Section (TPS) staff has greatly increased link density and data fidelity specific to Prince George's County. The County model is the most appropriate choice for a corridor-level study along Central Avenue.

The County's transportation modelers and project staff provided model outputs for three distinct years: 2000, 2010, and 2040. The 2000 version of the model is the County's most recent, calibrated, and validated model, and uses data from the US Census, American Community Survey, MWCOG, and other sources. Ideally, this would be the model used throughout the project area to represent existing conditions. However, the 2000 model's transportation network is missing some important transportation links that are part of the 2011 existing transportation system. Most notable among these differences is the addition of two Blue Line Metro stations at Morgan Boulevard and Largo Town Center, and a fully directional interchange at I-495 and Arena Drive. Not surprisingly, a comparison between the 2000 model results and 2011 traffic counts revealed these differences are particularly substantial on Central Avenue east of Morgan Boulevard and in the Largo Town Center.

The 2010 version of the model mitigated these concerns, as the transportation network more accurately represents actual existing conditions. The 2010 model includes the current version of the Metro transit network, as well as other relevant interchanges and roadways improvements constructed since 2000. The County is currently working to complete the validation for the year 2010 model, and is approximately halfway through the process. The model has yet to be validated for the transit network and Central Avenue, but preliminary results indicated that the model accurately depicts travel patterns in the study area.

The County has a future-year model that includes the demographic information from the adopted and approved master and sector plans in Prince George's County. The model's forecast year is not specified since the end dates of all the master and sector plans are not the same, but 2040 is the most common horizon year of the future plans. The future forecast year assumes the full build-out of all of the master plans from within the County. The transportation network in the model includes all identified master plan sector plan improvements within Prince George's County, and 2040 fiscally-constrained projects from MWCOG's long-range transportation plan for areas outside of the County. Community Planning Division staff provided land-use inputs to Prince George's County travel demand modeling staff, which then disaggregated the data and applied it to their model's Transportation Analysis Zone (TAZ) zonal network. Based on the land-use and transportation network in the future model, it was assumed that it represents conditions in the year 2040. This model was used to evaluate No-Build conditions and as the starting point for the evaluation of Build alternatives.

Modeling data for 2007 and 2030 was obtained from MWCOG. While this data was not specifically used to develop travel-demand forecasting for future scenarios, including the No-Build alternative, the data provided an additional check and comparison for the Prince George's County's model data. The 2007 model was especially useful in comparison to the County's in-process 2010 model, as well as recent traffic counts.

For the Central Avenue project, AECOM completed a market-based assessment of likely growth in households and employment through the year 2033. Setting the future analysis year to 2035 ensures that any land-use changes and forecasted development from the 2033 AECOM land use/employment forecast data is incorporated into the analysis of the Build Alternatives.

Modeling Approach

The modeling approach was designed with the goal to assess future transportation conditions within the study area and to develop a preferred transportation concept for accommodating anticipated growth.

County-wide models were used to develop the No-Build forecast. As the year 2000 model was the calibrated and validated model that the County currently uses for existing conditions work, the goal was to use this model for the entire study area. Because the year 2000 model does not account for more recent additions to the transportation network, the model produced results for areas east of Morgan Boulevard that were incongruent with existing traffic count data from 2011.

The year 2000 model was used as the baseline model only for areas west of Morgan Boulevard, and the year 2010 model was used for areas east of Morgan Boulevard and Largo Town Center. The 2040 model was used as the future model. The model output data, in conjunction with existing traffic counts for the study area, were analyzed using (National Cooperative Highway Research Program) NCHRP 255 post-processing procedures to complete the forecast for the No-Build alternative. The year 2040 volume data was adjusted downward to represent year 2035 volumes and entered into the Synchro traffic model developed for the project. The final analysis volumes were developed by balancing turning movements and segment volumes in Synchro.

The Build Alternatives scenarios were developed through coordination with Park and Planning staff. The three scenarios used data from the Economic/Market Analysis for the Central Avenue corridor, in conjunction with the volumes prepared for the No-Build alternative. The market study data included projected future development tied to appropriate parcels, with supporting information on supportable office space, supportable housing units, and retail.

Forecasting of future volumes and turning movements for the three Build Alternatives began by post-processing the No-Build results. Post-processing involves the refinement of modeling outputs based on factors that may not be contained in the model – such as additions to the network, effect of mixed-use development, and non-motorized mode splits. Post-processing relies on the experience the modeling, an understanding of the land use and transportation network in the study area, and on engineering judgment

The methodology for post-processing the model results took into account No-Build trip generation, market data, potential for mode split changes, travel demand management strategies, internal capture effects, non-auto infrastructure improvements, and traffic diversion/route choice changes created by potential adoption of new transportation network changes developed as part of the Complete Streets strategy recommendations. These parameters incorporate the effects of mixed-use development, non-auto infrastructure, and travel demand management strategies not captured explicitly within the model. Alternatives also considered the potential for dedicated transitways within the study area.

The Build Alternatives were evaluated with Synchro to assess year 2035 operations for all alternatives, and comparisons were made to the No-Build scenario. Based on Prince George's County's methodology, LOS E or better will be the standard performance metric at all signalized intersections. Our analysis approach assessed the impacts of proposed improvements that used a range of evaluation criteria that captures safety, operations, and non-automobile travel.

Existing Count Year	2011
Base Model Year	2000
Future Model Year	2040

AM Peak

NCHRP 255 Method selected: Ratio; Difference; Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume	2035 Volume / 2011 Existing Volume
Central Avenue/Southern Ave	Total	3515		4533	1.1%	5089	6556	1.29	5084	5538	5311	1.53	4885	4648	32%
	SB Approach	510	100.00%	1248	0.2%	1275	1347	2.50	539	582	560	1.10	560	552	8%
	SBL	30	5.88%			75	79	2.50	32	34	33	1.10	33	32	
	SBT	325	63.73%			813	858	2.50	343	371	357	1.10	357	351	
	SBR	155	30.39%			388	409	2.50	164	177	170	1.10	170	168	
	WB Approach	2150	100.00%	2202	1.3%	2520	3358	1.17	2865	2988	2927	1.36	2927	2793	30%
	WBL	70	3.26%			82	109	1.17	93	97	95	1.36	95	91	
	WBT	1970	91.63%			2309	3077	1.17	2625	2738	2682	1.36	2682	2559	
	WBR	110	5.12%			129	172	1.17	147	153	150	1.36	150	143	
	NB Approach	585	100.00%	341	4.1%	493	895	0.84	1061	987	1024	1.75	1024	948	62%
	NBL	40	6.84%			34	61	0.84	73	67	70	1.75	70	65	
	NBT	540	92.31%			455	826	0.84	980	911	945	1.75	945	875	
	NBR	5	0.85%			4	8	0.84	9	8	9	1.75	9	8	
	EB Approach	270	100.00%	742	0.7%	801	956	2.97	322	425	374	1.38	374	356	32%
	EBL	40	14.81%			119	142	2.97	48	63	55	1.38	55	53	
	EBT	210	77.78%			623	744	2.97	251	331	291	1.38	291	277	
	EBR	20	7.41%			59	71	2.97	24	31	28	1.38	28	26	
Central Avenue/Addison Road	Total	4349		5230	0.6%	5587	6528	1.20	5421	5643	5531	1.27	5217	5066	17%
	SB Approach	257	100.00%	885	-0.5%	832	691	3.24	214	116	165	0.64	214	221	-14%
	SBL	65	25.29%			210	175	3.24	54	29	42	0.64	54	56	
	SBT	178	69.26%			576	479	3.24	148	81	114	0.64	148	153	
	SBR	14	5.45%			45	38	3.24	12	6	9	0.64	12	12	
	WB Approach	2592	100.00%	2244	0.4%	2344	2609	0.90	2885	2857	2871	1.11	2871	2823	9%
	WBL	90	3.47%			81	91	0.90	100	99	100	1.11	100	98	
	WBT	2439	94.10%			2206	2455	0.90	2714	2688	2701	1.11	2701	2656	
	WBR	63	2.43%			57	63	0.90	70	69	70	1.11	70	69	
	NB Approach	802	100.00%	1298	1.8%	1557	2241	1.94	1154	1486	1320	1.65	1320	1231	53%
	NBL	382	47.63%			742	1067	1.94	550	708	629	1.65	629	586	
	NBT	311	38.78%			604	869	1.94	448	576	512	1.65	512	477	
	NBR	109	13.59%			212	305	1.94	157	202	179	1.65	179	167	
	EB Approach	692	100.00%	803	0.6%	854	987	1.23	800	825	813	1.17	813	792	14%
	EBL	37	5.35%			46	53	1.23	43	44	43	1.17	43	42	
	EBT	545	78.76%			672	777	1.23	630	650	640	1.17	640	624	
	EBR	110	15.90%			136	157	1.23	127	131	129	1.17	129	126	

Existing Count Year	2011
Base Model Year	2000
Future Model Year	2040

AM Peak

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume	2035 Volume / 2011 Existing Volume
Central Avenue/Cindy Lane	Total	3411		3565	0.3%		3986	1.05	3814	3832	3823	1.12	3714	3662	7%
	SB Approach	104	100.00%	169	-0.2%	165	155	1.59	98	94	96	0.92	96	97	-7%
	SBL	23	22.12%			37	34	1.59	22	21	21	0.92	21	21	
	SBT	0	0.00%			0	0			0			0	0	
	SBR	81	77.88%			129	121	1.59	76	73	75	0.92	75	76	
	WB Approach	2570	100.00%	2255	0.4%	2344	2577	0.91	2826	2803	2815	1.10	2815	2773	8%
	WBL	0	0.00%			0	0			0			0	0	
	WBT	2550	99.22%			2325	2557	0.91	2804	2782	2793	1.10	2793	2751	
	WBR	20	0.78%			18	20	0.91	22	22	22	1.10	22	22	
	NB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0	
	NBL	0												0	
	NBT	0												0	
	NBR	0												0	
	EB Approach	737	100.00%	1141	0.2%	1172	1254	1.59	789	819	804	1.09	804	792	7%
	EBL	26	3.53%			41	44	1.59	28	29	28	1.09	28	28	
	EBT	711	96.47%			1131	1210	1.59	761	790	775	1.09	775	764	
	EBR	0	0.00%			0	0			0			0	0	
Central Avenue/Hill Road/Shady Lane	Total	4170		5694	0.0%	5693	5692	1.37	4169	4168	4168	1.00	4186	4183	0%
	SB Approach	588	100.00%	713	0.8%	777	945	1.32	715	756	736	1.25	736	710	21%
	SBL	288	48.98%			380	463	1.32	350	370	360	1.25	360	348	
	SBT	108	18.37%			143	174	1.32	131	139	135	1.25	135	130	
	SBR	192	32.65%			254	309	1.32	234	247	240	1.25	240	232	
	WB Approach	2543	100.00%	2913	-0.2%	2834	2625	1.11	2356	2334	2345	0.92	2345	2379	-6%
	WBL	95	3.74%			106	98	1.11	88	87	88	0.92	88	89	
	WBT	2240	88.08%			2496	2312	1.11	2075	2056	2066	0.92	2066	2096	
	WBR	208	8.18%			232	215	1.11	193	191	192	0.92	192	195	
	NB Approach	349	100.00%	863	-0.4%	824	720	2.36	305	245	275	0.79	305	313	-10%
	NBL	146	41.83%			345	301	2.36	128	103	115	0.79	128	131	
	NBT	151	43.27%			356	312	2.36	132	106	119	0.79	132	135	
	NBR	52	14.90%			123	107	2.36	45	37	41	0.79	45	47	
	EB Approach	690	100.00%	1205	0.4%	1259	1402	1.82	768	833	801	1.16	801	781	13%
	EBL	62	8.99%			113	126	1.82	69	75	72	1.16	72	70	
	EBT	594	86.09%			1084	1207	1.82	661	717	689	1.16	689	673	
	EBR	34	4.93%			62	69	1.82	38	41	39	1.16	39	39	

Existing Count Year 2011
Base Model Year 2000
Future Model Year 2040

AM Peak

NCHRP 255 Method selected
Ratio
Difference
Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume	2035 Volume / 2011 Existing Volume
Central Avenue/Morgan Blvd/Ritchie Road	Total	4742		5837	-0.2%	5722	5417	1.23	4401	4322	4361	0.92	4496	4539	-4%
	SB Approach	342	100.00%	313	2.0%	380	558	1.11	502	520	511	1.49	511	482	41%
	SBL	117	34.21%			130	191	1.11	172	178	175	1.49	175	165	
	SBT	134	39.18%			149	219	1.11	197	204	200	1.49	200	189	
	SBR	91	26.61%			101	148	1.11	133	138	136	1.49	136	128	
	WB Approach	2457	100.00%	2801	-0.4%	2685	2380	1.09	2178	2152	2165	0.88	2165	2215	-10%
	WBL	166	6.76%			181	161	1.09	147	145	146	0.88	146	150	
	WBT	2189	89.09%			2392	2120	1.09	1940	1917	1929	0.88	1929	1974	
	WBR	102	4.15%			111	99	1.09	90	89	90	0.88	90	92	
	NB Approach	854	100.00%	1054	0.0%	1051	1042	1.23	847	845	846	0.99	846	847	-1%
	NBL	366	42.86%			450	447	1.23	363	362	363	0.99	363	363	
	NBT	211	24.71%			260	257	1.23	209	209	209	0.99	209	209	
	NBR	277	32.44%			341	338	1.23	275	274	274	0.99	274	275	
	EB Approach	1089	100.00%	1669	-0.3%	1605	1437	1.47	975	921	948	0.87	975	995	-9%
	EBL	84	7.71%			124	111	1.47	75	71	73	0.87	75	77	
	EBT	867	79.61%			1278	1144	1.47	776	733	755	0.87	776	792	
	EBR	138	12.67%			203	182	1.47	124	117	120	0.87	124	126	
Addison Road/Wilburn	Total	1484		2082	0.9%		2867	1.40	2044	2269	2156	1.45	1982	1896	28%
	SB Approach	423	100.00%	777	-0.5%	737	632	1.74	363	318	340	0.80	340	355	-16%
	SBL	13	3.07%			23	19	1.74	11	10	10	0.80	10	11	
	SBT	410	96.93%			714	613	1.74	352	308	330	0.80	330	344	
	SBR	0	0.00%			0	0			0			0	0	
	WB Approach	143	100.00%	39	3.2%	53	89	0.37	241	179	210	1.47	210	199	39%
	WBL	65	45.45%			24	40	0.37	110	81	96	1.47	96	90	
	WBT	0	0.00%			0	0			0			0	0	
	WBR	78	54.55%			29	49	0.37	132	98	115	1.47	115	108	
	NB Approach	918	100.00%	1266	1.7%	1508	2146	1.64	1306	1556	1431	1.56	1431	1343	46%
	NBL	0	0.00%			0	0			0			0	0	
	NBT	850	92.59%			1396	1987	1.64	1210	1441	1325	1.56	1325	1243	
	NBR	68	7.41%			112	159	1.64	97	115	106	1.56	106	99	
	EB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0	
	EBL	0												0	
	EBT	0												0	
	EBR	0												0	

Existing Count Year	2011
Base Model Year	2000
Future Model Year	2040

AM Peak

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume	2035 Volume / 2011 Existing Volume
Hill Rlad/Willow	Total	1162		1476	0.2%	1509	1596	1.27	1256	1282	1269	1.09	1307	1282	10%
	SB Approach	404	100.00%	567	0.6%	607	713	1.50	474	510	492	1.22	492	477	18%
	SBL	35	8.66%			53	62	1.50	41	44	43	1.22	43	41	
	SBT	366	90.59%			550	646	1.50	430	462	446	1.22	446	432	
	SBR	3	0.74%			5	5	1.50	4	4	4	1.22	4	4	
	WB Approach	196	100.00%	68	5.9%	112	229	0.57	400	313	356	1.82	356	329	68%
	WBL	140	71.43%			80	164	0.57	286	223	254	1.82	254	235	
	WBT	4	2.04%			2	5	0.57	8	6	7	1.82	7	7	
	WBR	52	26.53%			30	61	0.57	106	83	95	1.82	95	87	
	NB Approach	534	100.00%	731	-0.5%	690	583	1.29	451	427	439	0.82	439	455	-15%
	NBL	11	2.06%			14	12	1.29	9	9	9	0.82	9	9	
	NBT	440	82.40%			569	480	1.29	372	352	362	0.82	362	375	
	NBR	83	15.54%			107	91	1.29	70	66	68	0.82	68	71	
	EB Approach	28	100.00%	110	-0.9%	99	71	3.55	20	0	20	0.72	20	21	-24%
	EBL	3	10.71%			11	8	3.55	2	0	2	0.72	2	2	
	EBT	4	14.29%			14	10	3.55	3	0	3	0.72	3	3	
	EBR	21	75.00%			74	53	3.55	15	0	15	0.72	15	16	
Morgan Blvd/Ridgefield blvd	Total	782		1049	3.3%	1431	2437	1.34	1817	2170	1993	2.55	1477	1335	71%
	SB Approach	309	100.00%	298	4.4%	441	818	1.43	573	686	630	2.04	630	574	86%
	SBL	7	2.27%			10	19	1.43	13	16	14	2.04	14	13	
	SBT	285	92.23%			407	754	1.43	529	633	581	2.04	581	530	
	SBR	17	5.50%			24	45	1.43	32	38	35	2.04	35	32	
	WB Approach	70	100.00%	173	3.9%	247	443	3.53	125	266	196	2.79	125	116	66%
	WBL	40	57.14%			141	253	3.53	72	152	112	2.79	72	66	
	WBT	2	2.86%			7	13	3.53	4	8	6	2.79	4	3	
	WBR	28	40.00%			99	177	3.53	50	106	78	2.79	50	46	
	NB Approach	358	100.00%	499	1.7%	593	840	1.66	507	605	556	1.55	556	522	46%
	NBL	12	3.35%			20	28	1.66	17	20	19	1.55	19	17	
	NBT	337	94.13%			558	791	1.66	478	570	524	1.55	524	491	
	NBR	9	2.51%			15	21	1.66	13	15	14	1.55	14	13	
	EB Approach	45	100.00%	79	8.1%	150	336	3.33	101	231	166	3.69	166	123	172%
	EBL	28	62.22%			93	209	3.33	63	144	103	3.69	103	90	
	EBT	2	4.44%			7	15	3.33	4	10	7	3.69	7	6	
	EBR	15	33.33%			50	70	3.33	21	35	28	1.86	28	26	

Existing Count Year	2011	AM Peak	
Base Model Year	2000		
Future Model Year	2040		

NCHRP 255 Method selected: Ratio / Difference / Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume	2035 Volume / 2011 Existing Volume
	Total	1166		1221	0.2%		1331	1.05	1271	1276	1274	1.09	1140	1125	-4%
Morgan Blvd/Park-N-Ride	SB Approach	444	100.00%	673	-0.2%	657	614	1.48	415	401	408	0.92	408	414	-7%
	SBL	0	0.00%			0	0			0			0	0	
	SBT	375	84.46%			555	519	1.48	351	339	345	0.92	345	350	
	SBR	69	15.54%			102	95	1.48	65	62	63	0.92	63	64	
	WB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0	
	WBL	0												0	
	WBT	0												0	
	WBR	0												0	
	NB Approach	608	100.00%	548	0.8%	594	717	0.98	733	731	732	1.20	732	711	17%
	NBL	308	50.66%			301	363	0.98	371	370	371	1.20	371	360	
	NBT	300	49.34%			293	354	0.98	362	360	361	1.20	361	351	
	NBR	0	0.00%			0	0			0			0	0	
	EB Approach	114	100.00%	0	#DIV/0!	#DIV/0!	0							0	
	EBL	29	25.44%				0							0	
	EBT	0	0.00%				0							0	
	EBR	85	74.56%				0							0	

Existing Count Year 2011
Base Model Year 2010
Future Model Year 2040

AM Peak

NCHRP 255 Method selected
Ratio
Difference
Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/Hampton Road/Brightseat Road	Total	5231		4295	0.8%	4319	5018	0.82	6112	5954	6033	1.15	6126	5972
	SB Approach	360	100.00%	120	15.3%	138	670	0.38	1744	892	1318	3.66	892	800
	SBL	143	39.72%			55	266	0.38	693	354	523	3.66	354	318
	SBT	138	38.33%			53	257	0.38	668	342	505	3.66	342	307
	SBR	79	21.94%			30	147	0.38	383	196	289	3.66	196	176
	WB Approach	3073	100.00%	3230	-0.3%	3220	2936	1.05	2802	2789	2795	0.91	2795	2843
	WBL	479	15.59%			502	458	1.05	437	435	436	0.91	436	443
	WBT	2212	71.98%			2318	2113	1.05	2017	2007	2012	0.91	2012	2047
	WBR	382	12.43%			400	365	1.05	348	347	347	0.91	347	353
	NB Approach	543	100.00%	229	1.3%	232	317	0.43	742	628	685	1.26	685	661
	NBL	138	25.41%			59	81	0.43	189	160	174	1.26	174	168
	NBT	101	18.60%			43	59	0.43	138	117	127	1.26	127	123
	NBR	304	55.99%			130	177	0.43	415	352	384	1.26	384	370
	EB Approach	1255	100.00%	716	1.8%	729	1095	0.58	1886	1621	1754	1.40	1754	1668
	EBL	109	8.69%			63	95	0.58	164	141	152	1.40	152	145
	EBT	985	78.49%			572	859	0.58	1480	1273	1376	1.40	1376	1309
	EBR	161	12.83%			93	140	0.58	242	208	225	1.40	225	214
Central Avenue/I-95 SB	Total	5905		5414	-0.3%		4902	0.92	5347	5393	5370	1	5408	5493
	SB Approach	1135	100.00%	827	-0.1%	826	795	0.73	1092	1104	1098	1	1098	1105
	SBL	777	68.46%			565	544	0.73	748	756	752	1	752	756
	SBT	0	0.00%			0	0			0				0
	SBR	358	31.54%			261	251	0.73	345	348	346	1	346	348
	WB Approach	3220	100.00%	3764	-0.4%	3750	3343	1.16	2871	2813	2842	1	2842	2907
	WBL	901	27.98%			1049	935	1.16	803	787	795	1	795	813
	WBT	2319	72.02%			2701	2408	1.16	2067	2026	2047	1	2047	2094
	WBR	0	0.00%			0	0			0			0	0
	NB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	NBL	0												0
	NBT	0												0
	NBR	0												0
	EB Approach	1550	100.00%	823	-0.2%	821	764	0.53	1442	1493	1468	1	1468	1482
	EBL	0	0.00%			0	0			0			0	0
	EBT	1224	78.97%			648	603	0.53	1139	1179	1159	1	1159	1170
	EBR	326	21.03%			173	161	0.53	303	314	309	1	309	312

Existing Count Year 2011
Base Model Year 2010
Future Model Year 2040

AM Peak

NCHRP 255 Method selected: Ratio / Difference / Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/I-95 NB	Total	6243		4939	-0.3%		4525	0.79	5720	5829	5774	1	5876	5939
	SB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	SBL	0												0
	SBT	0												0
	SBR	0												0
	WB Approach	3609	100.00%	3728	-0.4%	3713	3268	1.03	3177	3164	3171	1	3171	3246
	WBL	0	0.00%			0	0			0			0	0
	WBT	2970	82.29%			3055	2689	1.03	2614	2604	2609	1	2609	2671
	WBR	639	17.71%			657	579	1.03	562	560	561	1	561	575
	NB Approach	931	100.00%	480	0.1%	480	493	0.52	955	944	949	1	949	946
	NBL	294	31.58%			152	156	0.52	302	298	300	1	300	299
	NBT	0	0.00%			0	0			0			0	0
	NBR	637	68.42%			329	337	0.52	654	646	650	1	650	647
	EB Approach	1703	100.00%	731	0.2%	732	764	0.43	1777	1735	1756	1	1756	1747
	EBL	541	31.77%			233	243	0.43	565	551	558	1	558	555
	EBT	1162	68.23%			500	521	0.43	1213	1184	1198	1	1198	1192
	EBR	0	0.00%			0	0			0			0	0
Harry S. Truman Drive/Largo Center Drive (NOTE: NB/SB is Harry S. Truman Drive)	Total	2794		698	1.4%		989	0.39	2562	2085	2311	1	3365	2267
	SB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	SBL	0												0
	SBT	0												0
	SBR	0												0
	WB Approach	80	100.00%	10	3.7%	10	21	0.13	162	91	91	1	162	148
	WBL	62	77.50%			8	16	0.13	126	70	98	2	126	115
	WBT	0	0.00%			0	0			0			0	0
	WBR	18	22.50%			2	5	0.13	36	20	28	2	36	33
	NB Approach	1400	100.00%	507	1.7%	515	758	0.37	2059	1643	1851	1	1851	1773
	NBL	0	0.00%			0	0			0			0	0
	NBT	836	59.71%			308	453	0.37	1230	981	1105	1	1105	1059
	NBR	564	40.29%			208	305	0.37	830	662	746	1	746	714
	EB Approach	314	100.00%	181	0.5%	182	210	0.58	362	342	352	1	352	346
	EBL	23	7.32%			13	15	0.58	27	25	26	1	26	25
	EBT	106	33.76%			61	71	0.58	122	115	119	1	119	117
	EBR	185	58.92%			107	124	0.58	214	202	208	1	208	204

Existing Count Year	2011	AM Peak
Base Model Year	2010	
Future Model Year	2040	

NCHRP 255 Method selected: Ratio; Difference; Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Arena Drive/Shoppers Way	Total	1411		1147	9.2%		2235	0.91	2749	3499	3124	2	2611	2494
	SB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	SBL	0												0
	SBT	0												0
	SBR	0												0
	WB Approach	623	100.00%	477	5.0%	501	1197	0.80	1488	1319	1404	2	1404	1269
	WBL	45	7.22%			36	86	0.80	108	95	101	2	101	92
	WBT	578	92.78%			465	1111	0.80	1381	1224	1302	2	1302	1177
	WBR	0	0.00%			0	0			0			0	0
	NB Approach	204	100.00%	222	-1.7%	218	111	1.07	104	97	100	0	100	118
	NBL	155	75.98%			166	84	1.07	79	73	76	0	76	90
	NBT	0	0.00%			0	0			0	0		0	0
	NBR	49	24.02%			52	27	1.07	25	23	24	0	24	28
	EB Approach	584	100.00%	448	3.6%	464	927	0.79	1167	1047	1107	2	1107	1017
	EBL	0	0.00%			0	0			0			0	0
	EBT	440	75.34%			350	698	0.79	879	789	834	2	834	766
	EBR	144	24.66%			114	229	0.79	288	258	273	2	273	251
Lotsford Road/Harry S. Truman Drive	Total	1246		358	4.6%		848	0.29	2951	1736	1736	1	1720	1638
	SB Approach	274	100.00%	16	50.2%	24	257	0.09	2930	507	507	2	507	467
	SBL	0	0.00%			0	0			0			0	0
	SBT	91	33.21%			8	85	0.09	973	168	571	6	168	155
	SBR	183	66.79%			16	172	0.09	1957	339	1148	6	339	312
	WB Approach	868	100.00%	341	2.4%	349	590	0.40	1466	1109	1287	1	1109	1067
	WBL	22	2.53%			9	15	0.40	37	28	33	1	28	27
	WBT	421	48.50%			169	286	0.40	711	538	624	1	538	518
	WBR	425	48.96%			171	289	0.40	718	543	630	1	543	523
	NB Approach	104	100.00%	1	0.0%	1	1	0.01	104	104	104	1	104	104
	NBL	5	4.81%			0	0	0.01	5	5	5	1	5	5
	NBT	99	95.19%			1	1	0.01	99	99	99	1	99	99
	NBR	0	0.00%			0	0			0			0	0
	EB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	EBL	0												0
	EBT	0												0
	EBR	0												0
Arena/Lottsford	Total	2102		716	8.0%	759	2002	0.34	5877	3388	4633	2	3424	3196
	SB Approach	587	100.00%	86	11.1%	96	373	0.16	2291	864	864	1	864	817
	SBL	39	6.64%			6	25	0.16	152	57	105	3	57	54
	SBT	273	46.51%			44	173	0.16	1066	402	734	3	402	380
	SBR	275	46.85%			45	175	0.16	1073	405	739	3	405	383
	WB Approach	466	100.00%	111	6.3%	118	322	0.25	1271	670	971	2	670	635
	WBL	260	55.79%			66	180	0.25	709	374	542	2	374	354
	WBT	175	37.55%			44	121	0.25	477	252	365	2	252	238
	WBR	31	6.65%			8	21	0.25	85	45	65	2	45	42
	NB Approach	545	100.00%	293	2.3%	300	491	0.55	893	736	815	1	815	768
	NBL	211	38.72%			116	190	0.55	346	285	315	1	315	297
	NBT	290	53.21%			159	261	0.55	475	392	434	1	434	409
	NBR	44	8.07%			24	40	0.55	72	59	66	1	66	62
	EB Approach	504	100.00%	226	8.7%	246	816	0.49	1674	1074	1374	3	1074	976
	EBL	266	52.78%			130	431	0.49	884	567	725	3	567	515
	EBT	170	33.73%			83	275	0.49	565	362	464	3	362	329
	EBR	68	13.49%			33	110	0.49	226	145	185	3	145	132

