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Transportation Management Plan for BRAC 133 at Mark Center

PREPARED FOR:

Department of the Army
U.S. Army Corps of Engineers, New York District

IN ASSOCIATION WITH

Washington Headquarters Services

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BENHAM an SAIC company

SAIC From Science to Solutions

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TRANSPORTATION MANAGEMENT PLAN FOR

BRAC 133 AT MARK CENTER

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List of Acronyms

ACP	Access Control Point
ADA	Americans with Disabilities Act
ADDT	Average Annual Daily Traffic
AM	Morning Peak Hour
AVB	Active Vehicle Barrier
AVO	Average Vehicle Occupancy
AVR	Average Vehicle Ridership
BRAC	Base Realignment and Closure Act
CNA	Center for Naval Analyses
CNG	Compressed Natural Gas
CORSIM	Corridor Simulation Traffic Model
CWS	Compressed Work Schedule
CWW	compressed work week
DASH	City of Alexandria Transit Company
DC	District of Columbia
DoD	Department of Defense
DOT	Department of Transportation
FHWA	Federal Highway Administration
FRESIM	Freeway Simulation
FWW	Flexible Work Week
GP	General Purpose
GRH	Guaranteed Ride Home
GSA	General Services Administration
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
I-	Interstate -
ID	Identification
IDA	Institute for Defense Analysis
IJR	Interchange Justification Report
ITE	Institute of Transportation Engineers
LNG	Liquid Natural Gas
LOS	Level of Service
MARC	Maryland Area Regional Commuter Rail
MOE	Measure of Effectiveness
MTBP	Mass Transit Benefit Program
MUTCD	Manual on Uniform Traffic Control Devices
MWCOG	Metropolitan Washington Council of Governments
NCPC	National Planning Commission
NCR	National Capital Region
NETSIM	Network Simulation
PFPA	Pentagon Force Protection Agency
PMB	Parking Management Branch
POC	Point of Contact
PRTC	Potomac Rappahannock Transportation Commission
PVB	Passive Vehicle Barrier
RDF	Remote Delivery Facility
RIF	Remote Inspection Facility
SOV	Single Occupant Vehicle
TAZ	Transportation Analysis Zones
TDM	Travel Demand Management
TDY	Temporary Duty Assignment
TIMP	Transportation Improvement and Management Plan
TIS	Traffic Impact Study
TMP	Transportation Management Plan
TMPC	Transportation Management Plan Coordinator
TOP	Traffic or Transit Operations Plan
US	United States
USACE	US Army Corps of Engineers
USDOT	US Department of Transportation
VCC	Visitor Control Center
VDOT	Virginia Department of Transportation
VISSIM	Visual Simulation Traffic Model
VMT	Vehicle Miles of Travel
vph	vehicles per hour
vpmpl	vehicles per mile per lane
VRE	Virginia Rail Express
VT	Vehicle Trip
WHS	Washington Headquarters Services
WMATA	Washington Metropolitan Area Transit Authority
ZEV	Zero Emission Vehicle

Executive Summary

Benham / SAIC was contracted by the United States Army Corps of Engineers (USACE) to develop a Transportation Management Plan (TMP) for BRAC 133 in Mark Center. BRAC 133, the Base Realignment and Closure Commission's Recommendation No. 133 involves relocation of 6,409 federal personnel working in 24 different defense organizations occupying leased spaces throughout the National Capital Region (NCR) to a consolidated space in the City of Alexandria. As mandated by the 2005 BRAC legislation, the move will occur by September 15, 2011. The Mark Center site is an established mixed-use business park with a 16-acre master-planned space for office buildings and structured parking and will be owned by the U.S. Army Fort Belvoir.

Mark Center is located adjacent to Interstate 395 (I-395), and is bounded by Seminary Road to the east and North Beauregard Street to the north. The proposed BRAC 133 facility will have a North and South Campus, and a Remote Inspection Facility (RIF). The north campus will include the North Parking Garage with visitor parking and a Transportation Center. The south campus will include the East and West office building towers, the South Parking garage, the visitor control center, the main access control point to the site and the remote delivery facility. The complex is being designed and constructed to achieve a LEED "Gold" rating, a national standard set by the U.S. Green Building Council to foster sustainable building design and construction. The facility, when completed, will use 30 percent less energy and 45 percent less water than comparable office buildings. A number of on-site amenities will also be made available for the employees.

This TMP identifies and discusses a series of Travel Demand Management (TDM) strategies that can influence travel behavior and mode choice of employees thus reducing SOV trips made to the site. Guidelines and standards set forth by National Capital Planning Commission (NCPC), General Services Administration (GSA) and Metropolitan Washington Council of Governments (MWCOG) were utilized in development of the BRAC 133 TMP to obtain an achievable plan.

Transportation Management Plan Goals

- *Achieve a minimum 40% reduction in single occupancy vehicle trips*
- *Encourage alternate commuter modes to facilitate mobility*
    - *Ridesharing (Carpool/Vanpool/Slug)*
    - *Public Transit Use (Metrorail/Bus)*
    - *Walk & Bike*
- *Establish a Transportation Management Program Office*

A brief review of previous studies and the trip generation methodology was evaluated. Employee home zip codes were obtained from human resources records, and existing commute patterns, employee attitudes towards alternate modes, and expected mode choice data were obtained from a transportation survey conducted by WHS. This information was compared against general commuter patterns in the Washington DC region to determine anticipated employee mode choices for commuters to BRAC 133. Single occupant vehicle trips were determined based on the number of parking spaces that will be available at the site for employees, visitors and government vehicles.

The following mode splits are anticipated at the BRAC 133 site:

- SOV – 57%
- Carpool – 5%
- Vanpool – 3%
- Slug – 3%
- Bus Transit – 5%
- Rail Transit – 23%
- Walk – 2%
- Bike – 2%

The proposed DoD shuttle plan will provide connections from key Metrorail stations to BRAC 133 and the shuttle service is expected to serve all the anticipated rail ridership. The proposed plan serves a total of 2,970 commuters during the peak period, providing connections to the Pentagon Transit Center and the King Street Metrorail station (serving VRE, Blue and Yellow Lines) as well as to Ballston, East Falls Church, and West Falls Church (serving Orange Line). The site also offers public and private bus transit service provided by City of Alexandria Transit Company (DASH), Washington Metropolitan Area Transit Authority (WMATA), and Quick's Bus Company.

A detailed review of the existing and proposed site conditions including site access, external and internal roadway network, pedestrian facilities, access control points, and pedestrian, shuttle bus and truck circulation was conducted to study the adequacy of the facilities. The roadway geometry and lane configuration data were used in conducting detailed traffic operational analysis for the proposed site. The proposed site offers pedestrian walkways, and bike racks, lockers and shower facilities for employees who walk or bike to work. A slug area is being provided near the parking garages with a pedestrian refuge area to promote slugging.

The Traffic Impact Analysis section of the Transportation Management Plan documents the operational analysis results for the existing and build-out morning and evening peak hour conditions on the adjacent roadway network at the BRAC 133 site. Traffic operational analysis and micro simulation modeling using Synchro and CORSIM (Corridor Simulation) were conducted for the existing conditions with baseline (2011) traffic demand and future conditions with projected traffic demand. The projected traffic demand included drive-alone and rideshare trips such as carpool, vanpool, slug and shuttle trips generated by the BRAC 133 facility and the proposed IDA facility. The rideshare trips to the BRAC 133 facility were determined based on the above mode split and a 2.3 passengers per vehicle occupancy for

carpools, a 7.0 passengers per vehicle occupancy for vanpools and 3.0 passengers per vehicle occupancy for slugs.

The Mark Center site with BRAC 133 and IDA is expected to generate a total of 2,022 trips in the morning peak hour and 1,910 trips in the evening peak hour. The generated trips were distributed along the existing roadway network serving the site as per the home zip code distribution. The future operational analysis under full build-out conditions included existing and interim site improvements (scheduled for completion before September 15, 2011).

Upon review of the analysis results, it was noted that the interim improvements offered minor operational benefits with many ramp sections, roadways and intersections operating at unacceptable Level of Service (LOS) under full build-out conditions. The notable areas of congestion and vehicular delay are as follows:

- I-395 general purpose northbound and southbound ramps
- I-395 general purpose mainline diverge sections
- Seminary Road rotary interchange southeast ramp intersection
- North Beauregard Street and Seminary Road intersection

In addition to the interim recommendations that are being implemented by the DoD to accommodate BRAC growth, various short and long-term recommendations are identified in the report to improve traffic operations and LOS. A direct HOV access ramp plan from I-395 to Mark Center is also currently being evaluated by Virginia Department of Transportation (VDOT) in association with the City of Alexandria.

The TMP includes a detailed Travel Demand Management (TDM) Plan identifying goals and strategies to effectively reduce the transportation related impacts of BRAC 133 on the adjacent roadway network. The primary task in implementing the TDM plan is to establish a "WHS Transportation Management Program Office" onsite at BRAC 133 to assist all commute needs of employees and visitors. The Washington Headquarters Services (WHS) BRAC Program Office will manage the BRAC 133 TMP program in coordination with the Pentagon Force Protection Agency-Parking Management Branch (PFPA PMB) which will manage the BRAC 133 parking facilities. The highlights of the proposed TDM Plan and strategies are listed below:

- Designation of a Transportation Management Plan Coordinator
- Employee Orientation and Pre-Relocation Outreach
- Employee Enrollment and Periodic Transportation Survey
- Ride matching Assistance
- Biking and Walking Assistance
- Coordination with Pentagon Transit Center and Public Transit Agencies
- DoD NCR Mass Transportation Benefit Program
- Shuttle Service to Pentagon Metrorail Station
- Coordination of Telecommuting/Flex time/Compressed Work Week Programs

- Parking Permitting
- Priority Parking (Carpool/Vanpool/Low-Emission vehicle)
- Reserved Flex-Time Employee Parking
- Parking Overflow Management
- Special Events Protocol

The TMP discusses multiple recommendations to the transportation management program to improve the effectiveness of many of the recommended TDM Plan elements and strategies. A Monitoring and Evaluation Plan will help the Transportation Coordinator to evaluate the effectiveness of the various transportation programs and strategies under the BRAC 133. The Transportation Management Program is included as part of the TMP. A periodic survey will assess vehicle ridership, parking utilization, mode choice and incentives offered under BRAC 133 Transportation Management Program. It will be conducted annually with the TMP being amended as necessary to effectively and efficiently serve the BRAC 133 commuters and surrounding community needs.

1.0 Introduction

1.1 History of the Project

To mitigate the administration and operations of the Armed Forces and to achieve cost efficiency, numerous realignment and closure actions for domestic military installations and Department of Defense (DoD) organizations were recommended by the Base Realignment and Closure (BRAC) Commission. The recommendations became law after presidential concurrence, and must be implemented. One such recommendation involved relocation of various defense agency personnel and activities including Washington Headquarters Services (WHS) from leased space within the National Capital Region (NCR) to Fort Belvoir, Virginia. The proposed relocation demanded about 1.75 million square feet of existing or newly-constructed office space and 1.3 million square feet of associated parking facilities. Due to land use, environmental considerations, and transportation limitations within Fort Belvoir to accommodate the proposed demand, alternative sites throughout Northern Virginia were evaluated during 2007-2008 for implementing the proposed relocation[1]. After careful consideration of project timelines, transportation management, available space requirements, site adaptability, mission coordination requirements, proximity to Pentagon, contractor support relationships, quality of life, and change of residency or school requirements for employees, the Mark Center development in Alexandria, Virginia, was chosen as the site for a portion of the relocation, termed BRAC 133. The Mark Center site is an established mixed-use business park that had already been allocated by the City of Alexandria for redevelopment into office space and structured parking, and a Transportation Management Plan (TMP) for the previous site was approved by the City in 2003[2]. The site will be owned by the Department of the Army (the Army) and will become part of Fort Belvoir.

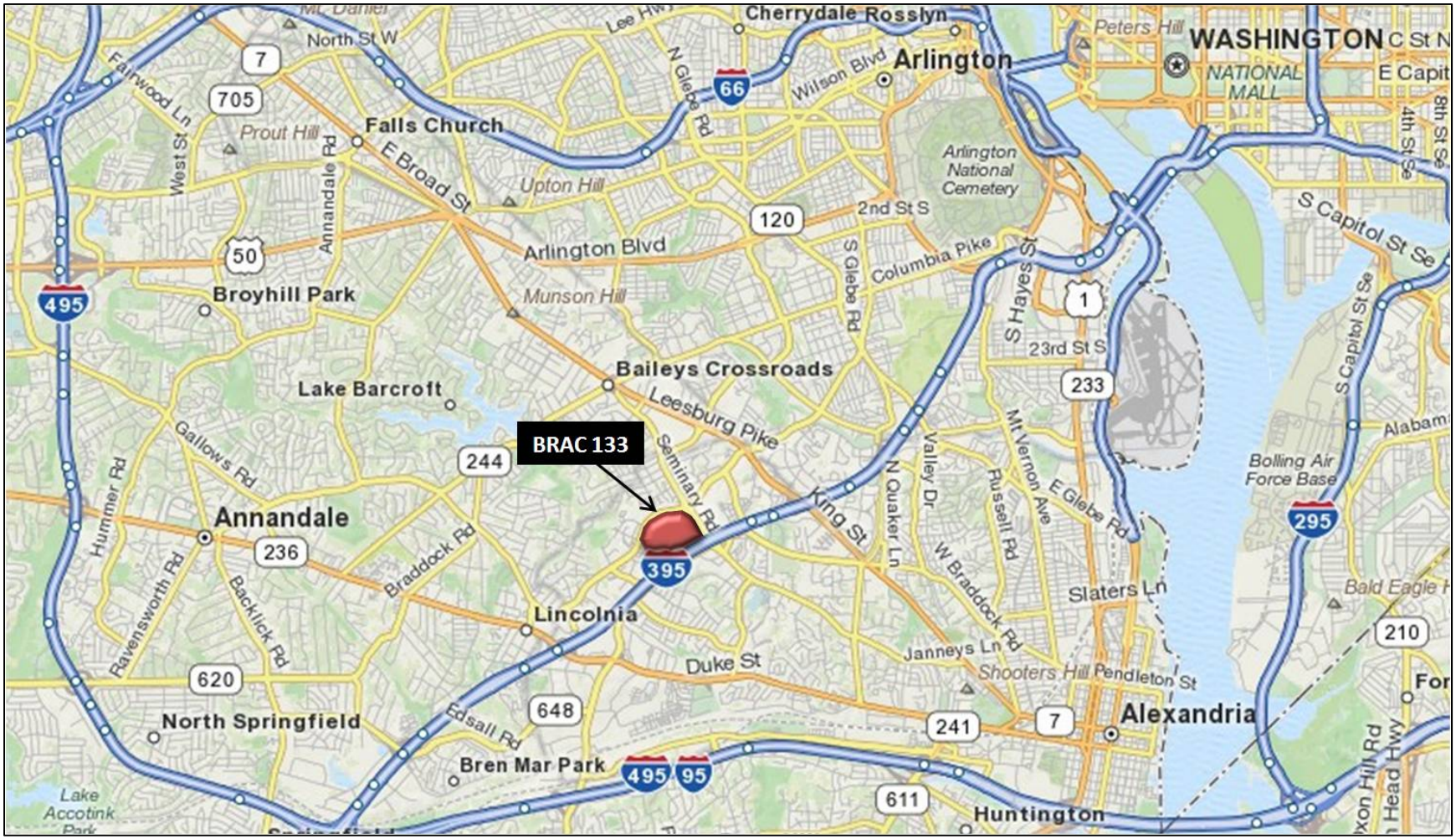
Mark Center is the new planned work location for the 24 DoD organizations who will work at BRAC 133. As shown in Figure 1-1, BRAC 133 is located adjacent to Interstate 395 (I-395), and is bounded by Seminary Road to the east and North Beauregard Street to the north. The new complex will consist of two multi-story office towers - a 15-story building and a 17-story building - as well as two parking garages and a publicly-accessible Transportation Center. A total of 6,409 DoD personnel will be relocated to BRAC 133. As mandated by the 2005 BRAC legislation, the move will occur by September 15, 2011.

The United States Army Corps of Engineers (USACE) is responsible for construction of the BRAC 133 facility, and in this role has taken responsibility for developing this TMP; upon completion of the building, ownership will be transferred to the Army. The move is being managed by WHS, who will also manage the building after opening day. The Pentagon Force Protection Agency Parking Management Branch (PFPA PMB) will manage parking at the building.

[1] Belvoir New Vision, DoD BRAC 133 Project at Mark Center, available online at http://www.belvoirnewvision.com/files/FINAL_BRAC133_Website_Collateral%5B1%5D.pdf

[2] *Mark Center Parcel 1A and 1B Traffic Impact Study and Transportation Management Plan*, Wells & Associates, LLC for The Mark Winkler Company, March 31, 2003.

Figure 1-1: Regional Location of the BRAC 133 Site



Source: ©2010 MapQuest, Inc.

1.2 Community Outreach and Coordination

USACE and DoD have been coordinating closely with the existing community at Mark Center. This coordination has included regular meetings with Duke Realty Corporation, the property owner for the majority of the commercial properties at Mark Center, as well as extensive communication with area residents through the BRAC Advisory Group that has been established by the City of Alexandria to serve as a forum for developing ideas and recommendations related to transportation improvements and other issues associated with the BRAC relocation at the Mark Center[3]. USACE has attended and actively participated in the monthly meetings of the BRAC Advisory Group since the group's inception in early 2009. Continued and ongoing communication with area residents will be critical as DoD occupies the site and becomes part of the Mark Center community.

1.3 Purpose of the Transportation Management Plan

The purpose of a TMP is to establish a plan to promote more efficient employee commuting patterns by minimizing single occupancy vehicle (SOV) trips to a work location. This is accomplished through identification of a series of travel demand management (TDM) strategies and policies that can influence travel behavior. A TMP identifies these strategies and policies and documents how they will be applied.

Guidelines available from the General Services Administration (GSA), the Metropolitan Washington Council of Governments (MWCOG), and the National Capital Planning Commission (NCPC)[4] suggest that a TMP include stated goals for single occupant vehicle (SOV) trip reduction, transportation mode split, and vehicle occupancy; strategies to minimize SOV work trips and to discourage SOV travel during peak and off-peak hours; measures to monitor achievement of goals and to adjust SOV trip reduction strategies, as needed; and a description of existing and projected peak hour traffic by mode.

In developing this TMP, USACE and DoD have considered guidance from the National Capital Planning Commission (NCPC), both through discussions and through information available in their document, *Implementing a Successful TMP*. They have also had multiple discussions with the City of Alexandria concerning their TMP Ordinance, which is part of the *City of Alexandria Zoning Ordinance, Article XI, Division B, Development Approvals, Section 11-700 – Transportation Management Special Use Permits*. The DoD has aligned the BRAC 133 TMP with the format and specifications of the City ordinance to ensure proper alignment with future development plans in this area.

1.4 Transportation Management Plan Goals and Objectives

The goals of the TMP are two-fold:

1. To reduce peak-hour travel by striving for a 40 percent reduction of SOV trips to the BRAC 133 site in order to minimize traffic impacts on the neighboring community.

[3] City of Alexandria, "Planning & Zoning: Base Realignment & Closure (BRAC-133)" web page, http://alexandriava.gov/BRAC (last accessed May 5, 2010).
[4] *Implementing a Successful TMP*, GSA / MWCOG / NCPC, May 2008.

2. To facilitate tenant mobility to the site by providing a viable transportation program in order to help employees choose appropriate commute methods for getting to Mark Center.

In terms of specific objectives, within 6 months of operations, WHS will establish baseline mode splits for BRAC 133 employees. Upon review of these baseline mode splits, WHS will establish specific annual mode-share goals. More details on this are explained in the monitoring and evaluation plan in Section 6.

Since parking at the site is restricted to only 3,747 spaces, SOV trips to the site will be severely limited. As a result, the goals and objectives of the TMP will be achieved primarily through execution of a parking program, implementation of a comprehensive DoD shuttle program, and implementation of an aggressive employee commute program geared toward promoting other modes of travel (aside from driving alone). Preliminary plans for the shuttle program are presented in Section 3.5 and the employee education program and the parking program are presented in Section 5. As it will be important to have a mechanism for determining whether the plan is "working" once in place (i.e., whether the goals established here are being achieved), this document also lays out a monitoring and evaluation plan (Section 6) that the government will use to monitor progress over time.

The TMP also serves to provide an analysis of the impacts of the site on traffic operations at the surrounding roadways and intersections. Although a number of previous studies have examined traffic operations (including a *Transportation Improvement Management Plan* prepared for the site in July 2008[5], an *Internal Roadway Network Traffic Analysis* conducted for the site in August 2009[6], and independent studies conducted by the Virginia Department of Transportation (VDOT)[7] and the City of Alexandria[8] in 2009), this study revisits these analyses with additional detail, including information on employee home zip codes and information about current and expected commute patterns. The results of the traffic impact analysis are presented in Section 4.

1.5 Roadmap to the TMP

The remainder of this document is organized as follows:

Section 2 provides background on the current and expected travel characteristics of the employees who will be moving to BRAC 133.

Section 3 presents information about site conditions, including building location and roadway and pedestrian access to the site. It also presents information about existing and potential future transit (both public and private) serving the site, discusses expected slugging to the site, and presents the DoD shuttle program. Finally, this section also describes how parking will be managed at BRAC 133.

[5] *Washington Headquarters Services at Mark Center Alexandria, Virginia BRAC 133 Build to Suit Transportation Improvement Management Plan*, Wells and Associates, July 30, 2008.
[6] *WHS Internal Roadway Network Traffic Analysis*, Wells and Associates, August 20, 2009.
[7] *Mark Center (BRAC) Transportation Study, Technical Memorandum*, Parsons Brinkerhoff, April, 2009.
[8] *Mark Center (BRAC 133) Transportation Study*, Vanasse Hangen Brustlin, Inc., November 2, 2009.

Section 4 presents the findings of a traffic impact analysis and an assessment of the traffic operations of the study area roadway network under the projected traffic demand conditions.

Section 5 presents the BRAC 133 TDM plan, which includes information about how the program will be managed, presents plans for educating employees about alternate modes of travel, and presents information about how parking will be managed to reduce SOV trips to the site.

Section 6 presents a monitoring and evaluation plan that the government will use to monitor their progress over time.

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2.0 Employee Relocation & Travel Characteristics

2.1 Tenant Organizations Relocation

A total of 24 different DoD organizations will be relocated to Mark Center. These organizations are currently located at various leased spaces throughout Arlington and Alexandria. Most organizations are currently at locations that are easily-accessible via Metrorail, which will certainly mean different commute patterns for many employees. Nearly 60 percent of the employees currently work in the Crystal City area with 45 percent working in Crystal City and 14 percent working in Pentagon City. An additional 31 percent currently work along the Rosslyn-Ballston Corridor. A total of eight percent work in Alexandria today, with five percent in Old Town Alexandria and another three percent at Mark Center.

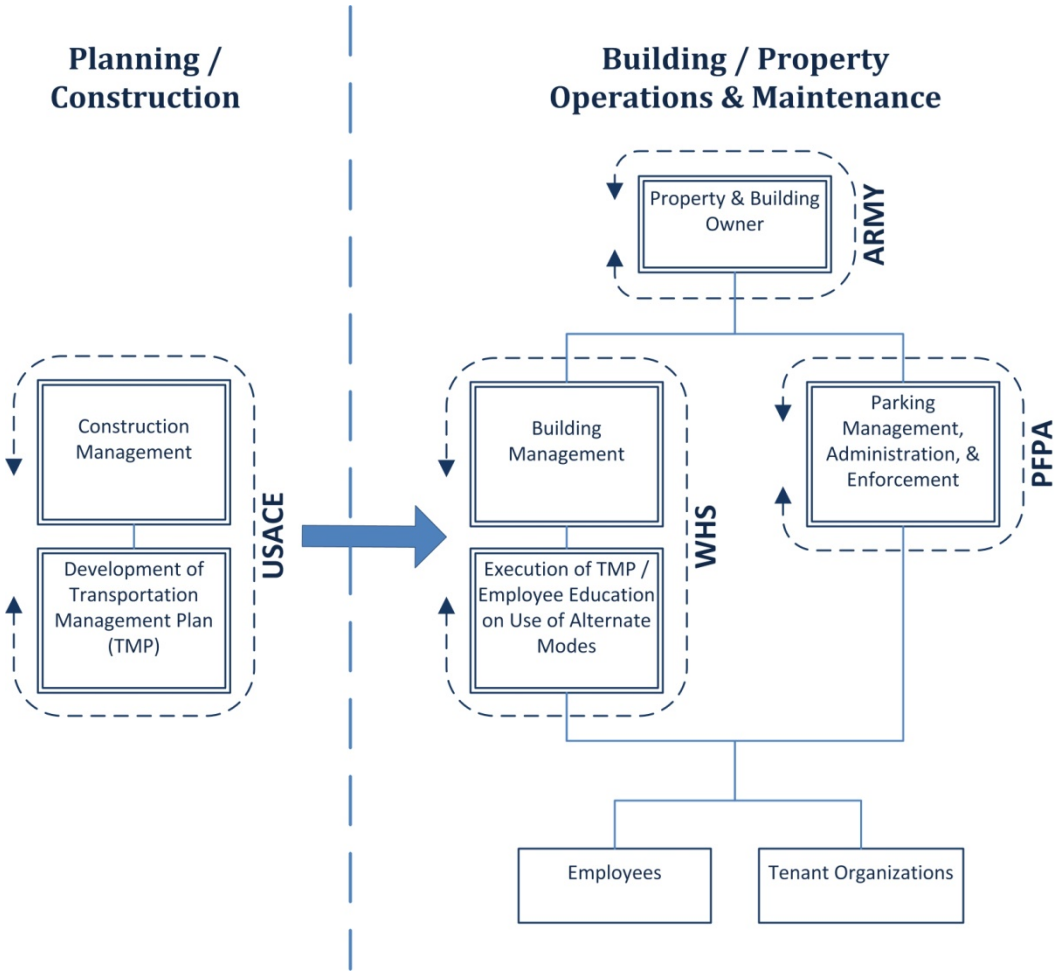
Managing a move with so many different tenant organizations requires extensive coordination. As the property manager, WHS has taken responsibility for this effort and will serve as the primary interface to the 24 tenant organizations before, during, and after relocation. WHS has already begun this process and meets monthly with representatives from each tenant organization to keep them informed and to hear any concerns they may have about the move. WHS will be responsible for carrying out the TMP and for monitoring the progress of TMP activities over time. As part of this responsibility, WHS will provide active outreach to tenants and employees to educate them about the various modes of travel available to the site (both in advance of the move as well as on an on-going basis after the building is open). WHS will also be responsible for establishing a WHS Transportation Management Program Office as is described in Section 5.2.

Other involved organizations include:

- **USACE** has responsibility for managing the construction of the building. As part of this responsibility, USACE is developing the TMP and has coordinated closely with WHS throughout this process.
- **The Army**, as property owner, will have responsibility for facilitating communication with the neighboring community.
- **PFPA PMB** will be responsible for managing parking at BRAC 133. PFPA PMB will manage the parking permit process as they do at the Pentagon today, and will monitor parking utilization and enforce parking.

The organizational structure defining the relationships between these organizations is shown in Figure 2-1.

Figure 2-1: Organizational Chart for BRAC 133



2.2 Employee Attitudes toward Alternative Commute Modes

When considering employee attitudes toward alternate commute modes, it is first important to consider where they live and work today. Certain modes may be perceived to be more feasible for employees today based on their current home or work location and their proximity to transit.

WHS obtained employee home zip codes from human resources records for all federal employees who will be relocating to BRAC 133, which accounts for 69 percent of the total employees. This sample size is large enough to be considered representative of the population[9]. These data show that employees are distributed quite broadly throughout the DC region, but that the large majority of employees (71 percent) commute from within Virginia (see Figure 2-2). As seen in the figure, the areas of highest density are in Fairfax County as well as along the I-95/I-395 corridor near the Virginia Railway Express (VRE) commuter rail line and Metrorail's Blue Line. Approximately one-quarter of the employees (23 percent) live in Maryland, and 6 percent live in the District of Columbia. Details of the number of

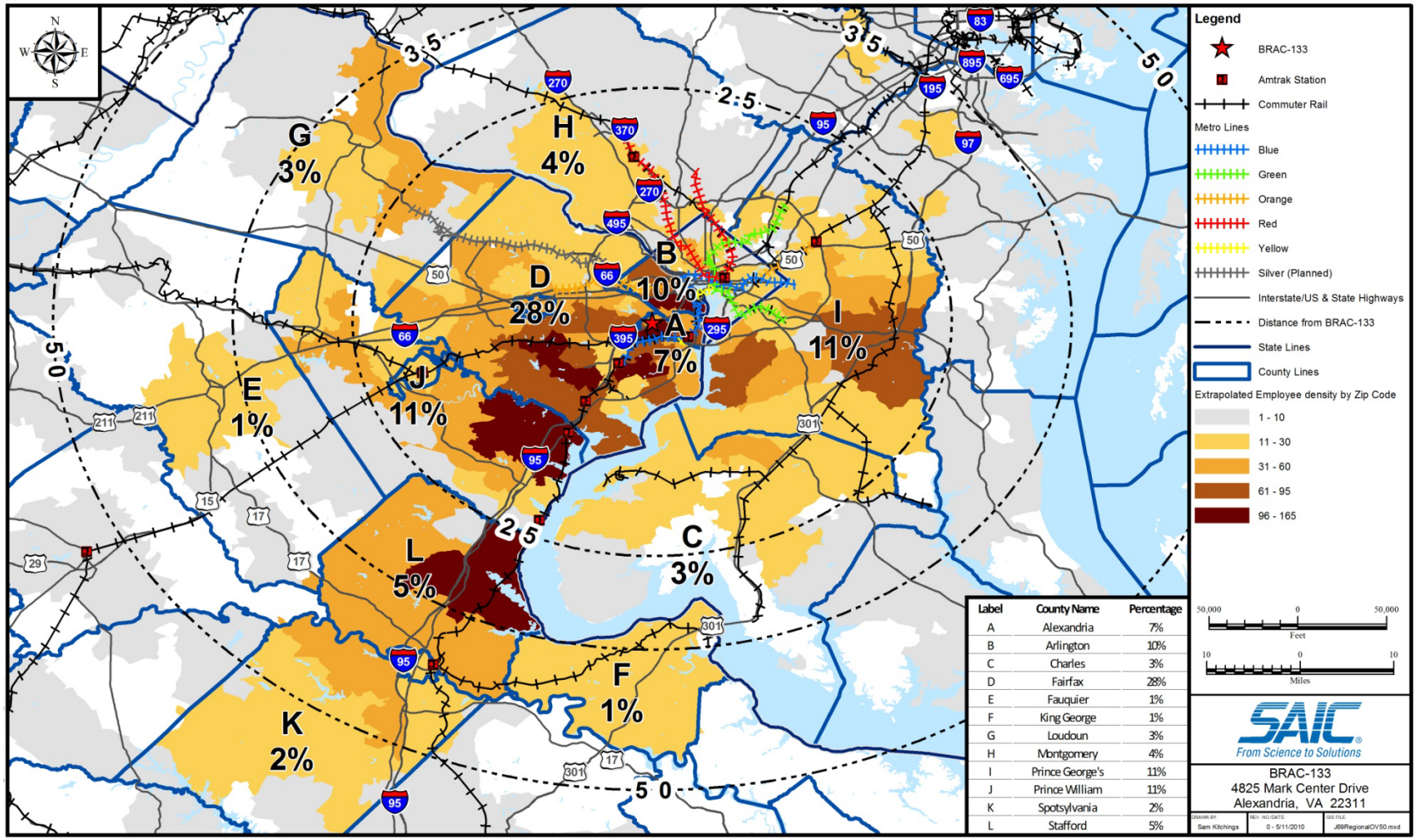
[9] Zip codes were obtained for all federal employees. The missing 31 percent of zip codes represents contractor staff who will be working at BRAC 133.

employees in each zip code are provided in Appendix A along with density maps for each of the major jurisdictions.

To predict future mode choice, it is also important to consider what modes of travel employees are using today. Despite the fact that current employee mode share is attributed in some part to where they work today, looking at current mode share can provide some sense of employee attitudes toward various modes. In August 2009 WHS conducted a survey of all employees who will be relocating to BRAC 133. WHS received responses from 2,815 employees, representing 44 percent of the employee population, a response rate that can be considered representative of the population. On the survey, employees were asked about their current commute patterns including what mode(s) of transportation they typically use to get to work. Respondents were asked to "check all that apply" for the benefit of employees who use multiple modes during their typical commute (for example they may drive to a park-and-ride lot and then take Metrorail, or they may typically slug to work but they take the bus home on days when they need to work late), and for employees who take different modes on different days.

The survey findings indicate that a large number of employees use transit – including Metrorail, bus, and/or VRE – for at least some part of their commute today. Eighteen percent use transit as their only mode of travel and an additional 27 percent use transit along with other modes (i.e., transit is one of multiple modes that they use on a daily basis for their commute, or they use transit on a regular basis, but not every day). This is not surprising given that the majority of employees work near a Metro station today. As shown in Table 2-1, nearly one-third of employees ride Metrorail with 9 percent using it as their primary mode and an additional 21 percent using it along with other modes. Over one-fifth of employees ride buses with 5 percent having it be their primary mode, and an additional 16 percent using buses along with other modes. Fewer employees use VRE, with 3 percent indicating that they use it as their primary mode of travel and 3.5 percent indicating that it is one of multiple modes that they use. It is expected that many of the employees who are already using transit (in particular those coming from Maryland and DC) will remain on transit and use the DoD shuttle (described in Section 3.5.2) to transfer to Mark Center.

Figure 2-2: Population Density of BRAC 133 Employees



Source: WHS 2009 Commuter Survey; DoD Human Resources Department; ESRI

Table 2-1: Current Commute Modes for Employees

Mode	Percentage of Employees		
	Using this Mode Only	Using this Mode along with Other Modes	Total Using this Mode
Drive Alone	40.78%	14.27%	55.05%
Metrorail	9.35%	21.18%	30.53%
Bus	5.11%	16.18%	21.29%
Carpool/Vanpool	6.22%	4.28%	10.50%
Slug	2.95%	5.68%	8.63%
Walk	1.65%	5.04%	6.69%
VRE	3.16%	3.49%	6.65%
Bike	0.11%	1.40%	1.51%

Note: Values do not total to 100 as respondents were given the option of selecting more than one mode of travel.

The percentages presented in Table 2-1 are helpful in gauging the openness of employee attitudes toward taking transit. Given that over 45 percent of employees use some form of transit today and that many indicated that they *think they will use transit to get to BRAC 133*, educating employees about transit options will be a major focus of WHS in managing the employee commute program for BRAC 133.

The survey revealed that a large number of employees (41 percent) drive alone today as their primary mode (i.e., this was the only mode of travel that these employees selected on the survey), but it also revealed that many employees are accustomed to ridesharing, in particular those originating from the south. Nearly one-third of employees who live in Virginia (29 percent) rideshare today, and the large majority of these employees live in areas to the south along I-395 in Prince William and Stafford Counties. This is not a surprising statistic given that many commuters from these counties make use of the HOV lanes on I-395 between Fredericksburg and the Pentagon. Overall, 9 percent of employees use ridesharing as their primary mode today while an additional 10 percent use ridesharing along with other modes (again, ridesharing is either one of multiple modes used on a daily basis for their commute, or they rideshare on a regular basis, but not every day). With nearly one-fifth of employees accustomed to ridesharing today, continuing to encourage this practice will also be a major focus for WHS.

A very small percentage of employees (two percent) currently walk or bike as their only mode of travel. However, over four percent of employees indicated that they anticipate *walking or biking to work at the new site.* It is important to consider walking and biking given that a large number of employees (over 500, or 11 percent of the building population) live within 2 miles of Mark Center with over 100 of these employees (2 percent) living within just 1 mile of the site.

In light of restricted parking at the Mark Center (BRAC 133), the biggest challenge that most commuters face is the fact that the site is not easily-accessible by Metrorail. To address this, WHS will be establishing a shuttle system (described in more detail in Section 3.5.2) providing employees frequent access to a number of Metro stations throughout Northern Virginia including the Pentagon, King Street,

Ballston, West Falls Church, and East Falls Church. As a result of the DoD shuttle service, many commuters already on transit - and in particular those coming from DC and Maryland - will be able to continue their current commute patterns in combination with the DoD shuttle. For those who do not perceive transit as a viable option, rideshare and telework programs can be considered as alternative mode choices. For those who live near the site, there are local transit options, walking/biking, and finally the DoD shuttle which will serve as the primary mode of transportation for some employees. Plans for promoting these various mode choices are discussed in detail in the Travel Demand Management Plan in Section 5.

2.3 Employee Trip Generation

2.3.1 Previous Studies

A comparison of the existing traffic studies was done to study the trip generation methodology adopted in those reports and to identify the future site-generated trips for the proposed BRAC 133 and Institute for Defense Analyses (IDA) building developments. For all previous studies, the estimates for new trips generated by BRAC 133 were calculated only for SOV trips, shuttle buses, and trucks, and did not explicitly include rideshare vehicle trips (i.e., carpool, vanpool, and slug). Previous studies assumed that 10 percent to 25 percent of employees would be absent on any given day due to travel, vacation, illness, flexible work schedule, and telecommuting and then applied a 40 percent TMP reduction to this total number of employees to determine SOV trips generated during a typical day. The total number of typical day SOV trips was then compared against available parking spaces to determine parking adequacy and potential overflow. Table 2-2 shows a comparison of the various factors that were utilized in the trip generation process from all past Mark Center traffic studies. The discussions below provide further details on the methodology that was adopted in determining the projected mode splits for the BRAC 133 site.

Table 2-2: Comparisons of Projected Mode Splits and Site Generated Peak Hour Trips from Prior Mark Center Studies

Report / Study	Employees present on a Typical Day Shift		Visitors per day	Opening Year Employee Trip Modal Split	Single Occupant Vehicle (SOV) Peak Hour Trips (Employee + Visitor)	Rideshare Peak Hour Trips (Carpool/Vanpool/Slug)	Shuttle Bus & Truck Peak Hour Trips	Total Number of Parking Spaces
	Percent %	Total Number of Employees						
Mark Center Traffic Impact Study (TIS) - Wells & Associates, March 2003	n/a (Note 1)	n/a (Note 1)	n/a (See Note 1)	10% Transportation Management Plan Trip Reduction assumed	WHS: • AM Peak - 1,801 trips • PM Peak - 1,872 trips IDA: • AM Peak - 481 trips • PM Peak - 449 trips	Not considered	Included as part of SOV trips	4,839 spaces (inclusive of government vehicle and visitor parking spaces)
Final Environmental Assessment (FEIS) BRAC 133, Fort Belvoir - USACE/Tetra Tech, July 2008	90%	5,768	500 visitors	• SOV - 58% • Rideshare - 21% • Walk/Bike/Other - 1% • Metrorail - 20%	WHS/BRAC 133: • AM Peak - 1,091 trips • PM Peak - 1,091 trips	WHS/BRAC 133: • AM Peak - 395 trips • PM Peak - 395 trips	WHS/BRAC 133: • AM Peak - 31 trips • PM Peak - 31 trips	3,845 spaces (inclusive of government vehicle and visitor parking spaces)
BRAC 133 Transportation Improvement & Management Plan (TIMP) - Wells & Associates, July 2008	75%	4,807	239 visitors (5% of employees present during day shift)	• SOV - 60% • Rideshare - 12% • Bus Transit - 5% • Walk/Bike/Other - 3% • Metrorail - 20%	WHS: • AM Peak - 1,240 trips • PM Peak - 1,309 trips IDA: • AM Peak - 470 trips • PM Peak - 433 trips	Not considered	• AM Peak - 34 trips • PM Peak - 34 trips	3,904 spaces (inclusive of government vehicle and visitor parking spaces)
VDOT Mark Center (BRAC) Transportation Study	88%	5,618	239 visitors (5% of employees present during day shift)	• SOV - 60% • Rideshare - 12% • Bus Transit - 5% • Walk/Bike/Other - 3% • Metrorail - 15% • *Re-adjusted SOV - 80%*	WHS: • AM Peak - 1,240 + 332 trips • PM Peak - 1,309 + 332 trips IDA: • AM Peak - 470 trips • PM Peak - 433 trips	Not considered	• AM Peak - 34 trips • PM Peak - 34 trips	3,846 spaces (inclusive of government vehicle and visitor parking spaces)
Marc Center (BRAC 133) Transportation Study - City of Alexandria/VHB, November 2009	89%	5,721	239 visitors (5% of employees present during day shift)	• SOV - 60% • Rideshare - 12% • Bus Transit - 5% • Walk/Bike/Other - 3% • Metrorail - 20%	WHS: • AM Peak - 1,240 + 110 trips • PM Peak - 1,309 + 110 trips IDA: • AM Peak - 470 trips • PM Peak - 433 trips	Not considered	• AM Peak - 34 trips • PM Peak - 34 trips	3,900 spaces (95% occupncy considerd full; inclusive of government vehicle and visitor parking spaces)
Mark Center (BRAC 133) Access Study Operational Analysis Report / IJR - VDOT, January 2010	75%	4,807	239 visitors (5% of employees present during day shift)	• SOV - 60% • Rideshare - 12% • Bus Transit - 5% • Walk/Bike/Other - 3% • Metrorail - 20%	WHS: • AM Peak - 1,254 trips • PM Peak - 1,323 trips IDA: • AM Peak - 470 trips • PM Peak - 433 trips	Not considered	• AM Peak - 34 trips • PM Peak - 34 trips	3,904 spaces (inclusive of government vehicle and visitor parking spaces)
USACE Transportation Management Plan (TMP) - Benham/SAIC, July 2010	90%	5,768	500 visitors	• SOV - 57% • Carpool - 5% • Vanpool - 3% • Slug - 3% • Bus Transit - 5% • Walk - 2% • Bike - 2% • Metrorail - 23%	WHS: • AM Peak - 1,387 trips • PM Peak - 1,316 trips IDA: • AM Peak - 470 trips • PM Peak - 433 trips	WHS: • AM Peak - 81 trips • PM Peak - 77 trips	WHS: • AM Peak - 30 trips • PM Peak - 30 trips	3,747 spaces (inclusive of 150 government vehicle and 67 visitor parking spaces)

NOTE: 1. Institute of Transportation Engineers (ITE) Trip Generation rates to generate peak hour trips.

The overall BRAC 133 employee origin zip code data obtained from WHS were examined for origin locations, zip code clusters, existing travel patterns, adjacent transit corridors, and ride sharing prospects. The data were also compared with the WHS commuter survey mode choice results to determine travel characteristics of the relocating employees in order to develop future anticipated mode choices. Observations made from the above comparison were used to determine the likely future projected non-SOV mode splits including carpool, vanpool, slug, walk, bike, bus transit, and Metrorail transit to the BRAC 133 site. The Metrorail users will be transported to the BRAC 133 site by the DoD shuttles operating during the morning and evening peak periods at frequent headways from multiple Metro stations. Table 2-3 shows the various assumptions and mode split factors that were considered in developing future non-SOV mode trip split projections.

Table 2-3: Projected Future Mode Splits and Assumptions

Primary Mode Choice	Mode Choice Percent Split from WHS Commuter Survey		
	Existing Mode Choice		Anticipated Mode Choice
	Exclusive Use	Combined Use	
Rideshare	6.22%	10.50%	7.30%
Slug	2.95%	8.63%	4.47%
Bus Transit	5.11%	21.29%	14.40%
Walk	1.65%	6.69%	2.13%
Bike	0.11%	1.51%	1.95%
Metrorail	9.35%	30.53%	12.58%
VRE	3.16%	6.65%	3.16%

Source: WHS Employee Transportation Survey for Commuter Patterns, Fall 2009.

Table 2-3 above displays the current and anticipated mode choice of employees as reported on the 2009 WHS commuter survey.

The proposed mode split percentages were determined based on current and anticipated employee travel modes as shown in the above table, current employee origin zip codes (and hence, their feasible modes), and commuter patterns in the metropolitan Washington D.C. region obtained from various sources. The assumptions that went into determining each percent mode split are explained below.

Rideshare

The *2007 State of the Commute Survey Report from the Metropolitan Washington DC Region*[10] developed by Commuter Connections showed 7.6 percent of commuters in the region regularly utilizing rideshare options. The WHS commuter survey reported 6.2 percent of the employees exclusively using carpool or vanpool as their primary mode of transportation. However, there are several reasons that

[10] *"2007 State of the Commute Survey Report from the Metropolitan Washington DC Region",* Commuter Connections, June 2008 webpage http://www.mwcog.org/uploads/pub-documents/yldZWA20080903151902.pdf (last accessed May 5, 2010)

suggest that there will be greater opportunity for rideshare options headed to the new work location at BRAC 133. As mentioned above, a significant number of current employees are already familiar with carpool/vanpool as their primary or secondary mode of travel. Also, the fact that parking is so severely restricted at BRAC 133, and that carpools and vanpools will be guaranteed a parking space, will definitely generate more interest. This creates a great incentive for carpools and vanpools to form. Employee comments from WHS survey results requesting verification on a guaranteed parking space allotment for carpool/vanpool commuters suggest the same. Furthermore, it is feasible for more carpools and vanpools to form based on where employees live. The density maps generated from the zip code data (see Appendix A) show high densities of origin zip codes located within close proximity in southern suburbs along I-395 in Virginia, in counties where ridesharing is traditionally very high. Lastly, of all the commuters in the region who have access to HOV lanes for their commute, 11 percent use vanpool/carpool to get to work[11]. Although, there is not currently a direct HOV access at Seminary Road, it is expected that many employees will still take advantage of HOV lanes for the time savings as discussed below and in Section 3.4.

Slug

Based on the existing and anticipated travel modes, it is anticipated that a certain percent of employees at BRAC 133 are expected to commute by means of "slugging" or "casual carpooling." Similar to the rideshare options previously discussed, slugging is feasible for employees traveling to Mark Center because of its proximity to the I-95/I-395 corridor, despite the lack of a direct HOV access at Seminary Road. An August 2009 report titled *Estimating the Energy Impact of Casual Carpooling*[12] projected that almost 9,700 commuters in the Washington D.C. region slug every day. Prince William County (56 percent), Fairfax County (22 percent), Stafford County (17 percent), and the City of Fredericksburg (5 percent) are home to the greatest number of "sluggers," which also holds true for a significant portion of BRAC 133 employees originating from these locations[13]. More importantly, the Pentagon is the most popular slugging destination, representing 33 percent of slug trips made throughout the Washington D.C. region[14]. BRAC 133 employees with a BRAC 133 parking permit can use the slug option to utilize the HOV lanes by picking up sluggers, dropping them off at the Pentagon, and then driving back to Mark Center. Even though three miles may seem like a significant distance to travel after the drop-off point, a December 2008 study titled *The Native Slugs of Northern Virginia* shows that 65 percent of sluggers travel to work anywhere from 10 minutes to greater than 30 minutes beyond the slugging drop-off point. This fact is also promising for employees who do not have access to parking. These employees can participate in casual carpooling as they can ride to the Pentagon with other sluggers and then take the DoD shuttle from there to Mark Center. The preliminary proposed DoD shuttle plan will offer

[11] "*2007 State of the Commute Survey Report from the Metropolitan Washington DC Region",* Commuter Connections, June 2008 webpage http://www.mwcog.org/uploads/pub-documents/yldZWA20080903151902.pdf (last accessed May 5, 2010)
[12] "Estimating the Energy Consumption Impact of Casual Carpooling", Minett, P. and Pearce, J., August 2009 webpage http://www.flexiblecarpooling.org/casualcarpoolingenergysaving.pdf (last accessed May 5, 2010)
[13] "Dynamic Ridesharing (Slugging) Data", Prepared for Virginia Department of Transport, Final Report", Prepared by Vanasse Hangen Brustlin, Inc., June 15, 2006
[14] Ibid.

service every 10 minutes to 15 minutes between Mark Center and the Pentagon. More details regarding the proposed DoD shuttle are discussed in Section 3.5.2.

Local Bus Transit

This mode share projection focuses only on employees who use local bus transit routes that directly serve Mark Center as their primary mode of transportation. The projected mode share was determined based on a comparison of the existing bus routes that serve Mark Center along with the origin zip codes retrieved from the employee survey data. Currently, a number of employees live near the existing bus routes that serve Southern Towers. While the employee zip codes indicate that commuting via bus will require a significant walk to the bus stop for some commuters, 51 percent of regional commuters who use alternate modes travel up to 1 mile from their home to the alternate mode meeting point[15] (see Section 3.3 for more discussion on bus transit service). More details regarding bus transit routes serving the region are included in Appendix B.

Walk / Bicycling

Based on the existing and anticipated travel modes, it is anticipated that a number of BRAC 133 employees are expected to walk and/or bicycle as their primary mode of travel. Results from the U.S. Census Bureau presented in a 2006 report show that almost four percent of Alexandria residents walk to work while slightly over half a percent bike to work[16]. The same study showed that the average commute for walkers is 1.42 miles while the average commute for bikers is 8.17 miles. Currently, over 100 employees live within 1 mile, and over 500 live within two miles of Mark Center. In addition, the BRAC 133 facility includes bicycle racks, shower facilities, and other amenities for commuters bicycling/walking to work. The *2007 State of the Commute Survey Report from the Metropolitan Washington DC Region*[17] showed that 12 percent of people who work for employers in Alexandria, Arlington County, and the District of Columbia that provide incentives/support services have used the bicycle/walk services at some point and that three percent report bicycling/walking as their *primary mode*. With a significant number of employees within walking/biking distance to Mark Center and their excessive interest in information regarding walk/bicycle amenities, employer incentives (as expressed in the WHS commuter survey comments), as well as the on-site amenities being provided at BRAC 133, a high percent of walking and bicycling trips are anticipated.

[15] *2007 State of the Commute Survey Report from the Metropolitan Washington DC Region,* Commuter Connections, June 2008 webpage http://www.mwcog.org/uploads/pub-documents/yldZWA20080903151902.pdf (last accessed May 5, 2010)

[16] Bicycle and Pedestrian Plan for the National Capital Region. July 2006, webpage (last accessed May 5, 2010) http://www.mwcog.org/uploads/committee-documents/v1ZfWl020070726155118.pdf

[17] *2007 State of the Commute Survey Report from the Metropolitan Washington DC Region*. Commuter Connections. June 2008. http://www.mwcog.org/uploads/pub-documents/yldZWA20080903151902.pdf

Rail Transit (WMATA, VRE, MARC)

A higher percent of Mark Center employees than that observed from the 2009 commuter survey are expected to take rail transit as their primary mode of travel. This assumption is justified based on the extensive DoD express shuttle service planned directly to serve Mark Center from nearby Metro stations (Blue/Yellow/Orange Lines and VRE) at frequent headways. Employees were not fully informed of the proposed DoD shuttle plan when the survey was conducted and were unable to make informed decisions about rail transit use. However, many employees, as noted from the WHS commuter survey, had requested for an extensive shuttle program to make transit an attractive mode choice, since parking is so severely limited at the BRAC 133 site. Additionally, with 10 percent to 30 percent of employees riding Metrorail today, it is implicit that employees are accustomed to transit.

2.3.2 Trip Projections and Proposed Mode Split

Based on a comparative analysis of the 2009 commuter survey results and the above regional travel patterns, the following mode choice splits are being proposed and used in the analysis presented in this TMP:

- SOV – 57%
- Carpool – 5%
- Vanpool – 3%
- Slug – 3%
- Local Bus Transit – 5%
- Rail Transit – 23%
- Walk – 2%
- Bike – 2%

The above generated mode splits were applied toward varying employee occupancy percentage rates on a typical day shift to determine the total number of employees accessing the site by various modes, overall site generated vehicular trips, and parking adequacy. The proposed plan for the BRAC 133 site provides free government parking in two parking structures. The proposed North garage is an eight-level structure and will allow both employee and visitor parking. The south garage is a nine level structure and will be exclusively used for employee parking only. The north garage provides a total of 2,032 parking spaces, of which 67 spaces would be allotted for visitor parking, and the south garage provides 1,715 spaces. Together this provides for a total of 3,747 parking spaces. As 150 spaces will be reserved for government vehicle parking, this allows a total of 3,530 employee parking spaces. This was considered as the threshold value for determining the potential number of SOV trips that could be accommodated by the site without any parking spillover.

To accurately determine the total number of employees served by rideshare modes, an average carpool vehicle occupancy rate of 2.3 persons per vehicle was assumed. Similarly, a vanpool vehicle occupancy rate of 7.0 persons per vehicle and a slug vehicle rate of 3.0 persons per vehicle were assumed. The carpool occupancy rate is an average rate accounting for rideshare car pool vehicles, hybrid vehicles and bikes. Table 2-4 shows the trip projections and modal splits of BRAC 133 employees. For traffic analysis purposes, the TMP will assume that 90 percent of BRAC 133 employees will be present on a typical work day shift and will be commuting to the site. Based on the projected mode split employee trips for a typical day (90 percent occupancy), it is estimated that a buffer of 34 additional parking spaces would be available to satisfy unexpected parking demand. Detailed discussion of trip distribution along the existing roadway network and opening day (2011) traffic volumes are included in Section 4.

Table 2-4: Trip Projections of BRAC 133 Employees with Proposed Mode Split

		Percentage of Total Employees Present on a Typical Weekday						
		100%	**95%**	**93%**	**90%**	**85%**	**80%**	**75%**
Number of Employees present on a Typical Day Shift		6409	6089	5928	**5768**	5448	5127	4807
57% Single Occupant Vehicle Trips		3653	3470	3379	**3288**	3105	2923	2740
Carpool	Number of Employees (5%)	320	304	296	**288**	272	256	240
	Vehicle Trips (2.3 ppv)	139	132	129	**125**	118	111	104
Vanpool	Number of Employees (3%)	192	183	178	**173**	163	154	144
	Vehicle Trips (7 ppv)	27	26	25	**25**	23	22	21
Number of Walking & Biking Employees (2% each)		256	244	237	**231**	218	205	192
Slug	Number of Employees (3%)	192	183	178	**173**	163	154	144
	Vehicle Trips (3 ppv)	64	61	59	**58**	54	51	48
Employees Riding Local Bus Transit serving Mark Center (WMATA/DASH) (5%)		320	304	296	**288**	272	256	240
Number of Employees Utilizing Rail Transit (23%)		1474	1400	1364	**1327**	1253	1179	1106
Number of Employees Using Shuttle Bus (27 person shuttles with 75% occupancy)		1474	1400	1364	**1327**	1253	1179	1106
Total Incoming Employee Trips on a typical Weekday		3884	3690	3593	**3496**	3301	3107	2913
Parking Spaces Available		-354	-160	-63	**34**	229	423	617

Total Number of BRAC 133 Employees = 6,409
Total Number of Government Vehicle Parking Spaces = 150
Total Number of Parking Spaces = 3,747
Total Number of BRAC 133 Employee Parking Spaces = 3,530
Total Number of Visitor Parking Spaces = 67

NOTE: ppv – persons per vehicle (vehicle occupancy rate)

3.0 Site Conditions

3.1 BRAC 133 Site Description and Land Use

Mark Center is a mixed-use business park located in Alexandria, Virginia at the southwest quadrant of the I-395 and Seminary Road interchange. The area currently includes 1.6 million square feet of office space, a Hilton hotel and conference center, numerous restaurants, two day care centers, and a shopping center. The site is located immediately adjacent to the 43-acre Winkler Botanical Preserve.

The BRAC 133 facility is a 16-acre site which was master-planned and approved in 2004 by the City of Alexandria for a development of this size and character[18]. The site plan shown in Figure 3-1 displays the 1.8 million square feet of office spaces in two towers located on the southwest corner of the site. Parking structures are located to the south of the office buildings along I-395 (South Parking) and on the north side of the site (the North Parking Garage). The North Parking garage will include a publicly-accessible community Transportation Center that will provide multiple transportation options for DoD employees as well as Mark Center commuters and visitors[19].

The office complex is being designed and constructed to achieve a LEED "Gold" rating[20], a national standard set by the U.S. Green Building Council to foster sustainable building design and construction. Cutting-edge strategies in environmentally sustainable construction and site development are being employed to ensure water savings, energy efficiency, and indoor environmental quality. When completed, the two towers will use 30 percent less energy and 45 percent less water than comparable office buildings. Figure 3-2 shows the scorecard for the building, demonstrating each of the elements that together achieve a LEED Gold rating.

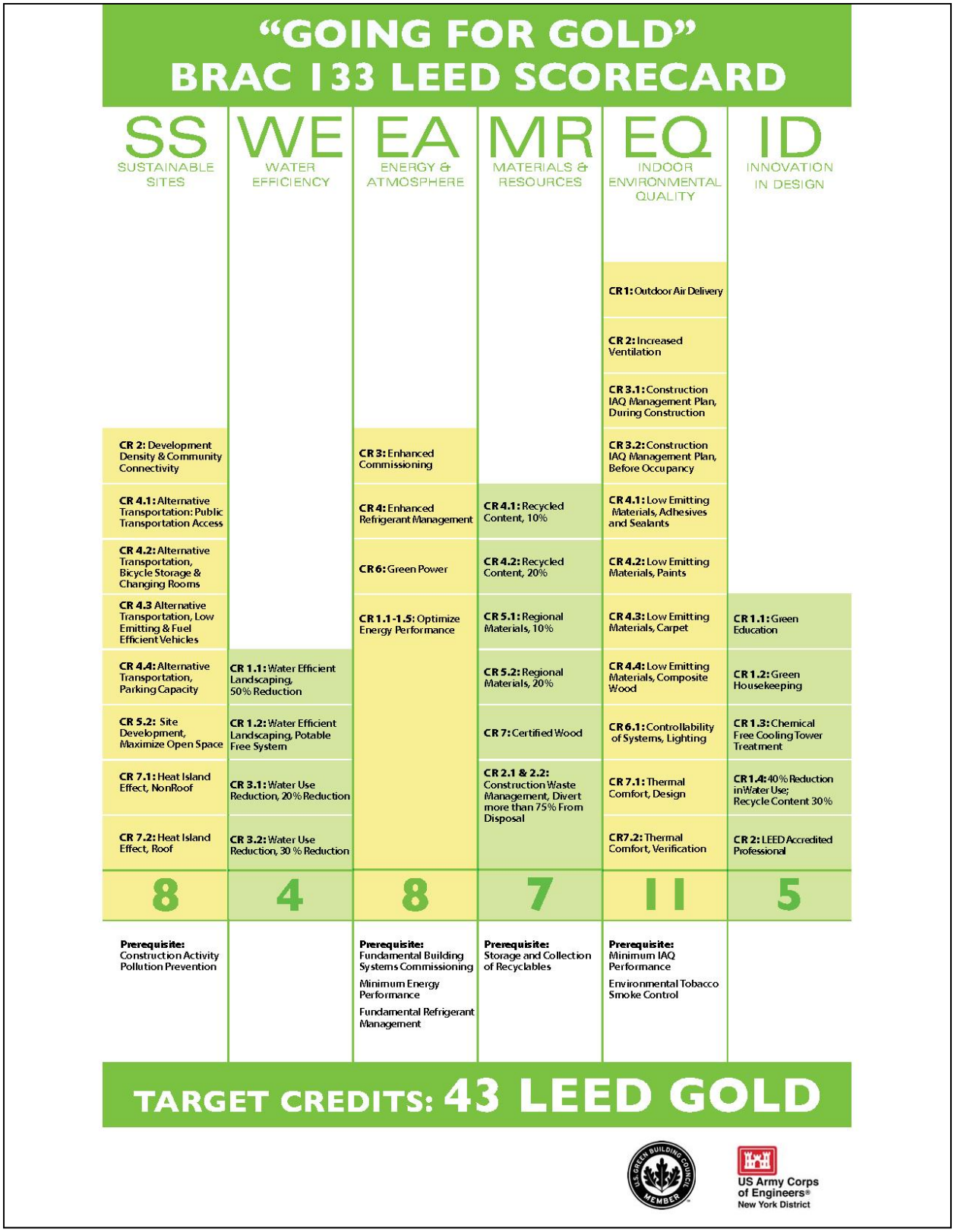
The building will also contain a number of retail facilities and amenities for employees including a fitness center, a cafeteria, an office supply store, a snack/coffee shop, a health clinic, and a credit union. These on-site amenities will help to reduce mid-day trips.

[18] Special Use Permit Certificate issued to the Mark Winkler Company, February 17, 2004.
[19] Belvoir New Vision - DoD BRAC 133 Project at Mark Center web page, http://www.belvoirnewvision.com/files/FINAL_BRAC133_Website_Collateral%5B1%5D.pdf (last accessed April 12, 2010).
[20] U.S Green Building Council "What LEED is" web page, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988 (last accessed May 5, 2010).

Figure 3-1: Site Plan for the BRAC 133 Development

Source: USACE

Figure 3-2: LEED Scorecard for the BRAC 133 Development



Source: USACE

3.2 Site Access

3.2.1 Existing Roadway Access

The study area is served by an extensive roadway system that includes an interstate freeway, a principal arterial, and collector streets. The BRAC 133 site is bounded by I-395 to the east, Seminary Road to the north, North Beauregard Street and Mark Center Drive to the west, and the Winkler Botanical Preserve to the south. The existing site can be accessed via:

1. The intersection of North Beauregard Street and Mark Center Drive to the west of the site.
2. The intersection of Seminary Road and Mark Center Drive to the east of the site.

The existing site traffic from I-395 northbound and southbound ramps accesses the site via the intersection of Seminary Road and Mark Center Drive and has inadequate weave lengths to make the necessary lane changes.

I-395/Henry G. Shirley Memorial Highway is a north-south interstate freeway in the vicinity of the study area connecting Springfield and Washington DC. The interstate freeway is a six-lane general purpose (GP) facility with a barrier separated two-lane HOV facility in the median. The freeway section through the study area offers three GP lanes along the northbound and southbound movements, with a full southbound auxiliary lane between the adjacent interchanges of King Street and Duke Street. The GP lanes operate at 55 mph and the HOV lanes at 65 mph. The HOV lanes are reversible in nature serving the peak direction of travel during the morning and evening peak hours, and are restricted to motor vehicles with three or more occupants. The HOV lanes are open from 6:00 AM through 9:00 AM during the morning peak hours and 3:30 PM through 6:00 PM during the evening peak hours on weekday. The HOV lanes are open to all during the off peak periods except during the hours closed for lane reversals.

The I-395 interchange at Seminary Road is the primary access point for traffic traveling from the northern and southern regions to the Mark Center site. The interchange is a three-level full service interchange with Seminary Road at the third level, the Seminary Road ramp intersections in a rotary arrangement at the second level, and the I-395 mainline in the first level. The interstate also provides access to the City of Alexandria via the King Street and Duke Street interchanges to the north and south of the Seminary Road interchange. Both King and Duke Streets intersect with the North Beauregard Street corridor, approximately 0.75 and 2.0 miles, north and south of Seminary Road respectively.

Seminary Road is an east-west arterial that provides direct access to the site from I-395. The arterial intersects at-grade with Library Lane, Mark Center Drive, and North Beauregard Street, and is controlled by traffic signals. Seminary Road is a six-lane divided arterial between Library Lane and North Beauregard Street, except for the overpass over I-395, which is a four-lane section. Seminary Road operates at a posted speed limit of 35 mph between Library Lane and North Beauregard Street. The arterial provides access to office complexes and developments along the corridor and offers exclusive turn lanes at intersections.

North Beauregard Street is a north-south four-lane divided arterial operating at a posted speed limit of 35 mph. The intersection with Mark Center Drive is another primary access point to the site. This

intersection will also serve as the only access to the site for vehicles approaching the site from the I-395 ramps. The corridor also provides access to developments along the corridor.

Mark Center Drive is a two-lane loop road providing local access to the developments within Mark Center and connects with both Seminary Road and North Beauregard Street. Currently, IDA and Mark Center Express shuttle buses circulate Mark Center Drive to provide access to existing office complexes in the study area.

The existing Mark Center traffic exiting from I-395 north and southbound movements at Seminary Road interchange is prevented from accessing Mark Center Drive at Seminary Road intersection by a white solid dividing stripe. Only the westbound Seminary Road traffic can legally execute left turns at Mark Center Drive intersection. I-395 traffic accessing Mark Center is required to travel along Seminary Road and execute left turns at the Seminary Road and North Beauregard Street intersection and then access the site via North Beauregard Street and Mark Center Drive intersection. This is required due to the limited weaving distance available between the exit ramp merge point at Seminary Road and the beginning of the left turn lane taper at Mark Center Drive. However, through observation of traffic, drivers usually violate this solid stripe and make left turns from I-395 ramps to access Mark Center Drive. The solid white stripe has been placed to discourage this maneuver.

