AMERICAN UNIVERSITY

Transportation Existing Conditions Assessment for 2011 Master Plan Update

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EXECUTIVE SUMMARY

The following report contains the 2009 American University transportation existing conditions assessment. It summarizes the existing conditions of University transportation facilities and services and details opportunities and concerns identified during a series of campus visits and meetings with campus officials. American University is located at the intersection of Massachusetts Avenue and Nebraska Avenue at Ward Circle in Northwest, Washington, D.C.

Key findings including the following:

- AU has a compact, walkable campus containing favorable walkways and a vibrant, pedestrian only center.
- Bicyclists are visible throughout the campus during pleasant weather and bicycle racks are often full.
- AU provides convenient and high quality shuttle service between campus and major off-campus destinations. The shuttles are an essential transportation service that reduce the number of campus generated vehicle trips and parking demand. These shuttles link the campus with a regional transit network.
- AU requires all students, faculty, staff, visitors and guests to park on-campus, provides ample parking spaces on-campus that exceeds demand, and strictly enforces parking restrictions on the residential streets surrounding AU.
- The capacity analyses results indicate that all study area intersections operate at overall acceptable levels of service during both the morning and afternoon peak hours.

Future planning efforts for the University should focus on improvements to the shuttle, pedestrian and bicycle systems and should consider not adding any parking spaces.

A summary of findings per mode is as follows:

Pedestrian: AU is a compact campus that has good pedestrian walkways throughout and a vibrant, pedestrian only center. There are locations where pedestrian walkways and gathering space could be enhanced but there are no major areas of concern

Bicycle: Bicyclists are visible throughout the campus during pleasant weather and bicycle racks are often full, regardless of weather. Access routes to campus are less than ideal due to changes in topography and roadway conditions. DDOT's 2005 Bicycle Master Plan recommends creating multi-use bike routes along Massachusetts and Nebraska Avenues, which would significantly improve bicycling conditions and encourage more bicycle commuting. Long-term bicycle storage may desirable, for students that bring their bikes to campus to use and do so infrequently but often enough to want convenient parking options. It is worth investigating whether bicycle-sharing can be brought to campus, possibly as part of an expansion of the DC SmartBike program to northwest DC.

AU Shuttle Service: AU provides free shuttle service between the main campus and the Tenley campus, Washington College of Law and Tenleytown/AU Metro station. AU shuttle service is an essential transportation service provided by the campus. In 2008, AU shuttle provide approximately 1.7 million passenger trips. The on-campus routes and stops are well located because they separate vehicle routes and pedestrian routes, which limit conflicts. A review of shuttle conditions found no major areas of concern but improvements to shuttle routes and stops are possible.

Transit: AU is directly served by Metrobus and linked with Metrorail Stations located on the Red Line by AU shuttles and Metrobus. There are no plans in place to change transit services in the near term. To encourage transit use by employees, AU operates a SmartBenefits program for employees. The SmartBenefits program provides employees with pre-tax dollars to pay for monthly transit expenses, up to $120 per month. The current AU shuttle system does a good job of connecting the main campus and College of Law with Metrorail. Improvements Metrobus could be made include adding amenities such as shelter, seating, and route information.

Parking: AU requires all students, faculty, staff, visitors and guests to park on-campus. The university has multiple surface parking lots and parking garages located throughout the campus. Most parking is located on the periphery of the campus core, which reduces on-campus vehicle and pedestrian conflicts because these pathways rarely cross. AU has implemented parking management programs to minimize on-street parking in the adjacent neighborhood. The management program has a strict enforcement component that has effectively reduced the number of AU vehicles parking on-street. A review of parking conditions found no major areas of concern but there may be opportunities to reduce the overall number of parking spaces provide on-campus.

Traffic: In the area surrounding the main campus the percentage of traffic attributable to AU is equal to 4.38% and 12.64% of the morning and afternoon peak hour, respectively. Capacity analyses of intersection surrounding campus indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours, although certain movements at intersections experience unacceptable levels of congestion. Commuting traffic heavily influences traffic patterns on street adjacent to the University.

Sustainability: AU recently created a sustainability coordinator and is a signatory to *The American College & University Presidents Climate Commitment*. Current AU transportation programs, such as the AU shuttle program, already accomplish many transportation suitability goals. In addition, the location of AU, and its compact design indirectly lead to many sustainable transportation qualities. There are several opportunities to enhance sustainability, including incentives that encourage walking, bicycling and transit, a Transportation Demand Management program, and initiatives that reduce environmental impacts associated with transportation, such as storm water management and alternative fuels.

INTRODUCTION

This report contains the 2009 American University transportation existing conditions assessment. It summarizes the existing conditions of University transportation facilities and services and details opportunities and concerns identified during a series of campus visits and meetings with campus officials. American University is located at the intersection of Massachusetts Avenue and Nebraska Avenue at Ward Circle in Northwest, Washington, D.C. The University has approximately 10,800 students and 1,700 faculty/staff.

Report Organization and Summary

This report is organized into four sections: 1) an overview of the existing conditions of University transportation facilities and services, 2) a summary on transportation sustainability activities on campus, 3) a summary of trends and areas of opportunity and 4) and appendix that contains summary of previous transportation studies conducted at the University and details the street network. The following provides a brief summary of each section as they appear in this report:

Existing Conditions - Main Campus

This section provides a summary of existing campus and neighborhood transportation facilities and services. It also identifies transportation deficiencies and opportunities to improve transportation conditions. This section includes a series of figures mapping the transportation facilities and services on campus and in the neighborhood for the main campus.

Existing Conditions - Tenley Campus

This section provides a similar overview of existing conditions, focusing on the Tenley Campus.

Sustainability

This section describes current campus transportation sustainability efforts, and offers suggestions on ways to enhance and add to these efforts.

Trends and of Areas of Opportunity

This section provides a summary of the status of each mode on campus and the trends observed in campus transportation since the prior Master Plan. Also included is a list of areas of concern and opportunity for future study and consideration.

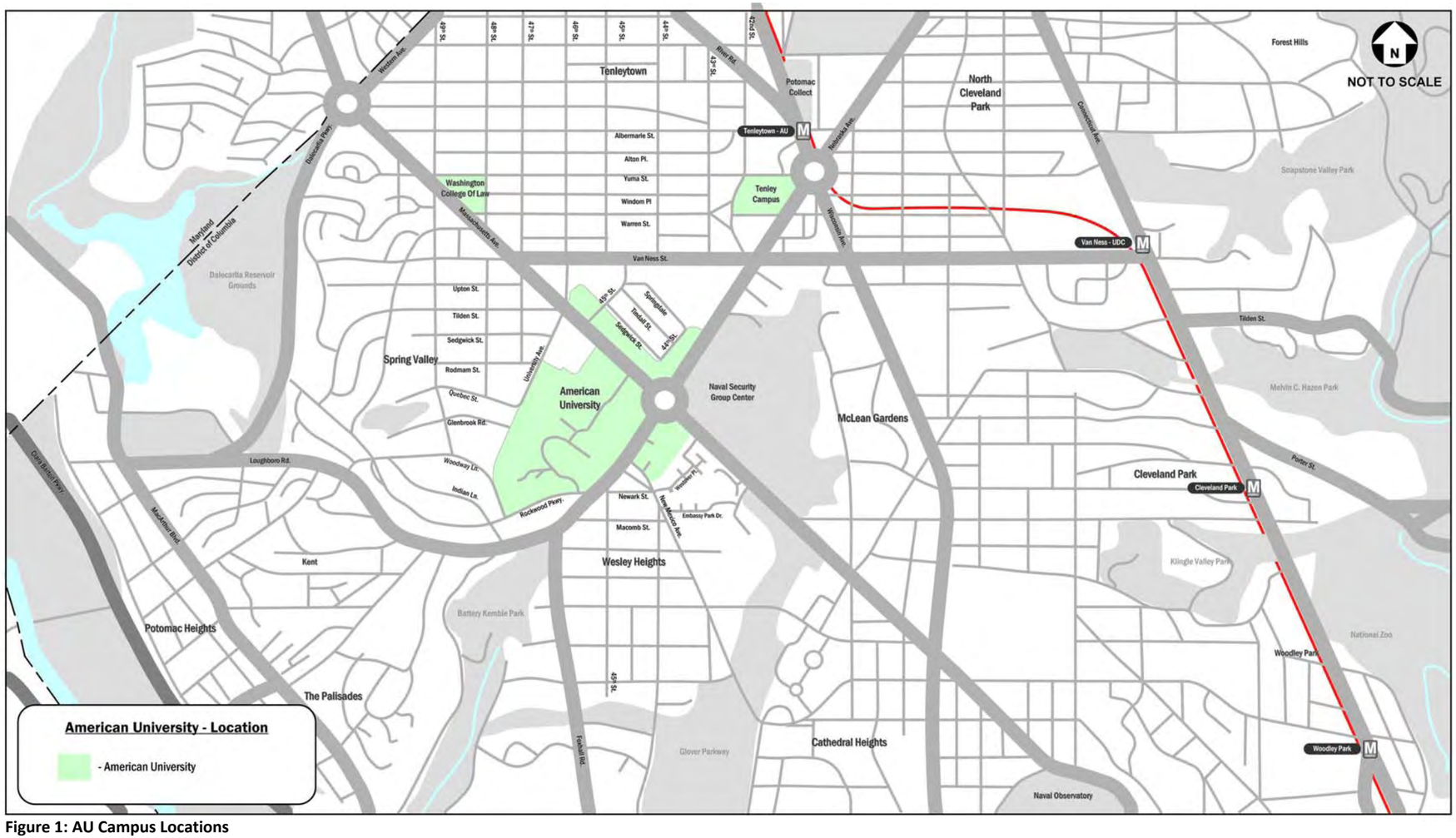

Figure 1: AU Campus Locations

Appendix A: AU Transportation Document Review

This section contains a summary of previous transportation studies compiled since 2000 by the University and in the neighborhood. The purpose of this document review was to ensure continuity between this report and previous planning efforts. Summaries of their findings and recommendations are provided.

Appendix B: Detailed Traffic Capacity Analysis

This section details the traffic capacity analyses undertaken during the Existing Conditions Assessment and details analysis of traffic capacity based on traffic data collected during rush hour. Also included in this section is a description of area roadways and a summary of observations made during commuter rush hours.

Report Scope

Gorove/Slade took the following actions as part of this study:

- Established a scope of work during meetings with the University;
- Reviewed University and neighborhood transportation studies compiled since 2000;
- Met with the University to identify existing conditions, concerns, and opportunities;
- Conducted several campus visits to establish existing conditions, concerns, and opportunities;
- Conducted field reconnaissance of existing roadway and intersection geometrics, traffic controls, speed limits and operations;
- Performed morning and afternoon peak period turning movement counts at the study intersections;
- Determined the existing levels of service at the study intersections;
- Compiled parking usage surveys to determine the parking demand;
- Assembled list of concerns and opportunities; and
- Compiled report

EXISTING CONDITIONS - MAIN CAMPUS

This section details the existing condition of transportation facilities and services at American University main campus and the surrounding neighborhood.

The first part of this section contains text detailing existing conditions and issues for each facilities and service. The second section contains a series of figures that map existing conditions and summarize conditions and issues. The University has approximately 10,800 students and 1,700 faculty/staff. Traditionally, traffic demand is highest during fall semester. Figure 1 identifies the location of the AU main campus, as well as the Tenley campus and the College of Law.

Pedestrian

AU is a compact campus that has good pedestrian walkways throughout and a vibrant, pedestrian only center. The size of the campus, pedestrian amenities, and location of transit stops and parking results in high pedestrian traffic throughout campus.

Campus housing, transit stops, and parking lots located on the periphery are the primary sources of pedestrian traffic. The primary destination is the campus quad, the Eric Frieheim Quadrangle. The quad is buffered from busy arterials immediately adjacent to the campus and internal campus roads by buildings and landscaping. It attracts and concentrates academic and social activities and has numerous formal and informal gathering locations outside. On days with nice weather, students and staff can be seen through out the quad socializing or small classes in session on the steps of an academic building. Photo 1 captures conditions in the quad on such a day.

Between the core and campus housing, transit stops, and parking lots there are good walkways for pedestrians. Figure 2 identifies primary and secondary pedestrian pathways. This Figure highlights that AU roadways, parking, and transit routes are located on the periphery of the campus, which limits the number of locations where pedestrian pathways and vehicular traffic cross. This results in excellent pedestrian conditions in most locations. There are pathways between off-campus housing and parking facilities that result in heavy pedestrian volumes at crossings on Massachusetts and Nebraska Avenue. Most of these crossings have good pedestrian amenities to limit potential conflicts with vehicular traffic on these major arterials.

There are locations where pedestrian walkways and gathering space could be enhanced but there are no major areas of concern. Improvements to pedestrian treatments could be done in tandem with long-term maintenance or construction projects. Improvements include expanding walkway widths in the locations with heavy traffic, establishing uniform walking design and landscaping, and enhancing street crossing facilities and amenities at major crossings. Shuttle stops, the open space northwest of McKinley, which is located at the northwest corner of the main quad, and pedestrian crossings on Massachusetts and Nebraska Avenues are three locations where review during the master plan may identify if upgrades are desired. These locations are identified on Figure 2.