Existing Count Year	2011	PM Peak
Base Model Year	2000	
Future Model Year	2040	

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/Southern Ave	Total	3200		4911	0.5%	5180	5888	1.53	3837	4177	4007	1	3866	3751
	SB Approach	630	100.00%	867	1.7%	1027	1449	1.63	889	1052	970	1.54	970	912
	SBL	55	8.73%			90	127	1.63	78	92	85	1.54	85	80
	SBT	510	80.95%			831	1173	1.63	720	852	786	1.54	786	738
	SBR	65	10.32%			106	150	1.63	92	109	100	1.54	100	94
	WB Approach	550	100.00%	949	1.7%	1124	1585	2.04	776	1011	893	1.62	893	834
	WBL	75	13.64%			153	216	2.04	106	138	122	1.62	122	114
	WBT	400	72.73%			817	1153	2.04	564	735	650	1.62	650	607
	WBR	75	13.64%			153	216	2.04	106	138	122	1.62	122	114
	NB Approach	660	100.00%	652	1.3%	747	996	1.13	880	909	895	1.36	895	854
	NBL	10	1.52%			11	15	1.13	13	14	14	1.36	14	13
	NBT	585	88.64%			662	883	1.13	780	806	793	1.36	793	757
	NBR	65	9.85%			74	98	1.13	87	90	88	1.36	88	84
	EB Approach	1360	100.00%	2443	-0.6%	2282	1858	1.68	1107	936	1022	0.75	1107	1151
	EBL	240	17.65%			403	328	1.68	195	165	180	0.75	195	203
	EBT	1100	80.88%			1846	1503	1.68	896	757	826	0.75	896	931
	EBR	20	1.47%			34	27	1.68	16	14	15	0.75	16	17
Central Avenue/Addison Road	Total	4717		5009	0.6%	5346	5233	1.06	5870	5941	5905	1.25	5601	5448
	SB Approach	761	100.00%	991	-0.1%	978	943	1.28	734	726	730	0.96	730	735
	SBL	136	17.87%			175	169	1.28	131	130	130	0.96	130	131
	SBT	382	50.20%			491	473	1.28	368	365	366	0.96	366	369
	SBR	243	31.93%			312	301	1.28	234	232	233	0.96	233	235
	WB Approach	1174	100.00%	1259	0.9%	1380	1698	1.18	1445	1492	1469	1.25	1469	1418
	WBL	223	18.99%			262	323	1.18	274	283	279	1.25	279	269
	WBT	845	71.98%			993	1222	1.18	1040	1074	1057	1.25	1057	1020
	WBR	106	9.03%			125	153	1.18	130	135	133	1.25	133	128
	NB Approach	699	100.00%	1066	0.2%	1088	1145	1.56	736	756	746	1.07	746	738
	NBL	243	34.76%			378	398	1.56	256	263	259	1.07	259	257
	NBT	256	36.62%			398	419	1.56	269	277	273	1.07	273	270
	NBR	200	28.61%			311	328	1.56	211	216	213	1.07	213	211
	EB Approach	2083	100.00%	1693	1.1%	1900	2447	0.91	2682	2630	2656	1.28	2656	2557
	EBL	82	3.94%			75	96	0.91	106	104	105	1.28	105	101
	EBT	1673	80.32%			1526	1965	0.91	2154	2112	2133	1.28	2133	2054
	EBR	328	15.75%			299	385	0.91	422	414	418	1.28	418	403

Existing Count Year	2011	PM Peak	NCHRP 255 Method selected: Ratio (red), Difference (yellow), Average (green)
Base Model Year	2000		
Future Model Year	2040		

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/Cindy Lane	Total	3577		3292	0.2%		3620	0.92	3933	3905	3919	1.10	3825	3782
	SB Approach	122	100.00%	251	-0.7%	231	178	1.89	94	69	82	0.67	94	99
	SBL	20	16.39%			38	29	1.89	15	11	13	0.67	15	16
	SBT	0	0.00%			0	0			0			0	0
	SBR	102	83.61%			193	149	1.89	79	58	68	0.67	79	83
	WB Approach	1152	100.00%	1146	0.9%	1262	1569	1.10	1432	1459	1445	1.25	1445	1395
	WBL	1	0.09%			1	1	1.10	1	1	1	1.25	1	1
	WBT	1121	97.31%			1228	1527	1.10	1393	1419	1406	1.25	1406	1357
	WBR	30	2.60%			33	41	1.10	37	38	38	1.25	38	36
	NB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	NBL	0												0
	NBT	0												0
	NBR	0												0
	EB Approach	2303	100.00%	1895	0.0%	1889	1873	0.82	2284	2287	2285	0.99	2285	2288
	EBL	93	4.04%			76	76	0.82	92	92	92	0.99	92	92
	EBT	2210	95.96%			1813	1797	0.82	2191	2195	2193	0.99	2193	2196
	EBR	0	0.00%			0	0			0			0	0
Central Avenue/Hill Road/Shady Lane	Total	4254		5169	0.4%	5404	6022	1.22	4956	5107	5032	1.18	4624	4648
	SB Approach	527	100.00%	700	2.5%	896	1413	1.70	831	1044	937	1.78	831	867
	SBL	286	54.27%			486	767	1.70	451	567	509	1.78	509	470
	SBT	152	28.84%			258	408	1.70	240	301	270	1.78	270	250
	SBR	89	16.89%			151	239	1.70	140	176	158	1.78	158	146
	WB Approach	1385	100.00%	1897	0.3%	1958	2118	1.41	1498	1545	1522	1.10	1522	1498
	WBL	100	7.22%			141	153	1.41	108	112	110	1.10	110	108
	WBT	1059	76.46%			1497	1619	1.41	1146	1182	1164	1.10	1164	1146
	WBR	226	16.32%			319	346	1.41	244	252	248	1.10	248	244
	NB Approach	303	100.00%	750	0.1%	759	781	2.50	312	325	319	1.05	319	316
	NBL	93	30.69%			233	240	2.50	96	100	98	1.05	98	97
	NBT	162	53.47%			406	418	2.50	167	174	170	1.05	170	169
	NBR	48	15.84%			120	124	2.50	49	52	50	1.05	50	50
	EB Approach	2039	100.00%	1822	-0.2%	1791	1710	0.88	1947	1958	1952	0.96	1952	1967
	EBL	90	4.41%			79	75	0.88	86	86	86	0.96	86	87
	EBT	1847	90.58%			1623	1549	0.88	1763	1773	1768	0.96	1768	1782
	EBR	102	5.00%			90	86	0.88	97	98	98	0.96	98	98

Existing Count Year	2011	PM Peak
Base Model Year	2000	
Future Model Year	2040	

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/Morgan Blvd/Ritchie Road	Total	5276		5979	0.0%	6006	6078	1.13	5363	5375	5369	1.02	5312	5306
	SB Approach	627	100.00%	670	1.6%	785	1087	1.25	869	929	899	1.43	899	852
	SBL	207	33.01%			259	359	1.25	287	307	297	1.43	297	281
	SBT	318	50.72%			398	551	1.25	441	471	456	1.43	456	432
	SBR	102	16.27%			128	177	1.25	141	151	146	1.43	146	139
	WB Approach	1645	100.00%	1611	0.0%	1617	1632	0.98	1660	1660	1660	1.01	1660	1658
	WBL	257	15.62%			253	255	0.98	259	259	259	1.01	259	259
	WBT	1263	76.78%			1241	1253	0.98	1275	1275	1275	1.01	1275	1273
	WBR	125	7.60%			123	124	0.98	126	126	126	1.01	126	126
	NB Approach	799	100.00%	1323	0.1%	1340	1384	1.68	825	843	834	1.04	834	828
	NBL	221	27.66%			371	383	1.68	228	233	231	1.04	231	229
	NBT	236	29.54%			396	409	1.68	244	249	246	1.04	246	245
	NBR	342	42.80%			573	592	1.68	353	361	357	1.04	357	355
	EB Approach	2205	100.00%	2375	-0.4%	2265	1975	1.03	1923	1915	1919	0.87	1919	1968
	EBL	223	10.11%			229	200	1.03	194	194	194	0.87	194	199
	EBT	1811	82.13%			1860	1622	1.03	1579	1573	1576	0.87	1576	1616
	EBR	171	7.76%			176	153	1.03	149	149	149	0.87	149	153
Addison Road/Wilburn	Total	1698		2287	1.0%		3163	1.35	2348	2574	2461	1.45	2252	2157
	SB Approach	907	100.00%	1193	1.5%	1384	1889	1.53	1238	1412	1325	1.46	1325	1253
	SBL	49	5.40%			75	102	1.53	67	76	72	1.46	72	68
	SBT	858	94.60%			1310	1787	1.53	1171	1335	1253	1.46	1253	1185
	SBR	0	0.00%			0	0			0			0	0
	WB Approach	100	100.00%	36	4.9%	56	107	0.56	193	151	172	1.72	172	160
	WBL	69	69.00%			38	74	0.56	133	105	119	1.72	119	110
	WBT	0	0.00%			0	0			0			0	0
	WBR	31	31.00%			17	33	0.56	60	47	53	1.72	53	49
	NB Approach	691	100.00%	1058	0.3%	1088	1167	1.57	741	770	756	1.09	756	744
	NBL	0	0.00%			0	0			0			0	0
	NBT	610	88.28%			960	1030	1.57	654	680	667	1.09	667	657
	NBR	81	11.72%			128	137	1.57	87	90	89	1.09	89	87
	EB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	EBL	0												0
	EBT	0												0
	EBR	0												0

Existing Count Year	2011
Base Model Year	2000
Future Model Year	2040

PM Peak

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Hill Riad/Willow	Total	1272		1657	0.4%	1737	1949	1.30	1496	1564	1530	1.20	1475	1440
	SB Approach	486	100.00%	752	0.9%	822	1008	1.69	596	672	634	1.30	634	608
	SBL	58	11.93%			98	120	1.69	71	80	76	1.30	76	73
	SBT	421	86.63%			712	873	1.69	516	582	549	1.30	549	527
	SBR	7	1.44%			12	15	1.69	9	10	9	1.30	9	9
	WB Approach	154	100.00%	60	8.4%	115	261	0.75	349	300	324	2.11	324	295
	WBL	97	62.99%			73	164	0.75	220	189	204	2.11	204	186
	WBT	5	3.25%			4	8	0.75	11	10	11	2.11	11	10
	WBR	52	33.77%			39	88	0.75	118	101	109	2.11	109	100
	NB Approach	606	100.00%	701	-0.6%	656	537	1.08	496	487	492	0.81	492	511
	NBL	25	4.13%			27	22	1.08	20	20	20	0.81	20	21
	NBT	448	73.93%			485	397	1.08	367	360	363	0.81	363	378
	NBR	133	21.95%			144	118	1.08	109	107	108	0.81	108	112
	EB Approach	26	100.00%	144	0.0%	144	143	5.53	26	25	26	0.98	26	26
	EBL	4	15.38%			22	22	5.53	4	4	4	0.98	4	4
	EBT	3	11.54%			17	17	5.53	3	3	3	0.98	3	3
	EBR	19	73.08%			105	105	5.53	19	18	19	0.98	19	19
Morgan Blvd/Ridgefield blvd	Total	892		1612	1.3%	1837	2431	1.81	1345	1711	1528	1.71	1257	1194
	SB Approach	406	100.00%	822	0.5%	871	1001	2.15	466	536	501	1.23	501	485
	SBL	18	4.43%			39	44	2.15	21	24	22	1.23	22	21
	SBT	363	89.41%			779	895	2.15	417	479	448	1.23	448	433
	SBR	25	6.16%			54	62	2.15	29	33	31	1.23	31	30
	WB Approach	34	100.00%	71	7.8%	132	293	3.88	75	195	135	3.98	75	68
	WBL	22	64.71%			85	190	3.88	49	126	87	3.98	49	44
	WBT	0	0.00%			0	0			0				0
	WBR	12	35.29%			47	103	3.88	27	69	48	3.98	27	24
	NB Approach	425	100.00%	707	1.5%	824	1133	1.94	584	734	659	1.55	659	619
	NBL	18	4.24%			35	48	1.94	25	31	28	1.55	28	26
	NBT	370	87.06%			717	986	1.94	509	639	574	1.55	574	539
	NBR	37	8.71%			72	99	1.94	51	64	57	1.55	57	54
	EB Approach	27	100.00%	12	-1.7%	10	4	0.36	11	21	16	0.60	21	22
	EBL	10	37.04%			4	1	0.36	4	8	6	0.60	8	8
	EBT	1	3.70%			0	0	0.36	0	1	1	0.60	1	1
	EBR	16	59.26%			6	2	0.36	7	13	10	0.60	13	13

Existing Count Year	2011
Base Model Year	2000
Future Model Year	2040

PM Peak

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2000 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
	Total	1247		1381	1.7%		2302	1.11	2079	2168	2123	1.70	1434	1345
Morgan Blvd/Park-N-Ride	SB Approach	442	100.00%	659	2.6%	851	1356	1.92	705	947	826	1.87	826	760
	SBL	1	0.23%			2	3	1.92	2	2	2	1.87	2	2
	SBT	405	91.63%			779	1242	1.92	646	868	757	1.87	757	696
	SBR	36	8.14%			69	110	1.92	57	77	67	1.87	67	62
	WB Approach	0	0.00%	0	#DIV/0!	#DIV/0!	0							0
	WBL	0												0
	WBT	0												0
	WBR	0												0
	NB Approach	477	100.00%	722	0.8%	784	946	1.64	576	639	608	1.27	608	585
	NBL	91	19.08%			149	180	1.64	110	122	116	1.27	116	112
	NBT	386	80.92%			634	766	1.64	466	517	492	1.27	492	473
	NBR	0	0.00%			0	0			0			0	0
	EB Approach	328	100.00%	0	#DIV/0!	#DIV/0!	0							0
	EBL	88	26.83%				0							0
	EBT	0	0.00%				0							0
	EBR	240	73.17%				0							0

Existing Count Year	2011	PM Peak
Base Model Year	2010	
Future Model Year	2040	

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/Hamptom Road/Brightseat Road	Total	5606		6705	-0.4%	6410	5831	1.20	4708	4532	4620	0.82	4996	5101
	SB Approach	668	100.00%	224	9.8%	465	1100	0.70	1581	1303	1442	2.16	1303	1194
	SBL	329	49.25%			229	542	0.70	778	642	710	2.16	642	588
	SBT	171	25.60%			119	282	0.70	405	334	369	2.16	334	306
	SBR	168	25.15%			117	277	0.70	398	328	363	2.16	328	300
	WB Approach	1746	100.00%	2604	-0.8%	2361	1719	1.35	1271	1104	1188	0.68	1271	1353
	WBL	439	25.14%			594	432	1.35	320	278	299	0.68	320	340
	WBT	1187	67.98%			1605	1169	1.35	864	751	808	0.68	864	920
	WBR	120	6.87%			162	118	1.35	87	76	82	0.68	87	93
	NB Approach	862	100.00%	1538	-0.4%	1476	1313	1.71	767	699	733	0.85	733	755
	NBL	295	34.22%			505	449	1.71	262	239	251	0.85	251	258
	NBT	136	15.78%			233	207	1.71	121	110	116	0.85	116	119
	NBR	431	50.00%			738	657	1.71	383	349	366	0.85	366	378
	EB Approach	2330	100.00%	2339	-0.9%	2108	1499	0.90	1657	1721	1689	0.72	1689	1799
	EBL	132	5.67%			119	85	0.90	94	97	96	0.72	96	102
	EBT	1955	83.91%			1769	1258	0.90	1390	1444	1417	0.72	1417	1510
	EBR	243	10.43%			220	156	0.90	173	179	176	0.72	176	188
Central Avenue/I-95 SB	Total	6123		5224	-0.6%	5192	4267	0.85	5001	5166	5084	0.83	5117	5290
	SB Approach	1108	100.00%	594	-0.5%	591	510	0.53	956	1027	991	0.89	991	1011
	SBL	750	67.69%			400	345	0.53	647	695	671	0.89	671	685
	SBT	0	0.00%			0	0			0			0	0
	SBR	358	32.31%			191	165	0.53	309	332	320	0.89	320	327
	WB Approach	2018	100.00%	1964	-0.4%	1957	1747	0.97	1802	1808	1805	0.89	1805	1842
	WBL	643	31.86%			623	557	0.97	574	576	575	0.89	575	587
	WBT	1375	68.14%			1333	1190	0.97	1228	1232	1230	0.89	1230	1255
	WBR	0	0.00%			0	0			0			0	0
	NB Approach	0	0.00%	0			0			0				0
	NBL	0												0
	NBT	0												0
	NBR	0												0
	EB Approach	2997	100.00%	2666	-0.8%	2644	2010	0.88	2278	2363	2321	0.77	2321	2437
	EBL	0	0.00%			0	0			0			0	0
	EBT	2594	86.55%			2289	1740	0.88	1972	2045	2009	0.77	2009	2109
	EBR	403	13.45%			356	270	0.88	306	318	312	0.77	312	328

Existing Count Year 2011
Base Model Year 2010
Future Model Year 2040

PM Peak

NCHRP 255 Method selected
Ratio
Difference
Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Central Avenue/I-95 NB	Total	7153		5248	-1.4%	5177	3110	0.73	4239	5015	4627	0.65	5074	6432
	SB Approach	0	0.00%	0			0			0				0
	SBL	0												0
	SBT	0												0
	SBR	0												0
	WB Approach	2088	100.00%	1937	-0.5%	1927	1625	0.92	1761	1786	1774	0.85	1774	1828
	WBL	0	0.00%			0	0			0			0	0
	WBT	1737	83.19%			1603	1352	0.92	1465	1486	1476	0.85	1476	1521
	WBR	351	16.81%			324	273	0.92	296	300	298	0.85	298	307
	NB Approach	1694	100.00%	1102	-2.1%	1079	424	0.64	665	1039	852	0.50	1039	1152
	NBL	281	16.59%			179	70	0.64	110	172	141	0.50	172	191
	NBT	0	0.00%			0	0			0			0	0
	NBR	1413	83.41%			900	354	0.64	555	866	711	0.50	866	961
	EB Approach	3371	100.00%	2209	-1.7%	2171	1061	0.64	1648	2261	1954	0.58	2261	2453
	EBL	661	19.61%			426	208	0.64	323	443	383	0.58	443	481
	EBT	2710	80.39%			1745	853	0.64	1325	1818	1571	0.58	1818	1972
	EBR	0	0.00%			0	0			0			0	0
Harry S. Truman Drive/Largo Center Drive (NOTE: NB/SB is Harry S. Truman Drive)	Total	1969		758	4.9%	795	1867	0.38	4850	3078	3964	2.01	3135	2934
	SB Approach	0	0.00%	0			0			0			0	0
	SBL	0												0
	SBT	0												0
	SBR	0												0
	WB Approach	258	100.00%	19	13.3%	22	95	0.08	1138	331	331	1.28	331	319
	WBL	226	87.60%			19	83	0.08	997	290	644	2.85	290	279
	WBT	0	0.00%			0	0			0	0		0	0
	WBR	32	12.40%			3	12	0.08	141	41	91	2.85	41	40
	NB Approach	888	100.00%	439	1.5%	446	635	0.50	1266	1077	1172	1.32	1172	1123
	NBL	0	0.00%			0	0			0	0		0	0
	NBT	475	53.49%			238	340	0.50	677	576	627	1.32	627	601
	NBR	413	46.51%			207	295	0.50	589	501	545	1.32	545	522
	EB Approach	823	100.00%	300	9.3%	328	1137	0.40	2854	1632	2243	2.73	1632	1493
	EBL	21	2.55%			8	29	0.40	73	42	57	2.73	42	38
	EBT	237	28.80%			94	327	0.40	822	470	646	2.73	470	430
	EBR	565	68.65%			225	781	0.40	1959	1120	1540	2.73	1120	1025

Existing Count Year 2011
Base Model Year 2010
Future Model Year 2040

PM Peak

NCHRP 255 Method selected
Ratio
Difference
Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
Arena Drive/Shoppers Way	Total	2239		1502	3.1%	1548	2878	0.67	4290	3615	3953	1.77	3570	3340
	SB Approach	0	0.00%	0			0			0			0	0
	SBL	0												0
	SBT	0												0
	SBR	0												0
	WB Approach	802	100.00%	386	4.5%	403	909	0.50	1807	1308	1557	1.94	1308	1220
	WBL	82	10.22%			41	93	0.50	185	134	159	1.94	134	125
	WBT	720	89.78%			362	816	0.50	1622	1174	1398	1.94	1174	1096
	WBR	0	0.00%			0	0			0			0	0
	NB Approach	377	100.00%	87	-0.8%	86	67	0.23	293	358	358	0.95	358	361
	NBL	221	58.62%			51	39	0.23	172	210	191	0.86	210	212
	NBT	0	0.00%			0	0			0	0		0	0
	NBR	156	41.38%			36	28	0.23	121	148	135	0.86	148	149
	EB Approach	1060	100.00%	1029	2.8%	1058	1902	1.00	1905	1904	1905	1.80	1905	1759
	EBL	0	0.00%			0	0			0	0		0	0
	EBT	721	68.02%			720	1294	1.00	1296	1295	1296	1.80	1296	1196
	EBR	339	31.98%			338	608	1.00	609	609	609	1.80	609	563
Lotsford Road/Harry S. Truman Drive	Total	1098		544	2.5%	558	949	0.50	1915	1503	1709	1.56	1627	1536
	SB Approach	431	100.00%	259	2.5%	266	456	0.62	740	621	681	1.58	681	638
	SBL	0	0.00%			0	0			0			0	0
	SBT	291	67.52%			179	308	0.62	500	420	460	1.58	460	431
	SBR	140	32.48%			86	148	0.62	240	202	221	1.58	221	207
	WB Approach	515	100.00%	283	2.5%	290	492	0.56	874	717	795	1.54	795	747
	WBL	43	8.35%			24	41	0.56	73	60	66	1.54	66	62
	WBT	275	53.40%			155	263	0.56	467	383	425	1.54	425	399
	WBR	197	38.25%			111	188	0.56	334	274	304	1.54	304	286
	NB Approach	152	100.00%	2	-1.7%	2	1	0.01	77	151	151	0.99	151	151
	NBL	9	5.92%			0	0	0.01	5	9			9	9
	NBT	143	94.08%			2	1	0.01	73	142			142	142
	NBR	0	0.00%			0	0			0			0	0
	EB Approach	0	0.00%	0			0			0			0	0
	EBL	0												0
	EBT	0												0
	EBR	0												0

Existing Count Year	2011
Base Model Year	2010
Future Model Year	2040

PM Peak

NCHRP 255 Method selected
- Ratio
- Difference
- Average

Intersection Name	Movement	2011 Existing Turning Volumes	% Approach Volume	2010 Base Model Link Volume	Base to Future Model Growth Factor	2011 Adjusted Base Model Volumes	2040 Future Model Link Volume	2011 Base Model: 2011 Existing Volume	Ratio Method (Existing * Future/Base)	Difference Method (Ex. + Future - Base)	Average ((Ratio + Diff.)/2)	Growth Factor (From Ex. Volume)	2040 Analysis Volume	2035 Final Analysis Volume
	Total	2738		1907	2.7%	1958	3437	0.70	4935	4268	4601	1.68	4441	4148
Arena/Lottsford	SB Approach	738	100.00%	127	8.8%	138	461	0.19	2463	1061	1061	1.44	1061	1005
	SBL	91	12.33%			17	57	0.19	304	131			131	124
	SBT	233	31.57%			44	146	0.19	778	335			335	317
	SBR	414	56.10%			77	259	0.19	1382	595			595	564
	WB Approach	442	100.00%	741	-0.4%	738	641	1.67	384	345	365	0.83	365	378
	WBL	82	18.55%			137	119	1.67	71	64	68	0.83	68	70
	WBT	327	73.98%			546	474	1.67	284	255	270	0.83	270	280
	WBR	33	7.47%			55	48	1.67	29	26	27	0.83	27	28
	NB Approach	651	100.00%	285	2.5%	292	500	0.45	1114	859	986	1.52	986	929
	NBL	133	20.43%			60	102	0.45	228	175	202	1.52	202	190
	NBT	291	44.70%			131	224	0.45	498	384	441	1.52	441	415
	NBR	227	34.87%			102	174	0.45	388	299	344	1.52	344	324
	EB Approach	907	100.00%	754	4.8%	790	1835	0.87	2107	1952	2029	2.24	2029	1836
	EBL	302	33.30%			263	611	0.87	701	650	676	2.24	676	611
	EBT	484	53.36%			422	979	0.87	1124	1042	1083	2.24	1083	980
	EBR	121	13.34%			105	245	0.87	281	260	271	2.24	271	245

Appendix 4
"No Build" Traffic Analysis and Queuing Reports

Queues
10: Southern Ave NE & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NET	SWT
Lane Group Flow (vph)	58	315	95	2589	153	868	579
v/c Ratio	0.29	0.11	0.12	1.36	0.16	1.12	0.77
Control Delay	10.0	10.3	5.5	191.5	4.7	104.1	35.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	10.3	5.5	191.5	4.7	104.1	35.7
Queue Length 50th (ft)	12	31	17	~1165	15	~344	156
Queue Length 95th (ft)	26	46	33	#1301	44	#469	225
Internal Link Dist (ft)		460		823		251	355
Turn Bay Length (ft)	175		330				
Base Capacity (vph)	202	2781	768	1897	940	776	756
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.11	0.12	1.36	0.16	1.12	0.77

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
10: Southern Ave NE & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	55	275	25	90	2460	145	65	750	10	30	350	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		-1.0	6.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00		0.95			0.95	
Frt	1.00	0.99		1.00	1.00	0.85		1.00			0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	5022		1770	3539	1583		3519			3366	
Flt Permitted	0.08	1.00		0.55	1.00	1.00		0.74			0.71	
Satd. Flow (perm)	150	5022		1030	3539	1583		2616			2382	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	58	289	26	95	2589	153	68	789	11	32	368	179
RTOR Reduction (vph)	0	10	0	0	0	43	0	1	0	0	51	0
Lane Group Flow (vph)	58	305	0	95	2589	110	0	867	0	0	528	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	53.1	48.8		50.7	47.6	47.6		26.0			26.0	
Effective Green, g (s)	55.1	53.8		60.7	52.6	55.6		29.0			29.0	
Actuated g/C Ratio	0.56	0.54		0.61	0.53	0.56		0.29			0.29	
Clearance Time (s)	4.0	11.0		4.0	11.0	11.0		6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	170	2732		693	1882	890		767			698	
v/s Ratio Prot	c0.02	0.06		0.01	c0.73							
v/s Ratio Perm	0.17			0.07		0.07		c0.33			0.22	
v/c Ratio	0.34	0.11		0.14	1.38	0.12		1.13			0.76	
Uniform Delay, d1	21.0	10.9		7.8	23.2	10.2		35.0			31.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	1.2	0.0		0.1	172.5	0.1		74.8			4.7	
Delay (s)	22.2	11.0		7.9	195.6	10.2		109.8			36.4	
Level of Service	C	B		A	F	B		F			D	
Approach Delay (s)		12.7			179.3			109.8			36.4	
Approach LOS		B			F			F			D	

Intersection Summary			
HCM Average Control Delay	135.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	98.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	125.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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HCM Unsignalized Intersection Capacity Analysis
20: Davey Street & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	155	2425	10	0	300	15	30	5	40	5	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	163	2553	11	0	316	16	32	5	42	5	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		903										
pX, platoon unblocked												
vC, conflicting volume	332			2563			2995	3216	856	1546	3213	113
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	332			2563			2995	3216	856	1546	3213	113
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			0	37	86	83	100	99
cM capacity (veh/h)	1225			169			5	8	301	30	8	918

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NE 1	NE 2	SW 1
Volume Total	163	1021	1021	521	0	126	126	79	37	42	11
Volume Left	163	0	0	0	0	0	0	0	32	0	5
Volume Right	0	0	0	11	0	0	0	16	0	42	5
cSH	1225	1700	1700	1700	1700	1700	1700	1700	6	301	58
Volume to Capacity	0.13	0.60	0.60	0.31	0.00	0.07	0.07	0.05	6.55	0.14	0.18
Queue Length 95th (ft)	11	0	0	0	0	0	0	0	Err	12	15
Control Delay (s)	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Err	18.9	79.8
Lane LOS	A								F	C	F
Approach Delay (s)	0.5				0.0				4676.3		79.8
Approach LOS									F		F