3.2.2 Planned Roadway Access

Many adjacent roadway improvements are being implemented and are considered as part of BRAC 133 development mitigation measures to improve traffic operations along the adjacent roadway network and access points to the BRAC 133 facility. For the TMP development process, only the interim improvements that are currently under construction and scheduled for completion before September 15, 2011 have been considered as part of future roadway geometry.

The overall site-generated vehicular trips including the SOV, rideshare, and shuttle bus trips will access the site via Mark Center Drive / Seminary Road and Mark Center Drive / North Beauregard Street intersections. It was noted that the projected traffic demand at these intersections under build-out conditions will require additional left turn lane capacity to maintain acceptable levels of service. In addition, the existing Nottingham Drive / Mark Center Drive (future Mark Center Drive / Mark Center Drive) will be improved to serve as a major internal roadway facilitating access and circulation within the site. This necessitated traffic control improvements along Mark Center Drive intersections. The 2003 *Mark Center Parcel 1A and 1B Traffic Impact Study (TIS) and Transportation Management Plan (TMP)*[21] identified these capacity and traffic control improvements as being necessary to maintain acceptable traffic operations under full build-out conditions.

In addition to the capacity and traffic control improvements identified in the 2003 Mark Center TIS, a fourth offsite roadway improvement was recommended to minimize traffic weaving and promote traffic safety along Seminary Road. Most of the I-395 exit ramp traffic accessing Mark Center violates the existing solid pavement marking barrier that prohibits left turns to Mark Center Drive from Seminary

[21] *Mark Center Parcel 1A and 1B Traffic Impact Study and Transportation Management Plan*, Wells & Associates, March 31, 2003.

Road. Drivers weave over multiple lanes within a 100 foot distance in order to execute an illegal left turn. This weaving maneuver has resulted in multiple vehicular crashes and safety concerns. Therefore, the proposed offsite roadway improvement will include a solid obstruction to prohibit this lane change maneuver in the future.

Interim (2011) roadway improvements that are currently under construction and scheduled for completion before September 15, 2011 include:

1. Construction of a third left turn lane from westbound Seminary Road to southbound North Beauregard Street
2. Construction of a second southbound-to-eastbound left-turn lane at the North Beauregard Street and Mark Center Drive intersection
3. Installation of a new traffic signal at the Mark Center Drive and IDA Driver on-site intersection
4. Elimination of the I-395 ramp traffic from accessing Mark center via the intersection of Seminary Road and Mark Center Drive by providing a concrete barrier obstruction. This site access will be allowed for eastbound Seminary Road traffic only

Figure 3-3 highlights the proposed internal and external roadway improvements that will be in-place to serve the opening day traffic demand.

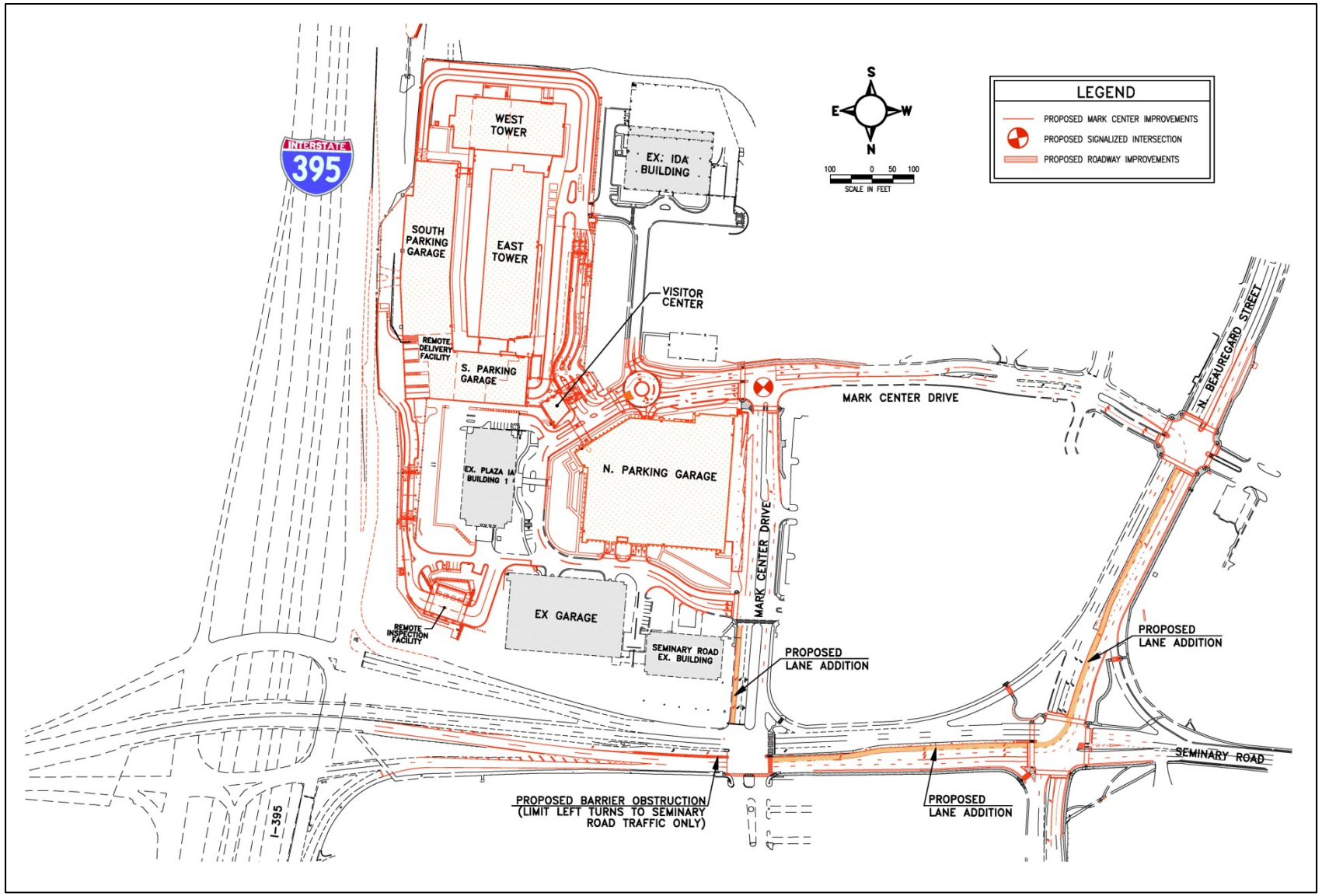
Besides these short-term improvements, other additional short-term and long-term improvements including roadway widening and traffic control improvements, and a direct HOV access ramp from I-395 South to Seminary Road[22] are currently being considered and evaluated[23].

Various access ramp alternatives serving the BRAC 133 site directly from I-395 South were considered and evaluated by VDOT. Two alternatives have been narrowed down for further study and are being evaluated for operations, access, and other impacts. VDOT, the City of Alexandria, and DoD are currently pursuing options to analyze the feasibility of these alternatives and potential funding opportunities.

These long-term improvements would enhance the traffic flow and operations of this site as well as the regional traffic.

[22] Virginia Department of Transportation Mega Projects web page, http://www.vamegaprojects.com/faqsdocuments/mark-center-documents/ (last accessed April 5, 2010).
[23] City of Alexandria, "Planning & Zoning: Base Realignment & Closure (BRAC-133)" web page, http://alexandriava.gov/BRAC (last accessed May 5, 2010).

Figure 3-3: BRAC 133 Internal and External Roadway Improvements



Source: "Overall Site with Improvements" AutoCAD Drawing, USACE, March 01, 2010

3.2.3 Internal Site Access

The existing Mark Center Drive that runs in an east-west direction will be widened to four lanes and serve as a loop road providing access to both North and South parking garages, visitor parking areas and the IDA buildings. A two-lane roundabout is proposed at the intersection of WHS Circle/IDA Drive and the North Parking Garage to slow down internal traffic and circulate them efficiently without stopping the through movements. A three-legged "T-intersection" is proposed at the South Parking Garage access from WHS Circle[24].

The proposed BRAC 133 developments can be divided into the North Campus, South Campus and the Remote Inspection Facility (RIF)[25]. The North Campus includes the North Parking Garage and the Transportation Center. The South Campus is the largest area of the site including the South Parking Garage, WHS east and west towers, Visitor Center, and Remote Delivery Facility (RDF). The main access control point to the site is located at the South Campus. The north parking garage has two access points, via the WHS Circle and the internal loop road. The access point along the internal loop road has two inbound lanes and one outbound lane. The access point along WHS Circle offers one inbound lane and one outbound lane. The visitor parking area is located within the north parking garage and has one inbound lane and one outbound lane.

The south parking garage has one inbound lane and one outbound lane along with one reversible lane to meet morning peak hour entry and evening peak hour exit demand. A proposed pedestrian bridge will connect the North Campus to the South Campus which accommodates the access control point to the site allowing employees and visitors to enter from the same location. Access to the WHS towers is secured through guarded access control points with employee identity verification booths at the South Campus. The location of the main access control point at the South Campus prevents the possibility of spillback from traffic queues waiting at the access control gates. This will prevent traffic queues from affecting the adjacent major roadway network operations.

The visitor traffic entering the site will be strictly controlled and managed by the PFPA PMB. Every visitor will be required to register in advance and receive approval from PFPA, at least one day prior to visiting the site. When arriving at the site, the visitor credentials will be verified by the PFPA security guard before being permitted into the visitor parking area. This advance verification process will minimize the traffic queues at the visitor parking entry point, promote regulation of arrival times of visitor vehicles and limit the number of daily visitors entering the site.

A proposed RDF will be located adjacent to the South Parking Garage, and will be connected to nearby roads by an access road paralleling I-395 between the South Parking Garage and the Remote Inspection Facility.

A proposed RIF for commercial trucks will be located in a secure area along the northeast corner of the site adjacent to the existing Center for Naval Analyses (CNA) building and the parking garage at 4890 Seminary Road. Trucks accessing the RIF will circulate around the South Parking Garage via an access

[24] *WHS Internal Roadway Network Traffic Analysis*, Wells and Associates, August 20, 2009.
[25] Fort Belvoir BRAC 133 Project, Mark Center Development, Department of Army Staff Recommendation to NCPC, December 30, 2009.

road paralleling I-395 and enter the facility for vehicle inspection. Any vehicles that fail the scan will be escorted to exit the site. The RIF will be located partially below grade and will incorporate screening along Seminary Road and green roofing to blend in with the surrounding landscape and to minimize visibility from adjacent roadways.

3.2.4 Pedestrian Access & Facilities

Existing site conditions indicate a continuous walkway system along Seminary Road, North Beauregard Street and Mark Center Drive providing access to Southern Towers and existing Mark Center buildings. Sidewalks exist along both sides of Seminary Road between North Beauregard Street and Mark Center Drive intersections, and along both sides of North Beauregard Street from Sanger to Seminary Road intersections, with Americans with Disabilities Act (ADA)-standard ramps and high visibility markings at pedestrian crossing locations. Marked pedestrian crosswalks exist only along the north and west crossing legs of the Seminary Road and Mark Center Drive intersection forcing pedestrians to cross only at these locations. Pedestrian signal heads with push buttons exist along some pedestrian signal crossing locations.

However, the existing pedestrian walkway system adjacent to the Mark Center site is in a poor condition with substandard effective sidewalk widths (4 feet or less) and pavement conditions, discouraging pedestrian mode of travel and posing a threat to pedestrian safety, especially to the disabled pedestrians. The signage for pedestrian travel is also inconsistent through the region. The existing Seminary Road and North Beauregard Street intersection does not offer pedestrian signal heads at crossing locations making it unsafe for the pedestrians crossing this heavily traveled intersection. Discontinuous sidewalks exist along the east side of North Beauregard Street between Mark Center Drive and Seminary Road intersections. The existing pedestrian push buttons at the signalized crossing locations do not meet the ADA standards[26].

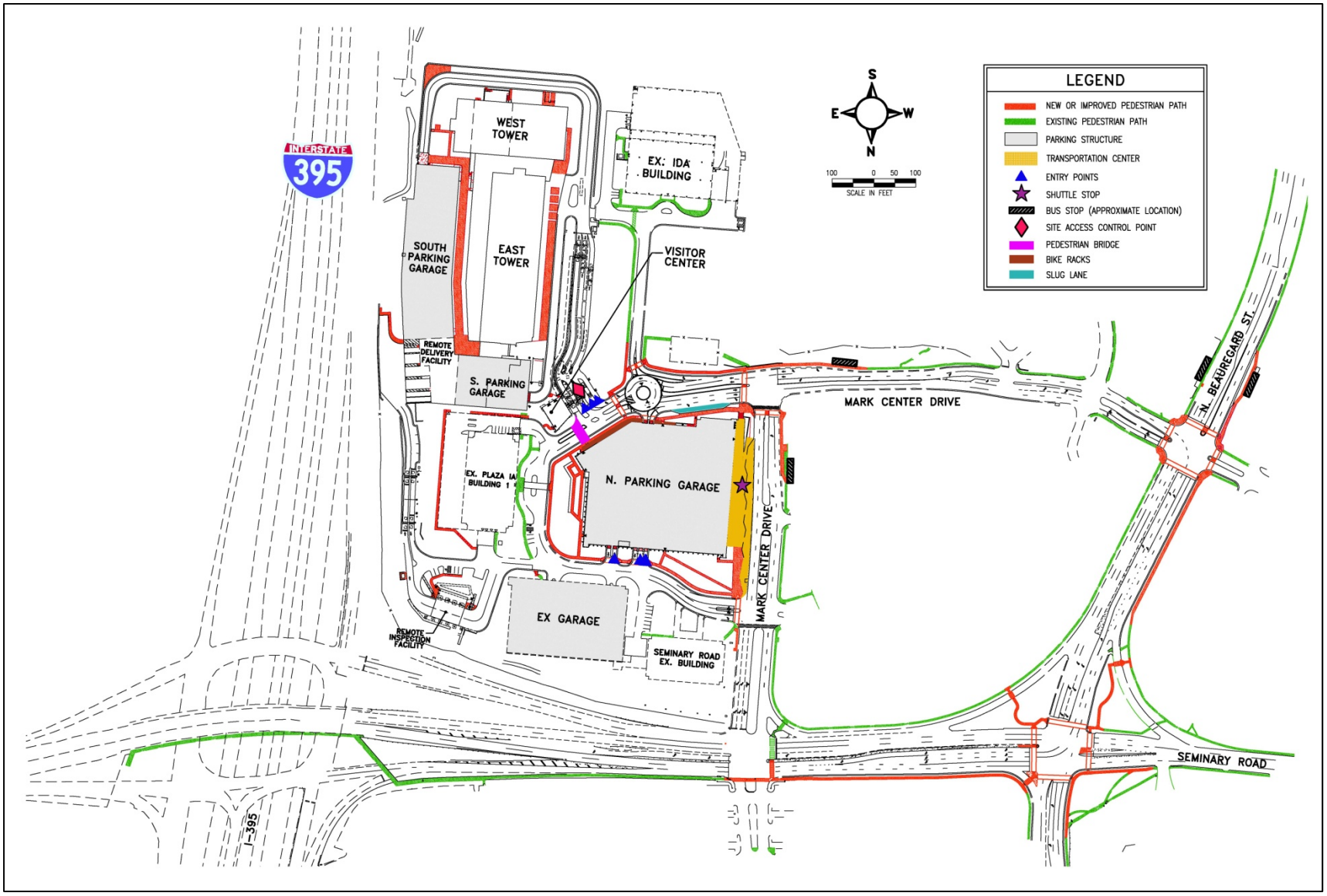
The proposed sidewalk and crosswalk plan as part of the BRAC 133 development promotes connectivity by integrating the existing sidewalks and pathways to the boundary roadways that provide access to the BRAC 133 facility and the internal circulating system. The proposed plan includes improvement of the existing walkways and addition of new sidewalks throughout the site to promote continuity. The proposed improvements includes wider sidewalks and crosswalks (6 feet or more) throughout the study area, highly visible pavement markings, pedestrian refuge areas closer to high pedestrian traffic generators and activity centers, lateral separation between traffic and pedestrians, planting and landscape, and lighting. All intersection crosswalks will meet the accessibility guidelines set by the Americans with Disabilities Act (ADA) guidelines by including gentle grades and cross slopes and ADA ramps at crossing locations. These improvements will promote safe and enjoyable pedestrian travel throughout the study area. The proposed plan will also allow pedestrian crossing opportunities at all major intersections by providing optimized signal timing for pedestrian crossings, thus minimizing any potential conflict with vehicular traffic. Figure 3-4 shows the pedestrian circulation plan highlighting the existing and proposed or improved walkways along with the major pedestrian activity centers.

[26] *Seminary Road/Beauregard Street Corridor(s) Traffic Study*, Wilbur Smith Associates, January 19, 2007.

No pedestrian movement will be allowed at the ground level area between the north and south parking garages to prevent any potential conflict with vehicular traffic. Shuttle buses, the Transportation Center and slug lines will be connected to primary pedestrian paths to provide convenient access to BRAC 133 commuters. A pedestrian bridge will connect the North Campus to the South Campus. Visitors entering the site from the North Parking Garage will be able to access the Visitor Control Center (VCC) located in the main building using the pedestrian bridge. The access control point to the site is located at the South Campus. Employees and visitors can access the towers from this location after being verified.

Crosswalks and pedestrian signal timing allocation for pedestrians crossing at Seminary Road and Mark Center Drive intersection will be provided only along the north side of Mark Center Drive and the west side of Seminary Road to maximize intersection operations by providing adequate green time for the critical intersection movements. Secondary paths throughout the site will be enhanced by providing landscaping and lighting to provide an attractive, amenable, and comfortable environment for visitors and employees.

Figure 3-4: Proposed Pedestrian Circulation Plan and Major Activity Centers



Source: "Overall Site with Improvements" AutoCAD Drawing, USACE, March 01, 2010

3.2.5 Access Control Facilities

The proposed access control security features at the BRAC 133 site are in compliance with the Army required Access Control Point (ACP) standards[27]. The south campus will serve as the main ACP to the site. The visitors and employees from the North parking garage will access the South campus via the pedestrian bridge for verification and identification before entering the facility. The ACP at the South Parking Garage implements the vehicle presence detection safety method for entry control.

The proposed access control includes Active Vehicle Barrier (AVB) and Passive Vehicle Barrier (PVB) systems that work sequentially to provide security to the site and the ACP users. The entry vehicles will be checked and authorized by the guards at the entry guard booth. Authorized vehicles will be guided through the PVB consisting of chicanes and traffic bollards to arrive at a stop and go signal control at the AVB location. The AVB at its default position will be down or depressed. The authorized vehicles from the guard booths will stop for a red signal at the AVB location and proceed forward when the indication turns green. Any unauthorized vehicles identified at the guard booth will be guided to a turn-around path adjacent to the guard booth. If failing to obey, the AVB will be activated by the guard and the unauthorized vehicle will be physically restricted from accessing the parking garage and the site. The AVB will be the final denial barrier.

The ACP at the South Parking Garage includes two inbound ID lanes with guard booths and a third ID lane reserved for overflow capacity. Under normal processing conditions, each proposed ID check point will process 350 vehicles per hour, a maximum of 700 vehicles during the highest peak hour demand. Two AVBs proposed along the two inbound lanes proceeding from the ID check points will also process vehicles at the rate of 350 vehicles per hour per AVB, serving a maximum of 700 vehicles during the highest peak hour demand[28]. The projected trips generated by the site indicate an hourly demand of only 550 vehicles entering the South Parking Garage during the highest peak hour. This allows adequate gaps between entering vehicles at the ACP and prevents any possible queue build-up. The two lanes proceeding from the AVBs merge to a single lane before entering the South Parking Garage. The third reserved ID lane can be used for commercial trucks, rideshare, or VIP vehicle check-ins, based on the generated demand. Detailed discussion on the projected trips, future traffic operations and traffic queues are included in Section 4.

3.3 Transit

3.3.1 Existing Bus Transit Service

BRAC 133 is currently served by a number of public bus routes provided by the Alexandria Transit Company (DASH) and the Washington Metropolitan Area Transit Authority (WMATA), as well as one private bus route provided by Quick's Bus Company. Public bus stops are located at the Southern Towers apartment complex, one quarter mile away from the BRAC 133 site, and on Mark Center Drive just across from the proposed Transportation Center. While Mark Center is not served by a Metrorail

[27] *WHS Internal Roadway Network Traffic Analysis*, Wells and Associates, August 20, 2009.
[28] Main Vehicle Access Control Point (ACP) Active Vehicle Barrier (AVB) Traffic Issue Memorandum, Department of the Army, August 26, 2009.

station, most of the bus routes serving the area lead to a Metrorail destination, in addition to other major destinations.

DASH Service

Alexandria Transit Company currently operates two DASH bus routes that serve Mark Center at the Southern Towers apartment complex and provide access to and from four Metrorail stations, including Eisenhower Avenue, Braddock Road, Van Dorn Street, and King Street Metrorail stations. Route maps for DASH routes AT1 and AT2 are provided in Appendix B.

The AT 1 route provides service to the Eisenhower Avenue and Van Dorn Metrorail stations. This route operates seven runs to and from Mark Center during the 6:00 AM to 9:00 AM peak period and seven runs to and from Mark Center during the 3:00 PM to 6:00 PM peak period. This line operates from 5:09 AM to 11:11 PM on weekdays and operates a total of 32 runs to and from Mark Center during operating hours. The AT1 operates on 25 to 30 minute headways during peak periods.

The AT 2 route provides service to the King Street and Braddock Road Metrorail stations. This route operates nine runs to and from Mark Center during the 6:00 AM to 9:00 AM peak period and seven runs to and from Mark Center during the 3:00 PM to 6:00 PM peak period. This line operates from 5:40 AM to 11:26 PM on weekdays and operates a total of 35 runs to and from Mark Center during operating hours. The AT2 operates on headways ranging from 17 to 30 minute headways during peak periods.

Metrobus Service

WMATA currently operates 10 bus routes that serve Mark Center at the Southern Towers apartment complex and provide access to and from five Metrorail stations, including the Pentagon, Ballston, Van Dorn Street, West Falls Church, and King Street Metrorail stations. Route maps for Metrobus routes 7, 25B, 28A, and 28G are provided in Appendix B.

Route 7 (Lincolnia-North Fairlington Line) operates very frequent service through Mark Center via routes A,B,D,E,F,W, and X. The Route operates 46 runs through Mark Center during the 6:00 AM to 9:00 AM peak period and nine runs through Mark Center during the 3:00 PM to 6:00 PM peak period in the northbound direction, as well as 10 runs through Mark Center during the 6:00 AM to 9:00 AM peak period and 29 runs through Mark Center during the 3:00 PM to 6:00 PM peak period in the southbound direction. This line operates from 5:05 AM to 3:54 AM during weekdays and conducts 172 runs through Mark Center during operating hours.

Route 25B (Landmark-Ballston Line) also operates service to Mark Center. During the 6:00 AM to 9:00 AM peak period, Route 25B operates six runs though Mark Center and six runs through Mark Center during the 3:00 PM to 6:00 PM peak period in the northbound direction, as well as six runs through Mark Center during the 6:00 AM to 9:00 AM peak period and six runs through Mark Center during the 3:00 PM to 6:00 PM peak period in the southbound direction. This line operates from 6:04 AM to 10:07 PM and conducts 45 runs through Mark Center during operating hours.

Route 28A (Alexandria-Tysons Corner Line) operates service to Mark Center, with six runs operating during the 6:00 AM to 9:00 AM peak period and six runs through Mark Center during the 3:00 PM to

6:00 PM peak period in the eastbound direction, as well as six runs through Mark Center during the 6:00 AM to 9:00 AM peak period and six runs through Mark Center during the 3:00 PM to 6:00 PM peak period in the westbound direction. This line operates from 5:30 AM to 12:59 AM and conducts 72 runs through Mark Center during operating hours.

Route 28G (Skyline City Line) operates limited service to Mark Center, with eight runs operating during the 6:00 AM to 9:00 AM peak period in the northbound direction, as well as eight runs through Mark Center during the 3:00 PM to 6:00 PM peak period in the southbound direction. This line operates from 5:50 AM to 7:18 PM and conducts 18 runs through Mark Center during operating hours.

Figure 3-5 illustrates existing public transit service within one mile of the BRAC 133 site. A summary of operating routes and services is provided in Table 3-1 and these routes and services are discussed in more detail below. The routes summarized in Table 3-1 are routes that stop within walking distance (1/2 mile) from the BRAC 133 site.

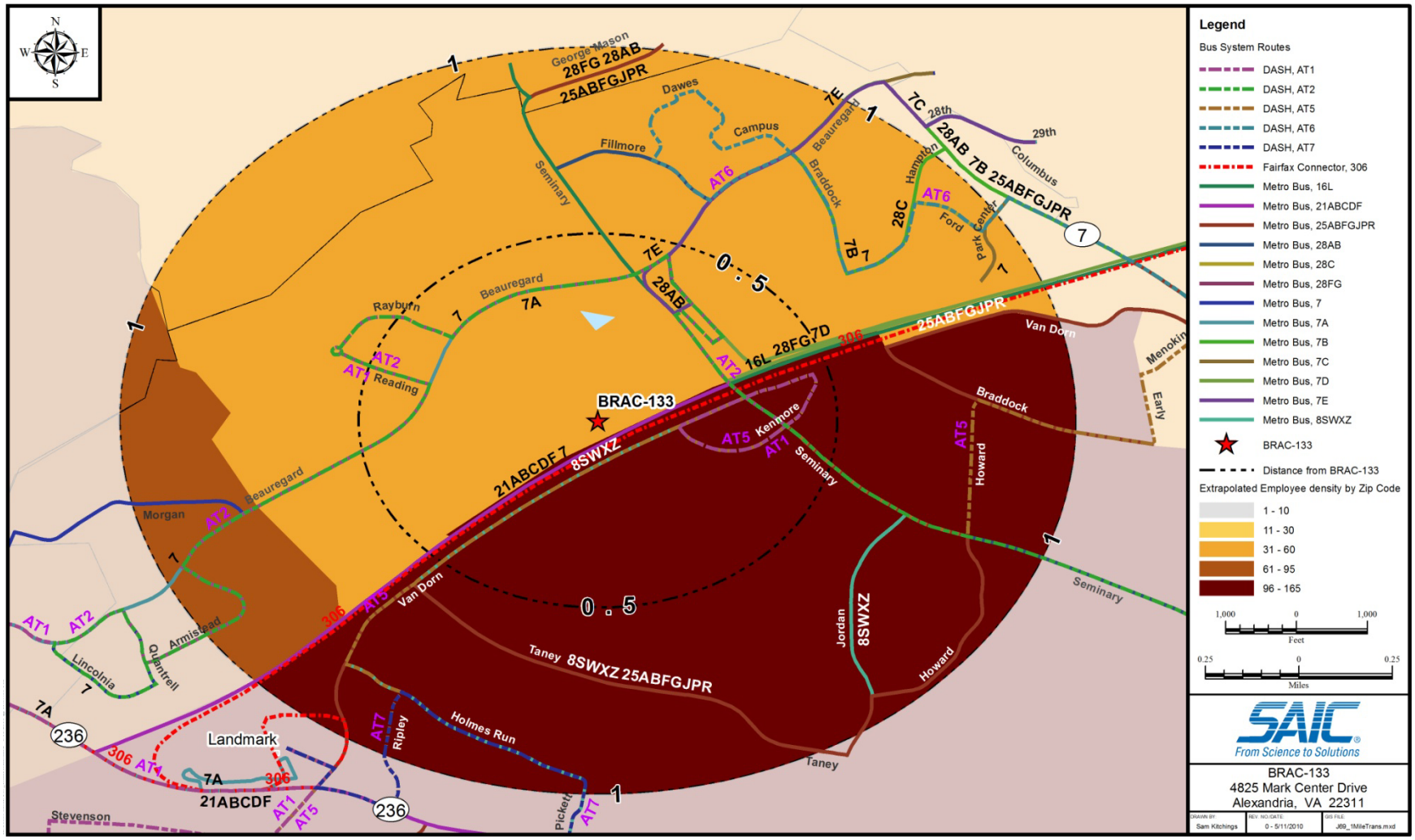
Quick's Bus Service

Quick's Bus Company is a private company operating commuter bus service from Fredericksburg, Virginia. The company currently operates one bus route that provides direct service to Mark Center from Fredericksburg and Stafford. The route conveniently serves Mark Center with stops at two buildings immediately adjacent to BRAC 133 (buildings 4900 and 4850). Quick's Bus Run #9 operates only once during the AM and PM peak periods, arriving at Mark Center at 6:00 AM, and leaving Mark Center at 3:20 PM. It is important to note that Quick's Bus, like many other private commuter bus companies, is equipped to accept federal transit vouchers through the DoD NCR Mass Transit Benefit Program (MTBP).

Public Feeder Service to Metrorail and VRE Stations

Given that the building population is distributed throughout the region and that the DoD will be establishing extensive shuttle service between Mark Center and key Metrorail and VRE stations, public bus transit service bringing commuters from the closest home bus stop to rail transit stations (otherwise known as public feeder service) will be critical to serve as the first leg of commuter trips. There are currently public feeder service options in place from nearly every jurisdiction around the region. Appendix B provides information on available public feeder services throughout the region that serve Metrorail and VRE stations.

Figure 3-5: Existing Bus Routes within 1 Mile of BRAC-133 Facility



Sources: ESRI, WMATA, DASH, Fairfax County Department of Transportation

Table 3-1: Transit Routes Serving Mark Center within One-Half Mile of the BRAC 133 Site

Route #	Origin	Destination	Direction	Stop Near BRAC 133	Number of Weekday Trips			Weekday Headways		
					AM Peak	PM Peak	Off-Peak	AM Peak	PM Peak	Off-Peak
Dash - Alexandria Transit Company										
AT1	Eisenhower/Van Dorn Metro	Seminary Plaza	NB	Southern Towers	7	7	18	25	25	30
	Seminary Plaza	Eisenhower/Van Dorn Metro	SB	Southern Towers	7	7	18	30	30	30
AT2	Lincolnia	Braddock Metro	EB	Southern Towers	9	7	19	17	30	30
	Braddock Metro	Lincolnia	WB	Southern Towers	7	9	19	30	20	30
Metrobus - WMATA										
7 A,B,D,E,F,W,X	Lincolnia	Pentagon	NB	Southern Towers	46	9	28	30	30	30
	Pentagon	Lincolnia	SB	Southern Towers	10	29	50	30	10	30
25B	Van Dorn Metro	Ballston Metro	NB	Southern Towers	6	6	11	30	30	60
	Ballston Metro	Van Dorn Metro	SB	Southern Towers	6	6	10	30	30	60
28A	Tysons Corner Center	King Street Metro	EB	Southern Towers	6	6	26	30	30	30
	King Street Metro	Tysons Corner Center	WB	Southern Towers	6	6	22	30	30	30
28G	Skyline City	Pentagon	NB	Southern Towers	8	0	0	25	---	---
	Pentagon	Skyline City	SB	Southern Towers	0	8	2	---	20	25
Private - Quick's Bus Company										
Run #9	Fredericksburg	Mark Center	NB	Bldgs 4850 & 4900	1	0	0	---	---	---
	Mark Center	Fredericksburg	SB	Bldgs 4850 & 4900	0	1	0	---	---	---

Source: WMATA, DASH, Quick's Bus

NOTE: AM Peak = 6:00 AM - 9:00 AM; PM Peak = 3:00 PM - 6:00 PM

3.3.2 Need for Modifications of Transit Routes

As part of the TMP process, the Army has engaged in discussions with transit service providers in the region to determine if any providers with cross-jurisdictional service capabilities (i.e., PRTC/Omniride, Loudoun County Transit, WMATA) are considering establishing new service or adjusting existing routes to serve the needs of the employees who will be relocated to BRAC 133. The Army also engaged in multiple discussions with WMATA and DASH to determine if any of the routes that currently stop near the BRAC 133 site could be modified to include a stop at the Mark Center Transportation Center. Discussions were also held with local transit providers (i.e., Arlington Transit, DASH, Fairfax Connector) to determine if there are any planned modifications to public feeder routes that service VRE and/or Metrorail stations, as public feeder service will be critical to serving the BRAC 133 population.

On March 10, 2010, the Army conducted a BRAC 133 Transit Round Table Discussion with public transit providers from across Northern Virginia, including WMATA, DASH, Fairfax Connector, ART, PRTC/Omniride, and Loudoun County Transit. The purpose of the discussion was to provide these agencies with information about the population of individuals who will be moving to BRAC 133 and to have a constructive discussion about potential service modifications that would best serve this population. During this meeting the Army presented information about where BRAC 133 trips will originate based on employee home zip codes, as well as information about the current and expected mode share of this population by jurisdiction.

Transit agencies across the region generally expressed an interest in expanding service to meet the new travel patterns and needs of BRAC 133 employees, and are exploring solutions to implement modifications to transit routes. WHS and the Army have engaged in discussions with WMATA and DASH to identify any potential modifications in bus stop locations, frequency, or routing that may be feasible in the future. WMATA staff and transit staff from the City of Alexandria have identified a number of possible transit improvements that could be implemented to serve the BRAC 133 population; however, final decisions on moving forward with solutions have not been made to date. The most promising possibilities include those shown in Table 3-2.

Table 3-2: Possible Transit Improvements to serve the BRAC 133 Population

Description of Transit Improvement	Details of Transit Improvement
Establishing Bus Service from King Street Metro to BRAC 133	Making adjustments to routes that currently serve nearby areas such as Southern Towers as well as the King Street Metro station to directly serve BRAC 133. These include DASH's AT2 bus route and WMATA's 28A route.
	Making adjustments to routes that currently serve as Southern Towers to directly serve BRAC 13. These include WMATA's routes 7BDE, 25AD (which serve the Northern Virginia Community College), 25B, 28B, and 28F (which serves the Pentagon and Skyline City), and DASH's route AT1.
	Increasing the frequency of DASH's AT2 route and adding a few runs each peak with limited-stop service from the King Street Metro station that coordinate with VRE arrivals at King Street.
Improving Existing Bus Service serving Ballston and Van Dorn Metro stations and add stop at BRAC 133	Increasing the frequency of WMATA's 25B route which serves the Ballston and Van Dorn Metro stations and adding a few runs each peak with limited-stop service with consideration of modifying the route using Van Dorn Street and Kenmore Avenue to access Seminary Road.
Establishing Bus Service between BRAC 133 and the Pentagon	Putting WMATA buses into service that are currently deadheading between the Pentagon and Mark Center on the 7 route.

Sources: Presentation given by Wendy Jia, WMATA, at BRAC Coordinators Meeting on February 18, 2010; Discussions with WMATA staff on March 3,2010; memo received from the City of Alexandria on May 3, 2010; WMATA Technical Memorandum 4.2 dated January 2010, "Transit Service Impacts of the Base Realignment and Closure Recommendations in the Metropolitan Washington Region."

Another possibility for a mid-term modification is for private bus companies to establish direct service to Mark Center from areas to the south (e.g., Lorton/Quantico, Woodbridge, Fredericksburg). In March 2010, USACE and WHS met with two private commuter bus companies, Martz and Quick's Bus, to explore whether either would be interested in establishing direct commuter service to Mark Center. Although both companies saw the potential for significant ridership on this type of route, neither indicated definitive plans to establish new service, at least in the short term. However, both indicated that service in the future is a distinct possibility, particularly if either sees a decline in the number of riders to the Crystal City area, an area where many BRAC 133 employees currently work and a key market that both companies serve today.

These companies, and possibly others, will likely be assessing their routes in the months following the move, to determine if establishing new service is feasible. To facilitate this decision-making, within 6 months following the move, WHS will arrange a meeting with any private bus companies who have interest in providing bus service directly to Mark Center. The purpose of the meeting will be to share information about what is known about employee commute patterns at that point in time. The private bus companies may also elect to conduct an on-board survey of their existing riders to gauge interest in service to Mark Center.

WHS will be reevaluating the DoD shuttle regularly, to determine if any shuttle service changes are needed as a result of modifications to public or private transit service and/or changes in employee demand for transit.

3.3.3 Transportation Center

As shown in Figure 3-6, the BRAC 133 site will include a publicly-accessible Transportation Center attached to the North Parking Garage. The Transportation Center is located on Mark Center Drive west of Seminary Road. It includes five bus bays that will be available for shared-use by any public or private transit providers who are interested in providing service to the Mark Center. Any public or private agencies interested in providing service to the Transportation Center may do so by coordinating with WHS. Additionally there are two bus stops located on the west side of Mark Center Drive, directly across from the Transportation Center. These stops will remain in place and available for use through coordination with the City of Alexandria.

Figure 3-6: Mark Center Transportation Center

Source: USACE.

The Transportation Center has been designed as an open-air facility with overhead protection to shield travelers from the elements. It will include a restroom for use by bus operators and benches for public use. It will also include an area for agencies to post transit schedules and route information as well as overhead electronic signage to announce bus arrivals.

3.4 Slug Lines and Taxis

Slugging is a phenomenon that has been prominent in the DC region since HOV lanes were introduced on the Shirley Highway (I-395) in the 1970s. Initially the lanes were restricted to vehicles with four or more occupants, making it extremely difficult for commuters to establish reliable carpools. This led to the creation of what is commonly called “casual carpooling”, whereby individuals looking to take advantage of the uncongested HOV lanes meet at designated pick-up locations to share a ride. Slugging

is an informal, unofficial, local custom which is not sponsored by the U.S. Government. Although the HOV designation has since been lowered to require only three passengers per vehicle, the slugging phenomenon has remained strong.

Slugging plays a particularly critical role in transportation at the Pentagon given the large number of people who work at the Pentagon and the fact that the Pentagon itself is a major transit hub. Although currently there is no direct access (on or off) of the HOV lanes at Seminary Road in peak-hour directions, it is still expected that many BRAC 133 employees will make slugging part of their regular commute. This can be accomplished in any number of ways. For example, employees who have a parking space may choose to save time by picking up slugs at any number of well-established pick-up locations throughout the southern suburbs (see Appendix C) and driving them to the Pentagon before turning around and returning to the site via the uncongested 1-395 southbound lanes. These same drivers may then elect to pick up "slugs" at Mark Center on their way home from work to save time (although the southbound HOV lanes cannot be accessed directly from Seminary Road, commuters can access the HOV lanes via a slip ramp located approximately 2.5 miles south of Seminary Road). As for slugs, they may elect to slug to the Pentagon in the morning where they can ride the DoD shuttle to Mark Center. In the evenings they may elect to do the reverse or they may instead slug with a driver leaving directly from Mark Center.

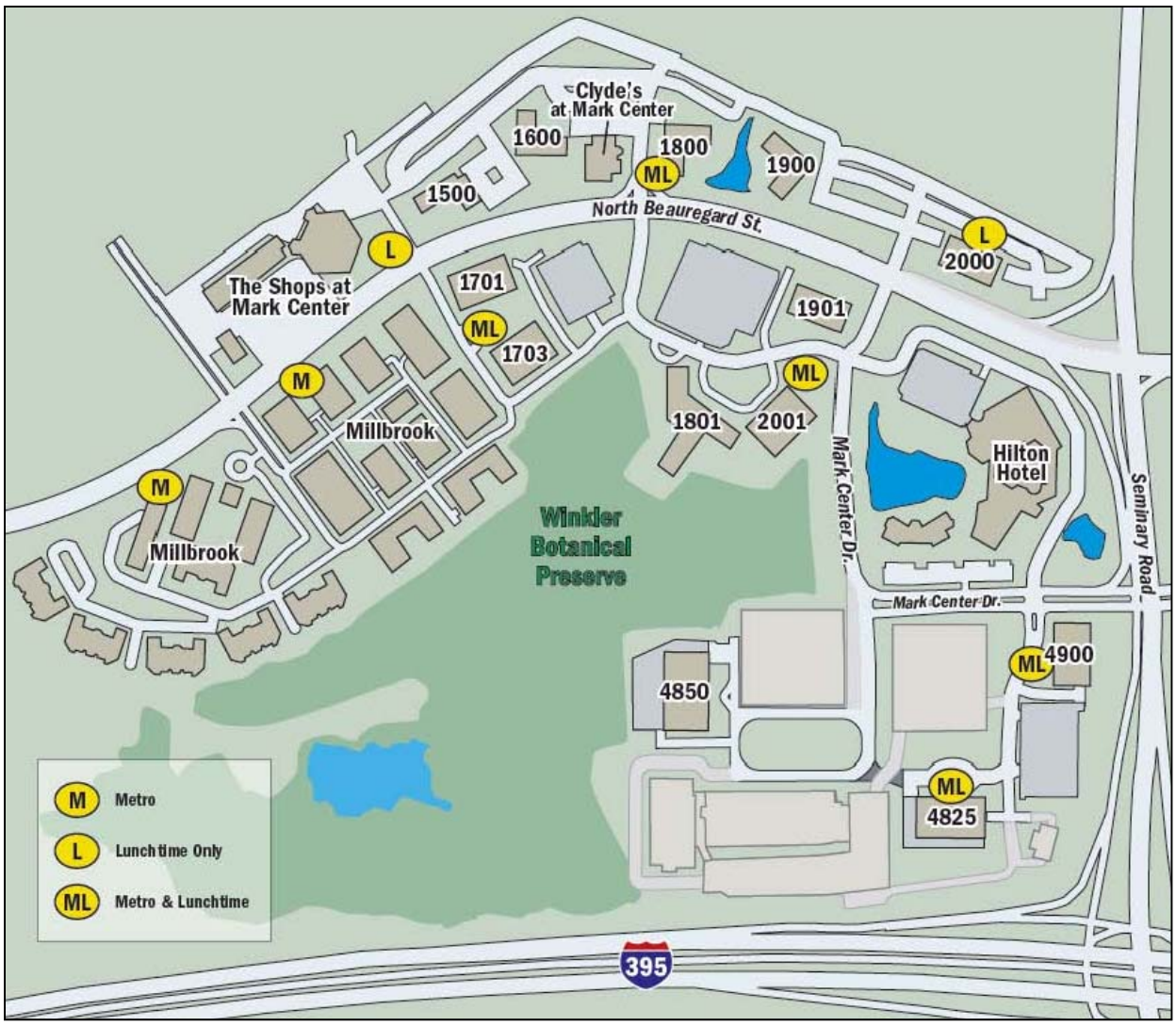
To accommodate to the local custom, the BRAC 133 site includes a designated location for slug lines. The designated slug area is located along Mark Center Drive just to the west of the North Parking Garage. The area will include signage instructing slugs and drivers about appropriate places to queue safely.

3.5 Shuttle Services

3.5.1 Local Mark Center Express Shuttle

The Duke Realty Corporation and Mark Center tenants CNA and IDA provide private shuttle service to Mark Center tenants, employees, and residents. Duke Realty Corporation provides the free weekday Mark Center Express shuttle service for Mark Center tenants to and from the Pentagon City Metrorail station, as well as within Mark Center. Tenants must display a Mark Center Express shuttle card in order to board. The shuttle operates on 20 minute headways from 6:00 AM to 9:45 AM and 3:30 PM to 7:10 PM for service to Metrorail, as well as at 10 minute headways from 11:30 AM to 2:00 PM for lunchtime service to restaurants and shops. Figure 3-7 provides a map of the Mark Center Express shuttle route and stops for both the Metrorail and lunch time services.

Figure 3-7: Mark Center Express Route Map



Source: Duke Realty Corporation

Mark Center tenants CNA and IDA also provide private shuttle services to Metrorail stations; however, shuttle service is provided for CNA and IDA employees only with proper identification.

The Duke Realty Corporation, CNA, and IDA shuttles will not be available to BRAC 133 employees, as these services are private shuttles offered only for tenants and employees of the respective organizations. However, to accommodate to BRAC 133 employees, private DoD shuttle services are being provided for BRAC 133 employees, as described in the following section.

3.5.2 DoD Shuttles

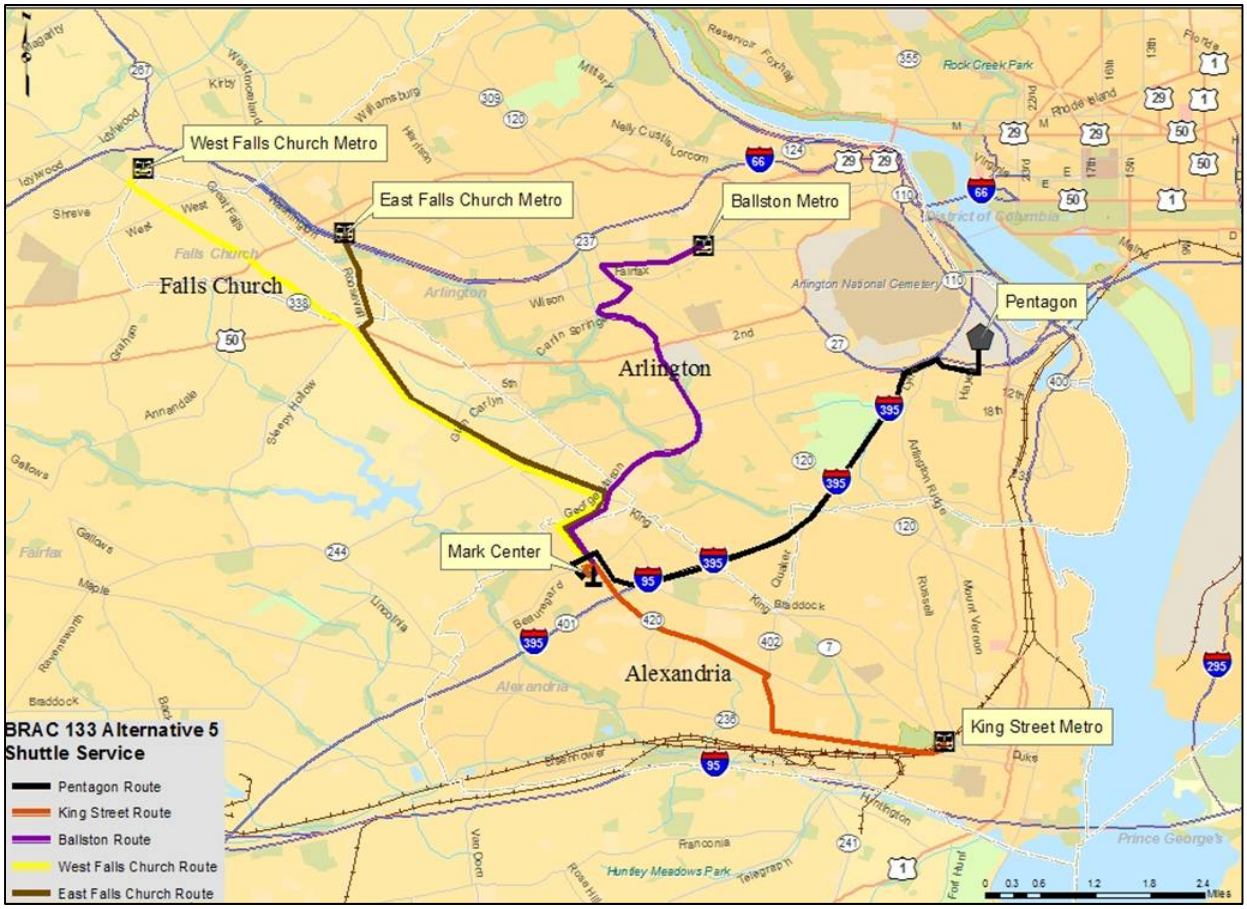
WHS is currently in the process of planning the DoD BRAC 133 shuttle program. Although plans are not final at this time, the plans center on meeting the following requirements: providing capacity to support a 20 to 40 percent mode split; providing 10-minute or 15-minute headways during peak hours; and providing connections to Metrorail Orange, Yellow, and Blue Lines, as well as VRE.

At this time WHS is looking at a variety of alternatives to provide service between BRAC 133 and key Metrorail stations. At a minimum there will be service between BRAC 133 and the Pentagon and the King Street Metro Station. The Pentagon was selected since it serves as a major transit hub for the region and it is expected that employees will need to travel between BRAC 133 and the Pentagon throughout the day. The King Street Metro Station was selected since it serves VRE as well as both the Blue and Yellow Lines. In addition there will be service between BRAC 133 and one or more Orange Line stations. WHS is currently exploring options for service to Ballston, East Falls Church, and West Falls Church. WHS is also exploring possibilities to provide service to additional Blue or Yellow Line stations beyond the King Street Station.

According to the preferred option, service is proposed to operate Monday through Friday from 5:30 AM to 8:30 PM, with 10-minute or 15-minute headways during peak hours (6:30 AM to 9:30 AM and 3:30 PM to 6:30 PM) and 30-minute headways during off-peak hours. Preliminary proposed routes are shown in Figure 3-8. The service will be provided through a combination of vehicles including 25-passenger vehicles, 35-passenger vehicles, and 45-passenger vehicles. Vehicle sizes will vary depending on the route and/or time of day.

As the exact demand at each Metrorail station cannot be anticipated at this time, and as demand will change over time as employees move and/or as changes occur to local transit options, WHS will monitor the use of the shuttles on an periodic basis and make adjustments to reflect actual ridership and demand. This will be especially important during the first 6 months as employees adjust to their new commute. At the 3-month and 6-month mark WHS will conduct a detailed analysis of ridership trends to determine if adjustments are needed at that time. After that time, they will conduct a study annually for the first 3 years and then biannually after that point. On-board passenger counters on each vehicle will facilitate ease and accuracy of data collection.

Figure 3-8: Preliminary Proposed Shuttle Routes



Source: WHS

3.6 Parking

3.6.1 BRAC 133 Parking

As was previously shown in the site plan in Figure 3-1, there are two parking garages, one of which is within the secure perimeter. The North Parking Garage (located outside of the secure perimeter), will contain 2,032 parking spaces while the South Parking Garage (located within the secure perimeter) will contain 1,715 spaces for a total of 3,747 parking spaces in total between the two garages. It should be noted, however, that a number of these parking spaces will be set aside for particular uses as described below:

- **Disabled Parking:** BRAC 133 will have 48 disabled parking spaces per ADA requirements[29]. It should be noted that in order to qualify for a disabled parking permit, employees must first apply for a permit and supply a physician's certification from a medical evaluation deeming the applicant as disabled.

[29] Section 4.1.2 of ADA Accessibility Guidelines for Buildings and Facilities, http://www.access-board.gov/adaag/html/adaag.htm#4.1 (last accessed May 10, 2010).

- **Carpool/vanpool Parking:** As the building is LEED Gold certified[30], there will be a large number of preferential parking spaces that are set aside for carpools/vanpools. The South Garage contains 320 parking spaces that will be reserved for carpools and vanpools. In the event there is a higher demand for carpool/vanpool parking than allocated, WHS will meet the demand. Carpool/vanpool parking will not be capped.
- **Alternative Fuel and Low/No Emission Vehicle Parking:** Also in line with LEED Gold certification requirements, a large number of parking spaces are set aside for alternative fuel vehicles, low/no emission and/or fuel-efficient vehicles. There are 192 spaces reserved for alternative fuel vehicles (including ultra low sulfur diesel, CNG, LNG, electric, fuel cell, E85, as well as an average B50 biodiesel in a standard diesel engine), low-emission vehicles, and fuel-efficient vehicles (ZEVs).
- **Government Vehicles:** There will be a total of 150 parking spaces set aside for government vehicles.
- **Visitor Parking:** There are a total of 67 visitor parking spaces which are all located in the North Parking Garage, outside of the secure perimeter. This section of the garage is separate from the main garage, and access will be controlled manually by PFPA PMB staff working from the VCC. Visitor access was previously described in detail in Section 3.2.3, Internal Site Access.

3.6.2 Park and Ride Lots

As the BRAC 133 commuter population is greatly dispersed throughout the region and mostly concentrated around transit corridors, and as over 40 percent of commuters will use alternative modes of transportation, including transit, slugging, and vanpooling, commuters may need to take advantage of park and ride lots that are available throughout the region. As shown in Figure 3-9, many park and rides are located in areas highly concentrated by BRAC 133 employees, making park and rides a convenient option for commuters who decide to utilize transit, carpooling, vanpooling, and/or slugging. Currently, many park and ride lots are underutilized and have excess capacity to accommodate much of the BRAC 133 commuting population. Table 3-3 illustrates the region's overall park and ride lot capacity while Table 3-4 illustrates Metro-operated park and ride capacities for select Metrorail stations in Northern Virginia. See Appendix D for details on regional park and ride lot capacities and select park and ride utilization rates.

[30] "LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects", October 2005, http://www.usgbc.org/ShowFile.aspx?DocumentID=1097 (last accessed May 10, 2010).

Table 3-3: Regional Park & Ride Parking Capacity

Park and Ride Locations	Parking Capacity
Maryland or DC	61,273
Fairfax County	10,059
Other NoVA	13,087
Metro Rail Station	17,973
Total	**102,392**

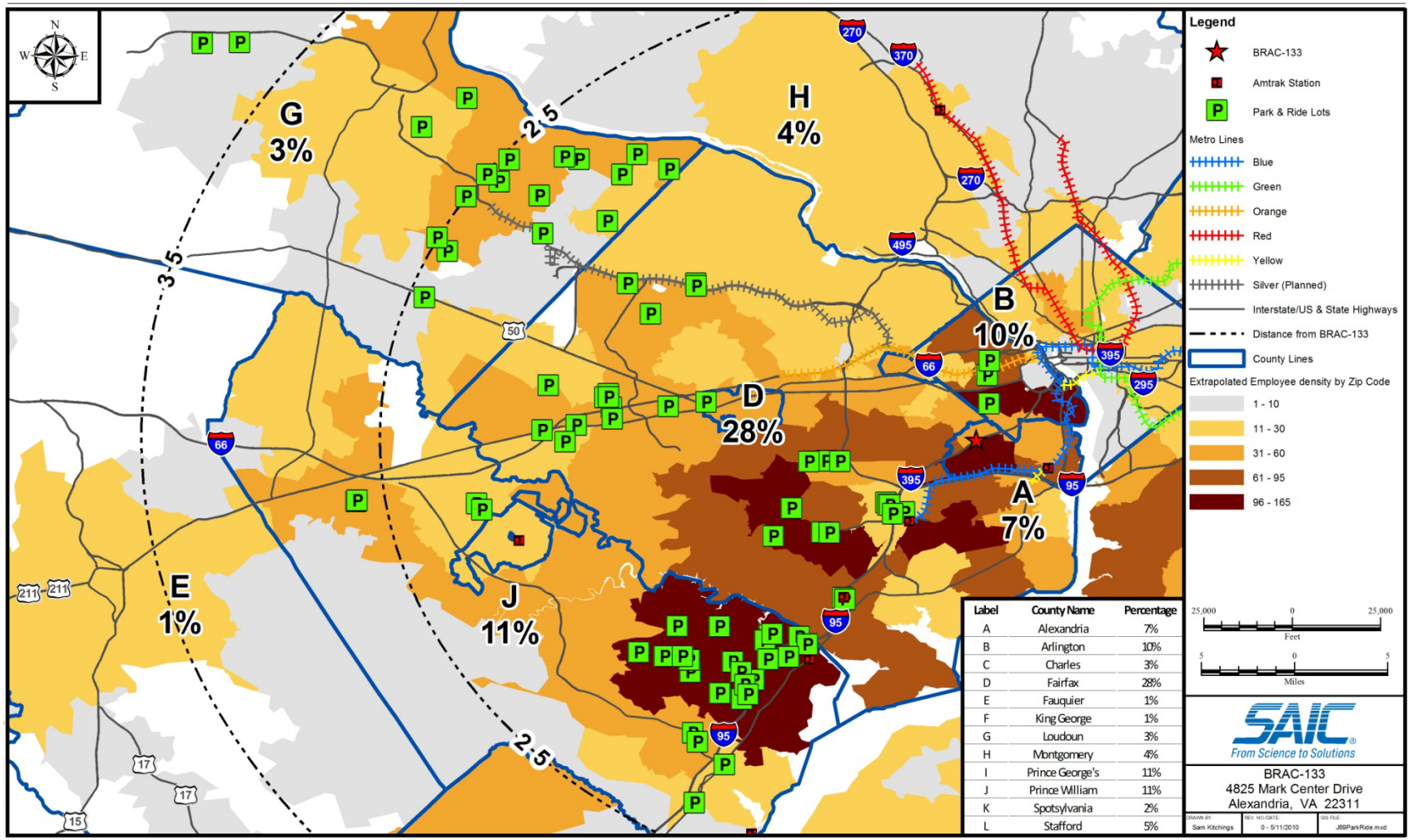
Sources: VDOT;
MWCOG Commuter Connections Website, http://www.mwcog.org/commuter2/commuter/ridesharing/prlocations.html, last accessed May 1, 2010.
Arlington County Commuter Page, http://www.commuterpage.com/parkandride.htm, last accessed May 1, 2010.

Table 3-4: Regional Park & Ride Parking Capacity

WMATA Metrorail Park & Rides	Parking Capacity
Huntington	3,617
West Falls Church	2,009
Dunn Loring	1,326
Vienna	5,169
Franconia-Springfield	5,069
Van Dorn	361
East Falls Church	422
TOTAL	**17,973**

Source: MWCOG Commuter Connections Website, http://www.mwcog.org/commuter2/commuter/ridesharing/prlocations.html (last accessed May 1, 2010).

Figure 3-9: Park and Ride Lots in Northern Virginia Relative to BRAC 133 Employees



Source: ESRI, VDOT

4.0 Traffic Impact Analysis

4.1 Summaries of Previous Traffic Studies

4.1.1 Mark Centre Parcel 1A and 1B Traffic Impact Study and Transportation Management Plan, Wells and Associates, March 31, 2003

Scope of Analysis

The study was prepared for the Mark Winkler Company. The purpose of the study was to evaluate the traffic impacts from developing Parcels 1A and 1B, a total of 1,743, 116 square feet of office space by Mark Winkler Company previously approved by City of Alexandria. Traffic impacts from the generated trips on the adjacent roadway network were analyzed and roadway improvements along with TDM strategies were proposed to achieve mobility.

Methodology

The TIS/TMP included the following tasks:

- Conducted traffic counts of adjacent roadway network
- Used ITE trip generation rates for Parcels 1A, 1B and IDA Building based on net square footage of the floor area for office land use; number of employees were not considered
- Projected future traffic without ambient growth adjustment
- Used 10 percent TMP reduction for mode choice was
- Distributed trip distribution based on then existing traffic patterns
- LOS analysis for the existing intersections with and without projected development trips
- Identified TDM strategies to reduce the proportion of single occupancy vehicle trips and to promote transit, shuttle bus, rideshare and flexible work schedules among employees

Based on the LOS analysis of the future traffic demand, the following roadway improvements were identified as necessary to maintain the existing LOS at the signalized intersections,

- Third west bound-to-southbound left-turn lane along Seminary Road at N. Beauregard Street
- Second southbound-to-eastbound left turn lane along N. Beauregard Street at Mark Center Drive
- Installation of a new traffic signal at the Mark Center Drive/IDA Drive on-site intersection

Study Conclusions

The report concludes that with the implementation of the proposed roadway improvements and 10 percent TMP trip reduction, all study intersections will operate at an acceptable LOS under full buildout and occupancy conditions.

4.1.2 Seminary Road / Beauregard Street Corridor Study, Wilbur Smith Associates, January 19, 2007

Scope of Analysis

The study was completed for the City of Alexandria. The purpose of the study was to identify, analyze and make short and long term recommendations to address operational and safety issues within the study corridor. The study area included the section of Beauregard Street between Seminary Road and Mark Center Drive.

Methodology

The study utilized a series of neighborhood meetings to identify traffic issues and concerns along the corridor. Vehicle and pedestrian traffic counts were taken to establish baseline conditions. Future conditions assumed office development of Mark Center Parcels 1A and 1B. The traffic forecasts prepared by Wells and Associates, TIMP, March 2003 were used to develop future volumes. Several scenarios of road improvements were evaluated by the study which included widening of Seminary Road and Beauregard Street to allow additional turn lanes.

Study Conclusions

The report concludes with a series of short term (within 2 years) and mid-term (5-10 years) recommendations to improve safety and mobility. Many of the recommendations are focused on improving access by pedestrians and transit users.

4.1.3 I-95/I-395 Transit/TDM Study, TDM Technical Committee, Virginia Department of Rail and Public Transportation, February 29, 2008

Scope of Analysis

This study was made in conjunction with the I-95/ I-395 HOV/Bus/HOT lane project to specifically address transit needs and services within the corridor. The study provides a comprehensive examination of existing transit services within the corridor.

Methodology

A set of alternatives were evaluated based upon a tiered level of investment. The Federal Highway Administration (FHWA) Travel Demand Management (TDM) model was used to predict changes in travelers' likelihood to use various modes of travel when offered particular TDM strategies. In other words the study could evaluate strategies to reduce single occupancy vehicles.

Study Conclusions

The study includes an investment strategy to fund the recommended Refined Alternative and Park and Ride Analysis with estimates of anticipated available revenues.

4.1.4 Transportation Improvement Management Plan (TIMP), Wells and Associates, July 30, 2008

Scope of Analysis

Prepared for WHS and Duke Realty Corporation, the study updates and supersedes the March 31, 2003 Traffic Impact Study and Transportation Management Plan approved by the City of Alexandria. The revised TIMP is based on the specific BRAC-133 requirements of the proposed WHS development at the Mark Center site. The TIMP examines the existing intersection levels of service (LOS) for seven off-site and two on-site intersections; projects future traffic volumes, with and without BRAC 133; estimates BRAC 133 auto-, shuttle bus-, and truck-trips; analyses future intersection levels of service, with and without BRAC 133; and provides a queuing analysis.

Methodology

The TIMP was based on the following assumptions:

- Traffic counts:
    - Used May 2002 data without ambient growth adjustment
    - Used ITE trip generation rates for IDA Building 5 with a 10 percent TMP reduction.
    - Trip distribution based on then existing traffic patterns
    - Trip generation for WHS facility based three work shifts per day with 83 percent of total employees scheduled for day shift. The trip generation rate is further adjusted 25 percent to discount employees not reporting to work due to illness, vacation or on flex time
    - Of employees reporting to work 60 percent are expected to drive automobile.

- Anticipated improvements for projected LOS:
    - Third west bound-to-southbound left-turn lane along Seminary Road at N. Beauregard Street
    - Second southbound-to-eastbound left turn lane along N. Beauregard Street at Mark Center Drive
    - Installation of a new traffic signal at the Mark Center Drive/IDA Drive on-site intersection
    - Signal timing optimization

Study Conclusions

- "All signalized intersections are forecasted to operate at level of service (LOS) "D" or better during both the AM and PM peak hours, with the additional traffic generated by full build out and occupancy of WHS."
- "Sufficient garage driveway capacity and multiple points of access will be provided to adequately accommodate peak hour traffic expected to be generated by build out and full occupancy of WHS."

- Mark Center is currently serviced by several mass transit services that provide access to multiple Metro stations on three Metro lines (Orange, Blue and Yellow).

4.1.5 I-95/I-395 HOV/Bus/HOT Lanes Interchange Justification Report (IJR), HNTB, January 7, 2009

Scope of Analysis

The IJR was prepared for VDOT for submission to the Federal Highway Administration for approval of a proposed interchange and access modifications to a 36-mile section of I-95/I-395 between Garrisonville Road (Route 610) in Stafford County and Boundary Channel Drive in Arlington County. The project proposes to add a third lane to the existing 28-miles of HOV lanes on I-95/I-395 from South Eads Street near the Pentagon in Arlington County, to their existing southern terminus Route 234 (Dumfries Road) near Dumfries in Prince William County and to convert these lanes to HOV/Bus/HOT lanes. In addition, the project proposes to improve modal interrelationships by adding new direct ramp access from the HOV/Bus/HOT lanes to the General Purpose (GP) lanes at eleven (11) locations, one of which is at Seminary Road. The change will allow transit vehicles to use the HOV/Bus/HOT lanes toll free and implement TDM strategies that will improve the interrelationships between GP lanes, HOV/Bus/HOT lanes, mass transit and ridesharing along the I-95/I-395 corridor.

Methodology

The operational performance of I-95/I-395 was evaluated for three analysis years: existing conditions, opening year (2015) and design year (2030). Raw traffic forecast model data were post processed for future 2015 and 2030 Build and No-Build forecast scenarios on the mainline, HOV/Bus/HOT lanes, ramps, and interchanging crossroad intersections. The post processing of forecast mainline and ramp volumes were based on procedures detailed in *NCHRP 255, Highway Traffic Data for Urbanized Area Project Planning and Design.*

Study Conclusions

The study concludes that the proposed project will relieve congestion at key locations within the improvement limits and meets the justification requirements specified by the FHWA.

4.1.6 Mark Center (BRAC) Transportation Study, Technical Memorandum, Parsons Brinkerhoff (PB), April, 2009

Scope of Analysis

This study was prepared for the Virginia Department of Transportation (VDOT). The purpose of the study was to evaluate the impact of BRAC development at the Mark Center on the surrounding arterials and the I-395 Interchange. The Technical Memorandum provides a critical review of the July 2008 TIMP and includes its own independent traffic analysis of the existing, opening year and 2030 traffic conditions.