Photo 1: Eric Frieheim Quadrangle

Figure 2: Pedestrian Pathways & Conditions

Bicycle

Bicyclists are visible throughout the campus during pleasant weather and bicycle racks are often full, regardless of weather. AU requires that bicycles must be registered with Public Safety. Bicycling is common at AU even though it has a compact campus and access routes (external to campus) with fair to poor bicycling conditions. Access routes to campus are less than ideal due to changes in topography and roadway conditions. The adjacent streets, in particular Massachusetts Avenue and Nebraska Avenue, have narrow lane widths, high traffic volumes, and high traffic speeds. The District Department of Transportation (DDOT) indicates that bicyclist use the sidewalk in the vicinity of AU due to roadway conditions, one of a few locations in the District where this is recommended (DDOT, January 2008).

The 2005 DDOT Bicycle Master Plan recommends creating multi-use trails along Nebraska and Massachusetts Avenues. This would greatly improve conditions for bicyclist and make AU much more accessible by bicycle.

Most campus destinations are within walking distance, a quarter mile or less, than housing, transit stops, or parking lots, which results in most on-campus trips done by walking rather than bicycle. Due to this most bicycling is likely done between campus and off-campus housing, retail, or recreation. Figure 3 identifies bicycle routes and parking locations.

Bicycle parking is located throughout campus at most buildings. Photo 2 captures bicycle parking conditions throughout the campus. AU parking regulations stipulate that, "when parked, bicycles must be in bicycle racks or other spaces or areas designated for their use. Bicycles must be parked clear of sidewalks, ramps, building entrances and handrails/fences." In some locations, bicycles are locked to railings or polls when the racks are full or not conveniently located.

The newly created DC bike-sharing system, DC Smart Bike, does not have any locations near AU nor do they have any plans to expand near AU in the near future. Even if bike sharing stations were not implemented in neighborhoods external to AU, establishing a station on each of the three AU campuses would provide another option for inter-campus travel.

Overall, the campus has good bicycle amenities but some improvements are possible, particularly with parking. Long-term bicycle storage may be a solution, for students that bring their bikes to campus to use and do so infrequently but often enough to want convenient parking options. Another area for improvement is sidewalks that have heavy pedestrian traffic and are also designated for bicycling. In these locations, expanding the width of the pedestrian and bicycle right-of-ways may be warranted.

Figure 3: Bicycle Facilities Near AU Campuses

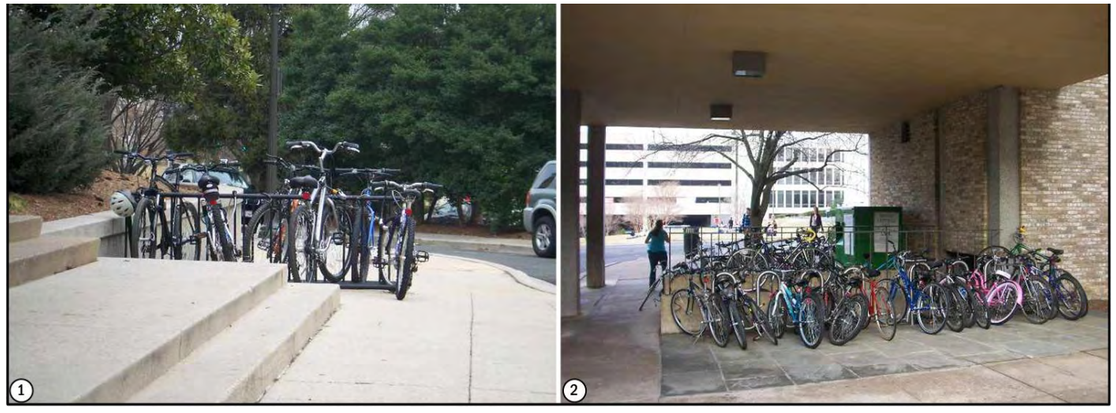

Photo 2: Bicycle Parking Conditions on Campus

AU Shuttle Service

AU provides free shuttle service between the main campus and the Tenley campus, Washington College of Law and Tenleytown/AU Metro station. AU shuttle service is essential transportation service provided by the campus. Figure 4 identifies shuttle routes and stop locations.

AU provides shuttle service to reduce campus vehicle trips and parking demand. Since 1995, ridership grown has grown significantly and continuously, which speaks to the quality and convenience of the service provided. In 2008, AU shuttle provided approximately 1.7 million passenger trips. Figure 5 illustrates annual ridership trends since 1995 while Figure 6 illustrates month by month ridership trends.

On campus, shuttles enter and exit via Fletcher and Glover gates; stops are located near these gates. Another heavily used stop is located on Nebraska Avenue adjacent to the Ward Circle Building.

These stops are major sources of pedestrian traffic and high volumes of passengers waiting, boarding and alighting. The on-campus routes and stops are well located because they separate vehicle routes and pedestrian routes, which limit conflicts. Photo 3 captures conditions at these shuttle stops.

A review of shuttle conditions found no major areas of concern but improvements to shuttle routes and stops are possible. Stop improvements include adding amenities such as shelter, seating, and route information. Intelligent Transportation Systems (ITS) could be implemented to enhance shuttle service. For example, shuttle stops could provide information on the time remaining until the next bus arrives. This information could also be made available on the internet, which would help passengers plan there trip before departing for the shuttle stop. The number and routing of AU shuttle routes are another area of operation that may warrant further study to determine the most efficient routing and stop location given ridership trends and available resources. There is a substantial amount of overlap between the three routes, combining them in some fashion may help reduce operational costs and/or increase service frequency. Another possible improvement to the AU shuttle system would be the addition of bicycle racks to shuttle vehicles, to allow for better integration of the two modes.

Photo 3: AU Shuttle Stops On-Campus

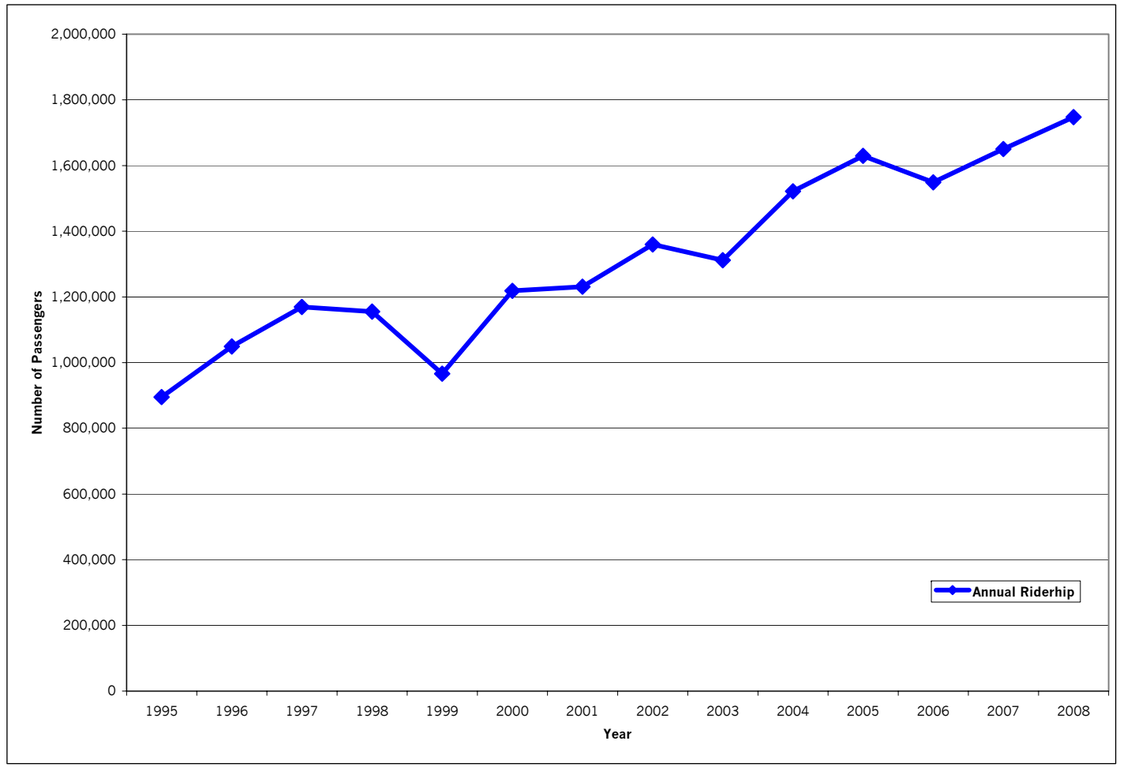

Figure 5: AU Shuttle Annual Ridership

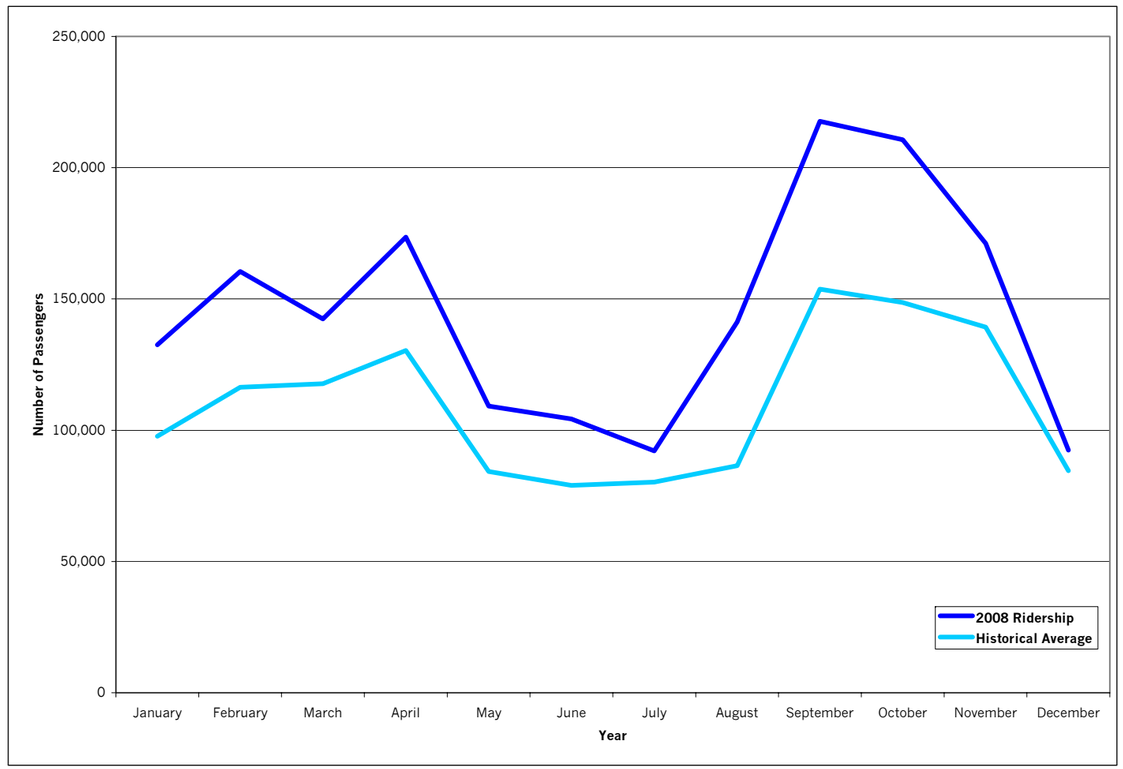

Figure 6: AU Shuttle Ridership by Month

Transit

AU is directly served by Metrobus and linked with Metrorail Stations located on the Red Line by AU Shuttles and Metrobus. Figure 7 identifies Metrobus routes and stops and the nearest Metrorail station location that serve AU. Transit connects the campus and destinations throughout the District and Maryland.

Ridership data from WMATA indicates that approximately 400 riders board and alight at the stops immediately adjacent to AU. The data was collected in 2002 and 2004 and reflects conditions on a typical weekday. The data indicates that Metrobus ridership is lower than typical, daily AU shuttle ridership, but that it provides access for a number of AU faculty, staff, students and visitors.

To encourage transit use by employees, AU operates a SmartBenefits program for employees. The SmartBenefits program provides employees with pre-tax dollars to pay for monthly transit expenses, up to $120 per month. There are no plans in place to change transit services in the near term.

Figure 7: WMATA Bus Service near AU Campuses

Parking

AU requires all students, faculty, staff, visitors and guests to park on-campus. To accommodate demand for parking, the university provides ample parking spaces that exceeds demand and strictly enforces parking restrictions on the residential streets surrounding AU.

The university has multiple parking lots and garages located throughout the campus. AU has a total of 2,291 parking spaces. Most parking is located on the periphery of the campus core, which reduces on-campus vehicle and pedestrian conflicts because these pathways rarely cross. Figure 8 identifies parking lot locations and a future lot under construction beneath the SIS building. The SIS parking lot with add an additional 350 parking spaces to AU's inventory.

Parking at the university is by permit only every weekday between the hours of 8:00 am and 5:00 pm. AU has implemented parking management programs to minimize on-street parking in the adjacent neighborhood.

Table 1 details the parking permits issued since the 2005-2006 academic year.

Table 1: Annual Permit Sales

Academic Year	Average Monthly Faculty Enrollment	Annual Student Permit Sales
2005 - 2006	1,146	708
2006 - 2007	1,198	913
2007 - 2008	1,112	866
2008 - 2009*	1,169	488

Hourly permits are valid in the Nebraska lot and Katzen Garage and can be purchased from the Pay-As-You-Go machines in the lot or from the Transportation Services office.