Intersection Summary			
Average Delay	118.0		
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

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Queues
90: Addison Rd. & MD 214 West

7/24/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	42	658	132	132	2868	542	500	174	58	174
v/c Ratio	0.26	0.25	0.15	0.27	1.02	0.73	0.65	0.36	0.32	0.49
Control Delay	17.6	21.7	4.4	15.5	53.1	60.3	57.4	8.1	66.8	66.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	21.7	4.4	15.5	53.1	60.3	57.4	8.1	66.8	66.5
Queue Length 50th (ft)	15	128	0	50	~1123	255	235	0	54	84
Queue Length 95th (ft)	37	183	42	m105	#1310	309	288	61	99	122
Internal Link Dist (ft)		307			296		726			986
Turn Bay Length (ft)	200		200	175		350		575	200	
Base Capacity (vph)	162	2627	853	486	2802	858	885	526	443	880
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.25	0.15	0.27	1.02	0.63	0.56	0.33	0.13	0.20

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
90: Addison Rd. & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑	↱	↰	↑↑↑↱		↰↰	↑↑	↱	↰	↑↱	
Volume (vph)	40	625	125	125	2625	100	515	475	165	55	155	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	6.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	1770	5057		3433	3539	1583	1770	3506	
Flt Permitted	0.05	1.00	1.00	0.34	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	98	5085	1583	624	5057		3433	3539	1583	1770	3506	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	658	132	132	2763	105	542	500	174	58	163	11
RTOR Reduction (vph)	0	0	67	0	2	0	0	0	136	0	4	0
Lane Group Flow (vph)	42	658	65	132	2866	0	542	500	38	58	170	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					3			
Actuated Green, G (s)	78.9	73.4	73.4	87.5	77.7		29.6	29.6	29.6	12.2	12.2	
Effective Green, g (s)	84.9	77.4	74.4	92.2	81.7		32.6	32.6	32.6	15.2	15.2	
Actuated g/C Ratio	0.57	0.52	0.50	0.61	0.54		0.22	0.22	0.22	0.10	0.10	
Clearance Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	2.5	5.0	5.0	2.5	5.0		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	150	2624	785	481	2754		746	769	344	179	355	
v/s Ratio Prot	0.02	0.13		c0.02	c0.57		c0.16	0.14		0.03	c0.05	
v/s Ratio Perm	0.14		0.04	0.15					0.02			
v/c Ratio	0.28	0.25	0.08	0.27	1.04		0.73	0.65	0.11	0.32	0.48	
Uniform Delay, d1	32.3	20.2	19.9	12.5	34.1		54.6	53.5	47.1	62.6	63.7	
Progression Factor	1.00	1.00	1.00	1.11	0.93		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	0.2	0.2	0.2	27.6		3.3	1.8	0.1	0.8	0.7	
Delay (s)	33.1	20.4	20.1	14.1	59.2		57.9	55.3	47.2	63.4	64.4	
Level of Service	C	C	C	B	E		E	E	D	E	E	
Approach Delay (s)		21.0			57.3			55.3			64.2	
Approach LOS		C			E			E			E	

Intersection Summary			
HCM Average Control Delay	51.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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HCM Unsignalized Intersection Capacity Analysis
95: MD 214 West 7/24/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	695	130	265	2525	150	100
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	732	137	279	2658	158	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	376					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			868		2244	312
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			607		2081	11
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			69		0	89
cM capacity (veh/h)			902		30	996

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	293	293	283	279	886	886	886	263
Volume Left	0	0	0	279	0	0	0	158
Volume Right	0	0	137	0	0	0	0	105
cSH	1700	1700	1700	902	1700	1700	1700	48
Volume to Capacity	0.17	0.17	0.17	0.31	0.52	0.52	0.52	5.44
Queue Length 95th (ft)	0	0	0	33	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	10.8	0.0	0.0	0.0	Err
Lane LOS				B				F
Approach Delay (s)	0.0			1.0				Err
Approach LOS								F

Intersection Summary			
Average Delay	647.5		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
100: Cabin Branch Rd/Soper Ln & MD 214 West 7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	700	90	145	2710	10	60	0	85	5	5	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	737	95	153	2853	11	63	0	89	5	5	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					941							
pX, platoon unblocked	0.73						0.73	0.73		0.73	0.73	0.73
vC, conflicting volume	2863			832			2075	3963	293	3509	4005	956
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2252			832			1169	3763	293	3139	3821	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			81			0	100	87	0	0	97
cM capacity (veh/h)	164			797			0	2	703	2	2	789

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1
Volume Total	5	295	295	242	153	1141	1141	581	153	32
Volume Left	5	0	0	0	153	0	0	0	63	5
Volume Right	0	0	0	95	0	0	0	11	89	21
cSH	164	1700	1700	1700	797	1700	1700	1700	0	7
Volume to Capacity	0.03	0.17	0.17	0.14	0.19	0.67	0.67	0.34	Err	4.65
Queue Length 95th (ft)	2	0	0	0	18	0	0	0	Err	Err
Control Delay (s)	27.7	0.0	0.0	0.0	10.6	0.0	0.0	0.0	Err	Err
Lane LOS	D				B				F	F
Approach Delay (s)	0.2				0.5				Err	Err
Approach LOS									F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		

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Queues
110: MD 214 West & Cindy

7/24/2012

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	32	805	2863	21	95
v/c Ratio	0.22	0.18	0.68	0.13	0.49
Control Delay	22.3	0.6	7.2	63.4	37.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	0.6	7.2	63.4	37.1
Queue Length 50th (ft)	3	9	383	20	36
Queue Length 95th (ft)	25	17	536	47	95
Internal Link Dist (ft)		861	1511	430	
Turn Bay Length (ft)	225			250	
Base Capacity (vph)	143	4429	4199	422	421
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.22	0.18	0.68	0.05	0.23

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
110: MD 214 West & Cindy

7/24/2012

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↱		↰	↱
Volume (vph)	30	765	2700	20	20	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5080		1770	1583
Flt Permitted	0.03	1.00	1.00		0.95	1.00
Satd. Flow (perm)	61	5085	5080		1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	805	2842	21	21	95
RTOR Reduction (vph)	0	0	0	0	0	52
Lane Group Flow (vph)	32	805	2863	0	21	43
Turn Type	pm+pt	NA	NA		NA	custom
Protected Phases	1	6	2			
Permitted Phases	6				8	8
Actuated Green, G (s)	126.6	126.6	117.9		10.4	10.4
Effective Green, g (s)	128.6	130.6	121.9		13.4	13.4
Actuated g/C Ratio	0.86	0.87	0.81		0.09	0.09
Clearance Time (s)	5.0	7.0	7.0		6.0	6.0
Vehicle Extension (s)	3.0	6.0	6.0		3.0	3.0
Lane Grp Cap (vph)	117	4427	4128		158	141
v/s Ratio Prot	c0.01	0.16	c0.56			
v/s Ratio Perm	0.23				0.01	c0.03
v/c Ratio	0.27	0.18	0.69		0.13	0.31
Uniform Delay, d1	9.6	1.5	6.0		62.9	63.9
Progression Factor	4.29	0.34	1.00		1.00	1.00
Incremental Delay, d2	1.3	0.1	1.0		0.4	1.2
Delay (s)	42.3	0.6	7.0		63.3	65.2
Level of Service	D	A	A		E	E
Approach Delay (s)		2.2	7.0		64.8	
Approach LOS		A	A		E	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
130: Garrett Morgan & Ridgefield 7/24/2012

Lane Group	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	126	68	52	21	463	16	590
v/c Ratio	0.33	0.20	0.11	0.05	0.16	0.03	0.20
Control Delay	13.2	13.3	5.9	5.9	5.3	5.7	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	13.3	5.9	5.9	5.3	5.7	5.4
Queue Length 50th (ft)	16	10	1	2	15	1	20
Queue Length 95th (ft)	55	36	19	10	33	8	41
Internal Link Dist (ft)	623		482		695		523
Turn Bay Length (ft)				150		125	
Base Capacity (vph)	1323	1234	1578	765	4960	869	4945
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.06	0.03	0.03	0.09	0.02	0.12

Intersection Summary

HCM Signalized Intersection Capacity Analysis
130: Garrett Morgan & Ridgefield

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰	↱		↰	↑↑↱		↰	↑↑↱	
Volume (vph)	90	5	25	65	5	45	20	425	15	15	530	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.91		1.00	0.91	
Frt		0.97		1.00	0.86		1.00	0.99		1.00	0.99	
Flt Protected		0.96		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1745		1770	1610		1770	5059		1770	5044	
Flt Permitted		0.75		0.68	1.00		0.42	1.00		0.48	1.00	
Satd. Flow (perm)		1349		1260	1610		780	5059		887	5044	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	5	26	68	5	47	21	447	16	16	558	32
RTOR Reduction (vph)	0	15	0	0	38	0	0	3	0	0	6	0
Lane Group Flow (vph)	0	111	0	68	14	0	21	460	0	16	584	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)		6.4		6.4	6.4		16.5	16.5		16.5	16.5	
Effective Green, g (s)		6.4		6.4	6.4		16.5	16.5		16.5	16.5	
Actuated g/C Ratio		0.19		0.19	0.19		0.50	0.50		0.50	0.50	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)		262		245	313		391	2537		445	2530	
v/s Ratio Prot					0.01			0.09			c0.12	
v/s Ratio Perm		c0.08		0.05			0.03			0.02		
v/c Ratio		0.42		0.28	0.05		0.05	0.18		0.04	0.23	
Uniform Delay, d1		11.6		11.3	10.8		4.2	4.5		4.2	4.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1		0.6	0.1		0.2	0.1		0.1	0.1	
Delay (s)		12.7		11.9	10.8		4.4	4.6		4.3	4.8	
Level of Service		B		B	B		A	A		A	A	
Approach Delay (s)		12.7			11.4			4.6			4.7	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	32.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Synchro 7 - Report
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Queues
140: Morgan Metro Park and Ride & Garrett A Morgan

7/24/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	368	68	363	358	63	126
v/c Ratio	0.23	0.13	0.44	0.10	0.21	0.34
Control Delay	13.2	5.1	18.1	3.4	21.1	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	5.1	18.1	3.4	21.1	7.9
Queue Length 50th (ft)	27	0	43	10	15	0
Queue Length 95th (ft)	52	22	88	21	48	38
Internal Link Dist (ft)	667			1365	395	
Turn Bay Length (ft)		100	150			
Base Capacity (vph)	3436	1092	2320	5085	1428	1302
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.06	0.16	0.07	0.04	0.10

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
140: Morgan Metro Park and Ride & Garrett A Morgan

7/24/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑↑	↱	↰↰	↑↑↑	↰	↱
Volume (vph)	350	65	345	340	60	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.91	1.00	0.97	0.91	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5085	1583	3433	5085	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5085	1583	3433	5085	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	368	68	363	358	63	126
RTOR Reduction (vph)	0	47	0	0	0	110
Lane Group Flow (vph)	368	21	363	358	63	16
Turn Type	NA	custom	Prot	NA	NA	Perm
Protected Phases			1	6	4	
Permitted Phases	2	2				4
Actuated Green, G (s)	14.4	14.4	10.9	30.3	5.8	5.8
Effective Green, g (s)	14.4	14.4	10.9	30.3	5.8	5.8
Actuated g/C Ratio	0.31	0.31	0.24	0.66	0.13	0.13
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	3.0	3.0
Lane Grp Cap (vph)	1588	494	812	3342	223	199
v/s Ratio Prot			c0.11	0.07	c0.04	
v/s Ratio Perm	c0.07	0.01				0.01
v/c Ratio	0.23	0.04	0.45	0.11	0.28	0.08
Uniform Delay, d1	11.7	11.0	15.0	2.9	18.3	17.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	0.4	0.0	0.7	0.2
Delay (s)	12.0	11.1	15.4	3.0	19.0	18.0
Level of Service	B	B	B	A	B	B
Approach Delay (s)	11.8			9.2	18.3	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	46.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues
150: Ritchie/Garrett A Morgan & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	132	964	158	2474	296	435	289	174	200	168
v/c Ratio	0.44	0.33	0.78	0.87	0.54	0.76	0.18	0.52	0.58	0.47
Control Delay	77.9	18.4	103.7	37.1	66.0	74.7	0.3	78.2	80.0	23.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.9	18.4	103.7	37.1	66.0	74.7	0.3	78.2	80.0	23.9
Queue Length 50th (ft)	73	187	91	841	176	271	0	96	114	66
Queue Length 95th (ft)	109	256	#151	#1136	222	327	0	136	156	107
Internal Link Dist (ft)		1283		929		896			1365	
Turn Bay Length (ft)	350		600		350		200	500		
Base Capacity (vph)	301	2953	202	2835	877	908	1583	990	1020	354
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.33	0.78	0.87	0.34	0.48	0.18	0.18	0.20	0.47

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
150: Ritchie/Garrett A Morgan & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	790	125	150	2200	150	420	275	275	165	190	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.86	0.86	1.00	0.97	0.95	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	4981		3433	5037		3044	3151	1583	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	4981		3433	5037		3044	3151	1583	3433	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	832	132	158	2316	158	442	289	289	174	200	168
RTOR Reduction (vph)	0	7	0	0	3	0	0	0	0	0	0	61
Lane Group Flow (vph)	132	957	0	158	2471	0	296	435	289	174	200	107
Turn Type	Prot	NA		Prot	NA		Split	NA	Free	Split	NA	pm+ov
Protected Phases	1	6		5	2		4	4		3	3	1
Permitted Phases									Free			3
Actuated Green, G (s)	12.9	97.6		8.0	92.7		28.9	28.9	170.0	14.5	14.5	27.4
Effective Green, g (s)	14.9	100.6		10.0	95.7		30.9	30.9	170.0	16.5	16.5	31.4
Actuated g/C Ratio	0.09	0.59		0.06	0.56		0.18	0.18	1.00	0.10	0.10	0.18
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0		2.5	2.5		2.5	2.5	3.0
Lane Grp Cap (vph)	301	2948		202	2836		553	573	1583	333	343	292
v/s Ratio Prot	c0.04	0.19		0.05	c0.49		0.10	c0.14		0.05	c0.06	0.03
v/s Ratio Perm									0.18			0.04
v/c Ratio	0.44	0.32		0.78	0.87		0.54	0.76	0.18	0.52	0.58	0.37
Uniform Delay, d1	73.6	17.5		78.9	31.9		63.0	66.0	0.0	73.0	73.5	60.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.3		25.4	4.0		0.8	5.5	0.3	1.1	2.1	0.8
Delay (s)	74.6	17.8		104.3	35.9		63.8	71.5	0.3	74.1	75.5	61.4
Level of Service	E	B		F	D		E	E	A	E	E	E
Approach Delay (s)		24.7			40.0			49.1			70.7	
Approach LOS		C			D			D			E	

Intersection Summary			
HCM Average Control Delay	41.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	170.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
160: Shady Glen Dr/Hill Rd & MD 214 West

7/24/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	74	753	95	2358	205	137	189	272	233	242
v/c Ratio	0.44	0.24	0.19	0.74	0.20	0.44	0.57	0.68	0.56	0.58
Control Delay	26.1	12.9	8.2	22.3	6.0	68.8	61.7	70.4	65.9	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	12.9	8.2	22.3	6.0	68.8	61.7	70.4	65.9	12.1
Queue Length 50th (ft)	19	108	25	538	28	67	80	150	126	0
Queue Length 95th (ft)	76	164	55	768	80	100	120	198	170	79
Internal Link Dist (ft)		1835		2003			924		2121	
Turn Bay Length (ft)	300		225		325	350		300		150
Base Capacity (vph)	170	3186	504	3206	1044	881	896	781	806	586
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.24	0.19	0.74	0.20	0.16	0.21	0.35	0.29	0.41

Intersection Summary

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Synchro 7 - Report
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HCM Signalized Intersection Capacity Analysis
160: Shady Glen Dr/Hill Rd & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↑	↱	↰↰	↑↱		↰↰	↰↑	↱
Volume (vph)	70	675	40	90	2240	195	130	135	45	350	130	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	0.97	0.95		0.86	0.86	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	1770	5043		1770	5085	1583	3433	3407		3044	3139	1583
Flt Permitted	0.04	1.00		0.33	1.00	1.00	0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	80	5043		611	5085	1583	3433	3407		3044	3139	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	711	42	95	2358	205	137	142	47	368	137	242
RTOR Reduction (vph)	0	3	0	0	0	46	0	26	0	0	0	210
Lane Group Flow (vph)	74	750	0	95	2358	159	137	163	0	272	233	32
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6			2		2						4
Actuated Green, G (s)	99.8	91.7		99.6	91.6	91.6	10.5	10.5		16.8	16.8	16.8
Effective Green, g (s)	103.8	94.7		103.6	94.6	94.6	13.5	13.5		19.8	19.8	19.8
Actuated g/C Ratio	0.69	0.63		0.69	0.63	0.63	0.09	0.09		0.13	0.13	0.13
Clearance Time (s)	5.0	6.0		5.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0	5.0	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	169	3184		499	3207	998	309	307		402	414	209
v/s Ratio Prot	c0.03	0.15		0.01	c0.46		0.04	c0.05		c0.09	0.07	
v/s Ratio Perm	0.27			0.12		0.10						0.02
v/c Ratio	0.44	0.24		0.19	0.74	0.16	0.44	0.53		0.68	0.56	0.15
Uniform Delay, d1	21.6	12.0		7.8	19.1	11.4	64.7	65.2		62.0	61.0	57.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.8	0.2		0.2	1.5	0.3	0.7	1.3		4.1	1.4	0.2
Delay (s)	23.4	12.1		8.0	20.6	11.7	65.4	66.5		66.1	62.5	57.9
Level of Service	C	B		A	C	B	E	E		E	E	E
Approach Delay (s)		13.2			19.5			66.0			62.3	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
170: Hill Rd & Willow Hill Rd 7/24/2012

Lane Group	EBT	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	10	16	258	95	406	74	495	5
v/c Ratio	0.02	0.04	0.71	0.19	0.37	0.08	0.47	0.01
Control Delay	13.4	7.3	29.1	4.8	8.4	2.4	9.7	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	7.3	29.1	4.8	8.4	2.4	9.7	4.6
Queue Length 50th (ft)	2	0	73	0	62	0	82	0
Queue Length 95th (ft)	11	10	138	25	142	16	185	4
Internal Link Dist (ft)	480		402		2121		554	
Turn Bay Length (ft)								100
Base Capacity (vph)	606	595	501	645	1085	964	1043	936
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.03	0.51	0.15	0.37	0.08	0.47	0.01

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
170: Hill Rd & Willow Hill Rd

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		↰	↱		↰	↱
Volume (vph)	5	5	15	235	10	90	10	375	70	40	430	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.98	1.00		0.95	1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)		1817	1583		1778	1583		1860	1583		1855	1583
Flt Permitted		0.88	1.00		0.73	1.00		0.99	1.00		0.95	1.00
Satd. Flow (perm)		1639	1583		1356	1583		1840	1583		1767	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	16	247	11	95	11	395	74	42	453	5
RTOR Reduction (vph)	0	0	12	0	0	69	0	0	30	0	0	2
Lane Group Flow (vph)	0	10	4	0	258	26	0	406	44	0	495	3
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		15.4	15.4		15.4	15.4		33.7	33.7		33.7	33.7
Effective Green, g (s)		15.4	15.4		15.4	15.4		33.7	33.7		33.7	33.7
Actuated g/C Ratio		0.27	0.27		0.27	0.27		0.59	0.59		0.59	0.59
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		442	427		366	427		1086	934		1043	934
v/s Ratio Prot												
v/s Ratio Perm		0.01	0.00		c0.19	0.02		0.22	0.03		c0.28	0.00
v/c Ratio		0.02	0.01		0.70	0.06		0.37	0.05		0.47	0.00
Uniform Delay, d1		15.3	15.3		18.8	15.5		6.2	4.9		6.7	4.8
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0	0.0		6.1	0.1		1.0	0.1		1.5	0.0
Delay (s)		15.3	15.3		24.9	15.5		7.1	5.0		8.2	4.8
Level of Service		B	B		C	B		A	A		A	A
Approach Delay (s)		15.3			22.4			6.8			8.2	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	57.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
180: Hampton Park/Brightseat Rd. & MD 214 West 7/24/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	153	1232	226	468	2258	374	179	132	389	211	321	184
v/c Ratio	0.45	0.83	0.36	0.52	0.98	0.46	0.69	0.48	0.33	0.28	0.79	0.38
Control Delay	68.0	55.1	6.3	52.2	53.5	18.5	73.3	63.3	30.7	48.5	68.9	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.0	55.1	6.3	52.2	53.5	18.5	73.3	63.3	30.7	48.5	68.9	7.7
Queue Length 50th (ft)	74	413	0	203	779	127	169	120	142	89	300	0
Queue Length 95th (ft)	111	473	63	#331	#1136	271	240	181	209	118	385	60
Internal Link Dist (ft)		1118			496			563			1338	
Turn Bay Length (ft)	650		425	340						350		350
Base Capacity (vph)	338	1492	624	894	2315	817	490	515	1193	950	515	571
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.83	0.36	0.52	0.98	0.46	0.37	0.26	0.33	0.22	0.62	0.32

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
180: Hampton Park/Brightseat Rd. & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰	↑	↱↱	↰↰	↑	↱
Volume (vph)	145	1170	215	445	2145	355	170	125	370	200	305	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	1.00	1.00	0.88	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	1770	1863	2787	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	1770	1863	2787	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	153	1232	226	468	2258	374	179	132	389	211	321	184
RTOR Reduction (vph)	0	0	160	0	0	96	0	0	0	0	0	144
Lane Group Flow (vph)	153	1232	66	468	2258	278	179	132	389	211	321	40
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	pt+ov	Split	NA	Perm
Protected Phases	1	6		5	2		4	4	4 5	3	3	
Permitted Phases			6			2						3
Actuated Green, G (s)	12.8	41.0	41.0	37.0	65.2	65.2	19.2	19.2	62.2	29.8	29.8	29.8
Effective Green, g (s)	14.8	44.0	44.0	39.0	68.2	68.2	22.2	22.2	65.2	32.8	32.8	32.8
Actuated g/C Ratio	0.10	0.29	0.29	0.26	0.45	0.45	0.15	0.15	0.43	0.22	0.22	0.22
Clearance Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)	2.5	5.0	5.0	5.0	5.0	5.0	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	339	1492	464	893	2312	720	262	276	1211	751	407	346
v/s Ratio Prot	0.04	0.24		c0.14	c0.44		c0.10	0.07	0.14	0.06	c0.17	
v/s Ratio Perm			0.04			0.18						0.03
v/c Ratio	0.45	0.83	0.14	0.52	0.98	0.39	0.68	0.48	0.32	0.28	0.79	0.12
Uniform Delay, d1	63.8	49.4	39.1	47.5	40.1	27.1	60.6	58.6	27.9	48.8	55.3	47.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	5.4	0.6	1.1	14.0	1.6	6.6	1.0	0.1	0.1	9.4	0.1
Delay (s)	64.5	54.8	39.7	48.6	54.1	28.6	67.1	59.5	28.0	48.9	64.8	47.1
Level of Service	E	D	D	D	D	C	E	E	C	D	E	D
Approach Delay (s)		53.6			50.2			43.9			55.6	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	51.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
200: MD 214/MD 214 West & I-495 SB off-ramp to WB 214

7/24/2012

Lane Group	EBT	WBL	WBT	SBR
Lane Group Flow (vph)	1137	995	2553	353
v/c Ratio	0.57	0.86	0.67	0.60
Control Delay	45.8	64.3	12.8	65.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	45.8	64.3	12.8	65.4
Queue Length 50th (ft)	381	570	495	208
Queue Length 95th (ft)	497	608	623	260
Internal Link Dist (ft)	215		315	
Turn Bay Length (ft)		325		
Base Capacity (vph)	1993	1430	3842	593
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.70	0.66	0.60

Intersection Summary

HCM Signalized Intersection Capacity Analysis
200: MD 214/MD 214 West & I-495 SB off-ramp to WB 214

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↰↰	↑↑↑							↱↱
Volume (vph)	0	1080	0	945	2425	0	0	0	0	0	0	335
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0							4.0
Lane Util. Factor		0.91		0.97	0.91							0.88
Frt		1.00		1.00	1.00							0.85
Flt Protected		1.00		0.95	1.00							1.00
Satd. Flow (prot)		5085		3433	5085							2787
Flt Permitted		1.00		0.95	1.00							1.00
Satd. Flow (perm)		5085		3433	5085							2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1137	0	995	2553	0	0	0	0	0	0	353
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	0	1137	0	995	2553	0	0	0	0	0	0	339
Turn Type		NA		Prot	NA							custom
Protected Phases		4		3	8							
Permitted Phases												6
Actuated Green, G (s)		70.3		60.4	134.7							37.3
Effective Green, g (s)		70.3		60.4	134.7							37.3
Actuated g/C Ratio		0.39		0.34	0.75							0.21
Clearance Time (s)		4.0		4.0	4.0							4.0
Vehicle Extension (s)		3.0		3.0	3.0							3.0
Lane Grp Cap (vph)		1986		1152	3805							578
v/s Ratio Prot		0.22		c0.29	c0.50							
v/s Ratio Perm												c0.12
v/c Ratio		0.57		0.86	0.67							0.59
Uniform Delay, d1		43.1		55.9	11.4							64.4
Progression Factor		1.00		1.00	1.00							1.00
Incremental Delay, d2		0.4		6.9	0.5							4.3
Delay (s)		43.5		62.9	11.9							68.7
Level of Service		D		E	B							E
Approach Delay (s)		43.5			26.2			0.0			68.7	
Approach LOS		D			C			A			E	

Intersection Summary			
HCM Average Control Delay	33.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
240: I-495 NB to WB off-ramp & MD 214 7/24/2012

Lane Group	EBT	WBT	NBL
Lane Group Flow (vph)	1347	3232	316
v/c Ratio	0.36	0.87	0.52
Control Delay	4.7	12.2	37.0
Queue Delay	0.0	0.0	0.0
Total Delay	4.7	12.2	37.0
Queue Length 50th (ft)	84	407	85
Queue Length 95th (ft)	102	489	126
Internal Link Dist (ft)	369	230	179
Turn Bay Length (ft)			
Base Capacity (vph)	3729	3729	610
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.36	0.87	0.52

Intersection Summary

HCM Signalized Intersection Capacity Analysis
240: I-495 NB to WB off-ramp & MD 214

7/24/2012

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑	↰↰	
Volume (vph)	1280	0	0	3070	300	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.91			0.91	0.97	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	5085			5085	3433	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	5085			5085	3433	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1347	0	0	3232	316	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1347	0	0	3232	316	0
Turn Type	NA			NA	NA	
Protected Phases	4			8	2	
Permitted Phases						
Actuated Green, G (s)	66.0			66.0	16.0	
Effective Green, g (s)	66.0			66.0	16.0	
Actuated g/C Ratio	0.73			0.73	0.18	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	3729			3729	610	
v/s Ratio Prot	0.26			c0.64	c0.09	
v/s Ratio Perm						
v/c Ratio	0.36			0.87	0.52	
Uniform Delay, d1	4.4			8.8	33.5	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.1			2.3	3.1	
Delay (s)	4.4			11.1	36.6	
Level of Service	A			B	D	
Approach Delay (s)	4.4			11.1	36.6	
Approach LOS	A			B	D	

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
260: Harry S. Truman Drive & Largo Town Center Drive
7/24/2012

Lane Group	EBL	EBT	WBL	WBR	NBT	NBR
Lane Group Flow (vph)	26	342	121	37	1447	422
v/c Ratio	0.15	0.44	0.41	0.07	0.61	0.38
Control Delay	17.2	13.4	30.9	9.0	11.5	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	13.4	30.9	9.0	11.5	1.3
Queue Length 50th (ft)	0	15	40	0	120	0
Queue Length 95th (ft)	24	49	107	23	218	18
Internal Link Dist (ft)		672			788	
Turn Bay Length (ft)						
Base Capacity (vph)	174	1480	690	954	3589	1311
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.23	0.18	0.04	0.40	0.32

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
260: Harry S. Truman Drive & Largo Town Center Drive