Methodology

The PB report analyzes the same seven signalized intersections as the TIMP study. The number of trips generated by the WHS facility was adjusted upward to be consistent with the number of available parking spaces. A 0.5 percent annual growth rate was used for calculating 2030 traffic volumes.

Synchro files were obtained from the City of Alexandria and VDOT and field verified for the analysis.

Study Conclusions

The proposed off site road improvements identified in the TIMP will not be adequate to handle the additional site generated traffic and several of the intersections would operate at LOS E or F. The study suggests that direct access to Mark Center from I-395 is warranted to provide an alternative path and redistribute traffic.

4.1.7 Memorandum - Mark Center Transit Center, Wells and Associates, April 17, 2009

Scope of Analysis

The study reviews the number of buses that might potentially serve the new Transportation Center on Mark Center Drive.

Methodology

The study examines existing bus routes serving Mark Center and anticipates diversion of Metro and Dash buses from their present route through the Mark Transportation Center. In addition to public transit the analysis includes existing Duke Shuttle trips and estimated WHS shuttle trips.

Study Conclusions

The analysis projects that the Mark Center Transportation Center could potentially be served by 69 buses including public transit vehicles and DoD shuttles during both the AM and PM peak hour.

4.1.8 WHS Internal Roadway Network Traffic Analysis, Wells and Associates, August 20, 2009

Scope of Analysis

This technical memorandum updates an earlier memorandum prepared for Duke Realty which analysis the internal road network serving the BRAC 133 site and the pending WHS building.

Methodology

The trip generation and distribution assumption used for the July 2008 TIMP were used for the internal analysis. Level of service (LOS) and queue analyses based on the Highway Capacity Manual (HCM) intersection analysis methodology were completed on critical intersections. The analysis also includes an examination of the entry control facility with respect to traffic operations.

Study Conclusions

The study concludes that the proposed roadway network with three ID check stations at the Access Control Point will operate "generally well" during the AM and PM peak hours.

4.1.9 Mark Center (BRAC 133) Transportation Study, Vanasse Hangen Brustlin, Inc. (VHB), November 2, 2009

Scope of Analysis

This study was prepared for the City of Alexandria. It evaluated a series of conceptual alternatives to provide additional access to BRAC 133 site and the parking garage. The VHB study looked at direct access and egress from I-395 to BRAC 133 and the south parking structure in addition to the programmed improvements to the turn lanes on Seminary Road and N. Beauregard Street.

Methodology

- Collected new traffic count data to assess weekday AM and PM peak hour traffic
- Alternatives were assessed based on 2013 estimated traffic volumes
- Based on the MWCOG Travel Demand Model an annual growth rate of 0.51 percent was assumed for 2013 traffic volume projections
- Baseline conditions for the trip generation included BRAC 133, IDA, and the 4661 Kenmore Avenue Medical Office Building
- Modeling based on HCM module in Synchro and VISSIM(Version 5.10)

Conceptual Alternatives Evaluated Under Projected 2013 Conditions

- New Ramp to South Parking Garage with and without turn lane improvements
- New Ramp to Mark Center Drive with and without turn lane improvements
- New Ramp to South Garage and Mark Center Drive with and without turn lane improvements
- Additional left turn lanes on westbound Seminary at N. Beauregard Street (triple left) and on southbound N. Beauregard Street at Mark Centre Drive (double left) without access ramps

Study Conclusions

The turn lane improvements will have little effect on improving the PM Peak Hour LOS. Given continued growth of the corridor, the area would benefit from direct access to the Mark Center Drive from I-395.

4.1.10 Mark Center (BRAC 133) Access Study, Virginia Department of Transportation, December 2009

Scope of Analysis

This study prepared under the direction of VDOT is an operational analysis of the I-395/Seminary Road interchange and surrounding local street network providing access to Mark Center. The study was initiated at the request of the City of Alexandria and the U.S. Army in order to document the impact of the anticipated employment activity in the area primarily resulting from the relocation of 6,409 DoD personnel to BRAC 133 and to identify transportation solutions to mitigate such impacts.

Methodology

The study includes an operational analysis based on current conditions (2009) and as well as projected traffic volumes for 2015 and 1035. The analysis took into consideration programmed intersection improvements at Mark Center as well as the planned HOT lane project on I-395. In addition to the "No-Build" scenario, the study identified seven unique "Build" alternatives that would facilitate access from I-395 to Mark Center. A detailed traffic operations analysis of the no-build scenario and two of the build scenarios are included in the study. The operations analysis utilized both VISSIM and HCS modeling.

Conceptual Alternatives Evaluated

- No-Build Scenario which included programmed intersection improvements, HOT lane improvements, transportation system management improvements as well as TDM strategies incorporated herein
- Alternative A1 – Access to the South Parking Garage via a braided flyover along the existing I-395 southbound ramp
- Alternative D – Access to Mark Center Drive from the I-395 HOT lane via a one-lane, reversible ramp with a connection with a South Parking Garage exit lane

Study Conclusions

The study identified five areas of operational deficiencies under the 2035 No-Build peak traffic conditions. Three of the five involved unacceptable levels of service on the GP lanes on I-395; the fourth affected the signalized "rotary" at the second level of the I-395 and Seminary Road interchange; and the fifth area involved the arterial intersection in the vicinity of the BRAC 133 development. Alternative D was found to produce "better levels of service" for each of the five areas whereas Alternative A1 only improved deficiencies at the arterial intersections with either no improvement or worse levels of services on I-395 and the Seminary Road interchange[31]. VDOT is continuing to evaluate new alternatives to establish a direct ramp access from I-395 South to Mark Center.

4.1.11 Technical Memorandum, Task 4.1: Analysis of Existing and Potential Transit Demand, WMATA, January 2010

Scope of Analysis

The report was prepared under the direction of the WMATA in order to anticipate the effect of eight BRAC sites within the metropolitan Washington region on public transit. Estimates of public transit use at the eight sites were developed for the BRAC deadline year of 2011 and 2020.

[31] *Mark Center (BRAC 133) Access Study, Virginia Department of Transportation, December 2009.*

Methodology

The study used MWCOG's Census Transportation Planning Package with data by Transportation Analysis Zones to estimate the distribution of residence locations by installation personnel and the share of personnel using public transit. When available employee surveys were compared to the TAZ data and adjustments made to the model as to reflect the survey data. At the time of the study no survey data was available and 2006 employee payroll data from the Fort Belvoir EIS was used to estimate the residential distribution of DoD/WHS employees relocating to Mark Center. High and low scenarios were developed based on the amount of employee parking that is planned for the center and assumption regarding the split between car / vanpooling and transit use.

Study Conclusions

The transit mode use is expected to range between 13 and 26 percent. The lower number is based on carpooling and van pooling to be more highly used and is the more likely scenario after the opening of the planned HOV off-ramp to Seminary Road.

4.1.12 Technical Memorandum, Task 4.2: Development of Transit Service Plan, WMATA, January 2010

Scope of Analysis

This report presents service planning concepts for the seven military installations that will gain employees as a result of the BRAC process in the metropolitan Washington region. The discussion of each site begins with a summary of the range of transit demand estimated in Task 4.1. The service planning takes into consideration not only existing service proposals but identifies additional service improvements that may be implemented to accommodate additional transit use as a result of the BRAC initiatives.

Methodology

The study identifies existing transit services available to the gaining sites and describes transit improvements that are being proposed to support additional transit demands. The study did not examine vehicle loads or running times. Further studies will address crowding and reliability issues.

Study Conclusions

A variety of modifications and improvements to the bus routes which would improve transit service for BRAC 133 employees are identified. However, the report concludes that shuttle bus service offered by DoD would provide the most effective connections to the rail network

4.2 Study Area

4.2.1 Streets and Intersections Examined

The traffic analysis study area along I-395 mainline extends north and south of the Seminary Road interchange, inclusive of Seminary Road entrance and exit ramps and ramp influence areas along

Seminary Road from Library Lane on the east to North Beauregard Street to the west; and along North Beauregard Street from Seminary Road to Mark Center Drive intersections. Figure 4-1 shows the extents of the traffic analysis study area.

The following signalized and unsignalized intersections that are part of the adjacent roadway network within the study area were analyzed for optimum traffic operations:

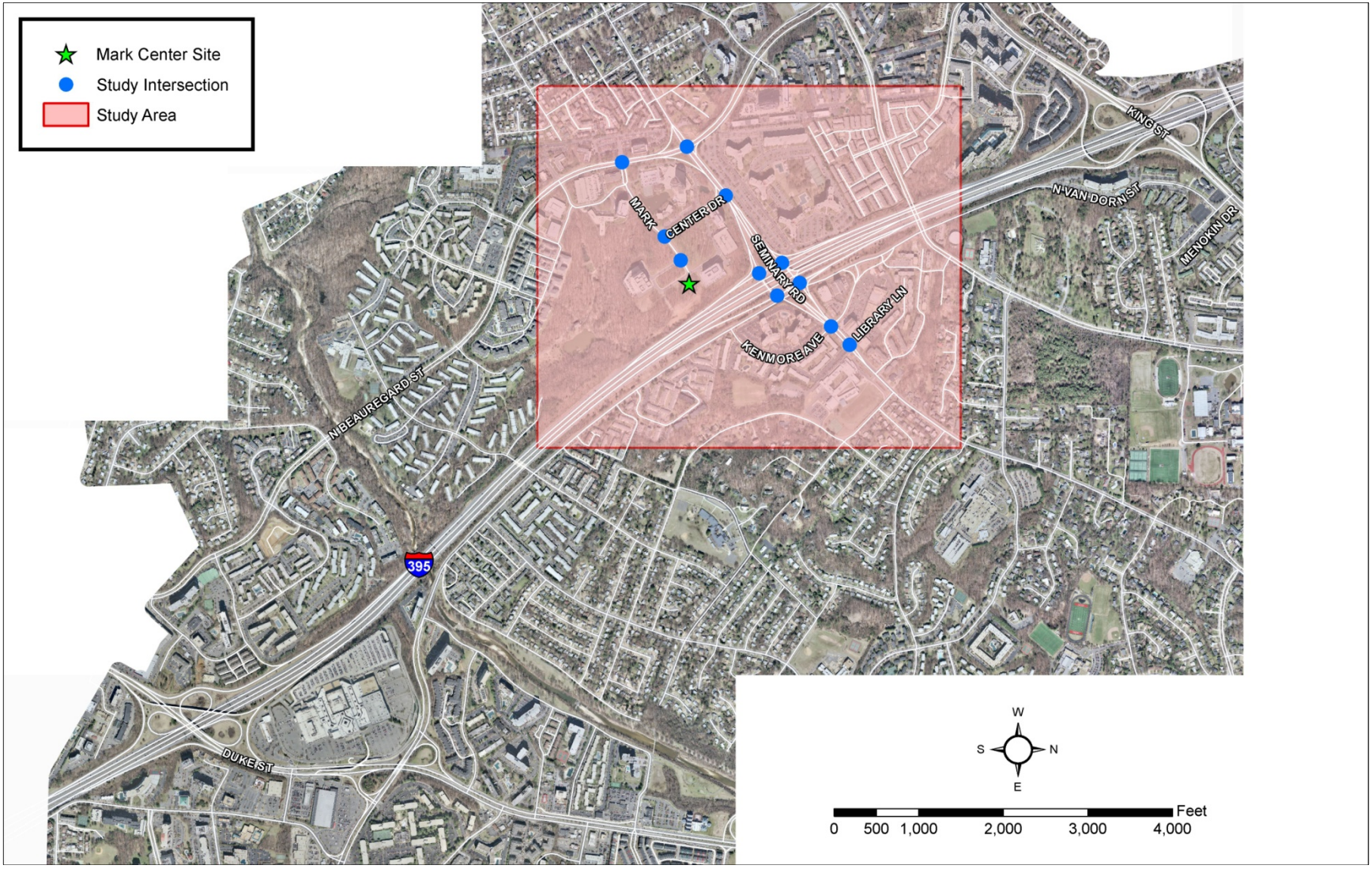
- Seminary Road / Library Lane
- Seminary Road / Kenmore Avenue
- I-395 Northbound Ramps / Seminary Road
- I-395 Southbound Ramps / Seminary Road
- Seminary Road / Mark Center Drive
- North Beauregard Street / Seminary Road
- North Beauregard Street / Mark Center Drive

In addition, the following signalized and non-signalized intersections that are part of the internal roadway network within the study area were also analyzed for optimum traffic operations:

- Mark Center Drive signalized intersection
- WHS Circle/IDA Drive - North Parking Garage roundabout

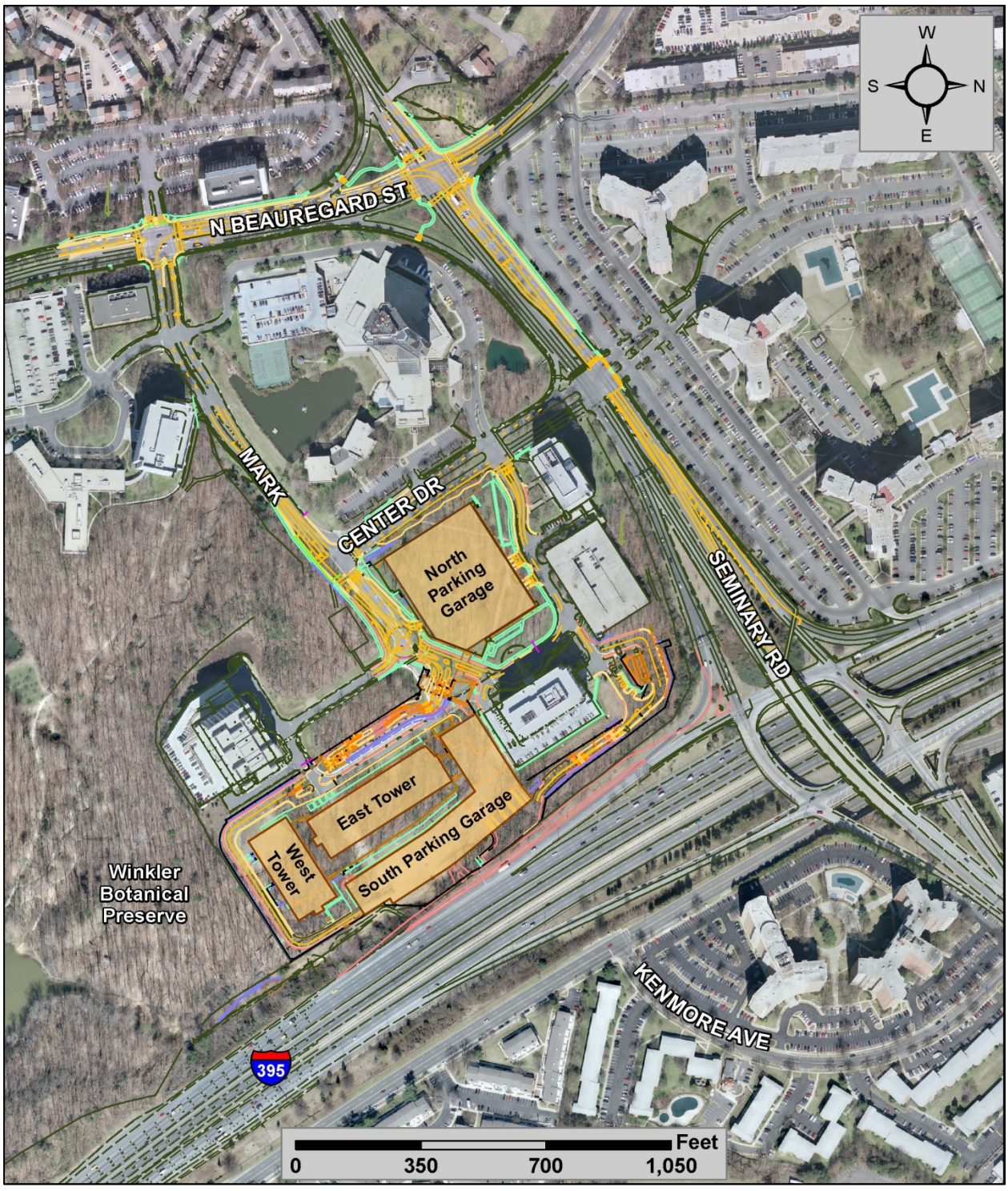
Figure 4-2 shows an overall site plan highlighting the proposed BRAC 133 development and the adjacent roadway network.

Figure 4-1: Traffic Analysis Study Area Extents



Source: ESRI

Figure 4-2: Overall Site Plan



Source: "City of Alexandria GIS DVD," "Overall Site with Improvements" AutoCAD Drawing, USACE, March 01, 2010.

4.2.2 Existing Roadway Conditions

The existing roadway geometry, lane configuration, roadway widths, storage bay lengths, intersection traffic control and signal timing parameters were inventoried and utilized to analyze the existing traffic operations. Figure 4-3 shows the existing lane geometry and traffic control for the study area along with the interim roadway improvements that are currently under construction and scheduled for completion before September 15, 2011[32].

I-395 and Seminary Road Interchange:

I-395 through the study area is a seven-lane general purpose facility along with a barrier separated two exclusive High Occupancy Vehicle (HOV) lanes to the left side of the general purpose lanes. The general purpose lanes are 12 feet wide, with 12 feet wide outside shoulders and 6 feet wide inside shoulders, providing three northbound and four southbound freeway lanes. A full service rotary interchange at Seminary Road allows access from the general purpose lanes. Existing ramp configurations at the Seminary Road merge and diverge locations are as follows:

- Single lane exit ramp from northbound I-395 GP lanes - 700 foot long deceleration lane
- Double lane entrance ramp to northbound I-395 GP lanes - full auxiliary lane to King Street and 650 foot long acceleration lane
- Double lane exit ramp from southbound I-395 GP lanes - full auxiliary lane from King Street and 100 foot long deceleration lane
- Single lane entrance ramp to southbound I-395 GP lanes - 200 foot long acceleration lane

The I-395 HOV lanes are reversible serving northbound directional traffic demand during the morning peak hour and southbound directional traffic demand during the evening peak hour. I-395 HOV lanes are restricted to motor vehicles with three or more occupants during the peak hour. Transit and shuttle buses serving federal employees are allowed to use the HOV lanes. A single lane HOV ramp with a 450 foot long acceleration (or deceleration) lane allows direct access to Seminary Road from the north.

The ramp intersections are served by a rotary type interchange with four signalized intersections. These intersections can be coordinated with optimum cycle lengths to facilitate continued traffic flow within the rotary and reduce traffic queue buildup within the interchange and along the ramp approaches. The intersection approach lane configurations at the existing rotary interchange are shown in the above figure. It was noted that delineation of the existing island within the rotary and restriping would improve the rotary capacity by allowing three full lanes to circulate the rotary.

The existing geometry and traffic control features of the study area signalized intersections are shown below in Table 4-1[33]. Adequacy of the existing roadway capacity, lane configurations, storage bay lengths, and signal operations to serve the existing traffic demand are analyzed under existing traffic operations.

[32] *WHS Transportation Improvement and Management Plan, Wells and Associates, July 30, 2008.*
[33] Aerial Image and Map Source: "City of Alexandria GIS DVD & Google Earth Imagery".

Figure 4-3: Existing and Proposed External Roadway Lane Geometry

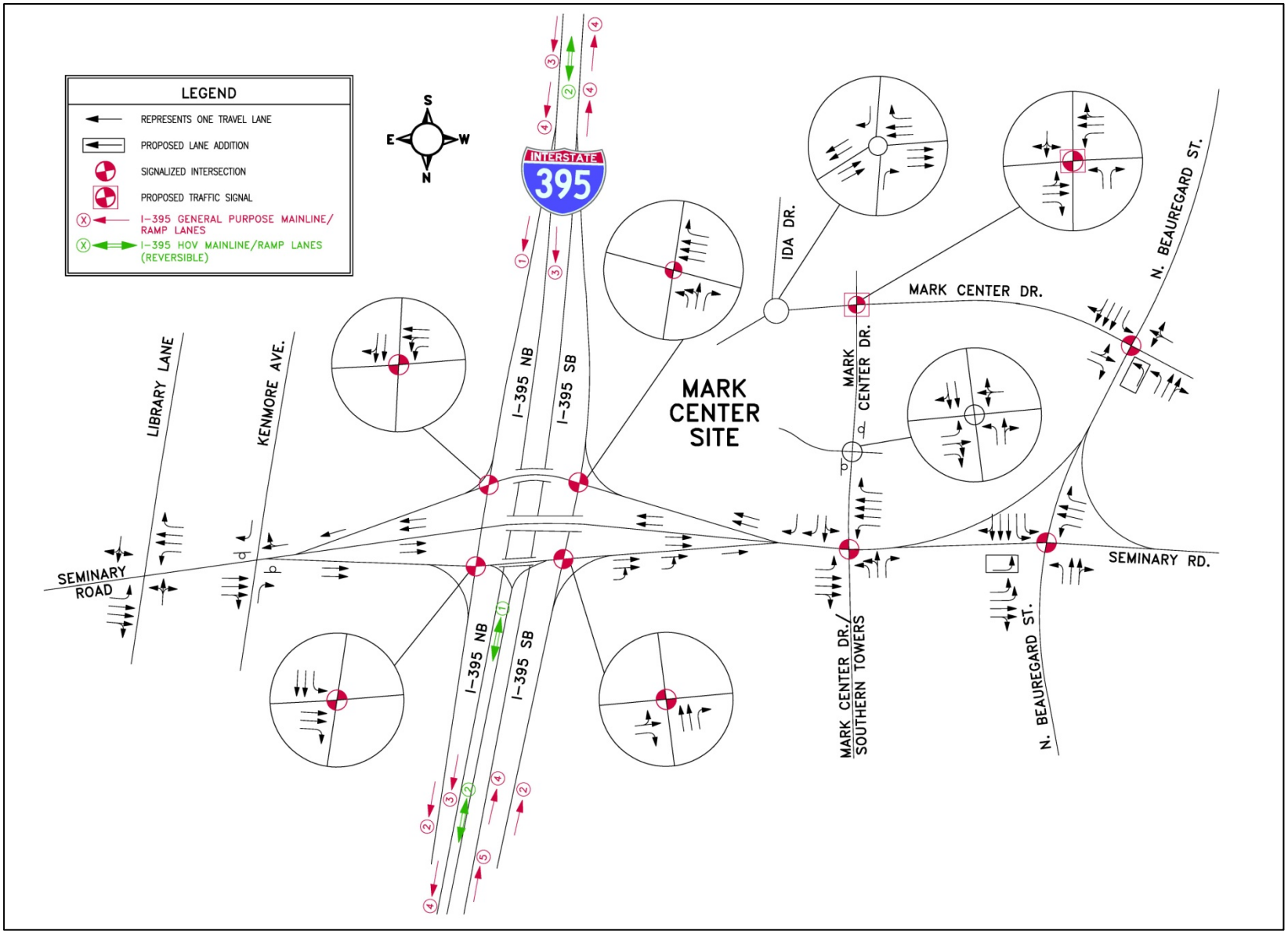


Table 4-1: Existing Roadway and Traffic Control Characteristics at Study Area Signalized Intersections

Intersection	Existing Approach Lane Configuration	Existing Traffic Control Characteristics
Seminary Road and Mark Center Drive	12 ft wide travel lanes, unless otherwise noted Eastbound Approach - one 100 ft left turn bay, three exclusive through lanes, one exclusive free right turn lane from upstream Seminary Road and N. Beauregard Street Westbound Approach - one 120 ft left turn bay, two Seminary Road exclusive through lanes, one I-395 exit ramp movements shared through - right turn lane Northbound Approach - one shared left-through lane, two exclusive right turn lanes Southbound Approach - one exclusive left turn lane, one shared left - through lane and one exclusive right turn lane	• Actuated-Coordinated Controller type • Signal design allows crossing time for vehicular and pedestrian traffic
Seminary Road and N. Beauregard Street	12 ft wide travel lanes, unless otherwise noted Eastbound Approach - one 100 ft left turn bay, one exclusive through lane , one shared through- yield-controlled channelization right turn lane; Approach widens to three exclusive through lanes past the channelized right turn island Westbound Approach - one 200 ft left turn bay, one full left turn lane, one exclusive through lane, one shared through - yield controlled channelized right turn lane Northbound Approach - one 120 ft left turn bay, one full left turn lane, one exclusive through lane, one shared through-free right turn channelized lane Southbound Approach - one 90 ft left turn bay, one exclusive through lane, one shared through - right turn lane	• Actuated-Coordinated Controller type • Signal design allows crossing time for vehicular and pedestrian traffic
N. Beauregard Street and Mark Center Drive	12 ft wide travel lanes, unless otherwise noted Eastbound Approach - one 18 ft wide shared left-through- right turn lane Westbound Approach - one shared left-through lane, one full exclusive right turn lane Northbound Approach - one 150 ft left turn bay, one exclusive through lane , one shared through- right turn lane Southbound Approach - one 80 ft left turn bay, two exclusive through lanes, one shared through - right turn lane	• Actuated-Coordinated Controller type • Signal design allows crossing time for vehicular and pedestrian traffic

4.3 Traffic Volumes

4.3.1 Existing Traffic Volumes

Existing traffic data (2009) for the study area roadway network including I-395 mainline and ramps, Seminary Road, North Beauregard Street, Mark Center Drive and the roadway intersections were extracted from all prior Mark Center traffic studies and compared. After careful review, the reassigned-existing intersection turning movement counts from the *Wells & Associates 2008 Transportation Improvement and Management Plan (TIMP)*[34] were used in conjunction with the *City of Alexandria Mark Center (BRAC 133) Transportation Study* performed by VHB to develop future baseline traffic[35]. Existing

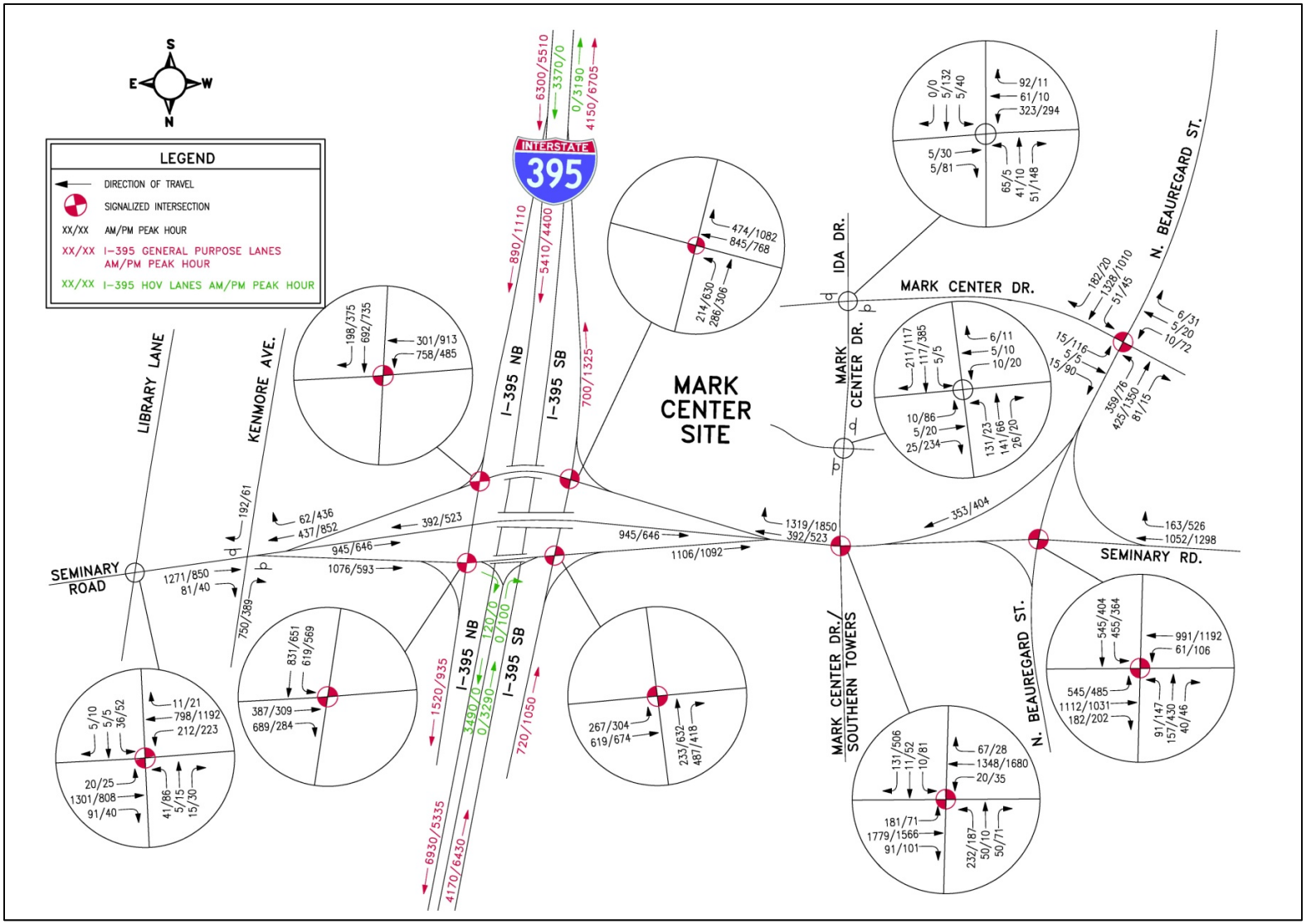
[34] *WHS Transportation Improvement and Management Plan, Wells and Associates, July 30, 2008*.
[35] *Mark Center (BRAC 133) Transportation Study, Vanasse Hangen Brustlin, Inc., November 2, 2009*

traffic volumes and heavy vehicle percentages along I-395 GP and HOV mainline lanes and ramps were obtained from *VDOT's Mark Center (BRAC 133) Access Study Operational Analysis Report (IJR)*[36]. These volumes were balanced to obtain existing 2009 travel demand. Review of the MWCOG travel demand model data conducted by previous studies indicate a half percent annual traffic growth rate for the study area roadway network.[37] This percent was utilized to project the existing 2009 traffic data to obtain baseline 2011 traffic data for the study area. Figure 4-4 shows the baseline traffic volumes for the year 2011 without BRAC growth. Peak hour heavy vehicle data obtained from VDOT's IJR for Mark Center reported a total of five percent trucks along I-395 mainline, with four percent utilizing the GP lanes, and one percent utilizing the HOV lanes.

The existing roadway conditions and 2011 baseline traffic volumes without BRAC growth were utilized to perform baseline traffic operational analysis to identify existing roadway and intersection locations operating at unacceptable levels.

[36] *Mark Center (BRAC 133) Access Study Operational Analysis Report, VDOT web site* http://www.vamegaprojects.com/faqsdocuments/mark-center-documents (last accessed May 1, 2010).
[37] *Mark Center (BRAC 133) Transportation Study, Vanasse Hangen Brustlin, Inc., November 2, 2009* & Mark Center (BRAC) Transportation Study, Technical Memorandum, Parsons Brinkerhoff (PB), April, 2009.

Figure 4-4: Re-distributed 2011 Baseline Traffic Volumes without BRAC Growth



Data Source: WHS Transportation Improvement and Management Plan, Wells and Associates, July 30, 2008; Mark Center (BRAC 133) Transportation Study, Vanasse Hangen Brustlin, Inc., November 2, 2009; Mark Center (BRAC 133) Access Study Operational Analysis Report.

4.3.2 Projected Traffic Volumes

The projected trips identified in Section 2.3 were used in the determination of morning and evening peak hour trips and distribution of the projected peak hour trips along the existing adjacent roadway network roadway to determine projected traffic volumes for the 2011 build out condition. The morning and evening peak periods with the highest demand were identified from the fall 2009 WHS employee commute survey results along with the peak hours of travel during those periods. The travel patterns of the BRAC 133 employees indicate the morning peak period to the site extending from 6:00 AM to 9:00 AM with the highest peak hour demand occurring between 7:00 AM to 8:00 AM. The evening peak period extends from 3:00 PM to 6:00 PM with the highest peak hour demand occurring between 4:00 to 5:00 PM. The SOV trips including employee and visitor trips, and rideshare vehicle trips were distributed along the morning and evening peak periods of travel. Table 4-2 and Table 4-3 show the traffic distribution of the site generated trips for the morning and evening peak periods. The highest traffic demand from the morning and evening peak hours were used for trip distribution.

Table 4-2: Projections of Peak Hour BRAC 133 Employee and Visitor SOV and Rideshare Trips – AM Peak Period

Employee Occupancy	Total Number of		57% SOV Trips	60% SOV Trips	11% Rideshare Trips	AM Peak Period				
	Employees	Visitors	Employees	Visitors	Employees	Hourly Trip Distribution	Peak Hour	Employee	Visitor	Rideshare
100% Occupancy	6409	320	3653	300	231	5%	5-6 am	183	10	12
						26%	6-7 am	950	50	60
						39%	7-8 am	1425	75	90
						24%	8-9 am	877	46	55
						5%	9-10 am	183	10	12
95% Occupancy	6089	304	3470	285	219	5%	5-6 am	174	9	11
						26%	6-7 am	902	47	57
						39%	7-8 am	1353	71	86
						24%	8-9 am	833	44	53
						5%	9-10 am	174	9	11
90% Occupancy	**5768**	**288**	**3288**	**270**	**208**	5%	5-6 am	164	9	10
						26%	6-7 am	855	45	54
						39%	**7-8 am**	**1282**	**67**	**81**
						24%	8-9 am	789	42	50
						5%	9-10 am	164	9	10
85% Occupancy	5448	272	3105	255	196	5%	5-6 am	155	8	10
						26%	6-7 am	807	42	51
						39%	7-8 am	1211	64	77
						24%	8-9 am	745	39	47
						5%	9-10 am	155	8	10

NOTE: (1) Refer to Section 2: Table 2-4 "Trip Projection of Mark Center Employees with Proposed Mode Split" for Rideshare mode splits

(2) A 40% trip reduction goal was assumed for visitors. Visitors attending special events like conferences, seminars and other meeting events must conform to the parking protocol explained in Section 5.4.4

(3) Assuming visitors will arrive throughout the day, a 5% of employees present have been assumed for visitors arriving during the morning hours in confirmity with all prior Mark Center traffic studies.

Table 4-3: Projections of Peak Hour BRAC 133 Employee and Visitor SOV and Rideshare Trips – PM Peak Period

Employee Occupancy	Total Number of		57% SOV Trips	60% SOV Trips	11% Rideshare Trips	PM Peak Period Trips				
	Employees	Visitors	Employees	Visitors	Employees	Hourly Trip Distribution	Peak Hour	Employee	Visitor	Rideshare
100% Occupancy	6409	320	3653	300	231	4%	2-3 pm	146	8	9
						20%	3-4 pm	731	38	46
						37%	4-5 pm	1352	71	85
						28%	5-6 pm	1023	54	65
						10%	6-7 pm	365	19	23
95% Occupancy	6089	304	3470	285	219	4%	2-3 pm	139	7	9
						20%	3-4 pm	694	37	44
						37%	4-5 pm	1284	68	81
						28%	5-6 pm	972	51	61
						10%	6-7 pm	347	18	22
90% Occupancy	**5768**	**288**	**3288**	**270**	**208**	4%	2-3 pm	132	7	8
						20%	3-4 pm	658	35	42
						37%	**4-5 pm**	**1216**	**64**	**77**
						28%	5-6 pm	921	48	58
						10%	6-7 pm	329	17	21
85% Occupancy	5448	272	3105	255	196	4%	2-3 pm	124	7	8
						20%	3-4 pm	621	33	39
						37%	4-5 pm	1149	60	73
						28%	5-6 pm	869	46	55
						10%	6-7 pm	311	16	20

NOTE: (1) Refer to Section 2: Table 2-4 "Trip Projection of Mark Center Employees with Proposed Mode Split" for Rideshare mode splits

(2) A 40% trip reduction goal was assumed for visitors. Visitors attending special events like conferences, seminars and other meeting events must conform to the parking protocol explained in Section 5.4.4

(3) Assuming visitors will arrive throughout the day, a 5% of employees present have been assumed for visitors arriving during the afternoon hours in confirmity with all prior Mark Center traffic studies.

The BRAC 133 site-generated employee and visitor trips were combined with the proposed IDA Building generated trips to obtain the overall generated trips to the future Mark Center location. The incoming and outgoing vehicle percentages were obtained from the *Wells & Associates 2008 TIMP*[38]. Table 4-4 shows the total BRAC 133 and IDA generated trips and the incoming and outgoing split for the AM and PM peak hour. To account for shift workers, and employees departing the site for meetings, a small percent of trips have been assumed to exit the site during the morning peak hour and enter the site during the evening peak hour. This is in alignment with Institute of Transportation Engineers recommended directional distribution for an office park and in conformity with all the prior Mark Center traffic studies.

Table 4-4: BRAC 133 and IDA Building Site-Generated Trips

90% Typical Day Shift Employee Occupancy	AM Peak Hour Trips			PM Peak Hour Trips		
	IN	OUT	TOTAL	IN	OUT	TOTAL
	95%	5%	100%	10%	90%	100%
BRAC 133 Employee SOV Trips	1218	64	1282	122	1094	1216
BRAC 133 Visitor SOV Trips	64	3	67	6	58	64
BRAC 133 Rideshare Trips	77	4	81	8	69	77
Proposed DOD / WHS Shuttles[1]	30	30	60	30	30	60
Truck Trips[2]	4	4	8	4	4	8
Sub-Total	**1393**	**105**	**1498**	**169**	**1256**	**1425**
IDA Building 5 SOV Trips[2,3]	413	57	470	74	359	433
TOTAL	**1806**	**162**	**1968**	**243**	**1615**	**1858**

NOTE: (1) Proposed DOD WHS Shuttle Plan Alternative 1: Operates five routes (Ballston, Pentagon, King St, East Falls Church, West Falls Church) at 10-minute headways during the peak hour, as received on April 10, 2010.
(2) BRAC 133 Transportation Improvement and Management Plan (TIMP), Wells & Associates, July 2008.
(3) Institute of Transportation Engineers Trip Generation Manual recommendations for an Office Park per 1000 Sq. Feet Gross Floor Area for 368,400 Sq. Feet.

The total site-generated trips were distributed based on the origin zip codes, existing travel patterns, future transit riding potential dependent on transit corridors adjacent to origin points, and future rideshare prospects along high density zip code clusters. The total SOV and rideshare trips generated from all Virginia locations, Washington D.C., and Maryland were distributed to routes along the existing roadway system within the City of Alexandria and to the Mark Center site from the north, south, east and west via I-395, Seminary Road and North Beauregard Street corridors. (Appendix A shows employee population density maps by home zip codes.) Based on the home zip codes, it was determined that most of the trips originating from north and south directions will travel along I-395, and access the site at Seminary Road interchange. Table 4-5 shows the proposed traffic distribution along the existing roadway network and their directions of travel.

[38] *Mark Center Parcel 1A and 1B Traffic Impact Study and Transportation Management Plan, Wells & Associates, March 31, 2003.*

Table 4-5: Proposed BRAC 133 Trip Distributions along Existing Roadway Network

Percent Trip Distribution along Existing Roadways						
(Direction of Approach)						
Southbound I-395	Northbound I-395 / I-95	Southbound Beauregard	Northbound Beauregard	Westbound Seminary	Eastbound Seminary	Southern Towers
19%	**29%**	**8%**	**16%**	**15%**	**12%**	**1%**

The projected Mark Center trips were internally distributed based on the percentage splits obtained from the *Wells & Associates 2008 TIMP* and the *WHS 2009 Internal Roadway Network Study*. Figure 4-5 shows the distribution of the BRAC 133 and IDA generated SOV, rideshare and shuttle trips along the study area roadway network. Rideshare trips originating from the south along I-95/I-395 were assumed to use the GP lanes for projected traffic demand estimation purposes. However, there is a possibility that some or all of the northbound rideshare vehicles will use the I-95/I-395 HOV lanes, exit at the Pentagon, and turn around to travel along I-395 northbound GP lanes to Mark Center. The rideshare trips and shuttle buses originating from the north, and traveling southbound on I-395 will use the GP lanes, since the HOV lanes during the morning peak period serve only the northbound traffic. The projected trips were combined with the existing baseline trips to obtain the total future trips accessing the Mark Center site. Figure 4-6 shows the projected traffic volumes at build-out on opening day (2011), including baseline trips, and WHS and IDA generated SOV, rideshare and shuttle trips along the study area roadway network. This projected traffic demand in combination with the proposed interim roadway improvements (as listed in Section 3.2.2) were added to the existing roadway network to determine the future traffic operations (levels of service) along the adjacent roadway network to Mark Center site.

Figure 4-5: BRAC & IDA Generated Peak Hour Trips

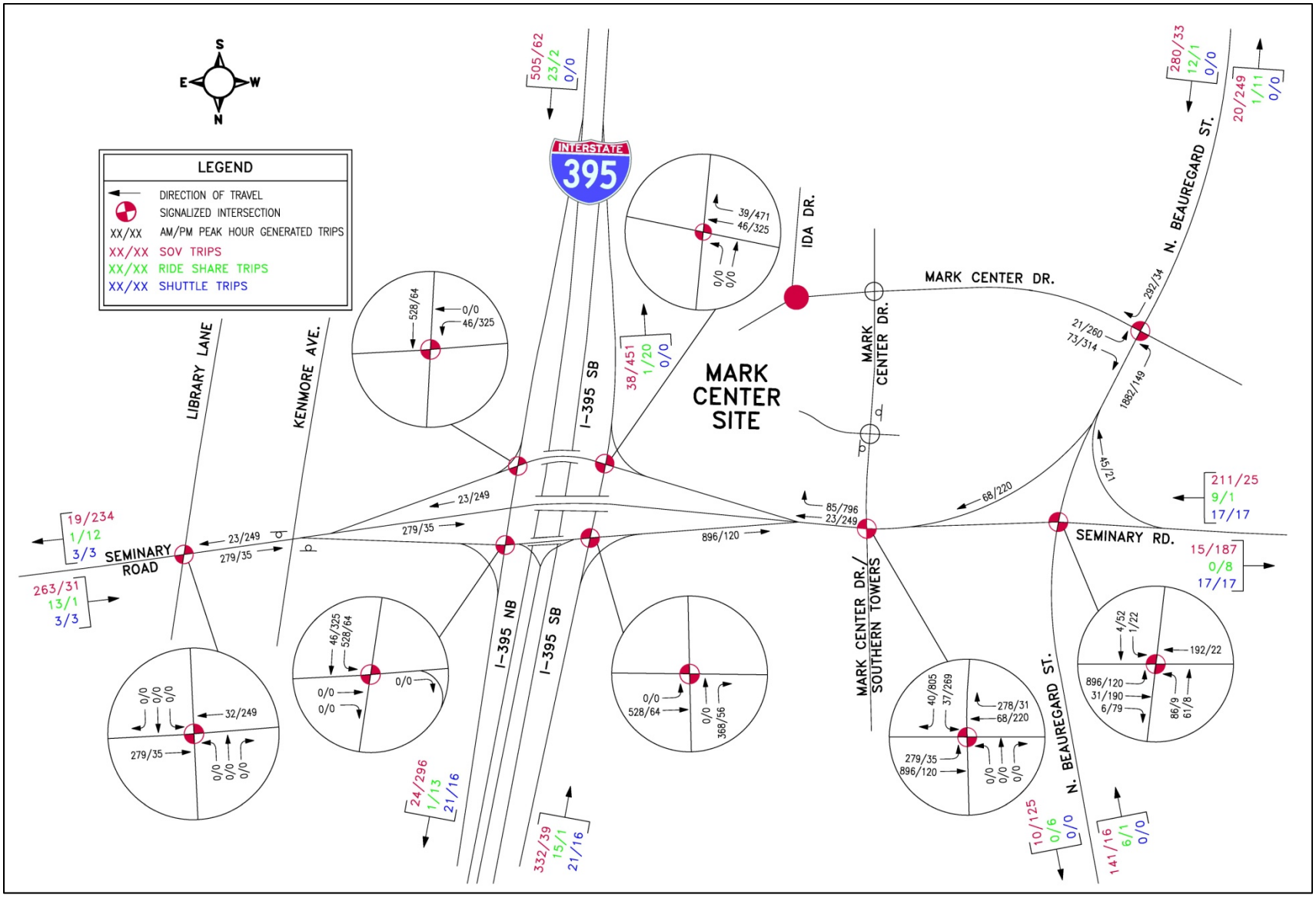
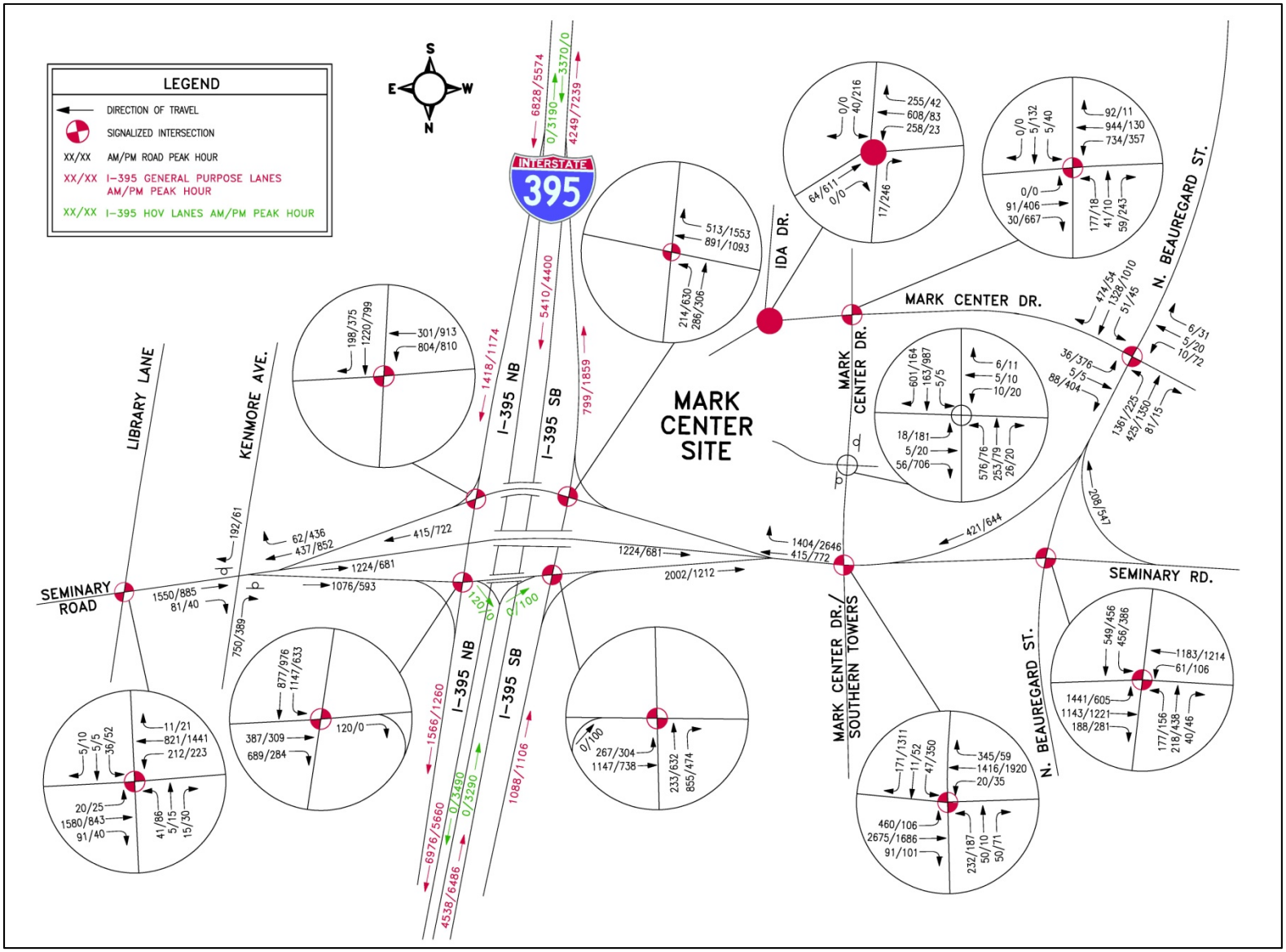


Figure 4-6: Projected (2011) Peak Hour Traffic Volumes (Baseline/BRAC 133/IDA Trips)



4.4 Traffic Operations

4.4.1 Simulation Modeling

Traffic operational analysis and micro simulation modeling for the overall study area was performed using TSIS-CORSIM software version 6.2. Existing and proposed site conditions under the baseline and projected traffic demand were performed and analyzed. Synchro, the macroscopic design software, was used to optimize signal timing and coordination for all the signalized intersections within the study area. The data obtained from the optimized Synchro traffic signal design model was then transferred to CORSIM to obtain the overall model operating under optimum conditions.

Synchro is a macroscopic signal design software based on the Highway Capacity Manual (HCM) recommended guidelines for signalized intersections. Synchro is a location-based analysis tool and is not used to model interactions between vehicles within the traffic stream. Synchro models traffic arriving or present at the intersection approaches and does not account for traffic flow or spillback conditions at adjacent intersections. Thus, CORSIM, a microscopic simulation model was used to accurately determine the traffic operations of the roadway network.

CORSIM is a time-based stochastic simulation model used to effectively simulate combined arterial and freeway traffic operations. CORSIM analyzes both the freeway (FRESIM) and arterial (NETSIM) elements of the study area to provide a detailed review of the overall traffic operations and problem locations. CORSIM accounts for individual vehicle travel patterns, lane changing behavior, adjacent intersection operations and its effect on upstream or downstream intersections. Comprehensive system and link measures of effectiveness (MOE's) can be collected for each vehicle entering the network for every second of model simulation. The link MOE's provide information for any part of the roadway network within the study area. The simulation model can be viewed using TRAFVU to study the traffic flow, queues and spillback effects. Because of the stochastic nature of the model, each simulation run results provide only an estimation of the model's true characteristic. Multiple simulations performed with varying random seeds provide an accurate representation of the network performance.

The overall CORSIM model developed for the study area includes the roadway extents and intersections as outlined previously in Section 4.2.1. The traffic model includes transit bus stations, transit bus routes and shuttle bus routes that currently exist within the study area extents. The model also integrates the proposed DoD shuttle plan along with the shuttle routes and shuttle trip headways.

Micro simulation models of the study area were initially developed for the following two scenarios and analyzed under the morning and evening peak hour traffic demands:

- Baseline (2011) Traffic Demand without Improvements
- Projected (2011) Traffic Demand with Interim Improvements

4.4.2 Study and Data Assumptions

The traffic analysis includes operations of I-395 mainline and ramps at the Seminary Road interchange only and does not account for any potential adverse operations initiated by traffic queues or other operational impediments extending from the adjacent Duke Street and King Street interchanges. It is to

be noted that traffic spillback extending from any upstream or downstream weaving sections and/or bottlenecks can severely degrade the interchange operations at I-395/Seminary Road, along with the operations of the ramp terminal intersections and cross street corridor. The existing conditions along northbound I-395 general purpose lanes indicate moderate to high congestion (LOS D - LOS E) between Duke Street and King Street interchanges during the morning peak hour, and light to moderate traffic (LOS B - LOS C) during the evening peak hour. The existing conditions along southbound I-395 general purpose lanes indicate light to high congestion (LOS C - LOS E) between Duke Street and King Street interchanges during the morning peak hour, and light to severe congestion (LOS C - LOS F) during the evening peak hour[39]. An overall analysis of the I-395 corridor including adjacent interchanges should be performed to accurately identify the operational impacts. Table 4-6 shows some of the traffic flow parameters used in developing the simulation models for the Mark Center traffic analysis.

Table 4-6: Traffic Flow Parameters used in the CORSIM Model

Roadway	Free Flow Speed	Truck %	Lane widths
I-395 GP Mainline	65 mph	4%	12 ft
I-395 HOV Mainline	70 mph	1%	12 ft
I-395 Entrance Ramps	35 mph	2%	15 ft
I-395 Exit Ramps	35 mph	2%	15 ft
Seminary Road	35 mph	2%	12 ft
N Beauregard Street	35 mph	2%	12 ft
Mark Center Drive	25 mph	2%	12 ft

The Erlang distribution type with and Erlang distribution shape parameter value of one (1) was used for vehicle entry headways.

CORSIM does not allow actuated-coordinated type controls for multiple intersections controlled by one master controller. To obtain optimum interchange performance, the ramp terminal intersections at the Seminary Road rotary interchange were modeled as actuated-uncoordinated type controls, with the signal phasing and timing calibrated to simulate coordination conditions. Optimized signal timing and coordination plans were used in developing the 2011 baseline traffic models without BRAC improvements.

A 30 to 80 second dwell time was assumed for bus transit and shuttle bus vehicles traveling through the modeled roadway network. The lower range of dwell times were allotted to transit vehicles that did not have exclusive bus bays and stopped along the traffic lanes blocking the through traffic operations.

CORSIM assumes 100 percent possibility of a vehicle discharging and joining a spillback during queue overflow and spillback from downstream intersections. The default factors were adjusted to assume zero probability of vehicles discharging and joining a spillback. MUTCD recommended “Do Not Block Intersection” (R10-7) signs should be installed along BRAC 133 internal roadway network at intersection

[39] *Mark Center (BRAC 133) Access Study Operational Analysis Report, VDOT web site* http://www.vamegaprojects.com/faqsdocuments/mark-center-documents (last accessed May 1, 2010).

crossings, especially at exit points from parking garages to reduce the likelihood of traffic from joining queues and obstructing other intersection approaches from discharging.

CORSIM assumes that 50 percent of the drivers within any modeled traffic network cooperating with a lane-change behavior will slow down to allow a lane change to occur in front of them. This default value was modified based on site observations to show 60 percent of drivers cooperating with a lane change maneuver. Existing conditions indicate that drivers are more cognizant of the various lane change maneuvers occurring along Seminary Road and North Beauregard Street, and in fact slow down to let other drivers change lanes in front of them.

Even though CORSIM does not explicitly model roundabout movements, it can be used to indirectly model one by accurately coding the traffic movements through the roundabout to their destination nodes, and by modifying gap acceptance parameters for driver types. The proposed roundabout at WHS Circle/IDA Drive - North Parking Garage was modeled in CORSIM. The default right turn gap acceptance parameters within the NETSIM setup were modified for the various driver types to accurately reflect gap acceptance behaviors at roundabouts. Table 4-7 shows the modifications to the gap acceptance parameters for various driver types.

Table 4-7: Modifications to Driver Gap Acceptance Parameters for NETSIM Right Turns

Parameters	Random Driver Type From Least Aggressive Driver to Most Aggressive Driver									
	1	2	3	4	5	6	7	8	9	10
CORSIM Default Gap Acceptance	10.0	8.8	8.0	7.2	6.4	6.0	5.6	5.2	4.8	3.6
Modified Gap Acceptance for Roundabout Behavior	8.1	6.9	6.1	5.3	4.5	4.1	3.7	3.3	2.9	1.7

4.4.3 Transit Routes and Schedules

Existing public bus transit and shuttle bus routes and their service schedules within the study area were reviewed and summarized for morning and evening peak period and peak hour trips, route origin and destination points and bus stop locations. This data was coded in the traffic simulation model to accurately reflect the vehicle flow and vehicular interactions within the roadway network. Public bus transit service through the region is offered by DASH, and WMATA. Duke Realty Corporation, IDA, and CNA operate private shuttle bus service between Mark Center and the Pentagon Metro Station during hours for their tenant organizations. The proposed DoD shuttle bus trips to serve BRAC 133 were also included as part of the 2011 projected traffic simulation model (See Section 3.3.1 for details on existing public bus transit serving Mark Center and Appendix B for all the existing public transit bus routes).

Table 4-8 summarizes the bus routes and service trips that were included in the traffic simulation model. This table is different from that in Section 3, in that it shows all the buses including public transit and shuttles utilizing roadway networks in the study area whereas Table 3-1 summarizes buses that directly serve BRAC 133 employees within a half mile walking distance.

Table 4-8: Service Schedule and Routes of Bus Transit and Shuttle Bus Services adjacent to Mark Center

Transit Agency	Route Number	Route Connection	Direction of Travel	Morning Peak Period 6:00 - 9:00 AM				Evening Peak Period 3:00 - 6:00 PM			
				Total # of Bus Trips	AM Peak Hour Trips	Peak Hour Headway (min)	Peak Hour Offset (min)	Total # of Bus Trips	PM Peak Hour Trips	Peak Hour Headway (min)	Peak Hour Offset (min)
DASH[1]	AT1	Van Dorn / Eisenhower Metro - Seminary Plaza	Northbound	7	2	25	19	7	2	25	14
			Southbound	7	2	30	28	7	2	30	28
DASH	AT2	Lincolnia (Landmark Mall) - King Street / Braddock Metro	Eastbound	9	3	17	11	7	2	30	5
			Westbound	7	2	30	15	9	3	20	12
WMATA[2]	7A,7F	Lincolnia - North Fairlington Line / Pentagon Metro	Northbound	0	0	-	-	6	2	29	23
			Southbound	6	2	25	21	2	0	-	-
WMATA	7W,7X	Lincolnia - North Fairlington Line / Pentagon Metro	Northbound	20	11	5.5	4	0	0	-	-
			Southbound	0	0	-	-	14	6	10	0
WMATA	16L	Annandale - Skyline City - Pentagon Metro	Eastbound	2	2	30	0	0	0	-	-
			Westbound	0	0	-	-	1	1	60	0
WMATA	25B	Landmark - Ballston MU	Northbound	6	2	30	26	6	2	30	5
			Southbound	6	1	30	25	6	2	30	5
WMATA	28A	Alexandria / King Street Metro - Tysons Corner	Eastbound	6	2	30	26	6	2	30	7
			Westbound	6	2	30	7	6	2	30	20
WMATA	28F	Skyline City - Pentagon Metro	Northbound	0	0	-	-	7	2	25	18
			Southbound	6	2	25	11	0	0	-	-
WMATA	28G	Skyline City - Pentagon Metro	Northbound	8	2	25	14	0	0	-	-
			Southbound	0	0	-	-	8	3	20	5
IDA/CNAC[3]	Shuttle	Pentagon Metro - Mark Center	-	12	4	15	0	12	4	15	0
Duke[4]	Shuttle	Pentagon Metro - Mark Center	-	21	10	6	0	11	5	12	0
Proposed DoD Shuttle Plan[5]	Shuttle	Pentagon Metro - Mark Center	-	18	6	10	0	18	6	10	0
		King Street Metro - Mark Center	-	18	6	10	0	18	6	10	0
		Ballston Metro - Mark Center	-	18	6	10	0	18	6	10	0
		East Falls Church - Mark Center	-	18	6	10	0	18	6	10	0
		West Falls Church - Mark Center	-	18	6	10	0	18	6	10	0

Notes:

[1]WMATA bus schedule data obtained from http://www.wmata.com Metrobus Virginia Timetables

[2]DASH bus schedule data obtained from http://www.dashbus.com DASH system maps routes and schedules

[3]IDA/CNAC shuttle schedules obtained from WHS

[4]Duke shuttle schedules obtained from Mark Center Express flyer

[5]Proposed DoD shuttle plan Alternative 1 - obtained from WHS April 10, 2010

4.4.4 Traffic Operational Measures of Effectiveness

Traffic operations of the transportation elements are usually defined in terms of level of service (LOS) with the designations ranging from LOS A to LOS F. LOS A indicates free flow and LOS F indicates forced flow or breakdown conditions. The LOS of the various transportation elements are defined in terms of varying measures of effectiveness pertinent to the functional classification of the facility.

Traffic flow conditions and LOS of freeway mainline and ramps are usually measured in terms of density expressed in vehicles per mile per lane (vpmpl). Density is defined as the total number of vehicles occupying a given length of a lane at a given time. Speed of the traffic stream will also be considered since it helps assess the service quality of the facility. Threshold values of density help determine LOS of the freeway and ramp facilities.

The LOS for signalized intersections is usually measured in terms of control delay values. The average control delay per vehicle in every lane group of the intersection approach is aggregated to obtain the overall control delay of the intersection. Control delay is expressed in seconds per vehicle (s/veh). The aggregation of control delay for every individual lane group at intersection approaches helps identify individual movements operating inefficiently, and consequently, hindering overall intersection operations. Threshold values of control delay per vehicle help determine LOS of the signalized intersections and its approaches.

The operation of multilane arterials is usually measured in terms of density, speed, and volume to capacity ratios. The LOS is usually defined in terms of density measured in vpmpl. Driver freedom to maneuver and change lanes is restricted at higher densities resulting in lower operating speeds. Forced flow or flow breakdown occurs when the vehicular demand or arrival rate exceeds that of the discharge rate. Volume to capacity (v/c) ratios greater than 1.0 indicates vehicular demand exceeding available capacity. The LOS for urban arterials is also influenced by the total number of signalized intersections per mile, signal timing and signal coordination. Poor coordination can result in spillback affecting operations of downstream intersections. Threshold values of density and speed help determine LOS of the freeway and ramp facilities.

The traffic operations of un-signalized intersections or roundabouts can be analyzed for individual approaches only and not for the whole intersection. LOS is measured in terms of control delay expressed in seconds per vehicle (s/veh). Threshold values of control delay values help determine LOS for the individual movements at unsignalized intersections or roundabouts. The capacity of a roundabout is however, dependent mainly on the gap acceptance behavior of the drivers with respect to critical gap and follow-up time parameters.

Table 4-9 shows the range of the Highway Capacity Manual (HCM) recommended threshold values for various roadway elements and their measures of effectiveness that can be used to determine LOS for the study area roadway network. The cumulative measures of effectiveness obtained from CORSIM output reports were compared against the threshold values to determine LOS and operational conditions.

Table 4-9: HCM Recommended Threshold Values of Measures of Effectiveness for LOS Determination

LOS	Freeway Density Range (vpmpl)	Ramp Segment Density Range (vpmpl)	Intersection Control Delay per vehicle (s/veh)	Class III Urban Street (typical speed of 35 mph)	Roundabout Average Control Delay [1] (s/veh)
A	0-11	≤ 10	≤ 10	> 30	0-10
B	> 11-18	> 10-20	> 10-20	> 24-30	> 10-15
C	> 18-26	> 20-28	> 20-35	> 18-24	> 15-25
D	> 26-35	> 28-35	> 35-55	> 14-18	> 25-35
E	> 35-45	> 35	> 55-80	> 10-14	> 35-50
F	> 45	Note 2	> 80	<= 10	> 50

Note:
1. Data Source - 2010 Highway Capacity Manual
2. Demand exceeds capacity

4.4.5 Baseline Traffic Operations without Improvements

Traffic operational analysis of existing roadway network with 2011 baseline traffic volumes without any proposed BRAC 133 generated traffic was performed using CORSIM and Synchro analysis tools. The existing roadway geometry and lane configuration previously shown in Figure 4.3 and the baseline (2011) traffic volumes previously shown in Figure 4-4 were used as primary inputs to perform the existing condition traffic operational analysis for the morning and evening peak hour demands. Optimized signal timing and coordination plans were used in developing the 2011 baseline traffic models without BRAC improvements. Multiple simulation runs were made by changing the random seed values for vehicle entry headways, driver responses to traffic choices including gap acceptance, lane change and queue blockages, and driver and vehicle behavior assignment of to surface street vehicles. The data from the multiple runs was evaluated for the baseline condition morning and evening peak hour analysis. Flow rate, speed and density data for freeway mainline and ramp links, and flow rate, control delay, and maximum queue lengths by intersection approach movements for surface links were obtained from the simulation output reports to determine roadway traffic operations.

Table 4-10 and Table 4-11 show the 2011 baseline traffic operational analysis results for I-395 mainline and ramp sections including speed, density, and LOS. Table 4-12 and Table 4-13 show the 2011 baseline traffic operational analysis results of the arterial network including control delay, LOS and traffic queues by lane group movement, intersection approach and overall intersection, for all the signalized intersections within the study area. In Tables 4-10 through 4-14, intersections with the highest levels of congestion (LOS E and LOS F) have been highlighted for ease of reference.

Results of the 2011 baseline operational analysis without BRAC improvements indicate most of the freeway network and overall signalized intersections operating at acceptable LOS, except for the Seminary Road and North Beauregard Street intersection that operates at a LOS E during the morning and evening peak hours, and the southeast rotary intersection that operates at a LOS E during the morning peak hour. However, as can be seen from Table 4-12 and Table 4-13, many of the lane group movements and intersection approaches operate at unacceptable LOS for the 2011 baseline condition.

These degrading operations at the individual approaches will eventually lead to the failure of the overall intersection.