AU has implemented parking management programs to minimize on-street parking in the adjacent neighborhood.

The management program has a strict enforcement component that has effectively reduced the number of AU vehicles parking on-street. The parking policy states that: "any member of the University community who parks in the surrounding neighborhood in an effort to circumvent the parking policy will receive a $75.00 fine." Citation data and conversations with AU transportation services staff indicate that on-street parking has decreased since 2005 due to strict enforcement.

AU has unused capacity that could accommodate future growth in demand, or that could be reduced to minimize costs and impacts associated with providing parking. The university conducts regular parking lot surveys to establish usage. Table 2 lists data compiled during the 2008 Fall Semester. Gorove/Slade Associates, Inc. conducted field surveys and found similar trends were during 2009. In addition to parking provided for faculty/staff, students and visitors, there is ADA parking, service vehicle parking and other parking spaces located throughout campus. Table 2 lists the number of these spaces and Figure 8 identifies their location and designated use where possible.

Parking supply and usage indicates both supply and demand have decreased since the 2000 master plan. A reason for this may be the significant increase in annual AU shuttle ridership seen since 2000, which may indicate a reduction in driving by faculty, staff, students, and visitors. Another reason may be the availability of car-sharing on campus, which reduces the need for individual car ownership.

Table 2: Parking Inventory & Occupancy (Fall 2008)

#	Lot Name	Type	Total Spaces	Peak Occupied	% Occupied	Available	% Available
1	Kreeger	Faculty and Staff	17	15	88%	2	12%
2	Clark	Faculty and Staff	48	48	100%	0	0%
3	Nebraska	All Permits	903	723	80%	180	20%
4	Nebraska Hall	Students	27	20	74%	7	26%
5	SPG	Faculty and Staff	469	232	49%	237	51%
6	Tenley	Faculty and Staff	65	43	66%	22	34%
7	Katzen	All Permits	470	187	40%	283	60%
8	McDowell	Students	40	29	71%	12	29%
9	Asbury	Faculty and Staff	54	51	94%	3	6%
10	Hamilton	Faculty and Staff	57	57	100%	0	0%
11	Centennial	Students	141	63	45%	78	55%
	Various	Service, ADA, & Other	189	150	79%	39	21%
	Total		**2,480**	**1,618**	**65%**	**863**	**35%**
	Total	On-campus Students	208	112	42%		
	Total	Commuter Students & Visitors	1,373	910	50%		
	Total	Faculty & Staff	710	446	66%		
	Total	Service, ADA, & Other	189	150	79%		

Note: Data collected during peak parking times for commuter-based parking (commuter students and faculty & staff, which is 10am or 3pm on a weekday).

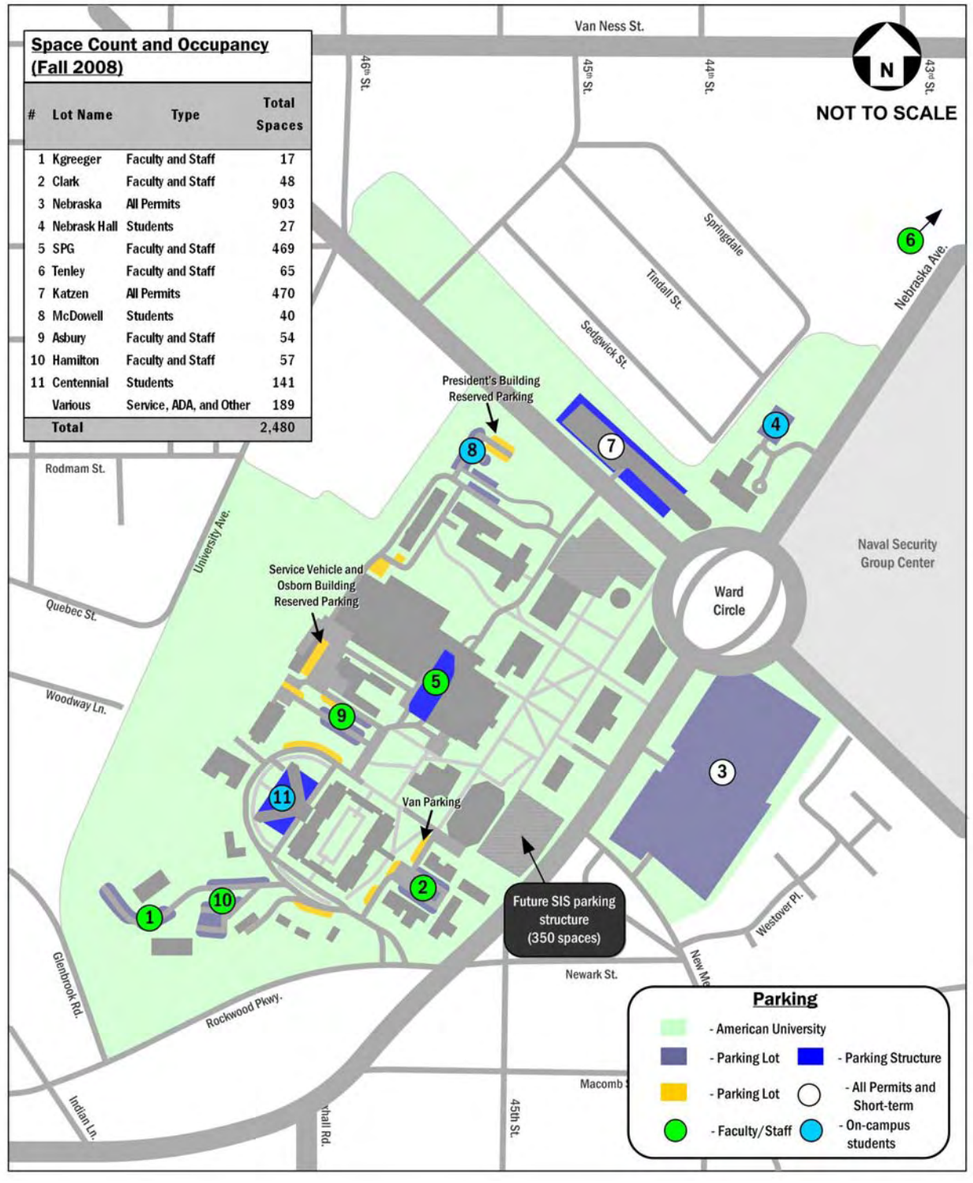

Figure 8: Campus Parking Inventory

Traffic Overview

Site Access and Circulation

Access for the AU main campus is provided primarily by Massachusetts Avenue and Nebraska Avenue, as well as 46th Street, Tilden Street, University Avenue, New Mexico Avenue, 45th Street, Rockwood Parkway, Newark Street, and Glenbrook Road. Site access for the main campus is provided by Glover Gate on the north side of the campus on Massachusetts Avenue, Fletcher Gate on the south side of campus on Rockwood Parkway, and Woods gate on the east side of campus on Nebraska Avenue. Access to the Nebraska Avenue Parking Lot is provided on Nebraska Avenue and New Mexico Avenue.

Figure 9 identifies the traffic controls on roadways adjacent to the University including the access gates.

Passenger drop-off and pick-up activity occurs throughout the campus. Figure 10 identifies the most commonly used locations for passenger drop-off and pick-up. There are no designated drop-off or pick-up locations on campus or areas where this activity is easily accommodated.

Shipping and receiving facilities are located throughout the campus. Figure 10 identifies the location of shipping and receiving facilities. These facilities and the vehicle ingress and egress routes do not cross or conflict primary pedestrian routes.

Figure 9: Traffic Controls

Roadway Capacity Analysis

Gorove/Slade conducted field reconnaissance to obtain the existing lane usage and traffic controls at the intersections within the main campus study area. Turning movement counts were conducted at the study intersections in order to determine the peak hour traffic volumes. The traffic volumes obtained were used to estimate the percent of traffic within the regional roadway network that is attributable to the AU main campus, as shown in Figure 11. Traffic volumes entering and exiting the regional area bounded by the study intersections were summed in order to determine the total regional traffic. In order to calculate the AU-generated traffic, volumes entering and exiting the Glover Gate, Fletcher Gate, and Nebraska Avenue Parking Lot were summed. This percentage of traffic attributable to AU is equal to 4.38% and 12.64% of the morning and afternoon peak hour, respectively.

Morning and afternoon peak hour traffic observations were conducted at the study area intersections in order to determine traffic conditions near the AU main campus. Traffic observations are shown on Figure 12 and Figure 14 for the morning and afternoon peak hours, respectively.

Existing conditions capacity analyses was performed to determine the existing Levels of Service (LOS) for the AM and PM peak hours for the study intersections. The existing LOS capacity analyses were based on: (1) the existing lane use and traffic controls; (2) the peak hour turning movement volumes; and (3) the *Highway Capacity Manual 2000* (HCM) methodologies (using Synchro 7 software).

Figure 10: Loading & Pick-up/Drop-off Activity

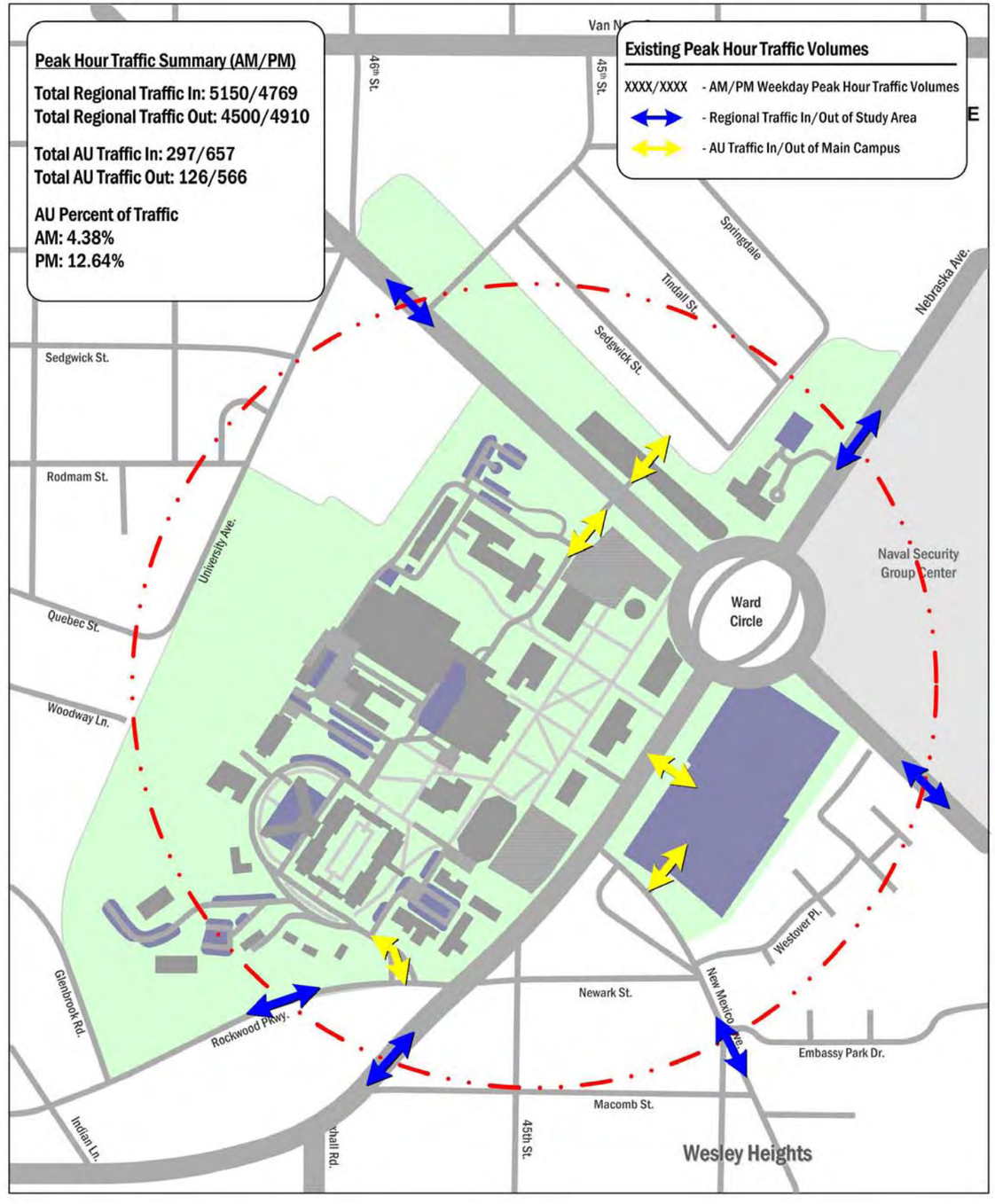

Figure 11: AU & Regional Roadway Traffic

Figure 12: AM Peak Hour Observations

Figure 13: AM Peak Hour Levels of Service

Figure 14: PM Peak Hour Observations

Figure 15: PM Peak Hour Levels of Service

The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours. Figure 13 and Figure 15 present the existing capacity analysis results, as well as traffic observations recorded in the field. Detailed results and observations can be found in Appendix B "CAPACTIY ANALYSIS".

Car-Sharing

AU has car-sharing on-campus provided by Zipcar. Zipcar is a private company that allows registered users to reserve cars for a minimum of 30 minutes or for longer periods up to several days. Car-sharing provides individual access to automobiles for trips made easier by car. Many universities have car-sharing programs because they reduce the number of students that bring cars to campus, which reduces the number of parking spaces that are needed.