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰		↱		↑↑↱	↱			
Volume (vph)	25	120	205	115	0	35	0	1060	715	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0		4.0		4.0	4.0			
Lane Util. Factor	1.00	0.91		1.00		1.00		0.86	0.86			
Frt	1.00	0.91		1.00		0.85		0.97	0.85			
Flt Protected	0.95	1.00		0.95		1.00		1.00	1.00			
Satd. Flow (prot)	1770	4604		1770		1583		4641	1362			
Flt Permitted	0.95	1.00		0.95		1.00		1.00	1.00			
Satd. Flow (perm)	1770	4604		1770		1583		4641	1362			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	126	216	121	0	37	0	1116	753	0	0	0
RTOR Reduction (vph)	25	180	0	0	0	26	0	51	149	0	0	0
Lane Group Flow (vph)	1	162	0	121	0	11	0	1396	273	0	0	0
Turn Type	Prot	NA		Prot		custom		NA	pm+ov			
Protected Phases	7	4		3				2	3			
Permitted Phases						8			2			
Actuated Green, G (s)	1.6	10.7		10.4		19.5		31.4	41.8			
Effective Green, g (s)	1.6	10.7		10.4		19.5		31.4	41.8			
Actuated g/C Ratio	0.02	0.17		0.16		0.30		0.49	0.65			
Clearance Time (s)	4.0	4.0		4.0		4.0		4.0	4.0			
Vehicle Extension (s)	3.0	3.0		3.0		3.0		3.0	3.0			
Lane Grp Cap (vph)	44	764		285		479		2259	967			
v/s Ratio Prot	0.00	c0.04		c0.07				c0.30	c0.05			
v/s Ratio Perm						0.01			0.16			
v/c Ratio	0.01	0.21		0.42		0.02		0.62	0.28			
Uniform Delay, d1	30.7	23.3		24.4		15.8		12.1	4.9			
Progression Factor	1.00	1.00		1.00		1.00		1.00	1.00			
Incremental Delay, d2	0.1	0.1		1.0		0.0		0.5	0.2			
Delay (s)	30.8	23.4		25.4		15.8		12.7	5.1			
Level of Service	C	C		C		B		B	A			
Approach Delay (s)		23.9			23.1			10.9			0.0	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	64.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
270: Lottsford Road & Harry S. Truman Drive 7/24/2012

Lane Group	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	42	1121	5	105	163	326
v/c Ratio	0.06	0.52	0.01	0.16	0.13	0.48
Control Delay	9.5	7.7	11.0	11.7	11.0	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.5	7.7	11.0	11.7	11.0	9.0
Queue Length 50th (ft)	6	45	1	17	13	27
Queue Length 95th (ft)	24	100	7	54	38	100
Internal Link Dist (ft)		887		758	736	
Turn Bay Length (ft)						150
Base Capacity (vph)	1286	3521	1028	1584	3008	1370
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.32	0.00	0.07	0.05	0.24

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
270: Lottsford Road & Harry S. Truman Drive

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	40	530	535	5	100	0	0	155	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor				1.00	0.91		1.00	1.00			0.95	1.00
Frt				1.00	0.92		1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770	4702		1770	1863			3539	1583
Flt Permitted				0.95	1.00		0.65	1.00			1.00	1.00
Satd. Flow (perm)				1770	4702		1208	1863			3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	42	558	563	5	105	0	0	163	326
RTOR Reduction (vph)	0	0	0	0	218	0	0	0	0	0	0	105
Lane Group Flow (vph)	0	0	0	42	903	0	5	105	0	0	163	221
Turn Type				Split	NA		Perm	NA			NA	Perm
Protected Phases				3	3			4			2	
Permitted Phases							4					2
Actuated Green, G (s)				18.6	18.6		16.3	16.3			16.3	16.3
Effective Green, g (s)				18.6	18.6		16.3	16.3			16.3	16.3
Actuated g/C Ratio				0.41	0.41		0.36	0.36			0.36	0.36
Clearance Time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			6.0	6.0
Lane Grp Cap (vph)				733	1948		439	676			1285	575
v/s Ratio Prot				0.02	c0.19			0.06			0.05	
v/s Ratio Perm							0.00					c0.14
v/c Ratio				0.06	0.46		0.01	0.16			0.13	0.38
Uniform Delay, d1				7.9	9.5		9.1	9.7			9.5	10.6
Progression Factor				1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2				0.0	0.2		0.0	0.1			0.1	1.2
Delay (s)				7.9	9.7		9.2	9.8			9.7	11.8
Level of Service				A	A		A	A			A	B
Approach Delay (s)		0.0			9.6			9.7			11.1	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	44.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

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Synchro 7 - Report
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Queues
280: Lottsford Road & Arena Drive 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	271	755	187	482	311	495	58	558	247
v/c Ratio	0.76	0.69	0.62	0.52	0.97	0.29	0.51	0.82	0.31
Control Delay	58.1	43.6	54.1	44.1	94.5	29.9	71.8	53.5	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.1	43.6	54.1	44.1	94.5	29.9	71.8	53.5	5.4
Queue Length 50th (ft)	224	195	159	131	~247	101	44	212	20
Queue Length 95th (ft)	#402	270	254	172	#482	147	95	303	78
Internal Link Dist (ft)		719		1095		560		666	
Turn Bay Length (ft)			300		500		200		
Base Capacity (vph)	391	1204	391	1204	319	1708	137	780	830
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.63	0.48	0.40	0.97	0.29	0.42	0.72	0.30

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
280: Lottsford Road & Arena Drive

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	515	330	130	355	240	40	295	410	60	55	380	385
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	0.86	0.86		0.86	0.86		1.00	0.91		1.00	0.91	0.91
Frt	1.00	0.97		1.00	0.99		1.00	0.98		1.00	0.96	0.85
Flt Protected	0.95	0.98		0.95	0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1522	4593		1522	4653		1770	4988		1770	3246	1441
Flt Permitted	0.95	0.98		0.95	0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1522	4593		1522	4653		1770	4988		1770	3246	1441
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	542	347	137	374	253	42	311	432	63	58	400	405
RTOR Reduction (vph)	0	25	0	0	8	0	0	14	0	0	29	111
Lane Group Flow (vph)	271	730	0	187	474	0	311	481	0	58	529	136
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	1	1		2	2		7	4		3	8	1
Permitted Phases												8
Actuated Green, G (s)	27.5	27.5		23.3	23.3		21.2	39.3		6.4	24.5	52.0
Effective Green, g (s)	27.5	27.5		23.3	23.3		21.2	39.3		6.4	24.5	52.0
Actuated g/C Ratio	0.23	0.23		0.20	0.20		0.18	0.33		0.05	0.21	0.44
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	353	1066		299	915		317	1654		96	671	705
v/s Ratio Prot	c0.18	0.16		c0.12	0.10		c0.18	0.10		0.03	c0.16	0.04
v/s Ratio Perm												0.05
v/c Ratio	0.77	0.69		0.63	0.52		0.98	0.29		0.60	0.79	0.19
Uniform Delay, d1	42.5	41.5		43.6	42.6		48.5	29.3		54.8	44.5	20.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	9.6	1.8		4.0	0.5		45.1	0.1		7.2	6.1	0.1
Delay (s)	52.1	43.4		47.6	43.1		93.5	29.4		62.0	50.6	20.5
Level of Service	D	D		D	D		F	C		E	D	C
Approach Delay (s)		45.7			44.4			54.1			42.8	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	46.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	118.5	Sum of lost time (s)	22.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
290: Shoppers Way & Arena Drive
7/24/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	868	263	95	974	163	53
v/c Ratio	0.43	0.26	0.36	0.38	0.39	0.13
Control Delay	14.5	2.7	36.7	6.2	31.1	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.5	2.7	36.7	6.2	31.1	9.3
Queue Length 50th (ft)	141	0	39	94	63	0
Queue Length 95th (ft)	234	41	96	156	139	29
Internal Link Dist (ft)	494			472	436	
Turn Bay Length (ft)		150	350			
Base Capacity (vph)	2221	1091	414	2877	636	603
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.24	0.23	0.34	0.26	0.09

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
290: Shoppers Way & Arena Drive

7/24/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (vph)	825	250	90	925	155	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	868	263	95	974	163	53
RTOR Reduction (vph)	0	127	0	0	0	45
Lane Group Flow (vph)	868	136	95	974	163	8
Turn Type	NA	Perm	Prot	NA	NA	custom
Protected Phases	6		5	2		
Permitted Phases		6			8	8
Actuated Green, G (s)	36.1	36.1	7.1	48.2	11.2	11.2
Effective Green, g (s)	36.1	36.1	7.1	48.2	11.2	11.2
Actuated g/C Ratio	0.52	0.52	0.10	0.69	0.16	0.16
Clearance Time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lane Grp Cap (vph)	1828	818	180	2440	284	254
v/s Ratio Prot	c0.25		0.05	c0.28		
v/s Ratio Perm		0.09			c0.09	0.01
v/c Ratio	0.47	0.17	0.53	0.40	0.57	0.03
Uniform Delay, d1	10.8	8.9	29.8	4.6	27.1	24.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3	2.8	0.3	5.5	0.2
Delay (s)	11.4	9.2	32.6	5.0	32.6	24.9
Level of Service	B	A	C	A	C	C
Approach Delay (s)	10.9			7.4	30.7	
Approach LOS	B			A	C	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	69.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2035_AM_No Build 7:00 am 5/3/2012 2035_AM_No Build Synchro 7 - Report
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Queues
300: Addison Rd. & Wilburn Dr 7/24/2012

Lane Group	WBL	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	95	116	1311	105	374
v/c Ratio	0.44	0.42	0.92	0.09	0.30
Control Delay	41.3	14.8	20.8	1.6	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	41.3	14.8	20.8	1.6	3.9
Queue Length 50th (ft)	48	8	394	4	44
Queue Length 95th (ft)	94	54	#974	17	90
Internal Link Dist (ft)	536		382		427
Turn Bay Length (ft)				100	
Base Capacity (vph)	346	390	1518	1300	1306
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.27	0.30	0.86	0.08	0.29

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
300: Addison Rd. & Wilburn Dr 7/24/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	90	110	1245	100	10	345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5		4.5
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1770	1583	1863	1583		1860
Flt Permitted	0.95	1.00	1.00	1.00		0.86
Satd. Flow (perm)	1770	1583	1863	1583		1603
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	116	1311	105	11	363
RTOR Reduction (vph)	0	88	0	14	0	0
Lane Group Flow (vph)	95	28	1311	91	0	374
Turn Type	NA	Prot	NA	Perm	Perm	NA
Protected Phases	3	3	6			2
Permitted Phases				6	2	
Actuated Green, G (s)	9.7	9.7	61.7	61.7		61.7
Effective Green, g (s)	9.7	9.7	61.7	61.7		61.7
Actuated g/C Ratio	0.12	0.12	0.77	0.77		0.77
Clearance Time (s)	4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	214	191	1430	1215		1230
v/s Ratio Prot	c0.05	0.02	c0.70			
v/s Ratio Perm				0.06		0.23
v/c Ratio	0.44	0.15	0.92	0.08		0.30
Uniform Delay, d1	32.8	31.6	7.3	2.3		2.8
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	1.5	0.4	9.5	0.0		0.1
Delay (s)	34.3	32.0	16.8	2.3		3.0
Level of Service	C	C	B	A		A
Approach Delay (s)	33.0		15.7			3.0
Approach LOS	C		B			A

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	80.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
10: Southern Ave NE & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NET	SWT
Lane Group Flow (vph)	316	1537	121	637	121	911	963
v/c Ratio	0.77	0.80	0.46	0.67	0.22	0.63	0.90
Control Delay	31.3	30.7	19.2	36.7	6.3	22.8	37.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.3	30.7	19.2	36.7	6.3	22.8	37.5
Queue Length 50th (ft)	120	313	37	194	0	222	283
Queue Length 95th (ft)	#232	373	67	256	41	288	#418
Internal Link Dist (ft)		460		823		251	355
Turn Bay Length (ft)	175		330				
Base Capacity (vph)	429	1996	262	952	560	1517	1122
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.77	0.46	0.67	0.22	0.60	0.86

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
10: Southern Ave NE & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	300	1420	40	115	605	115	15	755	95	80	740	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		-1.0	6.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00		0.95			0.95	
Frt	1.00	1.00		1.00	1.00	0.85		0.98			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	5064		1770	3539	1583		3478			3469	
Flt Permitted	0.19	1.00		0.15	1.00	1.00		0.93			0.69	
Satd. Flow (perm)	357	5064		288	3539	1583		3235			2391	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	316	1495	42	121	637	121	16	795	100	84	779	100
RTOR Reduction (vph)	0	3	0	0	0	85	0	9	0	0	9	0
Lane Group Flow (vph)	316	1534	0	121	637	36	0	902	0	0	954	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	39.9	31.9		24.9	20.9	20.9		40.1			40.1	
Effective Green, g (s)	40.9	36.9		34.9	25.9	28.9		43.1			43.1	
Actuated g/C Ratio	0.42	0.38		0.36	0.27	0.30		0.44			0.44	
Clearance Time (s)	4.0	11.0		4.0	11.0	11.0		6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	384	1926		241	945	472		1437			1062	
v/s Ratio Prot	c0.14	c0.30		0.05	0.18							
v/s Ratio Perm	0.21			0.13		0.02		0.28			c0.40	
v/c Ratio	0.82	0.80		0.50	0.67	0.08		0.63			0.90	
Uniform Delay, d1	21.3	26.7		22.1	31.8	24.5		20.8			24.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	13.3	2.4		1.6	1.9	0.1		0.9			10.1	
Delay (s)	34.6	29.1		23.7	33.7	24.5		21.6			35.0	
Level of Service	C	C		C	C	C		C			D	
Approach Delay (s)		30.0			31.1			21.6			35.0	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	29.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	97.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	99.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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HCM Unsignalized Intersection Capacity Analysis
20: Davey Street & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	5	1585	5	140	805	5	25	5	140	5	5	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	1668	5	147	847	5	26	5	147	5	5	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		903										
pX, platoon unblocked				0.74			0.74	0.74	0.74	0.74	0.74	
vC, conflicting volume	853			1674			2267	2829	559	1861	2829	285
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	853			662			1467	2231	0	916	2231	285
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			78			42	78	82	94	78	99
cM capacity (veh/h)	782			680			45	24	798	95	24	712

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NE 1	NE 2	SW 1
Volume Total	5	667	667	339	147	339	339	175	32	147	16
Volume Left	5	0	0	0	147	0	0	0	26	0	5
Volume Right	0	0	0	5	0	0	0	5	0	147	5
cSH	782	1700	1700	1700	680	1700	1700	1700	40	798	56
Volume to Capacity	0.01	0.39	0.39	0.20	0.22	0.20	0.20	0.10	0.80	0.18	0.28
Queue Length 95th (ft)	1	0	0	0	21	0	0	0	74	17	24
Control Delay (s)	9.6	0.0	0.0	0.0	11.8	0.0	0.0	0.0	236.9	10.5	92.1
Lane LOS	A				B				F	B	F
Approach Delay (s)	0.0				1.7				50.5		92.1
Approach LOS									F		F

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	53.7%	ICU Level of Service		A
Analysis Period (min)	15			

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Queues
90: Addison Rd. & MD 214 West

7/24/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	105	2163	426	284	1211	274	284	221	137	636
v/c Ratio	0.37	1.23	0.67	0.66	0.50	0.59	0.59	0.54	0.35	0.79
Control Delay	21.6	148.9	31.0	59.3	26.6	65.6	65.5	11.7	50.7	54.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	148.9	31.0	59.3	26.6	65.6	65.5	11.7	50.7	54.1
Queue Length 50th (ft)	44	~952	218	243	231	131	138	0	115	271
Queue Length 95th (ft)	89	#1042	347	#431	339	174	183	77	169	322
Internal Link Dist (ft)		307			349		726			986
Turn Bay Length (ft)	200		200	175		350		575	200	
Base Capacity (vph)	287	1763	634	433	2406	858	885	562	450	914
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	1.23	0.67	0.66	0.50	0.32	0.32	0.39	0.30	0.70

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
90: Addison Rd. & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑	↱	↰	↑↑↑↱		↰↰	↑↑	↱	↰	↑↱	
Volume (vph)	100	2055	405	270	1020	130	260	270	210	130	370	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	6.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	1770	4999		3433	3539	1583	1770	3333	
Flt Permitted	0.21	1.00	1.00	0.07	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	390	5085	1583	138	4999		3433	3539	1583	1770	3333	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	2163	426	284	1074	137	274	284	221	137	389	247
RTOR Reduction (vph)	0	0	116	0	8	0	0	0	191	0	70	0
Lane Group Flow (vph)	105	2163	310	284	1203	0	274	284	30	137	566	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					3			
Actuated Green, G (s)	57.4	48.0	48.0	83.4	68.0		17.4	17.4	17.4	30.2	30.2	
Effective Green, g (s)	63.4	52.0	49.0	86.4	72.0		20.4	20.4	20.4	33.2	33.2	
Actuated g/C Ratio	0.42	0.35	0.33	0.58	0.48		0.14	0.14	0.14	0.22	0.22	
Clearance Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	2.5	5.0	5.0	2.5	5.0		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	279	1763	517	432	2400		467	481	215	392	738	
v/s Ratio Prot	0.03	c0.43		c0.14	0.24		0.08	c0.08		0.08	c0.17	
v/s Ratio Perm	0.13		0.20	0.24					0.02			
v/c Ratio	0.38	1.23	0.60	0.66	0.50		0.59	0.59	0.14	0.35	0.77	
Uniform Delay, d1	26.6	49.0	42.3	39.9	26.7		60.8	60.9	57.1	49.3	54.8	
Progression Factor	1.00	1.00	1.00	1.45	0.91		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	107.3	5.1	3.1	0.7		1.6	1.6	0.2	0.4	4.6	
Delay (s)	27.2	156.3	47.3	60.9	25.1		62.4	62.5	57.3	49.7	59.4	
Level of Service	C	F	D	E	C		E	E	E	D	E	
Approach Delay (s)		134.1			31.9			61.0			57.6	
Approach LOS		F			C			E			E	

Intersection Summary			
HCM Average Control Delay	87.3	HCM Level of Service	F
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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HCM Unsignalized Intersection Capacity Analysis
95: Addison Metro Station & MD 214 West

7/24/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑		↰	↑↑↑	Y	
Volume (veh/h)	2130	85	120	1295	85	165
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	2242	89	126	1363	89	174
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	429					
pX, platoon unblocked			0.66		0.66	0.66
vC, conflicting volume			2332		2994	792
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1211		2215	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			66		0	76
cM capacity (veh/h)			377		16	715

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	897	897	538	126	454	454	454	263
Volume Left	0	0	0	126	0	0	0	89
Volume Right	0	0	89	0	0	0	0	174
cSH	1700	1700	1700	377	1700	1700	1700	46
Volume to Capacity	0.53	0.53	0.32	0.34	0.27	0.27	0.27	5.73
Queue Length 95th (ft)	0	0	0	36	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	19.3	0.0	0.0	0.0	Err
Lane LOS				C				F
Approach Delay (s)	0.0			1.6				Err
Approach LOS								F

Intersection Summary			
Average Delay	644.9		
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

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HCM Unsignalized Intersection Capacity Analysis
100: Cabin Branch Rd/Soper Ln & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↱			✣			✣	
Volume (veh/h)	5	2270	20	50	1400	5	5	0	100	30	5	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	2389	21	53	1474	5	5	0	105	32	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					941							
pX, platoon unblocked	0.93						0.93	0.93		0.93	0.93	0.93
vC, conflicting volume	1479			2411			3020	3995	807	2494	4003	494
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1243			2411			2905	3955	807	2337	3964	181
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			73			0	100	68	0	0	99
cM capacity (veh/h)	516			195			0	2	324	10	2	770

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1
Volume Total	5	956	956	499	53	589	589	300	111	47
Volume Left	5	0	0	0	53	0	0	0	5	32
Volume Right	0	0	0	21	0	0	0	5	105	11
cSH	516	1700	1700	1700	195	1700	1700	1700	0	8
Volume to Capacity	0.01	0.56	0.56	0.29	0.27	0.35	0.35	0.18	Err	5.93
Queue Length 95th (ft)	1	0	0	0	26	0	0	0	Err	Err
Control Delay (s)	12.1	0.0	0.0	0.0	30.2	0.0	0.0	0.0	Err	Err
Lane LOS	B				D				F	F
Approach Delay (s)	0.0				1.0				Err	Err
Approach LOS									F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

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Queues
110: MD 214 West & Cindy

7/24/2012

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	95	2521	1569	37	89
v/c Ratio	0.31	0.56	0.39	0.26	0.42
Control Delay	5.9	4.6	4.7	68.7	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	4.6	4.7	68.7	18.0
Queue Length 50th (ft)	2	105	131	35	0
Queue Length 95th (ft)	m3	m24	176	72	56
Internal Link Dist (ft)		861	1511	430	
Turn Bay Length (ft)	225			250	
Base Capacity (vph)	330	4467	4061	425	448
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.29	0.56	0.39	0.09	0.20

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

2035_PM_No Build 5:00 pm 5/3/2012 2035_PM_No Build
CJD

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HCM Signalized Intersection Capacity Analysis
110: MD 214 West & Cindy 7/24/2012

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↑↱		↰	↱
Volume (vph)	90	2395	1455	35	35	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5067		1770	1583
Flt Permitted	0.13	1.00	1.00		0.95	1.00
Satd. Flow (perm)	248	5085	5067		1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	2521	1532	37	37	89
RTOR Reduction (vph)	0	0	1	0	0	82
Lane Group Flow (vph)	95	2521	1568	0	37	7
Turn Type	pm+pt	NA	NA		NA	Perm
Protected Phases	1	6	2		8	
Permitted Phases	6					8
Actuated Green, G (s)	127.8	127.8	116.3		9.2	9.2
Effective Green, g (s)	129.8	131.8	120.3		12.2	12.2
Actuated g/C Ratio	0.87	0.88	0.80		0.08	0.08
Clearance Time (s)	5.0	7.0	7.0		6.0	6.0
Vehicle Extension (s)	3.0	6.0	6.0		3.0	3.0
Lane Grp Cap (vph)	301	4468	4064		144	129
v/s Ratio Prot	0.02	c0.50	0.31		c0.02	
v/s Ratio Perm	0.25					0.00
v/c Ratio	0.32	0.56	0.39		0.26	0.06
Uniform Delay, d1	2.4	2.2	4.3		64.6	63.6
Progression Factor	3.95	1.92	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.2	0.3		0.9	0.2
Delay (s)	9.7	4.4	4.5		65.6	63.8
Level of Service	A	A	A		E	E
Approach Delay (s)		4.6	4.5		64.3	
Approach LOS		A	A		E	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
130: Garrett Morgan & Ridgefield 7/24/2012

Lane Group	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	32	47	31	26	626	21	490
v/c Ratio	0.08	0.10	0.07	0.04	0.17	0.04	0.14
Control Delay	9.9	12.9	7.8	4.6	3.6	4.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.9	12.9	7.8	4.6	3.6	4.7	3.6
Queue Length 50th (ft)	2	7	1	2	18	2	14
Queue Length 95th (ft)	18	28	16	9	34	8	27
Internal Link Dist (ft)	623		482		695		523
Turn Bay Length (ft)				150		125	
Base Capacity (vph)	1491	1832	1602	856	4979	746	4999
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.03	0.02	0.03	0.13	0.03	0.10

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
130: Garrett Morgan & Ridgefield 7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	5	15	45	5	25	25	540	55	20	435	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.91		1.00	0.91	
Frt		0.93		1.00	0.87		1.00	0.99		1.00	0.99	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1708		1770	1628		1770	5015		1770	5035	
Flt Permitted		0.87		1.00	1.00		0.46	1.00		0.40	1.00	
Satd. Flow (perm)		1517		1863	1628		863	5015		752	5035	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	5	16	47	5	26	26	568	58	21	458	32
RTOR Reduction (vph)	0	14	0	0	23	0	0	11	0	0	7	0
Lane Group Flow (vph)	0	18	0	47	8	0	26	615	0	21	483	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)		3.6		3.6	3.6		17.3	17.3		17.3	17.3	
Effective Green, g (s)		3.6		3.6	3.6		17.3	17.3		17.3	17.3	
Actuated g/C Ratio		0.12		0.12	0.12		0.56	0.56		0.56	0.56	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)		177		217	190		483	2808		421	2819	
v/s Ratio Prot					0.00			c0.12			0.10	
v/s Ratio Perm		0.01		c0.03			0.03			0.03		
v/c Ratio		0.10		0.22	0.04		0.05	0.22		0.05	0.17	
Uniform Delay, d1		12.2		12.4	12.1		3.1	3.4		3.1	3.3	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3		0.5	0.1		0.1	0.1		0.1	0.1	
Delay (s)		12.5		12.9	12.2		3.2	3.5		3.2	3.4	
Level of Service		B		B	B		A	A		A	A	
Approach Delay (s)		12.5			12.6			3.5			3.4	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	4.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	30.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
140: Morgan Metro Park and Ride & Garrett A Morgan 7/24/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	589	63	116	500	126	316
v/c Ratio	0.30	0.10	0.22	0.17	0.36	0.56
Control Delay	11.5	4.0	22.7	4.5	23.2	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.5	4.0	22.7	4.5	23.2	7.5
Queue Length 50th (ft)	43	0	15	19	33	0
Queue Length 95th (ft)	74	19	42	34	86	58
Internal Link Dist (ft)	667			1365	395	
Turn Bay Length (ft)		100	150			
Base Capacity (vph)	3647	1153	1055	4870	1603	1463
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.05	0.11	0.10	0.08	0.22

Intersection Summary

HCM Signalized Intersection Capacity Analysis
140: Morgan Metro Park and Ride & Garrett A Morgan 7/24/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	[3 through arrows]	[right-turn arrow]	[2 left-turn arrows]	[3 through arrows]	[left-turn arrow]	[right-turn arrow]
Volume (vph)	560	60	110	475	120	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.91	1.00	0.97	0.91	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5085	1583	3433	5085	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5085	1583	3433	5085	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	589	63	116	500	126	316
RTOR Reduction (vph)	0	39	0	0	0	254
Lane Group Flow (vph)	589	24	116	500	126	62
Turn Type	NA	custom	Prot	NA	NA	Perm
Protected Phases			1	6	4	
Permitted Phases	2	2				4
Actuated Green, G (s)	19.1	19.1	5.6	29.7	9.6	9.6
Effective Green, g (s)	19.1	19.1	5.6	29.7	9.6	9.6
Actuated g/C Ratio	0.39	0.39	0.11	0.60	0.19	0.19
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	3.0	3.0
Lane Grp Cap (vph)	1970	613	390	3063	345	308
v/s Ratio Prot			c0.03	0.10	c0.07	
v/s Ratio Perm	c0.12	0.02				0.04
v/c Ratio	0.30	0.04	0.30	0.16	0.37	0.20
Uniform Delay, d1	10.5	9.4	20.0	4.3	17.2	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	0.4	0.1	0.7	0.3
Delay (s)	10.7	9.5	20.5	4.4	17.9	17.0
Level of Service	B	A	C	A	B	B
Approach Delay (s)	10.6			7.4	17.2	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
150: Ritchie/Garrett A Morgan & MD 214 West

7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	211	2279	274	1474	162	338	374	295	453	147
v/c Ratio	0.43	0.84	1.27	0.64	0.35	0.71	0.24	0.49	0.73	0.24
Control Delay	66.6	35.9	210.4	35.5	62.2	72.7	0.4	61.8	69.5	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.6	35.9	210.4	35.5	62.2	72.7	0.4	61.8	69.5	3.9
Queue Length 50th (ft)	107	715	~186	414	89	198	0	145	240	0
Queue Length 95th (ft)	152	#973	#285	540	127	251	0	186	288	32
Internal Link Dist (ft)		1283		929		896			1365	
Turn Bay Length (ft)	350		600		350		200	500		
Base Capacity (vph)	487	2703	215	2302	932	969	1583	1116	1150	601
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.84	1.27	0.64	0.17	0.35	0.24	0.26	0.39	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
150: Ritchie/Garrett A Morgan & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑↱		↰↰	↰↑	↱	↰↰	↑↑	↱
Volume (vph)	200	2010	155	260	1275	125	230	245	355	280	430	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.86	0.86	1.00	0.97	0.95	1.00
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5031		3433	5017		3044	3166	1583	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5031		3433	5017		3044	3166	1583	3433	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	211	2116	163	274	1342	132	242	258	374	295	453	147
RTOR Reduction (vph)	0	3	0	0	5	0	0	0	0	0	0	100
Lane Group Flow (vph)	211	2276	0	274	1469	0	162	338	374	295	453	47
Turn Type	Prot	NA		Prot	NA		Split	NA	Free	Split	NA	pm+ov
Protected Phases	1	6		5	2		4	4		3	3	1
Permitted Phases									Free			3
Actuated Green, G (s)	20.7	82.9		8.0	70.2		22.1	22.1	160.0	26.0	26.0	46.7
Effective Green, g (s)	22.7	85.9		10.0	73.2		24.1	24.1	160.0	28.0	28.0	50.7
Actuated g/C Ratio	0.14	0.54		0.06	0.46		0.15	0.15	1.00	0.18	0.18	0.32
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0		2.5	2.5		2.5	2.5	3.0
Lane Grp Cap (vph)	487	2701		215	2295		459	477	1583	601	619	502
v/s Ratio Prot	0.06	c0.45		c0.08	0.29		0.05	c0.11		0.09	c0.13	0.01
v/s Ratio Perm									0.24			0.02
v/c Ratio	0.43	0.84		1.27	0.64		0.35	0.71	0.24	0.49	0.73	0.09
Uniform Delay, d1	62.8	31.3		75.0	33.3		61.0	64.6	0.0	59.6	62.4	38.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	3.4		154.6	1.4		0.3	4.4	0.4	0.5	4.2	0.1
Delay (s)	63.4	34.7		229.6	34.7		61.3	69.0	0.4	60.0	66.6	38.5
Level of Service	E	C		F	C		E	E	A	E	E	D
Approach Delay (s)		37.2			65.2			38.2			59.9	
Approach LOS		D			E			D			E	