In addition to the above analysis, all the LOS results obtained from the prior traffic operational analysis and transportation studies conducted for the study area roadway network were summarized for comparison. Table 4-14 shows the comparative summary of LOS results from prior studies. In Tables 4-10 through 4-14, intersections with the highest levels of congestion (LOS E and LOS F) have been highlighted for ease of reference.

Table 4-10: Freeway Measures of Effectiveness for the Morning (AM) Peak Hour 2011 Baseline Traffic Operational Analysis without Improvements

		LOCATION		NODE		LENGTH (ft)	VOLUMES			LINK STATISTICS			AGGREGATE STATISTICS			REMARKS
		From	To	From	To		Actual	Simulated	Difference	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS	
I-395 GENERAL PURPOSE (GP) & HIGH OCCUPANCY VEHICLE (HOV) LANES	I-395 NORTHBOUND MAINLINE	NB GP	Begin I-395 GP Lanes South of Seminary Road Interchange	1000	1001	692	6300	6296	-4	62	35	D	61	32	D	NB Freeway Mainline
				1001	1002	803	6300	6299	-1	61	34	D				NB Freeway Mainline
				1002	1005	1073	6300	6310	10	59	28	D				NB Freeway Mainline
		NB GP	Seminary Road Exit Ramp	1005	1006	790	5410	5415	5	61	29	D	61	30	D	NB Freeway Mainline
				1006	1008	1235	5410	5420	10	61	30	D				NB Freeway Mainline
				1008	1010	860	5410	5422	12	61	30	D				NB Freeway Mainline
		NB GP	Seminary Road Entrance Ramp	1010	1011	1093	6930	6720	-210	57	26	C	57	27	D	NB Freeway Mainline
				1011	1015	706	6930	6729	-201	57	29	D				NB Freeway Mainline
		NB GP	King Street Exit Ramp	1015	1017	635	5890	5691	-199	60	32	D	60	31	D	NB Freeway Mainline
		NB GP	End I-395 North of Seminary Road Interchange	1017	1019	485	5890	5691	-199	61	31	D				NB Freeway Mainline
		NB HOV	Begin I-395 HOV Lanes South of Seminary Road Interchange	1052	1053	643	3370	3353	-17	67	26	C	66	26	C	NB Freeway Mainline
				1053	1054	534	3370	3355	-15	68	25	C				NB Freeway Mainline
				1054	1056	501	3370	3357	-13	67	25	C				NB Freeway Mainline
				1056	1057	417	3370	3358	-12	66	25	C				NB Freeway Mainline
				1057	1058	513	3370	3361	-9	66	26	C				NB Freeway Mainline
				1058	1060	616	3370	3365	-5	65	26	C				NB Freeway Mainline
				1060	1062	560	3370	3370	0	65	26	C				NB Freeway Mainline
				1062	1063	525	3370	3373	3	65	26	C				NB Freeway Mainline
				1063	1064	571	3370	3370	0	65	26	C				NB Freeway Mainline
				1064	1066	675	3370	3370	0	65	26	C				NB Freeway Mainline
		NB HOV	Seminary Road HOV Entrance Ramp	1066	1067	1074	3490	3479	-11	64	20	C	65	27	D	NB Freeway Mainline
		NB HOV	End I-395 HOV Lanes North of Seminary Road Interchange	1067	1068	1010	3490	3481	-9	65	27	D				NB Freeway Mainline
	I-395 SOUTHBOUND MAINLINE	SB GP	Begin I-395 GP Lanes North of Seminary Road Interchange	2001	2002	812	3820	3822	2	64	15	B	64	15	B	SB Freeway Mainline
		SB GP	King Street Entrance Ramp	2002	2004	1209	4170	4180	10	60	14	B	60	14	B	SB Freeway Mainline
		SB GP	Seminary Road Exit Ramp	2004	2005	502	3450	3511	61	63	14	B	63	14	B	SB Freeway Mainline
				2005	2007	920	3450	3515	65	63	14	B				SB Freeway Mainline
				2007	2009	1142	3450	3512	62	63	14	B				SB Freeway Mainline
				2009	2012	1179	3450	3524	74	63	14	B				SB Freeway Mainline
		SB GP	Seminary Road Entrance Ramp	2012	2014	570	4210	4169	-41	56	17	B	59	17	B	SB Freeway Mainline
		SB GP	End I-395 South of Seminary Road Interchange	2014	2015	728	4210	4169	-41	61	17	B				SB Freeway Mainline
	I-395 NORTHBOUND RAMPS	NB GP	Seminary Road Exit Ramp	1005	1201	299	890	953	63	34	28	D	34	28	D	Diverge Ramp Section
				1201	7002	203	890	951	61	34	28	D				Diverge Ramp Section
				7002	1203	232	890	884	-6	43	-	A				Class III Type Urban Arterial
		NB GP	Seminary Road Entrance Ramp	1206	1208	232	1520	1299	-221	27	-	B	34	20	C	Class III Type Urban Arterial
				1208	7003	201	1520	1300	-220	33	-	A				Class III Type Urban Arterial
				7003	1210	221	1520	1312	-208	34	21	C				Merge Ramp Section
				1210	1010	234	1520	1315	-205	34	19	B				Merge Ramp Section
		NB HOV	Seminary Road Entrance Ramp	1212	1213	358	120	91	-29	27	-	B	47	2	A	Class III Type Urban Arterial
				1213	7005	331	120	91	-29	37	-	A				Class III Type Urban Arterial
				7005	1070	339	120	110	-10	45	3	A				Merge Ramp Section
				1070	1066	306	120	110	-10	49	2	A				Merge Ramp Section
	I-395 SOUTHBOUND RAMPS	SB GP	Seminary Road Exit Ramp	2004	2201	313	720	675	-45	35	10	A	35	10	A	Diverge Ramp Section
				2201	7004	485	720	676	-44	35	10	A				Diverge Ramp Section
				7004	2204	491	720	613	-107	39	-	A				Class III Type Urban Arterial
				2204	2205	376	720	616	-104	26	-	B				Class III Type Urban Arterial
		SB GP	Seminary Road Entrance Ramp	2213	2215	197	760	658	-102	32	-	A	32	16	B	Class III Type Urban Arterial
				2215	7001	371	760	659	-101	33	-	A				Class III Type Urban Arterial
				7001	2216	279	760	701	-59	32	12	B				Merge Ramp Section
				2216	2012	427	760	699	-61	32	19	B				Merge Ramp Section

Table 4-11: Freeway Measures of Effectiveness for the Evening (PM) Peak Hour 2011 Baseline Traffic Operational Analysis without Improvements

	LOCATION		NODE		LENGTH (ft)	VOLUMES			LINK STATISTICS			AGGREGATE STATISTICS			REMARKS
	From	To	From	To		Actual	Simulated	Difference	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS	
I-395 NORTHBOUND MAINLINE	NB GP	Begin I-395 GP Lanes South of Seminary Road Interchange	1000	1001	692	5510	5499	-11	62	30	D				NB Freeway Mainline
			1001	1002	803	5510	5496	-14	61	30	D	**60**	**28**	**D**	NB Freeway Mainline
			1002	1005	1073	5510	5486	-24	58	24	C				NB Freeway Mainline
	NB GP	Seminary Road Exit Ramp	1005	1006	790	4400	4309	-91	62	23	C				NB Freeway Mainline
			1006	1008	1235	4400	4293	-107	62	23	C	**62**	**23**	**C**	NB Freeway Mainline
			1008	1010	860	4400	4295	-105	62	23	C				NB Freeway Mainline
	NB GP	Seminary Road Entrance Ramp	1010	1011	1093	5335	5241	-94	58	20	C	**58**	**21**	**C**	NB Freeway Mainline
			1011	1015	706	5335	5240	-95	57	23	C				NB Freeway Mainline
	NB GP	King Street Exit Ramp	1015	1017	635	4055	3940	-115	62	21	C	**62**	**21**	**C**	NB Freeway Mainline
	NB GP	End I-395 North of Seminary Road Interchange	1017	1019	485	4055	3942	-113	62	21	C				NB Freeway Mainline
I-395 SOUTHBOUND MAINLINE	SB GP	Begin I-395 GP Lanes North of Seminary Road Interchange	2001	2002	812	5940	5942	2	63	24	C	**61**	**22**	**C**	SB Freeway Mainline
	SB GP	King Street Entrance Ramp	2002	2004	1209	6430	6433	3	60	21	C				SB Freeway Mainline
	SB GP	Seminary Road Exit Ramp	2004	2005	502	5380	5517	137	62	22	C				SB Freeway Mainline
			2005	2007	920	5380	5527	147	62	22	C	**62**	**22**	**C**	SB Freeway Mainline
			2007	2009	1142	5380	5523	143	62	22	C				SB Freeway Mainline
			2009	2012	1179	5380	5515	135	61	23	C				SB Freeway Mainline
	SB GP	Seminary Road Entrance Ramp	2012	2014	570	6768	6728	-40	48	32	D	**54**	**30**	**D**	SB Freeway Mainline
	SB GP	End I-395 South of Seminary Road Interchange	2014	2015	728	6768	6718	-50	58	29	D				SB Freeway Mainline
	SB HOV	Begin I-395 HOV Lanes South of Seminary Road Interchange	1068	1067	1010	3290	3293	3	67	25	C	**67**	**25**	**C**	SB Freeway Mainline
			1067	1066	1066	3290	3299	9	66	25	C				SB Freeway Mainline
	SB HOV	Seminary Road Exit Ramp	1066	1064	685	3190	3171	-19	65	24	C				SB Freeway Mainline
			1064	1063	564	3190	3171	-19	66	24	C				SB Freeway Mainline
			1063	1062	582	3190	3167	-23	66	24	C				SB Freeway Mainline
			1062	1060	505	3190	3167	-23	66	24	C				SB Freeway Mainline
			1060	1058	616	3190	3170	-20	66	24	C				SB Freeway Mainline
			1058	1057	513	3190	3170	-20	65	24	C	**82**	**27**	**D**	SB Freeway Mainline
			1057	1056	417	3190	3172	-18	65	24	C				SB Freeway Mainline
			1056	1054	477	3190	3175	-15	65	24	C				SB Freeway Mainline
			1054	1053	456	3190	3181	-9	65	24	C				SB Freeway Mainline
	SB HOV	End I-395 HOV Lanes North of Seminary Road Interchange	1053	1052	654	3190	3182	-8	65	24	C				SB Freeway Mainline
I-395 NORTHBOUND RAMPS	NB GP	Seminary Road Exit Ramp	1005	1201	299	1110	1171	61	33	35	E	**33**	**35**	E	Diverge Ramp Section
			1201	7002	203	1110	1170	60	33	35	E				Diverge Ramp Section
			7002	1203	232	1110	1170	60	43	-	A				Class III Type Urban Arterial
	NB GP	Seminary Road Entrance Ramp	1206	1208	232	935	941	6	29	-	B				Class III Type Urban Arterial
			1208	7003	201	935	941	6	32	-	A				Class III Type Urban Arterial
			7003	1210	221	935	941	6	34	15	B	**34**	**14**	**B**	Merge Ramp Section
			1210	1010	234	935	942	7	34	14	B				Merge Ramp Section
I-395 SOUTHBOUND RAMPS	SB GP	Seminary Road Exit Ramp	2004	2201	313	1050	921	-129	35	13	B	**35**	**13**	**B**	Diverge Ramp Section
			2201	7004	485	1050	923	-127	35	13	B				Diverge Ramp Section
			7004	2204	491	1050	920	-130	38	-	A				Class III Type Urban Arterial
			2204	2205	376	1050	920	-130	28	-	B				Class III Type Urban Arterial
	SB GP	Seminary Road Entrance Ramp	2213	2215	197	1388	1226	-162	30	-	B				Class III Type Urban Arterial
			2215	7001	371	1388	1220	-168	32	-	A				Class III Type Urban Arterial
			7001	2216	279	1388	1217	-171	32	21	C	**32**	**29**	**D**	Merge Ramp Section
			2216	2012	427	1388	1211	-177	31	35	D				Merge Ramp Section
	SB HOV	Seminary Road Exit Ramp	1066	1070	317	100	125	25	49	3	A	**49**	**3**	**A**	Diverge Ramp Section
			1070	7005	352	100	125	25	50	3	A				Diverge Ramp Section
			7005	1213	340	100	125	25	56	-	A				Class III Type Urban Arterial
			1213	1212	329	100	126	26	34	-	A				Class III Type Urban Arterial
			1212	1211	130	100	126	26	16	-	C				Class IV Type Urban Arterial

Table 4-12: Arterial Measures of Effectiveness for the Morning (AM) Peak Hour 2011 Baseline Traffic Operational Analysis without Improvements

		Location	Approach	Link	Demand Volumes				Modelled Volumes				Demand Volumes			Model Demand		Control Delay By Movement			LOS By Movement			LOS By Approach		LOS By Intersection		*Modelled Storage and Maximum Traffic Queuing (ft)*					
																												Through		Left Turn		Right Turn	
					Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	%	Left	Thru	Right	Left	Thru	Right	Delay	LOS	Delay	LOS	Link Length (ft)	Queue (ft)	Storage (ft)	Queue (ft)	Storage (ft)	Queue (ft)
MARK CENTER (BRAC 133) TRAFFIC ANALAYSIS STUDY AREA	LIBRARY LANE	Library Lane / Seminary Road Intersection (Node #5003)	WB	5002-5003	20	1301	91	1412	24	1308	76	1408	4	7	-15	-4	0%	14	9	7	B	A	A	9	A	10	A	310	720	50	120	-	-
			NB	6017-5003	36	5	5	46	41	5	1	47	5	0	-4	1	2%	29	27	3	C	C	A	28	C			264	100	-	-	-	-
			EB	5005-5003	212	798	11	1021	235	823	9	1067	23	25	-2	46	5%	22	5	11	C	A	B	9	A			311	160	150	140	-	-
			SB	6018-5003	41	5	15	61	43	4	13	60	2	-1	-2	-1	-2%	32	39	17	C	D	B	29	C			216	120	-	-	-	-
	I-395 / SEMINARY ROAD ROTARY INTERCHANGE	Southeast Intersection (Node #5015)	NB	1203-5015	0	692	198	890	0	733	215	948	0	41	17	58	7%	0	33	45	-	C	D	35	D	56	E	618	460	-	-	-	-
			EB	5013-5015	758	301	0	1059	694	290	0	984	-64	-11	0	-75	-7%	79	63	0	E	E	-	74	E			331	300	331	280	-	-
		Northeast Intersection (Node #5010)	NB	5015-5010	559	60	831	1450	564	59	801	1424	5	-1	-30	-26	-2%	7	17	21	A	B	C	15	B	23	C	276	240	276	200	-	-
			WB	5009-5010	0	327	60	387	0	278	51	329	0	-49	-9	-58	-15%	0	53	42	-	D	D	51	D			160	140	-	-	-	-
		Northwest Intersection (Node #5012)	WB	5010-5012	267	619	0	886	273	567	0	840	6	-52	0	-46	-5%	4	4	0	A	A	-	4	A	16	B	300	140	300	180	-	-
			SB	2205-5012	0	233	0	233	0	213	0	213	0	-20	0	-20	-9%	0	59	0	-	E	A	59	E			281	140	-	-	-	-
		Southwest Intersection (Node #5013)	SB	5012-5013	214	286	0	500	215	269	0	484	1	-17	0	-16	-3%	59	19	0	E	B	-	36	D	52	D	259	120	259	160	-	-
			WB	5019-5013	0	845	0	845	0	786	0	786	0	-59	0	-59	-7%	0	60	0	-	E	-	60	E			357	340	-	-	-	-
	MARK CENTER DRIVE	Mark Center Drive / Seminary Road Intersection (Node #5022)	WB 1	5021-5022	181	729	35	945	154	525	19	698	-27	-204	-16	-247	-26%	76	7	3	E	A	A	22	C	23	C	243	160	243	220	-	-
			WB 2	5018-5022	0	1050	56	1106	0	980	49	1029	0	-70	-7	-77	-7%	0	14	14	-	B	B	14	B			637	440	-	-	-	-
			NB	5060-5022	10	11	131	152	15	9	134	158	5	-2	3	6	4%	82	63	10	F	E	A	20	B			340	60	340	60	340	60
			EB	5023-5022	20	1348	67	1435	33	1322	41	1396	13	-26	-26	-39	-3%	55	15	0	D	B	A	15	B			395	300	150	80	395	160
			SB	5045-5022	232	50	50	332	235	47	46	328	3	-3	-4	-4	-1%	93	88	10	F	F	A	80	F			252	240	252	200	252	40
	N. BEAUREGARD STREET	N. Beauregard Street / Seminary Road Intersection (Node #5025)	WB	5023-5025	545	1112	0	1657	464	968	0	1432	-81	-144	0	-225	-14%	55	14	0	D	B	-	28	C	63	E	341	280	341	340	-	-
			NB	6004-5025	455	545	0	1000	369	454	0	823	-86	-91	0	-177	-18%	289	56	0	F	E	-	161	F			347	380	175	160	-	-
			EB	5026-5025	61	991	0	1052	56	988	0	1044	-5	-3	0	-8	-1%	79	35	0	E	C	-	37	D			323	300	100	100	-	-
			SB	6002-5025	91	157	40	288	90	158	39	287	-1	1	-1	-1	0%	75	41	27	E	D	C	50	D			250	120	135	120	-	-
		N. Beauregard Street / Mark Center Drive (Node #6005)	WB	5032-6005	15	5	15	35	26	12	26	64	11	7	11	29	83%	86	80	10	F	E	B	54	D	51	D	286	40	-	-	286	60
			NB	6007-6005	51	1328	182	1561	38	1172	151	1361	-13	-156	-31	-200	-13%	117	57	86	F	E	F	62	E			329	320	150	100	-	-
			EB	5030-6005	10	5	6	21	13	6	2	21	3	1	-4	0	0%	84	39	2	F	D	A	63	E			203	100	-	-	-	-
			SB	6004-6005	359	425	81	865	351	359	75	785	-8	-66	-6	-80	-9%	60	4	2	E	A	A	29	C			435	420	350	380	-	-

Table 4-13: Arterial Measures of Effectiveness for the Evening (PM) Peak Hour 2011 Baseline Traffic Operational Analysis without Improvements

		Location	Approach	Link	Demand Volumes				Modelled Volumes				Demand Volumes			Model Demand		Control Delay By Movement			LOS By Movement			LOS By Approach		LOS By Intersection		*Modelled Storage and Maximum Traffic Queuing (ft)*					
																												Through		Left Turn		Right Turn	
					Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	%	Left	Thru	Right	Left	Thru	Right	Delay	LOS	Delay	LOS	Link Length (ft)	Queue (ft)	Storage (ft)	Queue (ft)	Storage (ft)	Queue (ft)
MARK CENTER (BRAC 133) TRAFFIC ANALAYSIS STUDY AREA	LIBRARY LANE	Library Lane / Seminary Road Intersection (Node #5003)	WB	5002-5003	25	808	40	873	23	819	37	879	-2	11	-3	6	1%	21	9	5	C	A	A	9	A	10	A	310	160	50	40	-	-
			NB	6017-5003	52	5	10	67	53	5	6	64	1	0	-4	-3	-4%	34	27	31	C	C	C	33	C			264	80	-	-	-	-
			EB	5005-5003	223	1192	21	1436	245	1217	13	1475	22	25	-8	39	3%	11	6	4	B	A	A	7	A			311	160	150	120	-	-
			SB	6018-5003	86	15	30	131	91	16	23	130	5	1	-7	-1	-1%	38	44	23	D	D	C	36	D			216	200	-	-	-	-
	I-395 / SEMINARY ROAD ROTARY INTERCHANGE	Southeast Intersection (Node #5015)	NB	1203-5015	0	735	375	1110	0	721	399	1120	0	-14	24	10	1%	0	17	19	A	B	B	18	B	21	C	618	300	-	-	-	-
			EB	5013-5015	485	913	0	1398	464	825	0	1289	-21	-88	0	-109	-8%	21	23	0	C	C	A	22	C			331	260	331	200	-	-
		Northeast Intersection (Node #5010)	NB	5015-5010	569	651	0	1220	515	667	0	1182	-54	16	0	-38	-3%	9	7	0	A	A	A	8	A	10	A	276	120	276	200	-	-
			WB	5009-5010	0	309	0	309	0	319	0	319	0	10	0	10	3%	0	15	0	A	B	A	15	B			160	120	-	-	-	-
		Northwest Intersection (Node #5012)	WB	5010-5012	304	674	0	978	282	639	0	921	-22	-35	0	-57	-6%	10	9	0	A	A	A	10	A	12	B	300	100	300	100	-	-
			SB	2205-5012	0	632	0	632	0	523	0	523	0	-109	0	-109	-17%	0	16	0	A	B	A	16	B			281	180	-	-	-	-
		Southwest Intersection (Node #5013)	SB	5012-5013	630	306	0	936	557	247	0	804	-73	-59	0	-132	-14%	8	8	0	A	A	A	8	A	10	A	259	140	259	120	-	-
			WB	5019-5013	0	768	0	768	0	722	0	722	0	-46	0	-46	-6%	0	11	0	A	B	A	11	B			357	140	-	-	-	-
	MARK CENTER DRIVE	Mark Center Drive / Seminary Road Intersection (Node #5022)	WB 1	5021-5022	71	536	39	646	63	573	35	671	-8	37	-4	25	4%	63	11	15	E	B	B	16	B	21	C	243	160	243	120	-	-
			WB 2	5018-5022	0	1030	62	1092	0	970	45	1015	0	-60	-17	-77	-7%	0	24	20	A	C	B	24	C			637	580	-	-	-	-
			NB	5060-5022	81	52	506	639	65	38	398	501	-16	-14	-108	-138	-22%	70	70	18	E	E	B	28	C			340	160	340	160	340	140
			EB	5023-5022	35	1680	28	1743	52	1668	23	1743	17	-12	-5	0	0%	66	11	0	E	B	A	13	B			395	220	150	80	395	120
			SB	5045-5022	187	10	71	268	192	9	68	269	5	-1	-3	1	0%	66	73	17	E	E	B	54	D			252	200	252	100	252	80
	N. BEAUREGARD STREET	N. Beauregard Street / Seminary Road Intersection (Node #5025)	WB	5023-5025	605	1221	0	1826	483	979	0	1462	-122	-242	0	-364	-20%	82	18	0	F	B	A	39	D	61	E	341	280	341	200	-	-
			NB	6004-5025	386	456	0	842	367	446	0	813	-19	-10	0	-29	-3%	199	57	0	F	E	A	121	F			347	380	175	160	-	-
			EB	5026-5025	106	1214	0	1320	99	1212	0	1311	-7	-2	0	-9	-1%	136	31	0	F	C	A	38	D			323	300	100	100	-	-
			SB	6002-5025	156	438	46	640	153	429	48	630	-3	-9	2	-10	-2%	167	49	48	F	D	D	78	E			250	240	135	160	-	-
		N. Beauregard Street / Mark Center Drive (Node #6005)	WB	5032-6005	116	5	90	211	96	3	92	191	-20	-2	2	-20	-9%	62	89	5	E	F	A	35	C	23	C	286	260	-	-	286	60
			NB	6007-6005	45	1010	20	1075	45	1018	12	1075	0	8	-8	0	0%	70	9	3	E	A	A	12	B			329	280	150	80	-	-
			EB	5030-6005	72	20	31	123	78	18	19	115	6	-2	-12	-8	-7%	62	66	47	E	E	D	60	E			203	200	-	-	-	-
			SB	6004-6005	76	1350	15	1441	90	1174	16	1280	14	-176	1	-161	-11%	59	23	36	E	C	D	25	C			435	460	350	80	-	-

Table 4-14: Comparison of LOS Analysis to Previous Studies (Existing Conditions without BRAC 133)

Intersection	Intersection Approach	Wells & Associates Original TIS/TMP for NCPC, 2003 (Analysis Year 2002-2003)				Wells & Associates TIMP 2008 (Analysis Year 2008)				VHB Mark Center (BRAC 133) Study, City of Alexandria, 2009 (Analysis Year 2008)				PB Mark Center (BRAC 133) Study VDOT (Analysis Year 2008)				Mark Center (BRAC 133) IJR VDOT, 2010 (Analysis Year 2008)				Mark Center (BRAC 133) TMP USACE, 2010 (Analysis Year 2011)			
		By Approach		By Intersection		By Approach		By Intersection		By Approach		By Intersection		By Approach		By Intersection		By Approach		By Intersection		By Approach		By Intersection	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Seminary Rd. / Library Ln.	Eastbound									A	A							A	A			A	A		
	Westbound									A	B	A	B					B	B	B	B	A	C	A	A
	Northbound									E	D							D	D			C	A		
	Southbound									D	E							D	D			C	D		
I-395 NB Off-Ramp / Seminary Rd. (Southeast Rotary Intersection)	Eastbound	C	C	B	C	B	C	B	C	A	A	F	F	A	A	D	E	A	B	F	F	E	C	E	C
	Westbound	-	-			-	-			-	-			-	-			-	-			-	-		
	Northbound	C	C			B	B			F	F			F	F			F	F			D	B		
	Southbound	-	-			-	-			-	-			-	-			-	-			-	-		
I-395 NB On-Ramp / Seminary Rd. (Northeast Rotary Intersection)	Eastbound	-	-	C	C	-	-	B	B	-	-	B	B	-	-	B	B	-	-	B	B	-	-	C	A
	Westbound	C	C			C	C			C	D			C	D			C	D			D	B		
	Northbound	B	C			B	B			A	A			A	A			A	A			B	A		
	Southbound	-	-			-	-			-	-			-	-			-	-			-	-		
I-395 SB Off-Ramp / Seminary Rd. (Northwest Rotary Intersection)	Eastbound	-	-	B	C	-	-	B	C	-	-	B	C	-	-	B	C	-	-	B	C	-	-	B	B
	Westbound	C	B			C	C			A	A			A	A			A	A			A	A		
	Northbound	-	-			-	-			-	-			-	-			-	-			-	-		
	Southbound	B	C			B	C			C	D			C	D			C	E			E	B		
I-395 SB On-Ramp / Seminary Rd. (Southwest Rotary Intersection)	Eastbound	B	B	B	B	B	C	B	B	D	C	C	C	E	C	C	B	D	C	C	C	E	B	D	A
	Westbound	-	-			-	-			-	-			-	-			-	-			-	-		
	Northbound	-	-			-	-			-	-			-	-			-	-			-	-		
	Southbound	B	D			C	B			A	A			A	A			B	B			D	A		
Seminary Rd. / Mark Center Dr.	Eastbound	C	F	C	D	A	C	C	C	B	B	C	C	A	B	B	C	A	B	D	C	B	B	C	C
	Westbound	D	D			D	B			C	C			B	C			D	C			C	C		
	Northbound	C	B			A	A			C	D			B	D			C	D			B	C		
	Southbound	B	D			D	D			D	D			D	D			D	D			F	D		
Seminary Rd. / N. Beauregard St.	Eastbound	D	D	C	D	C	C	C	D	D	D	D	D	D	E	D	E	D	C	D	D	D	D	E	E
	Westbound	D	F			C	D			C	C			D	D			E	C			C	D		
	Northbound	C	D			C	D			E	F			D	E			C	D			F	F		
	Southbound	C	C			C	D			D	E			D	E			D	D			D	E		
N. Beauregard St. / Mark Center Dr.	Eastbound	B	A	B	B	D	C	B	B	D	D	A	B	D	D	C	B	D	D	B	B	E	E	D	C
	Westbound	B	B			C	B			D	E			D	E			D	D			D	C		
	Northbound	D	D			A	A			A	A			B	B			A	A			E	B		
	Southbound	D	D			B	B			A	A			C	A			B	A			C	C		

4.4.6 Projected Roadway Traffic Operations

Traffic operational analysis for the proposed condition with projected BRAC 133 trips and interim roadway improvements was performed using CORSIM and Synchro analysis tools. The existing roadway geometry and lane configuration along with interim improvements as shown previously in Figure 4-3, and the projected build-out condition traffic volumes on opening day (2011), including baseline trips, BRAC 133 and IDA generated SOV, rideshare and shuttle trips as shown previously in Figure 4-6 were used as primary inputs to perform the proposed condition traffic operational analysis for the morning and evening peak hour demands.

Optimized signal timing and coordination plans developed using Synchro were transferred appropriately to CORSIM to develop overall study area traffic models. As noted in Section 4.2.2, delineation of the existing island within the rotary and restriping would improve the rotary capacity. Traffic simulation models for the 2011 projected condition utilized this modified configuration to allow three full lanes to circulate the rotary. Multiple simulation runs were made by changing the random seed values for vehicle entry headways, driver responses to traffic choices including gap acceptance, lane change and queue blockages, and driver and vehicle behavior assignment of to surface street vehicles. The data from the multiple runs was evaluated for the projected condition morning and evening peak hour analysis.

Flow rate, speed and density data for freeway mainline and ramp links, and flow rate, control delay, and maximum queue lengths by intersection approach movements for surface links were obtained from the simulation output reports to determine traffic operations. Table 4-15 and Table 4-16 show the traffic operational parameters for the I-395 mainline and ramps under the 2011 projected conditions, including speed, density and LOS.

Table 4-17 and Table 4-18 show the 2011 projected condition traffic operations of the arterial network including control delay, LOS and traffic queues by movement, intersection approach and overall intersection for all the signalized intersections within the study area. In Tables 4-15 through 4-18, intersections with the highest levels of congestion (LOS E and LOS F) have been highlighted for ease of reference.

Table 4-15: Freeway Measures of Effectiveness for the AM Peak Hour 2011 Projected Traffic Operational Analysis with Interim Improvements

		LOCATION		NODE		LENGTH (ft)	VOLUMES			LINK STATISTICS			AGGREGATE STATISTICS			REMARKS
		From	To	From	To		Actual	Simulated	Difference	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS	
I-395 GENERAL PURPOSE (GP) & HIGH OCCUPANCY VEHICLE (HOV) LANES	I-395 NORTHBOUND MAINLINE	NB GP	Begin I-395 GP Lanes South of Seminary Road Interchange	1000	1001	692	6828	6343	-485	37	58	F				NB Freeway Mainline
				1001	1002	803	6828	6346	-482	61	93	F	41	69	F	NB Freeway Mainline
				1002	1005	1073	6828	6264	-564	28	57	F				NB Freeway Mainline
		NB GP	Seminary Road Exit Ramp	1005	1006	790	5410	5002	-408	59	28	D				NB Freeway Mainline
				1006	1008	1235	5410	5007	-403	61	28	D	60	28	D	NB Freeway Mainline
				1008	1010	860	5410	5018	-392	61	27	D				NB Freeway Mainline
		NB GP	Seminary Road Entrance Ramp	1010	1011	1093	6976	6340	-636	57	24	C	58	25	C	NB Freeway Mainline
				1011	1015	706	6976	6344	-632	58	27	D				NB Freeway Mainline
		NB GP	King Street Exit Ramp	1015	1017	635	5936	5343	-593	61	29	D	61	29	D	NB Freeway Mainline
		NB GP	End I-395 North of Seminary Road Interchange	1017	1019	485	5936	5349	-587	61	29	D				NB Freeway Mainline
		NB HOV	Begin I-395 HOV Lanes South of Seminary Road Interchange	1052	1053	643	3370	3377	7	67	26	C				NB Freeway Mainline
				1053	1054	534	3370	3374	4	68	25	C				NB Freeway Mainline
				1054	1056	501	3370	3369	-1	67	25	C				NB Freeway Mainline
				1056	1057	417	3370	3364	-6	67	25	C				NB Freeway Mainline
				1057	1058	513	3370	3362	-8	66	26	C				NB Freeway Mainline
				1058	1060	616	3370	3359	-11	66	26	C	66	26	C	NB Freeway Mainline
				1060	1062	560	3370	3360	-10	66	26	C				NB Freeway Mainline
				1062	1063	525	3370	3361	-9	66	26	C				NB Freeway Mainline
				1063	1064	571	3370	3356	-14	65	26	C				NB Freeway Mainline
				1064	1066	675	3370	3356	-14	65	26	C				NB Freeway Mainline
		NB HOV	Seminary Road HOV Entrance Ramp	1066	1067	1074	3490	3484	-6	64	20	C				NB Freeway Mainline
		NB HOV	End I-395 HOV Lanes North of Seminary Road Interchange	1067	1068	1010	3490	3479	-11	65	27	D	65	27	D	NB Freeway Mainline
	I-395 SOUTHBOUND MAINLINE	SB GP	Begin I-395 GP Lanes North of Seminary Road Interchange	2001	2002	812	4188	3926	-262	18	57	F	18	57	F	SB Freeway Mainline
		SB GP	King Street Entrance Ramp	2002	2004	1209	4538	4033	-505	14	57	F	14	57	F	SB Freeway Mainline
		SB GP	Seminary Road Exit Ramp	2004	2005	502	3450	3359	-91	61	14	B				SB Freeway Mainline
				2005	2007	920	3450	3360	-90	63	13	B	62	13	B	SB Freeway Mainline
				2007	2009	1142	3450	3358	-92	63	13	B				SB Freeway Mainline
				2009	2012	1179	3450	3359	-91	63	13	B				SB Freeway Mainline
		SB GP	Seminary Road Entrance Ramp	2012	2014	570	4249	4062	-187	57	16	B	60	16	B	SB Freeway Mainline
		SB GP	End I-395 South of Seminary Road Interchange	2014	2015	728	4249	4064	-185	62	16	B				SB Freeway Mainline
	I-395 NORTHBOUND RAMPS	NB GP	Seminary Road Exit Ramp	1005	1201	299	1418	1246	-172	11	113	F	9	139	F	Diverge Ramp Section
				1201	7002	203	1418	1130	-288	6	176	F				Diverge Ramp Section
				7002	1203	232	1418	1189	-229	10	-	F				Class III Type Urban Arterial
		NB GP	Seminary Road Entrance Ramp	1206	1208	232	1566	1283	-283	28	-	B				Class III Type Urban Arterial
				1208	7003	201	1566	1281	-285	33	-	A				Class III Type Urban Arterial
				7003	1210	221	1566	1312	-254	34	21	C	34	20	C	Merge Ramp Section
				1210	1010	234	1566	1314	-252	34	19	B				Merge Ramp Section
		NB HOV	Seminary Road Entrance Ramp	1212	1213	358	120	111	-9	27	-	B				Class III Type Urban Arterial
				1213	7005	331	120	111	-9	37	-	A				Class III Type Urban Arterial
				7005	1070	339	120	133	13	46	3	A	48	3	A	Merge Ramp Section
				1070	1066	306	120	132	12	50	3	A				Merge Ramp Section
	I-395 SOUTHBOUND RAMPS	SB GP	Seminary Road Exit Ramp	2004	2201	313	1088	661	-427	3	124	F	2	158	F	Diverge Ramp Section
				2201	7004	485	1088	624	-464	2	179	F				Diverge Ramp Section
				7004	2204	491	1088	564	-524	1	-	F				Class III Type Urban Arterial
				2204	2205	376	1088	572	-516	1	-	F				Class III Type Urban Arterial
		SB GP	Seminary Road Entrance Ramp	2213	2215	197	799	693	-106	32	-	A				Class III Type Urban Arterial
				2215	7001	371	799	695	-104	33	-	A				Class III Type Urban Arterial
				7001	2216	279	799	708	-91	33	12	B	33	16	B	Merge Ramp Section
				2216	2012	427	799	707	-92	33	19	B				Merge Ramp Section

Table 4-16: Freeway Measures of Effectiveness for the PM Peak Hour 2011 Projected Traffic Operational Analysis with Interim Improvements

		LOCATION		NODE		LENGTH (ft)	VOLUMES			LINK STATISTICS			AGGREGATE STATISTICS			REMARKS
		From	To	From	To		Actual	Simulated	Difference	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS	
I-395 GENERAL PURPOSE (GP) & HIGH OCCUPANCY VEHICLE (HOV) LANES	I-395 NORTHBOUND MAINLINE	NB GP	Begin I-395 GP Lanes South of Seminary Road Interchange	1000	1001	692	5574	5585	11	62	31	D	60	28	D	NB Freeway Mainline
				1001	1002	803	5574	5587	13	61	30	D				NB Freeway Mainline
				1002	1005	1073	5574	5588	14	58	25	C				NB Freeway Mainline
		NB GP	Seminary Road Exit Ramp	1005	1006	790	4400	4447	47	62	24	C	62	24	C	NB Freeway Mainline
				1006	1008	1235	4400	4445	45	62	24	C				NB Freeway Mainline
				1008	1010	860	4400	4445	45	61	24	C				NB Freeway Mainline
		NB GP	Seminary Road Entrance Ramp	1010	1011	1093	5660	5670	10	57	22	C	57	23	C	NB Freeway Mainline
				1011	1015	706	5660	5671	11	56	25	C				NB Freeway Mainline
		NB GP	King Street Exit Ramp	1015	1017	635	4380	4373	-7	61	24	C	62	24	C	NB Freeway Mainline
		NB GP	End I-395 North of Seminary Road Interchange	1017	1019	485	4380	4376	-4	62	24	C				NB Freeway Mainline
	I-395 SOUTHBOUND MAINLINE	SB GP	Begin I-395 GP Lanes North of Seminary Road Interchange	2001	2002	812	5996	5993	-3	63	24	C	61	23	C	SB Freeway Mainline
		SB GP	King Street Entrance Ramp	2002	2004	1209	6486	6490	4	59	22	C				SB Freeway Mainline
		SB GP	Seminary Road Exit Ramp	2004	2005	502	5380	5504	124	62	22	C	62	22	C	SB Freeway Mainline
				2005	2007	920	5380	5509	129	62	22	C				SB Freeway Mainline
				2007	2009	1142	5380	5511	131	62	22	C				SB Freeway Mainline
				2009	2012	1179	5380	5507	127	61	23	C				SB Freeway Mainline
		SB GP	Seminary Road Entrance Ramp	2012	2014	570	7239	6927	-312	47	34	D	53	32	D	SB Freeway Mainline
		SB GP	End I-395 South of Seminary Road Interchange	2014	2015	728	7239	6933	-306	58	30	D				SB Freeway Mainline
		SB HOV	Begin I-395 HOV Lanes South of Seminary Road Interchange	1068	1067	1010	3290	3290	0	67	25	C	67	25	C	SB Freeway Mainline
				1067	1066	1066	3290	3289	-1	67	25	C				SB Freeway Mainline
		SB HOV	Seminary Road Exit Ramp	1066	1064	685	3190	3190	0	66	24	C	82	28	D	SB Freeway Mainline
				1064	1063	564	3190	3196	6	66	24	C				SB Freeway Mainline
				1063	1062	582	3190	3193	3	66	24	C				SB Freeway Mainline
				1062	1060	505	3190	3188	-2	66	24	C				SB Freeway Mainline
				1060	1058	616	3190	3191	1	66	24	C				SB Freeway Mainline
				1058	1057	513	3190	3190	0	66	24	C				SB Freeway Mainline
				1057	1056	417	3190	3189	-1	65	24	C				SB Freeway Mainline
				1056	1054	477	3190	3193	3	65	24	C				SB Freeway Mainline
				1054	1053	456	3190	3196	6	65	25	C				SB Freeway Mainline
		SB HOV	End I-395 HOV Lanes North of Seminary Road Interchange	1053	1052	654	3190	3201	11	65	25	C				SB Freeway Mainline
	I-395 NORTHBOUND RAMPS	NB GP	Seminary Road Exit Ramp	1005	1201	299	1174	1145	-29	33	35	D	33	35	D	Diverge Ramp Section
				1201	7002	203	1174	1146	-28	33	35	D				Diverge Ramp Section
				7002	1203	232	1174	1147	-27	43	-	A				Class III Type Urban Arterial
		NB GP	Seminary Road Entrance Ramp	1206	1208	232	1260	1224	-36	29	-	B	34	19	C	Class III Type Urban Arterial
				1208	7003	201	1260	1228	-32	32	-	A				Class III Type Urban Arterial
				7003	1210	221	1260	1229	-31	34	20	B				Merge Ramp Section
				1210	1010	234	1260	1228	-32	34	18	B				Merge Ramp Section
	I-395 SOUTHBOUND RAMPS	SB GP	Seminary Road Exit Ramp	2004	2201	313	1106	983	-123	34	15	B	24	23	C	Diverge Ramp Section
				2201	7004	485	1106	960	-146	18	28	C				Diverge Ramp Section
				7004	2204	491	1106	925	-181	38	-	A				Class III Type Urban Arterial
				2204	2205	376	1106	882	-224	13	-	E				Class III Type Urban Arterial
		SB GP	Seminary Road Entrance Ramp	2213	2215	197	1859	1420	-439	32	-	A	34	34	D	Class III Type Urban Arterial
				2215	7001	371	1859	1419	-440	32	-	A				Class III Type Urban Arterial
				7001	2216	279	1859	1419	-440	38	24	C				Merge Ramp Section
				2216	2012	427	1859	1420	-439	32	40	E				Merge Ramp Section
		SB HOV	Seminary Road Exit Ramp	1066	1070	317	100	97	-3	49	2	A	49	2	A	Diverge Ramp Section
				1070	7005	352	100	98	-2	49	2	A				Diverge Ramp Section
				7005	1213	340	100	98	-2	56	-	A				Class III Type Urban Arterial
				1213	1212	329	100	99	-1	56	-	A				Class III Type Urban Arterial
				1212	1211	130	100	99	-1	20	-	C				Class III Type Urban Arterial

Table 4-17: Arterial Measures of Effectiveness for the AM Peak Hour 2011 Projected Traffic Operational Analysis with Interim Improvements

		Location	Approach	Link	Demand Volumes				Modelled Volumes				Demand Volumes			Model Demand		Control Delay By Movement			LOS By Movement			LOS By Approach		LOS By Intersection		*Modelled Storage and Maximum Traffic Queuing (ft)*					
																												Through		Left Turn		Right Turn	
					Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	%	Left	Thru	Right	Left	Thru	Right	Delay	LOS	Delay	LOS	Link Length (ft)	Queue (ft)	Storage (ft)	Queue (ft)	Storage (ft)	Queue (ft)
MARK CENTER (BRAC 133) TRAFFIC ANALAYSIS STUDY AREA	LIBRARY LANE	Library Lane / Seminary Road Intersection (Node #5003)	WB	5002-5003	20	1580	91	1691	32	1584	74	1690	12	4	-17	-1	0%	16	12	10	B	B	A	12	B			310	300	50	40	-	-
			NB	6017-5003	36	5	5	46	43	3	1	47	7	-2	-4	1	2%	34	32	36	C	C	D	34	C	12	B	264	60	-	-	-	-
			EB	5005-5003	212	821	11	1044	214	792	9	1015	2	-29	-2	-29	-3%	21	6	8	C	A	A	9	A			311	180	150	120	-	
			SB	6018-5003	41	5	15	61	42	5	12	59	1	0	-3	-2	-3%	30	29	13	C	C	B	26	C			216	80	-	-	-	-
	I-395 / SEMINARY ROAD ROTARY INTERCHANGE	Southeast Intersection (Node #5015)	NB	1203-5015	0	1220	198	1418	0	950	163	1113	0	-270	-35	-305	-22%	0	71	99	-	E	F	75	E	79	E	618	560	-	-	-	-
			EB	5013-5015	804	301	0	1105	779	261	0	1040	-25	-40	0	-65	-6%	86	70	0	F	E	-	82	F			331	300	331	300	-	
		Northeast Intersection (Node #5010)	NB	5015-5010	1087	60	877	2024	887	78	765	1730	-200	18	-112	-294	-15%	5	22	28	A	C	C	16	B	22	C	276	240	276	140	-	
			WB	5009-5010	0	327	60	387	0	295	55	350	0	-32	-5	-37	-10%	0	53	32	-	D	C	50	D			160	140	-	-	-	-
		Northwest Intersection (Node #5012)	WB	5010-5012	267	1147	0	1414	223	951	0	1174	-44	-196	0	-240	-17%	5	6	0	A	A	-	6	A	15	B	300	200	300	100	-	-
			SB	2205-5012	0	233	0	233	0	222	0	222	0	-11	0	-11	-5%	0	58	0	-	E	A	58	E			281	160	-	-	-	-
		Southwest Intersection (Node #5013)	SB	5012-5013	214	286	0	500	201	246	0	447	-13	-40	0	-53	-11%	41	19	0	D	B	-	29	C	48	D	259	160	259	200	-	-
			WB	5019-5013	0	891	0	891	0	841	0	841	0	-50	0	-50	-6%	0	58	0	-	E	-	58	E			357	340	-	-	-	-
	MARK CENTER DRIVE	Mark Center Drive / Seminary Road Intersection (Node #5022)	WB 1	5021-5022	460	729	35	1224	304	611	22	937	-156	-118	-13	-287	-23%	195	40	49	F	D	D	91	F	51	D	243	280	243	260	-	-
			WB 2	5018-5022	0	1946	56	2002	0	1314	20	1334	0	-632	-36	-668	-33%	0	21	17	-	C	B	21	C			637	580	-	-	-	-
			NB	5060-5022	47	11	171	229	55	9	151	215	8	-2	-20	-14	-6%	94	105	9	F	F	A	35	C			340	80	340	120	340	60
			EB	5023-5022	20	1416	345	1781	35	1389	318	1742	15	-27	-27	-39	-2%	55	35	7	E	D	A	31	C			395	360	150	100	395	240
			SB	5045-5022	232	50	50	332	246	54	38	338	14	4	-12	6	2%	180	224	20	F	F	C	169	F			252	280	252	240	252	140
	N BEAUREGARD STREET	N. Beauregard Street / Seminary Road Intersection (Node #5025)	WB	5023-5025	1441	1143	0	2584	1070	853	0	1923	-371	-290	0	-661	-26%	56	10	0	E	B	-	36	D	68	E	341	240	341	360	-	-
			NB	6004-5025	456	549	0	1005	354	471	0	825	-102	-78	0	-180	-18%	278	61	0	F	E	-	154	F			347	380	175	160	-	-
			EB	5026-5025	61	1183	0	1244	47	1200	0	1247	-14	17	0	3	0%	100	49	0	F	D	-	51	D			323	300	100	100	-	-
			SB	6002-5025	177	218	40	435	169	222	43	434	-8	4	3	-1	0%	155	43	32	F	D	C	86	F			250	260	135	140	-	-
		N. Beauregard Street / Mark Center Drive (Node #6005)	WB	5032-6005	36	5	88	129	71	19	164	254	35	14	76	125	97%	62	74	15	E	E	B	32	C	47	D	286	140	-	-	286	160
			NB	6007-6005	51	1328	474	1853	32	1055	338	1425	-19	-273	-136	-428	-23%	123	67	26	F	E	C	58	E			329	360	150	100	-	-
			EB	5030-6005	10	5	6	21	9	7	4	20	-1	2	-2	-1	-5%	73	42	10	E	D	B	50	D			203	60	-	-	-	-
			SB	6004-6005	1361	425	81	1867	1074	375	67	1516	-287	-50	-14	-351	-19%	51	4	3	D	A	A	38	D			435	460	350	320	-	-

Table 4-18: Arterial Measures of Effectiveness for the PM Peak Hour 2011 Projected Traffic Operational Analysis with Interim Improvements

		Location	Approach	Link	Demand Volumes				Modelled Volumes				Demand Volumes			Model Demand		Control Delay By Movement			LOS By Movement			LOS By Approach		LOS By Intersection		*Modelled Storage and Maximum Traffic Queuing (ft)*					
																												Through		Left Turn		Right Turn	
					Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	%	Left	Thru	Right	Left	Thru	Right	Delay	LOS	Delay	LOS	Link Length (ft)	Queue (ft)	Storage (ft)	Queue (ft)	Storage (ft)	Queue (ft)
MARK CENTER (BRAC 133) TRAFFIC ANALAYSIS STUDY AREA	LIBRARY LANE	Library Lane / Seminary Road Intersection (Node #5003)	WB	5002-5003	25	843	40	908	22	865	28	915	-3	22	-12	7	1%	26	7	6	C	A	A	8	A	10	A	310	140	50	20	-	-
			NB	6017-5003	52	5	10	67	55	4	8	67	3	-1	-2	0	0%	40	40	14	D	D	B	37	D			264	100	-	-	-	-
			EB	5005-5003	223	1441	21	1685	201	1286	11	1498	-22	-155	-10	-187	-11%	10	6	4	A	A	A	7	A			311	160	150	120	-	-
			SB	6018-5003	86	15	30	131	94	18	21	133	8	3	-9	2	2%	39	38	21	D	D	C	36	D			216	160	-	-	-	-
	I-395 / SEMINARY ROAD ROTARY INTERCHANGE	Southeast Intersection (Node #5015)	NB	1203-5015	0	799	375	1174	0	789	404	1193	0	-10	29	19	2%	0	16	17	A	B	B	17	B	20	B	618	280	-	-	-	-
			EB	5013-5015	810	913	0	1723	691	751	0	1442	-119	-162	0	-281	-16%	22	22	0	C	C	A	22	C			331	280	331	240	-	-
		Northeast Intersection (Node #5010)	NB	5015-5010	633	976	0	1609	572	923	0	1495	-61	-53	0	-114	-7%	8	7	0	A	A	A	7	A	10	A	276	140	276	180	-	-
			WB	5009-5010	0	309	0	309	0	327	0	327	0	18	0	18	6%	0	20	0	A	B	A	20	B			160	120	-	-	-	-
		Northwest Intersection (Node #5012)	WB	1211-5012	304	738	0	1042	307	701	0	1008	3	-37	0	-34	-3%	9	9	0	A	A	A	9	A	14	B	300	100	300	100	-	-
			SB	2205-5012	0	632	0	632	0	537	0	537	0	-95	0	-95	-15%	0	23	0	A	C	A	23	C			281	220	-	-	-	-
		Southwest Intersection (Node #5013)	SB	5012-5013	630	306	0	936	570	266	0	836	-60	-40	0	-100	-11%	9	9	0	A	A	A	9	A	10	A	259	140	259	140	-	-
			WB	5019-5013	0	1093	0	1093	0	884	0	884	0	-209	0	-209	-19%	0	10	0	A	B	A	10	B			357	160	-	-	-	-
	MARK CENTER DRIVE	Mark Center Drive / Seminary Road Intersection (Node #5022)	WB 1	5021-5022	106	536	39	681	108	547	38	693	2	11	-1	12	2%	66	15	11	E	B	B	23	C			243	140	243	160	-	-
			WB 2	5018-5022	0	1150	62	1212	0	1040	58	1098	0	-110	-4	-114	-9%	0	33	36	A	C	D	33	C			637	580	-	-	-	-
			NB	5060-5022	350	52	1311	1713	261	46	1001	1308	-89	-6	-310	-405	-24%	66	60	26	E	E	C	35	C	54	D	340	220	340	220	340	200
			EB	5023-5022	35	1920	59	2014	35	1609	65	1709	0	-311	6	-305	-15%	142	95	37	F	F	D	94	F			395	420	150		395	
			SB	5045-5022	187	10	71	268	179	11	70	260	-8	1	-1	-8	-3%	68	86	21	E	F	C	56	E			252		252		252	
	N BEAUREGARD STREET	N. Beauregard Street / Seminary Road Intersection (Node #5025)	WB	5023-5025	605	1221	0	1826	547	1095	0	1642	-58	-126	0	-184	-10%	70	23	0	E	C	A	38	D	77	E	341	360	341	220	-	-
			NB	6004-5025	386	456	0	842	357	441	0	798	-29	-15	0	-44	-5%	178	51	0	F	D	A	107	F			347	360	175	160	-	-
			EB	5026-5025	106	1214	0	1320	84	1052	0	1136	-22	-162	0	-184	-14%	157	79	0	F	E	A	85	F			323	320	100	100	-	-
			SB	6002-5025	156	438	46	640	105	394	39	538	-51	-44	-7	-102	-16%	349	78	64	F	E	E	129	F			250	260	135	140	-	-
		N. Beauregard Street / Mark Center Drive (Node #6005)	WB	5032-6005	376	5	404	785	335	1	304	640	-41	-4	-100	-145	-18%	45	24	8	D	C	A	27	C	22	C	286	320	-	-	286	320
			NB	6007-6005	45	1010	54	1109	48	1028	44	1120	3	18	-10	11	1%	71	15	12	E	B	B	17	B			329	260	150	120	-	-
			EB	5030-6005	72	20	31	123	79	15	26	120	7	-5	-5	-3	-2%	50	41	37	D	D	D	46	D			203	180	-	-	-	-
			SB	6004-6005	225	1350	15	1590	217	1217	0	1434	-8	-133	-15	-156	-10%	56	16	0	E	B	A	22	C			435	440	350	160	-	-

Results of the 2011 baseline operational analysis without BRAC improvements indicate some of the I-395 mainline and ramp sections serving Seminary Road interchange experiencing higher density values restricting lane changes and operating at unacceptable LOS. Many of the lane group movements at existing signalized intersections within the study area experienced severe delay under the projected demand operating at unacceptable levels of service. These degrading operations at the individual intersection approaches will eventually lead to the failure of the overall intersection. In addition, the overall intersection at the Seminary Road and North Beauregard Street intersection operated at unacceptable levels under the projected morning and evening peak hour demands, with all the intersection approaches and lane group movements experiencing severe delay. The Southeast rotary intersection serving the I-395 northbound exit ramp also operated at an unacceptable level under the projected morning peak hour demand.

Table 4-19 shows a comparative summary of the intersection LOS for the morning and evening peak hours with and without BRAC 133 and IDA improvements for the opening year 2011. Table 4-19 intersections with the highest levels of congestion (LOS E and LOS F) have been highlighted for ease of reference.

Table 4-19: Comparative Analysis of the Intersection Level of Service for 2011 Baseline and Projected Morning & Evening Peak Hour Traffic Demand With and Without BRAC 133 and IDA Improvements[40]

					Mark Center (BRAC 133) TMP USACE, 2010 AM PEAK ANALYSIS				Mark Center (BRAC 133) TMP USACE, 2010 PM PEAK ANALYSIS			
					Baseline 2011 Without BRAC 133 & IDA		Projected 2011 With BRAC 133 & IDA		Baseline 2011 Without BRAC 133 & IDA		Projected 2011 With BRAC 133 & IDA	
		Location	Approach	Link	LOS By Approach	LOS By Intersection	LOS By Approach	LOS By Intersection	LOS By Approach	LOS By Intersection	LOS By Approach	LOS By Intersection
MARK CENTER (BRAC 133) TRAFFIC ANALAYSIS STUDY AREA	LIBRARY LANE	Library Lane / Seminary Road Intersection (Node #5003)	WB	5002-5003	A	A	B	B	A	A	A	A
			NB	6017-5003	C		C		C		D	
			EB	5005-5003	A		A		A		A	
			SB	6018-5003	C		C		D		D	
	I-395 / SEMINARY ROAD ROTARY INTERCHANGE	Southeast Intersection (Node #5015)	NB	1203-5015	D	E	E	E	B	C	B	B
			EB	5013-5015	E		F		C		C	
		Northeast Intersection (Node #5010)	NB	5015-5010	B	C	B	C	A	A	A	A
			WB	5009-5010	D		D		B		B	
		Northwest Intersection (Node #5012)	WB	5010-5012	A	B	A	B	A	B	A	B
			SB	2205-5012	E		E		B		C	
		Southwest Intersection (Node #5013)	SB	5012-5013	D	D	C	D	A	A	A	A
			WB	5019-5013	E		E		B		B	
	MARK CENTER DRIVE	Mark Center Drive / Seminary Road Intersection (Node #5022)	WB 1	5021-5022	C	C	F	D	B	C	C	D
			WB 2	5018-5022	B		C		C		C	
			NB	5060-5022	B		C		C		C	
			EB	5023-5022	B		C		B		F	
			SB	5045-5022	F		F		D		E	
	N. BEAUREGARD STREET	N. Beauregard Street / Seminary Road Intersection (Node #5025)	WB	5023-5025	C	E	D	E	D	E	D	E
			NB	6004-5025	F		F		F		F	
			EB	5026-5025	D		D		D		F	
			SB	6002-5025	D		F		E		F	
		N. Beauregard Street / Mark Center Drive (Node #6005)	WB	5032-6005	D	D	C	D	C	C	C	C
			NB	6007-6005	E		E		B		B	
			EB	5030-6005	E		D		E		D	
			SB	6004-6005	C		D		C		C	

[40] A third scenario was analyzed to identify the impacts of BRAC 133 traffic only (i.e., without the traffic from the IDA development). Results of the analysis for this scenario indicated only minor improvements in control delay values for signalized intersections within the study area, and a decrease in freeway and ramp densities. However, no significant change in LOS values for the freeway mainline, ramps, or signalized intersections was observed, with the exception of the I-395 NB general purpose lanes during the morning peak hour, which improved from LOS F to LOS E.

4.4.7 Projected Internal Circulation and Traffic Operations

Traffic simulation models developed for the Mark Center projected traffic condition show the proposed internal roadways operating at acceptable conditions with free flowing traffic throughout the internal roadways. The simulation model results were evaluated to identify traffic operations and LOS for the proposed signalized intersection at Mark Center Drive and the proposed roundabout at WHS Circle/IDA Drive - North Parking Garage. The proposed roundabout within the Mark Center site was coded in as a one-way link circulating in a counterclockwise direction, with the roundabout approach legs controlled by yield signs. Conditional turn movements were used to accurately replicate Origin-Destination assignments of the left, through and right turning movements. The output data from the multiple simulation runs were averaged for flow rate, control delay, average and maximum queue lengths for approach movements. Table 4-20 shows the projected morning and evening peak hour traffic operations of the signalized intersection at Mark Center Drive and the roundabout at WHS Circle/IDA Drive-North Parking Garage.

Results from the above table indicate that the proposed internal roadway lane configurations and storage lengths adequately serve the site generated morning and evening peak hour traffic. In addition, the access control facilities at the South Parking Garage experience lesser peak hour vehicle demand than the maximum capacity of the proposed system. Hence, no traffic queues are expected to extend from the access control gates and adversely impact the internal roadway operations. The ACP also has a reserved inbound check-in lane that can be utilized during special scenarios when heavy inbound demand occurs.

Table 4-20: Traffic Operational Analysis of the Proposed Internal Roadway Network for 2011 Projected Morning & Evening Peak Hours

		Location	Approach	Link	Demand Volumes				Modelled Volumes			LOS By Movement		LOS By Approach		LOS By Intersection		*Modelled Storage and Maximum Traffic Queuing (ft)*					
																		Through		Left Turn		Right Turn	
					Left	Thru	Right	Total	Left	Thru	Right	Thru	Right	Delay	LOS	Delay	LOS	Link Length (ft)	Queue (ft)	Storage (ft)	Queue (ft)	Storage (ft)	Queue (ft)
MARK CENTER INTERNAL ROADWAYS	SIGNALIZED AM PEAK	Mark Center Drive / Mark Center Drive (Node #5033)	WB	35-5033	0	91	30	121	0	92	46	C	A	21	C	**11**	**B**	254	160	-	-	254	60
			NB	5031-5033	5	5	0	10	9	1	0	B	-	26	C			265	40	-	-	-	-
			EB	5034-5033	734	944	92	1770	667	762	83	A	A	8	A			167	180	167	180	-	-
			SB	5060-5033	177	41	59	277	125	38	49	B	A	19	B			533	120	533	140	-	-
	SIGNALIZED PM PEAK	Mark Center Drive / Mark Center Drive (Node #5033)	WB	35-5033	0	406	667	1073	0	410	594	B	A	9	A	**11**	**B**	254	140	-	-	254	140
			NB	5031-5033	40	132	0	172	45	127	0	B	-	17	B			265	120	-	-	-	-
			EB	5034-5033	357	130	11	498	217	63	7	B	A	18	B			167	120	167	160	-	-
			SB	5060-5033	18	10	243	271	15	8	181	B	A	5	A			533	20	533	120	-	-
	ROUNDABOUT AM PEAK [1]	WHS Circle/IDA Drive - North Parking Garage	EB	5033-35	258	608	255	1121	193	518	185			2	A			254	20				
			NB	5040-36	40	0	0	40	40	0	0			3	A			153	60				
			WB	5042-37	0	64	0	64	0	67	0			0	A			109	40				
			SB	5039-38	0	0	17	17	0	0	18			3	A			131	0				
	ROUNDABOUT PM PEAK [1]	WHS Circle/IDA Drive - North Parking Garage	EB	5033-35	258	608	255	1121	193	518	185			2	A			254	0				
			NB	5040-36	40	0	0	40	40	0	0			1	A			153	20				
			WB	5042-37	0	64	0	64	0	67	0			0	A			109	60				
			SB	5039-38	0	0	17	17	0	0	18			3	A			131	0				

NOTE:

1. Average control delay values in seconds per vehicle can be measured for individual approaches only and not for the whole roundabout intersection.

4.4.8 Projected Problem Areas

Traffic operational analysis and simulation modeling results for the projected condition morning and evening peak hour demand indicated locations of concern throughout the study area roadway network that were marked by long traffic queues and spillovers. The LOS at these locations deteriorated to an unacceptable E or F, with demand exceeding capacity. Some of the notable locations that require improvements are shown below.

Along Interstate Mainline and Ramps:

- I-395 Northbound GP lanes south of the Seminary Road interchange and the Seminary Road exit ramp section
- I-395 Southbound GP lanes north of the Seminary Road interchange and the Seminary Road exit ramp section,
- Seminary Road entrance ramp section to southbound I-395

Projected traffic queue spillback along southbound I-395 extends north past the King Street interchange, affecting the entrance ramp operations and weave section maneuvers from King Street. The extents of the northbound queue spillback and its impact on Duke and Seminary Road interchange operations should be evaluated.

Along Arterial Streets and Intersections:

- Southeast rotary intersection that controls the I-395 northbound exit ramp approach - identified as the primary cause of projected traffic congestion along southbound I-395 and eastbound Seminary Road
- North Beauregard Street and Seminary Road intersection - the heavy left turn demands from conflicting intersection approaches result in an inadequate allotment of green time splits that affects the capacity and operations of the overall intersection
- Eastbound Seminary Road queue spillback due to degrading traffic operations at the southeast rotary intersection

Other Concerns causing Traffic Operational Problems:

- Short distance weaving maneuvers executed by the right turns from northbound North Beauregard Street to eastbound Seminary Road create vehicular conflicts and impedance of through traffic flow
- Existing lane configurations along Seminary Road have multiple lane merges and splits occurring over short distances that require quick driver decision-making and reaction skills. Unfamiliar drivers and familiar drivers with slow reaction times who fail to execute these merge and lane change maneuvers in timely fashion block may traffic and impede traffic operations

In addition, the traffic demand at many of the intersection approach movements within the study area exceed available capacity resulting in spillover and traffic overflow that extends into downstream intersections impeding corridor wide traffic flow and operations.

4.4.9 Recommended Solutions

The locations identified in the previous section were assessed for potential improvements that would help improve overall operations. After review of the traffic characteristics and travel patterns from the simulation models under the projected demand conditions, preliminary improvements were identified that require further review and validation. Some of the proposed recommendations are long-term by nature, due to the associated costs and funding approval. Extensive coordination between participating agencies including VDOT, City of Alexandria, USACE, and other agencies is required in the identification of specific improvements and their implementation.

Recommended Roadway Improvements:

1. Improve Seminary Road rotary interchange capacity by delineating the existing island within the rotary and restriping to allow three full lanes to circulate the rotary.

2. Widen the existing single lane approach from I-395 north and south exit ramp traffic movements going westbound on Seminary Road, to two lanes. This significantly improves the southbound I-395 mainline and ramp operations at the Seminary Road interchange.

3. Widen northbound I-395 exit ramp approach to allow a longer two-lane wide ramp section. This adds more capacity to the ramp and helps mitigate some traffic congestion along I-395. However, this can only be a short-term improvement since the traffic queues are attributed to the inadequacy of the downstream rotary intersection.

4. Provide a direct HOV access ramp from I-395 south to Seminary Road to serve rideshare trips and to relieve traffic congestion from the GP lanes. This improvement combined with optimized signal timing at the southeast rotary intersection can help eliminate most, if not all of the projected queuing and spillback problems along Seminary Road and northbound I-395.

5. Reconfigure the existing southbound I-395 entrance ramp from Seminary Road, and the ramp merge influence area to add capacity. The existing entrance ramp from Seminary Road tapers from a double lane to a single lane ramp before entering the freeway section via a 200 ft acceleration lane. The projected traffic demand requires a longer merge section.