Intersection Safety

A safety analysis was performed to determine if there was an abnormally high accident rate at any study area intersection. The District Department of Transportation (DDOT) provided the last three years of intersection accident data; from 2005 to 2007 (2008 data had not been compiled yet). This data set included all intersections adjacent to American University except for intersections at University gates and parking lot entrances.

This data was reviewed and analyzed to determine the accident rate at each location. For intersections, the accident rate is measured in accidents per million-entering vehicles (MEV). The accident rates per intersection are shown in Table 3.

Table 3: Intersection Accident Rates

Location	Total Accidents (2005 to 2007)	Accident Rate (per million-entering vehicles*)
Massachusetts Ave & Tilden/46th St/University Ave	0	0.00
Massachusetts Ave & Nebraska Ave (Ward Circle)	0	0.00
Nebraska Ave & New Mexico Ave	12	0.37
Nebraska Ave & 45th St	4	0.17
Nebraska Ave & Newark St	2	0.07
Nebraska Ave & Rockwood Parkway	5	0.18
Rockwood Parkway & Glenbrook Road	0	0.00

** - Volumes estimated based on turning movement count data*

According to the Institute of Transportation Engineer's *Transportation Impact Analysis for Site Development*, an accident rate of 1.0 or higher is an indication that further study is required. Thus, none of the study area intersections has a high accident rate that requires further study.

Of the study intersections, only the intersection of Nebraska Avenue and New Mexico Avenue measures a 0.25 or higher accident rate. The majority of accidents at this intersection occurred during daylight hours on a weekday. Half of the accidents were recorded as 'side-wipe' or 'rear end' collisions. Based on these details, it may be that accidents occur at this location because of the high amount of left turns from Nebraska Avenue onto New Mexico Avenue from a shared through and left turn lane. Vehicles turning left share this lane with vehicles travelling straight. When vehicles turning left slow down as they approach the intersection, the vehicles behind them travelling straight may generate the 'side swipe' and 'ear end' collisions. Because the DDOT accident data does not contain information on the direction the vehicle(s) were travelling, combined with the relatively small number of accidents, it is very difficult to determine if this theory is true.

EXISTING CONDITIONS - TENLEY CAMPUS

This section provides a summary of the transportation facilities and services provided at AU's Tenley campus. The Tenley campus primarily provides housing and support services to AU students. Figure 16 identifies the location of Tenley campus.

Pedestrian

The Tenley campus comprises a single city block and has good pedestrian walkways between buildings and the adjacent pedestrian network. The campus is within walking distance of AU's main campus, Tenley-AU Metrorail station and commercial uses located along Wisconsin Avenue. The Tenley campus proximity to transit and diverse land uses allow many trips to be made by walking. Photo 4 captures conditions at Tenley campus.

Bicycle

Bicyclists are visible throughout the campus during pleasant weather and bicycle racks are often full, regardless of weather. The Tenley campus has a bike rack located at the main entrance that is frequently occupied with bicycles. The adjacent streets at the Tenley campus have narrow lane widths, high traffic volumes, and high traffic speeds.

The District Department of Transportation (DDOT) indicates that bicyclist use the sidewalk on Nebraska Avenue and at Tenley Circle, but that an experienced bicyclist will feel conformable riding on-street on Wisconsin Avenue and nearby local streets (DDOT, January 2008). The 2005 DDOT Bicycle Master Plan recommends creating multi-use trails along Nebraska which would improve bicycling conditions between the Tenley campus and main campus.

The newly created DC bike-sharing system, DC Smart Bike, does not have any locations near the Tenley campus nor do they have any plans to expand near it in the near future. Even if bike sharing stations were not implemented in neighborhoods external to AU, establishing a station on each of the three AU campuses would provide another option for inter-campus travel.

Figure 16: Tenley Campus

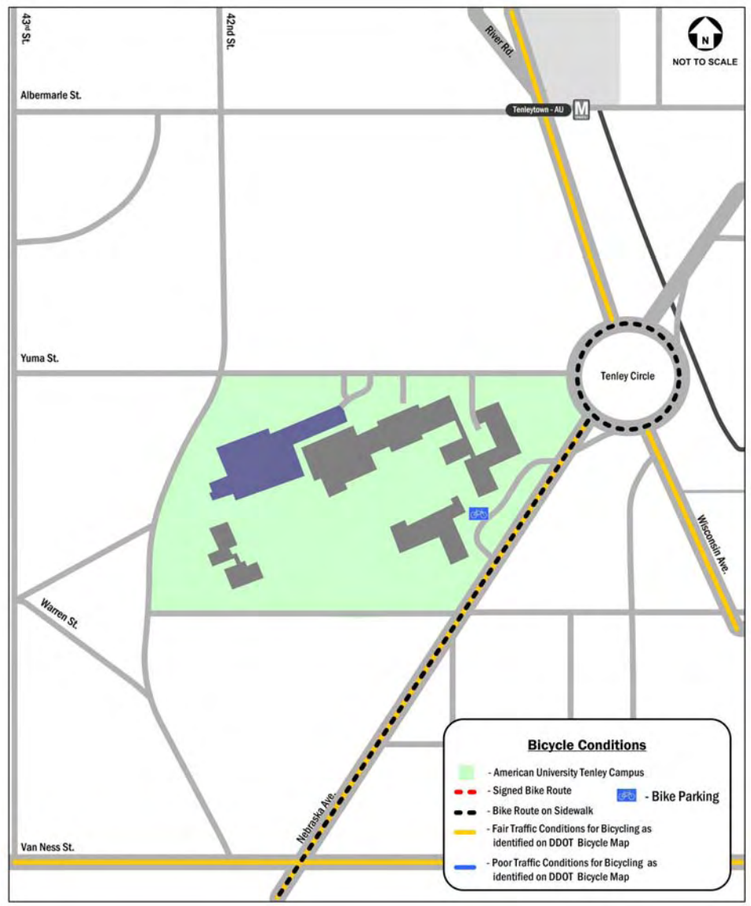

Figure 17: Bicycle Facilities at Tenley Campus

AU Shuttle Service

AU provides free shuttle service between the main campus and the Tenley campus, Washington College of Law and Tenleytown/AU Metro station. There are two stops at the Tenley campus. One serves those traveling westbound between the Tenley campus and Tenley-AU Metrorail station and one traveling eastbound that links the Tenley and Main campus. Figure 18 identifies shuttle routes and stop locations.

Transit

The AU Tenley campus is directly served by Metrobus and is within walking distance of the Red Line Tenley-AU Metrorail Station. Figure 19 identifies Metrobus routes and stops and the nearest Metrorail station location that serve AU. Transit connects the campus and destinations throughout the District and Maryland.

Parking

AU requires all students, faculty, staff, visitors and guests to park on-campus. To accommodate demand for parking, the university provides ample parking spaces that exceeds demand and strictly enforces parking restrictions on the residential streets surrounding AU.

The Tenley campus has a 65 parking spaces located in a surface lot and along the driveway adjacent to Nebraska Avenue. Parking at the Tenley campus is by permit only every weekday between the hours of 8:00 am and 5:00 pm. The Tenley campus has unused capacity that could accommodate future growth in demand, or that could be reduced to minimize costs and impacts associated with providing parking. The university conducts regular parking lot surveys to establish usage. Table 4 lists data compiled during the 2008 Fall Semester. Gorove/Slade Associates, Inc. conducted field surveys and found similar trends were visible during the 2009 Spring Semester. Parking supply and usage analysis indicate parking demand at Tenley is below the supply provided.

Figure 18: AU Shuttles Routes at Tenley Campus

Figure 19: WMATA Bus Service at Tenley Campus

Table 4: Tenley Campus Parking Inventory

#	Lot Name	Type	Total Spaces	Mean Occupied	% Occupied	Mean Available	% Available
6	Tenley	Faculty and Staff	65	33	51%	32	49%
	Note: Data collected during peak parking times for commuter-based parking (commuter students and faculty & staff, which is 10am or 3pm on a weekday).						

Traffic Overview

Site Access and Circulation

Access for the Tenley campus AU is provided primarily by Nebraska Avenue, as well as Yuma Street. Drive way access is provided on both these streets. The driveway on Nebraska Avenue is primarily used to pick-up and drop-off activities and there are a few parking spaces. The Yuma Street driveway provides access to pick-up and drop-off facilities and a parking lot with 65 spaces as well as parking for service vehicles.

Passenger drop-off and pick-up activity occurs throughout the campus. Figure 20 identifies the most commonly used locations for passenger drop-off and pick-up. There are no designated drop-off or pick-up locations on campus or areas where this activity is easily accommodated.

Shipping and receiving facilities are located along Yuma Street. Figure 20 identifies the location of shipping and receiving facilities.

Roadway Capacity Analysis

Gorove/Slade conducted field reconnaissance to observe traffic conditions at the Tenley campus but did not conduct a detailed capacity analysis of the adjacent intersections because the Tenley campus generates a small about of traffic that has a limited impact on adjacent roadways. Observations indicate that traffic conditions in this area or primarily the result of commuter traffic during the AM and PM commuter peak periods.

Car-Sharing

AU has a car-sharing located at the Tenley campus. The Tenley campus is an ideal location to have car-sharing because there is limited student parking and most of the buildings are student dorms.

Photo 5: Tenley Campus Driveway and Adjacent Bus Stop

Figure 20: Tenley Campus Loading & Pick-up Activity

SUSTAINABILITY

Numerous universities are developing broad sustainability initiatives and incorporating them into campus planning and policy documents. AU recently created a sustainability coordinator to identify new sustainability initiatives. AU is also a signatory to *The American College & University Presidents Climate Commitment*, which is an effort to address global warming by neutralizing greenhouse gas emissions. Current AU transportation programs, such as the AU shuttle program, already accomplish many transportation sustainability goals. In addition, the location of AU, and its compact design indirectly lead to many sustainable transportation qualities

This section of the report presents a broad review of transportation sustainability on campus, starting with establishment of goals and detailing campus policies and programs.

Sustainable transportation initiatives have three goals:

- Improve accessibility and mobility
- Conserve Environmental resources
- Enhance social equity and economic vitality

The remainder of this section examines these three goals in detail, identifying current programs and polices and making recommendations on how to better achieve these goals.

Improve Accessibility and Mobility

AU accessibility and mobility needs are met by an off campus multimodal transportation network including sidewalks, bike routes, transit, and an extensive roadway network. On campus, AU provides a campus shuttle service, as well as pedestrian, bicycle, and vehicular services.

Pedestrian:

- Current Status: AU has excellent walkways, a vibrant pedestrian core, and many destinations within walking distance. This allows many trips to be made by walking, especially those within campus. This promotes public health, reduces automobile trips, and creates vibrant public spaces.
- Possible Improvements: It is likely that in order to increase the amount of campus users that walk to/from campus, AU will need to encourage more student, faculty and staff to live within walking distance to campus, and provide more on-campus services (varied land-uses within campus). Since campus pedestrian infrastructure is already high quality, improvements will not likely lead to a significant increase in the percentage of campus users that walk.

Bicycle:

- Current Status: Bicycles are common on campus and bicycling is a viable option for many trips. Bicycling promotes public health and reduces automobile trips.
- Possible Improvements: Increasing the amount of campus users that bicycle to and from campus may be difficult due to the poor nature of external bike routes. Programs to encourage more users to bike could take the form of expanded and enhanced bicycle parking on campus, a bicycle sharing program, bicycle shower and storage facilities for commuter use, and bicycle subsidies for faculty/staff commuters.

AU Shuttle Service:

- Current Status: AU provides convenient and high quality shuttle service between campus and major off-campus destinations. The shuttles are an essential transportation service that significantly increase campus mobility and accessibly. Passengers ride free. The shuttle service also reduces private vehicle trips, parking demand, and is a low cost option available for all users.
- Possible Improvements: The existing shuttle service is of high quality; efforts to encourage more use would be to decrease wait times by using more shuttles and enhancing shuttle stops on campus with benches, shelters and other amenities.

Transit:

- Current Status: AU is well served by a public transit system that links AU with the city and region; this is especially beneficial for faculty, staff, commuter students, and visitors. Transit reduces private automobile trips and is a low cost option that ensures access and mobility for all users. To encourage transit use by employees, AU operates a SmartBenefits program.
- Possible Improvements: AU is limited in how it can enhance the Metrobus and Metrorail service. The current SmartBenefits program already encourages transit use. One possible improvement would be to enhance the closest Metrobus stops to campus with benches, shelters and other amenities.

Traffic and Parking:

- Current Status: On- and off-campus roadways are extensive and traffic operates with limited delay. There is also ample parking to accommodate demand, some of which is located in structured facilities beneath buildings, which reduce several of the negative impacts associated with parking. There are car-sharing vehicles on campus, which reduces the number of on-campus students that need to bring a car to campus parking space because they have access to a vehicle.
- Possible Improvements: The current AU traffic and parking system operates well; on a typical day there are many available parking spaces, and access points to campus operate efficiently. Enhancements to the traffic and parking system may be counter-productive for many sustainable initiatives, so no improvements to the traffic and parking system are recommended.

Conserve Environmental Resources

Transportation has an enormous impact on the environment. Transportation infrastructure consumes amounts of land, motorized vehicles consume enormous amounts of energy, and transportation is a major source of pollution.