Intersection Summary			
HCM Average Control Delay	48.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
160: Shady Glen Dr/Hill Rd & MD 214 West

7/24/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	89	2168	116	1205	258	100	232	343	383	153
v/c Ratio	0.28	0.76	0.57	0.41	0.25	0.29	0.63	0.68	0.74	0.39
Control Delay	12.2	28.3	39.3	19.0	2.8	63.5	64.8	65.7	67.9	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.2	28.3	39.3	19.0	2.8	63.5	64.8	65.7	67.9	10.2
Queue Length 50th (ft)	28	563	57	224	0	47	103	186	210	0
Queue Length 95th (ft)	61	775	133	330	47	76	147	236	262	62
Internal Link Dist (ft)		1835		2003			924		2121	
Turn Bay Length (ft)	300		225		325	350		300		150
Base Capacity (vph)	325	2865	203	2955	1028	881	896	781	810	520
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.76	0.57	0.41	0.25	0.11	0.26	0.44	0.47	0.29

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
160: Shady Glen Dr/Hill Rd & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑↱		↰	↑↑↑	↱	↰↰	↑↑↱		↰↰	↰↑	↱
Volume (vph)	85	1960	100	110	1145	245	95	170	50	440	250	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	0.97	0.95		0.86	0.86	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	1770	5048		1770	5085	1583	3433	3418		3044	3155	1583
Flt Permitted	0.18	1.00		0.05	1.00	1.00	0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	337	5048		87	5085	1583	3433	3418		3044	3155	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	89	2063	105	116	1205	258	100	179	53	463	263	153
RTOR Reduction (vph)	0	3	0	0	0	108	0	22	0	0	0	128
Lane Group Flow (vph)	89	2165	0	116	1205	150	100	210	0	343	383	25
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6			2		2						4
Actuated Green, G (s)	90.8	82.0		95.0	84.1	84.1	12.3	12.3		21.8	21.8	21.8
Effective Green, g (s)	94.8	85.0		99.0	87.1	87.1	15.3	15.3		24.8	24.8	24.8
Actuated g/C Ratio	0.63	0.57		0.66	0.58	0.58	0.10	0.10		0.17	0.17	0.17
Clearance Time (s)	5.0	6.0		5.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0	5.0	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	316	2861		202	2953	919	350	349		503	522	262
v/s Ratio Prot	0.02	c0.43		c0.05	0.24		0.03	c0.06		0.11	c0.12	
v/s Ratio Perm	0.16			0.33		0.09						0.02
v/c Ratio	0.28	0.76		0.57	0.41	0.16	0.29	0.60		0.68	0.73	0.10
Uniform Delay, d1	11.7	24.7		34.4	17.3	14.6	62.3	64.4		58.9	59.5	53.1
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	1.9		3.9	0.4	0.4	0.3	2.4		3.5	5.0	0.1
Delay (s)	12.2	26.6		38.3	17.7	14.9	62.6	66.9		62.4	64.5	53.2
Level of Service	B	C		D	B	B	E	E		E	E	D
Approach Delay (s)		26.0			18.8			65.6			61.7	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
170: Hill Rd & Willow Hill Rd 7/24/2012

Lane Group	EBT	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	10	42	206	105	421	116	658	11
v/c Ratio	0.03	0.11	0.69	0.24	0.36	0.11	0.60	0.01
Control Delay	16.7	7.1	33.2	6.0	6.6	1.5	9.8	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	7.1	33.2	6.0	6.6	1.5	9.8	2.9
Queue Length 50th (ft)	3	0	64	0	60	0	118	0
Queue Length 95th (ft)	12	20	124	30	117	15	233	5
Internal Link Dist (ft)	480		402		2121		554	
Turn Bay Length (ft)								100
Base Capacity (vph)	437	454	364	500	1162	1065	1097	1027
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.09	0.57	0.21	0.36	0.11	0.60	0.01

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
170: Hill Rd & Willow Hill Rd

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	5	40	185	10	100	20	380	110	75	550	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.98	1.00		0.95	1.00		1.00	1.00		0.99	1.00
Satd. Flow (prot)		1817	1583		1779	1583		1858	1583		1852	1583
Flt Permitted		0.88	1.00		0.73	1.00		0.96	1.00		0.91	1.00
Satd. Flow (perm)		1635	1583		1361	1583		1796	1583		1698	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	42	195	11	105	21	400	116	79	579	11
RTOR Reduction (vph)	0	0	33	0	0	82	0	0	41	0	0	4
Lane Group Flow (vph)	0	10	9	0	206	23	0	421	75	0	658	7
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		13.2	13.2		13.2	13.2		38.9	38.9		38.9	38.9
Effective Green, g (s)		13.2	13.2		13.2	13.2		38.9	38.9		38.9	38.9
Actuated g/C Ratio		0.22	0.22		0.22	0.22		0.65	0.65		0.65	0.65
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		359	348		299	348		1162	1025		1099	1025
v/s Ratio Prot												
v/s Ratio Perm		0.01	0.01		c0.15	0.01		0.23	0.05		c0.39	0.00
v/c Ratio		0.03	0.03		0.69	0.07		0.36	0.07		0.60	0.01
Uniform Delay, d1		18.4	18.4		21.6	18.6		4.9	3.9		6.1	3.8
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0	0.0		6.5	0.1		0.9	0.1		2.4	0.0
Delay (s)		18.4	18.4		28.0	18.7		5.8	4.1		8.5	3.8
Level of Service		B	B		C	B		A	A		A	A
Approach Delay (s)		18.4			24.9			5.4			8.4	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
180: Hampton Park/Brightseat Rd. & MD 214 West 7/24/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	105	1979	200	463	1384	126	274	126	400	568	321	316
v/c Ratio	0.43	1.39	0.36	0.65	0.65	0.18	0.76	0.33	0.33	0.72	0.76	0.60
Control Delay	72.7	219.9	11.2	59.7	39.1	11.3	69.1	51.7	30.4	58.6	65.0	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.7	219.9	11.2	59.7	39.1	11.3	69.1	51.7	30.4	58.6	65.0	20.4
Queue Length 50th (ft)	51	~941	25	217	400	18	255	106	146	267	296	86
Queue Length 95th (ft)	85	#1034	93	#439	538	72	333	156	213	310	381	178
Internal Link Dist (ft)		1118			496			563			1338	
Turn Bay Length (ft)	650		425	340						350		350
Base Capacity (vph)	242	1424	563	712	2120	715	502	528	1200	973	528	602
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	1.39	0.36	0.65	0.65	0.18	0.55	0.24	0.33	0.58	0.61	0.52

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
180: Hampton Park/Brightseat Rd. & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰	↑	↱↱	↰↰	↑	↱
Volume (vph)	100	1880	190	440	1315	120	260	120	380	540	305	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	1.00	1.00	0.88	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	1770	1863	2787	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	1770	1863	2787	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	1979	200	463	1384	126	274	126	400	568	321	316
RTOR Reduction (vph)	0	0	120	0	0	55	0	0	0	0	0	165
Lane Group Flow (vph)	105	1979	80	463	1384	71	274	126	400	568	321	151
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	pt+ov	Split	NA	Perm
Protected Phases	1	6		5	2		4	4	4 5	3	3	
Permitted Phases			6			2						3
Actuated Green, G (s)	8.6	39.0	39.0	29.1	59.5	59.5	27.6	27.6	62.7	31.3	31.3	31.3
Effective Green, g (s)	10.6	42.0	42.0	31.1	62.5	62.5	30.6	30.6	65.7	34.3	34.3	34.3
Actuated g/C Ratio	0.07	0.28	0.28	0.21	0.42	0.42	0.20	0.20	0.44	0.23	0.23	0.23
Clearance Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)	2.5	5.0	5.0	5.0	5.0	5.0	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	243	1424	443	712	2119	660	361	380	1221	785	426	362
v/s Ratio Prot	0.03	c0.39		c0.13	0.27		c0.15	0.07	0.14	0.17	c0.17	
v/s Ratio Perm			0.05			0.04						0.10
v/c Ratio	0.43	1.39	0.18	0.65	0.65	0.11	0.76	0.33	0.33	0.72	0.75	0.42
Uniform Delay, d1	66.8	54.0	41.0	54.5	35.1	26.7	56.2	51.0	27.7	53.5	53.9	49.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	179.8	0.9	2.9	1.6	0.3	8.4	0.4	0.1	3.1	7.0	0.6
Delay (s)	67.7	233.8	41.9	57.3	36.6	27.0	64.7	51.3	27.8	56.6	61.0	49.9
Level of Service	E	F	D	E	D	C	E	D	C	E	E	D
Approach Delay (s)		209.3			40.9			44.1			56.0	
Approach LOS		F			D			D			E	

Intersection Summary			
HCM Average Control Delay	105.6	HCM Level of Service	F
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Synchro 7 - Report
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Queues
200: MD 214/MD 214 West & I-495 SB off-ramp to WB 214

7/24/2012

Lane Group	EBT	WBL	WBT	SBR
Lane Group Flow (vph)	2579	616	1479	279
v/c Ratio	0.85	0.88	0.35	0.52
Control Delay	33.2	83.4	4.1	27.5
Queue Delay	23.2	0.0	0.0	0.0
Total Delay	56.4	83.4	4.1	27.5
Queue Length 50th (ft)	849	367	119	54
Queue Length 95th (ft)	949	429	123	114
Internal Link Dist (ft)	215		315	
Turn Bay Length (ft)		325		
Base Capacity (vph)	3051	801	4322	535
Starvation Cap Reductn	581	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.04	0.77	0.34	0.52

Intersection Summary

2035_PM_No Build 5:00 pm 5/3/2012 2035_PM_No Build
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Synchro 7 - Report
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HCM Signalized Intersection Capacity Analysis
200: MD 214/MD 214 West & I-495 SB off-ramp to WB 214 7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↰↰	↑↑↑							↱↱
Volume (vph)	0	2450	0	585	1405	0	0	0	0	0	0	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0							4.0
Lane Util. Factor		0.91		0.97	0.91							0.88
Frt		1.00		1.00	1.00							0.85
Flt Protected		1.00		0.95	1.00							1.00
Satd. Flow (prot)		5085		3433	5085							2787
Flt Permitted		1.00		0.95	1.00							1.00
Satd. Flow (perm)		5085		3433	5085							2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2579	0	616	1479	0	0	0	0	0	0	279
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	167
Lane Group Flow (vph)	0	2579	0	616	1479	0	0	0	0	0	0	112
Turn Type		NA		Prot	NA							custom
Protected Phases		4		3	8							
Permitted Phases												6
Actuated Green, G (s)		107.3		36.9	148.2							23.8
Effective Green, g (s)		107.3		36.9	148.2							23.8
Actuated g/C Ratio		0.60		0.20	0.82							0.13
Clearance Time (s)		4.0		4.0	4.0							4.0
Vehicle Extension (s)		3.0		3.0	3.0							3.0
Lane Grp Cap (vph)		3031		704	4187							369
v/s Ratio Prot		c0.51		c0.18	0.29							
v/s Ratio Perm												c0.04
v/c Ratio		0.85		0.88	0.35							0.30
Uniform Delay, d1		29.8		69.3	4.0							70.6
Progression Factor		1.00		1.00	1.00							1.00
Incremental Delay, d2		2.5		11.7	0.1							2.1
Delay (s)		32.3		81.0	4.0							72.7
Level of Service		C		F	A							E
Approach Delay (s)		32.3			26.7			0.0			72.7	
Approach LOS		C			C			A			E	

Intersection Summary			
HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
240: I-495 NB to WB off-ramp & MD 214 7/24/2012

Lane Group	EBT	WBT	NBL
Lane Group Flow (vph)	2447	1895	200
v/c Ratio	0.72	0.56	0.25
Control Delay	9.9	7.7	29.0
Queue Delay	0.0	0.0	0.0
Total Delay	9.9	7.7	29.0
Queue Length 50th (ft)	252	161	47
Queue Length 95th (ft)	300	193	79
Internal Link Dist (ft)	369	230	179
Turn Bay Length (ft)			
Base Capacity (vph)	3908	3908	796
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.63	0.48	0.25
Intersection Summary			

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HCM Signalized Intersection Capacity Analysis
240: I-495 NB to WB off-ramp & MD 214
7/24/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑	↰↰	
Volume (vph)	2325	0	0	1800	190	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.91			0.91	0.97	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	5085			5085	3433	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	5085			5085	3433	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2447	0	0	1895	200	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	2447	0	0	1895	200	0
Turn Type	NA			NA	NA	
Protected Phases	4			8	2	
Permitted Phases						
Actuated Green, G (s)	55.6			55.6	19.2	
Effective Green, g (s)	55.6			55.6	19.2	
Actuated g/C Ratio	0.67			0.67	0.23	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	3415			3415	796	
v/s Ratio Prot	c0.48			0.37	c0.06	
v/s Ratio Perm						
v/c Ratio	0.72			0.55	0.25	
Uniform Delay, d1	8.6			7.1	25.9	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.7			0.2	0.8	
Delay (s)	9.3			7.3	26.7	
Level of Service	A			A	C	
Approach Delay (s)	9.3			7.3	26.7	
Approach LOS	A			A	C	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues
260: Harry S. Truman Drive & Largo Town Center Drive

7/24/2012

Lane Group	EBL	EBT	WBL	WBR	NBT	NBR
Lane Group Flow (vph)	84	1469	284	42	906	273
v/c Ratio	0.40	1.07dr	0.71	0.05	0.67	0.33
Control Delay	20.7	16.5	41.6	4.2	26.6	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.7	16.5	41.6	4.2	26.6	4.8
Queue Length 50th (ft)	8	142	145	0	149	27
Queue Length 95th (ft)	54	238	242	17	217	72
Internal Link Dist (ft)		672			788	
Turn Bay Length (ft)						
Base Capacity (vph)	263	2213	583	999	1700	954
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.66	0.49	0.04	0.53	0.29

Intersection Summary

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

HCM Signalized Intersection Capacity Analysis
260: Harry S. Truman Drive & Largo Town Center Drive

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰		↱		↑↑↱	↱			
Volume (vph)	80	430	965	270	0	40	0	600	520	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0		4.0		4.0	4.0			
Lane Util. Factor	1.00	0.91		1.00		1.00		0.86	0.86			
Frt	1.00	0.90		1.00		0.85		0.95	0.85			
Flt Protected	0.95	1.00		0.95		1.00		1.00	1.00			
Satd. Flow (prot)	1770	4558		1770		1583		4588	1362			
Flt Permitted	0.95	1.00		0.95		1.00		1.00	1.00			
Satd. Flow (perm)	1770	4558		1770		1583		4588	1362			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	453	1016	284	0	42	0	632	547	0	0	0
RTOR Reduction (vph)	66	391	0	0	0	19	0	82	90	0	0	0
Lane Group Flow (vph)	18	1078	0	284	0	23	0	824	183	0	0	0
Turn Type	Prot	NA		Prot		custom		NA	pm+ov			
Protected Phases	7	4		3				2	3			
Permitted Phases						8			2			
Actuated Green, G (s)	4.0	30.6		18.5		45.1		22.6	41.1			
Effective Green, g (s)	4.0	30.6		18.5		45.1		22.6	41.1			
Actuated g/C Ratio	0.05	0.37		0.22		0.54		0.27	0.49			
Clearance Time (s)	4.0	4.0		4.0		4.0		4.0	4.0			
Vehicle Extension (s)	3.0	3.0		3.0		3.0		3.0	3.0			
Lane Grp Cap (vph)	85	1666		391		853		1239	734			
v/s Ratio Prot	0.01	c0.24		c0.16				c0.18	0.06			
v/s Ratio Perm						0.01			0.08			
v/c Ratio	0.22	1.07dr		0.73		0.03		0.67	0.25			
Uniform Delay, d1	38.3	22.1		30.3		9.0		27.2	12.4			
Progression Factor	1.00	1.00		1.00		1.00		1.00	1.00			
Incremental Delay, d2	1.3	0.9		6.6		0.0		1.4	0.2			
Delay (s)	39.6	22.9		36.8		9.0		28.5	12.5			
Level of Service	D	C		D		A		C	B			
Approach Delay (s)		23.8			33.3			24.8			0.0	
Approach LOS		C			C			C			A	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	83.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

2035_PM_No Build 5:00 pm 5/3/2012 2035_PM_No Build
CJD

Synchro 7 - Report
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Queues
270: Lottsford Road & Harry S. Truman Drive 7/24/2012

Lane Group	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	63	721	21	189	453	221
v/c Ratio	0.12	0.45	0.05	0.23	0.29	0.27
Control Delay	12.8	8.9	7.3	8.2	8.0	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.8	8.9	7.3	8.2	8.0	2.3
Queue Length 50th (ft)	10	28	2	24	30	0
Queue Length 95th (ft)	38	71	12	63	66	26
Internal Link Dist (ft)		887		758	736	
Turn Bay Length (ft)						150
Base Capacity (vph)	1307	3589	841	1711	3251	1472
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.20	0.02	0.11	0.14	0.15

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
270: Lottsford Road & Harry S. Truman Drive

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	60	400	285	20	180	0	0	430	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor				1.00	0.91		1.00	1.00			0.95	1.00
Frt				1.00	0.94		1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770	4768		1770	1863			3539	1583
Flt Permitted				0.95	1.00		0.49	1.00			1.00	1.00
Satd. Flow (perm)				1770	4768		914	1863			3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	63	421	300	21	189	0	0	453	221
RTOR Reduction (vph)	0	0	0	0	175	0	0	0	0	0	0	122
Lane Group Flow (vph)	0	0	0	63	546	0	21	189	0	0	453	99
Turn Type				Split	NA		Perm	NA			NA	Perm
Protected Phases				3	3			4			2	
Permitted Phases							4					2
Actuated Green, G (s)				12.5	12.5		18.4	18.4			18.4	18.4
Effective Green, g (s)				12.5	12.5		18.4	18.4			18.4	18.4
Actuated g/C Ratio				0.31	0.31		0.45	0.45			0.45	0.45
Clearance Time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			6.0	6.0
Lane Grp Cap (vph)				541	1457		411	838			1592	712
v/s Ratio Prot				0.04	c0.11			0.10			c0.13	
v/s Ratio Perm							0.02					0.06
v/c Ratio				0.12	0.37		0.05	0.23			0.28	0.14
Uniform Delay, d1				10.2	11.1		6.3	6.9			7.1	6.6
Progression Factor				1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2				0.1	0.2		0.1	0.1			0.3	0.3
Delay (s)				10.3	11.3		6.4	7.0			7.4	6.9
Level of Service				B	B		A	A			A	A
Approach Delay (s)		0.0			11.2			7.0			7.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	40.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	43.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues
280: Lottsford Road & Arena Drive
7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	396	1209	76	503	200	779	132	630	297
v/c Ratio	0.86	0.85	0.28	0.58	0.87	0.66	0.74	0.84	0.36
Control Delay	58.9	44.4	45.0	46.2	85.4	36.2	76.1	44.2	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	44.4	45.0	46.2	85.4	36.2	76.1	44.2	11.0
Queue Length 50th (ft)	325	322	58	134	149	160	96	189	83
Queue Length 95th (ft)	#579	#439	113	179	#308	216	#195	273	158
Internal Link Dist (ft)		719		1095		560		666	
Turn Bay Length (ft)			300		500		200		
Base Capacity (vph)	459	1426	407	1275	229	1292	198	854	836
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.85	0.19	0.39	0.87	0.60	0.67	0.74	0.36

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
280: Lottsford Road & Arena Drive

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	495	825	205	80	435	35	190	415	325	125	315	565
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	0.86	0.86		0.86	0.86		1.00	0.91		1.00	0.91	0.91
Frt	1.00	0.97		1.00	0.99		1.00	0.93		1.00	0.93	0.85
Flt Protected	0.95	0.99		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1522	4653		1522	4749		1770	4750		1770	3150	1441
Flt Permitted	0.95	0.99		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1522	4653		1522	4749		1770	4750		1770	3150	1441
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	521	868	216	84	458	37	200	437	342	132	332	595
RTOR Reduction (vph)	0	22	0	0	7	0	0	108	0	0	127	46
Lane Group Flow (vph)	396	1187	0	76	496	0	200	671	0	132	503	251
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	1	1		2	2		7	4		3	8	1
Permitted Phases												8
Actuated Green, G (s)	35.1	35.1		21.0	21.0		15.0	26.4		11.7	23.1	58.2
Effective Green, g (s)	35.1	35.1		21.0	21.0		15.0	26.4		11.7	23.1	58.2
Actuated g/C Ratio	0.30	0.30		0.18	0.18		0.13	0.23		0.10	0.20	0.50
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	460	1406		275	858		228	1079		178	626	796
v/s Ratio Prot	c0.26	0.26		0.05	c0.10		c0.11	c0.14		0.07	c0.16	0.10
v/s Ratio Perm												0.08
v/c Ratio	0.86	0.84		0.28	0.58		0.88	0.62		0.74	0.80	0.32
Uniform Delay, d1	38.2	38.0		41.0	43.5		49.7	40.4		50.8	44.4	17.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	15.1	4.8		0.5	0.9		28.5	1.1		13.5	7.4	0.2
Delay (s)	53.4	42.8		41.6	44.5		78.2	41.5		64.3	51.8	17.4
Level of Service	D	D		D	D		E	D		E	D	B
Approach Delay (s)		45.4			44.1			49.0			43.7	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	45.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	116.2	Sum of lost time (s)	28.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues
290: Shoppers Way & Arena Drive 7/24/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	1258	595	132	1079	279	205
v/c Ratio	0.74	0.59	0.65	0.46	0.71	0.40
Control Delay	21.7	6.1	52.8	8.3	42.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.7	6.1	52.8	8.3	42.6	6.9
Queue Length 50th (ft)	295	37	72	144	145	0
Queue Length 95th (ft)	378	121	#142	187	232	54
Internal Link Dist (ft)	494			472	436	
Turn Bay Length (ft)		150	350			
Base Capacity (vph)	1746	1022	226	2403	432	541
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.58	0.58	0.45	0.65	0.38

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
290: Shoppers Way & Arena Drive

7/24/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Volume (vph)	1195	565	125	1025	265	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1258	595	132	1079	279	205
RTOR Reduction (vph)	0	246	0	0	0	159
Lane Group Flow (vph)	1258	349	132	1079	279	46
Turn Type	NA	Perm	Prot	NA	NA	custom
Protected Phases	6		5	2		
Permitted Phases		6			8	8
Actuated Green, G (s)	41.8	41.8	10.0	56.8	19.2	19.2
Effective Green, g (s)	41.8	41.8	10.0	56.8	19.2	19.2
Actuated g/C Ratio	0.48	0.48	0.12	0.66	0.22	0.22
Clearance Time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lane Grp Cap (vph)	1710	765	205	2324	393	351
v/s Ratio Prot	c0.36		c0.07	0.30		
v/s Ratio Perm		0.22			c0.16	0.03
v/c Ratio	0.74	0.46	0.64	0.46	0.71	0.13
Uniform Delay, d1	17.9	14.8	36.5	7.3	31.1	27.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.3	1.2	6.8	0.4	8.4	0.5
Delay (s)	20.2	16.0	43.3	7.8	39.5	27.4
Level of Service	C	B	D	A	D	C
Approach Delay (s)	18.9			11.6	34.4	
Approach LOS	B			B	C	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	86.5	Sum of lost time (s)	15.5
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
300: Addison Rd. & Wilburn Dr 7/24/2012

Lane Group	WBL	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	116	53	689	95	1321
v/c Ratio	0.51	0.21	0.46	0.07	0.94
Control Delay	42.4	11.9	5.0	0.9	26.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.4	11.9	5.0	0.9	26.3
Queue Length 50th (ft)	59	0	106	0	538
Queue Length 95th (ft)	110	31	207	11	#1071
Internal Link Dist (ft)	536		382		427
Turn Bay Length (ft)				100	
Base Capacity (vph)	332	340	1502	1294	1398
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.35	0.16	0.46	0.07	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
300: Addison Rd. & Wilburn Dr 7/24/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	110	50	655	90	70	1185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5		4.5
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1770	1583	1863	1583		1858
Flt Permitted	0.95	1.00	1.00	1.00		0.93
Satd. Flow (perm)	1770	1583	1863	1583		1733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	53	689	95	74	1247
RTOR Reduction (vph)	0	47	0	21	0	0
Lane Group Flow (vph)	116	6	689	74	0	1321
Turn Type	NA	Prot	NA	Perm	Perm	NA
Protected Phases	3	3	6			2
Permitted Phases				6	2	
Actuated Green, G (s)	9.2	9.2	66.0	66.0		66.0
Effective Green, g (s)	9.2	9.2	66.0	66.0		66.0
Actuated g/C Ratio	0.11	0.11	0.78	0.78		0.78
Clearance Time (s)	4.5	4.5	4.5	4.5		4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	193	173	1460	1241		1358
v/s Ratio Prot	c0.07	0.00	0.37			
v/s Ratio Perm				0.05		c0.76
v/c Ratio	0.60	0.03	0.47	0.06		0.97
Uniform Delay, d1	35.8	33.5	3.1	2.1		8.3
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	5.2	0.1	0.2	0.0		18.2
Delay (s)	40.9	33.6	3.4	2.1		26.4
Level of Service	D	C	A	A		C
Approach Delay (s)	38.6		3.2			26.4
Approach LOS	D		A			C

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	84.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	118.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

2035_PM_No Build 5:00 pm 5/3/2012 2035_PM_No Build
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Appendix 5
Build Scenario #1 Traffic Analysis and Queuing Reports

Queues
10: Southern Ave NE & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NET	SWT
Lane Group Flow (vph)	57	310	93	2269	175	825	567
v/c Ratio	0.43	0.15	0.12	1.08	0.18	1.11	0.78
Control Delay	22.6	13.4	7.9	77.0	8.2	116.4	52.2
Queue Delay	0.0	0.0	0.0	43.0	0.0	0.0	0.0
Total Delay	22.6	13.4	7.9	120.0	8.2	116.4	52.2
Queue Length 50th (ft)	18	65	27	~1320	43	~492	248
Queue Length 95th (ft)	47	90	47	#1447	79	#627	325
Internal Link Dist (ft)		460		823		251	355
Turn Bay Length (ft)	175		330		200		
Base Capacity (vph)	132	2105	764	2092	994	740	730
Starvation Cap Reductn	0	0	0	174	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.15	0.12	1.18	0.18	1.11	0.78

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
CJD

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HCM Signalized Intersection Capacity Analysis
10: Southern Ave NE & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	55	275	25	90	2200	170	65	725	10	30	350	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		-1.0	6.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		0.95			0.95	
Frt	1.00	0.99		1.00	1.00	0.85		1.00			0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	3495		1770	3539	1583		3518			3366	
Flt Permitted	0.05	1.00		0.56	1.00	1.00		0.70			0.69	
Satd. Flow (perm)	89	3495		1049	3539	1583		2487			2341	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Adj. Flow (vph)	57	284	26	93	2269	175	67	748	10	31	361	175
RTOR Reduction (vph)	0	5	0	0	0	27	0	1	0	0	34	0
Lane Group Flow (vph)	57	305	0	93	2269	148	0	824	0	0	533	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	87.2	82.9		86.6	82.6	82.6		41.0			41.0	
Effective Green, g (s)	89.2	87.9		95.9	87.6	90.6		44.0			44.0	
Actuated g/C Ratio	0.60	0.59		0.64	0.59	0.61		0.30			0.30	
Clearance Time (s)	4.0	11.0		4.0	11.0	11.0		6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	113	2063		719	2082	963		735			692	
v/s Ratio Prot	c0.02	0.09		c0.01	c0.64							
v/s Ratio Perm	0.28			0.08		0.09		c0.33			0.23	
v/c Ratio	0.50	0.15		0.13	1.09	0.15		1.12			0.77	
Uniform Delay, d1	34.5	13.7		10.0	30.7	12.6		52.5			47.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.5	0.0		0.1	49.1	0.1		71.9			5.3	
Delay (s)	38.0	13.7		10.0	79.7	12.7		124.3			53.1	
Level of Service	D	B		B	E	B		F			D	
Approach Delay (s)		17.5			72.5			124.3			53.1	
Approach LOS		B			E			F			D	