Recommended Intersection Improvements:

1. Eliminate northbound left turns from Seminary Road and North Beauregard Street intersection by constructing a three phase- signalized intersection at Foster Avenue for the redirected left turns. This will limit the number of signal phases at North Beauregard Street and Seminary Road intersection and improve overall intersection capacity and corridor operations along Seminary Road and North Beauregard Street. This improvement requires the following concurrent capacity and traffic control modifications to obtain the required results without causing any adverse traffic operational impacts along N. Beauregard corridor.

    a. Widen North Beauregard Street to receive four lanes of traffic at Foster Avenue with the two inside lanes operating as dedicated left turns

b. Widen and improve Foster Avenue to receive two lanes of one-way traffic and provide a direct merge to Seminary Road

c. Widen Seminary Road at the Fosters Avenue merge location to receive two additional full lanes; the added lanes should be tapered gradually to meet the existing lane geometry to allow smooth merging and eliminate any potential bottleneck

d. Restripe the two northbound dedicated left turn lanes at the Seminary Road and North Beauregard Street intersection as through lanes

e. Eliminate all southbound left turns from North Beauregard Street into Southern towers at the proposed Foster Avenue intersection location and redirect them to execute left turns at Seminary Road and North Beauregard Street intersection to access Southern Towers via Mark Center Drive. Additional capacity and signal timing review required to identify the impacts of this added traffic at Seminary Road and Mark Center Drive intersection.

f. The right turns from Southern Towers to North Beauregard Street should be yield-controlled

g. Coordinate signal timing operations of the proposed signal with the existing signals along Beauregard corridor

2. Optimize signal timing and coordination at the rotary interchange with the coordinated cycle length determined based on the demand experienced at the southeast rotary interchange.

3. Install advance warning signs, lane guidance regulatory signs, informational guide signs and highly visible pavement markings at all lane merge and split decision points to aid in advance decision making, and minimize vehicular conflicts.

4. Provide exclusive bus bays at all existing bus stop locations to prevent blocking of through traffic by stopped buses.

Recommended Traffic Control Improvements:

1. Optimize signal timing and coordination along Seminary Road by using an identical optimized cycle length throughout the corridor

2. Modify east-west signal coordination along Seminary Road by coordinating the westbound through movement at Mark Center Drive intersection and the westbound left turn movement at North Beauregard Street intersection. This will help clear Seminary Road at Mark Center Drive and North Beauregard Street intersections and reduce traffic queues, since most of the westbound through traffic exiting Seminary Road and Mark Center Drive intersection execute left turns to travel on North Beauregard Street. This will also improve the flow of the I-395 ramp traffic movement and minimize backups along I-395 mainline and ramps.

3. Improve existing pedestrian crossing signal equipment to include new countdown pedestrian signal heads, push buttons, audible pedestrian signals and pedestrian signage that meet ADA and MUTCD guidelines to adequately inform and serve the projected pedestrian traffic.

Recommended Internal Circulation Improvements:

Install MUTCD recommended "Do Not Block Intersection" (R10-7) signs along the Mark Center internal roadway network intersection crossings, especially at exit points from parking garages, to keep traffic from joining stopped queues and obstructing other intersection approaches from discharging.

Other On-Going Study Improvements:

VDOT is currently exploring the feasibility of a direct HOV access ramp from I-395 South to Seminary Road which would benefit BRAC 133 traffic and improve interchange traffic operations.

4.5 Impacts on Employees and Residents

4.5.1 Citizen and Neighborhood Associations

The following are concerns that have been articulated by citizens and neighborhood associations in the vicinity of BRAC 133. This study did not examine or attempt to validate the concerns and/or assumptions made by citizens, nor has an effort been made reference any studies that may validate citizen assumptions. The following serves as a list of documented citizen concerns and assumptions to which stakeholders (i.e., DoD, the City of Alexandria, VDOT, etc.) are currently working together to address.

The primary concern of the citizens and neighborhood communities is the addition of about 3,800 new vehicular trips to the BRAC 133 location and its traffic impacts on the surrounding roadway network. Another concern was the fear that the provision of free employee parking at the site would encourage more SOV trips to the site and ultimately result in parking overflow. Reduction of site-generated SOV trips by more than 40 percent was suggested for consideration. Other concerns include current lack of an extensive shuttle service plan and shuttle service amenities, internal roadway circulation, pedestrian and bicycle traffic circulation and safety, access control point processing and traffic backups, and lack of a comprehensive intermodal plan for the region. USACE and its affiliated organizations are working in close coordination with the City staff and the BRAC Advisory Group to identify their concerns and take appropriate action.

In response to the already raised citizen and neighborhood concerns, the Army is making or has already made the following transportation improvements or plan changes to meet their demands:

1. Implement interim roadway and traffic control improvements identified and approved as part of the 2003 TIS/TMP to improve roadway capacity and traffic operations.
2. Eliminate left turns from I-395 exit ramp traffic at Mark Center Drive and Seminary Road intersection by constructing a physical barrier obstruction to reduce vehicular conflicts and minimize short distance lane change maneuvers.

3. Propose TDM strategies that account for 40 percent or more reduction in site-generated SOV trips.
4. Develop a pedestrian circulation and sidewalk plan that includes improvement to the existing sub-standard sidewalks, ADA ramps and crosswalks to meet ADA guidelines, continuity to the existing sidewalk system and connectivity to major activity centers.
5. Relocate visitor control center to the south campus from its previous north campus location to minimize impacts of any traffic queues extending from the VCC and affecting Mark Center Drive and Seminary Road intersection operations.
6. Restrict site access control point (ACP) and verification guard booths to the south campus location to minimize impacts of any traffic queues extending from the access control gates from affecting the traffic operations along North Beauregard Street and Mark Center Drive.
7. Construct a pedestrian bridge connecting north and south parking garages to help transport employees and visitors to the south ID verification and security checkpoint before entering into the facility. Restricting North garage entering employees and visitors to use the pedestrian bridge for accessing the security and ID verification point eliminates potential traffic queues that may have originated from providing a second ACP at the north garage entrance.
8. Use Army recommended access control processing equipment with faster processing rates to adequately serve the peak hour arriving vehicular demand.
9. Provide multiple DoD/WHS shuttle bus services from the Pentagon Transit Center, Metrorail stations serving Blue, Yellow and Orange lines, and Virginia Rail Express (VRE) stations during the morning and evening peak periods of travel to promote Metrorail use and non-SOV site trips.
10. Proposed Transportation Center with five bus bays will offer short-term parking for DoD shuttles with facilities for shuttle bus drivers.

The projected trip origin and distribution patterns and traffic operational analysis concerns raised by the citizens and neighborhood communities are being addressed in the TMP document. In addition, the short-term roadway improvements recommended by the BRAC Advisory Group staff were reviewed for feasibility. Some of the recommendations identified by the BRAC Advisory Group staff match the TMP proposed recommendations and should be further studied for implementation.

4.5.2 Employee Concerns

The comments obtained from the WHS commuter survey respondents were summarized to identify the primary concerns of the relocating employees to the BRAC 133 site. Many of the employees were uncertain of their proposed future travel patterns and mode choices since they had not yet been briefed on all the available transportation options to access BRAC 133. Some of the primary concerns expressed by employees include the lack of attractive public transportation/Metrorail to BRAC 133, existing congestion along I-395 corridor, no direct HOV access from I395 South at Seminary Road interchange, lack of information on DoD shuttle bus plan (including frequency of shuttle service, bus sizes, bus headways and serviced Metrorail stations), pedestrian and bicycle facilities, shuttle bus service during

mid-day and off peak hours, parking restriction and management, slugging, emergency vehicle access, telecommuting and flexible work schedules. The traffic impacts from the proposed Mark Center site and the mitigation efforts in progress are outlined below.

1. The proposed development at BRAC 133 is expected to generate 57 percent drive-alone vehicle trips and 11 percent ride-share vehicle trips that include carpools, vanpools and shuttle buses. The total development at BRAC 133 and IDA adds a total of about 2,000 new AM peak hour trips, and 1,900 new PM peak hour trips to the existing roadway network surrounding Mark Center. Forty-eight percent of all the new trips are projected to use I-395, with 19 percent from the north and 29 percent from the South.

2. Interim roadway improvements including roadway widening and traffic signal modifications are scheduled for completion before September 15, 2011 and will improve capacity and traffic operations. However, the Seminary Road exit ramps from I-395 north and south directions will operate at unacceptable levels with traffic queues and congestion extending to the mainline. Traffic will also experience some delays at the Seminary Road and North Beauregard Street signalized intersection.

3. Short and long-term improvements are being identified within this TMP document and recommended for further review and implementation. These improvements if approved and implemented will alleviate traffic congestion and promote smooth travel.

4. A currently on-going VDOT study to develop alternatives for providing a direct HOV access from I-395 South to Seminary Road is being reviewed by FHWA, VDOT and other agencies for feasibility and funding. If approved, this improvement will relieve I-395 congestion and provide direct HOV access to the site.

5. Long-term studies to widen I-395 between Duke Street and King Street interchanges are also being evaluated and studied by VDOT. However, the approval process and securing of federal funds may be time consuming.

6. Rideshare trips from I-395 South have the option to travel on I-395 HOV lanes, exit at the Pentagon, and use DoD shuttles to travel to Mark Center site.

7. Multiple DoD/WHS shuttle buses operating at 10 or 15 minute headways will serve BRAC 133 employees from the Pentagon Transit Center, King Street Metro Station (Blue/Yellow Lines/VRE/MARC), Ballston, East Falls and West Falls Church (Orange Line) Metrorail stations during the morning and evening peak periods of travel. Shuttle buses during the off peak periods will service at 30-minute headways. Shuttle service will be offered for 15 hours a day, from 5:30 AM to 8:30 PM on all weekdays to serve employees working late. The proposed shuttle plan is flexible and will be modified for bus sizes and headways as per employee demand once the facility is open and operational.

8. Some Government vehicles may be made available by individual organizations for employee mid-day travel to off-site meetings.

9. A detailed pedestrian circulation and sidewalk plan that includes improvements to the existing walkway system (including, ADA ramps, crosswalks and pedestrian walkway facilities), provides continuity to the existing walkway system and connectivity to major activity centers is being implemented to promote pedestrian travel.
10. Bike racks and shower facilities with lockers are being provided at the site to serve employees who bike to work and to promote non-motorized mode of travel.
11. A slug lane with a pedestrian refuge area is being provided to anticipate slugging among employees.
12. Proposed Transportation Center with five bus bays will offer short-term parking and waiting area for DoD shuttles with facilities for shuttle bus drivers. A covered pedestrian bridge will safely transport employees entering or exiting the BRAC 133 complex to the North parking garage and the Transportation Center.
13. Parking spaces will be available for 57 percent of the total 6,409 employees. In addition, designated parking spaces will be allotted for rideshare vehicles including carpools, vanpools and slug vehicles. Hybrid vehicles and bikes will also be allotted designated parking spaces. ADA parking spaces will be located closer to the entry point for easy access. Parking spaces will be distributed to tenant organizations as per their employee ratios. Organizations will be ultimately responsible for designating employees to receive parking permits. Parking permits will be assigned by parking garage to eliminate added internal circulation trips between the North and South garages.
14. Telecommuting and flexible work schedules are being recommended for enforcement by tenant organizations to assist commuters and relieve traffic congestion problems.

Detailed discussions on TDM strategies including transit service, WHS/DoD shuttle plan alternatives, rideshare promotions and matching, public and private transit service, employee incentives, and parking management are included in the following Section 5.

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5.0 Travel Demand Management (TDM) Plan

5.1 Existing Mark Center Transportation Management Plan

A new development's TMP must attempt to meld its goals and strategies with existing TMPs in the development's community. In this case, the BRAC 133 TMP will consider the TDM strategies detailed in the existing *Mark Center Plaza 1A and 1B TMP*[41] (developed March 31, 2003) and meet and/or exceed the outcomes of the strategies through this BRAC 133 TDM Plan. The intent of the BRAC 133 TMP is not only to develop site-specific strategies, but also to address existing 2003 TMP strategies in order to build a more site-appropriate TMP that will effectively reduce the transportation-related impacts of BRAC 133 on the Mark Center community. The following Section 5.1 outlines the four major TDM strategies adopted as part of the 2003 Mark Center TMP and demonstrates the Army's commitment to including these strategies at a minimum, while building upon these strategies and incorporating additional strategies within the BRAC 133 TMP. The four TDM strategies are as follows:

i. Designation of a Transportation Management Plan Coordinator

Currently, the Mark Winkler Company's Commercial Property Manager of Alexandria properties (now Duke Realty Corporation) is designated as the Transportation Management Plan Coordinator (TMPC). Duties of the TMPC include:

- Managing the shuttle bus service between Mark Center and the Pentagon Metrorail station
- Promoting the use of carpools and vanpools, transit, flex-time, and other TDM programs to tenants and employees
- Administering a ridesharing program
- Providing annual reports to the City of Alexandria on the TDM program utilization
- Administering the on-site sale of transit fare
- Enforcing reserved carpool, vanpool, and flex-time employee parking
- Encouraging tenants to allow employee participation in flexible work hour programs
- Liaising with the City of Alexandria

The BRAC 133 TMP will tie all of the responsibilities of the TMPC into the roles and responsibilities of the BRAC 133 Transportation Coordinator, in addition to other responsibilities, as described in Section 5.2.2.

ii. Shuttle Service to Pentagon Metrorail Station

The first priority of the 2003 Mark Center TMP was the establishment of shuttle service between the Mark Center and Pentagon Metrorail station. Currently, Duke Realty, IDA, and CNA operate free shuttle services for their respective tenants and employees.

[41] *Mark Center Parcel 1A and 1B Traffic Impact Study and Transportation Management Plan*, Wells & Associates, LLC for The Mark Winkler Company, March 31, 2003.

The BRAC 133 TMP will also include the management of a free shuttle service for its employees to nearby Metrorail stations, to likely include service to the Pentagon, Ballston, King Street, East Falls Church, and West Falls Church Metrorail stations.

iii. Reserved Flex-Time Employee Parking

The current 2003 Mark Center TMP provides that up to three percent of new parking spaces for the area now encompassed by BRAC 133 will be reserved until 9:00 AM for flex-time employees.

The BRAC 133 TMP is not able to guarantee flex-time parking for employees. Instead, the TMP is allocating five percent of parking to be allotted for carpools and vanpools, as well as three percent to be set aside for alternative and low/no-emissions vehicles. Details on priority parking are presented in Section 5.4.2.

iv. Reserved Carpool and Vanpool Parking

The current Mark Center TMP indicates that up to five percent of new parking spaces for the area now encompassed by BRAC 133 will be reserved until 10:30 AM for carpool and vanpool parking. After 10:30 AM these spaces will be available for general use.

The BRAC 133 TMP will uphold the five percent parking allocation for carpools and vanpools, as well as three percent to be set aside for alternative and low/no-emissions vehicles. However, no time limits will be placed on the parking in order to encourage drivers to rideshare. Parking spaces for carpools and vanpools are priority spaces which are incentives to ridesharing to BRAC 133; as such, general users and single occupancy drivers will not be able to access these priority spaces. Details on priority parking are presented in Section 5.4.2.

Additional BRAC 133 TDM Plan strategies are derived from a multitude of other sources, in addition to the existing 2003 Mark Center TMP, including:

- DoD transportation program protocol
- Analysis of employee commute patterns and needs
- Research on Army transportation program needs
- Best practices and case studies in travel demand management

The following TDM Plan describes further the strategies of the BRAC 133 TDM Plan and corresponding details of its various programmatic elements.

5.2 Management Organization and Personnel

5.2.1 Managing Organizations

WHS will be managing the WHS Transportation Management Program (based upon this TDM Plan). In the past, WHS's Defense Facilities Directorate has managed the Pentagon's transportation program, including the current DoD Shuttle Bus Program, the Pentagon Transit Center, and the DoD NCR MTBP. WHS will lead the effort in managing the BRAC 133 property and associated facilities, including all

transportation elements. In coordination with WHS, the PFPA PMB will manage BRAC 133 parking facilities and the parking program, as it does for the Pentagon.

i. WHS will establish a "WHS Transportation Management Program Office" onsite at BRAC 133. The office will be staffed during normal weekday business hours with at least one BRAC 133 Transportation Coordinator who will serve as Program Manager for the "WHS Transportation Management Program" as well as employee point-of-contact for all commute-assistance inquiries and needs for BRAC 133 employees. This office will house information and staff dealing with the:

   a) DoD Shuttle Program

   b) DoD NCR Mass Transportation Benefit Program

   c) Mark Center Transportation Center

   d) BRAC 133 employee-commute assistance, including:

      - DoD Shuttle route and schedule information
      - Transit, Bike/Walk, and Rideshare Program materials
      - Transit subsidy dispersal and sales information
      - Ridematching assistance
      - Transit information, including schedules and maps
      - Bicycle and walking path maps
      - Information about the Mark Center community, including the location of shops, restaurants, retail facilities, banks, daycare, fitness, healthcare facilities, etc.
      - Taxi stand information
      - Slugging information
      - Car-sharing (i.e. Zipcar® and other car-sharing service providers) information
      - Regional Commuter Program information (i.e. Commuter Connections enrollment information, Guaranteed Ride Home (GRH) program enrollment information)

ii. The PFPA PMB will also have an onsite office at BRAC 133 that will deal with parking management operations, including parking permitting for commuters and visitors, as well as security within BRAC 133 parking facilities. The office will be located in the VCC.

5.2.2 Transportation Coordinator

At least one Transportation Coordinator shall be hired to operate, manage, and maintain the WHS Transportation Management Program for BRAC. The Transportation Coordinator(s) will be housed and managed under the WHS Transportation Management Program Office and shall maintain normal weekday business hours and be available onsite at the WHS Transportation Management Program Office.

i. A Transportation Coordinator's main objectives are to:

   a) Encourage employees to utilize alternative modes of transportation to the BRAC 133 site, including transit, carpooling, vanpooling, bicycling or walking to work, and/or teleworking one or more days a week in order to reduce employee stress, increase employee family time, ease traffic congestion, and improve air quality.

   b) Offer hands-on personalized commute assistance and act as a point of contact for any BRAC 133 employee requesting assistance on finding an alternative commute mode and/or options for driving alone to work less often.

ii. The Transportation Coordinator(s) will also attend at least one Employee Transportation Coordinator (ETC) Training, provided through the GSA, prior to building opening and annually thereafter to maintain ETC credentials. The Transportation Coordinator(s) must also organize a formal meeting with the City of Alexandria, VA's Employer Services Outreach Specialist in order to become familiar with the City's "Local Motion" program and its associated employer commuter services, both prior to the building opening and quarterly thereafter to maintain coordination with the City and receive updated information on City and community transportation programs.

iii. The main responsibilities of the Transportation Coordinator(s) are to:

   a) Brand the WHS Transportation Management Program (See Section 5.3.4) and organize program rules and registration design in order to cater to the needs of BRAC 133 employees.

   b) Develop language and information updates to be posted on a WHS Transportation Management Program web page to be developed in coordination with WHS staff and as a web page addition to the "WHS Online Defense Facilities Directorate" website, specifically on transportation matters as they relate to BRAC 133 and its employees.

   c) Develop and/or acquire both electronic and print media on local transportation schedules and route maps; bicycle/walk path and route maps; information about the Mark Center community, including the location of shops, restaurants, retail facilities, banks, daycare, fitness, healthcare facilities, etc.; taxi information; car-share program enrollment and membership information; slugging information; transit subsidy dispersal and sales information; and regional commuter program information (i.e. Commuter Connections enrollment information, Guaranteed Ride Home (GRH) program enrollment information).

   d) Manage the Mark Center Transportation Center (See Section 3.3.3) by coordinating with local transit agencies to upkeep schedules and route information as well as with facilities maintenance staff to maintain the cleanliness and preservation of the Transportation Center.

   e) Manage the DoD Shuttle Bus Program operations between Mark Center and Metrorail stations. This will include coordinating with the Pentagon Shuttle Program point of contact and with local transit providers utilizing bus bays at the Transportation Center on a regular basis to ensure efficient operations in order to mitigate queueing back-up at bus bays

assigned to shuttles. In addition, the Transportation Coordinator(s) will monitor and maintain shuttle service to all Metrorail stations in order to maintain schedule and prevent delays. The Transportation Coordinator(s) will also produce and maintain up-to-date information on scheduled pick-ups and drop-offs, route changes, Metrorail stop modifications and advertise the information both on the WHS Transportation Management Program web page and via print material.

f) Design and maintain an "Alternative Commute Incentive Program" (See Section 5.3.4) that will reward employees registered as non-solo drivers based on meeting certain minimum requirements (i.e., carpooled to work 15/20 work days in the month).

g) Develop and maintain a "Ridematching Program" (See Section 5.6) by assisting employees in enrolling in the program, helping them to fill empty seats in carpools and/or vanpools, etc. The Transportation Coordinator(s) will also plan and conduct annual ridematching activities to encourage interested employees to find carpool/vanpool partners.

h) Produce marketing materials to effectively promote the use of carpools, vanpools, transit, flex-time, bicycling, walking, telecommuting, and other TDM programs to employees.

i) Organize, plan, and conduct two annual transportation-related events: a Transportation Fair in the fall and a Bike to Work Day event, in coordination with MWCOG's Bike to Work Day festivities, in the spring.

j) Coordinate with the Mobile Commuter Store™ to administer the sale of transit fares at least biweekly on-site at BRAC 133.

k) Coordinate with the PFPA PMB office on a routine basis to enforce reserved carpool, vanpool, and low/no-emission vehicle parking.

l) Provide assistance to employees requesting commuting information to BRAC 133 and/or personalized commute assistance.

m) Enroll new employees into the WHS Transportation Management Program and assist them through educational orientation materials in making a decision on the most feasible commute for them.

n) Liaise with the City of Alexandria to discuss updates to local transportation information and available City programs.

o) Develop an annual "State of the Commute Report" for WHS detailing the success of the WHS Transportation Management Program in reducing single occupancy vehicle trips and improving mobility to and from the site as well as recommended Program modifications for the coming year.

The Transportation Coordinator(s) will also coordinate regularly with the "Pentagon/DoD Central Service Center" that will administer all DoD transportation-related matters. The Transportation Coordinator(s) will receive updated information on programmatic modifications to DoD programs, such as the Mass Transportation Benefit Program (which will continue to be maintained centrally out of the Pentagon,

including for BRAC 133 employees) and Pentagon/BRAC 133 DoD shuttle buses. The Transportation Coordinator(s) will receive updates through routinely scheduled meetings with the Pentagon/DoD Central Service Center.

5.3 Pre-Relocation Outreach

5.3.1 Marketing

WHS has already begun marketing and preparing employees and tenants for the move to BRAC 133. The Office currently maintains a "WHS BRAC 133" web page, under the "WHS Online Defense Facilities Directorate" website, which keep employees and the general public abreast of BRAC 133 activities. WHS also coordinates on a monthly basis with tenants moving to BRAC 133 and employee points of contact for BRAC 133 to discuss up-to-date information, such as transportation studies, relocation logistics, transportation concerns and/or ideas, etc. In May of 2010, WHS will hold its annual Transportation Fair at the Pentagon to educate DoD employees about transportation alternatives for commuting. This fair will include a booth for BRAC 133 employees specifically in order to begin engaging employees to start re-examining or planning for their new commutes.

While WHS is marketing to BRAC 133 employees and tenants currently, WHS will also plan for the following additional activities:

i. WHS will continue to hold monthly tenant focus group meetings to issue the latest information on the BRAC 133 relocation and planned Transportation Management Program.

ii. Upon acceptance of this TMP, WHS will conduct a focus group with tenants and employee points of contact to discuss major elements of the TDM Plan and associate Transportation Management Program in detail.

iii. Within 9 months prior to relocation, WHS will hire the Transportation Coordinator(s) to help facilitate design and marketing of the Transportation Management Program.

iv. Six months prior to relocation, WHS will also begin producing and/or acquiring brochures, pamphlets, posters, and other marketing media to increase employee awareness of transportation options available to BRAC 133. Other media will also include letters from ranked officers and other executives enforcing participation in the Transportation Management Program and informing employees of schedules and deadlines for relocation, program enrollment, events, etc.

5.3.2 Employee Orientation

WHS will develop several employee orientation-related guidance materials and events in order to familiarize employees with the new site and the procedural guidelines for the relocation and determining transportation to and from the site. The goal of the orientation tasks is to prepare employees for the impending change in commutes and to provide a level of comfort for employees so that the first day of their new commutes is less unfamiliar and daunting. This level of comfort may also help reframe the intimidation that employees may be feeling in shaping a new commute and may allow employees to make more informed decisions in selecting alternative transportation modes, thereby

increasing participation in the Transportation Management Program's various commute alternatives and incentive programs (See Section 5.3.4). WHS will conduct the following orientation activities in order to acquaint employees with new commutes and alternatives:

i. Six months prior to the relocation, WHS will develop a "BRAC 133 Employee Orientation Handbook" which will include, at a minimum, the following:

   a) Relocation Procedures and Codes of Conduct

   b) Introduction to the Transportation Coordinator(s) Roles and Responsibilities & Contact Information

   c) Transportation Management Program Details (including information on program registration and enrollment, benefits, and rules for participation)

   d) Mark Center Community and BRAC 133 Building Amenities

   e) Building Transportation Amenities Site Map (displaying location of bicycle facilities, retail facilities, etc.)

   f) Parking Permit Protocol (for special permits, carpool/vanpool permits, and general use permits)

   g) Telecommuting and/or Alternative work Schedule Requirements and Guidelines

   The "Orientation Handbook" will be released at least 4 months before relocation.

ii. After the release of the Handbook, WHS will organize an orientation outreach effort, backed by ranked officer and executive support, whereby various organizations that will be relocating will be scheduled for small group presentations to go over the Handbook and elements of the Transportation Program, detail the various incentive programs for choosing alternative commute modes, and advertise dates for the following events that will be used to educate employees on their travel options and promote their use of alternative transportation modes:

   a) WHS will hold multiple BRAC 133 Transportation Fairs at various current employee worksites to increase awareness of BRAC 133 commute options and programs, as well as to "meet and greet" transit agencies, vendors, and other commuter service-groups who will be invited and available to help acquaint employees with their travel options to Mark Center.

   b) WHS will hold home-location based focus group sessions for various communities where clusters of employees currently reside. Employees will register for the session that corresponds to the area in which they reside (i.e., Manassas Session, Centreville/Chantilly Session, Fairfax/Oakton Session, etc.). At the focus group, WHS will lead a couple of exercises, including a "know your neighbor" activity that will encourage employees to find potential ridesharing partners in their own neighborhood or zip code, as well as a scheduling exercise that will divide employees by the time they must report to work. WHS will then deliver instructions and guidelines on capitalizing on the

proximities of these neighbors by starting a carpool or vanpool and disseminate information on the benefits and incentives available to employees for ridesharing.

c) WHS will also hold a vanpool focus group session and "lunch and learns" to inform employees about the vanpool program, rules, and benefits, as well as register employees for internal BRAC 133 employee vanpools as well as regional vanpool options.

5.3.3 Survey

In the fall of 2009, WHS conducted an employee transportation survey to gauge employee interest and participation in various commute-related programs (See Section 2.3). In July of 2010, WHS will conduct a resurvey of employees to determine if their commuting patterns will change as a result of the relocation, now that employees are more informed about some of the options that will be available to them. However, at this point the TMP and the corresponding TDM Plan will not have been circulated to employees yet, nor have the details of the Transportation Management Program and associated incentives been announced, thus the results may not be precise. Therefore, WHS will conduct an additional resurvey in the winter of 2010. Employees will then be further informed about the TDM strategies that will be employed at BRAC 133 and the various events and programs that will be available to them. At this point, they will be able to make more informed decisions about what their transportation mode choice will be. The results of this survey will help WHS determine which transportation modes to market the most as target modes in the development of the BRAC 133 Transportation Management Program.

5.3.4 WHS Transportation Management Program & Employee Enrollment

The advantages of developing a branded WHS Transportation Management Program are to provide WHS with an accurate understanding of the planned commute choices in which employees are most interested as well as to inform the Transportation Coordinator(s) of the right target audience and interested parties on whom focus should be placed on marketing various commute options more accurately and effectively.

It is essential that employees are enrolled in a structured WHS Transportation Management Program in order to effectively maintain and develop an understanding of the commuting habits of BRAC 133 employees, and to keep firm control of BRAC 133 adherence to this TMP's goals for SOV reduction and improved mobility for BRAC 133 employees. It will be the responsibility of the Transportation Coordinator(s) to design and manage the Program; however, several components must be adhered to in order for it to be successful. The following are required program elements and procedures that the Transportation Coordinator(s) must follow at a minimum:

i. Every BRAC 133 employee will be encouraged to pre-register and enroll in the BRAC 133 Transportation Management Program, including those indicating an interest in driving alone.

ii. The Transportation Coordinator(s) will design Program rules of enrollment, electronic Program registry, and a registration and enrollment form (electronic and/or paper) that will, at a minimum, include the following mandatory information:

- Employee Name, ID Number, and Office Name
- Employee Home Address and Work Telephone/Email
- Planned Primary Mode of Transportation to BRAC 133
- Planned Secondary Modes of Transportation to BRAC 133
- Enrollment in the Mass Transportation Benefit Program
- Enrollment in Commuter Connections Guaranteed Ride Home Program
- Parking Permit Number (if applicable)

iii. The Transportation Coordinator(s) will also manually enter the registration forms into an electronic Program registry database (if forms are not electronic) for ease of reference and records management.

iv. For all employees who do not elect to drive alone, the Transportation Coordinator will issue a notice to employees to verify acceptance of automatic enrollment into the Guaranteed Ride Home Program and will address employee questions/concerns regarding registration and membership information.

5.4 Parking Management

5.4.1 Permitting

PFPA PMB will be in charge of managing all parking operations, including parking permit allocation and distribution of permits to carpools, vanpools, and low/no-emission vehicles. However, tenant organizations are responsible for general use parking permit distribution to employees (i.e., permits for employees who want to drive alone to work). Priority parking permits for carpools and vanpools will be distributed before general use parking permits and will also be guaranteed to BRAC 133 employee carpools and vanpools. The following information outlines the general use parking permitting process at BRAC 133:

i. Parking spaces will be allocated by PFPA PMB to each tenant organization according to the percent of the total employee population that the organization employs located at BRAC 133. Organizations will only be allotted the number of permits that correspond to the number of parking spaces dedicated to the organization, thus there will be a one to one ratio of parking permits to parking spaces.

ii. Each tenant organization will be responsible for distributing general use parking permits to employees. In order to receive a permit, employees must access an online application form and fill out information about the type of permit requested and vehicle identification information. Upon review by the employee's supervisor, a parking permit may be granted if the employee meets given criteria (i.e., does not desire to receive a mass transit benefit subsidy). Tenant organizations may only grant as many permits as there are parking spaces allocated to that

organization. Permits will be granted on a first-come, first-serve basis to qualified applicants until the allotted number of permits within each organization is exhausted.

iii. Parking permits will be numbered, corresponding to a single employee's registered vehicle as indicated in the online application. Permits will also be colored according to type of permit (i.e. disabled, executive, carpool/vanpool, low/no-emission vehicle, government vehicle, etc.) and to which parking garage the permit is applicable (i.e., North or South Parking Garage). Parking permits will only be valid in one garage (either North or South Parking Garage).

iv. PFPA PMB officers will be responsible for resolving permit violation issues, including towing of unauthorized vehicles, or those which do not display a permit. Officers may also issue Federal parking citations for parking in reserved areas, for vehicles parked unlawfully, etc. Officers will routinely patrol the parking garages to ensure compliance with protocol and security.

5.4.2 Priority Parking

PFPA PMB will be responsible for distribution of priority parking permits and spaces to employees who choose to carpool, vanpool, or utilize low/no-emission vehicles. There will not be a parking cap to the number of permits PFPA PMB can assign to carpool and vanpool commuters – parking for carpools and vanpools is guaranteed. A minimum of 320 carpool/vanpool priority parking spaces will be reserved in North Parking Garage closest to the pedestrian bridge as the North Parking Garage offers the least inconvenience to carpoolers/vanpoolers by eliminating dwell time at the security checkpoint. If the demand for carpool/vanpool parking permits is higher than the allotted amount of parking, spaces will be removed from general use permit parking and re-designated as carpool/vanpool permit parking. Parking is capped at 192 spaces for low/no-emission vehicle parking spaces, which will be located in the South Parking Garage closest to the entrance of the building. Requirements and protocol for receiving a priority parking space are as follows:

i. A qualified carpool or vanpool must have at least two DoD employees riding in the vehicle to apply for a permit, in addition to a BRAC 133 employee driver. If a significant demand for carpool/vanpool spaces for two-person carpools/vanpools arises, PFPA PMB will consider allotting permits for these vehicles.

ii. The driver of a carpool or vanpool must apply for a carpool/vanpool parking permit in person at the PFPA PMB office and show a valid driver's license. The driver must also list the names of the BRAC 133 employees also in the carpool/vanpool on the application. PFPA PMB will verify that the employees are designated riders in the driver's carpool/vanpool before a permit will be granted. Both the driver and riders agree to waive their right to the mass transit benefit subsidy in order to obtain the carpool/vanpool parking permit.

iii. A qualified low/no-emissions vehicle must be a alternative fuel vehicle (ultra low sulfur diesel, CNG, LNG, electric, fuel cell, E85; or use average B50 biodiesel in standard diesel engine) and/or low-emission and/or fuel efficient vehicle (ZEV). Proof of vehicle eligibility will be determined upon review of the vehicle make, model, and registration as indicated on the employee permit application.

iv. PFPA PMB officers will enforce permit requirements by conducting random phone calls to riders to ensure they are still members of the carpool/vanpool as well as through surveillance of carpools and vanpools into and out of the parking garage.

5.4.3 Overflow Management

PFPA PMB is only responsible for the management of Army-owned property and parking facilities. However, businesses-owners and residents have reasonable concerns about spillover parking from BRAC 133 affecting the availability of parking near their businesses and homes. Although the majority of parking near the facility is permit or access controlled, some parking, both street and off-street may be impacted by spillover. The parking that may be impacted can be categorized as parking lots where enforcement may be challenging and/or where parking is unpermitted (i.e., residential community parking).

In order to mitigate parking overflow, several actions will or already have been implemented, by WHS as well as area businesses and residential associations, including:

i. Installing parking garage barrier gates and counters and/or are staffing by parking management personnel at surrounding Mark Center properties with publicly accessible commercial parking capacity. These garages will also have a higher posted price for parking than for visitors to tenants in the property, who will receive parking validation upon exit. Therefore, it will be more expensive for BRAC 133 employees to park in commercial garages (if any desire to do so).

ii. Limiting guest parking to 4 hours and implementing a towing program based on tire markings (or other means of identifying vehicles that have been parked too long) both in lots and garages. Employees or tenants of the commercial properties are exempt from the requirement through parking permits and/or a registry of employee license plates maintained by the parking management office or personnel.

iii. Issuing resident and guest parking permits to residential community members and implementing a strict towing policy for vehicles not displaying a permit.

Properties that have not considered the aforementioned strategies should consider implementing one or more of these strategies to help mitigate the effects of any possible overflow parking.

WHS will maintain a BRAC 133 building management hotline for community members to voice a complaint about frequent parking violations. This hotline will be maintained by the Transportation Coordinator(s) at the WHS Transportation Management Program Office and frequent violations will be resolved through communications from the Transportation Coordinator(s).

5.4.4 Special Events Protocol

As the BRAC 133 will house many special events, including conferences, training seminars, and organized large meeting events, there will be special events parking protocol in place to which all visiting non-BRAC 133 employees must conform, including:

i. All visitors attending a conference, training seminar, organized large meeting, or other special event must board a DoD shuttle bus from a designated Metrorail pick-up point. Visitors will not be permitted to park at the Pentagon if attending a special event at BRAC 133. Visitors may only park at a lot near the Metrorail station at which they are boarding a train, bus, or DoD shuttle bus, and/or at a commercial parking facility.

ii. For visitors from outside of the DC Metropolitan Area, WHS will conduct arrangements with area hotels, such as the Hilton Alexandria Mark Center, that will allow for visitors to stay at the hotel and walk or be shuttled over by hotel shuttle or taxi to the BRAC 133 site.

5.5 Public Transit Program

5.5.1 Subsidies

Effective October 1, 2000, Executive Order 13150 "Federal Workforce Transportation in the NCR" allows qualified employees to participate in a transportation fringe benefit program, otherwise known as the MTBP. WHS is managing this program for NCR employees and is assisted by the United States Department of Transportation (USDOT) in its implementation. The following guidance will apply to BRAC 133 employees:

i. Upon registering for the WHS Transportation Management Program (See Section 5.3.4), employees who indicate that they intend to use transit as their primary mode will be directed to file a web based application (DD Form 2845) with the Defense Facilities Directorate Programs and Services Division, which will manage the MTBP enrollment process for the NCR, to include BRAC 133. All BRAC 133 employees who desire to be a part of the MTBP must reapply for the subsidy, even if they are currently utilizing transit to get to their current work location, in order to account for the potential change in transit fare that will be required to alight at a different Metrorail station or bus stop closer to BRAC 133 or DoD shuttle bus pick-up/drop-off points.

ii. Participating employees will receive, in addition to their current compensation, transit subsidies in amounts equal to their personal commuting costs, not to exceed the amount as determined by law. Parking costs will not be used in establishing commuter costs. This benefit applies to both mass transit and qualified vanpool participants. Subsidies are dispersed in the following forms:

   a) **Metro Fare Cards:** Metro fare card denominations issued will be $1, $5, $10, and $30.Those participants who ride those modes of transit that are compatible with the SmarTrip card will receive these fare cards at their quarterly distribution. Fare cards may be loaded directly onto a SmarTrip card, in the same fashion as the former metro check.

   b) **SmartBenefit Vouchers:** Smart Benefit vouchers will be distributed to all participants who utilize forms of transportation that are not compatible with the SmarTrip technology, such as the VRE, MARC, many private commuter buses, etc.

c) **TranBen Vouchers:** Tranben Vouchers will be provided to those applicants who ride vanpools and Quick's bus lines.

iii. Employees with subsidized parking must relinquish their parking permits to receive the transit subsidy. Similarly, employees who receive transit subsidies may not be counted as part of a DoD carpool for purposes of qualifying for a parking pass. Servicing parking offices will have the authority to make exceptions to this rule. They will notify WHS of any exceptions granted. Employees must give up their parking pass in order to receive this benefit.

iv. Subsidies will be distributed quarterly on widely-advertised scheduled dates whereby MTBP staff will be on-site at BRAC 133 to distribute the passes. Employees will be notified of distribution dates via email, on the "WHS NCR-Transit Subsidy" web page, and/or via print media.

5.5.2 Onsite Transit Pass Sales

Due to liability limitations, employees will not be able to purchase transit fare media onsite through Metro fare vending machines. Instead, employees will have the ability to purchase transit fare media onsite through an arrangement with the Mobile Commuter Store™. WHS will make arrangements to have the Mobile Commuter Store™ be available on-site at Mark Center Transportation Center twice a week during off-peak hours. The Mobile Commuter Store™ will also be accessible to Mark Center community employees and residents.

In addition to the Mobile Commuter Store™, employees may purchase transit fare media at many transit stores across the Greater Washington Metropolitan Region, as outlined in Table 5-1.

Table 5-1: Alternate Transit Store Locations for Employee Fare Purchasing

Transit Store Name	Address	City	State	Zip
Pentagon Transit Store	Pentagon Transit Center, Upper Level	Washington	DC	20301
Ballston Commuter Store	4238 Wilson Boulevard, Suite 2232	Arlington	VA	22203
Crystal City Commuter Store	1615-B Crystal Square Arcade	Arlington	VA	22202
Rosslyn Commuter Store	1700 N. Moore Street, Suite 235	Rosslyn	VA	22209
Shirlington Commuter Store	2975 S. Quincy Street	Shirlington	VA	22206
The Olde Town Transit Shop	1775C Duke Street	Alexandria	VA	22301
Connector Store	12530 Sunrise Valley Drive	Herndon	VA	20171
Connector Store	1860 Wiehle Avenue	Reston	VA	22090
Connector Store	12051 Bluemont Way	Reston	VA	20190
Connector Store	6880 Frontier Drive	Springfield	VA	22150
Connector Store	8300 Jones Branch Drive	McLean	VA	22102
TRiPS Commuter Store	8413 Ramsey Avenue	Silver Spring	MD	20910

Source: Arlington County "Commuter Page" web page, http://www.commuterpage.com/storeoth.htm (last accessed May 1, 2010).

5.5.3 Marketing

In order to maintain transit mode share at BRAC 133, the Transportation Coordinator(s) will commit to an aggressive transit marketing campaign. The Transportation Coordinator(s) will:

i. Develop and/or acquire brochures, pamphlets, and posters advertising as well as posting information on the WHS Transportation Management Program web page on various transit options available in the region. The Transportation Coordinator will also maintain stock of brochures and schedules in the WHS Transportation Management Program Office.

ii. Investigate the feasibility and, if funding is available, provide a "commuter kiosk" in order to provide employees with personalized transit commute assistance through a touch screen application.

iii. Organize, plan, and conduct an annual BRAC 133 Transportation Fair at BRAC 133 to increase awareness of BRAC 133 commute options and programs, as well as to "meet and greet" transit agencies, vendors, and other commuter service-groups who will be invited and available to help acquaint employees with their travel options to Mark Center.

5.5.4 Recommended Improvements

In the long run, there are some activities that WHS may explore in order to improve the effectiveness of their Transit Program, including the following:

i. Examining the coordination of the DoD shuttle program with the development of improved public transit services, including shuttle schedule alignment with public transit, route alignment, etc.

ii. Explore the feasibility of expanding the Mark Center Transportation Center to include additional bus bays and/or transit amenities. WHS may consider holding collaborative meetings with transit agencies, residential associations, and other Mark Center commercial properties to examine the probability of sharing costs of the expansion.

iii. In the event the Transportation Center is expanded and transit service to the site becomes more abundant, WHS should explore the feasibility of a future transit store location at the Mark Center Transportation Center. WHS may consider holding collaborative meetings with transit agencies, residential associations, and other Mark Center commercial properties to examine the probability of sharing costs for the transit store.

iv. Explore the feasibility of an open-to-the-public annual transit fair at or in the vicinity of the Mark Center Transportation Center. This fair will help showcase Army commitment to the Mark Center community and its goals to reduce traffic to the area, as well as become a more sustainable Federal entity. The fair should have transportation vendors on-site to answer Mark Center employee, resident, or visitor questions and encourage use of transit to and from the area, in a festive atmosphere.

5.6 Rideshare Program

5.6.1 Carpools

Encouraging carpooling is one of the most effective ways for employees to find a door to door commute solution. The Transportation Coordinator(s) will develop a Rideshare Program that is geared toward

forming BRAC 133 employee-only carpools. The employee zip code analysis presented in Section 2.3 demonstrates that many employees live within the same zip code and/or residential community, but may work in separate offices and not even know that one another works at BRAC 133. Other than the pre-relocation home-location based focus group sessions described in Section 5.3.2, the Transportation Coordinator(s) will encourage use of carpooling through:

i. Purchasing a licensing agreement to ridematching software and/or online applications that allow for employees interested in finding a carpool to enter their information, home address, and work schedule into a secure database for BRAC 133 employees only. The system will automatically send a message to other interested employees within the same zip code and/or geographic area, informing them of a match and will facilitate information exchange so that employees can setup a carpool on their own. The Transportation Coordinator(s) will advertise this option through the orientation handbook, email, and through other media to be given to employees as they enroll in the BRAC 133 Transportation Management Program.

ii. Organize, plan, and conduct a ridematching activity at the annual Transportation Fair that allows for employees to reevaluate their commutes and consider carpooling by meeting employees who may live in the same geographic area as one another.

iii. Develop and/or acquire brochures, pamphlets, and posters advertising as well as posting information on the WHS Transportation Management Program web page on various carpool program options available in the region, including those provided through Commuter Connections and the City of Alexandria.

5.6.2 Vanpools

As many employees are commuting from long distances outside of a viable connection to transit, it is important that WHS develop a strong vanpool program. The Transportation Coordinator(s) shall also have the responsibility of coordinating vanpool formation and/or seat-filling for vanpools that contain BRAC 133 personnel. The Transportation Coordinator(s) will:

i. Develop both a short-distance and long-distance oriented vanpool program to accommodate employees who live near and far from the BRAC 133 site, and are not convenient to transit. The Transportation Coordinator(s) will work with vanpool providers to develop an action plan for recruiting employees who are interested in vanpools and matching them to BRAC 133 only and community vanpools, such as those at IDA or CNA.

ii. Conduct a Maryland commuter-focused vanpool seminar to engage Maryland commuters outside of the transit network in discussions about utilizing vanpools to get to BRAC 133. The Transportation Coordinator(s) will organize an event, in coordination with vanpool service providers with service in Maryland, to encourage Maryland commuters to utilize vanpools, including a vanpool matching exercise.

iii. In addition to the vanpool “lunch and learns” in the pre-relocation outreach phase described in Section 5.3.2, the Transportation Coordinator will invite vanpool providers to the annual

Transportation Fair and allow for various providers to hold "lunch and learns" at their discretion, as long as they are coordinated and scheduled with the Transportation Coordinator.

iv. Maintain a vanpool database and/or board at the BRAC 133 Transportation Management Office that lists all registered BRAC 133 vanpools parked on the property, as well as any vanpools that employees may utilize to get to BRAC 133 (including those to the Pentagon). The board and/or database will display information on origin and destination of the vanpool, the seating capacity of the vanpool, whether the van is full, price per seat, and whether the vanpool is looking for additional riders. This information will be advertised and available to interested BRAC 133 employees.

v. Develop and/or acquire brochures, pamphlets, and posters advertising as well as posting information on the WHS Transportation Management Program web page on various vanpool program options available in the region, including those provided through Commuter Connections and private vanpool service providers.

5.6.3 Slug Lines

The Transportation Coordinator(s) will be responsible for providing information on slugging and the location of the slugging area. As slugging is informal, casual, inconsistent, and self-organized, it will be difficult to set up a formal program for slugging; however, in order to promote the safe queuing of slugging, the Transportation Coordinator(s) will explain the location of slugging queue space available to slugs using site plans in the orientation handbook, as well as during the pre-relocation outreach meetings, described in Section 5.3.2.

5.6.4 Guaranteed Ride Home

Guaranteed Ride Home (GRH) is a free service administered by MWCOG to provide Metropolitan Washington Area commuters who regularly carpool, vanpool, bike, walk, or take public transit to work a free ride home in the event of a personal emergency or if they work late at a supervisor's request. Commuters can utilize this service up to four times per year. If a commuter misses his or her ride home, GRH will arrange for a taxi, rental car, or paratransit service provider to take him or her. Members are issued a GRH card to be presented to the emergency ride driver to validate the four free rides.

Upon enrollment into the BRAC 133 Transportation Management Program, all employees who do not elect to drive alone will be notified by the Transportation Coordinator(s) to verify acceptance of automatic enrollment into the GRH Program. All employees who regularly carpool, vanpool, bike, walk, and/or take public transit must register into the GRH Program. Information on the GRH program will be posted on the WHS Transportation Management Program web page as well as advertised in the WHS Transportation Management Program Office.

5.6.5 Recommended Improvements

In the long run, there are some activities that WHS may explore in order to improve the effectiveness of their Rideshare Program, including the following:

i. If demand is high for vanpools, WHS should consider hiring a Vanpool Coordinator to serve as employee interface for establishing or maintaining vanpools, and also as an interface between vanpool service providers and BRAC 133 tenant agencies.

ii. A Vanpool Coordinator may also explore the feasibility of implementing SmartBenefits to provide ease of payment to vanpool providers. This would help make vanpooling more convenient for employees by removing the responsibility of coordinating payment from vanpool riders. It will also make payment for vanpool providers easier by removing the extra step for the vanpool service provider to trade in vouchers for payment and/or issue refunds for overpayment, as the cost of operating a vanpool fluctuates monthly.

5.7 Mid-Day Travel Options

The BRAC 133 site will have multiple options for employees to make mid-day trips without the use of a personal vehicle. The following are elements of the WHS Transportation Management Program as it relates to mid-day travel:

i. Many tenant agencies at BRAC 133 will have their own government vehicles onsite. Many of these vehicles will be used to transport employees during the work day for meetings, special events, etc.

ii. The DoD shuttle bus program will include mid-day services route to Metrorail stations throughout the day.

iii. All of the DASH and Metrobuses serving the BRAC 133 site (except for Metrobus route 28G) offer mid-day service at 30-60 minute headways. Employees will be able to access these buses for service to areas outside of Mark Center as well as to seven local Metrorail stations, including Pentagon, Eisenhower, Braddock, Van Dorn, Ballston, West Falls Church, and King Street stations.

iv. A mid-day taxi stand will be available near the Transportation Center during mid-day, off-peak hours. In addition, the Hilton Alexandria Mark Center Hotel has a taxi stand within walking distance of the BRAC 133 site.

v. A number of on-site amenities will be available to employees so that they will not need to make mid-day trips for errands or lunch, including:
   - Fitness Center
   - Cafeteria
   - Office supply store
   - Two snack/coffee shops
   - Health Clinic
   - Credit Union

vi. In addition to on-site amenities, the Mark Center community houses a number of amenities within walking distance from BRAC 133, including restaurants, a bank, coffee shops, a grocery store, and other services.

vii. Currently, there is one Zipcar® car-share vehicle available in Mark Center within walking distance from BRAC 133 (at 2001 North Beauregard Street). Employees who are registered with the Zipcar® program who do not have a parking permit but need to make a driving trip to their destination can reserve this vehicle for their own use.

5.7.1 Recommended Improvements

In the long run, there are some activities that WHS may explore in order to improve the effectiveness of mid-day travel options, including the following:

i. The Transportation Coordinator(s) should consider conducting a demand analysis for obtaining additional car-sharing vehicles to be available on-site or within walking distance of BRAC 133. The Transportation Coordinator should conduct a survey to determine employee interest in having additional car-share vehicles onsite. If there is a demand, discussions with car-sharing service providers should be held to develop a program for obtaining the vehicles as an additional amenity for the BRAC 133 site and Mark Center community.

ii. In order to encourage non-driving solutions for mid-day travel, the Transportation Coordinator(s) should consider conducting a demand analysis for developing a bike-sharing program for travelers who wish to bicycle at lunch for fitness, to nearby destinations (i.e., Old Town Alexandria, Shirlington Village, etc.) for more retail and restaurant options and/or errands. The Transportation Coordinator should conduct a survey to determine employee interest in having a BRAC 133 bike-sharing program available on-site. If there is a demand, discussions with bike-sharing service providers should be held to develop a program for obtaining the bicycles as an additional amenity for the BRAC 133 site and Mark Center community. The same analysis can be done for those interested in having a Segway Personal Transporter-rental program, for walkable trips and/or an environmental travel option for the disabled.

5.8 Variable Work Hour/Flex Time

5.8.1 Flexible Work Week

Many BRAC 133 employees are eligible for the Flex Work Week (FWW) Program. According to the WHS fall 2009 commute survey, 25 percent of survey respondents currently work on an FWW schedule. A flexible work schedule allows employees to be flexible on the hour they come into work and when they leave, as long as employees work during core work hours (10:00 AM through 3:00 PM) and for the total hours necessary to fulfill their job type (i.e., 40 hours for full-time and 30 hours for part-time, etc). Types of FWW schedules and the corresponding percentage of survey respondents participating in that type include:

- **Flexitour (32 percent):** Employee selects starting and stopping times are within the flexible hours. Once selected, the hours are fixed.
- **Gliding (63 percent):** Employee selects a starting and stopping time each day, and may change starting and stopping times daily within the established flexible hours.

- **Maxiflex (2 percent):** Employee maintains core hours on fewer than 10 workdays in the pay period, but an employee may vary the number of hours worked on a given workday or the number of hours each week.

WHS should aim for a 15 percent increase in the number of employees participating in the FWW Program within one year of BRAC 133 relocation. In order to achieve this goal, the Transportation Coordinator(s) will:

i. Coordinate with tenant organization points of contact to educate them on the importance of FWW schedules and encourage making most employees eligible for FWW.

ii. Advertise FWW in the orientation handbook and encourage employees who have not taken advantage of FWW to do so as they relocate to BRAC 133 (as described in Section 5.3.2).

iii. Develop new-hire orientation packets to inform employees about their FWW eligibility and encourage employees to travel during the early or later part of the peak period.

iv. Coordinate with traffic engineers to conduct biannual traffic counts at key intersections and parking garage entrances to determine actual peak hour congestion levels. The Transportation Coordinator will issue a report to tenant organization points of contact detailing peak hours of congestion. If it is determined that at a certain peak hour, intersections are operating at consistently failing levels of service, the report will encourage supervisors within each tenant organization to inform employees to avoid traveling to work during the peak hour of congestion and encourage being flexible with their arrival time to work, within reason and when possible.

v. Develop and/or acquire brochures, pamphlets, web-content, and posters advertising the FWW program.

5.8.2 Compressed Work Week

Many BRAC 133 employees are also eligible for the Compressed Work Schedule (CWS) Program. According to the WHS fall 2009 commute survey, 15 percent of survey respondents currently work on an FWW schedule. A compressed work schedule allows employees to be flexible the number of hours they work per day in order to work a shorter week and/or have a “compressed” day off. Types of CWS schedules include:

- **4/40 Work Week (11 percent):** Employee works 8 days in a pay period, 10 hours per day.
- **9/80 Work Week (89 percent):** Employee works 9 days in a pay period, 9 hours per day.

WHS should aim for a 10 percent increase in the number of employees participating in the CWS Program within one year of BRAC 133 relocation. In order to achieve this goal, the Transportation Coordinator(s) will:

i. Coordinate with tenant organization points of contact to educate them on the importance of CWS schedules and encourage making more employees eligible for CWS.

ii. Advertise CWS in the orientation handbook and encourage employees who have not taken advantage of CWS to do so as they relocate to BRAC 133 (as described in Section 5.3.2).

iii. Develop new-hire orientation packets to inform employees about their CWS eligibility and encourage employees to travel during the early or later part of the peak period.

iv. Coordinate with tenant organization points of contact and supervisors to allow employees to make their "compressed" day(s) off on days other than Friday whenever possible in order to alleviate congestion throughout the week.

v. Develop and/or acquire brochures, pamphlets, web-content, and posters advertising the CWS program.

5.8.3 Telecommuting

Less than two percent of overall survey respondents indicated that they telecommute to work at least one day a week. However, 19 percent indicated they telecommute via Temporary Duty Assignment (TDY) multiple times during the year, if not regularly. This demonstrates that almost 20 percent of the BRAC 133 workforce responding to the survey is capable of working off-site. As well, most organizations that will be relocating to BRAC 133 do allow telecommuting, or are currently working on drafting a telecommuting policy. While many organizations do not permit telecommuting due to the nature of the organization's work, those that can allow telecommuting should instate a formal written policy to allow for telecommuting at least once a week.

Therefore, WHS should aim for an 18 percent increase in the number of employees telecommuting within one year of BRAC 133 relocation. In order to achieve this goal, the Transportation Coordinator(s) will:

i. Coordinate with high-security organization points of contact and/or supervisors within those organizations that *can* allow telecommuting to participate in a training seminar on telecommuting options and policies in order to educate them on best practices in telecommute policy development. The Transportation Coordinator(s) will recruit telecommuting experts to run the training seminars.

ii. Work with DoD and U.S. Department of State Telework Coordinators (list is provided by GSA) to develop a WHS eTelework application and remote encryption program, similar to the one being used currently by Department of State. The eTelework application automatically routes a telework agreement from employee to supervisor to executive director and creates an electronic record of the agreement and provides notifications to the employee when decisions on the application are made and again when the annual agreement is set to expire. This allows for monitoring of employee telework activities to ensure compliance. Remote encryption programs, such as those used when DoD employees are TDY, can also be used for telecommuting purposes and can link up with eTelework applications.

iii. Provide guidance to organization representatives regarding the development of applicable telecommute policies for their organization so that each organization at BRAC 133 has a formal policy on telecommuting.

iv. Attend training seminars and/or information sessions on the latest high-security telework technologies in order to stay abreast of potential applications for use at the BRAC 133 site.

v. Educate supervisors and post information to the WHS Transportation Management Program website on the applicable use of telework centers, located throughout the region. Telework centers shorten the commute time of employees by allowing them to commute to their local center instead of to BRAC 133, in the event working from home does not provide employees with a structured work environment.

5.9 Bicycle and Pedestrian Program

5.9.1 Paths and Walkways

Many bicycle paths and routes are located within less than one mile of the BRAC 133 site. Table 5-2 outlines 17 of the bicycle paths and routes that can be used for travel into and out of the Mark Center area, including whether the path is classified as on-road or off-road.

Table 5-2: Bicycle Paths and Routes within 3 Miles of BRAC 133

Path/Route	Classification
Stream Valley Trail	Off-Road
Holmes Run	Off-Road
Richenbacher	On-Road
W. Braddock Rd	On-Road
W&OD	Off-Road
Four Mile Run	Off-Road
Dawes	On-Road
North Chambliss	On-Road
East Campus	On-Road
King Street	On-Road
Sanger	On-Road
Pegram	On-Road
Picket	On-Road
N. Howard	On-Road
S 28th	On-Road
S. Columbus	On-Road
Abingdon	On-Road
TOTAL	**17 Paths/Routes**

Source: City of Alexandria Bikeways Map

Over 500 employees live within three miles of BRAC 133, including over 400 employees within two miles, and over 100 employees in less than one mile. This indicates that many employees are able to bicycle or walk to BRAC 133 and be on-site in fewer than 20 minutes. Many employees also expressed an interest in learning about walking and bicycling, as observed from fall 2009 WHS survey comments. Appendix E illustrates various sample safe routes employees can utilize to travel to work by bicycle from a distance of less than three miles from Mark Center.

5.9.2 Bicycle Parking, Showers and Storage Facilities

The BRAC 133 building and parking garages are fully equipped to serve the bicycle and walking employee community. Accommodations for 167 bicycle parking racks will be located in the North

Parking Garage within feet of access to the pedestrian bridge. In addition, 44 showers are available on-site, with eight in the Fitness Center, and 36 designated bicyclist shower rooms in the lower level, complete with lockers. Bicycle parking and shower privileges are on a first-come, first-serve basis.

5.9.3 Marketing

The Transportation Coordinator will be responsible for:

i. Developing and/or acquiring bicycle maps, brochures, pamphlets, and posters advertising as well as posting information on the WHS Transportation Management Program web page about bicycle commuting information.

ii. Developing relationships with bicycle advocacy groups and bicycle shops in order to organize, plan, and conduct semi-annual health fairs and training seminars on bicycle and walking safety, bicycle maintenance, the health benefits of commuting for exercise, etc. The health fairs will help educate and market bicycling and walking as viable commuting options for BRAC 133 employees.

iii. Organizing an annual Bike to Work Day pit-stop at Mark Center for bicycle commuters to receive giveaways, information, and other incentives for bicycling to work, as the site is a major employment center in the Mark Center community. The pit-stop will be located outside the secure perimeter so that other employees working within Mark Center may also partake in Bike to Work Day activities; therefore, the Transportation Coordinator will take part in marketing the event and pit-stop to outside employers and residents in the Mark Center community to gain their participation.

iv. Organizing a "Walk-Buddy" Program for employees interested in walking to work to encourage safe walking. The Transportation Coordinator will use home address information and safe walkway knowledge to find interested employees a walking partner and safe route with which to walk to and from work.

5.9.4 Recommended Improvements

WHS may explore the planning and development of a community "bike station" in order to improve the effectiveness of bicycle commuting options should bicycle commuting become a valid source of transportation for a rising number of commuters. A bike station is an enclosed patron-paid facility that allows bicyclists to store their bicycles safely in a secure environment, in addition to having one-stop access to bicycle repair facilities and personnel as well as bicycle parts/apparel. The Transportation Coordinator should consider conducting a demand analysis using Bike to Work Day Event headcounts and surveys to determine if there is a demand for a Mark Center community bike station. If there is a demand, the Transportation Coordinator should organize planning meetings with the Mark Center community, commercial property owners in Mark Center, and bike station developers to come up with a concept plan, design, and location for a community bike station.

6.0 Monitoring & Evaluation Plan

6.1 Progress Monitoring & Annual Survey

In order to monitor the effectiveness of various transportation programs and strategies under the BRAC 133 Transportation Management Program, the Transportation Coordinator(s) will conduct surveys of employees 6 months after relocation, 1 year after relocation, and annually after the first year of program operations for three years. After three years, WHS may elect to monitor program progress every two years. The purpose of the survey will be to measure TMP progress in meeting its goals and objectives as well as determine the effectiveness of TMP programs. The survey will have an employee satisfaction element to measure attitudes toward current program elements, such as incentives, marketing tools, educational tools, etc. The survey will include the following topics at a minimum:

- Employee Information (contact information, organization)
- Primary mode of transportation
- Secondary form(s) of transportation
- Work schedule (work days and hours)
- Participation in alternative work schedules and telecommuting
- Satisfaction rating scale for each of the programs and incentives offered under the BRAC 133 Transportation Management Program
- Interest rating scale for gauging reaction to new programs and/or program modifications
- Use of the DoD shuttle bus program
- Satisfaction rating scale for the shuttle bus program
- Marketing effectiveness rating scale
- Participation in MTBP
- Parking permit type (if applicable)
- Metrorail boardings and alightings information
- Bus transit provider and route information
- Mode shift as a result of BRAC 133 Transportation Management Program
- Anticipated/planned mode for the next year

The Transportation Coordinator(s) will compile the results from the survey and conduct a data analysis on the survey results. The Transportation Coordinator(s) will also work with traffic engineers to conduct vehicle and trip counts at major intersections, parking counts at both BRAC 133 garages, and other necessary traffic assessments on a biannual basis to determine infrastructure operability over time.

6.2 Evaluation Report

The Transportation Coordinator(s) will utilize survey results, monthly commute diaries, and results from traffic counts and assessments to develop the "WHS Transportation Management Program Evaluation Report" which will detail the progress of the BRAC 133 Transportation Management Program, describe program successes, and define areas for program restructuring. This Report will be developed for the WHS with a copy submitted to the City of Alexandria.

The Report will outline:

- The progress the program has made in achieving the goals of the TMP and various program-specific targets (i.e. employee mode split, increases in AVR, vehicle trip reduction)
- Program strengths and areas for improvement or restructuring
- Employee satisfaction with the program and reactions to new proposed program elements
- Roadway infrastructure operations information
- Parking utilization

The following are descriptions of the various performance measures that will be used to determine the effectiveness of the TMP and its various programmatic elements:

Average Vehicle Ridership

The Report will express trip reduction using the Average Vehicle Ridership (AVR) calculation. AVR is a ratio of employee trips to vehicle trips. This ratio will be determined from survey data. As no baseline AVR has been established at the BRAC 133 site as of yet, the Transportation Coordinator(s) will utilize the survey taken after 6 months of BRAC 133 site occupation in order to establish a baseline AVR. The Transportation Coordinator(s) will then develop an AVR goal for the first full year of occupation and reexamine this goal on an annual basis. For example, if the AVR after 6 months of program operation is 1.5, the Transportation Coordinator could choose to set a higher goal for the next year for an AVR of 3.0. Setting an AVR goal will help focus program marketing and incentives on reducing the number of vehicle trips to the BRAC 133 site and help reach established TMP goals.

Parking Utilization

The Report will describe parking utilization rates by conducting parking counts in both parking garages. Parking counts will be conducted by PFPA PMB staff on a routine basis. A ratio of parking spaces utilized on a typical day to parking capacity will be developed to determine if parking is being underutilized and/or if parking is operating at or over capacity. Based on utilization, the Transportation Coordinator(s) will propose modification to the parking management program if parking is underutilized as well as if parking is operating over capacity.

Mode Split

The Report will include mode split information to determine which programs are working most effectively and to which commute options employees show preference. Mode split is the percentage of

people using various modes of travel. Particular attention will be paid to non-solo-driver mode shares, including carpooling, vanpooling, transit, bicycling, and walking. After establishing a baseline AVR after 6 months of operation, the Transportation Coordinator(s) will also establish non-solo driving goals for each of the various modes to be reached after 1 year of operations. Goals should be adjusted annually thereafter. At a minimum, the non-solo driving goal for the site should be 40 percent to reflect TMP goals. Upon analyzing the results of the sixth month survey, the goal may need to be adjusted to reflect the best achievable potential mode split.

The Transportation Coordinator(s) may also set goals for each mode. For example, if after 6 months, the transit mode share is 30 percent, the year end goal could be increased to 35 percent transit mode share. The Transportation Coordinator(s) will propose transit program modifications to help reach the new goal.

This section of the Report will aid WHS in determining funding needs for the transportation program and may streamline programs depending on which share the highest and lowest mode shares.

6.3 Amending the TMP

Upon review of the WHS Transportation Management Program Evaluation Report, the Transportation Coordinator(s) will:

i. Present proposed amendments to the TMP and WHS Transportation Management Program to WHS in order to best reflect current conditions, new and/or revised TMP goals, TMP performance, and program restructuring based upon employee satisfaction and interest.

ii. Conduct a cost benefit analysis for suggested Plan amendments to determine feasibility of programmatic changes.

iii. Develop language for the new TMP goals and modifications with WHS.

iv. Conduct a review of the proposed amendments and finalize amendments for submission to Army executives. A copy of the updated and modified TMP will be submitted to the City of Alexandria for their record.