Land Devoted to Infrastructure:

- Current Status: Land is required for sidewalks, roadways, and parking facilities but efficiently managing the per capita land devoted to transportation facilities is essential for conserving resources. Efficient infrastructure design and land use management is important for conservation because infrastructure and land use impact the number of trips required and the duration of trips taken.
- Possible Improvements: In terms of land consumed by transportation infrastructure, the one area where AU could realize improvements is with its parking foot print. AU's surface parking lots, in particular the Nebraska lot, consume valuable land resources. If surface lots can not be removed, reducing their impact by managing storm water run-off may be an option.

Energy consumption:

- Current Status: Transportation is responsible for 22 percent of global energy consumption. Energy consumption by campus fleets, commuting, and campus air travel are a major component of many institutions greenhouse gas emissions. Walking and bicycling are the most efficient modes in terms of energy consumption.
- Possible Improvements: Continued efforts to encourage student, faculty and staff walking and bicycling use.

Air pollution:

- Current Status: Transportation is a significant source of air pollution, air toxics and greenhouse gases. The combustion and evaporation fuel produces 30 percent of global air pollution and green house gasses and is the primary cause of air pollution in many urban areas. AU traffic, shuttles and campus service vehicles generate air pollution through the combustion and evaporation gasoline.
- Possible Improvements: AU can reduce pollution by promoting non-motorized options, alternative fueled vehicles, and efficient modes. It already pursues several of these options. While high transit usage reduces per capita emission of air pollutants and green house gases by decreasing vehicle trips, use of conventional energy sources generate air pollution and green house gases. Use of renewable resources at or below their rates of generation should be studied as an option for AU shuttles.

Noise pollution:

- Current Status: Roadway traffic is a major source of noise pollution. The main cause of noise pollution is noise created by engines and the friction of wheels on the road. The ambient noise created by cars, trucks and buses impairs the quality of life. Traffic noise within campus is generally low because vehicle volumes and speeds are low. Traffic noise is

occasionally an issue along the adjacent roadways due to the high volume of traffic, prevailing speeds and volume of heavy vehicle traffic. The impact is limited to buildings located along the periphery of campus.

- Possible Improvements: AU has limited options for reducing noise pollution along the periphery because most traffic is non-campus related. It may be possible to reduce the amount of noise generated by AU shuttles on campus through the purchasing of different vehicles, possibly implemented with the use of a renewable fuel source.

Water Pollution:

- Current Status**:** Vehicle exhaust, leaks, and wear and tear are sources of storm water pollution. During a rain storm, these pollutants leach into the ground or are washed from roadways and parking lots into the Chesapeake Bay through storm water drains.
- Possible Improvements: Reducing vehicle trips and treating storm water are two options for addressing water pollution. Thus, continued encouragement of alternate modes by AU could help reduce water pollution. Another is to create more permeable surfaces to help reduce storm water run off. One possible location for this may be the Nebraska parking lot, through the use of low-impact design and/or permeable pavement.

Enhance Social Equity and Economic Vitality

Transportation has social and economic aspects that impact the university community. Social impacts of the transportation network include impacts on equity, health, livability and cohesion, accessibility of historic and cultural resources, and aesthetics. The economic impacts of transportation include congestion, infrastructure costs, user costs, resource depletion, mobility barriers, and accident damages. These costs limit economic development and can be a strain on individual and community resources.

As a community, AU addresses these issues in various ways. AU provides quality facilities and services for all users, regardless of mode choice, especially for those with disabilities or limited financial resources. The campus location, size and design contribute to low accident rates and high physical activity. Economically, AU benefits from limited traffic congestion and accidents, which would reduce campus productivity and safety.

Proximity of Mixed-Land Uses:

- Current Status: Having mixed land uses or diverse land uses within walking or bicycling distance can reduce the amount of vehicle trips and shorten travel distances for typical trips. Sprawling development and separate land uses require more vehicle trips and longer travel distances. More frequent and longer trips increase energy consumption and transportation pollution. AU has a compact campus, a good land use mix and is located in compact, urban location. This reduces the number of trips required and allows many to be made by walking, bicycling or transit.
- Possible Improvements: There are two ways AU can increase the proximity of land-uses: (1) by encouraging more students, faculty and staff to live on or closer to campus, and (2) to increase the amount of services on campus. A user survey could help determine if additional trips could be reduced by adding news services on-campus or nearby.

User Costs:

- Current Status: AU currently offers a SmartBenefits program of up to $120 for commuting faculty and staff, and the AU shuttle service is free. No parking is free on campus; all parking is by permit with varied costs per user.
- Possible Improvements: Encouraging alternative modes can be done through increasing parking fees, although there is a limit to the amount of fees becomes too high for the campus to maintain competitiveness with other institutions. The University could also encourage alternative mode use through subsidizing bicycle commuting and car-sharing.

Accident Costs:

- Current Status: Transportation accidents on campus and on adjacent roadways have not been significant over the last three years of recorded accident data.
- Possible Improvements: Reducing vehicular speeds on and off campus may be the most efficient method to reduce accident rates where no particular problem is identified. The University may want to work with DDOT to examine speeds along Massachusetts and Nebraska Avenues.

Mobility Barriers:

- Current Status: There are several physical barriers surrounding the campus that may limit mobility. In order to minimize impact to local residents, the University does not encourage use of transportation infrastructure in these neighborhoods. The commuter roadways of Massachusetts and Nebraska Avenues also can be seen as a barrier to pedestrian and bicycle mobility. Although many crossings are made across these roadways, they can be seen as difficult due to high travel speeds, and because Massachusetts Avenue yields at Ward Circle (there is no Walk/Don't Walk sign for pedestrians). The high speeds combined with the narrow travel lanes and grades make bicycling difficult on these roadways.
- Possible Improvements: Efforts to reduce travel speeds can be helpful in reducing the barrier that these roadways may present. In addition, examining pedestrian issues around Ward Circle (in conjunction with DDOT) may be of benefit if a potential solution can be found to enhance the pedestrian experience.

Recommendations

Overall, existing AU transportation programs, campus location, and compact design have led to many sustainable transportation practices. The following is a summary of the possible improvements discussed above:

- Incentives to encourage walking, bicycling and transit
- Consider bike sharing
- Increase Transportation Demand Management policies and programs
- Increase parking fees
- Reducing land used by surface parking lots
- Implement storm water management program, especially for surface parking lots
- Utilize alternative fuels for campus fleet
- Increase diversity of uses on-campus or within walking distance
- Increase housing options on-campus or within walking distance

TRENDS AND AREAS OF OPPORTUNITY

Overall Trends

Based on the results of the analysis, interviews and observations made over the course of assembling this Existing Conditions Assessment, several trends have become apparent:

- Campus parking demand is decreasing
- Campus shuttle use is increasing
- Traffic congestion at intersections surrounding the campus during commuter rush hours is slightly improved from the time of the prior Master Plan (ten years ago)

It is likely that the first two trends, parking demand decreasing and campus shuttle use increasing, are directly related. It appears that campus programs encouraging users to forego vehicular use for alternative modes are working.

Although the reduction in campus parking demand may be responsible for the lower amount of congestion observed on roadways adjacent to campus, most likely it is not. This is because the amount of traffic generated by AU is not significant enough to heavily influence congestion levels on Nebraska and Massachusetts Avenues.

These trends should be taken into account in future planning efforts for the main campus. AU should be hesitant to construct any future parking supply, and future buildings and construction projects should not results in negative impacts to the pedestrian, bicycle and transit operations.

Summary and Areas of Opportunity

Pedestrian

Summary: AU is a compact campus that has good pedestrian walkways throughout and a vibrant, pedestrian only center. The size of the campus, pedestrian amenities, and location of transit stops and parking results in high pedestrian traffic throughout campus. AU roadways, parking, and transit routes are located on the periphery of the campus, which limits the number of locations where pedestrian pathways and vehicular traffic cross. This results in excellent pedestrian conditions in most locations. External to the campus, some pedestrian crossings at Ward Circle, where Massachusetts Avenue yields at the crosswalk, are observed to be difficult.

Areas of Opportunity: There are locations where pedestrian walkways and gathering space could be enhanced but there are no major areas of concern. Improvements to pedestrian treatments could be done in tandem with long-term maintenance or construction projects. Improvements include expanding walkway widths in the locations with heavy traffic, establishing uniform walking design and landscaping, and enhancing street crossing facilities and amenities at major crossings.

Bicycle

Summary: Bicyclists are visible throughout the campus during pleasant weather and bicycle racks are often full, regardless of weather. Access routes to campus are less than ideal due to changes in topography and roadway conditions. The adjacent streets, in particular Massachusetts Avenue and Nebraska Avenue, have narrow lane widths, high traffic volumes, and high traffic speeds.

Areas of Opportunity: Overall, the campus has good bicycle amenities but some improvements are possible, in particular with parking. Long-term bicycle storage may be a solution, for students that bring their bikes to campus to use and do so infrequently but often enough to want convenient parking options. Another area for improvement is on-campus sidewalks that have heavy pedestrian traffic and are also designated for bicycling. External to campus, coordination with DDOT could help expedite the creation of shared-use trails along Massachusetts and Nebraska Avenues (included in the DC Bike Plan). These trails would improve conditions for bicyclists and pedestrians. AU could also coordinate with DDOT to bring the DC Smart Bike system to AU and it surrounding neighborhoods, possibly starting with the three AU campuses.

AU Shuttle Service

Summary: AU provides free shuttle service between the main campus and the Tenley campus, Washington College of Law and Tenleytown/AU Metro station. AU shuttle service is essential transportation service provided by the campus. In 2008, AU shuttle provide approximately 1.7 million passenger trips. The on-campus routes and stops are well located because they separate vehicle routes and pedestrian routes, which limit conflicts.

Areas of Opportunity: A review of shuttle conditions found no major areas of concern but improvements to shuttle routes and stops are possible. Stop improvements include adding amenities such as shelter, seating, and route information. Technological improvements could be used to improve service though the increase of real-time route information at shuttle stops and made available on the internet. The number and routing of AU shuttle routes are another area of operation that may warrant further study to determine the most efficient routing and stop location given ridership trends and available resources. Bicycle racks can also be added to shuttle to enhance the connectivity of those modes.

Transit

Summary: AU is directly served by Metrobus and linked with Metrorail Stations located on the Red Line by AU Shuttles and Metrobus. There are no plans in place to change transit services in the near term. To encourage transit use by employees, AU operates a SmartBenefits program for employees. The SmartBenefits program provides employees with pre-tax dollars to pay for monthly transit expenses, up to $120 per month.

Areas of Opportunity: The current AU shuttle system does a good job of connecting the main campus and College of Law with Metrorail. Improvements to Metrobus could be made by adding amenities such as shelters, seating, and route information to the closest Metrobus stops to campus.

Parking

Summary: AU requires all students, faculty, staff, visitors and guests to park on-campus. The university has multiple surface parking lots and parking garages located throughout the campus. The current peak utilization of parking on campus is approximately 54%, which does not include the SIS parking garage which is under construction. Most parking is located on the periphery of the campus core, which reduces on-campus vehicle and pedestrian conflicts because these pathways rarely cross. AU has implemented parking management programs to minimize on-street parking in the adjacent neighborhood. The management program has a strict enforcement component that has effectively reduced the number of AU vehicles parking on-street.

Areas of Opportunity: AU has unused capacity that could accommodate future growth in demand, or that could be reduced to minimize costs and impacts associated with providing parking. Given that typical daily peak demand is easily accommodated, a reduction of the amount of spaces is possible, given that a plan for events and other high demand days can be established.

Traffic

Summary: In the area surrounding the main campus the percentage of traffic attributable to AU is equal to 4.38% and 12.64% of the morning and afternoon peak hour, respectively. Capacity analyses of intersection surrounding campus indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours, although certain movements at intersections experience unacceptable levels of congestion. Commuting traffic heavily influences traffic patterns on street adjacent to the University. No intersections adjacent to the campus have a high accident rate.

Areas of Opportunity: There are no major areas of concern with the traffic system within the University or on surrounding streets. Observed congestion is due to commuting patterns, and changes to the University transportation system would probably not influence rush hour conditions significantly.

Sustainability:

Summary: AU recently created a sustainability coordinator and is a signatory to *The American College & University Presidents Climate Commitment*. Current AU transportation programs, such as the AU shuttle program, already accomplish many transportation suitability goals. In addition, the location of AU, and its compact design indirectly lead to many sustainable transportation qualities.

Areas of Opportunity: There are several opportunities to enhance sustainability, including incentives that encourage walking, bicycling and transit, a Transportation Demand Management program, and initiatives that reduce environmental impacts associated with transportation, such as storm water management and alternative fuels.