Intersection Summary			
HCM Average Control Delay	75.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	148.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
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Synchro 7 - Report
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Queues
20: Davey Street & MD 214 West
7/24/2012

Lane Group	EBT	WBL	WBT	NET	SWT
Lane Group Flow (vph)	332	163	2564	79	10
v/c Ratio	0.16	0.51	0.88	0.35	0.05
Control Delay	7.8	30.2	11.4	19.3	23.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	30.2	11.4	19.3	23.0
Queue Length 50th (ft)	30	59	272	13	3
Queue Length 95th (ft)	60	111	#720	48	15
Internal Link Dist (ft)	823		427	436	351
Turn Bay Length (ft)		225			
Base Capacity (vph)	2075	398	2908	764	793
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.16	0.41	0.88	0.10	0.01

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
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HCM Signalized Intersection Capacity Analysis
20: Davey Street & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑↱		↰	↑↱			✥			✥	
Volume (vph)	0	300	15	155	2425	10	30	5	40	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor		0.95		1.00	0.95			1.00			1.00	
Frt		0.99		1.00	1.00			0.93			0.93	
Flt Protected		1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)		3514		1770	3537			1695			1695	
Flt Permitted		1.00		0.95	1.00			0.87			0.92	
Satd. Flow (perm)		3514		1770	3537			1504			1603	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	316	16	163	2553	11	32	5	42	5	0	5
RTOR Reduction (vph)	0	3	0	0	0	0	0	38	0	0	2	0
Lane Group Flow (vph)	0	329	0	163	2564	0	0	41	0	0	8	0
Turn Type	Perm	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		38.4		11.0	53.4			6.2			6.2	
Effective Green, g (s)		39.4		12.0	54.4			7.2			7.2	
Actuated g/C Ratio		0.58		0.18	0.80			0.11			0.11	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		2048		314	2846			160			171	
v/s Ratio Prot		0.09		0.09	c0.72							
v/s Ratio Perm								c0.03			0.01	
v/c Ratio		0.16		0.52	0.90			0.26			0.05	
Uniform Delay, d1		6.5		25.2	4.7			27.7			27.1	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.0		1.5	4.4			0.9			0.1	
Delay (s)		6.5		26.6	9.1			28.6			27.2	
Level of Service		A		C	A			C			C	
Approach Delay (s)		6.5			10.1			28.6			27.2	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	6.0
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet Synchro 7 - Report
CJD Page 4

Queues
30: Addison Rd. & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	774	129	2646	485	433	150	57	170
v/c Ratio	0.26	0.34	0.26	1.10	1.08	0.62	0.28	0.43	0.38
Control Delay	9.8	10.5	7.2	75.7	120.8	54.7	7.0	71.8	55.1
Queue Delay	0.0	0.0	0.0	76.4	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	10.5	7.2	152.1	120.8	54.7	7.0	71.8	55.1
Queue Length 50th (ft)	9	141	30	~1420	~250	191	0	49	72
Queue Length 95th (ft)	22	200	58	#1655	#384	249	53	99	109
Internal Link Dist (ft)		307		408		726			986
Turn Bay Length (ft)	200		175		350		575	200	
Base Capacity (vph)	160	2325	494	2402	448	1003	544	139	814
Starvation Cap Reductn	0	0	0	325	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.33	0.26	1.27	1.08	0.43	0.28	0.41	0.21

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
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Synchro 7 - Report
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HCM Signalized Intersection Capacity Analysis
30: Addison Rd. & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰↰	↑↑	↱	↰	↑↱	
Volume (vph)	40	625	125	125	2465	100	470	420	145	55	155	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	0.5	0.0		0.5	0.0		0.5	1.0	0.5	0.5	1.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	0.95	1.00	1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3451		1770	3519		3433	3539	1583	1770	3508	
Flt Permitted	0.05	1.00		0.30	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	84	3451		561	3519		3433	3539	1583	1770	3508	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Adj. Flow (vph)	41	645	129	129	2543	103	485	433	150	57	160	10
RTOR Reduction (vph)	0	10	0	0	2	0	0	0	110	0	3	0
Lane Group Flow (vph)	41	764	0	129	2644	0	485	433	40	57	167	0
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	1	6		5	2		7	4	5	3	8	
Permitted Phases	6			2					4			
Actuated Green, G (s)	89.2	85.3		94.2	87.8		14.5	23.5	29.9	5.9	14.9	
Effective Green, g (s)	95.2	89.3		98.2	91.8		17.5	26.5	35.9	8.9	17.9	
Actuated g/C Ratio	0.70	0.66		0.72	0.67		0.13	0.19	0.26	0.07	0.13	
Clearance Time (s)	3.5	4.0		3.5	4.0		3.5	4.0	3.5	3.5	4.0	
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	144	2264		488	2374		441	689	418	116	461	
v/s Ratio Prot	c0.01	0.22		c0.02	c0.75		c0.14	c0.12	0.01	0.03	0.05	
v/s Ratio Perm	0.18			0.17					0.02			
v/c Ratio	0.28	0.34		0.26	1.11		1.10	0.63	0.09	0.49	0.36	
Uniform Delay, d1	33.0	10.3		6.6	22.1		59.3	50.3	37.8	61.4	53.9	
Progression Factor	0.98	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.8	0.2		0.2	57.8		72.7	1.6	0.1	2.4	0.4	
Delay (s)	33.2	10.5		6.8	80.0		132.0	51.8	37.9	63.8	54.2	
Level of Service	C	B		A	E		F	D	D	E	D	
Approach Delay (s)		11.7			76.6			86.3			56.6	
Approach LOS		B			E			F			E	

Intersection Summary			
HCM Average Control Delay	66.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	136.1	Sum of lost time (s)	1.0
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
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Queues
95: Addison Metro Station & MD 214 West 7/24/2012

Lane Group	EBT	WBL	WBT	NBL
Lane Group Flow (vph)	869	279	2658	263
v/c Ratio	0.62	0.73	1.11	0.68
Control Delay	19.6	37.9	71.8	29.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	19.6	37.9	71.8	29.8
Queue Length 50th (ft)	147	106	~684	84
Queue Length 95th (ft)	246	#218	#951	154
Internal Link Dist (ft)	408		824	134
Turn Bay Length (ft)		175		
Base Capacity (vph)	1406	443	2394	681
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.62	0.63	1.11	0.39

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
95: Addison Metro Station & MD 214 West

7/24/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	Y	
Volume (vph)	695	130	265	2525	150	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	0.95		1.00	0.95	1.00	
Frt	0.98		1.00	1.00	0.95	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	3456		1770	3539	1711	
Flt Permitted	1.00		0.95	1.00	0.97	
Satd. Flow (perm)	3456		1770	3539	1711	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	732	137	279	2658	158	105
RTOR Reduction (vph)	17	0	0	0	35	0
Lane Group Flow (vph)	852	0	279	2658	228	0
Turn Type	NA		Prot	NA	NA	
Protected Phases	4		3	8	2	
Permitted Phases						
Actuated Green, G (s)	27.5		14.7	46.2	14.1	
Effective Green, g (s)	27.5		14.7	46.2	14.1	
Actuated g/C Ratio	0.40		0.22	0.68	0.21	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1392		381	2394	353	
v/s Ratio Prot	0.25		0.16	c0.75	c0.13	
v/s Ratio Perm						
v/c Ratio	0.61		0.73	1.11	0.65	
Uniform Delay, d1	16.2		25.0	11.0	24.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.8		7.1	56.3	4.0	
Delay (s)	17.0		32.1	67.3	28.8	
Level of Service	B		C	E	C	
Approach Delay (s)	17.0			64.0	28.8	
Approach LOS	B			E	C	

Intersection Summary			
HCM Average Control Delay	51.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	68.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
100: Cabin Branch Rd/Soper Ln & MD 214 West
7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	5	832	153	2864	152	31
v/c Ratio	0.07	0.35	0.68	0.99	0.68	0.14
Control Delay	68.6	10.1	72.0	27.0	56.3	27.2
Queue Delay	0.0	0.0	0.0	18.3	0.0	0.0
Total Delay	68.6	10.1	72.0	45.3	56.3	27.2
Queue Length 50th (ft)	4	143	125	900	91	8
Queue Length 95th (ft)	20	234	221	#1767	176	39
Internal Link Dist (ft)		824		489	324	349
Turn Bay Length (ft)	225		250			
Base Capacity (vph)	67	2448	280	2901	339	344
Starvation Cap Reductn	0	0	0	166	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.34	0.55	1.05	0.45	0.09

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
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HCM Signalized Intersection Capacity Analysis
100: Cabin Branch Rd/Soper Ln & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↱			✣			✣	
Volume (vph)	5	700	90	145	2710	10	60	0	85	5	5	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.98		1.00	1.00			0.92			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1770	3479		1770	3537			1681			1679	
Flt Permitted	0.95	1.00		0.95	1.00			0.88			0.95	
Satd. Flow (perm)	1770	3479		1770	3537			1509			1608	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	737	95	153	2853	11	63	0	89	5	5	21
RTOR Reduction (vph)	0	5	0	0	0	0	0	36	0	0	18	0
Lane Group Flow (vph)	5	827	0	153	2864	0	0	116	0	0	13	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	0.7	93.2		15.9	108.4			15.5			15.5	
Effective Green, g (s)	1.7	94.2		16.9	109.4			16.5			16.5	
Actuated g/C Ratio	0.01	0.69		0.12	0.80			0.12			0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	22	2399		219	2833			182			194	
v/s Ratio Prot	0.00	0.24		c0.09	c0.81							
v/s Ratio Perm								c0.08			0.01	
v/c Ratio	0.23	0.34		0.70	1.01			0.64			0.06	
Uniform Delay, d1	66.8	8.6		57.4	13.6			57.2			53.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	5.2	0.1		9.3	19.6			7.1			0.1	
Delay (s)	72.0	8.7		66.7	33.2			64.3			53.4	
Level of Service	E	A		E	C			E			D	
Approach Delay (s)		9.1			34.9			64.3			53.4	
Approach LOS		A			C			E			D	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	136.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	103.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

2035_AM_Road_Diet 7:00 am 5/3/2012 2035_AM_Road_Diet
CJD

Synchro 7 - Report
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Queues
10: Southern Ave NE & MD 214 West
7/24/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NET	SWT
Lane Group Flow (vph)	309	1506	119	624	119	892	908
v/c Ratio	0.67	0.99	0.48	0.54	0.19	0.68	0.98
Control Delay	20.9	50.6	19.4	30.3	5.3	27.5	55.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.9	50.6	19.4	30.3	5.3	27.5	55.5
Queue Length 50th (ft)	104	489	32	172	0	238	291
Queue Length 95th (ft)	160	#663	68	234	38	308	#435
Internal Link Dist (ft)		460		823		251	355
Turn Bay Length (ft)	175		330		200		
Base Capacity (vph)	488	1517	250	1150	639	1308	926
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.99	0.48	0.54	0.19	0.68	0.98

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2035_PM_Road_Diet 5:00 pm 5/3/2012 2035_PM_Road_Diet
CJD

Synchro 7 - Report
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HCM Signalized Intersection Capacity Analysis
10: Southern Ave NE & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑↱		↰	↑↑	↱		↰↑↱			↰↑↱	
Volume (vph)	300	1420	40	115	605	115	15	755	95	80	705	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		-1.0	6.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		0.95			0.95	
Frt	1.00	1.00		1.00	1.00	0.85		0.98			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	3525		1770	3539	1583		3478			3466	
Flt Permitted	0.26	1.00		0.12	1.00	1.00		0.93			0.66	
Satd. Flow (perm)	477	3525		229	3539	1583		3245			2291	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Adj. Flow (vph)	309	1465	41	119	624	119	15	779	98	83	727	98
RTOR Reduction (vph)	0	2	0	0	0	77	0	10	0	0	9	0
Lane Group Flow (vph)	309	1504	0	119	624	42	0	882	0	0	899	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	46.0	38.0		31.5	27.5	27.5		37.0			37.0	
Effective Green, g (s)	47.0	43.0		41.5	32.5	35.5		40.0			40.0	
Actuated g/C Ratio	0.47	0.43		0.42	0.32	0.36		0.40			0.40	
Clearance Time (s)	4.0	11.0		4.0	11.0	11.0		6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	425	1516		234	1150	562		1298			916	
v/s Ratio Prot	c0.11	c0.43		0.05	0.18							
v/s Ratio Perm	0.23			0.17		0.03		0.27			c0.39	
v/c Ratio	0.73	0.99		0.51	0.54	0.08		0.68			0.98	
Uniform Delay, d1	18.2	28.3		22.6	27.7	21.4		24.7			29.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	6.1	21.2		1.7	0.5	0.1		1.4			25.1	
Delay (s)	24.3	49.5		24.4	28.2	21.4		26.2			54.7	
Level of Service	C	D		C	C	C		C			D	
Approach Delay (s)		45.2			26.7			26.2			54.7	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM Average Control Delay	39.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

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Queues
20: Davey Street & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NET	SWT
Lane Group Flow (vph)	5	1673	147	852	178	15
v/c Ratio	0.03	0.81	0.91	0.34	0.49	0.06
Control Delay	23.4	14.1	80.9	4.5	11.8	15.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	14.1	80.9	4.5	11.8	15.8
Queue Length 50th (ft)	1	184	46	32	12	3
Queue Length 95th (ft)	10	#400	#143	120	55	15
Internal Link Dist (ft)		823		427	436	351
Turn Bay Length (ft)	235		225			
Base Capacity (vph)	162	2078	162	2494	956	921
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.81	0.91	0.34	0.19	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
20: Davey Street & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑↱		↰	↑↱			✥			✥	
Volume (vph)	5	1585	5	140	805	5	25	5	140	5	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.89			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1770	3538		1770	3536			1643			1750	
Flt Permitted	0.95	1.00		0.95	1.00			0.96			0.91	
Satd. Flow (perm)	1770	3538		1770	3536			1581			1619	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	1668	5	147	847	5	26	5	147	5	5	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	115	0	0	4	0
Lane Group Flow (vph)	5	1673	0	147	852	0	0	63	0	0	11	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	0.8	34.5		4.0	37.7			7.6			7.6	
Effective Green, g (s)	1.8	35.5		5.0	38.7			8.6			8.6	
Actuated g/C Ratio	0.03	0.61		0.09	0.67			0.15			0.15	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	55	2162		152	2355			234			240	
v/s Ratio Prot	0.00	c0.47		c0.08	0.24							
v/s Ratio Perm								c0.04			0.01	
v/c Ratio	0.09	0.77		0.97	0.36			0.27			0.04	
Uniform Delay, d1	27.4	8.3		26.5	4.3			22.0			21.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.7	1.8		62.4	0.1			0.6			0.1	
Delay (s)	28.1	10.1		88.9	4.4			22.6			21.3	
Level of Service	C	B		F	A			C			C	
Approach Delay (s)		10.2			16.8			22.6			21.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
90: Addison Rd. & MD 214 West 7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	103	2383	263	1186	268	279	217	134	624
v/c Ratio	0.33	1.12	1.12	0.52	1.10	0.40	0.43	1.07	0.86
Control Delay	9.6	88.9	135.8	14.1	149.6	53.6	40.3	163.2	61.8
Queue Delay	0.0	11.4	0.0	2.7	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	100.3	135.8	16.8	149.6	53.6	40.3	163.2	61.8
Queue Length 50th (ft)	27	~1355	~247	299	~154	125	154	~146	271
Queue Length 95th (ft)	43	#1413	#436	354	#251	172	234	#288	347
Internal Link Dist (ft)		307		415		726			986
Turn Bay Length (ft)	200		175		350		575	200	
Base Capacity (vph)	315	2126	235	2294	243	739	503	125	763
Starvation Cap Reductn	0	48	0	955	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	1.15	1.12	0.89	1.10	0.38	0.43	1.07	0.82

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
90: Addison Rd. & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰↰	↑↑	↱	↰	↑↱	
Volume (vph)	100	1930	380	255	1020	130	260	270	210	130	370	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	0.5	0.0		0.5	0.0		0.5	1.0	0.5	0.5	1.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	0.95	1.00	1.00	0.95	
Frt	1.00	0.98		1.00	0.98		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3452		1770	3479		3433	3539	1583	1770	3333	
Flt Permitted	0.18	1.00		0.04	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	343	3452		82	3479		3433	3539	1583	1770	3333	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Adj. Flow (vph)	103	1991	392	263	1052	134	268	279	217	134	382	242
RTOR Reduction (vph)	0	11	0	0	7	0	0	0	13	0	68	0
Lane Group Flow (vph)	103	2372	0	263	1179	0	268	279	204	134	556	0
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	1	6		5	2		3	8	5	7	4	
Permitted Phases	6			2					8			
Actuated Green, G (s)	92.9	87.0		103.0	93.6		7.5	26.5	39.0	7.5	26.5	
Effective Green, g (s)	98.9	91.0		106.0	97.6		10.5	29.5	45.0	10.5	29.5	
Actuated g/C Ratio	0.67	0.61		0.71	0.66		0.07	0.20	0.30	0.07	0.20	
Clearance Time (s)	3.5	4.0		3.5	4.0		3.5	4.0	3.5	3.5	4.0	
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	314	2115		235	2287		243	703	480	125	662	
v/s Ratio Prot	0.02	c0.69		c0.12	0.34		c0.08	0.08	0.04	0.08	c0.17	
v/s Ratio Perm	0.20			0.68					0.08			
v/c Ratio	0.33	1.12		1.12	0.52		1.10	0.40	0.43	1.07	0.84	
Uniform Delay, d1	10.6	28.8		55.3	13.2		69.0	51.8	41.4	69.0	57.2	
Progression Factor	0.99	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	61.7		94.5	0.4		88.0	0.3	0.4	101.1	9.0	
Delay (s)	11.0	90.3		149.8	13.6		157.0	52.0	41.9	170.1	66.3	
Level of Service	B	F		F	B		F	D	D	F	E	
Approach Delay (s)		87.0			38.3			86.0			84.6	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	73.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	148.5	Sum of lost time (s)	2.0
Intersection Capacity Utilization	116.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

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Queues
95: Addison Metro Station & MD 214 West 7/24/2012

Lane Group	EBT	WBL	WBT	NBL
Lane Group Flow (vph)	2331	126	1363	263
v/c Ratio	0.97	0.86	0.49	0.87
Control Delay	34.7	111.0	6.0	75.3
Queue Delay	85.8	0.0	0.3	0.0
Total Delay	120.5	111.0	6.3	75.3
Queue Length 50th (ft)	1083	124	218	200
Queue Length 95th (ft)	#1347	#250	255	#343
Internal Link Dist (ft)	415		817	328
Turn Bay Length (ft)		175		
Base Capacity (vph)	2445	146	2846	333
Starvation Cap Reductn	495	0	725	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.20	0.86	0.64	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
95: Addison Metro Station & MD 214 West

7/24/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2130	85	120	1295	85	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	0.95		1.00	0.95	1.00	
Frt	0.99		1.00	1.00	0.91	
Flt Protected	1.00		0.95	1.00	0.98	
Satd. Flow (prot)	3519		1770	3539	1668	
Flt Permitted	1.00		0.95	1.00	0.98	
Satd. Flow (perm)	3519		1770	3539	1668	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2242	89	126	1363	89	174
RTOR Reduction (vph)	2	0	0	0	48	0
Lane Group Flow (vph)	2329	0	126	1363	215	0
Turn Type	NA		Prot	NA	NA	
Protected Phases	4		3	8	2	
Permitted Phases						
Actuated Green, G (s)	99.6		12.0	115.6	22.1	
Effective Green, g (s)	99.6		12.0	115.6	22.1	
Actuated g/C Ratio	0.68		0.08	0.79	0.15	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2406		146	2808	253	
v/s Ratio Prot	c0.66		c0.07	0.39	c0.13	
v/s Ratio Perm						
v/c Ratio	0.97		0.86	0.49	0.85	
Uniform Delay, d1	21.6		66.0	5.1	60.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	11.7		37.5	0.1	23.1	
Delay (s)	33.3		103.5	5.2	83.3	
Level of Service	C		F	A	F	
Approach Delay (s)	33.3			13.5	83.3	
Approach LOS	C			B	F	

Intersection Summary			
HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	145.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
100: Cabin Branch Rd/Soper Ln & MD 214 West

7/24/2012

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	5	2410	53	1479	110	48
v/c Ratio	0.06	0.87	0.46	0.50	0.53	0.47
Control Delay	65.4	14.7	73.7	3.8	42.3	61.9
Queue Delay	0.0	0.4	0.0	0.1	0.0	0.0
Total Delay	65.4	15.1	73.7	4.0	42.3	61.9
Queue Length 50th (ft)	4	595	41	107	45	29
Queue Length 95th (ft)	20	907	#112	279	114	77
Internal Link Dist (ft)		817		861	324	349
Turn Bay Length (ft)	225		250			
Base Capacity (vph)	82	3128	115	3202	438	244
Starvation Cap Reductn	0	258	0	563	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.84	0.46	0.56	0.25	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
100: Cabin Branch Rd/Soper Ln & MD 214 West

7/24/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱			✥			✥	
Volume (vph)	5	2270	20	50	1400	5	5	0	100	30	5	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.87			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1770	3535		1770	3537			1619			1747	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.53	
Satd. Flow (perm)	1770	3535		1770	3537			1604			952	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	2389	21	53	1474	5	5	0	105	32	5	11
RTOR Reduction (vph)	0	0	0	0	0	0	0	45	0	0	8	0
Lane Group Flow (vph)	5	2410	0	53	1479	0	0	65	0	0	40	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	0.7	90.9		4.5	94.7			10.4			10.4	
Effective Green, g (s)	1.7	91.9		5.5	95.7			11.4			11.4	
Actuated g/C Ratio	0.01	0.78		0.05	0.81			0.10			0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	26	2758		83	2873			155			92	
v/s Ratio Prot	0.00	c0.68		c0.03	0.42							
v/s Ratio Perm								0.04			c0.04	
v/c Ratio	0.19	0.87		0.64	0.51			0.42			0.43	
Uniform Delay, d1	57.4	8.9		55.2	3.6			50.1			50.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	3.6	3.4		15.0	0.2			1.8			3.3	
Delay (s)	61.0	12.3		70.2	3.7			51.9			53.4	
Level of Service	E	B		E	A			D			D	
Approach Delay (s)		12.4			6.0			51.9			53.4	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	117.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Appendix 6
Build Scenario #2 Traffic Analysis and Queuing Reports

2011 Existing

Land Use	ITE Code	Size	Units	Entering AM	Exiting AM	AM Peak Hour Trips	Trips Entering AM	Exiting AM
Low Rise Apartments	221	192	DUs	0.21	0.79	94	20	74
Single Family Residential	210	1308	DUs	0.25	0.75	925	231	694
Furniture Store	890	76,400	SF	0.69	0.31	13	9	4
Shopping Center	820	52,500	SF	0.61	0.39	105	64	41
Middle School	522	120	Employees	0.54	0.46	636	343	293
Total						1,774	668	1106

In	Out	
668	1,106	
-114	-188	Reduction for pedestrian, bicycle, HOV 2+, HOV 3+ and transit mode share (17%)
554	918	Final auto trips

Land Use	ITE Code	Size	Units	Entering PM	Exiting PM	PM Peak Hour Trips	Trips Entering PM	Exiting PM
Low Rise Apartments	221	192	DUs	0.65	0.35	120	78	42
Single Family Residential	210	1308	DUs	0.63	0.37	1,063	670	393
Furniture Store	890	76,400	SF	0.48	0.52	34	17	18
Shopping Center	820	52,500	SF	0.49	0.51	413	202	211
Middle School	522	120	Employees	0.50	0.50	233	116	116
Total						1,863	1,083	780

In	Out	
1,083	780	
-184	-133	Reduction for pedestrian, bicycle, HOV 2+, HOV 3+ and transit mode share (17%)
899	648	Final auto trips

2035: Scenario 2: Mixed Use Concept A

Land Use	ITE Code	Size	Units	Entering AM	Exiting AM	AM Peak Hour Trips	Trips Entering AM	Exiting AM
3 Story Flat	220	596	DUs	0.20	0.80	296	59	237
Single Family Residential	210	17	DUs	0.25	0.75	22	5	16
Shopping Center	820	223,500	SF	0.61	0.39	248	151	97
General Office building	710	376,500	SF	0.88	0.12	542	477	65
Residential	220	105	DUs	0.20	0.80	55	11	44
Live/Work Unit	220	70	DUs	0.20	0.80	38	8	30
2 Story townhouse	230	67	DUs	0.17	0.83	57	10	47
Total						1,257	721	536

In	Out	
721	536	
477	65	Work trips
244	471	All other trip purposes (including unidentified work trips)
-105	-14	Work trip reduction for all modes (22%)
-41	-80	Reduction for other trips (17%)
574	442	Final auto trips

Land Use	ITE Code	Size	Units	Entering PM	Exiting PM	PM Peak Hour Trips	Trips Entering PM	Exiting PM
3 Story Flat	220	596	DUs	0.65	0.35	345	225	121
Single Family Residential	210	17	DUs	0.63	0.37	21	13	8
Shopping Center	820	223,500	SF	0.49	0.51	1,090	534	556
General Office building	710	376,500	SF	0.17	0.83	500	85	415
Residential	220	105	DUs	0.65	0.35	75	49	26
Live/Work Unit	220	70	DUs	0.65	0.35	56	36	20
2 Story townhouse	230	67	DUs	0.67	0.33	43	29	14
Total						2,133	972	1,161

In	Out	
972	1,161	
85	415	Work trips
887	745	All other trip purposes (including unidentified work trips)
-19	-91	Work trip reduction for all modes (22%)
-151	-127	Reduction for other trips (17%)
802	943	Final auto trips

2011 Trips		2011-2035 Growth		AECOM Trips		Total Trips (2035)		Model Trips (2035)		Total Trips/Model Trips (2035)	
AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1,472	1,546	1,997	2,507	1,016	1,745	3,014	4,252	3,742	4,854	0.81	0.88

Hill Road and Morgan Boulevard Road Diet 2035 AM
230: Garrett Morgan & Ridgefield 7/30/2012

Lane Group	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	126	68	52	21	463	16	558
v/c Ratio	0.33	0.20	0.11	0.04	0.22	0.03	0.27
Control Delay	13.6	13.8	6.1	5.7	5.7	5.5	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	13.8	6.1	5.7	5.7	5.5	5.9
Queue Length 50th (ft)	16	10	1	2	23	1	29
Queue Length 95th (ft)	56	38	19	10	50	8	61
Internal Link Dist (ft)	623		482		695		523
Turn Bay Length (ft)				150		125	
Base Capacity (vph)	1311	1223	1564	780	3330	855	3316
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.06	0.03	0.03	0.14	0.02	0.17

Intersection Summary

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Hill Road and Morgan Boulevard Road Diet — 2035 AM
230: Garrett Morgan & Ridgefield — 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	5	25	65	5	45	20	425	15	15	500	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt		0.97		1.00	0.86		1.00	0.99		1.00	0.99	
Flt Protected		0.96		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1745		1770	1610		1770	3521		1770	3509	
Flt Permitted		0.75		0.68	1.00		0.44	1.00		0.49	1.00	
Satd. Flow (perm)		1349		1260	1610		825	3521		905	3509	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	5	26	68	5	47	21	447	16	16	526	32
RTOR Reduction (vph)	0	16	0	0	38	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	110	0	68	14	0	21	461	0	16	554	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)		6.5		6.5	6.5		17.1	17.1		17.1	17.1	
Effective Green, g (s)		6.5		6.5	6.5		17.1	17.1		17.1	17.1	
Actuated g/C Ratio		0.19		0.19	0.19		0.51	0.51		0.51	0.51	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)		261		244	311		420	1792		461	1786	
v/s Ratio Prot					0.01			0.13			c0.16	
v/s Ratio Perm		c0.08		0.05			0.03			0.02		
v/c Ratio		0.42		0.28	0.05		0.05	0.26		0.03	0.31	
Uniform Delay, d1		11.9		11.6	11.0		4.2	4.7		4.1	4.8	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1		0.6	0.1		0.1	0.2		0.1	0.3	
Delay (s)		13.0		12.2	11.1		4.3	4.9		4.2	5.1	
Level of Service		B		B	B		A	A		A	A	
Approach Delay (s)		13.0			11.7			4.9			5.1	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	33.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Hill Road and Morgan Boulevard Road Diet
240: Morgan Metro Park and Ride & Garrett A Morgan