This TMP will be adopted by appropriate Army and DoD leadership, at all levels, to ensure compliance. Senior Army and DoD leadership will maintain situational awareness of the effectiveness of the TMP and will operationally support ongoing efforts to achieve the goals of the TMP.

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Appendix A

Zip Code Analysis

Part I: Actual Population

NOTE:

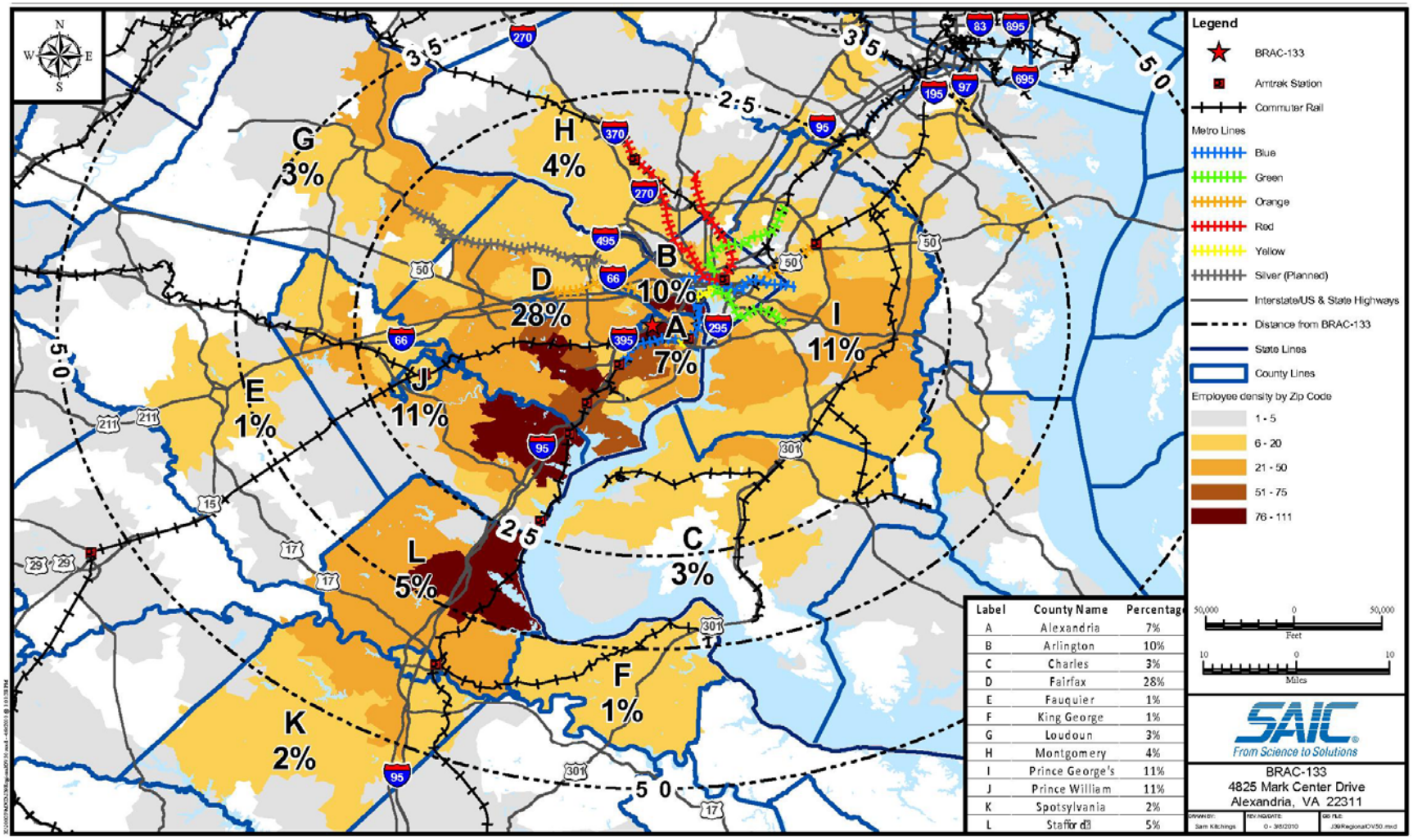
[1] BRAC 133 FEDERAL EMPLOYEE POPULATION ZIP CODE DATA PROVIDED BY DOD DEPARTMENT OF HUMAN RESOURCES RECORDS

[2] DATA ACCOUNTS FOR 69 PERCENT OF TOTAL BRAC 133 POPULATION

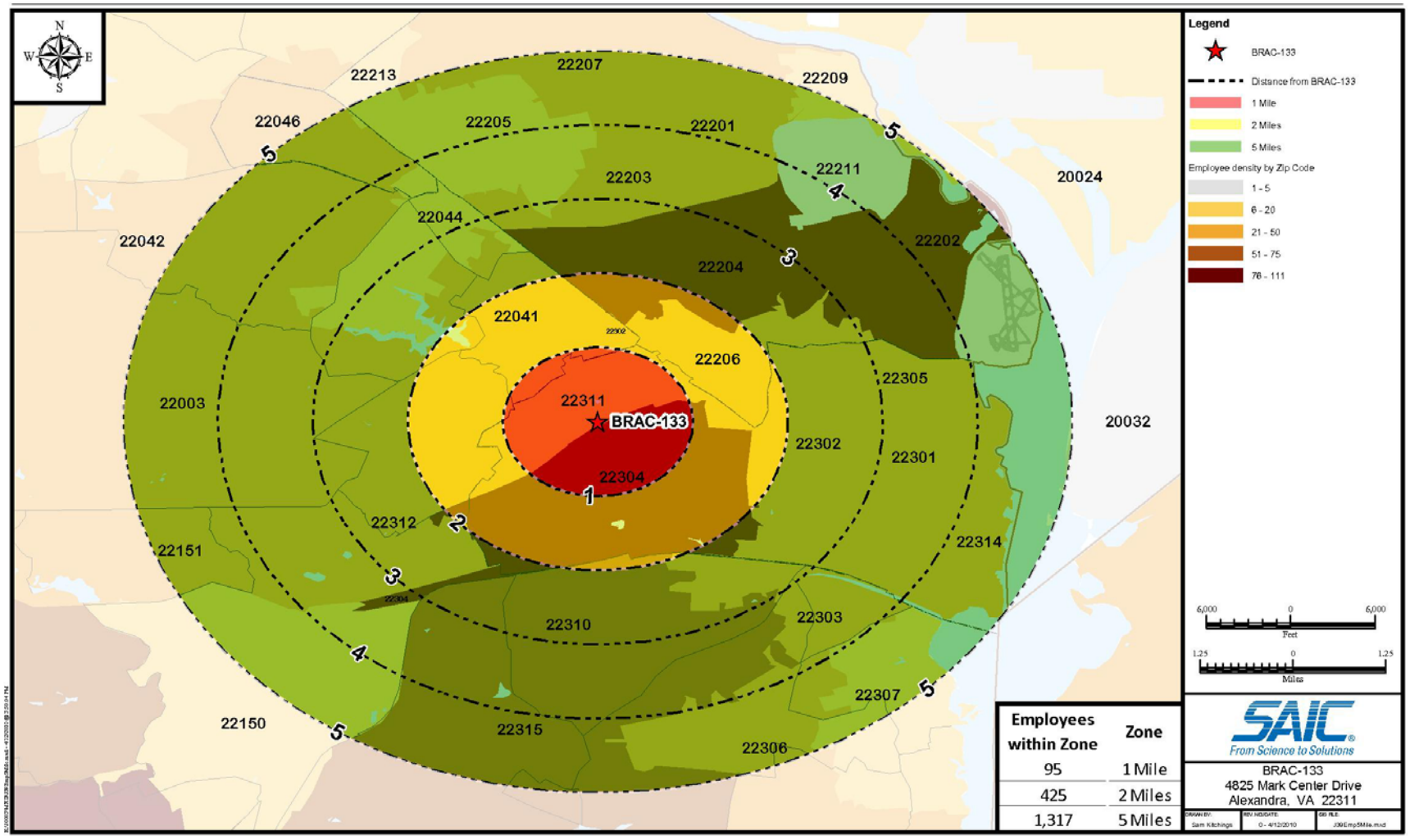
[3] DATA DOES NOT INCLUDE ZIP CODE DATA FOR CONSULTANTS/CONTRACTORS

[4] GIS DATA PROVIDED BY ESRI

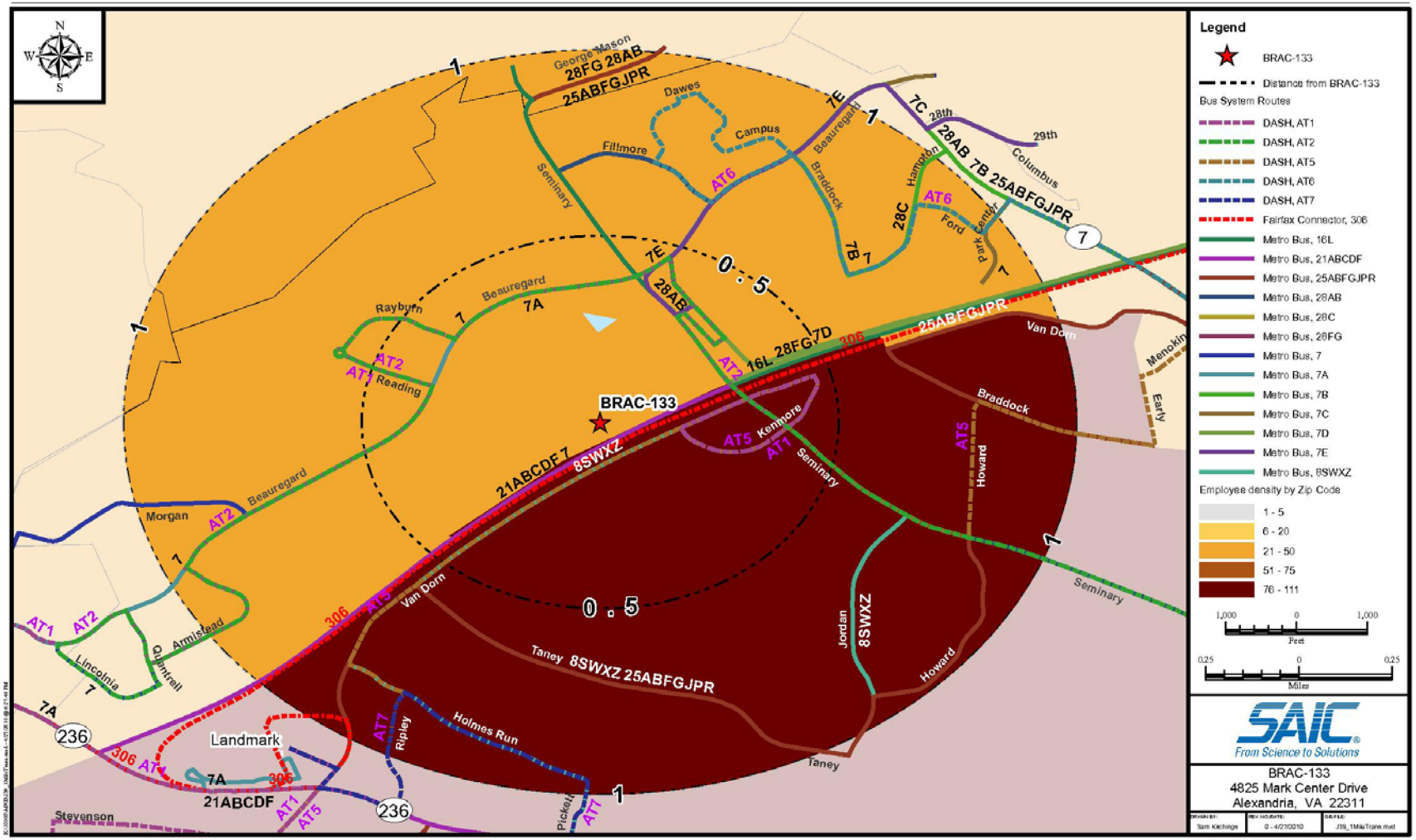
[5] TRANSIT DATA PROVIDED BY WMATA & CITY OF ALEXANDRIA



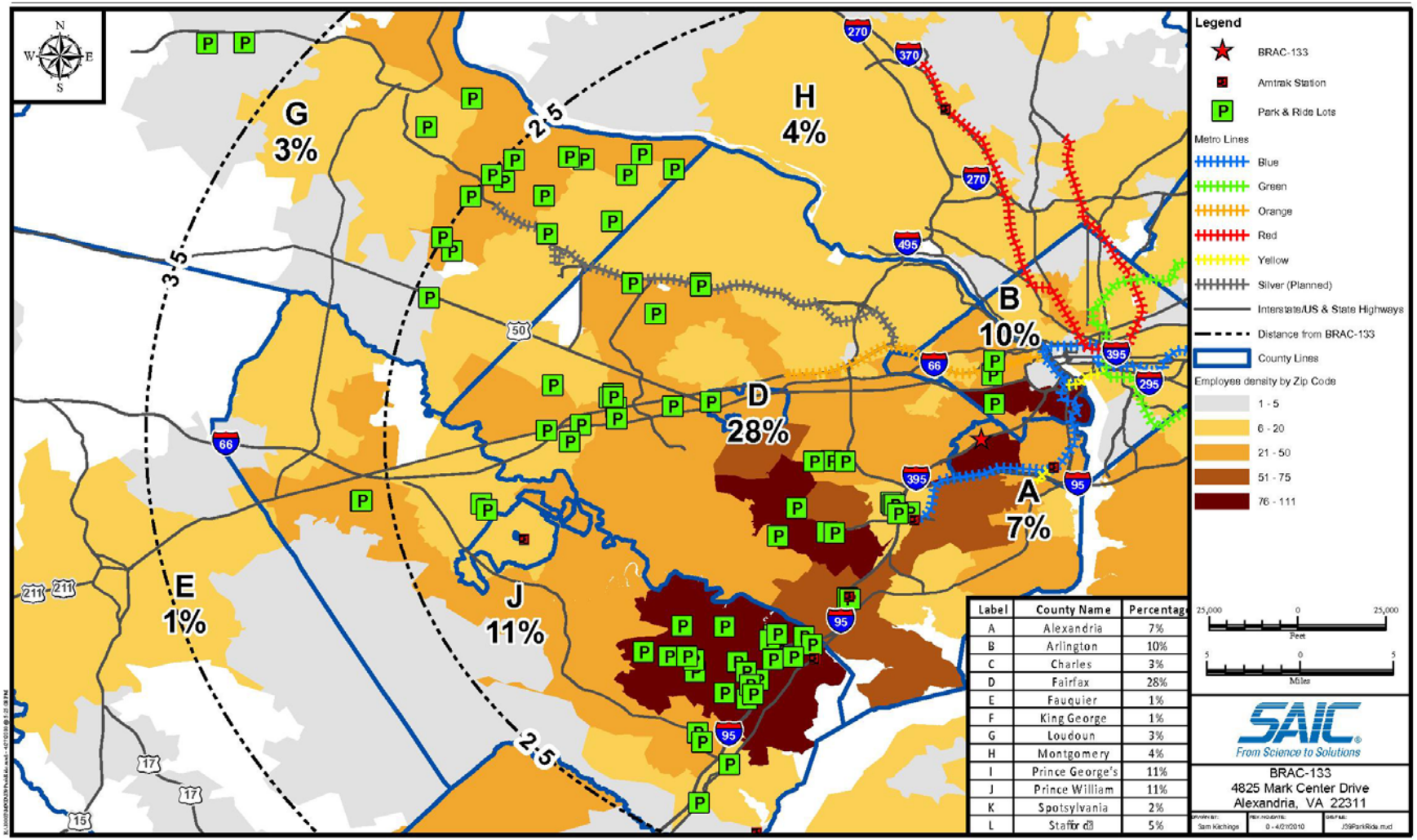
Location of Core Employee Population Density



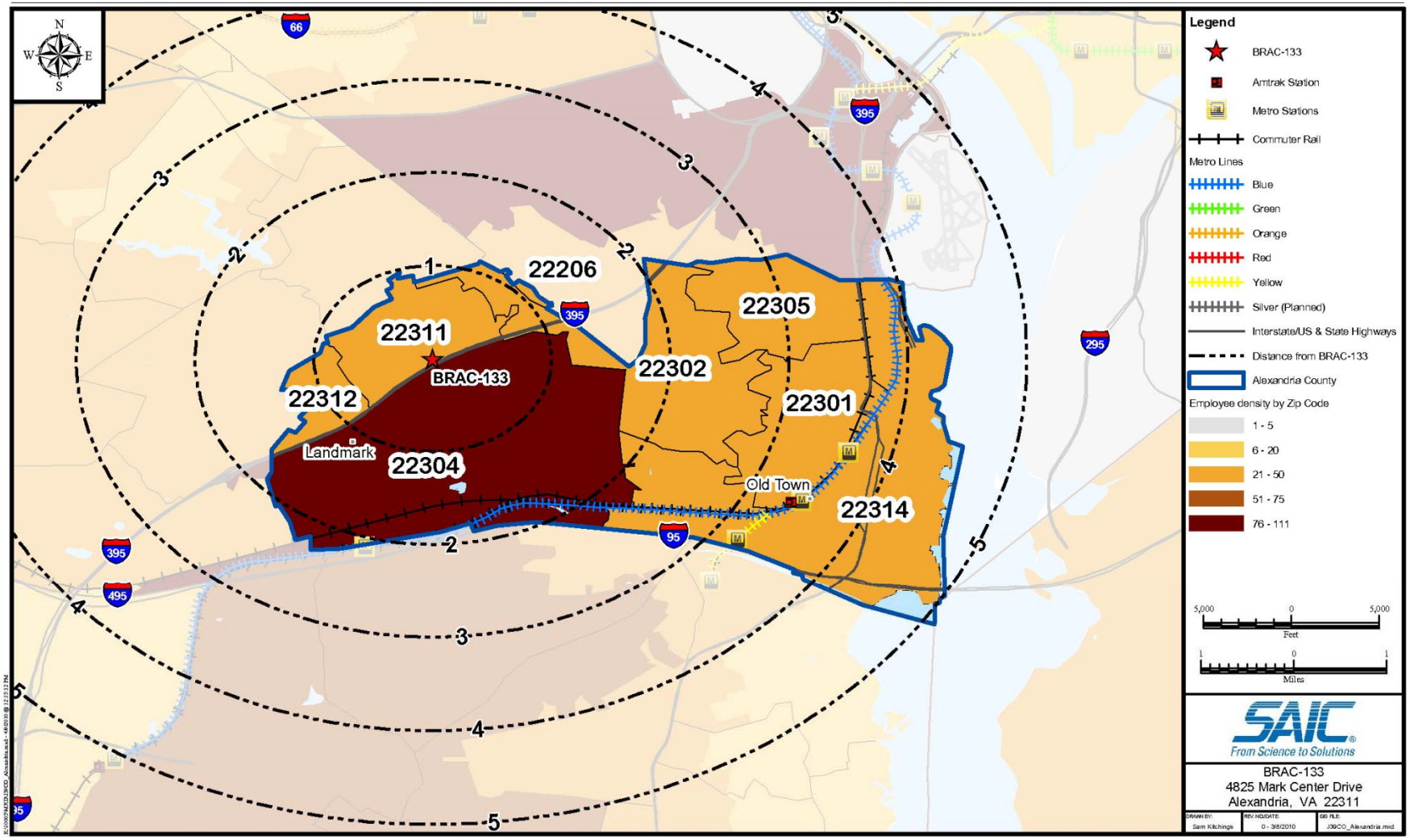
Employees within 5 Miles of BRAC-133



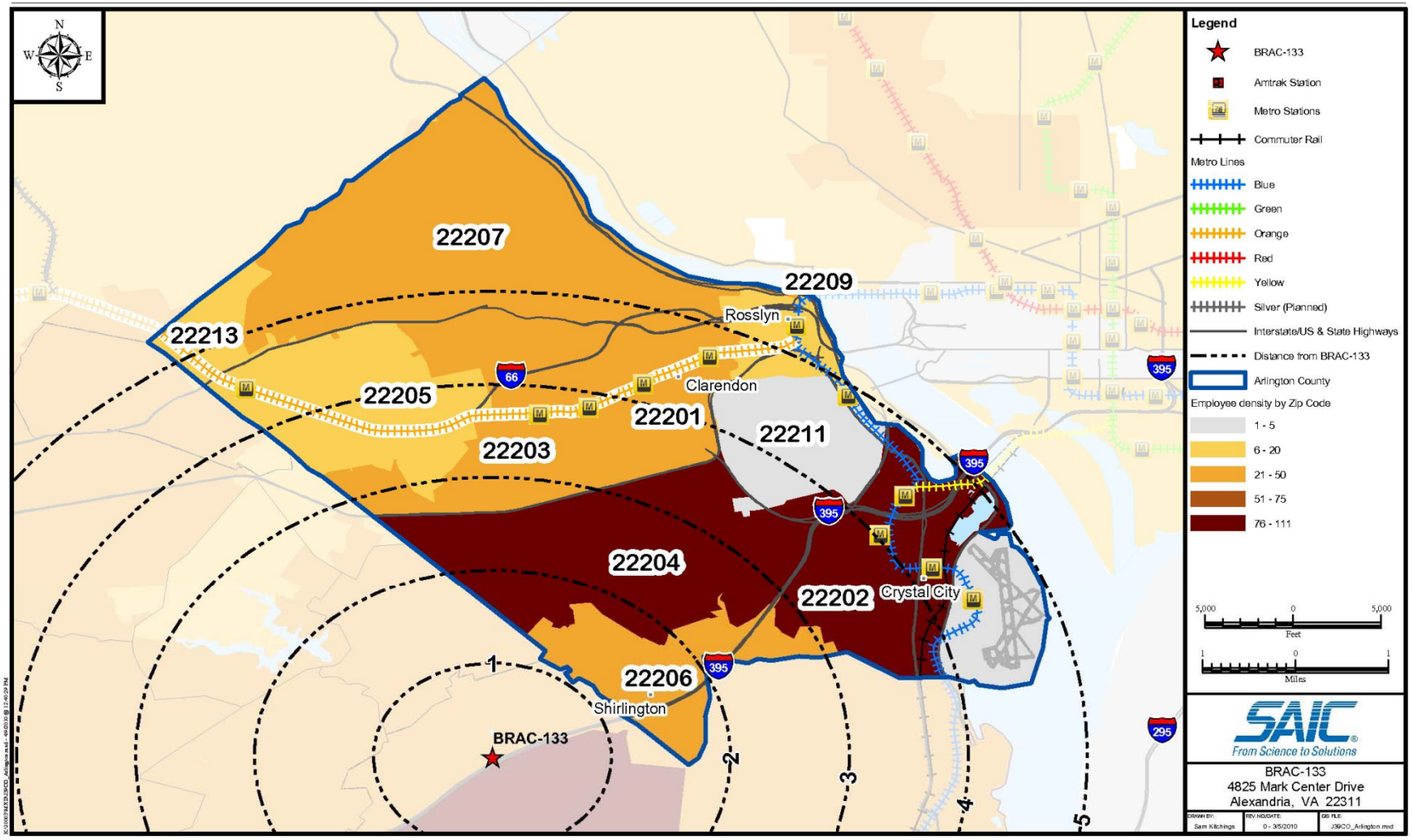
Bus Systems and Routes within 1 Mile of BRAC-133 Facility



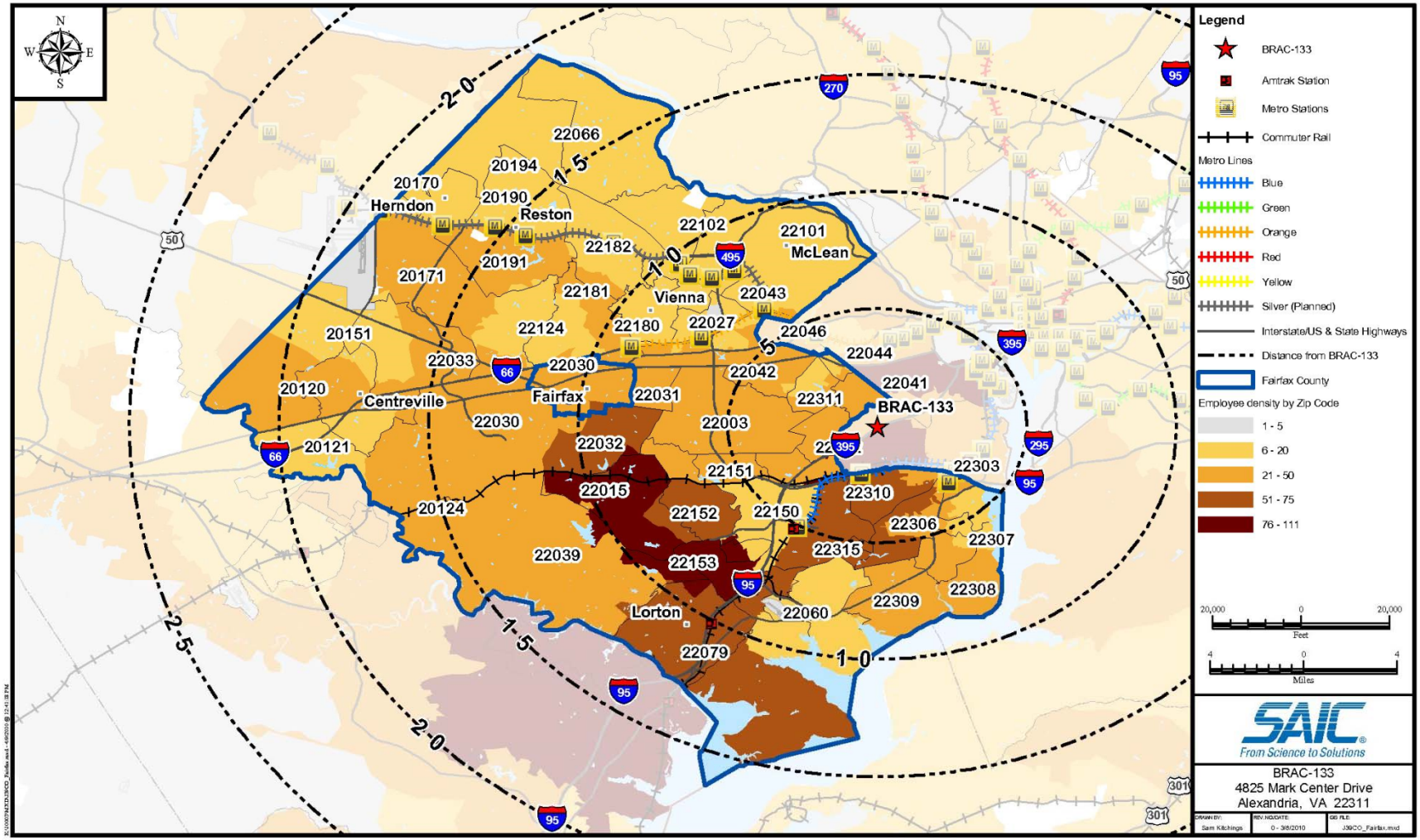
Northern Virginia Park and Ride Lots, Source: VDOT



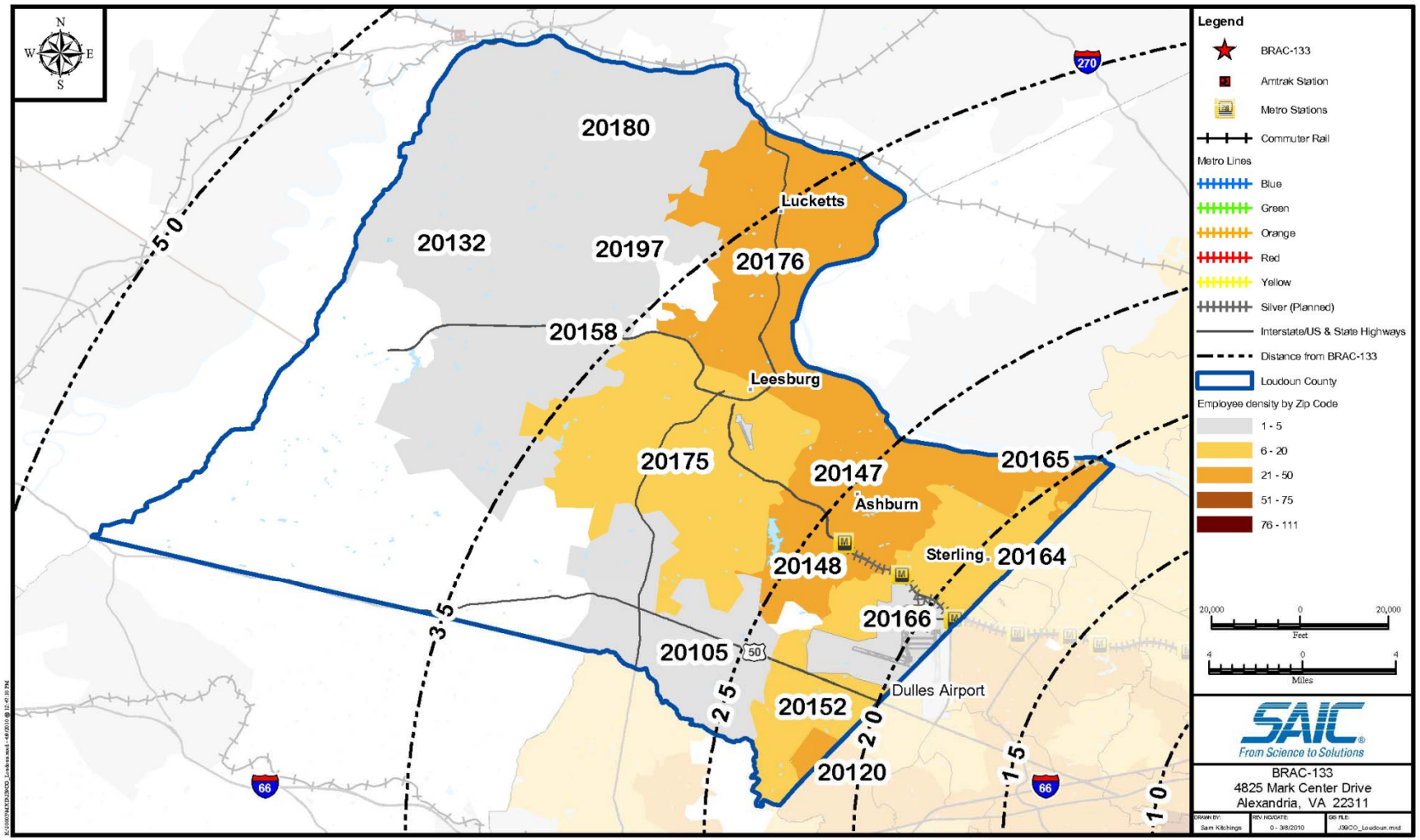
Employee Population Density by Home Zip Code – City of Alexandria



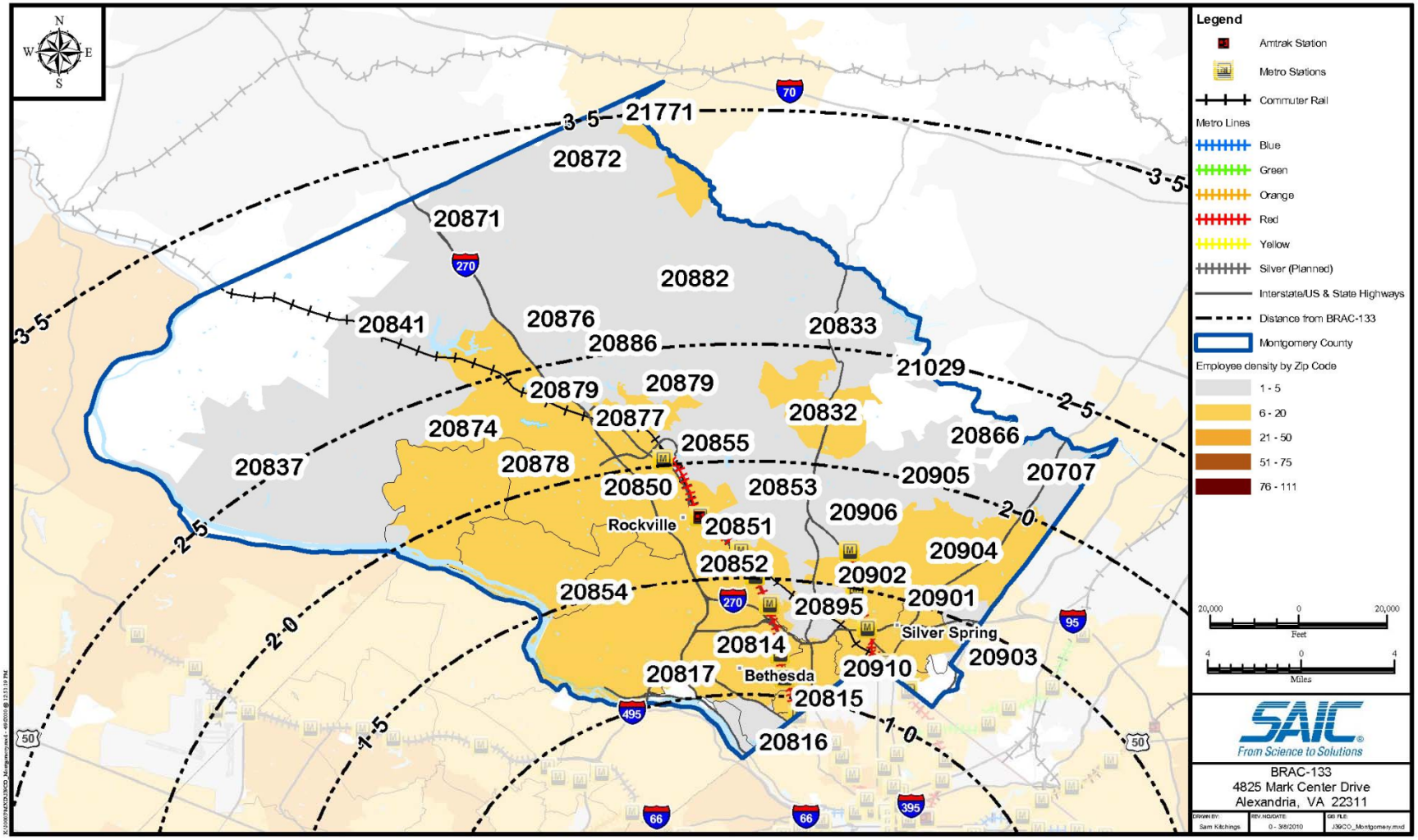
Employee Population Density by Home Zip Code – Arlington County



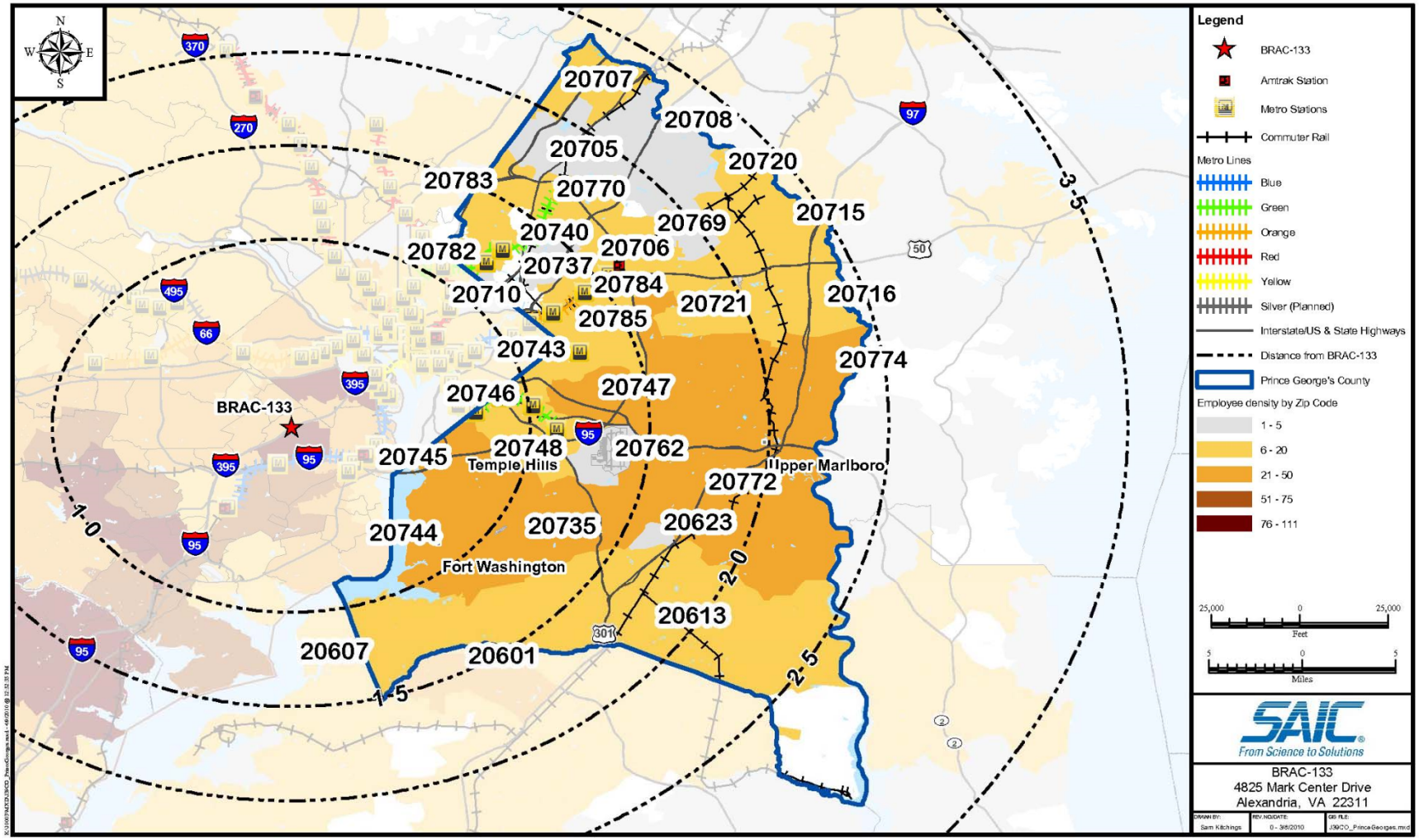
Employee Population Density by Home Zip Code – Fairfax County



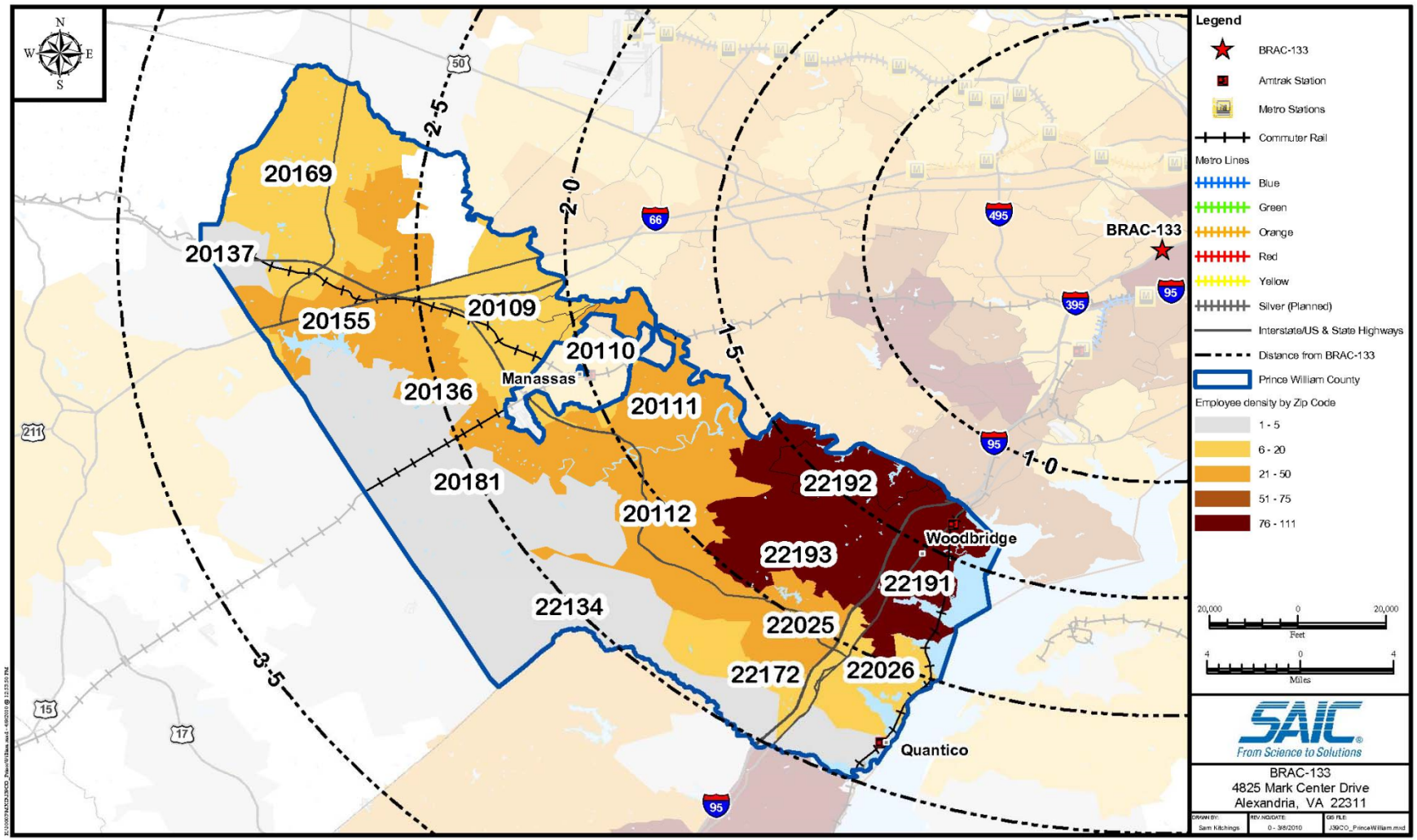
Employee Population Density by Home Zip Code – Loudoun County



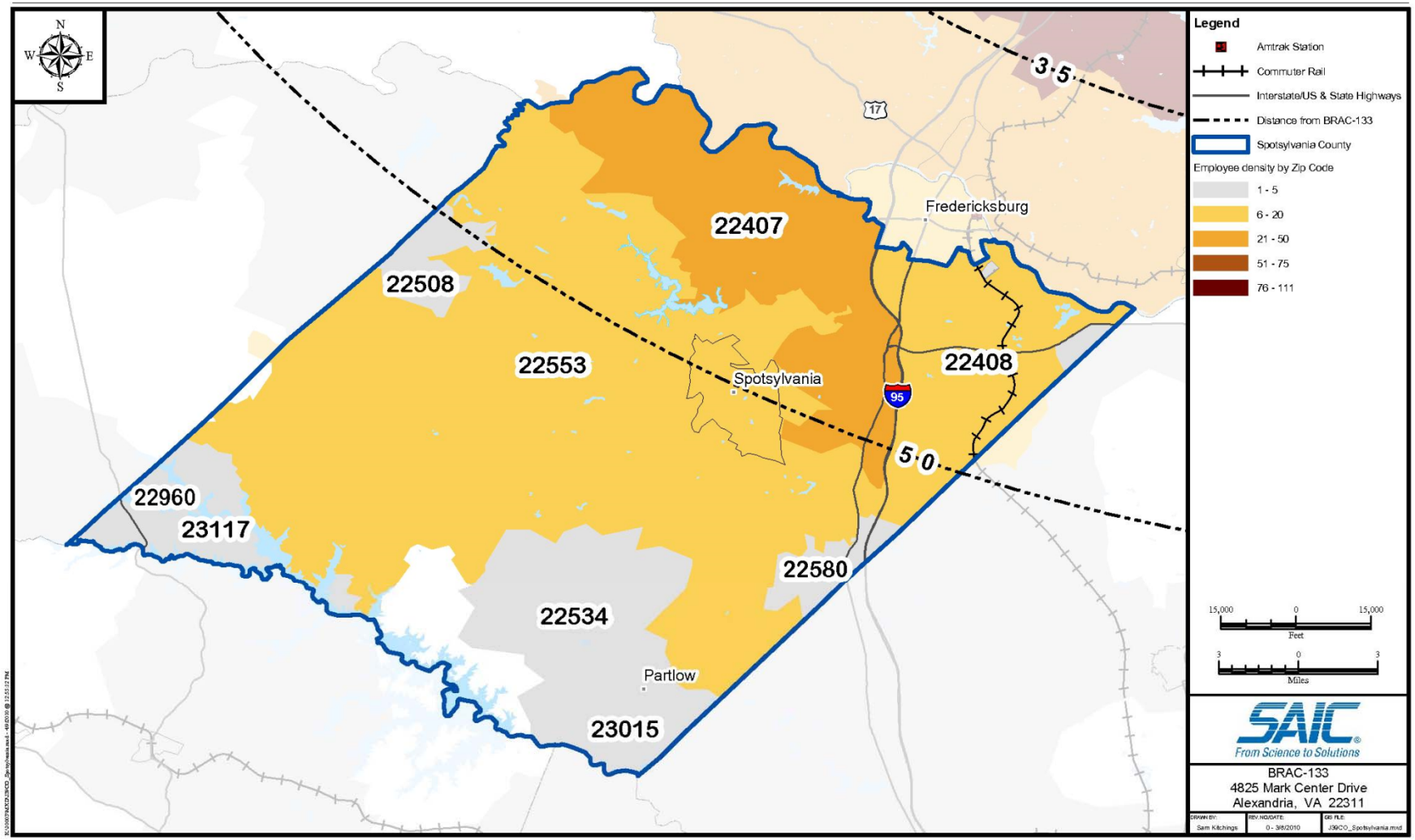
Employee Population Density by Home Zip Code – Montgomery County



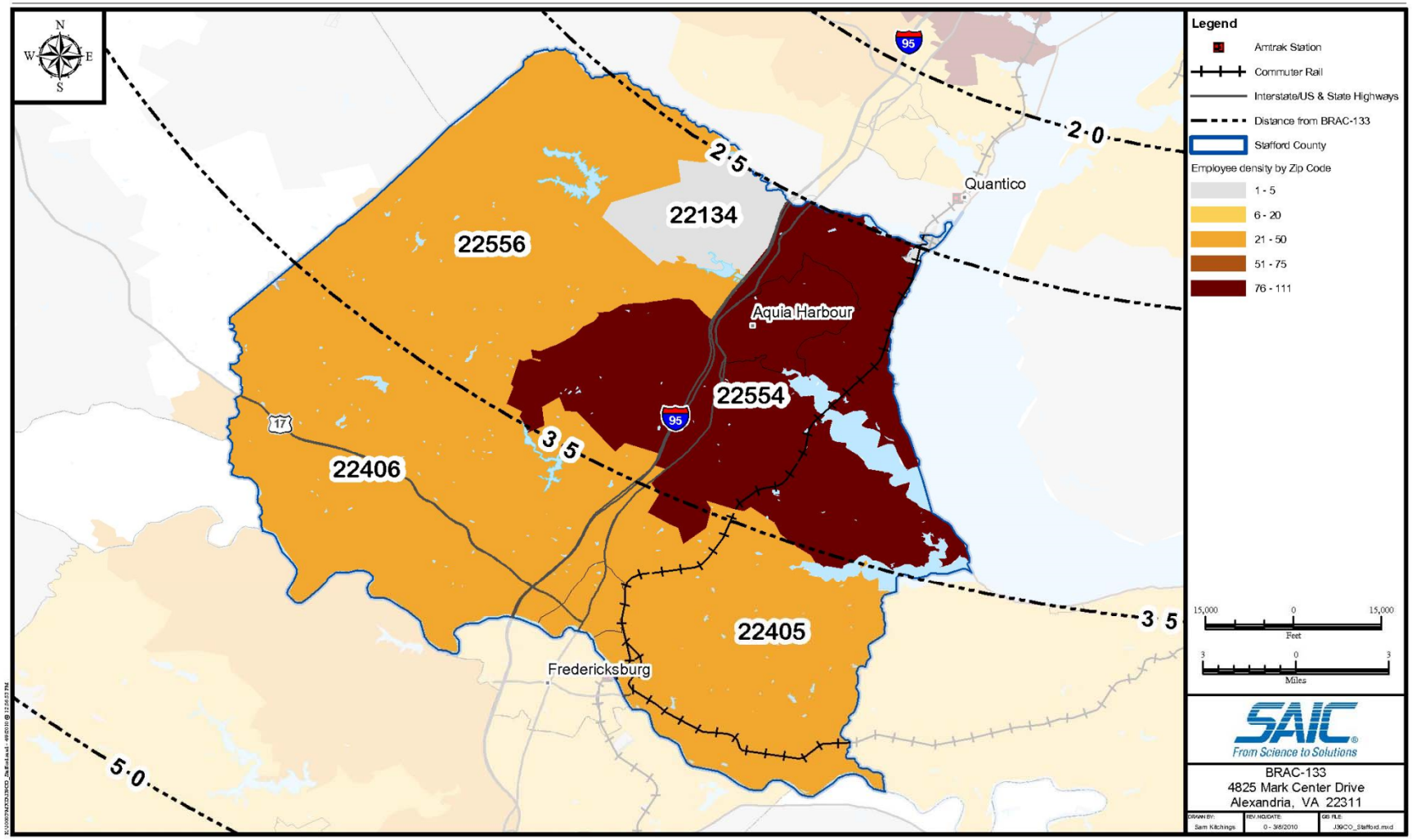
Employee Population Density by Home Zip Code – Prince George's County



Employee Population Density by Home Zip Code – Prince William County



Employee Population Density by Home Zip Code – Spotsylvania County



Employee Population Density by Home Zip Code – Stafford County

Part II: Extrapolated Population

NOTE:

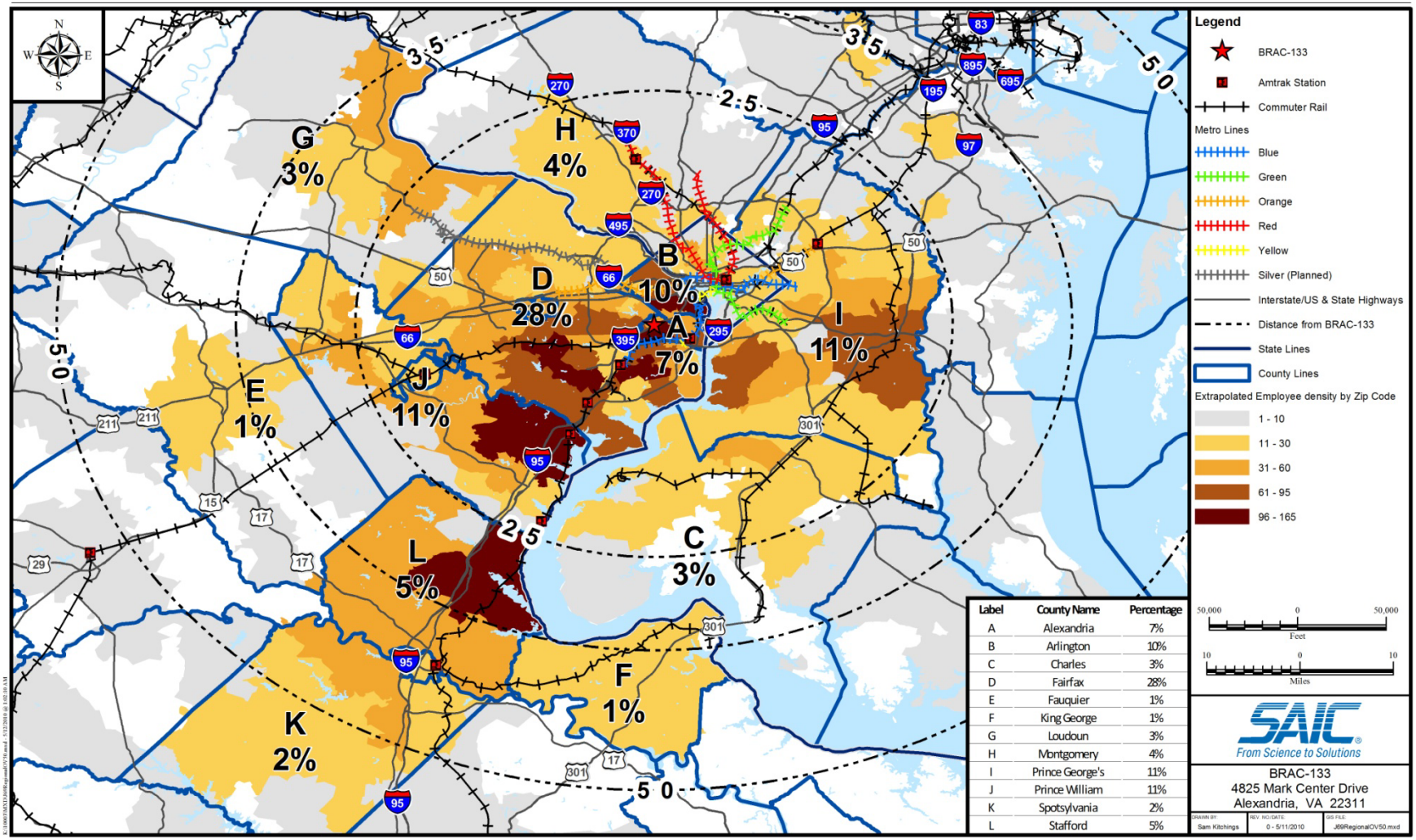
[1] BRAC 133 FEDERAL EMPLOYEE POPULATION ZIP CODE DATA PROVIDED BY DOD DEPARTMENT OF HUMAN RESOURCES RECORDS

[2] ZIP CODE DATA IS EXTRAPOLATED TO ACCOUNT FOR 31 PERCENT OF TOTAL BRAC 133 CONSULTANT/CONTRACTOR POPULATION

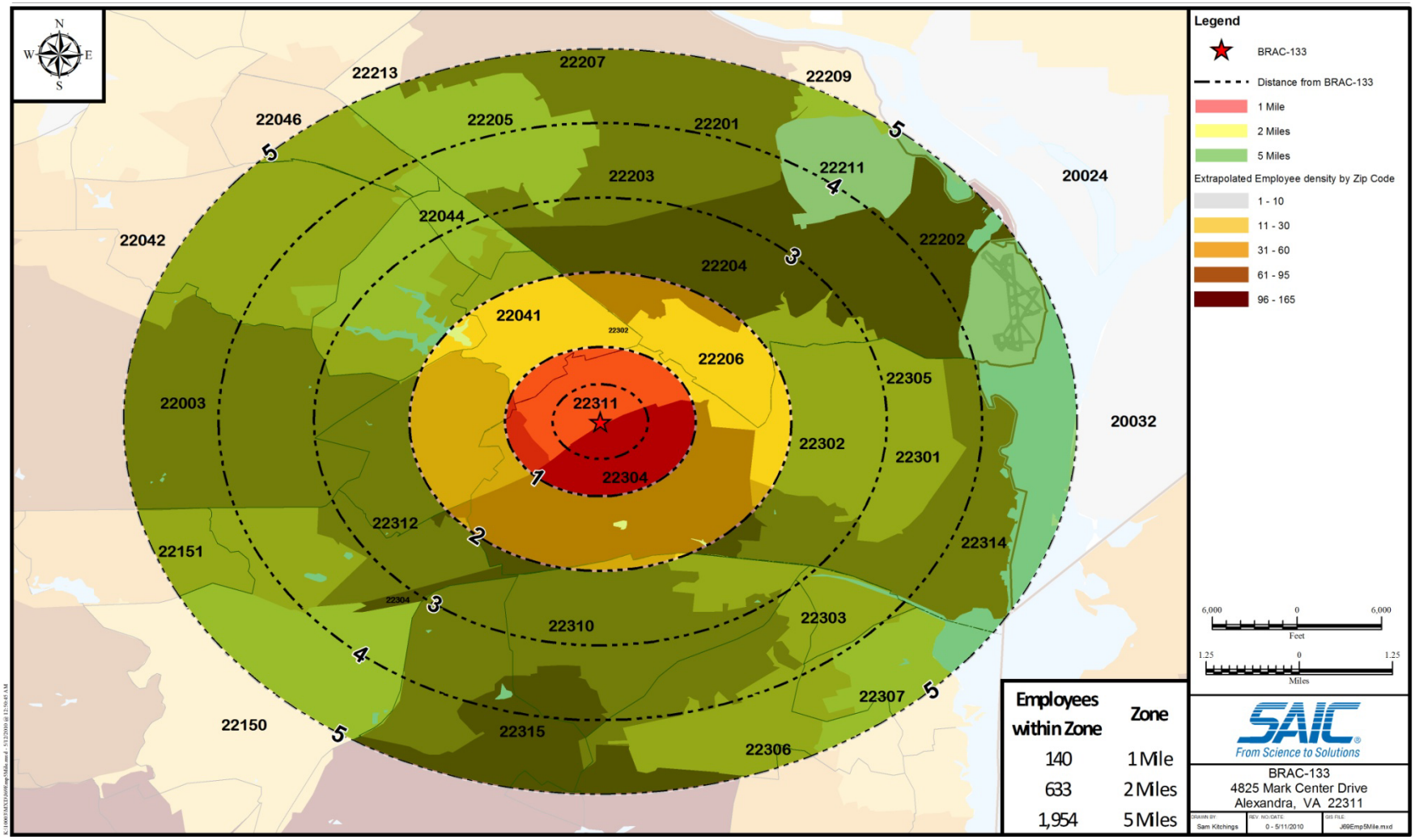
[3] DATA IS STATISTICALLY VAID

[4] GIS DATA PROVIDED BY ESRI

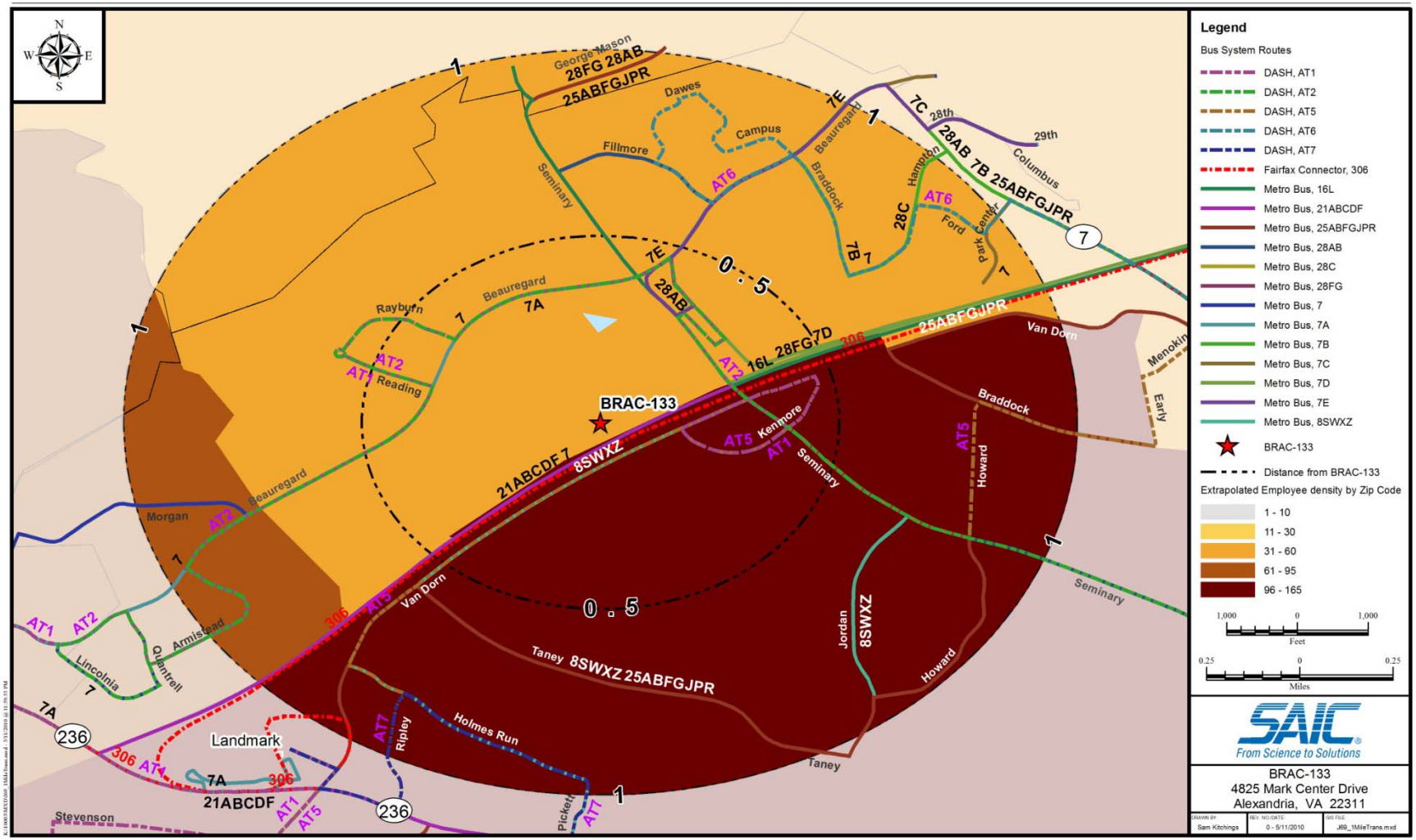
[5] TRANSIT DATA PROVIDED BY WMATA & CITY OF ALEXANDRIA



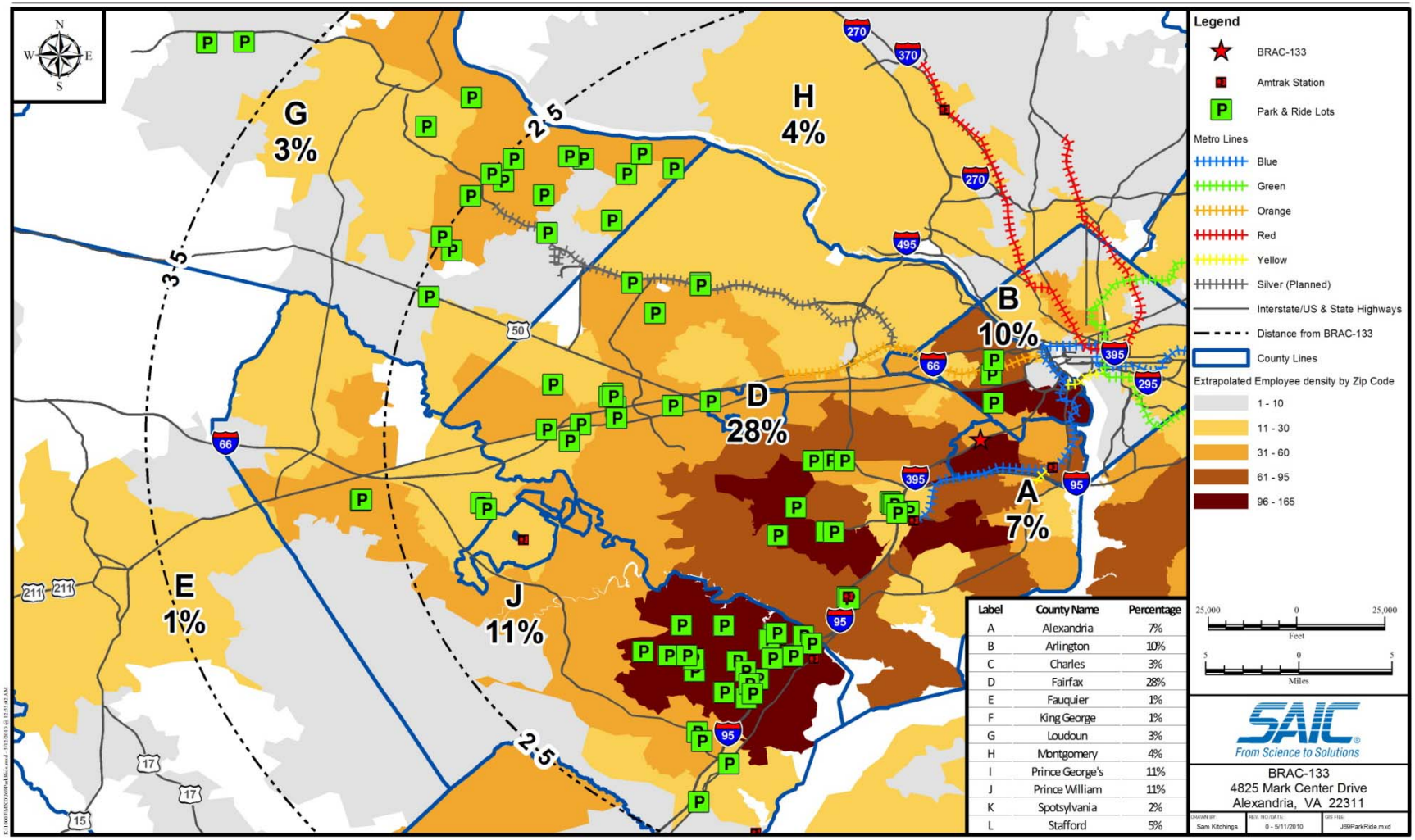
Location of Core Extrapolated Employee Population Density