APPENDIX A: AU TRANSPORTATION DOCUMENT REVIEW

American University Master Plan (2000)

The most recent American University master plan was completed and submitted in 2000. The following is a summary of the transportation findings contained within that report:

- A transportation mode choice survey was conducted during the study and found that 23% of students, 96% of faculty/staff, and 93% of visitors commuted to campus by automobile.
- All intersections operated at acceptable levels of service except the Reeves Gate and Cassell Center driveways egress from the University, and the Nebraska Avenue/Ward Circle East and Massachusetts Avenue/Wesley Circle East intersections. The Nebraska and Massachusetts Avenues intersections failed because of high commuter traffic.
- The study found that all intersections that operated at acceptable levels of service would continue to do so under future conditions.
- AU had an inventory of 2,523 parking spaces on-campus. A parking occupancy survey indicated that AU experienced a peak parking demand of 2,048 spaces (81%). The peak occurred at 1:00 PM on a Monday.
- AU operated two campus shuttle routes with 15-30 minute headways using six vehicles. The first route linked the campus with AU-Tenleytown Metro Stop and the second route linked the campus with Glover/Washington College of Law shuttle route.
- Pedestrians crossed Nebraska Avenue at a mid-block location between Massachusetts Avenue and New Mexico Avenue. These mid-block crossings were a very small percentage of the total number of pedestrians observed crossing Nebraska Avenue but were of concern because there is no pedestrian crossing at this location and there are high traffic volumes and speeds at this location.

Recommendations

The report made the following recommendations:

- Traffic related recommendations associated with the study included adding a left-turn lane on Nebraska Avenue at New Mexico Avenue and the proposed University driveway located across the street, and operating the Massachusetts Avenue/Glover Gate/Katzen Arts Center intersection with a split-traffic signal. These recommendations have not been implemented and the concerns identified at these locations have been mitigated somewhat by the reduced traffic volumes observed at these intersections during the Existing Conditions Assessment.
- The study suggested a campus parking inventory of 2,959 spaces to accommodate the maximum future population growth allowed in the campus plan. Parking demand may have decreased since the 2000 master plan due to increased transit usage.
- The study suggested studying safety measures to improve conditions at the mid-block crossing on Nebraska Avenue. One potential measure included the installation of pedestrian crossing warning sign along Nebraska Avenue. This recommendation was implemented.

2005 Parking Garage Study

The purpose of the study was to analyze potential traffic impacts of the proposed SIS parking garage on the existing street system. A supplemental report also reviewed the impact of the Katzen lot, which had not yet opened at the time of this report. The SIS lot, which is under construction now, will parking garage below grade. The parking facility will have a single vehicular access point on Nebraska Avenue that will be located opposite New Mexico Avenue. The SIS displaced the approximately 80 parking spaces currently on the site. The new garage will allow parking by permit only. The study projected a maximum occupancy of 90 percent of spaces.

The existing conditions capacity analysis showed that all study intersections operate at a level of service “B” or better at all study intersections. The future analysis showed a slight increase in intersection delay due to traffic generated by the SIS and the Katzen Arts Center. In most cases the level of service does not change. Acceptable conditions of level of service “C” or better were met at all studied intersections.

Areas of Concern

The report identified the following areas of concern.

- Traffic backed up from Ward Circle, interfering with operations at adjacent intersections. These queues were most prominently seen northbound on Nebraska Avenue and eastbound on Massachusetts Avenue.
- Traffic congestion also occurred in the peak periods due to queuing at Ward Circle and the intersection of Nebraska Avenue with Foxhall Road. However, computed level of service is acceptable at University-related intersections, even with high turning volumes.
- On-street parking on New Mexico Avenue adjacent to the Nebraska lot interfered with vehicles entering and exiting the lot as well as with vehicles making a right turn at Nebraska Avenue. Illegal left turns into the Nebraska lot from Nebraska Avenue and into Glover Gate from Massachusetts Avenue were an annoyance to other drivers, but were few enough not to be a significant contributor to congestion.

APPENDIX B: DETAILED TRAFFIC CAPACITY ANALYSIS

Existing Road Network

Regional access for the American University main campus is provided primarily by Massachusetts Avenue and Nebraska Avenue. Local access is also provided by 46th Street, Tilden Street, University Avenue, New Mexico Avenue, 45th Street, Rockwood Parkway, Newark Street, and Glenbrook Road. Regional access for the Tenley campus is also provided by Nebraska Avenue. Local access is provided by Yuma Street, Warren Street, and 42nd Street. Figure 21 shows the street network hierarchy for the study area, as well as the average annual weekday traffic volumes for the heavily travelled roadways.

Gorove/Slade conducted field reconnaissance to obtain the existing lane usage and traffic controls at the intersections within the main campus study area. Figure 22 presents the roadway lane configurations and traffic control devices provided at the study intersections.

The physical and service characteristics of the key roadways providing local site access are as follows:

Massachusetts Avenue

Massachusetts Avenue is a 4-lane arterial, which runs along the north side of the American University main campus. The roadway is classified by DDOT as a primary arterial with average annual weekday traffic of 20,900 vehicles. Within the limits of the study area, Massachusetts Avenue runs from 46th Street to Nebraska Avenue.

Nebraska Avenue

Nebraska Avenue is a 4-lane arterial, which runs along the east side of the American University main campus. The roadway is classified by DDOT as a primary arterial with average annual weekday traffic of 24,500 vehicles. Within the limits of the study area, Nebraska Avenue runs from Massachusetts Avenue to Rockwood Parkway. Within the limits of the Tenley campus, Nebraska Avenue runs from Yuma Street to Warren Street, with an average daily traffic of 16,700 vehicles.

46th Street

North of the American University main campus, 46th Street is a 2-lane roadway. The roadway is classified by DDOT as a collector with average annual weekday traffic of 2,300 vehicles. Within the limits of the study area, 46th Street intersects Massachusetts Avenue on the northwest corner of the main campus.

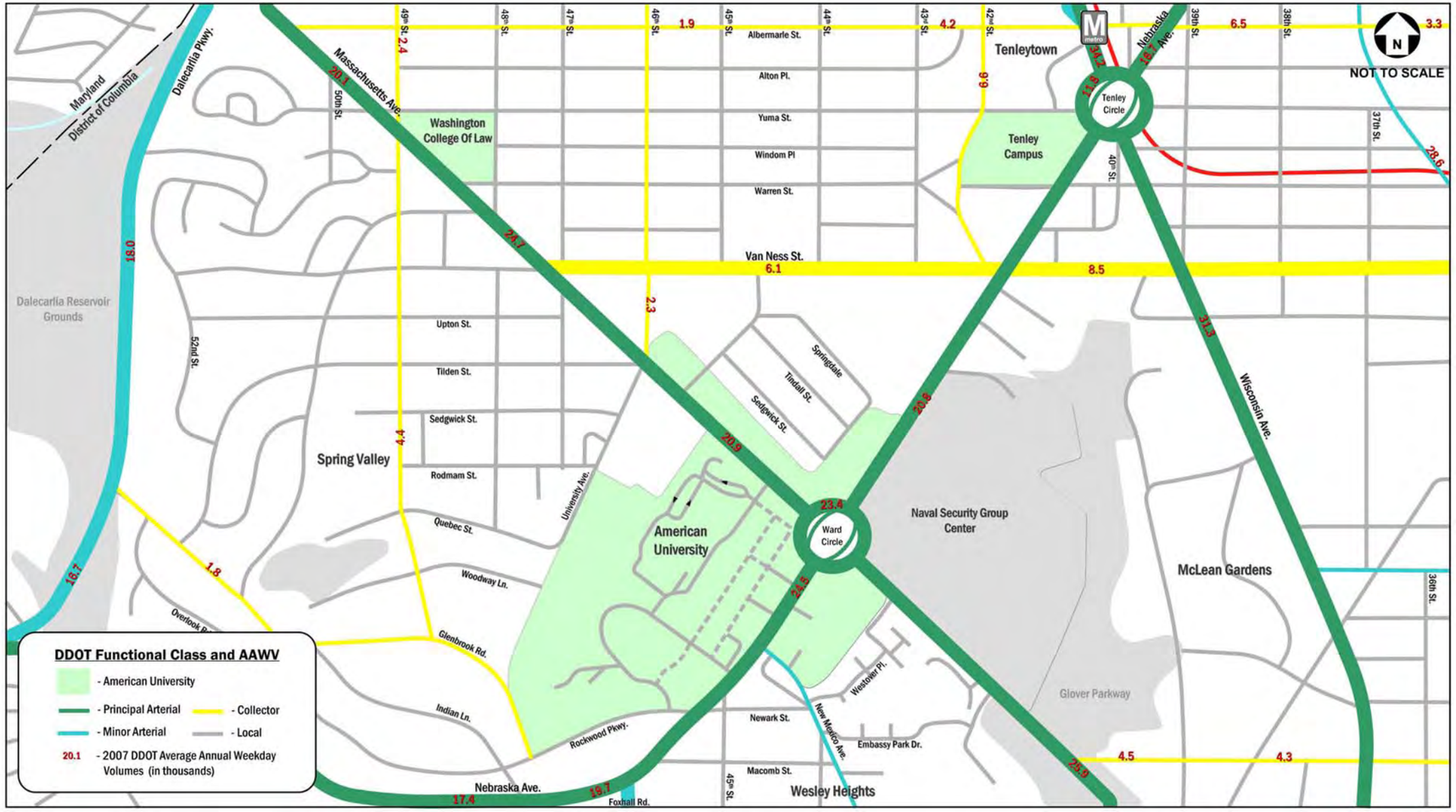

Figure 21: Roadway Functional Class and Daily Volumes

Tilden Street

Tilden Street is a 2-lane roadway, west of the American University main campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Tilden Street intersects Massachusetts Avenue on the northwest corner of the main campus.

University Avenue

University Avenue is a 2-lane roadway, west of the American University main campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, University Avenue intersects Massachusetts Avenue on the northwest corner of the main campus.

New Mexico Avenue

New Mexico Avenue is a 4-lane roadway, east of the American University main campus. The roadway is classified by DDOT as a minor arterial with average annual weekday traffic of 9,600 vehicles. Within the limits of the study area, New Mexico Avenue intersects Nebraska Avenue on the southeast side of the main campus.

45th Street

South of the American University main campus, 45th Street is a 2-lane roadway. The roadway is classified by DDOT as a local road. Within the limits of the study area, 45th Street intersects Nebraska Avenue on the southeast corner of the main campus.

Rockwood Parkway

Rockwood Parkway is a 2-lane roadway, south of the American University main campus. The roadway is classified by DDOT as a collector with average annual weekday traffic of 1,800 vehicles. Within the limits of the study area, Rockwood Parkway runs from Glenbrook Road to Nebraska Avenue.

Newark Street

Newark Street is a 2-lane roadway, south of the American University main campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Newark Street intersects Nebraska Avenue on the southeast corner of the main campus.

Glenbrook Road

Glenbrook road is a 2-lane roadway, west of the American University main campus. The roadway is classified by DDOT as a collector. Within the limits of the study area, Glenbrook Road intersects Rockwood Parkway on the southwest corner of the main campus.

Yuma Street

Yuma Street is a 2-lane roadway, north of the American University Tenley campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Yuma Street runs from 42nd Street to Nebraska Avenue.

Warren Street

Warren Street is a 2-lane roadway, south of the American University Tenley campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Warren Street runs from 42nd Street to Nebraska Avenue.

42nd Street

West of the American University Tenley campus, 42nd Street is a 2-lane roadway. The roadway is classified by DDOT as a collector, with an average daily traffic of 6,600 vehicles. Within the limits of the study area, 42nd Street runs from Yuma Street to Warren Street. The posted speed limit in the vicinity of the site is 25 mph.

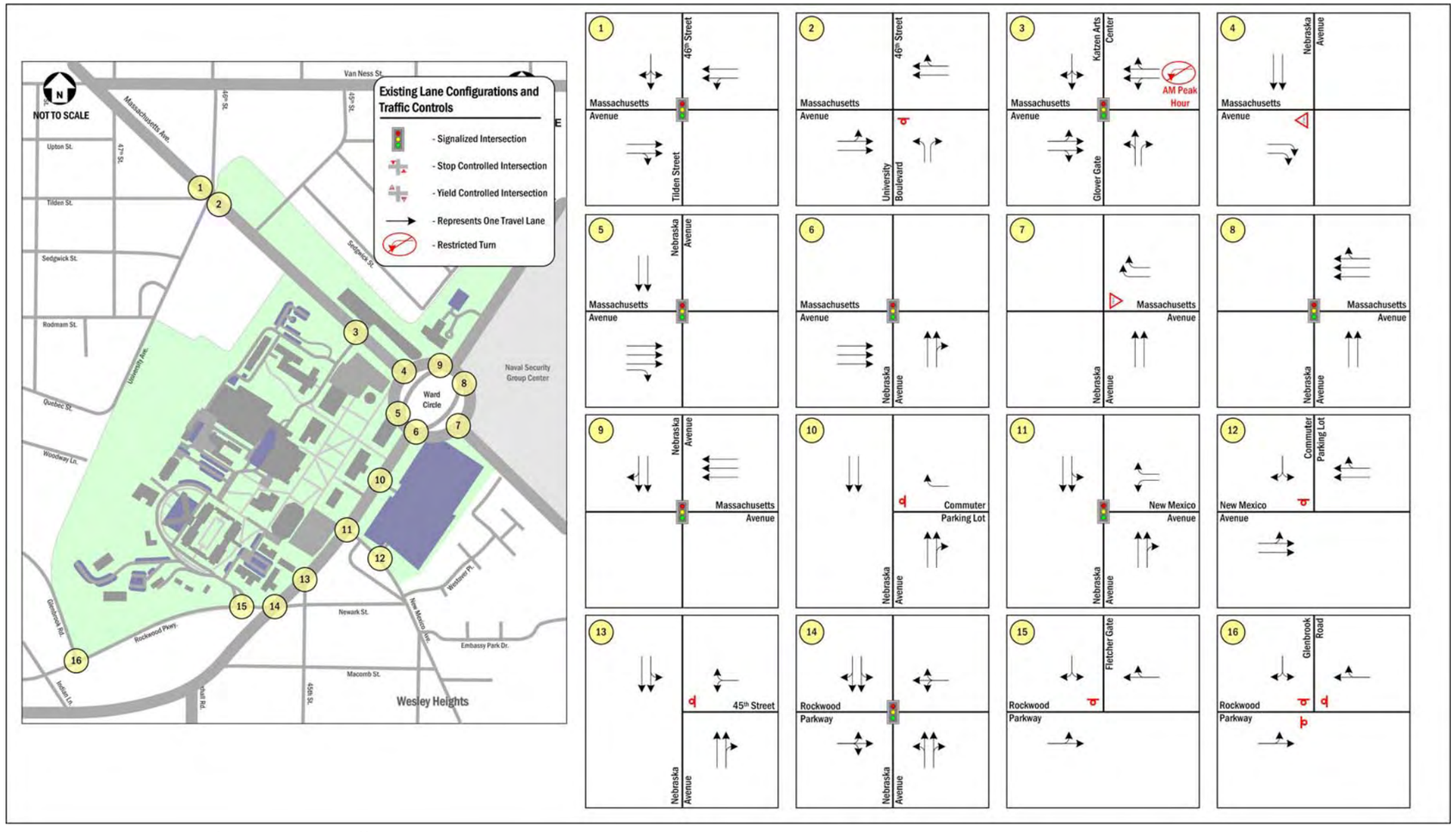

Figure 22: Existing Lane Configurations and Traffic Controls

Site Access

Site access for the main campus is provided by three gates that provide direct access to campus, as well as 2 access points to the Nebraska Avenue Parking Lot.