2035 AM
7/30/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	337	68	363	358	63	126
v/c Ratio	0.28	0.12	0.53	0.15	0.21	0.34
Control Delay	11.7	4.2	21.3	3.7	19.1	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	4.2	21.3	3.7	19.1	7.5
Queue Length 50th (ft)	32	0	43	15	14	0
Queue Length 95th (ft)	59	19	#100	31	43	35
Internal Link Dist (ft)	667			1365	395	
Turn Bay Length (ft)		100	150			
Base Capacity (vph)	1750	817	679	2762	1350	1237
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.08	0.53	0.13	0.05	0.10

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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Hill Road and Morgan Boulevard Road Diet — 2035 AM
240: Morgan Metro Park and Ride & Garrett A Morgan — 7/30/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑	↱	↰↰	↑↑	↰	↱
Volume (vph)	320	65	345	340	60	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	337	68	363	358	63	126
RTOR Reduction (vph)	0	45	0	0	0	110
Lane Group Flow (vph)	337	23	363	358	63	16
Turn Type	NA	custom	Prot	NA	NA	Perm
Protected Phases			1	6	4	
Permitted Phases	2	2				4
Actuated Green, G (s)	14.3	14.3	8.4	27.7	5.5	5.5
Effective Green, g (s)	14.3	14.3	8.4	27.7	5.5	5.5
Actuated g/C Ratio	0.33	0.33	0.19	0.64	0.13	0.13
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	3.0	3.0
Lane Grp Cap (vph)	1171	524	668	2269	225	202
v/s Ratio Prot			c0.11	0.10	c0.04	
v/s Ratio Perm	c0.10	0.01				0.01
v/c Ratio	0.29	0.04	0.54	0.16	0.28	0.08
Uniform Delay, d1	10.7	9.8	15.7	3.1	17.1	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.9	0.1	0.7	0.2
Delay (s)	11.1	9.9	16.6	3.2	17.7	16.8
Level of Service	B	A	B	A	B	B
Approach Delay (s)	10.9			9.9	17.1	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	43.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Hill Road and Morgan Boulevard Road Diet 2035 AM
250: Ritchie/Garrett A Morgan & MD 214 West 7/30/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	132	964	158	2474	442	289	289	163	189	158
v/c Ratio	0.40	0.37	0.99	1.04	0.63	0.76	0.18	0.32	0.69	0.36
Control Delay	67.3	22.7	137.6	66.4	58.2	69.2	0.3	57.8	73.0	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.3	22.7	137.6	66.4	58.2	69.2	0.3	57.8	73.0	15.7
Queue Length 50th (ft)	63	194	81	~948	206	270	0	74	178	47
Queue Length 95th (ft)	98	284	#159	#1260	245	351	0	105	252	68
Internal Link Dist (ft)		1283		929		896			1365	
Turn Bay Length (ft)	350		600		350		200	500		
Base Capacity (vph)	328	2612	160	2388	961	522	1583	961	522	437
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.37	0.99	1.04	0.46	0.55	0.18	0.17	0.36	0.36

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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Hill Road and Morgan Boulevard Road Diet 2035 AM
250: Ritchie/Garrett A Morgan & MD 214 West 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑↱		↰↰	↑	↱	↰↰	↑	↱
Volume (vph)	125	790	125	150	2200	150	420	275	275	155	180	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	4981		3433	5037		3433	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	4981		3433	5037		3433	1863	1583	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	832	132	158	2316	158	442	289	289	163	189	158
RTOR Reduction (vph)	0	10	0	0	4	0	0	0	0	0	0	52
Lane Group Flow (vph)	132	954	0	158	2470	0	442	289	289	163	189	106
Turn Type	Prot	NA		Prot	NA		Split	NA	Free	Split	NA	pm+ov
Protected Phases	1	6		5	2		4	4		3	3	1
Permitted Phases									Free			3
Actuated Green, G (s)	12.3	75.3		5.0	68.0		28.5	28.5	150.0	20.2	20.2	32.5
Effective Green, g (s)	14.3	78.3		7.0	71.0		30.5	30.5	150.0	22.2	22.2	36.5
Actuated g/C Ratio	0.10	0.52		0.05	0.47		0.20	0.20	1.00	0.15	0.15	0.24
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0		2.5	2.5		2.5	2.5	3.0
Lane Grp Cap (vph)	327	2600		160	2384		698	379	1583	508	276	385
v/s Ratio Prot	c0.04	0.19		0.05	c0.49		0.13	c0.16		0.05	c0.10	0.03
v/s Ratio Perm									0.18			0.04
v/c Ratio	0.40	0.37		0.99	1.04		0.63	0.76	0.18	0.32	0.68	0.27
Uniform Delay, d1	63.8	21.2		71.5	39.5		54.6	56.3	0.0	57.2	60.6	46.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.4		67.9	28.6		1.6	8.4	0.3	0.3	6.3	0.4
Delay (s)	64.7	21.6		139.4	68.1		56.3	64.8	0.3	57.4	66.9	46.4
Level of Service	E	C		F	E		E	E	A	E	E	D
Approach Delay (s)		26.8			72.4			42.8			57.5	
Approach LOS		C			E			D			E	

Intersection Summary			
HCM Average Control Delay	55.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Hill Road and Morgan Boulevard Road Diet 2035 AM
260: Shady Glen Dr/Hill Rd & MD 214 West 7/30/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	74	753	95	2358	205	121	158	47	172	192	358
v/c Ratio	0.43	0.26	0.20	0.79	0.21	0.64	0.40	0.22	0.71	0.38	0.76
Control Delay	27.1	17.0	11.4	28.3	7.9	78.3	63.4	16.8	76.4	58.6	25.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.1	17.0	11.4	28.3	7.9	78.3	63.4	16.8	76.4	58.6	25.9
Queue Length 50th (ft)	23	124	30	618	32	126	80	0	179	94	78
Queue Length 95th (ft)	81	198	69	#963	97	195	114	39	256	129	190
Internal Link Dist (ft)		1835		2003			924			1116	
Turn Bay Length (ft)	300		225		325	350		225	300		150
Base Capacity (vph)	171	2951	472	2981	980	413	866	431	413	857	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.26	0.20	0.79	0.21	0.29	0.18	0.11	0.42	0.22	0.59

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2035_AM_Morgan_Blvd 7:00 am 5/3/2012 2035_AM_Morgan_Blvd Synchro 7 - Report
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Hill Road and Morgan Boulevard Road Diet — 2035 AM

260: Shady Glen Dr/Hill Rd & MD 214 West — 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↑	↱	↰	↰↑	↱	↰	↰↑	↱
Volume (vph)	70	675	40	90	2240	195	130	135	45	220	125	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	0.91	0.91	1.00	0.91	0.91	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.99	1.00	0.95	0.98	1.00
Satd. Flow (prot)	1770	5043		1770	5085	1583	1610	3373	1583	1610	3338	1583
Flt Permitted	0.05	1.00		0.32	1.00	1.00	0.95	0.99	1.00	0.95	0.98	1.00
Satd. Flow (perm)	86	5043		595	5085	1583	1610	3373	1583	1610	3338	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	711	42	95	2358	205	137	142	47	232	132	358
RTOR Reduction (vph)	0	3	0	0	0	52	0	0	42	0	0	232
Lane Group Flow (vph)	74	750	0	95	2358	153	121	158	5	172	192	126
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6			2		2			3			4
Actuated Green, G (s)	92.8	84.6		93.4	84.9	84.9	14.5	14.5	14.5	19.4	19.4	19.4
Effective Green, g (s)	96.8	87.6		97.4	87.9	87.9	17.5	17.5	16.5	22.4	22.4	22.4
Actuated g/C Ratio	0.65	0.58		0.65	0.59	0.59	0.12	0.12	0.11	0.15	0.15	0.15
Clearance Time (s)	5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0	5.0	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	170	2945		469	2980	928	188	394	174	240	498	236
v/s Ratio Prot	c0.03	0.15		0.01	c0.46		c0.08	0.05		c0.11	0.06	
v/s Ratio Perm	0.25			0.12		0.10			0.00			0.08
v/c Ratio	0.44	0.25		0.20	0.79	0.17	0.64	0.40	0.03	0.72	0.39	0.53
Uniform Delay, d1	24.2	15.2		10.0	24.0	14.2	63.3	61.4	59.6	60.8	57.6	59.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	0.2		0.2	2.2	0.4	6.5	0.5	0.1	9.1	0.4	1.8
Delay (s)	26.0	15.5		10.2	26.2	14.6	69.8	61.9	59.7	69.9	58.0	60.8
Level of Service	C	B		B	C	B	E	E	E	E	E	E
Approach Delay (s)		16.4			24.7			64.5			62.2	
Approach LOS		B			C			E			E	

Intersection Summary			
HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2035_AM_Morgan_Blvd 7:00 am 5/3/2012 2035_AM_Morgan_Blvd — Synchro 7 - Report

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Hill Road and Morgan Boulevard Road Diet 2035 AM
270: Hill Rd & Willow Hill Rd 7/30/2012

Lane Group	EBT	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	10	16	258	95	406	74	468	5
v/c Ratio	0.02	0.04	0.71	0.19	0.37	0.08	0.45	0.01
Control Delay	13.4	7.3	29.1	4.8	8.4	2.4	9.3	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	7.3	29.1	4.8	8.4	2.4	9.3	4.6
Queue Length 50th (ft)	2	0	73	0	62	0	76	0
Queue Length 95th (ft)	11	10	138	25	142	16	173	4
Internal Link Dist (ft)	480		402		925		554	
Turn Bay Length (ft)						250		100
Base Capacity (vph)	606	595	501	645	1085	964	1040	936
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.03	0.51	0.15	0.37	0.08	0.45	0.01

Intersection Summary

2035_AM_Morgan_Blvd 7:00 am 5/3/2012 2035_AM_Morgan_Blvd Synchro 7 - Report
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Hill Road and Morgan Boulevard Road Diet 2035 AM
270: Hill Rd & Willow Hill Rd 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	5	15	235	10	90	10	375	70	40	405	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.98	1.00		0.95	1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)		1817	1583		1778	1583		1860	1583		1854	1583
Flt Permitted		0.88	1.00		0.73	1.00		0.99	1.00		0.95	1.00
Satd. Flow (perm)		1639	1583		1356	1583		1841	1583		1762	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	16	247	11	95	11	395	74	42	426	5
RTOR Reduction (vph)	0	0	12	0	0	69	0	0	30	0	0	2
Lane Group Flow (vph)	0	10	4	0	258	26	0	406	44	0	468	3
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		15.4	15.4		15.4	15.4		33.7	33.7		33.7	33.7
Effective Green, g (s)		15.4	15.4		15.4	15.4		33.7	33.7		33.7	33.7
Actuated g/C Ratio		0.27	0.27		0.27	0.27		0.59	0.59		0.59	0.59
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		442	427		366	427		1087	934		1040	934
v/s Ratio Prot												
v/s Ratio Perm		0.01	0.00		c0.19	0.02		0.22	0.03		c0.27	0.00
v/c Ratio		0.02	0.01		0.70	0.06		0.37	0.05		0.45	0.00
Uniform Delay, d1		15.3	15.3		18.8	15.5		6.2	4.9		6.5	4.8
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0	0.0		6.1	0.1		1.0	0.1		1.4	0.0
Delay (s)		15.3	15.3		24.9	15.5		7.1	5.0		7.9	4.8
Level of Service		B	B		C	B		A	A		A	A
Approach Delay (s)		15.3			22.4			6.8			7.9	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	57.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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HIll Road & Morgan Boulevard Road Diet 2035 PM
330: Garrett Morgan & Ridgefield 7/30/2012

Lane Group	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	32	47	31	26	626	21	458
v/c Ratio	0.08	0.10	0.07	0.04	0.25	0.04	0.18
Control Delay	10.7	13.9	8.4	4.4	3.9	4.4	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.7	13.9	8.4	4.4	3.9	4.4	3.7
Queue Length 50th (ft)	2	7	1	2	28	2	20
Queue Length 95th (ft)	20	30	17	9	55	8	40
Internal Link Dist (ft)	623		482		596		523
Turn Bay Length (ft)				150		125	
Base Capacity (vph)	1475	1813	1585	862	3312	731	3324
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.03	0.02	0.03	0.19	0.03	0.14

Intersection Summary

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HIll Road & Morgan Boulevard Road Diet — 2035 PM

330: Garrett Morgan & Ridgefield — 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰	↱		↰	↑↑		↰	↑↱	
Volume (vph)	10	5	15	45	5	25	25	540	55	20	405	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt		0.93		1.00	0.87		1.00	0.99		1.00	0.99	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1708		1770	1628		1770	3490		1770	3502	
Flt Permitted		0.87		1.00	1.00		0.49	1.00		0.41	1.00	
Satd. Flow (perm)		1517		1863	1628		909	3490		772	3502	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	5	16	47	5	26	26	568	58	21	426	32
RTOR Reduction (vph)	0	14	0	0	23	0	0	7	0	0	5	0
Lane Group Flow (vph)	0	18	0	47	8	0	26	619	0	21	453	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)		3.6		3.6	3.6		18.6	18.6		18.6	18.6	
Effective Green, g (s)		3.6		3.6	3.6		18.6	18.6		18.6	18.6	
Actuated g/C Ratio		0.11		0.11	0.11		0.58	0.58		0.58	0.58	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)		170		208	182		525	2016		446	2023	
v/s Ratio Prot					0.00			c0.18			0.13	
v/s Ratio Perm		0.01		c0.03			0.03			0.03		
v/c Ratio		0.10		0.23	0.04		0.05	0.31		0.05	0.22	
Uniform Delay, d1		12.9		13.0	12.8		3.0	3.5		3.0	3.3	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3		0.6	0.1		0.1	0.2		0.1	0.2	
Delay (s)		13.1		13.6	12.9		3.1	3.7		3.1	3.5	
Level of Service		B		B	B		A	A		A	A	
Approach Delay (s)		13.1			13.3			3.7			3.4	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	4.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	32.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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HIll Road & Morgan Boulevard Road Diet 2035 PM
340: Morgan Metro Park and Ride & Garrett A Morgan 7/30/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	558	63	116	500	126	316
v/c Ratio	0.39	0.09	0.29	0.25	0.35	0.59
Control Delay	11.3	3.8	24.4	5.2	20.9	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	3.8	24.4	5.2	20.9	9.4
Queue Length 50th (ft)	55	0	15	27	31	10
Queue Length 95th (ft)	101	18	40	57	73	65
Internal Link Dist (ft)	667			1365	395	
Turn Bay Length (ft)		100	150			
Base Capacity (vph)	1900	879	400	2581	1263	1208
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.07	0.29	0.19	0.10	0.26

Intersection Summary

2035_PM_Morgan_Blvd 4:30 pm 5/3/2012 2035_PM_Morgan_Blvd Synchro 7 - Report
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HIll Road & Morgan Boulevard Road Diet
340: Morgan Metro Park and Ride & Garrett A Morgan

2035 PM
7/30/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑	↱	↰↰	↑↑	↰	↱
Volume (vph)	530	60	110	475	120	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	558	63	116	500	126	316
RTOR Reduction (vph)	0	38	0	0	0	220
Lane Group Flow (vph)	558	25	116	500	126	96
Turn Type	NA	custom	Prot	NA	NA	Perm
Protected Phases			1	6	4	
Permitted Phases	2	2				4
Actuated Green, G (s)	18.5	18.5	3.7	27.2	9.2	9.2
Effective Green, g (s)	18.5	18.5	3.7	27.2	9.2	9.2
Actuated g/C Ratio	0.40	0.40	0.08	0.59	0.20	0.20
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	3.0	3.0
Lane Grp Cap (vph)	1411	631	274	2075	351	314
v/s Ratio Prot			c0.03	0.14	c0.07	
v/s Ratio Perm	c0.16	0.02				0.06
v/c Ratio	0.40	0.04	0.42	0.24	0.36	0.30
Uniform Delay, d1	10.0	8.5	20.3	4.6	16.1	15.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	1.1	0.2	0.6	0.6
Delay (s)	10.5	8.6	21.4	4.8	16.7	16.4
Level of Service	B	A	C	A	B	B
Approach Delay (s)	10.3			7.9	16.5	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	46.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HIll Road & Morgan Boulevard Road Diet 2035 PM
350: Ritchie/Garrett A Morgan & MD 214 West 7/30/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	211	2279	274	1474	242	258	374	284	437	142
v/c Ratio	0.42	1.15	1.33	0.95	0.38	0.75	0.24	0.29	0.84	0.19
Control Delay	62.1	113.8	228.7	64.0	54.2	70.5	0.4	42.0	64.6	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.1	113.8	228.7	64.0	54.2	70.5	0.4	42.0	64.6	2.5
Queue Length 50th (ft)	99	~962	~178	509	108	242	0	112	403	1
Queue Length 95th (ft)	145	#1265	#275	#781	141	321	0	141	498	20
Internal Link Dist (ft)		1283		929		896			1365	
Turn Bay Length (ft)	350		600		350		200	500		
Base Capacity (vph)	504	1982	206	1545	1099	596	1583	1167	633	756
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	1.15	1.33	0.95	0.22	0.43	0.24	0.24	0.69	0.19

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HIll Road & Morgan Boulevard Road Diet 2035 PM
350: Ritchie/Garrett A Morgan & MD 214 West 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑↱		↰↰	↑	↱	↰↰	↑	↱
Volume (vph)	200	2010	155	260	1275	125	230	245	355	270	415	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5031		3433	5017		3433	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5031		3433	5017		3433	1863	1583	3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	211	2116	163	274	1342	132	242	258	374	284	437	142
RTOR Reduction (vph)	0	4	0	0	7	0	0	0	0	0	0	79
Lane Group Flow (vph)	211	2275	0	274	1467	0	242	258	374	284	437	63
Turn Type	Prot	NA		Prot	NA		Split	NA	Free	Split	NA	pm+ov
Protected Phases	1	6		5	2		4	4		3	3	1
Permitted Phases									Free			3
Actuated Green, G (s)	20.0	56.0		7.0	43.0		25.9	25.9	150.0	40.1	40.1	60.1
Effective Green, g (s)	22.0	59.0		9.0	46.0		27.9	27.9	150.0	42.1	42.1	64.1
Actuated g/C Ratio	0.15	0.39		0.06	0.31		0.19	0.19	1.00	0.28	0.28	0.43
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0		2.5	2.5		2.5	2.5	3.0
Lane Grp Cap (vph)	504	1979		206	1539		639	347	1583	964	523	676
v/s Ratio Prot	0.06	c0.45		c0.08	0.29		0.07	c0.14		0.08	c0.23	0.01
v/s Ratio Perm									0.24			0.03
v/c Ratio	0.42	1.15		1.33	0.95		0.38	0.74	0.24	0.29	0.84	0.09
Uniform Delay, d1	58.2	45.5		70.5	50.9		53.5	57.7	0.0	42.3	50.7	25.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	73.6		177.9	14.2		0.3	7.9	0.4	0.1	10.9	0.1
Delay (s)	58.8	119.1		248.4	65.2		53.7	65.6	0.4	42.4	61.6	25.7
Level of Service	E	F		F	E		D	E	A	D	E	C
Approach Delay (s)		114.0			93.9			34.4			49.4	
Approach LOS		F			F			C			D	

Intersection Summary			
HCM Average Control Delay	87.2	HCM Level of Service	F
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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HIll Road & Morgan Boulevard Road Diet 2035 PM
360: Shady Glen Dr/Hill Rd & MD 214 West 7/30/2012

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	89	2168	116	1205	258	88	191	53	327	368	147
v/c Ratio	0.32	0.89	0.54	0.47	0.28	0.55	0.57	0.27	0.82	0.45	0.29
Control Delay	18.8	41.6	36.6	27.4	4.0	76.3	70.5	18.0	69.9	48.6	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	41.6	36.6	27.4	4.0	76.3	70.5	18.0	69.9	48.6	7.1
Queue Length 50th (ft)	36	686	56	275	0	92	100	0	335	168	0
Queue Length 95th (ft)	78	#1027	135	402	58	153	140	43	431	204	53
Internal Link Dist (ft)		1835		2003			924			2121	
Turn Bay Length (ft)	300		225		325	350		225	300		150
Base Capacity (vph)	282	2433	213	2538	920	413	868	436	437	907	537
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.89	0.54	0.47	0.28	0.21	0.22	0.12	0.75	0.41	0.27

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HIll Road & Morgan Boulevard Road Diet 2035 PM
360: Shady Glen Dr/Hill Rd & MD 214 West 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↑	↱	↰	↰↑	↱	↰	↰↑	↱
Volume (vph)	85	1960	100	110	1145	245	95	170	50	420	240	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	0.91	0.91	1.00	0.91	0.91	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00
Satd. Flow (prot)	1770	5048		1770	5085	1583	1610	3380	1583	1610	3338	1583
Flt Permitted	0.16	1.00		0.05	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00
Satd. Flow (perm)	304	5048		101	5085	1583	1610	3380	1583	1610	3338	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	89	2063	105	116	1205	258	100	179	53	442	253	147
RTOR Reduction (vph)	0	3	0	0	0	129	0	0	48	0	0	111
Lane Group Flow (vph)	89	2165	0	116	1205	129	88	191	5	327	368	36
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6			2		2			3			4
Actuated Green, G (s)	78.3	69.2		83.7	71.9	71.9	12.0	12.0	12.0	34.0	34.0	34.0
Effective Green, g (s)	82.3	72.2		87.7	74.9	74.9	15.0	15.0	14.0	37.0	37.0	37.0
Actuated g/C Ratio	0.55	0.48		0.58	0.50	0.50	0.10	0.10	0.09	0.25	0.25	0.25
Clearance Time (s)	5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	5.0		3.0	5.0	5.0	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	275	2430		213	2539	790	161	338	148	397	823	390
v/s Ratio Prot	0.02	c0.43		c0.05	0.24		0.05	c0.06		c0.20	0.11	
v/s Ratio Perm	0.15			0.27		0.08			0.00			0.02
v/c Ratio	0.32	0.89		0.54	0.47	0.16	0.55	0.57	0.03	0.82	0.45	0.09
Uniform Delay, d1	17.6	35.3		33.6	24.6	20.5	64.3	64.4	61.8	53.4	47.8	43.6
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	5.4		2.8	0.6	0.4	3.0	1.8	0.1	12.7	0.3	0.1
Delay (s)	18.3	40.8		36.5	25.3	20.9	67.2	66.1	61.9	66.1	48.1	43.6
Level of Service	B	D		D	C	C	E	E	E	E	D	D
Approach Delay (s)		39.9			25.4			65.8			54.3	
Approach LOS		D			C			E			D	

Intersection Summary			
HCM Average Control Delay	39.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2035_PM_Morgan_Blvd 4:30 pm 5/3/2012 2035_PM_Morgan_Blvd Synchro 7 - Report
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HIll Road & Morgan Boulevard Road Diet 2035 PM
370: Hill Rd & Willow Hill Rd 7/30/2012

Lane Group	EBT	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	10	42	206	105	421	116	621	11
v/c Ratio	0.03	0.11	0.69	0.24	0.36	0.11	0.57	0.01
Control Delay	16.7	7.1	33.2	6.0	6.6	1.5	9.2	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	7.1	33.2	6.0	6.6	1.5	9.2	2.9
Queue Length 50th (ft)	3	0	64	0	60	0	108	0
Queue Length 95th (ft)	12	20	124	30	117	15	212	5
Internal Link Dist (ft)	480		402		2121		554	
Turn Bay Length (ft)								100
Base Capacity (vph)	437	454	364	500	1163	1065	1093	1027
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.09	0.57	0.21	0.36	0.11	0.57	0.01

Intersection Summary

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HIll Road & Morgan Boulevard Road Diet 2035 PM
370: Hill Rd & Willow Hill Rd 7/30/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	5	40	185	10	100	20	380	110	75	515	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.98	1.00		0.95	1.00		1.00	1.00		0.99	1.00
Satd. Flow (prot)		1817	1583		1779	1583		1858	1583		1851	1583
Flt Permitted		0.88	1.00		0.73	1.00		0.97	1.00		0.91	1.00
Satd. Flow (perm)		1635	1583		1361	1583		1800	1583		1689	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	42	195	11	105	21	400	116	79	542	11
RTOR Reduction (vph)	0	0	33	0	0	82	0	0	41	0	0	4
Lane Group Flow (vph)	0	10	9	0	206	23	0	421	75	0	621	7
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		13.2	13.2		13.2	13.2		38.9	38.9		38.9	38.9
Effective Green, g (s)		13.2	13.2		13.2	13.2		38.9	38.9		38.9	38.9
Actuated g/C Ratio		0.22	0.22		0.22	0.22		0.65	0.65		0.65	0.65
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		359	348		299	348		1165	1025		1093	1025
v/s Ratio Prot												
v/s Ratio Perm		0.01	0.01		c0.15	0.01		0.23	0.05		c0.37	0.00
v/c Ratio		0.03	0.03		0.69	0.07		0.36	0.07		0.57	0.01
Uniform Delay, d1		18.4	18.4		21.6	18.6		4.9	3.9		5.9	3.8
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0	0.0		6.5	0.1		0.9	0.1		2.1	0.0
Delay (s)		18.4	18.4		28.0	18.7		5.8	4.1		8.1	3.8
Level of Service		B	B		C	B		A	A		A	A
Approach Delay (s)		18.4			24.9			5.4			8.0	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Appendix 7
Build Scenario #3 Traffic Analysis and Queuing Reports

Queues

260: Harry S. Truman Drive & Largo Town Center Drive

7/16/2012

Lane Group	EBL	EBT	EBR	WBL	WBR	NBT	NBR
Lane Group Flow (vph)	26	126	216	121	37	1304	565
v/c Ratio	0.19	0.43	0.50	0.45	0.07	0.79	0.48
Control Delay	17.5	30.6	8.8	32.5	7.3	17.8	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	30.6	8.8	32.5	7.3	17.8	2.1
Queue Length 50th (ft)	0	48	0	46	0	203	5
Queue Length 95th (ft)	23	97	53	99	19	355	37
Internal Link Dist (ft)		672				788	
Turn Bay Length (ft)							
Base Capacity (vph)	140	489	575	349	646	1918	1215
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.26	0.38	0.35	0.06	0.68	0.47

Intersection Summary

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HCM Signalized Intersection Capacity Analysis
260: Harry S. Truman Drive & Largo Town Center Drive

7/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰		↱		↑↱	↱			
Volume (vph)	25	120	205	115	0	35	0	1060	715	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0	4.0			
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		0.91	0.91			
Frt	1.00	1.00	0.85	1.00		0.85		0.98	0.85			
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00	1.00			
Satd. Flow (prot)	1770	1863	1583	1770		1583		3317	1441			
Flt Permitted	0.95	1.00	1.00	0.95		1.00		1.00	1.00			
Satd. Flow (perm)	1770	1863	1583	1770		1583		3317	1441			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	126	216	121	0	37	0	1116	753	0	0	0
RTOR Reduction (vph)	25	0	174	0	0	25	0	17	193	0	0	0
Lane Group Flow (vph)	1	126	42	121	0	12	0	1287	372	0	0	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	pm+ov			
Protected Phases	7	4		3				2	3			
Permitted Phases			4			8			2			
Actuated Green, G (s)	1.4	12.6	12.6	9.5		20.7		31.1	40.6			
Effective Green, g (s)	1.4	12.6	12.6	9.5		20.7		31.1	40.6			
Actuated g/C Ratio	0.02	0.19	0.19	0.15		0.32		0.48	0.62			
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0	4.0			
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0	3.0			
Lane Grp Cap (vph)	38	360	306	258		503		1582	986			
v/s Ratio Prot	0.00	c0.07		c0.07				c0.39	c0.06			
v/s Ratio Perm			0.03			0.01			0.20			
v/c Ratio	0.01	0.35	0.14	0.47		0.02		0.81	0.38			
Uniform Delay, d1	31.2	22.8	21.8	25.5		15.3		14.6	6.1			
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00	1.00			
Incremental Delay, d2	0.2	0.6	0.2	1.3		0.0		3.3	0.2			
Delay (s)	31.4	23.3	22.0	26.9		15.3		17.9	6.3			
Level of Service	C	C	C	C		B		B	A			
Approach Delay (s)		23.1			24.2			14.4			0.0	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
270: Lottsford Road & Harry S. Truman Drive 7/16/2012