Extrapolated Employees within 5 Miles of BRAC-133

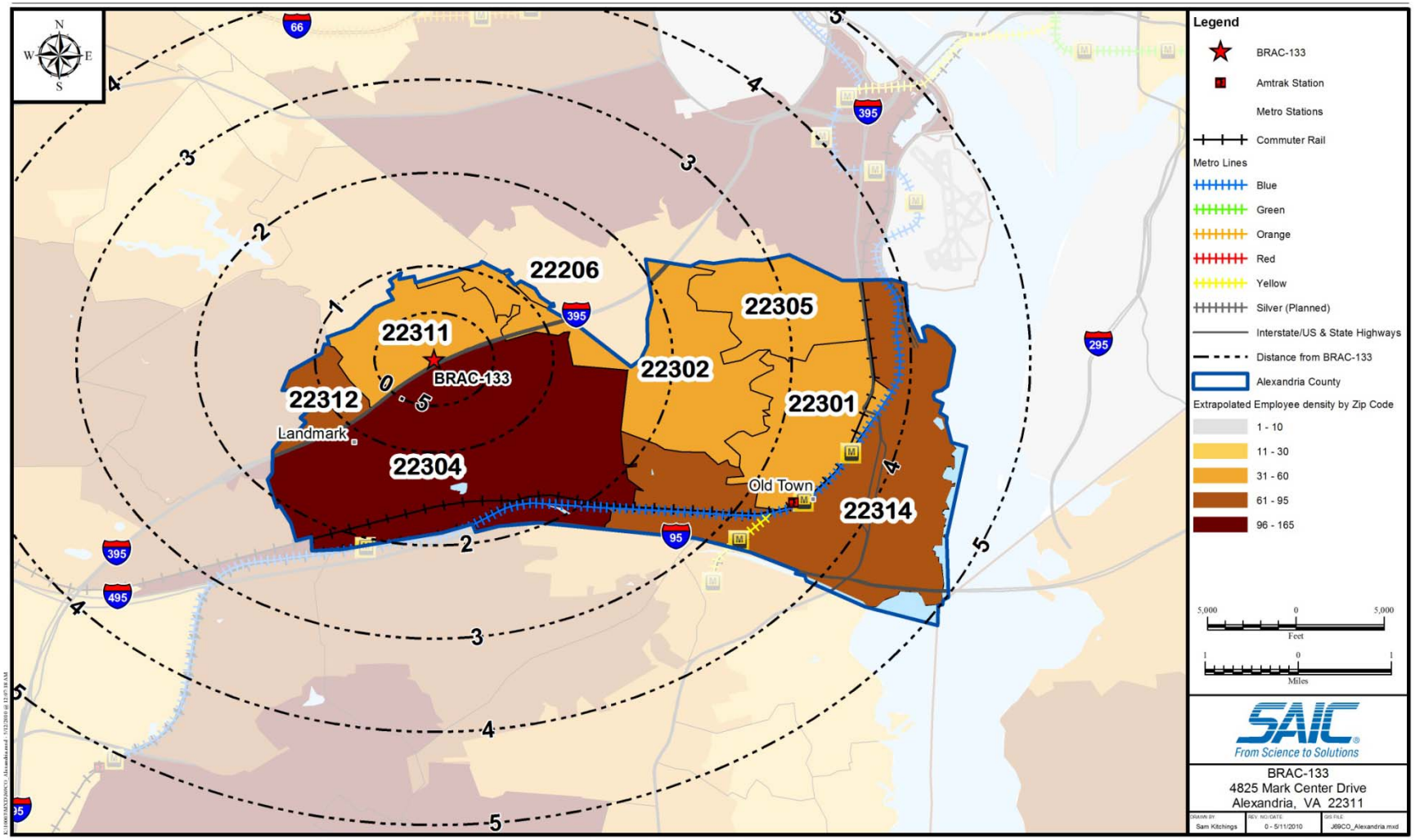


Bus Systems and Routes within 1 Mile of BRAC-133 Facility

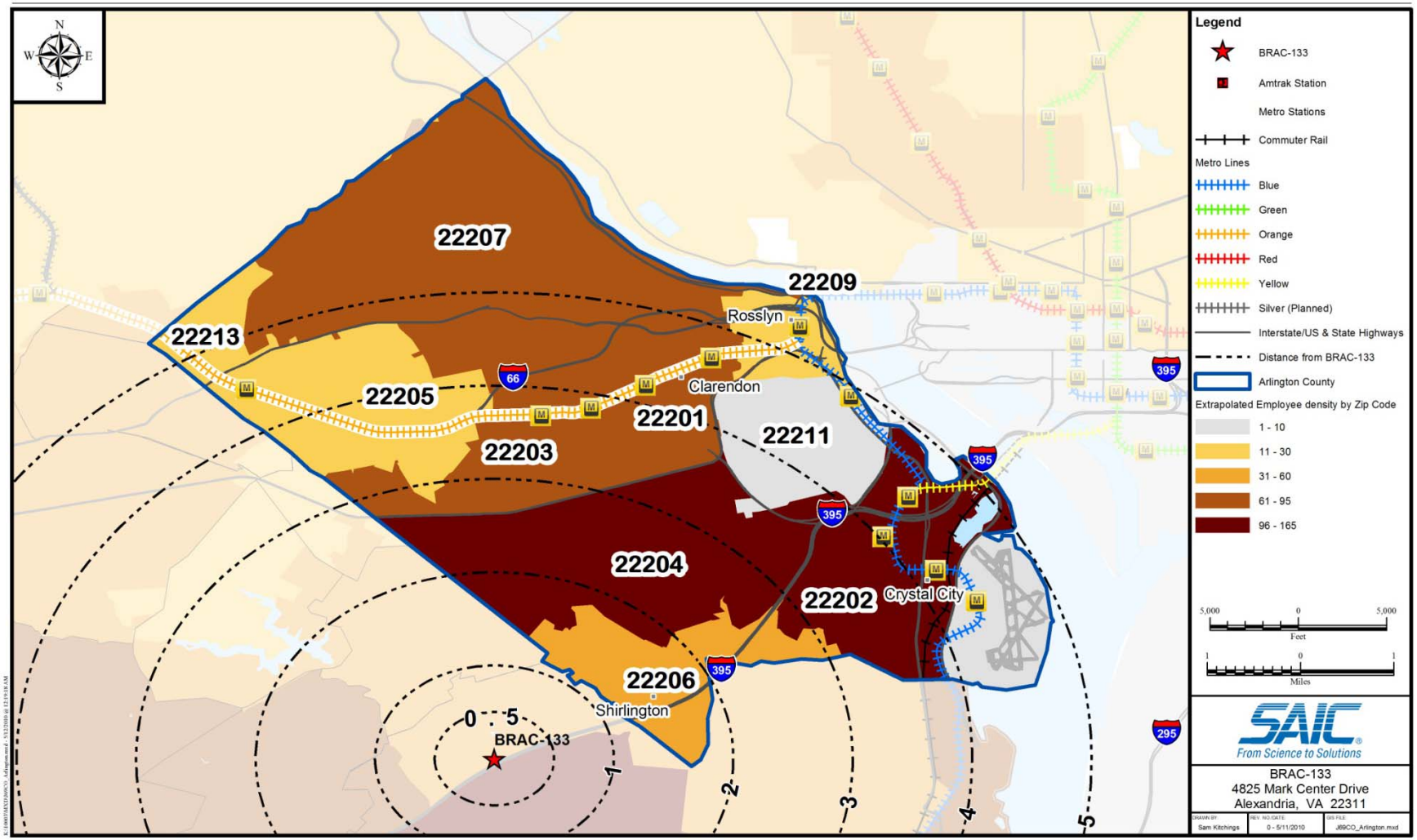


Label	County Name	Percentage
A	Alexandria	7%
B	Arlington	10%
C	Charles	3%
D	Fairfax	28%
E	Fauquier	1%
F	King George	1%
G	Loudoun	3%
H	Montgomery	4%
I	Prince George's	11%
J	Prince William	11%
K	Spotsylvania	2%
L	Stafford	5%

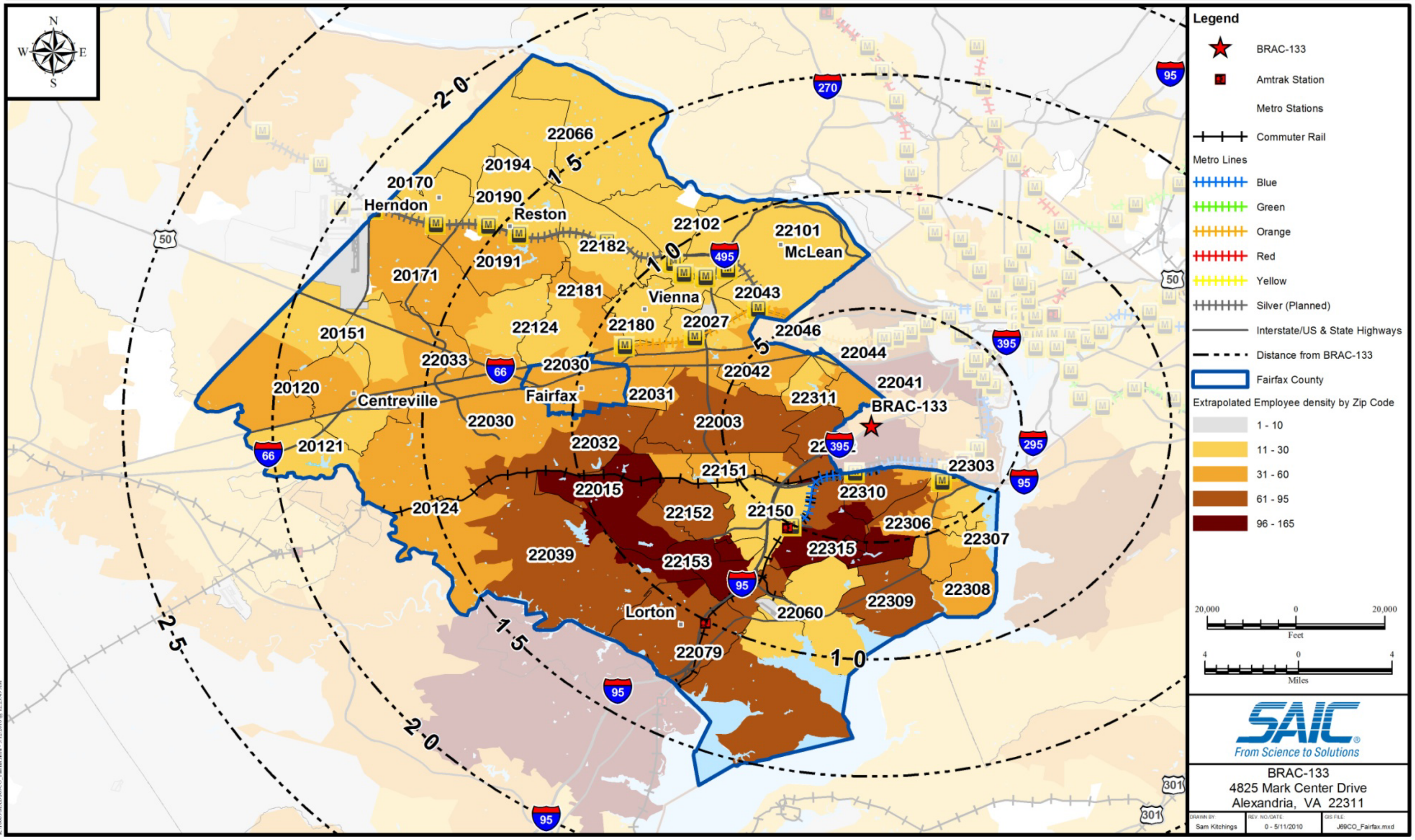
Northern Virginia Park and Ride Lots, Source: VDOT



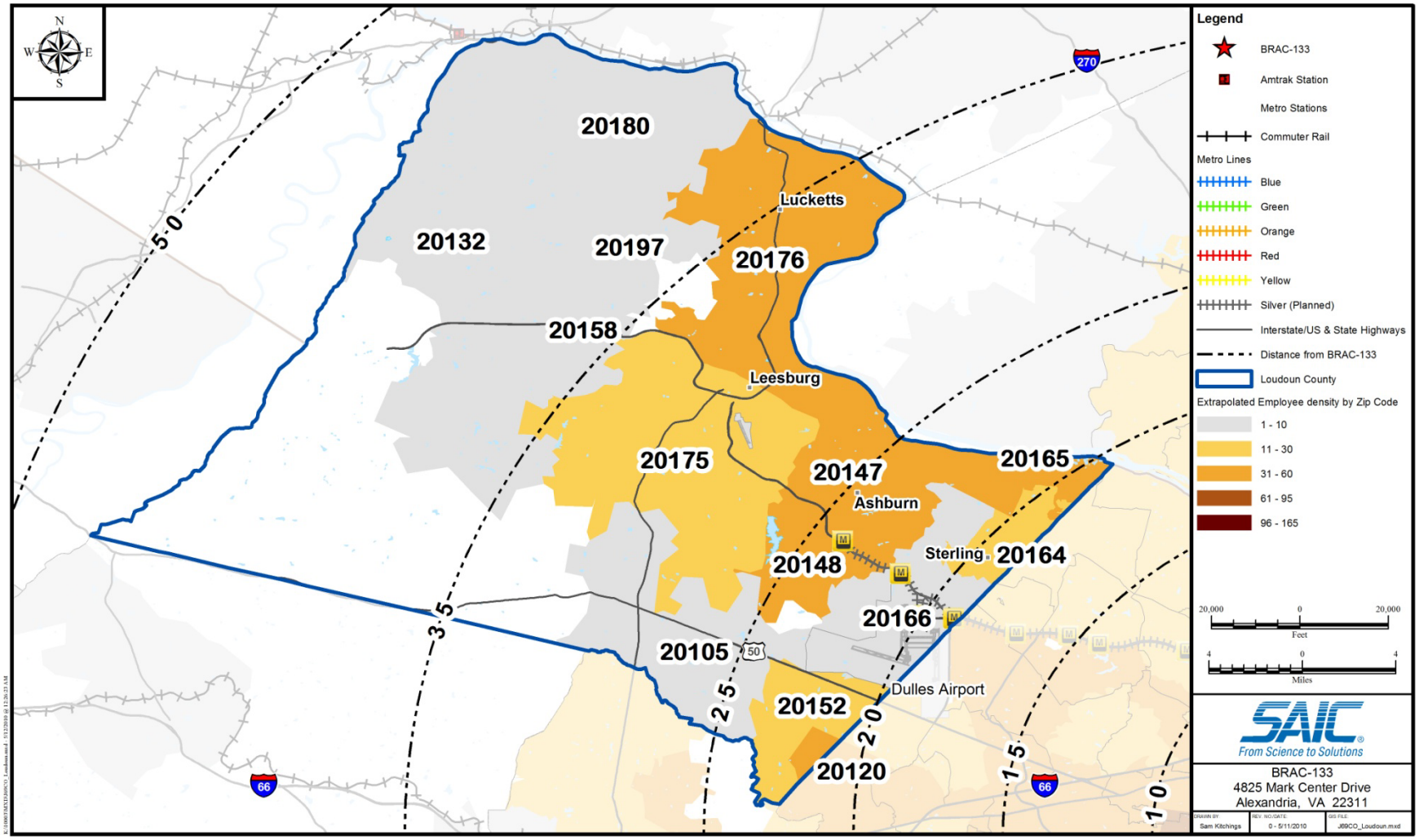
Extrapolated Employee Population Density by Home Zip Code – City of Alexandria



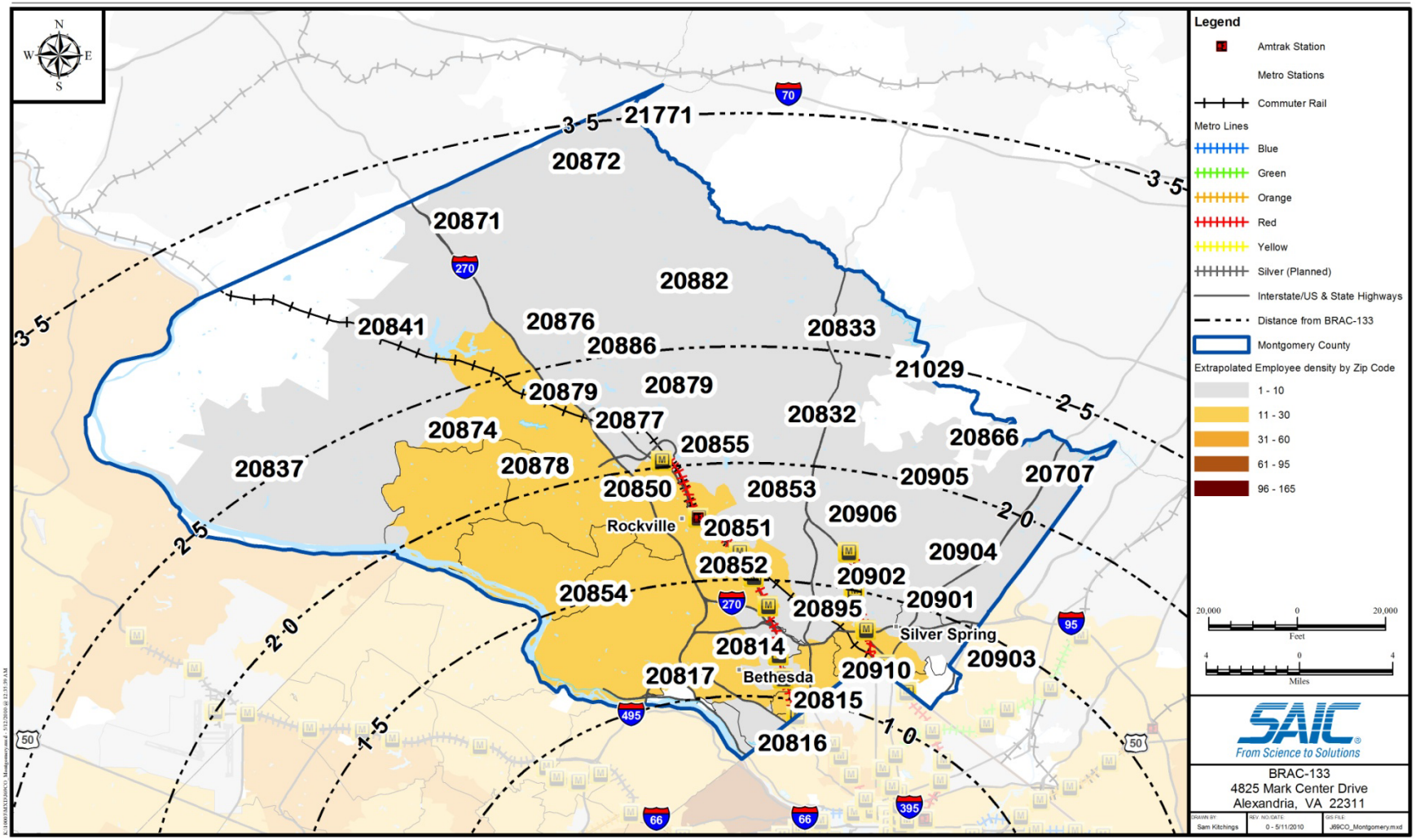
Extrapolated Employee Population Density by Home Zip Code – Arlington County



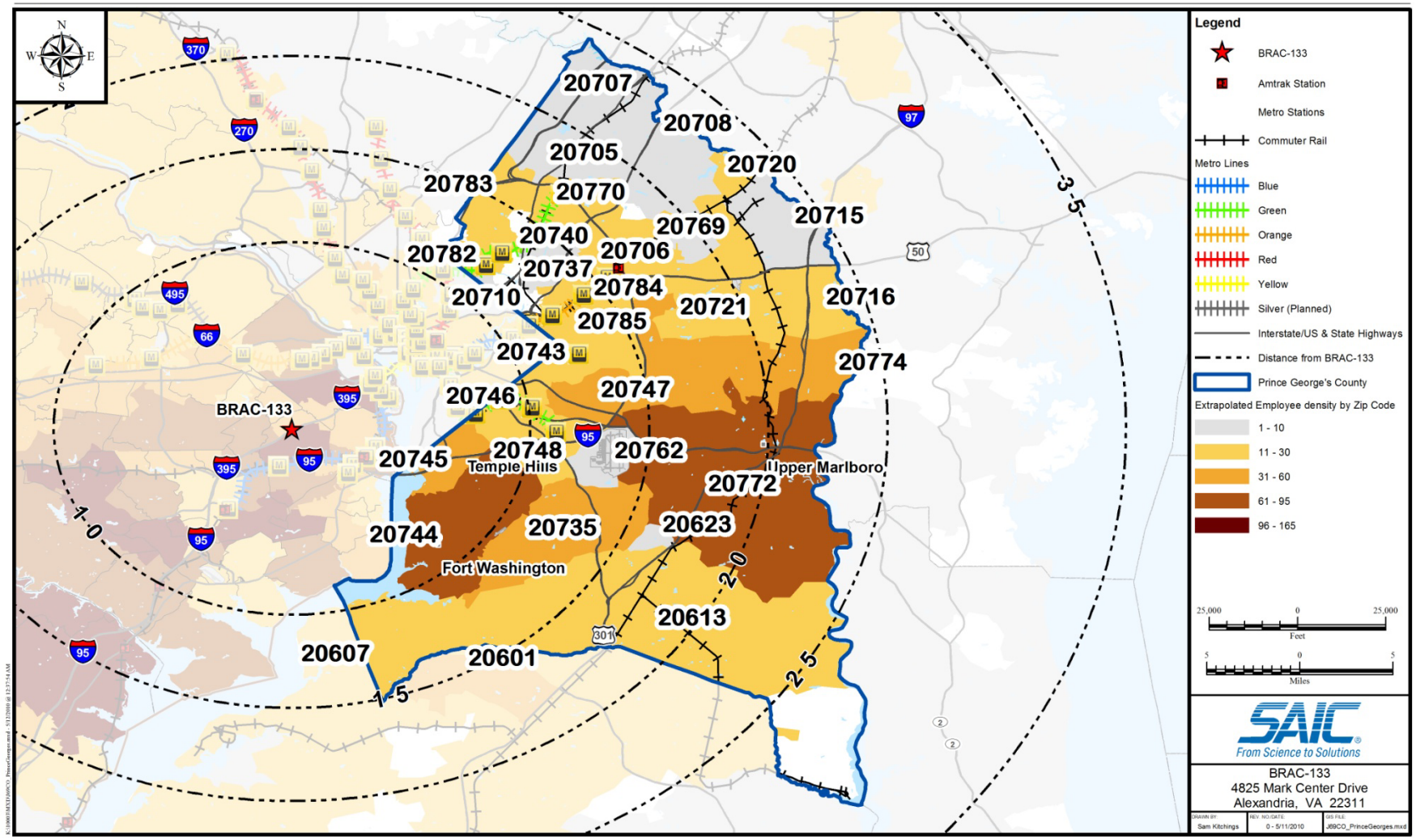
Extrapolated Employee Population Density by Home Zip Code – Fairfax County



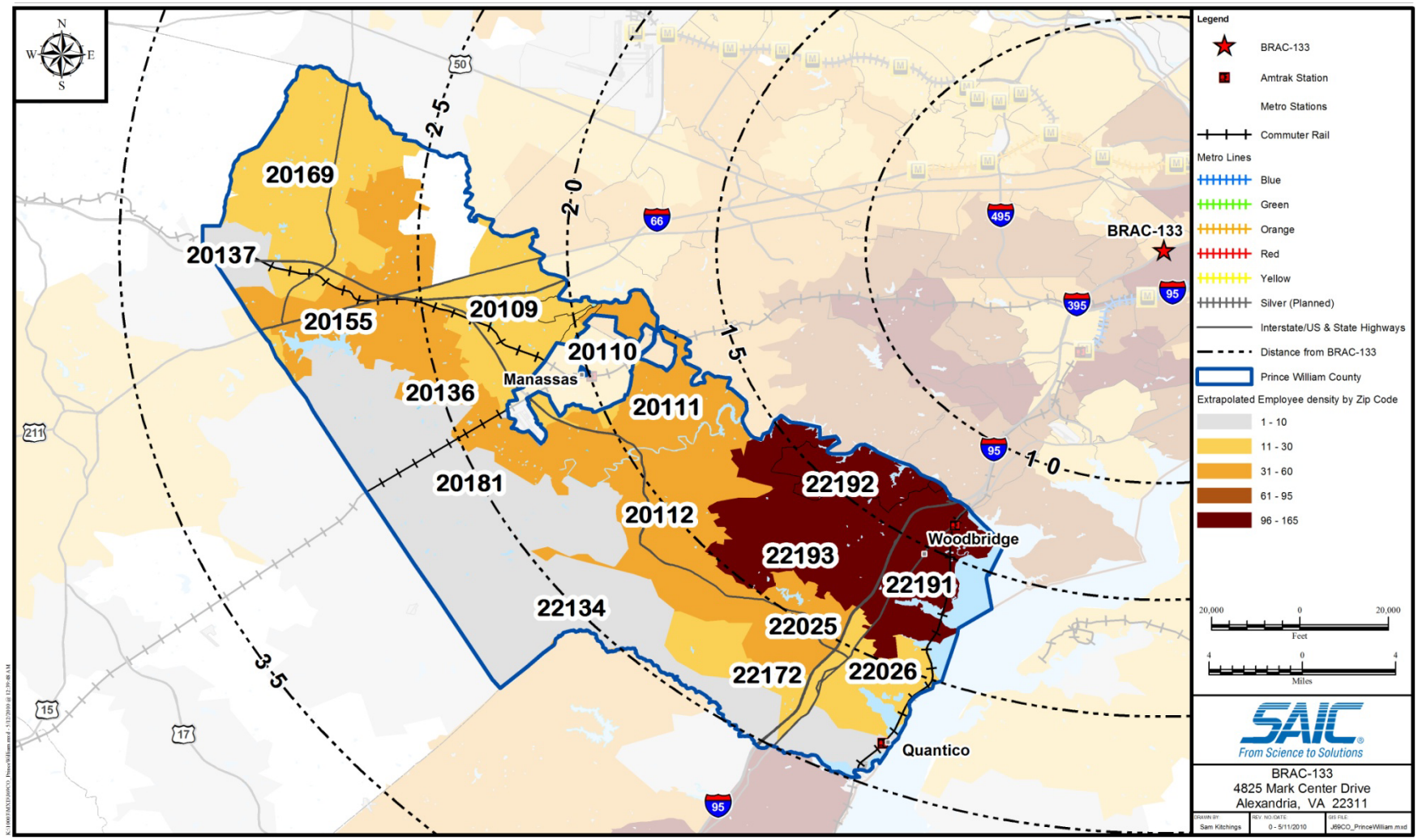
Extrapolated Employee Population Density by Home Zip Code – Loudoun County



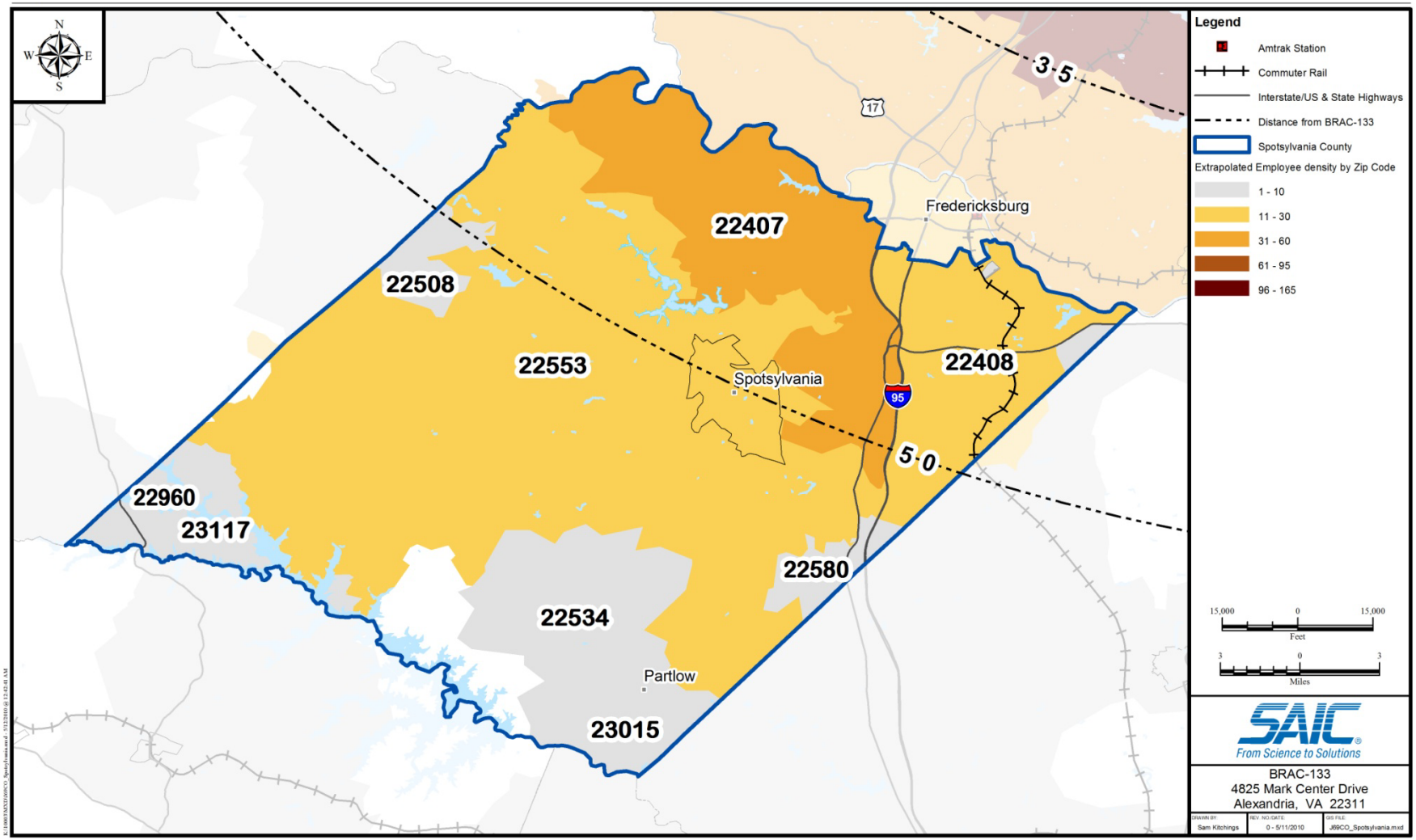
Extrapolated Employee Population Density by Home Zip Code – Montgomery County



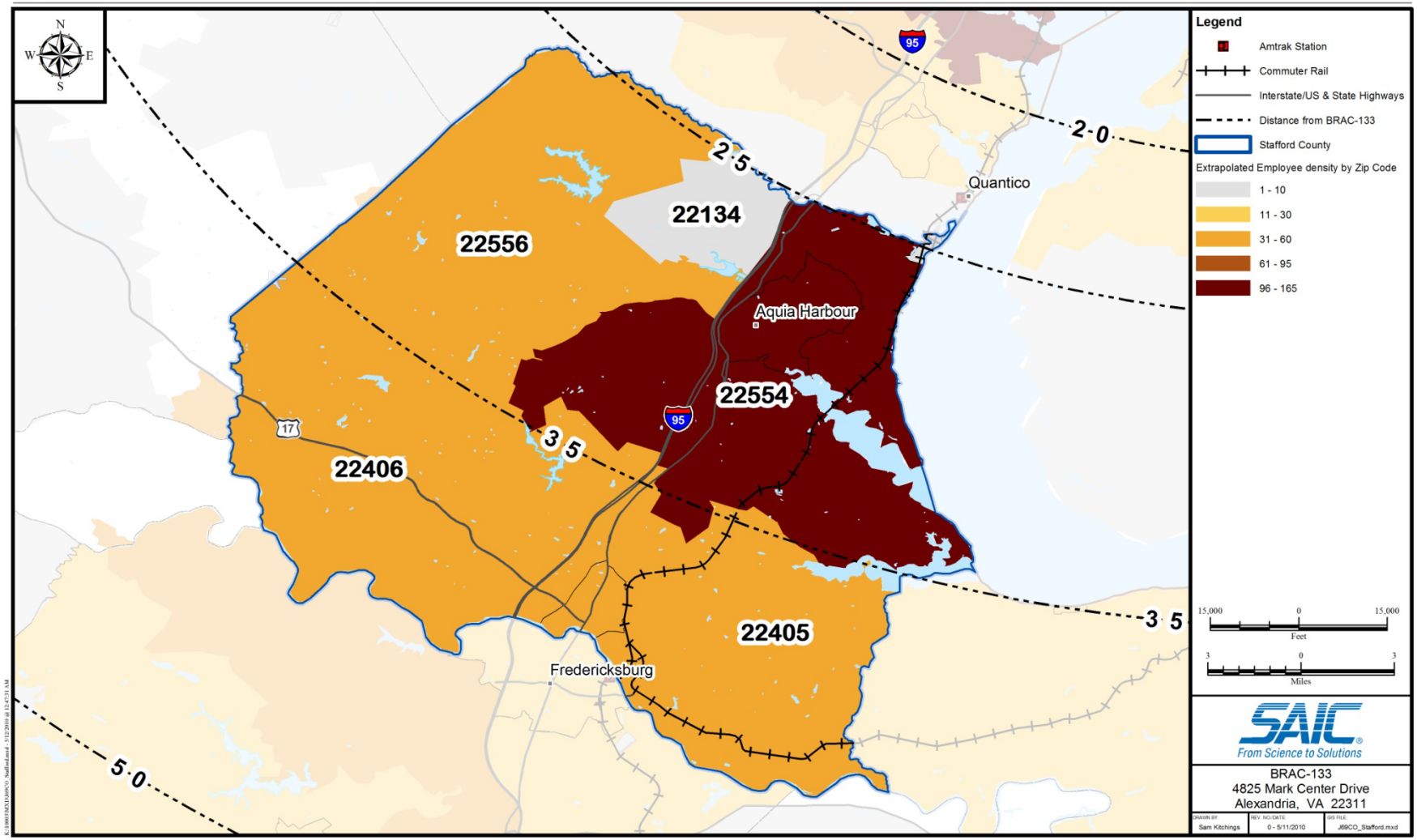
Extrapolated Employee Population Density by Home Zip Code – Prince George's County



Extrapolated Employee Population Density by Home Zip Code – Prince William County



Extrapolated Employee Population Density by Home Zip Code – Spotsylvania County



Extrapolated Employee Population Density by Home Zip Code – Stafford County

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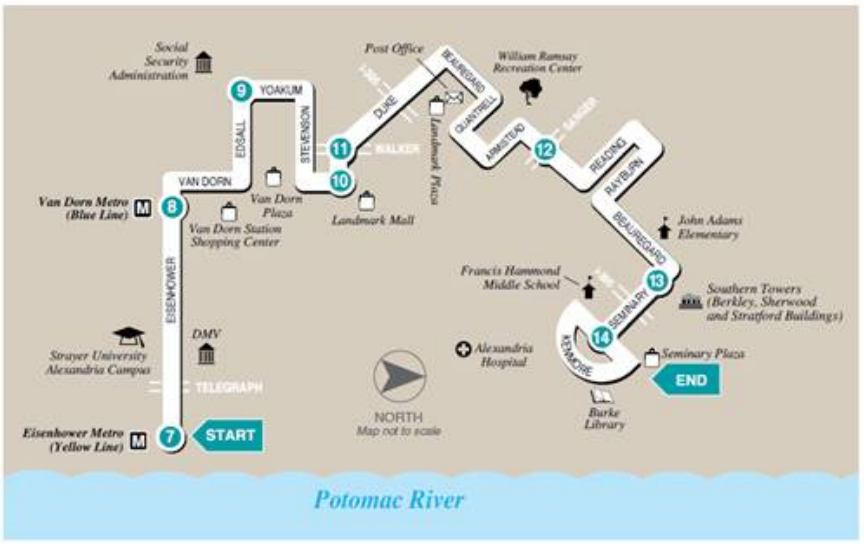
Appendix B

Public Transit Route Maps & Public Feeder Services

DASH AT1 Service Map

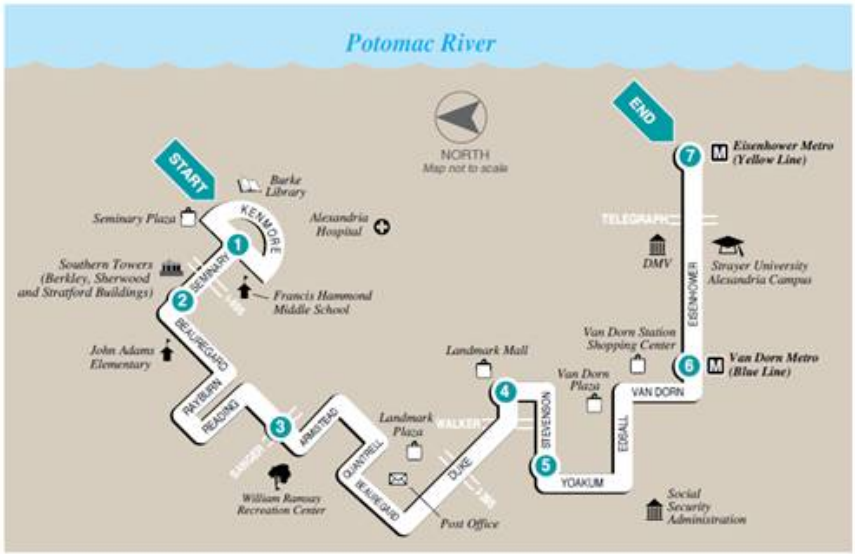
ROUTE AT1 TO SEMINARY PLAZA

Northbound
Eisenhower Metro and Van Dorn Metro to Southern Towers and Seminary Plaza



ROUTE AT1 TO VAN DORN M EISENHOWER M

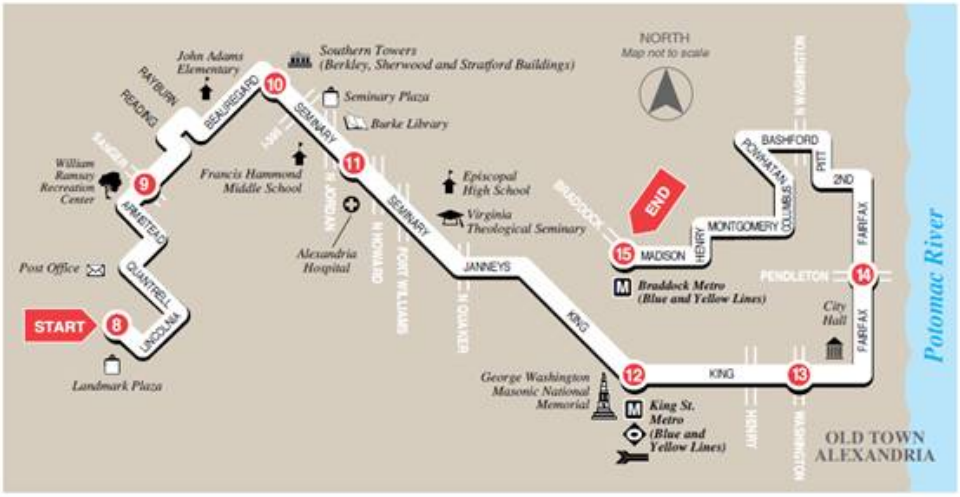
Southbound
Seminary Plaza to Van Dorn Metro and Eisenhower Metro



DASH AT2 Service Map

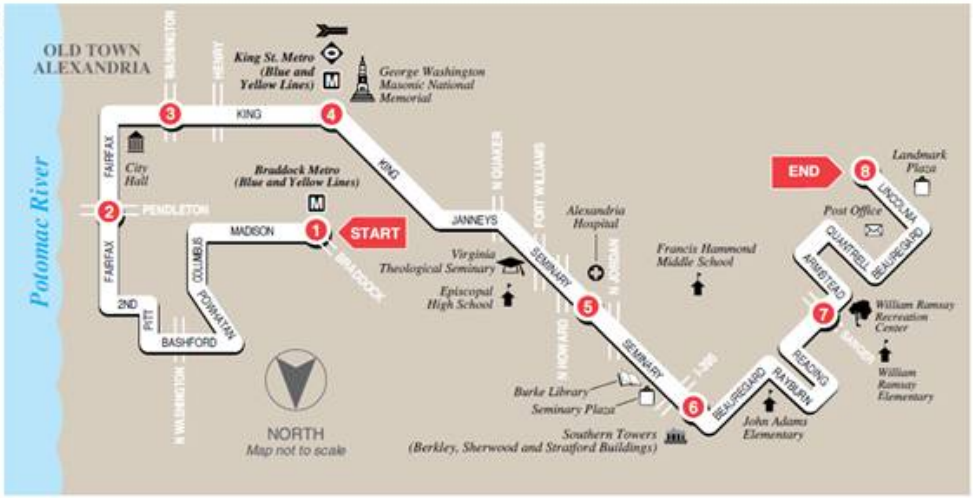
ROUTE AT2 TO BRADDOCK M VIA OLD TOWN

Eastbound
Lincolnia to Braddock Metro via Old Town Alexandria

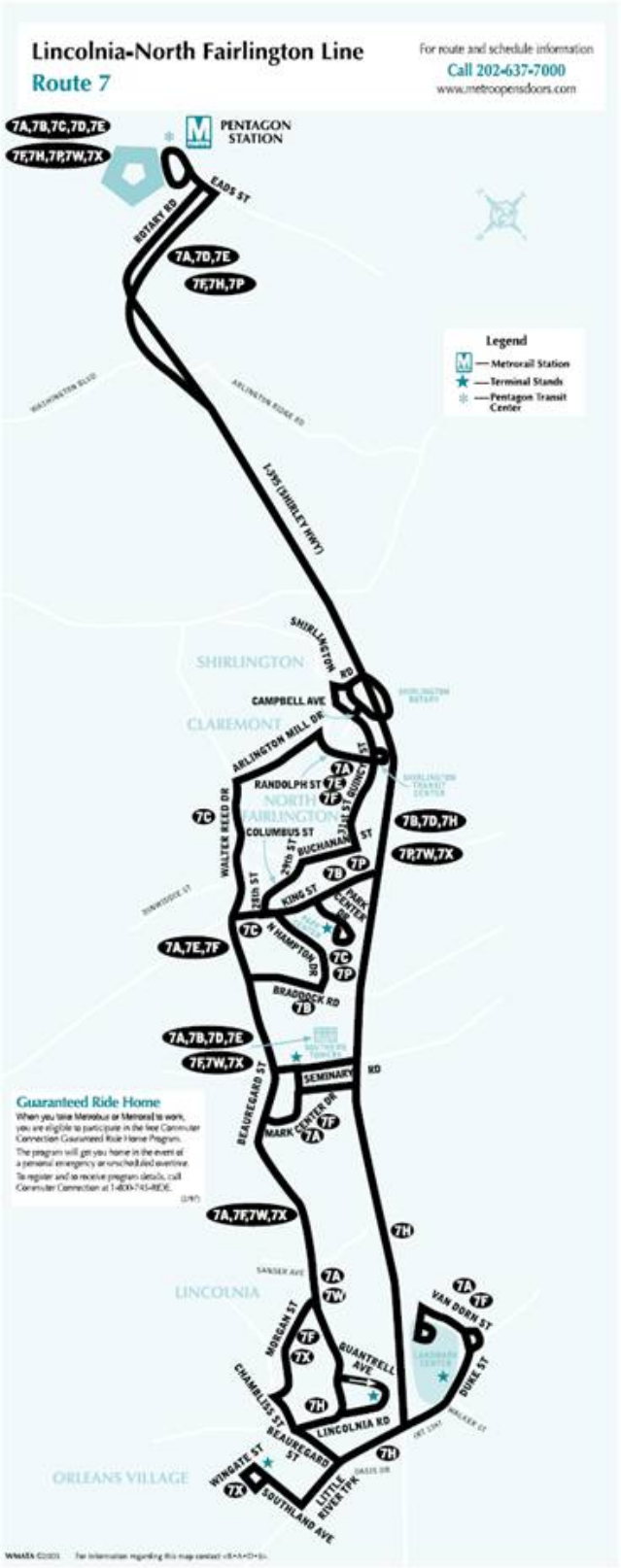


ROUTE AT2 TO LINCOLNIA

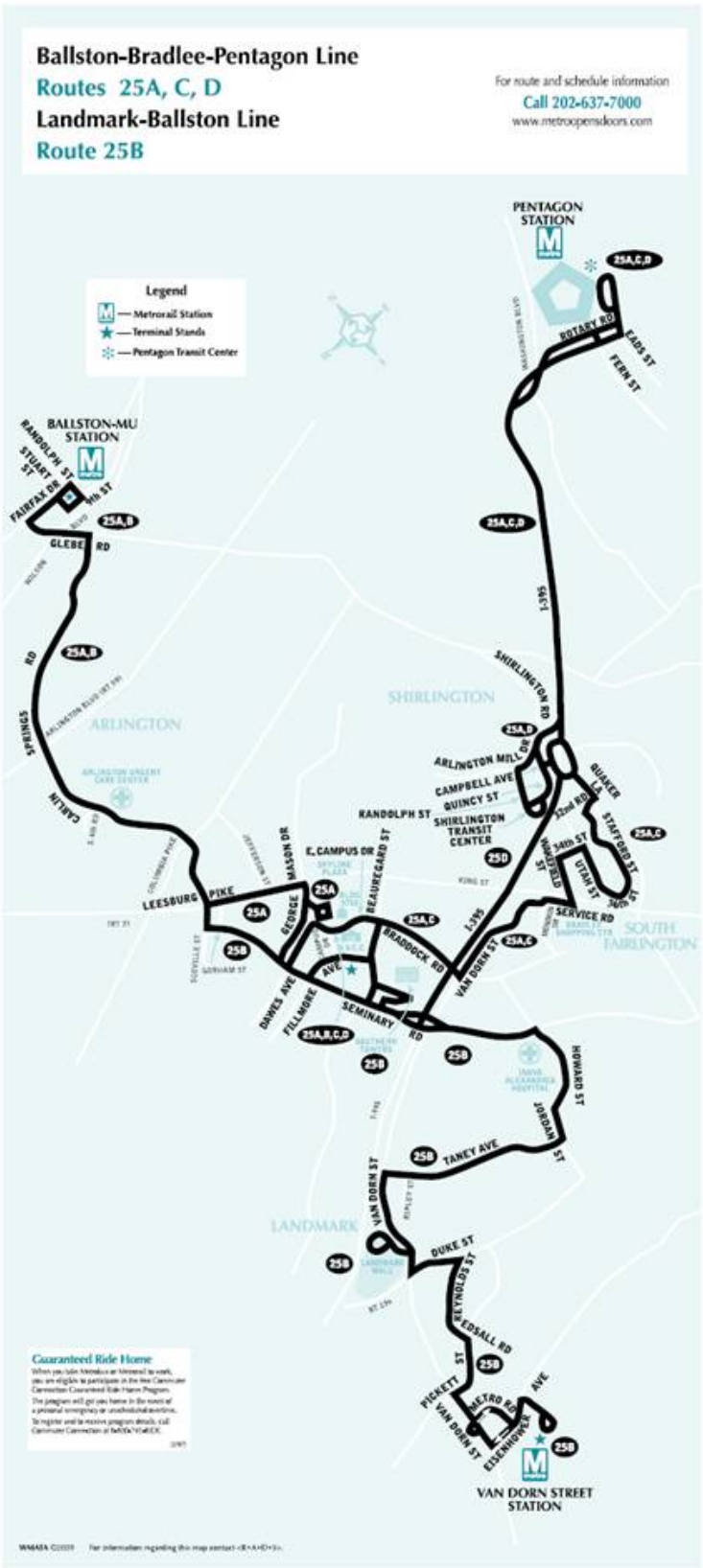
Westbound
Braddock Metro to Lincolnia via Southern Towers



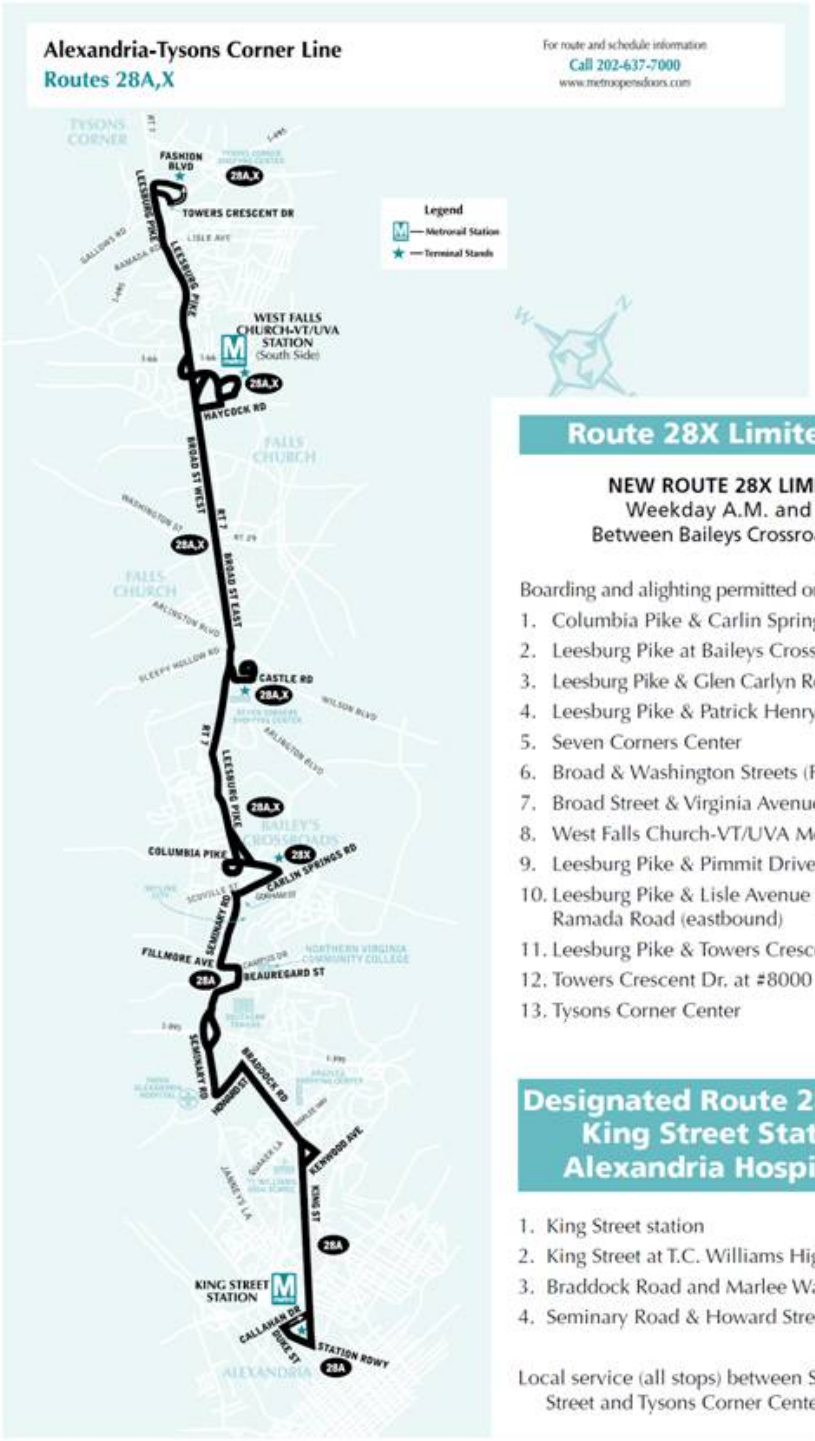
Metrobus Route 7 Service Map



Metrobus Route 25B Service Map



Metrobus Route 28A Service Map



Route 28X Limited Stop Service:

NEW ROUTE 28X LIMITED STOP SERVICE
Weekday A.M. and P.M. peak service
Between Baileys Crossroads and Tysons Corner

Boarding and alighting permitted only at the following stops:

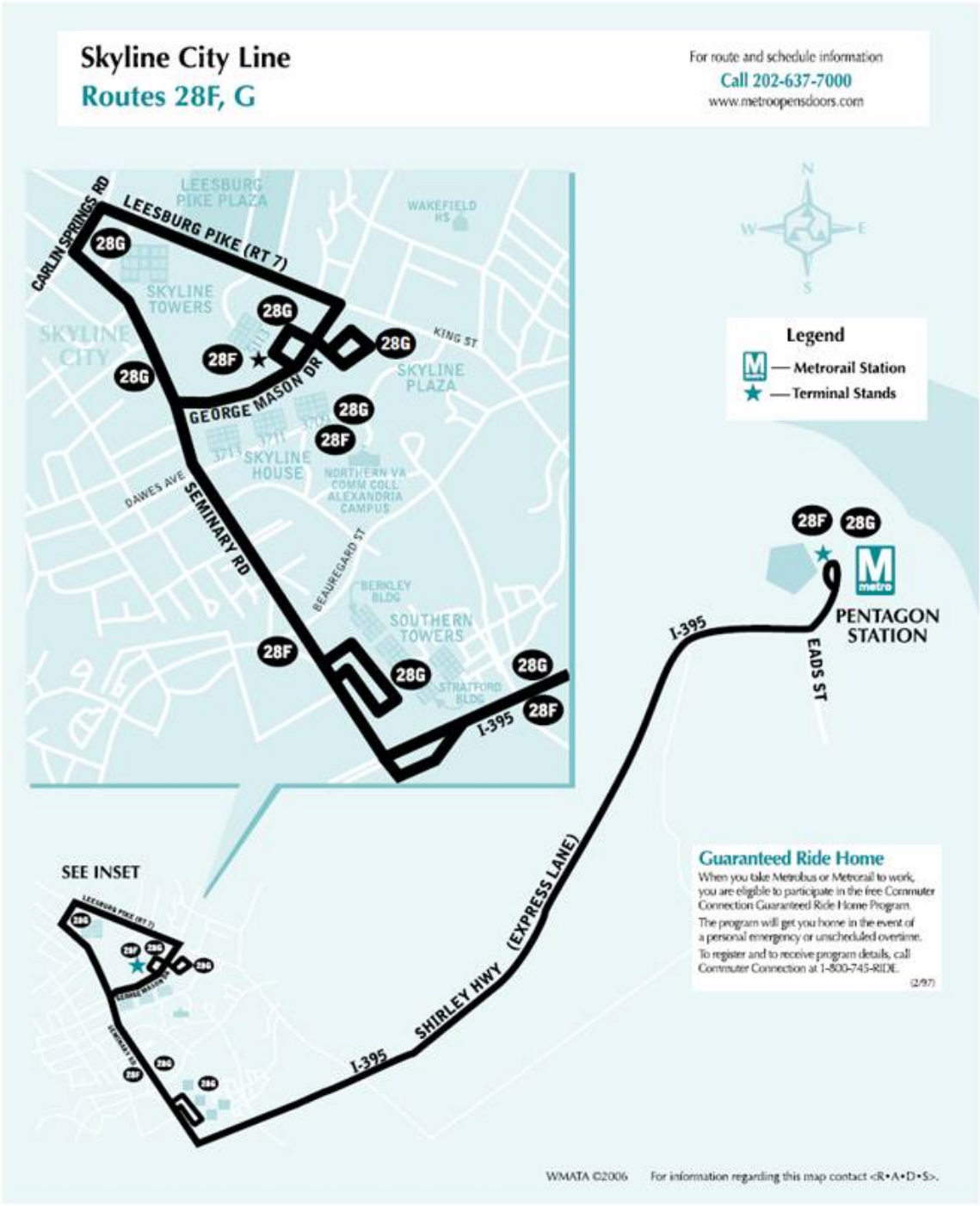
1. Columbia Pike & Carlin Springs Road
2. Leesburg Pike at Baileys Crossroads Shopping Center
3. Leesburg Pike & Glen Carlyn Road (Culmore Shopping Center)
4. Leesburg Pike & Patrick Henry Drive
5. Seven Corners Center
6. Broad & Washington Streets (Falls Church)
7. Broad Street & Virginia Avenue (Falls Church)
8. West Falls Church-VT/UVA Metro Station
9. Leesburg Pike & Pimmit Drive
10. Leesburg Pike & Lisle Avenue (westbound) / Leesburg Pike & Ramada Road (eastbound)
11. Leesburg Pike & Towers Crescent Drive
12. Towers Crescent Dr. at #8000 (westbound)
13. Tysons Corner Center

Designated Route 28A stops between King Street Station and Inova Alexandria Hospital at all times:

1. King Street station
2. King Street at T.C. Williams High School
3. Braddock Road and Marlee Way (Bradlee Center)
4. Seminary Road & Howard Street (Inova Alexandria Hospital)

Local service (all stops) between Seminary Road & Howard Street and Tysons Corner Center

Metrobus Route 28G Service Map



Available Public Feeder Services throughout the Region that serve Metrorail and VRE Stations

Metrorail Station Served	Operating Agency	Route No.	Headways during Peak	Route Origin	Route End	Express?	Web Link to Route Details
Pentagon	OmniRide	R1	NA	Dale and Lindendale	Pentagon	Yes	http://www.prtctransit.org/commuter-bus/schedules/rosslyn-
Pentagon	OmniRide	R2	NA	Dale and Lindendale	Pentagon	Yes	http://www.prtctransit.org/commuter-bus/schedules/rosslyn-
Pentagon	OmniRide	R3	NA	Dale and Lindendale	Pentagon	Yes	http://www.prtctransit.org/commuter-bus/schedules/rosslyn-
Pentagon	OmniRide	R4	NA	Dale and Lindendale	Pentagon	Yes	http://www.prtctransit.org/commuter-bus/schedules/rosslyn-
Franconia/ Springfield	OmniRide	PMD	NA	PRTC Transit Center	Franconia/Springfield	Unknown	http://www.prtctransit.org/commuter-bus/schedules/pwmd-am.php
West Falls Church	OmniRide	LMD	NA	Limestone	West Falls Church	Yes	http://www.prtctransit.org/commuter-bus/schedules/lhmd-
West Falls Church	OmniRide	MMD	NA	Manassas Junction	West Falls Church	Unknown	http://www.prtctransit.org/commuter-bus/schedules/mmd-
Union Station	OmniRide	C1	NA	Dale City Commuter Lot	7th & Independence	No	http://www.prtctransit.org/commuter-bus/schedules/caphill-
Pentagon	OmniRide	D-201	20	Dale City Commuter Lot	12th & Old Jefferson	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	D-202C	30	Lindendale Commuter Lot	12th & Old Jefferson	No	http://www.prtctransit.org/commuter-bus/schedules/dalecity-pentagon-am.php
Pentagon	OmniRide	D-203	20	PRTC Transit Center	12th & Old Jefferson	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	D-204T	20	Dale City Commuter Lot	13th & Old Jefferson	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	D-205C	120	Lindendale Commuter Lot	14th & Old Jefferson	No	http://www.prtctransit.org/commuter-bus/schedules/dalecity-pentagon-am.php
Pentagon	OmniRide	D-206	20	Dale City Commuter Lot	15th & Old Jefferson	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	D-207C	Last	Lindendale Commuter Lot	16th & Old Jefferson	No	http://www.prtctransit.org/commuter-bus/schedules/dalecity-pentagon-am.php
Pentagon	OmniRide	D-208	20	Dale City Commuter Lot	17th & Old Jefferson	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	LX-1	20	Dale City Commuter Lot	Pentagon	Yes	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	LX-2	Last	Dale City Commuter Lot	Pentagon	Yes	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-1	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-2	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-3	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-4	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-5	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-6	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-7	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-8R	15	Manassas Mall	Pentagon	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-9	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-10	15	Manassas Mall	Virginia & 21st	No	http://www.prtctransit.org/commuter-
Pentagon	OmniRide	M-11R	15	Manassas Mall	Pentagon	No	http://www.prtctransit.org/commuter-
Greenbelt Metro	TheBus (PG County)	11	30	Greenbelt Metro	Greenbelt Metro	No	http://www.princegeorgescountymd.gov/Government/Agen
West Hyattsville Metro	TheBus (PG County)	12	30	West Hyattsville Metro	West Hyattsville Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/Rt12.pdf
West Hyattsville Metro	TheBus (PG County)	13	40	West Hyattsville Metro	West Hyattsville Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/RT13TIME.pdf

Available Public Feeder Services throughout the Region that serve Metrorail and VRE Stations (cont.)

Metrorail Station Served	Operating Agency	Route No.	Headways during Peak	Route Origin	Route End	Express?	Web Link to Route Details
Prince George/College Park	TheBus (PG County)	14	45	Prince George Metro	College Park Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/Rt14.pdf
Greenbelt Metro	TheBus (PG County)	15	60	Greenbelt Metro	Maryland Corporate Center	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt15web.pdf
New Carrolton/ Greenbelt Metro	TheBus (PG County)	15 Express	80	New Carrolton Metro	Greenbelt Metro	Yes	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt15X.pdf
New Carrolton/ Greenbelt Metro	TheBus (PG County)	16	30	New Carrolton Metro	Greenbelt Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/rte16.pdf
Largo Town Center/New Carrolton	TheBus (PG County)	21	30	Equestrian Center	New Carrolton Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt21.pdf
NewCarrolton Metro	TheBus (PG County)	21 Express	20	New Carrolton Metro	Motor Vehicle Admin	Yes	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt21X.PDF
Morgan Boulevard Metro	TheBus (PG County)	22	40	Morgan Boulevard Metro	Landover Mall	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt22.pdf
Addison Road/Cheverly Metro	TheBus (PG County)	23	30	Addison Road Metro	Cheverly Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt23web.pdf
Morgan Boulevard/ Capitol Heights Metro	TheBus (PG County)	24	30	Morgan Boulevard Metro	Capitol Heights Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRT24web.pdf
Capitol Heights Metro	TheBus (PG County)	25	35	Capitol Heights Metro	Capitol Heights Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt25.pdf
Morgan Boulevard/Largo Town Center Metro	TheBus (PG County)	26	40	Morgan Boulevard Metro	Largo Town Center Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt26web.pdf
Landrover Metro	TheBus (PG County)	27	30	Landover Metro	Landover Metro	No	http://www.princegeorgescountymd.gov/Government/Agen
Largo Town Center Metro	TheBus (PG County)	28	30	Largo Town Center Metro	Campus Way North at Grey Gables Court	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/wRt28.pdf
Branch Avenue Metro	TheBus (PG County)	30	40	Stuart Lane at Surratts Rd.	Branch Avenue Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/Route30Web.pdf
Naylor Road Metro	TheBus (PG County)	32	30	Clinton Fringe Parking Lot	Naylor Road Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/Rt32.pdf
Southern Avenue Metro	TheBus (PG County)	33	40	Old Branch Avenue at Allentown Way	Southern Avenue Metro	No	http://www.princegeorgescountymd.gov/Government/AgencyIndex/DPW&T/Transit/Rt33.pdf
Suitland Metro	TheBus (PG County)	34	15	Suitland Metro	Suitland Metro	No	http://www.princegeorgescountymd.gov/Government/Agen
L'Enfant Plaza Metro	Tri-County	901	10	La Plata Park & Ride	State Department	No	http://mta.maryland.gov/services/commuterbus/schedulesSystemMaps/901_HTML_sched.cfm

Available Public Feeder Services throughout the Region that serve Metrorail and VRE Stations (cont.)