The primary access is Glover Gate, which is located on the north side of the American University main campus, along Massachusetts Avenue. Glover Gate intersects Massachusetts Avenue at a signalized intersection, across from access to the Katzen Arts Center and parking garage. Secondary access to the main campus is Fletcher Gate, which is located on the south side of the American University main campus, along Rockwood Parkway. Fletcher Gate intersects Rockwood Parkway at an unsignalized intersection. Woods Gate along the east side of the main campus provides access to a small parking lot but not the remainder of campus. All other campus gates are closed to vehicular traffic. Access to the Nebraska Avenue Parking Lot is provided by a right-in, right-out intersection on Nebraska Avenue and a full access unsignalized intersection on New Mexico Avenue. Site access for the Tenley campus is provided along Yuma Street. An additional access is provided for a small parking lot along Nebraska Avenue.

Existing Volumes

Traffic counts were conducted at the key study intersections between the hours of 6:00 to 9:00 AM and 3:00 to 7:00 PM on typical weekdays. The results of the traffic counts are included in the Technical Appendix. The morning and afternoon peak hours for the system of intersections being studied occur between 7:45 and 8:45 AM and 5:00 and 6:00 PM, respectively. Peak hour traffic volumes are shown on Figure 23.

Figure 23: Existing Peak Hour Traffic Volumes

Field Observations

Observations of the study intersections were performed by Gorove/Slade in order to determine the lane configurations and signal timings. During these observation periods, remarks were noted in regards to signal operation. The study area was observed on Tuesday, January 13 between 8:00 and 9:30 AM and between 4:30 and 6:00 PM.

Morning Peak Hour

Tenley Circle consists of two separate intersections within the roadway network. During the morning peak period, observations were recorded at the intersection of Massachusetts Avenue and Tilden Street/46th Street southbound and at the intersection of Massachusetts Avenue and University Avenue/46th Street northbound. Both intersections appeared to operate at acceptable conditions. The signalized intersection of Massachusetts Avenue and Tilden Street/46th Street southbound was most heavily trafficked by vehicles traveling eastbound on Massachusetts Avenue. Vehicles appeared to arrive mostly in platoons from an upstream intersection. Eastbound progression along Massachusetts Avenue appeared to be timed well, with platoons arriving as the signal turned to a green phase. Traffic traveling westbound on Massachusetts Avenue was not as heavy. Vehicles traveling westbound also appeared to arrive in platoons progressed from an upstream intersection. The east- and westbound movements experienced short queue development of approximately 3-4 vehicles. The majority of vehicles traveling southbound from 46th Street appeared to turn left onto Massachusetts Avenue eastbound. Southbound vehicles did not appear to incur an unacceptable amount of delay; though long queues of approximately 8-10 vehicles developed during the east- and westbound green time. Eastbound and westbound traffic free-flowed through the intersection of Massachusetts Avenue and University Avenue/46th Street, appearing to incur little to no delay. A small amount of traffic was observed traveling northbound. Vehicles did not appear to experience an unacceptable amount of delay due to large gaps in east- and westbound traffic. Very little pedestrian activity was observed at either intersection.

The intersection of Massachusetts Avenue and Glover Gate/Katzen Arts Center did not appear to experience an unacceptable amount of delay. The majority of traffic appeared to be traveling eastbound on Massachusetts Avenue. The eastbound approach appeared to experience a small amount of delay during the north- and southbound green time. The westbound approach appeared to have a high volume of vehicles as well, with a small amount of delay incurred during the north- and southbound green time. East- and westbound queues of approximately 3-4 vehicles developed. Only a small number of vehicles were observed traveling north- and southbound. The green time allocated to these approaches appeared to be provided for pedestrian traffic. The majority of pedestrians appeared to travel southbound across Massachusetts Avenue from the bus stop adjacent to the intersection. Some east- and westbound pedestrians were observed. Most of the pedestrians appeared to utilize the crosswalks and pedestrian signals.

The intersection of Massachusetts Avenue and Nebraska Avenue (Ward Circle) appeared to experience an acceptable amount of delay. The east- and westbound approaches (yield to traffic in circle) appeared to experience a small amount of delay due to heavy traffic volumes within the circle. Eastbound queues of approximately 4-6 vehicles and westbound queues of approximately 2-3 vehicles developed. The north- and southbound approaches appeared to incur a higher amount of delay due to vehicles stuck within the through movement of the circle. The vehicles within the circle appeared to clear the intersection during the allotted north- and southbound green time. Queues of approximately 6-8 vehicles developed for the north- and southbound approaches. Near the end of the morning peak period, a high amount of delay was observed for the northbound approach. This appeared to be due to vehicles parked along the northbound lanes, constricting the roadway from 2 lanes to 1 lane north of Massachusetts Avenue. In addition to the roadway constriction, an event was observed at the Japanese Embassy on Nebraska Avenue north of Massachusetts Avenue, which caused traffic to back up behind vehicles turning left into the Embassy. Few pedestrians were observed in Ward Circle. The majority appeared to cross Nebraska Avenue going westbound on Massachusetts Avenue from the commuter parking lot toward campus. Due to heavy traffic volumes, pedestrians appeared to utilize both crosswalks and pedestrian signals.

The intersection of Nebraska Avenue and the Nebraska Avenue Parking Lot appeared to experience little to no delay. Due to the right-in/right-out configuration of the intersection, southbound traffic did not incur any delay. Very little traffic appeared to enter the parking lot from the northbound approach. During the observation, no traffic was observed exiting the parking lot. Some pedestrian activity was observed, with the majority of pedestrians traveling southbound on Nebraska Avenue. Although pedestrians are prohibited from crossing Nebraska Avenue at the intersection, some crossings were observed with pedestrians weaving in between stopped vehicles.

The intersection of Nebraska Avenue and New Mexico Avenue appeared to experience an acceptable amount of delay. The majority of traffic appeared to be travelling northbound on Nebraska Avenue. The northbound approach did not appear to experience a significant amount of delay during the peak hour. However, near the end of the morning peak period, northbound vehicles experienced delay extending from Ward Circle. This caused a long northbound queue to develop of approximately 8-10 vehicles. Due to the southbound leading left-turn, the southbound movement was able to clear during the majority of the green time. Some southbound queuing was observed with approximately 8-10 vehicles waiting to make the southbound left-turn. Only a small number of vehicles were observed travelling westbound. Due to pedestrians and northbound queues extending from Ward Circle, some queuing developed in the westbound right-turn lane of approximately 3-4 vehicles. A significant number of pedestrians were observed, with the majority crossing westbound from the Nebraska Avenue Parking Lot and an adjacent bus stop. Most of the pedestrians appeared to utilize the crosswalks and pedestrians signals due to heavy traffic volumes along the north- and southbound approaches.

The intersection of New Mexico Avenue and the Nebraska Avenue Parking Lot appeared to experience little to no delay. The majority of traffic entering the parking lot appeared to be travelling eastbound on New Mexico Avenue, with very little traffic entering from the westbound approach. Some queuing was observed for the eastbound left-turn movement, with approximately 3-4 vehicles yielding to pedestrians in the crosswalk. During the observation, no traffic was observed exiting the parking lot. Some pedestrian activity was observed, with the majority of pedestrians traveling westbound on New Mexico Avenue.

The intersection of Nebraska Avenue and 45th Street appeared to experience little to no delay. Minor queuing was observed for the southbound left-turn movement on Nebraska Avenue, with approximately 2-3 vehicles yielding to opposing northbound traffic. The northbound approach appeared to be heavily trafficked, but did not appear to incur any delay. During the observation, very little traffic was observed on 45th Street. No pedestrian traffic was observed.

The intersection of Nebraska Avenue and Rockwood Parkway did not appear to experience an unacceptable amount of delay. The majority of traffic appeared to be traveling northbound on Nebraska Avenue. The southbound approach appeared to have a high volume of vehicles as well. North- and southbound queues of approximately 1-2 vehicles and east- and westbound queues of approximately 3-4 vehicles developed. Only a small number of vehicles were observed traveling east- and westbound, with a majority of those vehicles turning onto Nebraska Avenue. Very little pedestrian traffic was observed. Most of the pedestrians appeared to utilize the crosswalks and pedestrian signals.

The intersection of Rockwood Parkway and Fletcher Gate did not appear to experience any delay. The majority of traffic appeared to be traveling on Rockwood Parkway toward Nebraska Avenue. Only a small number of vehicles were observed turning into Fletcher Gate. A small number of vehicles were observed exiting campus from Fletcher Gate, with little to no queue development. Very few pedestrians were observed, although all appeared to be travelling to and from campus via the Fletcher Gate.

The intersection of Rockwood Parkway and Glenbrook Road did not appear to experience any delay during the morning peak hour. The majority of traffic appeared to be traveling on Rockwood Parkway toward Nebraska Avenue. Only a small number of vehicles were observed on Glenbrook Road, with little to no queue development. Very few pedestrians were observed.

Afternoon Peak Hour

During the afternoon peak period, observations were recorded at the intersection of Massachusetts Avenue and Tilden Street/46th Street southbound and at the intersection of Massachusetts Avenue and University Avenue/46th Street northbound. Both intersections appeared to operate at acceptable conditions. The signalized intersection of Massachusetts Avenue and Tilden Street/46th Street southbound was most heavily trafficked by vehicles traveling westbound on Massachusetts Avenue. Traffic traveling eastbound on Massachusetts Avenue was significant but not as heavy. The east- and westbound movements experienced short queue development of approximately 3-4 vehicles. Southbound vehicles did not appear to incur an unacceptable amount of delay, with queues of approximately 4-6 vehicles developing during the east- and westbound green time. Eastbound and westbound traffic free-flowed through the intersection of Massachusetts Avenue and University Avenue/46th Street, appearing to incur little to no delay. A small amount of traffic was observed traveling northbound. Vehicles did not appear to experience an unacceptable amount of delay due to large gaps in east- and westbound

traffic. Very little pedestrian activity was observed at either intersection.

The intersection of Massachusetts Avenue and Glover Gate/Katzen Arts Center did not appear to experience an unacceptable amount of delay. The majority of traffic appeared to be traveling westbound on Massachusetts Avenue. East- and westbound queues of approximately 3-4 vehicles developed during the north- and southbound green time. The green time allocated to these approaches appeared to be provided for pedestrian traffic as well as some vehicles exiting campus. North- and southbound queues of approximately 3-4 vehicles developed. The majority of pedestrians appeared to travel northbound across Massachusetts Avenue from campus toward the bus stop adjacent to the intersection. Some east- and westbound pedestrians were observed. Most of the pedestrians appeared to utilize the crosswalks and pedestrian signals.

The intersection of Massachusetts Avenue and Nebraska Avenue (Ward Circle) appeared to experience an acceptable amount of delay. The east- and westbound approaches (yield to traffic in circle) appeared to experience a small amount of delay due to heavy traffic volumes within the circle. East- and westbound queues of approximately 4-6 vehicles developed. The north- and southbound approaches appeared to incur a higher amount of delay due to vehicles stuck within the through movement of the circle. The vehicles within the circle appeared to clear the intersection during the allotted north- and southbound green time. Queues of approximately 8-10 vehicles developed for the north- and southbound approaches. With heavy traffic in the intersection, Ward Circle appeared to be near capacity. Few pedestrians were observed in Ward Circle. The majority appeared to cross Nebraska Avenue going eastbound on Massachusetts Avenue from campus toward the commuter parking lot. Due to heavy traffic volumes, pedestrians appeared to utilize both crosswalks and pedestrian signals.