Lane Group	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	42	1121	5	105	163	326
v/c Ratio	0.05	0.66	0.01	0.17	0.14	0.49
Control Delay	8.7	8.3	13.0	13.7	12.9	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.7	8.3	13.0	13.7	12.9	8.1
Queue Length 50th (ft)	6	58	1	19	15	19
Queue Length 95th (ft)	24	160	8	60	42	88
Internal Link Dist (ft)		887		758	736	
Turn Bay Length (ft)						150
Base Capacity (vph)	1335	2579	846	1303	2476	1173
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.43	0.01	0.08	0.07	0.28

Intersection Summary

HCM Signalized Intersection Capacity Analysis
270: Lottsford Road & Harry S. Truman Drive 7/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↑↑↱		↰	↑			↑↑	↱
Volume (vph)	0	0	0	40	530	535	5	100	0	0	155	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor				1.00	0.95		1.00	1.00			0.95	1.00
Frt				1.00	0.92		1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770	3273		1770	1863			3539	1583
Flt Permitted				0.95	1.00		0.65	1.00			1.00	1.00
Satd. Flow (perm)				1770	3273		1208	1863			3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	42	558	563	5	105	0	0	163	326
RTOR Reduction (vph)	0	0	0	0	243	0	0	0	0	0	0	145
Lane Group Flow (vph)	0	0	0	42	878	0	5	105	0	0	163	181
Turn Type				Split	NA		Perm	NA			NA	Perm
Protected Phases				3	3			4			2	
Permitted Phases							4					2
Actuated Green, G (s)				21.4	21.4		15.8	15.8			15.8	15.8
Effective Green, g (s)				21.4	21.4		15.8	15.8			15.8	15.8
Actuated g/C Ratio				0.45	0.45		0.33	0.33			0.33	0.33
Clearance Time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			6.0	6.0
Lane Grp Cap (vph)				803	1484		404	624			1185	530
v/s Ratio Prot				0.02	c0.27			0.06			0.05	
v/s Ratio Perm							0.00					c0.11
v/c Ratio				0.05	0.59		0.01	0.17			0.14	0.34
Uniform Delay, d1				7.2	9.6		10.5	11.1			10.9	11.8
Progression Factor				1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2				0.0	0.6		0.0	0.1			0.2	1.1
Delay (s)				7.2	10.3		10.5	11.2			11.1	12.9
Level of Service				A	B		B	B			B	B
Approach Delay (s)		0.0			10.2			11.2			12.3	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	47.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
280: Lottsford Road & Arena Drive

7/16/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	341	685	221	448	311	495	58	400	405
v/c Ratio	0.82	0.80	0.65	0.64	1.78	0.49	0.49	0.91	0.42
Control Delay	57.1	46.3	50.7	44.5	403.4	36.2	65.9	68.2	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.1	46.3	50.7	44.5	403.4	36.2	65.9	68.2	7.7
Queue Length 50th (ft)	251	243	164	163	~337	156	41	280	60
Queue Length 95th (ft)	#451	#347	256	220	#551	232	89	#504	145
Internal Link Dist (ft)		719		1095		560		666	
Turn Bay Length (ft)			300		500		200		
Base Capacity (vph)	434	890	434	891	175	1002	143	451	986
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.77	0.51	0.50	1.78	0.49	0.41	0.89	0.41

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
280: Lottsford Road & Arena Drive

7/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑↱		↰	↰↑↱		↰	↑↑↱		↰	↑	↱
Volume (vph)	515	330	130	355	240	40	295	410	60	55	380	385
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	0.91	0.91		0.91	0.91		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.99		0.95	0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1610	3241		1610	3286		1770	3472		1770	1863	1583
Flt Permitted	0.95	0.99		0.95	0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1610	3241		1610	3286		1770	3472		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	542	347	137	374	253	42	311	432	63	58	400	405
RTOR Reduction (vph)	0	17	0	0	6	0	0	9	0	0	0	114
Lane Group Flow (vph)	341	668	0	221	442	0	311	486	0	58	400	291
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	1	1		2	2		7	4		3	8	1
Permitted Phases												8
Actuated Green, G (s)	28.8	28.8		23.5	23.5		11.0	32.0		6.4	27.4	56.2
Effective Green, g (s)	28.8	28.8		23.5	23.5		11.0	32.0		6.4	27.4	56.2
Actuated g/C Ratio	0.26	0.26		0.21	0.21		0.10	0.28		0.06	0.24	0.50
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	411	828		336	685		173	986		101	453	874
v/s Ratio Prot	c0.21	0.21		c0.14	0.13		c0.18	0.14		0.03	c0.21	0.09
v/s Ratio Perm												0.10
v/c Ratio	0.83	0.81		0.66	0.64		1.80	0.49		0.57	0.88	0.33
Uniform Delay, d1	39.6	39.3		40.9	40.8		50.9	33.6		51.8	41.1	17.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	13.0	5.8		4.6	2.1		381.0	0.4		4.8	18.0	0.2
Delay (s)	52.6	45.1		45.5	42.9		431.9	34.0		56.7	59.2	17.2
Level of Service	D	D		D	D		F	C		E	E	B
Approach Delay (s)		47.6			43.7			187.5			39.3	
Approach LOS		D			D			F			D	

Intersection Summary			
HCM Average Control Delay	78.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	112.7	Sum of lost time (s)	22.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
290: Shoppers Way & Arena Drive
7/16/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	868	263	95	974	163	53
v/c Ratio	0.43	0.26	0.36	0.38	0.39	0.13
Control Delay	14.5	2.7	36.7	6.2	31.1	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.5	2.7	36.7	6.2	31.1	9.3
Queue Length 50th (ft)	141	0	39	94	63	0
Queue Length 95th (ft)	234	41	96	156	139	29
Internal Link Dist (ft)	494			472	436	
Turn Bay Length (ft)		150	350			
Base Capacity (vph)	2221	1091	414	2877	636	603
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.24	0.23	0.34	0.26	0.09

Intersection Summary

HCM Signalized Intersection Capacity Analysis
290: Shoppers Way & Arena Drive

7/16/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Volume (vph)	825	250	90	925	155	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	868	263	95	974	163	53
RTOR Reduction (vph)	0	127	0	0	0	45
Lane Group Flow (vph)	868	136	95	974	163	8
Turn Type	NA	Perm	Prot	NA	NA	custom
Protected Phases	6		5	2		
Permitted Phases		6			8	8
Actuated Green, G (s)	36.1	36.1	7.1	48.2	11.2	11.2
Effective Green, g (s)	36.1	36.1	7.1	48.2	11.2	11.2
Actuated g/C Ratio	0.52	0.52	0.10	0.69	0.16	0.16
Clearance Time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lane Grp Cap (vph)	1828	818	180	2440	284	254
v/s Ratio Prot	c0.25		0.05	c0.28		
v/s Ratio Perm		0.09			c0.09	0.01
v/c Ratio	0.47	0.17	0.53	0.40	0.57	0.03
Uniform Delay, d1	10.8	8.9	29.8	4.6	27.1	24.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3	2.8	0.3	5.5	0.2
Delay (s)	11.4	9.2	32.6	5.0	32.6	24.9
Level of Service	B	A	C	A	C	C
Approach Delay (s)	10.9			7.4	30.7	
Approach LOS	B			A	C	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	69.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Synchro 7 - Report
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Queues
260: Harry S. Truman Drive & Largo Town Center Drive 7/16/2012

Lane Group	EBL	EBT	EBR	WBL	WBR	NBT	NBR
Lane Group Flow (vph)	84	453	1016	284	42	818	361
v/c Ratio	0.38	0.66	0.93	0.88	0.05	0.86	0.42
Control Delay	14.0	24.3	21.9	59.5	3.9	34.7	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	24.3	21.9	59.5	3.9	34.7	5.7
Queue Length 50th (ft)	0	166	75	132	0	186	32
Queue Length 95th (ft)	39	262	#428	#271	15	#292	87
Internal Link Dist (ft)		672				788	
Turn Bay Length (ft)			400				
Base Capacity (vph)	227	764	1122	326	908	1006	863
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.59	0.91	0.87	0.05	0.81	0.42

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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HCM Signalized Intersection Capacity Analysis
260: Harry S. Truman Drive & Largo Town Center Drive

7/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰		↱		↑↱	↱			
Volume (vph)	80	430	965	270	0	40	0	600	520	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0	4.0			
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		0.91	0.91			
Frt	1.00	1.00	0.85	1.00		0.85		0.97	0.85			
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00	1.00			
Satd. Flow (prot)	1770	1863	1583	1770		1583		3275	1441			
Flt Permitted	0.95	1.00	1.00	0.95		1.00		1.00	1.00			
Satd. Flow (perm)	1770	1863	1583	1770		1583		3275	1441			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	453	1016	284	0	42	0	632	547	0	0	0
RTOR Reduction (vph)	81	0	489	0	0	19	0	34	130	0	0	0
Lane Group Flow (vph)	3	453	527	284	0	23	0	784	231	0	0	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	pm+ov			
Protected Phases	7	4		3				2	3			
Permitted Phases			4			8			2			
Actuated Green, G (s)	2.3	28.8	28.8	13.1		39.6		20.0	33.1			
Effective Green, g (s)	2.3	28.8	28.8	13.1		39.6		20.0	33.1			
Actuated g/C Ratio	0.03	0.39	0.39	0.18		0.54		0.27	0.45			
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0	4.0			
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0	3.0			
Lane Grp Cap (vph)	55	726	617	314		848		886	723			
v/s Ratio Prot	0.00	0.24		c0.16				c0.24	0.06			
v/s Ratio Perm			c0.33			0.01			0.10			
v/c Ratio	0.05	0.62	0.85	0.90		0.03		0.88	0.32			
Uniform Delay, d1	34.7	18.2	20.6	29.8		8.1		25.8	13.1			
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00	1.00			
Incremental Delay, d2	0.4	1.7	11.1	27.7		0.0		10.5	0.3			
Delay (s)	35.1	19.9	31.8	57.5		8.1		36.3	13.4			
Level of Service	D	B	C	E		A		D	B			
Approach Delay (s)		28.5			51.1			29.3			0.0	
Approach LOS		C			D			C			A	

Intersection Summary			
HCM Average Control Delay	31.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
270: Lottsford Road & Harry S. Truman Drive
7/16/2012

Lane Group	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	63	721	21	189	453	221
v/c Ratio	0.11	0.57	0.05	0.24	0.30	0.27
Control Delay	12.3	10.2	8.8	9.5	9.2	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	10.2	8.8	9.5	9.2	2.6
Queue Length 50th (ft)	10	43	3	27	34	0
Queue Length 95th (ft)	38	116	14	75	79	30
Internal Link Dist (ft)		887		758	736	
Turn Bay Length (ft)						150
Base Capacity (vph)	1234	2391	811	1650	3135	1428
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.30	0.03	0.11	0.14	0.15

Intersection Summary

HCM Signalized Intersection Capacity Analysis
270: Lottsford Road & Harry S. Truman Drive

7/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	60	400	285	20	180	0	0	430	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor				1.00	0.95		1.00	1.00			0.95	1.00
Frt				1.00	0.94		1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770	3318		1770	1863			3539	1583
Flt Permitted				0.95	1.00		0.49	1.00			1.00	1.00
Satd. Flow (perm)				1770	3318		914	1863			3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	63	421	300	21	189	0	0	453	221
RTOR Reduction (vph)	0	0	0	0	167	0	0	0	0	0	0	125
Lane Group Flow (vph)	0	0	0	63	554	0	21	189	0	0	453	96
Turn Type				Split	NA		Perm	NA			NA	Perm
Protected Phases				3	3			4			2	
Permitted Phases							4					2
Actuated Green, G (s)				14.8	14.8		19.1	19.1			19.1	19.1
Effective Green, g (s)				14.8	14.8		19.1	19.1			19.1	19.1
Actuated g/C Ratio				0.34	0.34		0.44	0.44			0.44	0.44
Clearance Time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			6.0	6.0
Lane Grp Cap (vph)				597	1119		398	811			1540	689
v/s Ratio Prot				0.04	c0.17			0.10			c0.13	
v/s Ratio Perm							0.02					0.06
v/c Ratio				0.11	0.50		0.05	0.23			0.29	0.14
Uniform Delay, d1				10.0	11.6		7.2	7.8			8.0	7.5
Progression Factor				1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2				0.1	0.3		0.1	0.1			0.3	0.3
Delay (s)				10.1	11.9		7.2	7.9			8.3	7.7
Level of Service				B	B		A	A			A	A
Approach Delay (s)		0.0			11.8			7.9			8.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	43.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
280: Lottsford Road & Arena Drive

7/16/2012

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	469	1136	76	503	200	779	132	332	595
v/c Ratio	0.90	1.05	0.24	0.76	1.04	0.92	0.87	0.89	0.63
Control Delay	63.5	83.4	46.1	57.2	132.3	57.5	105.6	76.1	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.5	83.4	46.1	57.2	132.3	57.5	105.6	76.1	20.2
Queue Length 50th (ft)	415	~572	60	221	~184	286	112	273	281
Queue Length 95th (ft)	#674	#758	110	287	#357	#422	#246	#458	441
Internal Link Dist (ft)		719		1095		560		666	
Turn Bay Length (ft)			300		500		200		
Base Capacity (vph)	523	1081	374	781	192	871	151	389	938
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	1.05	0.20	0.64	1.04	0.89	0.87	0.85	0.63

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
280: Lottsford Road & Arena Drive

7/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑↱		↰	↰↑↱		↰	↑↑↱		↰	↑	↱
Volume (vph)	495	825	205	80	435	35	190	415	325	125	315	565
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	0.91	0.91		0.91	0.91		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1610	3286		1610	3350		1770	3306		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1610	3286		1610	3350		1770	3306		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	521	868	216	84	458	37	200	437	342	132	332	595
RTOR Reduction (vph)	0	13	0	0	4	0	0	105	0	0	0	35
Lane Group Flow (vph)	469	1123	0	76	499	0	200	674	0	132	332	560
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	1	1		2	2		7	4		3	8	1
Permitted Phases												8
Actuated Green, G (s)	42.1	42.1		25.3	25.3		14.0	29.0		11.0	26.0	68.1
Effective Green, g (s)	42.1	42.1		25.3	25.3		14.0	29.0		11.0	26.0	68.1
Actuated g/C Ratio	0.33	0.33		0.20	0.20		0.11	0.22		0.09	0.20	0.53
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	524	1069		315	655		191	741		150	374	906
v/s Ratio Prot	0.29	c0.34		0.05	c0.15		c0.11	c0.20		0.07	0.18	0.20
v/s Ratio Perm												0.15
v/c Ratio	0.90	1.05		0.24	0.76		1.05	0.91		0.88	0.89	0.62
Uniform Delay, d1	41.5	43.7		43.9	49.2		57.7	48.9		58.5	50.3	21.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	17.6	41.6		0.4	5.2		78.1	15.0		39.7	21.6	1.3
Delay (s)	59.1	85.3		44.3	54.4		135.8	64.0		98.3	71.8	22.8
Level of Service	E	F		D	D		F	E		F	E	C
Approach Delay (s)		77.6			53.1			78.6			47.6	
Approach LOS		E			D			E			D	

Intersection Summary			
HCM Average Control Delay	67.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	129.4	Sum of lost time (s)	22.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

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Queues
290: Shoppers Way & Arena Drive 7/16/2012

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Group Flow (vph)	1258	595	132	1079	279	205
v/c Ratio	0.74	0.59	0.65	0.46	0.71	0.40
Control Delay	21.7	6.1	52.8	8.3	42.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.7	6.1	52.8	8.3	42.6	6.9
Queue Length 50th (ft)	295	37	72	144	145	0
Queue Length 95th (ft)	378	121	#142	187	232	54
Internal Link Dist (ft)	494			472	436	
Turn Bay Length (ft)		150	350			
Base Capacity (vph)	1746	1022	226	2403	432	541
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.58	0.58	0.45	0.65	0.38

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
290: Shoppers Way & Arena Drive

7/16/2012

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Volume (vph)	1195	565	125	1025	265	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1258	595	132	1079	279	205
RTOR Reduction (vph)	0	246	0	0	0	159
Lane Group Flow (vph)	1258	349	132	1079	279	46
Turn Type	NA	Perm	Prot	NA	NA	custom
Protected Phases	6		5	2		
Permitted Phases		6			8	8
Actuated Green, G (s)	41.8	41.8	10.0	56.8	19.2	19.2
Effective Green, g (s)	41.8	41.8	10.0	56.8	19.2	19.2
Actuated g/C Ratio	0.48	0.48	0.12	0.66	0.22	0.22
Clearance Time (s)	5.5	5.5	5.0	5.5	5.0	5.0
Vehicle Extension (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lane Grp Cap (vph)	1710	765	205	2324	393	351
v/s Ratio Prot	c0.36		c0.07	0.30		
v/s Ratio Perm		0.22			c0.16	0.03
v/c Ratio	0.74	0.46	0.64	0.46	0.71	0.13
Uniform Delay, d1	17.9	14.8	36.5	7.3	31.1	27.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.3	1.2	6.8	0.4	8.4	0.5
Delay (s)	20.2	16.0	43.3	7.8	39.5	27.4
Level of Service	C	B	D	A	D	C
Approach Delay (s)	18.9			11.6	34.4	
Approach LOS	B			B	C	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	86.5	Sum of lost time (s)	15.5
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

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Appendix 8
Traffic Analysis for Davey Street Road Diet

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
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MEMORANDUM

Date: May 25, 2012 Project #: 11788

To: Cipriana Thompson
Chief, Traffic Design & Planning Section
Prince George's County Department of Public Works & Transportation

From: Zachary Horowitz, PE; Yolanda Takesian, AICP; and Caitlin Doolin

Project: M-NCPPC Central Avenue TOD Mobility Study

Subject: Davey Street Road Diet

The Maryland National Capital Park and Planning Commission (M-NCPPC) is evaluating transportation enhancement options for Phase III of the Central Avenue Transit Oriented Development (TOD) Mobility Study. Kittelson & Associates, Inc. (KAI) has been scoped to evaluate transportation improvements and options that improve mobility within the Central Avenue (MD 214) corridor.

This memorandum evaluates the traffic impacts of implementing a "road diet" on Davey Street, which would primarily involve reducing Davey Street to one lane in each direction from Central Avenue to Southern Avenue SE. The traffic analysis indicates that a road diet on Davey Street from Central Avenue to Southern Avenue SE would have little impact on traffic operations..

Analysis Methodology and Results

KAI completed an analysis of the AM and PM peak hour traffic volumes on two intersections: East Capitol Street Extended/Davey Street and Davey Street/Capitol Heights Boulevard. The analysis evaluated and compared the operational results of existing conditions and a "road diet" scenario along Davey Street.

The road diet would modify Davey Street approaches at East Capitol Street Extended/Davey Street and Davey Street/Capitol Heights Boulevard to a single lane in each direction. No changes would be made to the geometry on East Capitol Street Extended or Capitol Heights Boulevard.

Traffic volumes were collected in 2011 and 2012 at the two intersections for the AM and PM peak periods. These traffic counts show relatively low traffic volumes along both the eastern and western segments of Davey Streets, with peak-hour bi-directional volumes of just over 500 vehicles on the most heavily traveled portion of Davey Street (west of Capitol Heights Boulevard). Volumes in this range are considerably lower than typical thresholds for 2-lane streets. The traffic counts used as part of this analysis are attached as an appendix to this memorandum.

Synchro 7 was used to develop the traffic operations model and evaluate operations using procedures from the Highway Capacity Manual (HCM). Synchro 7 incorporates the HCM analysis for unsignalized intersections for operational evaluations. The HCM analysis calculates the delay and Level of Service (LOS) for the stopped approaches of unsignalized intersections. A summary of the LOS and per vehicle delay for the existing conditions and road diet scenario are reported in Table 1.

Table 1 **Summary of Intersection Operations for Existing and Road Diet Conditions along Davey Street**

	East Capitol Street Extended/Davey Street		Davey Street/Capitol Heights Boulevard	
	Existing			
Approach	**LOS**	**Delay (sec/vehicle)**	**LOS**	**Delay (sec/vehicle)**
Northbound	D (E)	26.9 (39.7)	B (C)	14.2 (18.4)
Southbound	F (F)	51.1 (126.1)	B (C)	12.8 (15.9)
	Road Diet			
Approach	**LOS**	**Delay (sec/vehicle)**	**LOS**	**Delay (sec/vehicle)**
Northbound	D (F)	29.2 (77.8)	C (C)	15.4 (18.7)
Southbound	F (F)	51.1 (126.1)	B (C)	13.3 (17.0)

[1]AM (PM)

[2]For analysis purposes, North Akin Avenue was removed from the intersection in the Synchro model as the HCM unsignalized analysis cannot be performed on intersections with more than four legs. The volume on Akin Avenue in the AM and PM peak hours did not exceed 10 vehicles. Additional vehicles were added to other movements at the intersection to compensate for this adjustment.

Conclusions

The analysis indicates that the southbound approaches at Central Avenue/Davey Street would remain unchanged in the road diet scenario while the northbound approach would degrade from LOS E to LOS F in the PM peak hour. This primary reason for this is the reduction of the northbound approach from two lanes to one. The road diet configuration would trap northbound right-turning vehicles behind the small number of vehicles attempting to turn left onto Central Avenue or cross Central Avenue to continue north on Davey Street.

As the delay for the left-turning or through vehicles on the approach is expected to be high, most drivers would quickly realize that it would be faster to travel out-of-direction to Southern Avenue and then north to access Central Avenue. Alternatively, the northbound approach could be striped with both a right turn lane and a through-left lane, thus eliminating any impact to northbound delay.

The analysis at the intersection of Davey Street/Capitol Heights Boulevard shows that the road diet scenario would very slightly increase per vehicle delay for the northbound and southbound approaches. Based on the results it is unlikely that drivers would be able to perceive the small increase in delay shown from the analysis results.

Overall, given the relatively low volumes on Davey Street, reducing the street cross-section as part of a road diet treatment to a single lane in each direction would have little to no impact on vehicular traffic operations. This is particularly true, assuming that the northbound approach to East Capitol Street Extended/Davey Street be striped with two lanes (a through-left and a dedicated right turn lane).

We trust that this memorandum adequately addresses the planning-level operations associated with a road diet on Davey Street. Should you have any questions or concerns, please do not hesitate to contact us at (703) 885-8970.

Appendix 9
Costing Details for Short-Term

The following costs associated with the short term implementation projects are to be considered as planning level probably costs. A detailed engineering and costing study for each of the projects should be undertaken.

S1: Traffic signal on Central Avenue at entrance to Addition Road Metrorail station

Detailed information and assumptions are not available for this project.

S2: Traffic signal on Central Avenue at Cabin Branch Road

Detailed information and assumptions are not available for this project.

S3: Central High School Sidepath and Campus Entrance Improvements

CENTRAL AVENUE SHORT TERM IMPROVEMENTS OPINION OF PROBABLE COST

Item	Quantity	Unit	2012 Unit Cost	Total Cost	Assumptions
Mobilization (10%)	1.00	LS	$29,560.00	$29,560	[illegible]
Earthwork, Excavation, Grading	810	CY	$25.00	$20,250.00	[illegible]
Remove Curb & Gutter	190	LF	$20.00	$3,800.00	
Concrete Sidewalk (5" Thickness)	11,420	SF	$7.50	$85,650.00	
Curb and Gutter	200	LF	$70.00	$14,000.00	
Detectable Warning Materials	48	SF	$30.00	$1,440.00	[illegible]
Thermoplastic Pavement Marking (all widths up to 24")	170	LF	$3.00	$510.00	
24" Thermoplastic Pavement Marking	220	LF	$6.50	$1,430.00	
Thermoplastic Pavement Marking (Symbol or Text)	6	EA	$250.00	$1,500.00	[illegible]
Rapid Flash Beacon Assembly (set of 4)	1	EA	$25,000.00	$25,000.00	[illegible]
High School Sign Relocation	1	EA	$3,500.00	$3,500.00	
Utility Pole Relocation	4	EA	$13,500.00	$54,000.00	[illegible]
Lump Sum Items					
Construction Survey (15%)	1.00	LS	$31,662.00	$31,662.00	
Drainage (5%)	1.00	LS	$7,907.00	$7,907.00	
E&S (5%)	1.00	LS	$10,554.00	$10,554.00	
Maintenance of Traffic (10%)	1.00	LS	$21,108.00	$21,108.00	
Additional Utility Adjustments (10%)	1.00	LS	$21,108.00	$21,108.00	
			Subtotal	$333,000	
30% Contingency				$99,900	
Total Estimated Cost				$433,000	

Note: This cost estimate is a planning level estimate only.

S5: Corridor-wide Bus Stop Improvements

Detailed information and assumptions are not available for this project.

S6: Davey Street Road Diet

CENTRAL AVENUE SHORT TERM IMPROVEMENTS OPINION OF PROBABLE COST

Item	Quantity	Unit	2012 Unit Cost	Total Cost	
Mobilization (10%)	1.00	LS	$59,690.00	$59,690.00	Assume percentage taken total sum of all line items and lump sum items
Earthwork, Excavation, Grading	550	CY	$25.00	$13,750.00	Assume curb extensions/radii reduction area excavated to 2 foot depth, replace with 1 foot depth (back work for sidewalk installation included in sidewalk price). Assume 1 foot depth excavation and 0.5 replacement of fill at brick crosswalk.
Remove Curb & Gutter	1,280	LF	$20.00	$25,600.00	
Milling	6,500	SY	$8.00	$52,000.00	Assume 2" depth removal.
Asphalt	740	TON	$75.00	$55,500.00	Assume 2" depth replacement.
Concrete Sidewalk (5" Thickness)	8,250	SF	$7.50	$61,875.00	
Aggregate Base	60	CY	$30.00	$1,800.00	Assume 0.5 feet depth underneath brick crosswalks
Brick Paving	2,750	SF	$15.00	$41,250.00	Assume 10 foot wide crosswalk area
Curb and Gutter	1,480	LF	$70.00	$103,600.00	
Detectable Warning Materials	90	SF	$30.00	$2,700.00	Assume detectable warnings are added at all crossings (including those with existing curb ramps)
Catch Basin Relocation and Pipe Connection	14	EA	$5,000.00	$70,000.00	
Thermoplastic Pavement Marking (all widths up to 24")	5,790	LF	$3.00	$17,370.00	Assume crosswalk parallel lines (including brick crosswalks), and lines for the corridor's length for bike lane installation (keep existing double yellow centerline).
24" Thermoplastic Pavement Marking	630	LF	$6.50	$4,095.00	
Thermoplastic Pavement Marking (Symbol or Text)	19	EA	$250.00	$4,750.00	Bike lane symbol (arrow and bike symbol counted together as one)
Lump Sum Items					
Construction Survey (15%)	1.00	LS	$68,144.00	$68,144.00	
E&S (5%)	1.00	LS	$22,715.00	$22,715.00	
Maintenance of Traffic (10%)	1.00	LS	$45,429.00	$45,429.00	
Utility Adjustments (10%)	1.00	LS	$45,429.00	$45,429.00	
			Subtotal	**$695,700**	

30% Contingency	$208,710
Total Estimated Cost	**$905,000**

Note: This cost estimate is a planning level estimate only.

S5:

S7: Corridor-wide Bus Stop Improvements

Detailed information and assumptions are not available for this project.

S8: Watts Branch Trail Connection

CENTRAL AVENUE SHORT TERM IMPROVEMENTS OPINION OF PROBABLE COST

Item	Quantity	Unit	2012 Unit Cost	Total Cost	
Mobilization (10%)	1.00	LS	$21,680.00	$21,680	[illegible]
Earthwork, Excavation, Grading	1080	CY	$25.00	$27,000.00	[illegible]
Remove Curb & Gutter	700	LF	$20.00	$14,000.00	
Eradication of Pavement Marking	3600	LF	$1.50	$5,400.00	
Concrete Sidewalk (5" Thickness)	5,440	SF	$7.50	$40,800.00	
Curb and Gutter	620	LF	$70.00	$43,400.00	
Detectable Warning Materials	120	SF	$30.00	$3,600.00	[illegible]
Catch Basin Relocation and Pipe Connection	5	EA	$5,000.00	$25,000.00	
Thermoplastic Pavement Marking (all widths up to 24")	300	LF	$3.00	$900.00	
24" Thermoplastic Pavement Marking	500	LF	$6.50	$3,250.00	
Seed & Mulch	480	SY	$3.00	$1,440.00	
Lump Sum Items					
Construction Survey (15%)	1.00	LS	$24,719.00	$24,719.00	
E&S (5%)	1.00	LS	$8,240.00	$8,240.00	
Maintenance of Traffic (10%)	1.00	LS	$16,479.00	$16,479.00	
Utility Adjustments (10%)	1.00	LS	$16,479.00	$16,479.00	
			Subtotal	**$252,400**	
30% Contingency				$75,720	
Total Estimated Cost				**$329,000**	

Note: This cost estimate is a planning level estimate only.

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