Metrorail Station Served	Operating Agency	Route No.	Headways during Peak	Route Origin	Route End	Express?	Web Link to Route Details
L'Enfant Plaza Metro	Tri-County	902	20	La Plata Park & Ride	State Department	No	http://mta.maryland.gov/services/commuterbus/schedulesSystemMaps/902_sched.cfm
L'Enfant Plaza Metro	Tri-County	904	15	North Beach	State Department	No	http://mta.maryland.gov/services/commuterbus/schedulesSystemMaps/904_sched.cfm
L'Enfant Plaza Metro	Tri-County	905	15	California (Regional Airport)	Office of Personnel Mgmt.		http://mta.maryland.gov/services/commuterbus/schedulesSystemMaps/905_sched.cfm
West Falls Church	Loundon County	WFC Express	NA	West Falls Church	West Falls Church	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=51d70efcaa0f426a8ddb011da05bed04&t
Pentagon	Loundon County	DC2E	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Pentagon	Loundon County	DC5E	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Rosslyn Metro	Loundon County	DC7	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Rosslyn Metro	Loundon County	DC11	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Pentagon	Loundon County	DC17E	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Rosslyn Metro	Loundon County	DC20	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Rosslyn Metro	Loundon County	DC21	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Rosslyn Metro	Loundon County	DC26	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
Rosslyn Metro	Loundon County	DC36	NA	Purcellville	H & 4th Str.	No	http://www.loudoun.gov/controls/speerio/resources/RenderContent.aspx?data=886d715ac3ab4c4ea6a8dd6a50ed4458&
College Park Metro	Howard Transit	G	60	Laurel Mall	College Park Metro	No	http://www.corridortransit.com/static/website/54/54619/files/docs/G_Route.pdf
Rosslyn Metro	Georgetown	N/A	10	DuPont Circle	Rosslyn Metro	No	http://www.georgetowndc.com/getting-here/shuttle
East Falls Church	GEORGE	26E	25	East Falls Church Metro	West Falls Church	No	http://www.fallschurchva.gov/Content/CultureRecreation/G
West Falls Church	GEORGE	26W	30	West Falls Church	East Falls Church	No	http://www.fallschurchva.gov/Content/CultureRecreation/G
West Falls Church	Fairfax Connector	425	20	West Falls Church	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/425.pdf
West Falls Church	Fairfax Connector	427	21	West Falls Church	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/425.pdf
West Falls Church	Fairfax Connector	505	15	Reston Town Center	West Falls Church	Yes	http://www.fairfaxcounty.gov/connector/pdf/505.pdf
West Falls Church	Fairfax Connector	551	30	Herdon/Monroe Park & Ride	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/551.pdf
West Falls Church	Fairfax Connector	553	30	Reston South Park	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/553.pdf
West Falls Church	Fairfax Connector	557	30	Reston South Park	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/557.pdf
West Falls Church	Fairfax Connector	552	30	Ring Rd	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/552.pdf
West Falls Church	Fairfax Connector	554	30	Wiehle Ave	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/552.pdf

Available Public Feeder Services throughout the Region that serve Metrorail and VRE Stations (cont.)

Metrorail Station Served	Operating Agency	Route No.	Headways during Peak	Route Origin	Route End	Express?	Web Link to Route Details
West Falls Church	Fairfax Connector	585	25	Reston South Park & Ride	West Falls Church	Yes	http://www.fairfaxcounty.gov/connector/pdf/585.pdf
Pentagon	Fairfax Connector	595	30	Reston East	Pentagon	Yes	http://www.fairfaxcounty.gov/connector/pdf/595.pdf
West Falls Church	Fairfax Connector	950	20	Reston Town Center	West Falls Church	No	http://www.fairfaxcounty.gov/connector/pdf/950.pdf
West Falls Church	Fairfax Connector	980	6	Herdon/Monroe Park & Ride	West Falls Church	Yes	http://www.fairfaxcounty.gov/connector/pdf/950.pdf
Huntingdon	Fairfax Connector	101	30	Mount Vernon	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/101.pdf
Huntingdon	Fairfax Connector	109	35	Van Dorn Metro	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/109.pdf
Huntingdon	Fairfax Connector	151	30	Huntingdon Metro	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/151.pdf
Huntingdon	Fairfax Connector	161	30	Huntingdon Metro	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/161.pdf
Huntingdon	Fairfax Connector	162	30	Huntingdon Metro	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/162.pdf
Huntingdon	Fairfax Connector	171	30	Fraconia/Springfield Metro	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/171.pdf
Van Dorn Metro	Fairfax Connector	231	30	Fraconia/Springfield Metro	Fraconia/Springfield Metro	No	http://www.fairfaxcounty.gov/connector/pdf/231.pdf
Van Dorn Metro	Fairfax Connector	232	30	Fraconia/Springfield Metro	Fraconia/Springfield Metro	No	http://www.fairfaxcounty.gov/connector/pdf/232.pdf
Huntingdon	Fairfax Connector	301	30	Fraconia/Springfield Metro	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/301.pdf
Franconia/ Springfield	Fairfax Connector	304	30	Fraconia/Springfield Metro	Fraconia/Springfield Metro	No	http://www.fairfaxcounty.gov/connector/pdf/304.pdf
Franconia/ Springfield	Fairfax Connector	305	30	Newington Forest	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/305.pdf
Pentagon	Fairfax Connector	306	25	GMU	Pentagon	No	http://www.fairfaxcounty.gov/connector/pdf/306.pdf
Franconia/ Springfield	Fairfax Connector	310	30	Rolling Valley P&R	Huntingdon Metro	No	http://www.fairfaxcounty.gov/connector/pdf/310.pdf
Van Dorn Metro	Fairfax Connector	321	30	Van Dorn Metro	Van Dorn Metro	No	http://www.fairfaxcounty.gov/connector/pdf/321.pdf
Van Dorn Metro	Fairfax Connector	322	30	Van Dorn Metro	Van Dorn Metro	No	http://www.fairfaxcounty.gov/connector/pdf/322.pdf
Franconia/ Springfield	Fairfax Connector	331	30	Fraconia/Springfield Metro	Fraconia/Springfield Metro	No	http://www.fairfaxcounty.gov/connector/pdf/331.pdf
Franconia/ Springfield	Fairfax Connector	332	30	Fraconia/Springfield Metro	Fraconia/Springfield Metro	No	http://www.fairfaxcounty.gov/connector/pdf/332.pdf
Pentagon	Fairfax Connector	380D	20	Gambril P&R	Pentagon	Yes	http://www.fairfaxcounty.gov/connector/pdf/380-
Franconia/ Springfield	Fairfax Connector	401	15	Fraconia/Springfield Metro	Tysons West Park Transit	No	http://www.fairfaxcounty.gov/connector/pdf/401.pdf

Available Public Feeder Services throughout the Region that serve Metrorail and VRE Stations (cont.)

Metrorail Station Served	Operating Agency	Route No.	Headways during Peak	Route Origin	Route End	Express?	Web Link to Route Details
Franconia/ Springfield	Fairfax Connector	402	15	Fraconia/Springfield Metro	Tysons West Park Transit	No	http://www.fairfaxcounty.gov/connector/pdf/402.pdf
Vienna	Fairfax Connector	462	30	Van Dorn Metro	Old Lee Hwy & Hilltop	Yes	http://www.fairfaxcounty.gov/connector/pdf/462.pdf
Vienna	Fairfax Connector	463	30	Van Dorn Metro	Old Lee Hwy & Hilltop	Yes	http://www.fairfaxcounty.gov/connector/pdf/462.pdf
Vienna	Fairfax Connector	466	32	Vienna Metro	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/462.pdf
Vienna	Fairfax Connector	621	20	Vienna Metro	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/621.pdf
Vienna	Fairfax Connector	622	20	Vienna Metro	Vienna Metro	Yes	http://www.fairfaxcounty.gov/connector/pdf/621.pdf
Vienna	Fairfax Connector	623	20	Vienna Metro	Vienna Metro	Yes	http://www.fairfaxcounty.gov/connector/pdf/621.pdf
Vienna	Fairfax Connector	630	60	Central P&R	Vienna Metro	Yes	http://www.fairfaxcounty.gov/connector/pdf/630.pdf
Vienna	Fairfax Connector	631	35	Braddock Rd	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/630.pdf
Vienna	Fairfax Connector	632	30	Park Meadow	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/630.pdf
Vienna	Fairfax Connector	640	60	Lee Rd	Vienna Metro	Yes	http://www.fairfaxcounty.gov/connector/pdf/640.pdf
Vienna	Fairfax Connector	642	30	Sully Station P&R	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/640.pdf
Vienna	Fairfax Connector	644	15	Centerville P&R	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/640.pdf
Vienna	Fairfax Connector	650	45	Avion Parkway	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/650.pdf
Vienna	Fairfax Connector	651	30	Lee Rd	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/650.pdf
Vienna	Fairfax Connector	652	35	Lee Jackson Hwy	Vienna Metro	No	http://www.fairfaxcounty.gov/connector/pdf/650.pdf
Vienna	CUE	Green 1	35	Vienna Metro	Vienna Metro	No	http://www.fairfaxva.gov/cueBus/GreenRoute_S.pdf
Vienna	CUE	Green 2	35	Vienna Metro	Vienna Metro	No	http://www.fairfaxva.gov/cueBus/GreenRoute_S.pdf
Vienna	CUE	Gold 1	30	Vienna Metro	Vienna Metro	No	http://www.fairfaxva.gov/cueBus/GoldRoute_S.pdf
Vienna	CUE	Gold 2	30	Vienna Metro	Vienna Metro	No	http://www.fairfaxva.gov/cueBus/GoldRoute_S.pdf
Pentagon	Valley Coach Connector (private)	1	15	Strasburg	K St & 18th	No	http://www.shenvalleycommuters.com/Home_Page.php
Vienna Metro	Valley Coach Connector (private)	2	NA	Front Royal	Vienna Metro	Yes	http://www.shenvalleycommuters.com/Home_Page.php
Pentagon	Valley Van Connector (private)	3	20	Front Royal	Union Station	No	http://www.shenvalleycommuters.com/Home_Page.php
Pentagon	Martz Bus (private)	DC10 to Pentagon	NA	Rt. 208	14th & Indiana	Yes	http://www.martzgroupva.com/commuter-service-morning
Pentagon	Martz Bus (private)	Pentagon Express	NA	Rt. 209	15th & Indiana	Yes	http://www.martzgroupva.com/commuter-service-morning.asp

Appendix C

Existing Slug Pick-Up Points

AM Slug Pick Up Points-Springfield/Woodbridge

	Pickup location	Destination	Hours	Parking	Connecting Bus Lines
Springfield	Bob's: Just west of I-95 near the intersection of Old Keene Mill Road and Bland Street in Springfield, VA. Currently the line still operates out of the Long John Silver's parking area. However, at some point this line may move to the commuter lot next to K-Mart.	L'Enfant Plaza, 14th Street (all points), Memorial Bridge Area, 23rd Street	5:45 - 7 am (good) 7-8 am (excellent)	Commuter lot next to K-Mart with 155 spaces	Fairfax Connector route numbers are (110, 111, 204), MetroBus (18A, B, E, F,G, H, J, KL, P, R)
	Daventry: The Daventry slug line is located in the Daventry Subdivision. Because of the safety hazard of stopping on this road, the line has relocated from the bus stop on Old Keene Mill Road to the new location about 50 yards south on Hunter Village Drive. Slugs wait next to the curb in the median island.	Pentagon	5:30 - 7 am (very good) 7 - 8 am (good)	Limited curbside parking; Park on shoulder of Hunter Village Drive but pay close attention to no parking signs.	Fairfax Connector
	Cardinal Plaza: The Cardinal Forest (occasionally called Rolling Road) slug line operates next to the Shell station on Old Keene Mill Road, across from the Cardinal Forest Shopping Area. Slugs stand a few yards from the bus stop, actually putting them on the edge of the Springfield Golf and Country	Pentagon	6-7 am (slow) 7-8 am (good)	Commuter lot with 100 spaces; lot is in Cardinal Forest Shopping Center.	Metrobus (18P) and Fairfax Connector
	Rolling Valley: Springfield/Burke, in the commuter lot near the intersection of 9300 Old Keene Mill Road and Shiplett Boulevard.	All areas: Heaviest volume is to Pentagon; less volume to: Foggy Bottom, 20th and L, Crystal City, 14th and constitution, L'Enfant Plaza, 18th Street, and Rosslyn	5:45 - 7 am (good) 7-8 am (excellent) 8-8:30 am (good)	Commuter lot with 628 spaces	Fairfax Connector, Metrobus (18P)
	Huntsman: Springfield, near the intersection of Huntsman Blvd. and Sydenstricker Road.	Pentagon, Rosslyn	5:30-7 am (very good) 7-8:30 (good)	Limited parking on shoulder of Huntsman south of intersection or on Sydenstriker near school.	Fairfax Connector
	Sydenstricker Commuter Lot: West Springfield, near the intersection of Sydenstricker and Hooes Road (Hwy 640) adjacent to the Fairfax County Parkway (Hwy 7100).	Pentagon, Rosslyn	5:45-7 am (very good) 7-8:30 am (good)	Commuter lot with 167 spaces	Fairfax Connector (305 and 385)
Woodbridge	Old Hechinger's: Woodbridge, at Old Hechinger's, near the intersection of Old Bridge Road and Gordon Boulevard (Route 123). Approximately 1310 Old Bridge Road, Woodbridge, VA 22192	14th and Constituion, 14th and I, 18th Street	6-7 am (good), 7-8:30 am (excellent)	Commuter lot with 594 spaces.	OmniRide
	Tackett's Mill: Lake Ridge, near the intersection of Minnieville Road and Old Bridge Road.	Pentagon (heaviest volume), Crystal City, Rosslyn	5:45-7 am (old lot), 7-8:30 am (new lot)	New lot: 530 spaces, Old lot: 120 spaces	OmniRide
	Dillingham: Lake Ridge, near the intersection of Giffith Avenue and Cotton Mill Drive.	Pentagon	5:45- 8 am (sporadic)	Parking along curb	OmniRide
	Horner Road: Woodbridge, near the intersection of Prince William Parkway and Horner Road just west of I95 off exit 158.	Pentagon, Crystal City, Rosslyn, 14th Street (all points), L'Enfant Plaza, 18th Street and Constituion, Memorial Bridge area, 23rd Street, Washington Navy Yard	5:30- 7 am (excellent)	Commuter lot with 2425 spaces	OmniRide
	Potomac Mills: Woodbridge, on the South side of Potomac Mills Shopping Mall near the main entrance in parking areas #12 and #13. Approximately at 14362 Gideon Drive, Dale City, VA 22193	Pentagon, Rosslyn, 14th Street (all points), Crystal City, 18th Street and Constitution, L'Enfant Plaza, Memorial Bridge area, 23rd Street	5:30-9 am (excellent)	Commuter lot with 950 spaces.	OmniRide
	Montclair Fire Station: Waterway Drive and Spring Branch Blvd., Montclair, VA	Pentagon	6-6:30 am (good)	Limited curbside parking along Spring Branch Blvd.	OmniRide
	Montclair Northgate: Montclair at the intersection of Waterway Drive and Northgate	Pentagon	5:30-6:30 am	Parking on the shoulder of Northgate	OmniRide
	Route 234 (Dumfries Road): Rt. 234 (Dumfries Road) is located off Exit 152 and east of I-95 and just prior to Route 1 across from McDonald's.	Pentagon, 14th and Constitution, 14th at Commerce Department, 14th and New York, 14th and F, 18th Street, L'Enfant Plaza	Before 7 am	Commuter Lot	OmniRide

Source: www.slug-lines.com, (last accessed on May 1, 2010).

AM Slug Pick Up Points-Springfield/Woodbridge

	Pickup location	Destination	Hours	Parking	Connecting Bus Lines
Stafford	Route 610: Stafford, in the commuter lot behind McDonald's, north of Garrisonville Road (Route 610) off Stafford Boulevard. Use exit 143B (Route 610, Garrisonville) off I-95. Lot is near the intersection at Garrisionville and Mine Road, Stafford, VA 22554	Pentagon, Crystal City, Rosslyn (Possible)	5:45 - 7:30 am	Commuter Lot (generally full by 6:45 am); after 6:45, new lot on Mine Road; Garrisonville park-and-ride lot is located on Stafford Borough Blvd just off Garrisonville Road 1/2 mile west of I-95	Martz Bus
	Route 630: Stafford, use exit 140 (Route 630, Stafford) off I-95. Commuter lot and slug line are located approximately .2 miles west on Route 630 on the left side of the road. Approximately 1000 Courthouse Road, Stafford, VA 22554	Pentagon, Crystal City, Rosslyn, 14th Street	5:30-8:30 am	Commuter lot	National Coach, Lee, and Quick's Bus Service
Fredericksburg	Route 17: Fredericksburg, use exit 133B (Route 17, Warrenton) off I-95. Commuter lot and slug line are located approximately .5 miles north on Route 17 on the left side of the road. Street address - 575 Warrenton Rd. Fredericksburg, VA, 22405	Pentagon, Crystal City, Rosslyn, 14th Street, 14th and G, L'Enfant Plaza	5:30-8:30 am	Commuter lot	National Coach, Lee, and Quick's Bus Service
I-66/Manassas	Manassas Starbucks: At Starbucks in Manassas on Route 234 located at Manaport Plaza, 8329 Sudley Road Manassas VA, 22110	Pentagon	5:45 - 8:30 am	None listed	None

Source: www.slug-lines.com, (last accessed on May 1, 2010).

PM Slug Pick Up Points-Northern Virginia

	Dropoff location	Destination	Hours	Parking	Connecting Bus Lines
Pentagon	North Rotary Road	Horner Road/ Potomac Mills	3-6 pm	Permit only, reserved at all times to include the new carpool permits. Some meter parking along Fern Street and Army Drive south of I-395.	MetroBus: 7A, B, C, D, E, F, H, P, W, X, 8S, W, X, Z, 9A, E, 10A, E, 13A, B, F, G, 16A, B, C, D, E, F, G, J, 16L, 16S, U, W, X, 17A, B, F, M 17G, H, K, L, 18E, F 18G, H, J, 18P, 21A, B, C, D, F, 22A, B, C, F 24M, P, 25A, F, G, J, P, R, 28F, G, 29C, E, G, H, X, P13; OmniRide, Fairfax Connector, Alexandria DASH
		Montclair			
		Tackett's Mill/ Lorton VRE			
		Springfield/ Burke			
	Fern Street	Route 3, Fredericksburg/ Gordon Road			
		Rt. 17 Stafford (should be labeled Rt. 17 Fredericksburg)			
		Rt. 610 Mine Road			
		Rt. 610 Stafford			
Crystal City	1200 Crystal Drive and 12th Street.	Horner Road	4-5 pm	Metered parking and parking garages	OmniRide, Metrobus (11P, 23A, C)
		Potomac Mills			
		Tackett's Mill			
		Route 610 Stafford			
		Route 234 Dumfries			
Rosslyn	Lee Hwy Service Road	Potomac Mills	3:15-6 pm; Peaks at 4:30 pm	Meter parking along most streets as well as pay parking garages.	GW Shuttle, State Department Shuttle, Pentagon Shuttle, Metrobus (3A, 3B, 3E, 3F, 4A, 4B, 4E, 4H, 4S, 4L, 38B)
		Horner Road			
		Tackett's Mill			
		Route 610 Stafford			
		Route 3 - Gordon Road Fredericksburg			
	North Kent Street	Rolling Valley	4:45-5:15 pm		
		Sydenstricker			
		Daventry			
		Cardinal Forest			
	Wilson Blvd and Kent Street	Route 17			

Source: www.slug-lines.com, (last accessed on May 1, 2010).

Appendix D

Regional Park & Ride Lots

Availability and Capacity of Park and Ride Lots in Northern Virginia

Jurisdiction	Lot #	Lot name	Location	Corridor	2009 Capacity	2009 Usage	2009 % used
Arlington							
	55	Ballston Public Parking Garage	North Glebe Road and Randolph Street	I-66	500	0	0%
	39	Columbia Pike @ Four Mile Run	Columbia Pike & Four Mile Run	I-66	24	23	96%
	56	North Quincy Street	Quincy Street @ 17th Street	I-66	356	71	20%
			Arlington Totals		**880**	**94**	**11%**
Loudoun							
	89	Algonkian	Our Lady of Hope Catholic Church, Intersectionof Algonkian Parkway and Cascades Parkway	Dulles Toll Road	100	54	54%
	93	Ashburn	Crossroads United Methodist Church, 43454 Crossroads Drive (Gravel lot across from the church)	Dulles Toll Road	90	3	3%
	63	Ashburn Farm	Summerwood Circle and Ashburn Farm Parkway	Dulles Toll Road	20	13	65%
	101	Ashburn North	Russell Branch Parkway at Richfield Way (near Strayer University)	Loudoun	190	77	41%
	62	Ashburn Village Soccer Field	Grottoes Drive and Glouchester Parkway	Dulles Toll Road	40	3	8%
	85	Barber and Ross	Harrison Street / Catoctin Circle	Dulles Toll Road	365	416	114%
	90	Brambleton	Creighton Road east of Route 659	Dulles Toll Road	100	0	0%
	87	Broad Run Farms	Galilee Methodist Church on Winding Rd of Algonkian Pkway	Dulles Toll Road	48	8	17%
	91	Broadlands	Caliborne Parkway at Village Drive (HOA office/Park on west side of Claiborne Parkway	Dulles Toll Road	30	4	13%
	92	Broadlands South	Broadlands Southern Walk Village Center near Harris Teeter	Dulles Toll Road	75	28	37%
	64	Cascades Lot	Palisades Pkwy, .25 mi E of Cascades Pkwy. Lot is near library and close to Community Lutheran Church	Route 7	55	49	89%
	76	Dulles North	Lockridge Road at Moran Road	Dulles Toll Road	750	765	102%
	88	Dulles South	Stone Ridge Village Center	Dulles Toll Road	250	145	58%
	82	Lowes Island	Great Falls Plaza entrance off Hardwood Forest Dr.	Route 7	65	59	91%
	102	Patrick Henry College	1 Patrick Henry Circle	Loudoun	130	104	80%
	84	Potomac Station Dr.	Potomac Station Drive (PSD) and Rivercreek Parkway (RP). On PSD east of RP at the community park with tennis court and tot lot	Route 7	48	0	0%
	57	St. Andrew's Presbyterian Church	711 West Main Street, Purcellville	Route 7	90	73	81%
	66	Sterling Park Shopping Center	Enterprise St & Maple --Sterling Plaza	Dulles Toll Road	45	0	0%
			Loudoun County Totals		**2491**	**1801**	**72%**

Source: VDOT

Availability and Capacity of Park and Ride Lots in Northern Virginia (cont.)

Jurisdiction	Lot #	Lot name	Location	Corridor	2009 Capacity	2009 Usage	2009 % used
Prince William							
	15	Bethel United Methodist Church	Smoketown & Minneville	I-95	68	21	31%
	3	Brittany Neighborhood Park	Exeter Drive off VA 234	I-95	85	69	81%
	11	Cherrydale @ Dale Blvd	Cramer Mews off Cherrydale Dr.	I-95	20	6	30%
	16	Christ Chapel	Smoketown Rd & Pr. Wm. Pkwy	I-95	300	0	0%
	21	Church of the Brethren	Intersection Horner Rd and Millwood Dr. Woodbridge	I-95	31	20	65%
	9	Dale City Commuter Lot	Minnieville Road and Dale Boulevard	I-95	591	275	47%
	100	Gainesville United Methodist Church	Limestone Road and Mile Stone Ct., Gainesville	I-66	75	0	0%
	22	Harbor Drive	Harbor Drive and Minnieville Road	I-95	200	1	1%
	25	Hechinger's - Old Bridge	Intersection Rte 123 and Old Bridge Road	I-95	580	594	102%
	8	Hillendale Commuter Lot	Hillendale Road and Dale Boulevard	I-95	248	80	32%
	26	I-95/123 Loop Interchange	Intersection I-95 and Rte 123, Exit 160	I-95	580	139	24%
	7	Kirkdale @ Dale Blvd	Intersection Dale Blvd @ Kirkdale Rd	I-95	41	0	0%
	12	K-Mart, Dale City	Intersection Dale Blvd & Gideon Dr.	I-95	90	66	73%
	24	Lake Ridge Commuter Lot	Minnieville Road & Old Bridge Road	I-95	638	622	97%
	99	Limestone Road lot	Limestone Road and Mile Stone Ct., Gainesville	I-66	182	81	45%
	6	Lindendale Commuter Lot	Lindendale Road and Dale Boulevard	I-95	216	85	39%
	74	Manassas Mall	Manassas Mall: Sudley Rd (234) and Rixlew La	I-66	217	120	55%
	4	Montclair Commuter Lot	VA 234 North of Stockbridge Drive	I-95	50	49	98%
	14	Old Bridge Festival Shopping Center	Old Bridge Road and Smoketown Road	I-95	56	21	38%
	40	Portsmouth Road Commuter Lot	Portsmouth Road and Williamson Blvd.	I-66	605	47	8%
	19	Potomac Mills Mall	Potomac Mills Mall across from Pier I imports	I-95	936	936	100%
	13	Prince William County Stadium	Off Davis Ford Road at Stadium	I-95	190	58	31%
	20	Prince William Parkway lot	Prince William Parkway at I-95	I-95	2363	2293	97%
	17	Prince William Square	Smoketown Road and Gideon Drive	I-95	45	0	0%
	5	Princedale at Northton	Princedale Dr, W of Dale Blvd	I-95	43	0	0%
	18	PRTC Transit Center	Potomac Mills Road at Telegraph Road	I-95	200	152	76%
	23	Tackett's Mill Specialty Center	Minnieville Road & Old Bridge Road in shopping center	I-95	170	110	65%
	1	Triangle	VA 619 and US 1	I-95	31	29	94%
	2	US1/VA 234	VA 234 & US 1	I-95	850	610	72%
			Prince William County Totals		**9701**	**6484**	**67%**
			Grand Total		**13072**	**8379**	**64%**

Source: VDOT

Park and Ride Lots in Fairfax County

NAME	ADDRESS	DISTRICT	PARKING SPACES		MOST RECENT CAPACITY COUNT	% OF UTILIZATION OF LOT	AMENTIES						BUS ROUTES THAT SERVES THIS LOCATION	GRAVEL/ PAVED LOT
			SPACES	HANDICAP SPACES			CONNECTOR STORE ON-SITE	LIGHTS	PAY PHONE	BIKE RACKS/ LOCKERS	TRASH CANS	BUS SHELTERS		
American Legion	6520 Amherst Avenue Springfield, VA 22150	Lee	100	0	100	100%	NO	YES	NO	0	NO	NO	NONE	Paved
AMF Centreville Lane	13814 Lee Highway Centreville, VA 20120	Sully	35	0	0	0%	NO	YES	NO	0	NO	NO	NONE	Paved
Autumn Willow Park	13090 Autumn Willow Dr. Centreville, Va 20120	Sully	100	0	0	0%	NO	NO	NO	0	YES	NO	12M	Gravel
Backlick North	6831 Backlick Road Springfield, VA 22150	Lee	279	7	73	25%	NO	YES	NO	0	YES	YES	310, 331, 332	Paved
Canterbury Woods	5018 Wakefield Chapel Road Annandale, VA 22003	Braddock	29	0	0	0%	NO	NO	NO	2 bicycle racks	YES	NO	306, 17A,B,F,G, H,K,L	Gravel
Centreville Park & Ride(Rt. 29 & Stone Rd)	14700 Lee Highway Centreville, VA 20120	Sully	372	8	372	100%	NO	YES	YES	4 bicycle racks	YES	YES	12A,C,E,F	Paved
Centreville United Methodist Church	6400 Old Centreville Rd Centreville, Va 20121	Sully	144	8	60	41%	NO	YES	NO	2 bicycle racks	YES	YES	12A,E,F,R	Paved
Fairfax County Government Center	12000 Government Center Parkway Fairfax, VA 22035	Springfield	170	8	91	53%	NO	YES	NO	1 bicycle rack	YES	YES	605,621,623	Paved
Gambrill Road	7321 Gambrill Road Springfield, VA 22153	Springfield	225	7	121	53%	NO	YES	NO	12 lockers	YES	YES	305, S3018R	Paved
Greenbriar Park	4600 Stringfellow Road Fairfax, VA	Sully	60	0	0	0%	NO	YES	NO	0	YES	NO	605,12S	Gravel & Paved
Herndon Monroe Park and Ride	12530 Sunrise Valley Drive Herndon, VA 20191	Hunter Mill	1745	34	1744	99%	YES	YES	YES	10 lockers / 9 bicycle racks	YES	YES	551,922,924,926,927,929,950,951,952,980, RIBS2, Metrobus 5A	Paved
Lorton Market Street	9405 Lorton Market Street Lorton, VA 22079	Mt. Vernon	65	0	3	4%	NO	YES	NO	0	NO	NO	171	Paved
Lorton Park & Ride	9300 Gunston Cove Road Lorton, VA 22079	Mt. Vernon	170	5	65	3%	NO	YES	YES	24 lockers	YES	YES	307	Paved
Parkwood Baptist Church	8726 Braddock Road Annandale, VA 22003	Braddock	279	0	0	0%	NO	NO	NO	0	NO	NO	306,17A,F,H,K	Paved
Poplar Tree Park	4718 Stringfellow Road Chantilly, VA 20151	Sully	820	0	0	0%	NO	NO	YES	0	YES	NO	605,12S	Gravel

Source: Fairfax Connector

Park and Ride Lots in Fairfax County (cont.)

NAME	ADDRESS	DISTRICT	PARKING SPACES		MOST RECENT CAPACITY COUNT	% OF UTILIZATION OF LOT	AMENTIES						BUS ROUTES THAT SERVES THIS LOCATION	GRAVEL/ PAVED LOT
			SPACES	HANDICAP SPACES			CONNECTOR STORE ON-SITE	LIGHTS	PAY PHONE	BIKE RACKS/ LOCKERS	TRASH CANS	BUS SHELTERS		
Reston East	1860 Wiehle Avenue Reston, VA 20190	Hunter Mill	820	17	820	100%	YES	YES	YES	10 lockers / 13 bicycle racks	YES	YES	504,505,551,552,554,557,595,597,RIBS1,2,3	Paved
Reston North	11300 Sunset Hills Road Reston, VA 20190	Hunter Mill	368	8	368	100%	NO	YES	YES	4 bicycle racks	YES	YES	505,952	Paved
Reston South	2531 Reston Parkway Reston, VA 20191	Hunter Mill	412	10	175	42%	NO	YES	YES	11 bicycle racks	YES	YES	553,557,585	Paved
Rolling Valley	9220 Old Keene Mill Road Burke, Va 22015	Springfield	664	16	440	66%	NO	YES	YES	8 bicycle racks	YES	YES	310,18G,J,P,R,S	Paved
Sydenstricker Road	8500 Hooes Road Springfield, VA 22153	Springfield	170	6	170	100%	NO	YES	NO	14 lockers	YES	YES	305	Paved
South Run District Park	7550 Reservation Drive Springfield, VA 22153	Springfield	52	3	0	0%	NO	YES	NO	0	YES	NO	18R	Paved
Springfield Mall	6717 Frontier Drive Springfield, VA 22150	Lee	500	3	500	100%	NO	YES	NO	0	NO	NO	321,322,33,332, 401,S80,S91	Paved
Springfield Plaza	6400 Springfield Plaza Springfield, VA 22150	Lee	254	0	254	100%	NO	YES	NO	0	NO	NO	331,332,18E	Paved
Springfield United Methodist Church	6501 Springfield Road Springfield, VA 22150	Lee	56	0	56	100%	NO	YES	NO	0	NO	NO	18G,J,P	Paved
St. Paul Chung Catholic Church	4712 Rippling Pond Dr Fairfax, VA 22033	Springfield	100	5	9	9%	NO	YES	NO	0	NO	NO	12S	Paved
Stringfellow Road	4920 Stringfellow Rd. Centreville, VA 20120	Sully	385	8	385	100%	NO	YES	NO	2 bicycle racks	YES	YES	12E,D,M,S	Paved
Sully Station	4900 Stonecroft Blvd. Centreville, VA 20151	Sully	38	0	10	26%	NO	YES	YES	5 bicycle racks	YES	YES	12C,D,R,S	Paved
VRE Backlick Road Station	6900 Hechinger Drive Springfield, VA 22151	Lee	220	5	132	55%	NO	YES	YES	6 bicycle racks	YES	YES	321,322,401 18E	Paved
VRE Burke Centre Station	5671 Roberts Pkwy. Burke, VA 22015	Springfield	543	9	400	73%	NO	YES	YES	1 bicycle racks	YES	YES	17B,L	Paved
VRE Lorton Station	8990 Lorton Station Blvd. Lorton, VA 22079	Mt. Vernon	466	7	256	55%	NO	YES	YES	6 bicycle racks	YES	YES	171,307	Paved
VRE Rolling Road Station	9016 Burke Road Burke, VA 22015	Springfield	368	9	358	97%	NO	YES	YES	10 bicycle racks	YES	NO	17L	Paved
Wakefield Park	8100 Braddock Road Annandale, VA 22003	Braddock	50	0	0	0%	NO	NO	NO	0	NO	NO	306, 17A,B,F,G,H,K.L	Paved

Source: Fairfax Connector

Park and Ride Lots in the District of Columbia

Name	Jurisdiction	Location	Parking Spaces	Connecting Services
Anacostia Metro Station	DC	Shannon Pl, SE between MLKing Ave & Firth Sterling	408	Metrobus
Deanwood Metro Station	DC	Minnesota Ave between Nash & 48th Sts, NE	373	Metrobus
Fort Totten Metro Station	DC	Galloway St east of South Dakota Ave, NE	340	Metrobus
Minnesota Ave Metro Station	DC	Minnesota Ave north of Grant St, NE	194	Metrobus
Rhode Island Ave Metro Station	DC	Rhode Island Ave west of 8th St, NE	641	Metrobus
Union Station Rail Station	DC	60 Mass. Ave. & 1st St. N.E.	45	Amtrak, VRE, WMATA, MARC, Metrobus, Red Line

Source: Commuter Connections

Park and Ride Lots in Maryland

Name	Jurisdiction	Location	Parking Spaces	Connecting Services
Bristol	Anne Arundel	MD 4 and MD 258 (Bay Front Road West)	100	MTA Commuter Bus
Crofton	Anne Arundel	MD 3 at Crofton Country Club	10	Metrobus
Davidsonville	Anne Arundel	US 50/301 & MD 424 (Davidsonville Road)	100	MTA Commuter Bus
Harry S Truman	Anne Arundel	Harry S Truman Pkwy & Riva Road	100	MTA Commuter Bus
Lower Pindell Road	Anne Arundel	MD 980 at Lower Pindell Road	138	MTA Commuter Bus
Navy Stadium	Anne Arundel	Navy Stadium at Rowe Blvd & Taylor Ave	480	MTA Commuter Bus
Severna Park	Anne Arundel	MD 2 at Jones Station Road	400	MTA Local Bus
Waysons Corner	Anne Arundel	MD 4 (So. Maryland Blvd.) & MD 408 (Mt. Zion Marlboro Road.)	138	MTA Commuter Bus
Dunkirk Park	Calvert	MD 4, Dunkirk Park in Dunkirk	106	MTA Commuter Bus
Sunderland	Calvert	MD 2 & MD 4	35	MTA Commuter Bus
Smallwood Drive	Charles	US 301 at Smallwood Dr.	-	MTA Commuter Bus
Urbana (North Lot)	Frederick	I-270 & MD 80 Exit 26	164	Ride-On, MTA Commuter Bus
Urbana (South Lot)	Frederick	I-270 & MD 80 Exit 26	230	Ride-On, MTA Commuter Bus
Marywood	Harford	US 1 at MD 24	385	MTA Commuter Bus
Broken Land Pkwy East	Howard	MD 32 and Broken Land Pkwy.	210	MTA Commuter Bus
Broken Land Pkwy West	Howard	MD 32 & Broken Land Pkwy.	325	MTA Commuter Bus, Connect-a-Ride, Howard Transit
Clarksville	Howard	MD 32 & MD 108	300	MTA Commuter Bus, Howard Transit
Long Gate	Howard	Long Gate Pkwy & MD 100	318	MTA Commuter Bus, Howard Transit
Scaggsville	Howard	US 29 & MD 216	42	MTA Commuter Bus
Snowden River	Howard	MD 175 & Snowden River Pkwy.	356	MTA Commuter Bus, Howard Transit Connector
Briggs Chaney	Montgomery	Briggs Chaney Road. at Gateshead Manor Way	200	Metrobus, Ride-On
Burtonsville	Montgomery	US 29 north of MD 198 (Burtonsville Crossing Shpg. Ctr.)	131	Metrobus, MTA Commuter Bus, Connect-A-Ride
Colesville	Montgomery	MD 650 and Randolph Road	475	Metrobus
Comus Road	Montgomery	MD 355 north of Comus Road (Clarksburg, MD)	300	Ride-On
Forcey Memorial Church	Montgomery	E. Randolph Road at Old Columbia Pike	167	Metrobus
Forest Glen Metro Station	Montgomery	Georgia Ave & Forest Glen Rd	1,319	Metrobus
Gaithersburg	Montgomery	Quince Orchard Road at west side of I-270	583	Ride-On

Source: Commuter Connections

Park and Ride Lots in Maryland (cont.)

Name	Jurisdiction	Location	Parking Spaces	Connecting Services
Gaithersburg Rail Station	Montgomery	5 S. Summit Ave. @ East Diamond Ave.	3,364	Ride-On
Germantown Rail Station	Montgomery	19320 Mateny Hill Rd. @ Md. 118	46	Ride-On
Germantown Transit Center	Montgomery	Germantown Road & Aircraft Dr	200	Ride-On
Glenmont Metro Station	Montgomery	Georgia Ave & Layhill Rd	368	Metrobus, Ride-On
Greencastle	Montgomery	Greencastle Road & Turnbridge Dr	214	Metrobus
Grosvenor-Strathmore Metro Station	Montgomery	Rockville Pike between Montrose Ave & Tuckerman Ln	5,467	Metrobus
Kensington Rail Station	Montgomery	Howard Ave. & Montgomery Ave.	22	Ride-On
Kingsview	Montgomery	Clopper Road & Kingsview Village Blvd	820	Ride-On
Lakeforest Mall	Montgomery	Lost Knife Road & Odenhal Ave	236	Metrobus, Ride-On
Metropolitan Grove Rail Station	Montgomery	Clopper Rd. (near I-270) adjacent to MVA	306	Ride-On
Milestone Shopping Center	Montgomery	Shakespeare Blvd. & MD 355	35	Ride-On
Montgomery Mall	Montgomery	Westlake Ter & Westlake Dr near I-270	314	Metrobus, Ride-On
Montrose Road (permit & fee 301-770-8108)	Montgomery	Rockville Pike & Montrose Road	245	Ride-On
Norbeck Road	Montgomery	Norbeck Road. 1/4 mi. east of Georgia Ave.	353	Metrobus, Ride-On
Rockville Metro Station	Montgomery	Hungerford Dr near Park Ave	982	Metrobus
Rockville Rail Station	Montgomery	307 Stonestreet Ave. off MD 355 @ Rockville Metro Station	15	Metrorail Red Line, Metrobus, Ride-On
Shady Grove Metro Station	Montgomery	MD-355 & Shady Grove Rd	1,098	Metrobus
Silver Spring Metro Station	Montgomery	Colesville Rd between East-West Hwy and Second Ave	3,643	Metrobus, Ride-On
Tech Road	Montgomery	Tech Road at Old Columbia Pike	416	Metrobus, Ride-On

Source: Commuter Connections

Park and Ride Lots in Maryland (cont.)

Name	Jurisdiction	Location	Parking Spaces	Connecting Services
Twinbrook Metro Station	Montgomery	Twinbrook Pkwy & Halpine Rd. east of Rockville Pike	977	Metrobus, Ride-On
Washington Grove Rail Station	Montgomery	Railroad St. & Oakmont Ave.	352	Ride-On
West Diamond Ave	Montgomery	W Diamond Ave & I-270	192	Ride-On
Wheaton Metro Station	Montgomery	Georgia Ave & Reedie Dr	530	Metrobus, Ride-On
White Flint Metro Station	Montgomery	Rockville Pike & Marinelli Rd	716	Metrobus, Ride-On
Accokeek	Prince George's	MD 210 at MD 373	412	Metrobus
Addison Road-Seat Pleasant Metro Station	Prince George's	100 Addison Rd & Central Ave	808	Metrobus, THE BUS
Bowie	Prince George's	MD 197 at Northview Dr	99	Metrobus
Bowie (Market Place Mall)	Prince George's	MD 450 & Market Place Mall	19	Metrobus
Bowie State Rail Station	Prince George's	Laurel-Bowie Rd. (MD Rt. 197) @ BSU	652	Metrobus
Branch Avenue Metro Station	Prince George's	Auth Way & Old Soper Rd at Auth Rd	1,980	Metrobus, THE BUS
Capital Plaza	Prince George's	MD 450 at 62nd Ave.	265	Metrobus
Capitol Heights Metro Station	Prince George's	Southern Ave & E. Capitol St	1,268	Metrobus
Cheverly Metro Station	Prince George's	Columbia Park Rd south of Rt 50	1,866	Metrobus
Clinton	Prince George's	MD 5 at Woodyard Road	100	Metrobus, THE BUS
College Park - U of MD Metro Station	Prince George's	Calvert Rd & 50th Ave	1,068	Metrobus, Connect-A-Ride, THE BUS, UM Student Shuttle
College Park Rail Station	Prince George's	Calvert Rd. adjacent to the College Park Metro Station	15	Metrorail Green Line, Metrobus
Eastover Shopping Center	Prince George's	MD 210 at Audrey Lane	424	Metrobus
Equestrian Center	Prince George's	MD 4 & Water St.	576	MTA Commuter Bus, THE BUS
Fort Washington	Prince George's	East Swan Creek Road. & MD 210	649	Metrobus

Source: Commuter Connections

Park and Ride Lots in Maryland (cont.)

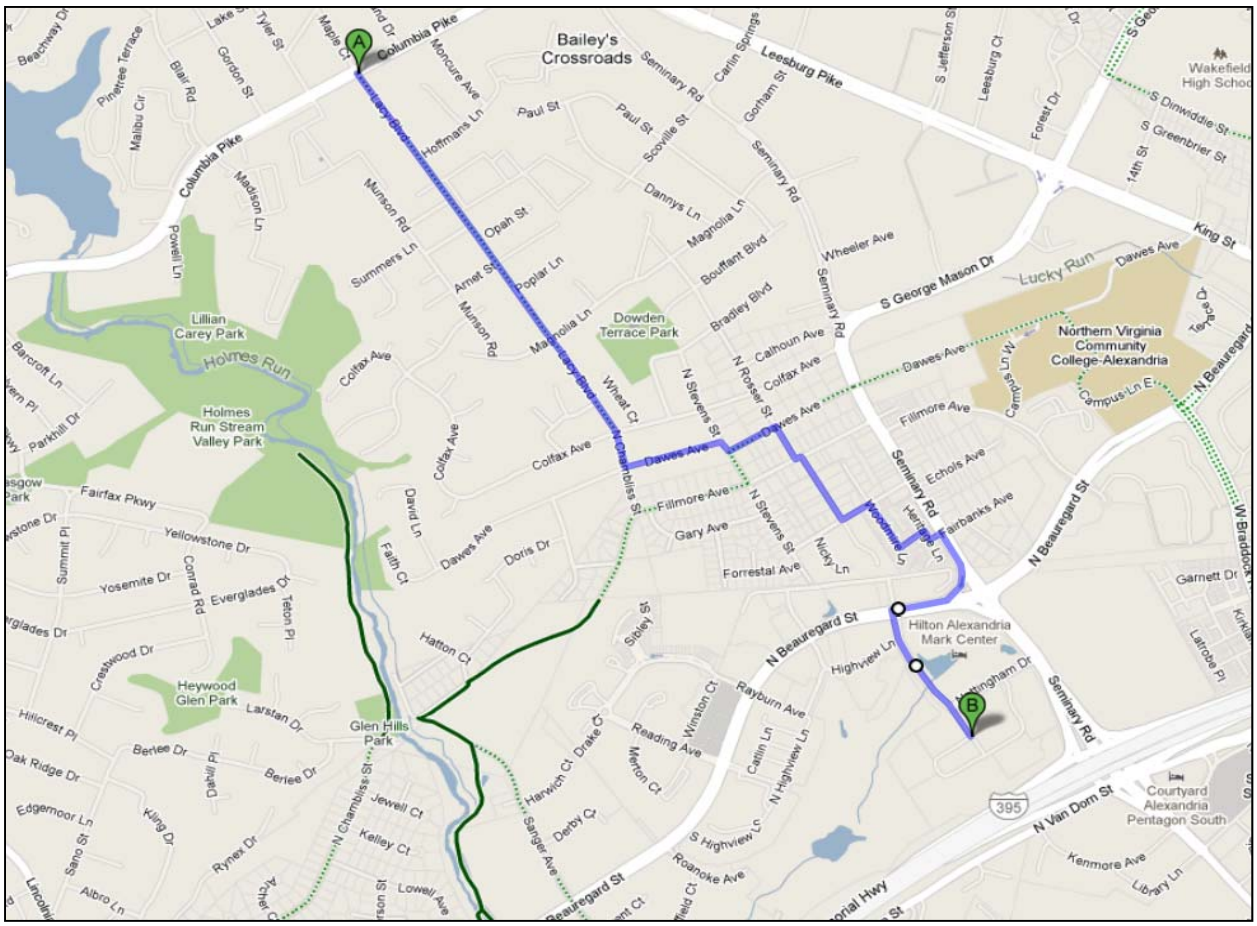
Name	Jurisdiction	Location	Parking Spaces	Connecting Services
Greenbelt Armory	Prince George's	MD 193 at B-W Pkwy.	62	Metrobus
Greenbelt Metro Station	Prince George's	Cherrywood Ln off of exit 24 of I-495	422	Metrobus, Connect-A-Ride, THE BUS
Greenbelt Rail Station	Prince George's	Greenbelt Metro Drive @ Greenbelt Metro Station Near Cherrywood Ln.	652	Metrorail, Metrobus, THE BUS, Connect-A-Ride
Landover Metro Station	Prince George's	Pennsy Dr north of Landover Rd	1,980	Metrobus, THE BUS
Laurel	Prince George's	Sandy Spring Road. at Van Dusen Rd.	684	Metrobus
Laurel South	Prince George's	MD 197 & Briarcroft Lane	70	Metrobus
Montpelier Recreation Park	Prince George's	MD 197 at Montpelier Dr.	50	Metrobus
Naylor Road Metro Station	Prince George's	Naylor Rd & Suitland Pkwy & Branch Ave	5,100	Metrobus
New Carrollton Metro Station	Prince George's	West of Garden City Dr north of John Hanson Hwy	3,364	Metrobus
New Carrollton Rail Station	Prince George's	4300 Garden City Dr. @ New Carrollton Metro Station	264	921, Amtrak, Metrorail Orange Line, Metrobus, THE BUS
Oxon Hill	Prince George's	Oxon Hill Road. near MD 210	100	Metrobus
Penn-Mar Shopping Center	Prince George's	Donnell Dr. at Marlboro Pike	300	Metrobus, THE BUS
Prince George's Plaza Metro Station	Prince George's	East-West Hwy west of Belcrest Rd	453	Metrobus
Riverdale Rail Station	Prince George's	Queensbury Rd. & Cleveland Ave.	299	Metrobus
Seabrook Rail Station	Prince George's	Lanham Severn Rd. (MD Rt. 564) @ Seabrook Rd.	375	Metrobus
Southern Avenue Metro Station	Prince George's	Southern Ave & Valley Terr, SE	1,781	Metrobus
Suitland Metro Station	Prince George's	North of Suitland Pkwy & west of Silver Hill Rd	3,072	Metrobus, THE BUS
West Hyattsville Metro Station	Prince George's	Ager Rd north of Queens Chapel Rd	1,890	Metrobus, THE BUS
Stevensville	Queen Anne's	US 50/301 at MD 8	50	MTA Commuter Bus
Charlotte Hall	St. Mary's	MD 5 at Charlotte Hall Shopping Center	80	MTA Commuter Bus
		Total	**61,273**	

Source: Commuter Connections

Appendix E

Bicycle Safe Routes

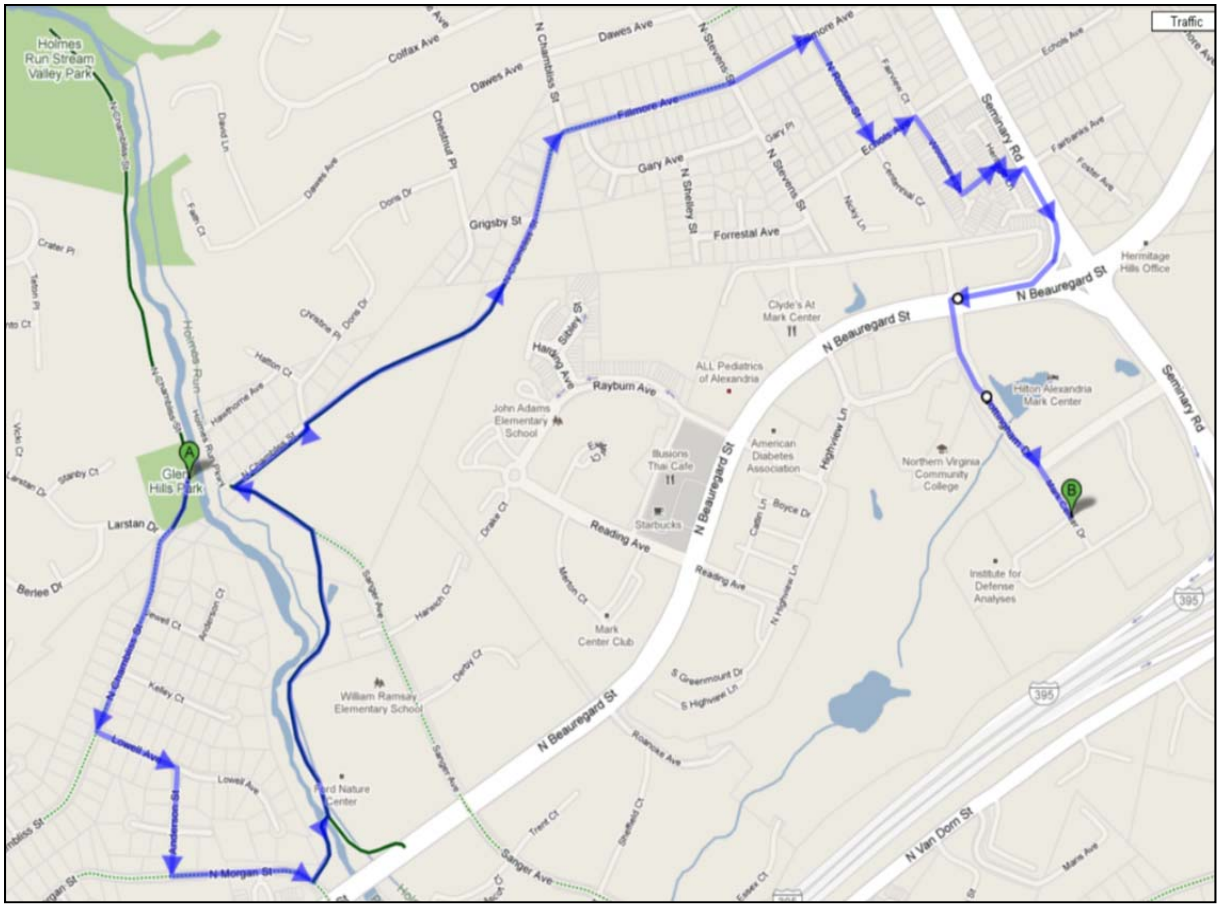
Figure E-1: Southbound Safe Route from Columbia Pike/Bailey's Crossroads via Lacy Boulevard



Source: Google Maps, ©2010

Figure E-1 illustrates a southbound safe route from Columbia Pike/Bailey's Crossroads via Lacy Boulevard. The route is about two miles long and about a 12 minute trip to BRAC 133. Lacy Boulevard has bicycle-designated sidewalks and primarily consists of residential traffic. The route mostly covers residential areas before reaching Seminary Road. Full sidewalks are available along Seminary Road and for right merging onto North Beauregard Street. An improved signalized crosswalk is in place for left turns from North Beauregard Street onto Mark Center Drive.

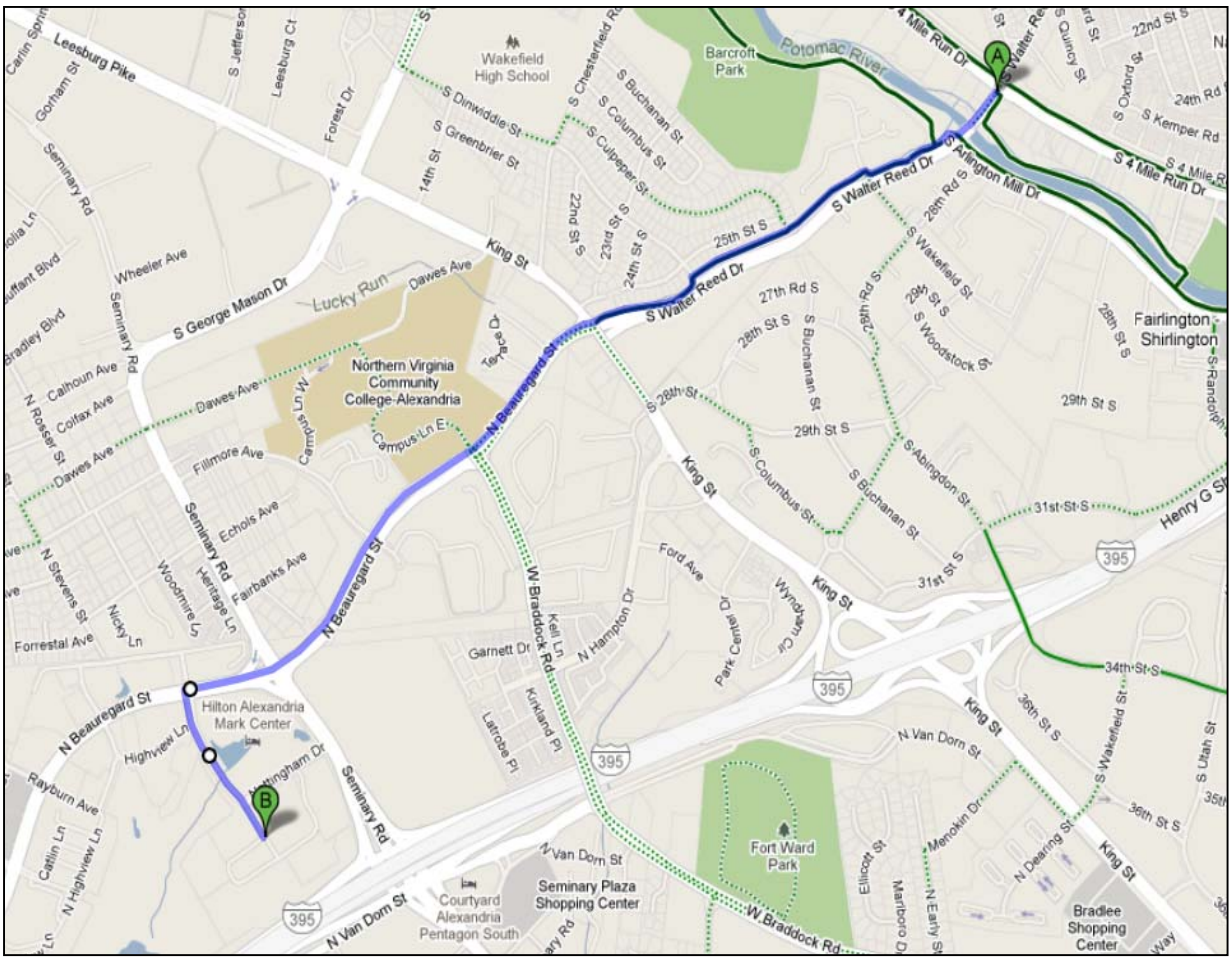
Figure E-2: Eastbound Safe Route from Glen Hills Park via Holmes Run Stream Valley Trail



Source: Google Maps, ©2010

Figure E-2 illustrates an eastbound safe route from Glen Hills Park via Holmes Run Stream Valley Trail. The route is about 2.8 miles long and about a 20 minute trip to BRAC 133. N. Chambliss Street, N. Morgan Street, Sanger Avenue, and Fillmore Avenue have designated sidewalks for bicycle traffic and Sanger Avenue eventually becomes a bicycle trail. The route covers primarily residential areas before reaching Seminary Road. Full sidewalks are available along Seminary Road and for right merging onto North Beauregard Street. An improved signalized crosswalk is in place for left turns from North Beauregard Street onto Mark Center Drive.

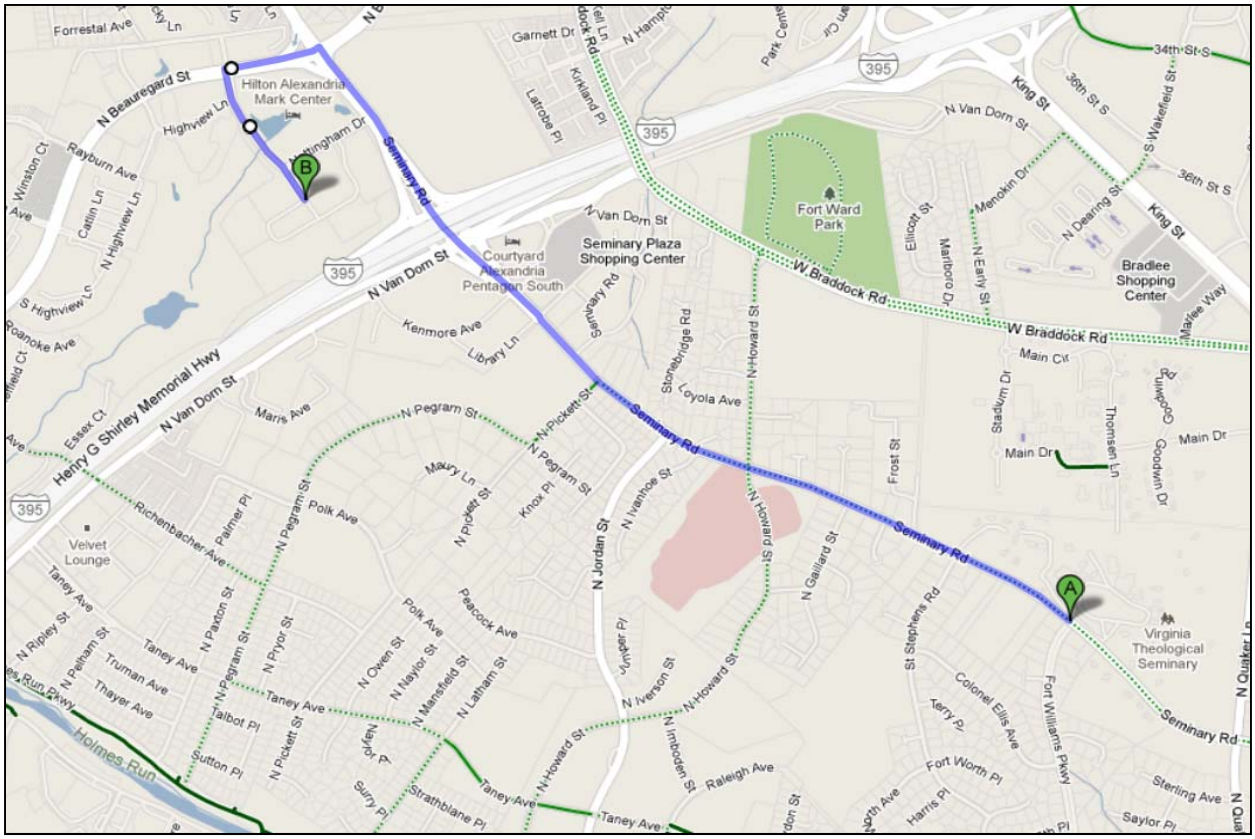
Figure E-3: Westbound Route from Arlington County via Four Mile Run



Source: Google Maps, ©2010

Figure E-3 illustrates a westbound route from Arlington County via Four Mile Run. The route is about 1.9 miles long and about a 15 minute trip to BRAC 133. Connecting from Four Mile Run, there is a designated bike path in both directions along the westbound side of S. Walter Reed Drive. The bike path becomes a sidewalk just before the intersection of King Street and continues as a sidewalk through the intersection and onto North Beauregard Street. North Beauregard Street has designated sidewalks and crosswalk signals throughout the remainder of the route. An improved signalized crosswalk is in place for left turns from North Beauregard Street onto Mark Center Drive.

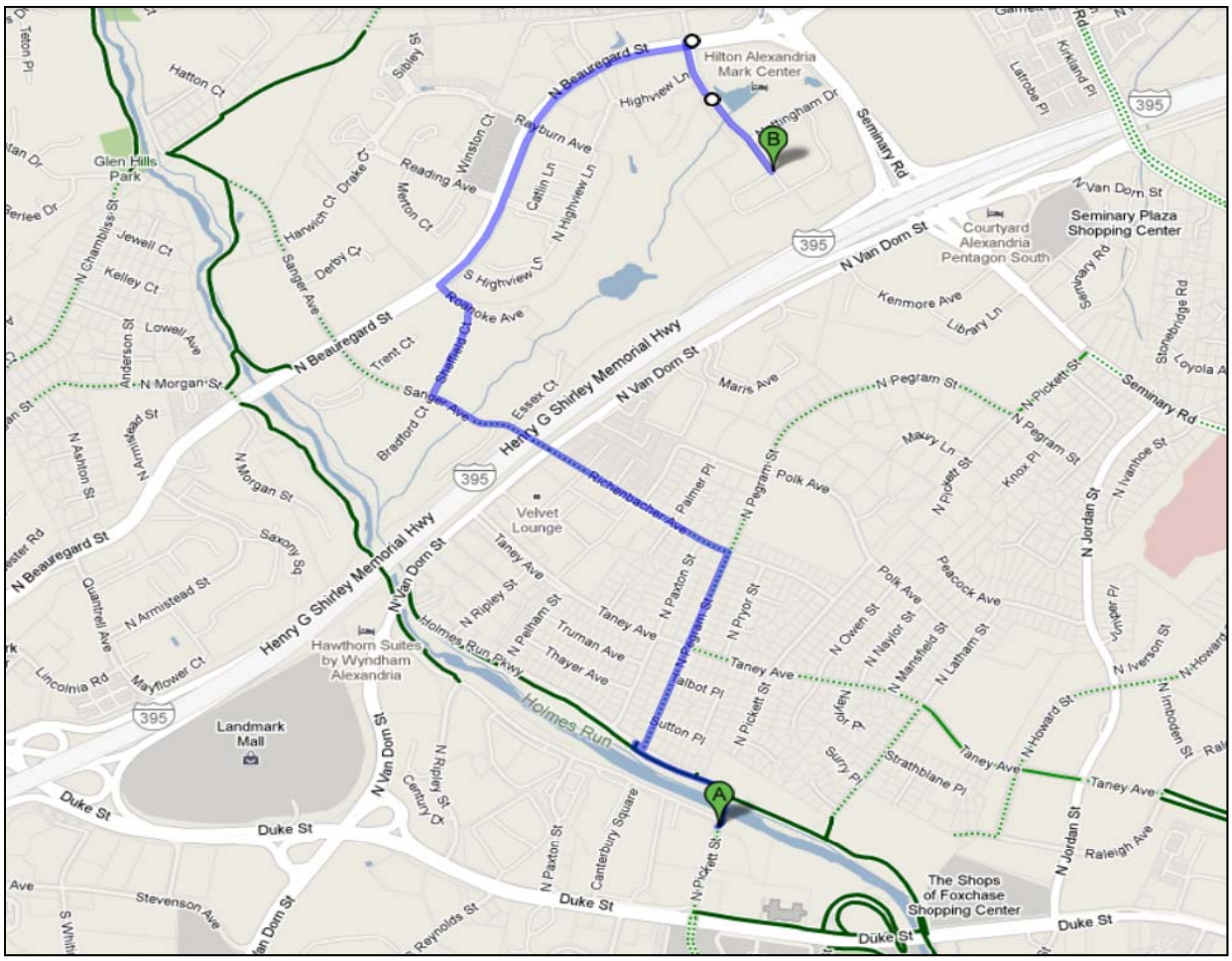
Figure E-4: Northbound Route from Seminary Hill via Seminary Road



Source: Google Maps, ©2010

Figure E-4 illustrates a northbound route from Seminary Hill via Seminary Road. The route is about two miles long and about a 10 minute trip to BRAC 133. There is a pedestrian/bicycle bridge on the right side of Seminary Road going northbound that crosses over I-395 and rejoins into a sidewalk on the other side. There is a signalized intersection at Seminary Road and North Beauregard Street that includes signalized crosswalks to make the left turn along the route.

Figure E-5: Northbound Route from Cameron Station via Holmes Run Stream Valley Trail



Source: Google Maps, ©2010

Figure E-5 illustrates an additional northbound route from Cameron Station via Holmes Run Stream Valley Trail. The route is about 2.2 miles long and about a 17 minute trip to BRAC 133. Starting on Holmes Run Stream Valley Trail out of Cameron Station, the route follows N. Pengram Street, Richenbacher Avenue, and Sheffield Court, all with sidewalks. North Beauregard Street has designated sidewalks and crosswalk signals throughout the rest of the route. An improved signalized crosswalk is in place for left turns from North Beauregard Street onto Mark Center Drive.