The intersection of Nebraska Avenue and the Nebraska Avenue Parking Lot appeared to experience little to no delay. Due to the RIRO configuration of the intersection, southbound traffic did not incur any delay. Very little traffic appeared to enter the parking lot from the northbound approach. Traffic exiting the parking lot appeared to experience some delay, with queues of approximately 3-4 vehicles developing. Occasional northbound queues from Ward Circle extended back to the intersection, blocking exiting traffic. Some pedestrian activity was observed, with the majority of pedestrians traveling southbound on Nebraska Avenue. Although pedestrians are prohibited from crossing Nebraska Avenue at the intersection, some crossings were observed with pedestrians weaving in between stopped vehicles toward the parking lot.

The intersection of Nebraska Avenue and New Mexico Avenue appeared to experience an acceptable amount of delay. The majority of traffic appeared to be travelling north- and southbound on Nebraska Avenue. The northbound approach did not appear to experience a significant amount of delay during the peak hour. Significant southbound queuing was observed with approximately 8-10 vehicles, which was caused by vehicles waiting to make the southbound left-turn. Occasional northbound queues from Ward Circle extended back to the intersection, blocking vehicles turning right from New Mexico Avenue. Due to pedestrians and northbound queues extending from Ward Circle, some queuing developed in the westbound right-turn lane of approximately 3-4 vehicles. Overall, westbound queues developed of approximately 4-6 vehicles per cycle. A significant number of pedestrians were observed, with the majority crossing eastbound to the Nebraska Avenue Parking Lot and an adjacent bus stop. Most of the pedestrians appeared to utilize the crosswalks and pedestrians signals due to heavy traffic volumes along the north- and southbound approaches.

The intersection of New Mexico Avenue and the Nebraska Avenue Parking Lot appeared to experience little to no delay. The majority of traffic exiting the parking lot appeared to turn right and travel westbound on New Mexico Avenue. During the observation, no traffic was observed entering the parking lot. Some pedestrian activity was observed, with the majority of pedestrians traveling eastbound on New Mexico Avenue toward the parking lot.

The intersection of Nebraska Avenue and 45th Street appeared to experience little to no delay. Minor queuing was observed for the southbound left-turn movement on Nebraska Avenue, with approximately 2-3 vehicles yielding to opposing northbound traffic. The northbound approach appeared to be heavily trafficked, but did not appear to incur any delay. During the observation, very little traffic was observed on 45th Street. No pedestrian traffic was observed.

The intersection of Nebraska Avenue and Rockwood Parkway did not appear to experience an unacceptable amount of delay. The majority of traffic appeared to be traveling north- and southbound on Nebraska Avenue. North- and southbound queues of approximately 6-8vehicles and east- and westbound queues of approximately 4-6 vehicles developed. Occasional northbound queues extended from the downstream intersection of Nebraska Avenue and New Mexico Avenue. Only a small number of vehicles were observed traveling east- and westbound, with a majority of those vehicles turning onto Nebraska Avenue. Very little pedestrian traffic was observed. Most of the pedestrians appeared to utilize the crosswalks and pedestrian signals.

The intersection of Rockwood Parkway and Fletcher Gate did not appear to experience any delay. The majority of traffic appeared to be traveling on Rockwood Parkway toward Nebraska Avenue. A small number of vehicles were observed exiting campus from Fletcher Gate, with queue development of approximately 2-3 vehicles. Very few pedestrians were observed, although all appeared to be travelling to and from campus via the Fletcher Gate.

The intersection of Rockwood Parkway and Glenbrook Road did not appear to experience any delay. The majority of traffic appeared to be traveling on Rockwood Parkway toward Nebraska Avenue. Only a small number of vehicles were observed on Glenbrook Road, with little to no queue development. Very few pedestrians were observed.

Existing Capacity Analysis

Capacity analyses were performed to determine the existing Level of Service (LOS) for the AM and PM peak hours for the study intersections. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS D is typically used as the acceptable LOS threshold in the District; although LOS E and F are sometimes accepted in certain highly urbanized areas. The *Highway Capacity Manual 2000* (HCM) methodology was used for all analyses.

The existing LOS capacity analyses were based on: (1) the existing lane use and traffic controls; (2) the peak hour turning movement volumes; and (3) the *Highway Capacity Manual 2000* (HCM) methodologies (using Synchro 7 software). Copies of the LOS calculation worksheets are included in the Technical Appendix. Table 5 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds).

The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Intersection LOS: This is a measure of congestion ranging from LOS A--least congested--to LOS F--most congested. LOS is one of the most common terms used to describe how "good" or how "bad" traffic is projected to be. The levels of service for signalized intersections are defined below:

Level of Service A describes operations with very low average delay per vehicle, i.e., less than 10.0 seconds. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop. Short signal cycle lengths may also contribute to low delay.

Level of Service B describes operations with average delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths.

Level of Service C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level although many still pass through the intersection without stopping.

Level of Service D describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high traffic volumes as compared to the capacity. Many vehicles are required to stop and the number of vehicles that do not have to stop declines. Individual signal cycle failures, where all waiting vehicles do not clear the intersection during a single green time, are noticeable.

Level of Service E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high traffic volumes. Individual cycle failures are frequent occurrences. LOS E has been set as the limit of acceptable conditions.

Level of Service F describes operations with average delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when traffic arrives at a flow rate that exceeds the capacity of the intersection. It may also occur at high volumes with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such delays.

Table 5: Existing Levels of Service

			2001 Master Plan LOS				2005 SIS Parking Study LOS				Existing Conditions (2008) LOS			
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
Intersection (Approach)	**Sign Control**	**(Approach)**	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*
Massachusetts Avenue & 46th Street/Tilden	Signalized	**Overall**	**21.2**	**C**	**14**	**B**	**--**	**--**	**--**	**--**	**16.4**	**B**	**10**	**B**
		Eastbound	22.9	C	10	B	--	--	--	--	16.8	B	8.6	A
		Westbound	17.6	B	15.4	B	--	--	--	--	10.4	B	6	A
		Southbound	22.8	C	26.9	C	--	--	--	--	29.3	C	38.3	D
Massachusetts Avenue & 46th Street/University	Unsignalized (Stop)	Northbound	60.1	F	51	F	--	--	--	--	12.2	B	13.2	B
Massachusetts Avenue & Glover Gate/Katzen Arts Center	Signalized	**Overall**	**9.3**	**A**	**12.6**	**B**	**--**	**A**	**--**	**B**	**7.5**	**A**	**20.3**	**C**
		Eastbound	10	A	10.1	B	--	--	--	--	6.6	A	5.9	A
		Westbound	5.6	A	12.4	B	--	--	--	--	6.2	A	24.9	C
		Northbound	30.5	C	26.6	C	--	--	--	--	34.6	C	38.4	D
		Southbound	--	--	--	--	--	--	--	--	34.2	C	35.7	D
Massachusetts Avenue Eastbound & Nebraska Avenue Southbound	Unsignalized (Yield)	Eastbound	--	--	--	--	--	--	--	--	35.9	E	28.9	D
Massachusetts Avenue Eastbound & Nebraska Avenue Southbound	Signalized	**Overall**	**67.2**	**E**	**80.1**	**F**	**--**	**--**	**--**	**--**	**14.4**	**B**	**16.7**	**B**
		Eastbound	17.1	B	15.6	B	--	--	--	--	18.3	B	21.5	C
		Southbound	46.4	D	85.5	F	--	--	--	--	7.3	A	10	A
Massachusetts Avenue Eastbound & Nebraska Avenue Northbound	Signalized	**Overall**	**67.2**	**E**	**80.1**	**F**	**--**	**--**	**--**	**--**	**14.3**	**B**	**15.7**	**B**
		Eastbound	17.1	B	15.6	B	--	--	--	--	2.4	A	1.4	A
		Northbound	151.8	F	135.4	F	--	--	--	--	28.5	C	29.3	C
Massachusetts Avenue Westbound & Nebraska Avenue Northbound	Unsignalized (Yield)	Westbound Right	--	--	--	--	--	--	--	--	12.5	B	20.3	C
Massachusetts Avenue Westbound & Nebraska Avenue Northbound	Signalized	**Overall**	**62.5**	**E**	**33.1**	**C**	**--**	**--**	**--**	**--**	**11.4**	**B**	**16.3**	**B**
		Westbound	14.5	B	17.9	B	--	--	--	--	14.3	B	20.5	C
		Northbound	37.1	D	38.8	D	--	--	--	--	7.6	A	8.5	A
Massachusetts Avenue Westbound & Nebraska Avenue Southbound	Signalized	**Overall**	**62.5**	**E**	**33.1**	**C**	**--**	**--**	**--**	**--**	**13.9**	**B**	**22**	**C**
		Westbound	14.5	B	17.9	B	--	--	--	--	2.2	A	1.9	A
		Southbound	125.1	F	51.4	D	--	--	--	--	22.4	C	43	D
Nebraska Avenue & Commuter Lot (RIRO)	Unsignalized (Stop)	Westbound Right	14.7	B	16.3	C	--	A	--	A	9.5	A	9.8	A
Nebraska Avenue & New Mexico Avenue	Signalized	**Overall**	**16.4**	**B**	**22.7**	**C**	**--**	**B**	**--**	**B**	**17.3**	**B**	**51**	**D**
		Westbound	15.9	B	21.7	C	--	--	--	--	28.1	C	27.8	C
		Northbound	26.6	C	26.3	C	--	--	--	--	17	B	19.5	B
		Southbound	7.2	A	20.8	C	--	--	--	--	14.6	B	74.5	E
New Mexico Avenue & Commuter Lot	Unsignalized (Stop)	Eastbound Left	8.4	A	8.7	A	--	--	--	--	3.8	A	6.6	A
		Southbound	16.3	C	15.2	C	--	--	--	--	12.5	B	12.9	B
Nebraska Avenue & 45th Street	Unsignalized (Stop)	Southbound Left	--	--	--	--	--	--	--	--	1.4	A	0.9	A
		Northwest	--	--	--	--	--	--	--	--	9.3	A	9.8	A
Nebraska Avenue & Rockwood Parkway	Signalized	**Overall**	**15.4**	**B**	**16.5**	**B**	**--**	**B**	**--**	**C**	**13.7**	**B**	**13.6**	**B**
		Eastbound	38.1	D	48.8	D	--	--	--	--	36.7	D	41.1	D
		Westbound	30.6	D	38.1	D	--	--	--	--	37.1	D	38.2	D
		Northbound	12.7	B	11.5	B	--	--	--	--	12.5	B	11.3	B
		Southbound	9.2	A	10.4	B	--	--	--	--	6.9	A	7.1	A
Rockwood Parkway & Fletcher Gate	Unsignalized (Stop)	Eastbound Left	8.1	A	8	A	--	--	--	--	0.8	A	1	A
		Southbound	13.6	B	12.5	B	--	--	--	--	10.8	B	12.4	B
Rockwood Parkway & Glenbrook Road	Unsignalized (Stop)	**Overall**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**8.2**	**A**	**7.8**	**A**
		Eastbound	--	--	--	--	--	--	--	--	8.2	A	7.8	A
		Westbound	--	--	--	--	--	--	--	--	7.6	A	7.8	A
		Southbound	--	--	--	--	--	--	--	--	8.6	A	7.9	A

Summary of Existing Capacity Analysis Results

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "D" or better on each approach. The following approaches operate at unacceptable LOS during either the morning or afternoon peak period:

- Eastbound Right at Massachusetts Avenue Eastbound & Nebraska Avenue Southbound
- Southbound at Nebraska Avenue & New Mexico Avenue

The results from the capacity analyses confirm what was observed in the field.

- All of the study intersections operate at acceptable conditions during both the morning and afternoon peak hours.
- The eastbound approach at Ward Circle (Massachusetts Avenue and Nebraska Avenue) experiences an unacceptable amount of delay during the morning peak period. This was observed in the field, with vehicles queuing in the eastbound approach due to heavy southbound traffic within the circle.
- The southbound approach at Nebraska Avenue and New Mexico Avenue experiences and unacceptable amount of delay during the afternoon peak hour. This was observed in the field, with southbound vehicles queuing due to vehicles turning left onto New Mexico Avenue.

<u>Comparison of 2008 and 2000 Capacity Analysis Results</u>

The results of the existing capacity analysis show some notable changes from the capacity analysis performed for the 2000 Master Plan. Several intersections did not experience a significant change in LOS for the comparison between the 2000 and 2008 capacity analyses. These include the following intersections:

- Nebraska Avenue & Commuter Lot
- New Mexico Avenue & Commuter Lot
- Nebraska Avenue & Rockwood Parkway
- Rockwood Parkway & Fletcher Gate

The following intersections experienced changes in LOS between the 2000 and 2008 capacity analyses:

- Massachusetts Avenue & 46th Street/Tilden: Morning peak hour overall LOS improved from LOS C in 2000 to LOS B in 2008.
- Massachusetts Avenue & 46th Street/University: Morning and afternoon peak hour northbound LOS improved from LOS F in 2000 to LOS B in 2008.
- Massachusetts Avenue & Nebraska Avenue (Ward Circle): Morning and afternoon peak hour LOS improved from LOS E/F in 2000 to LOS B/C in 2008 at the signalized intersections within Ward Circle.
- Massachusetts Avenue & Glover Gate/Katzen Arts Center: Afternoon peak hour overall LOS degraded from LOS B in 2000 to LOS C in 2008.
- Nebraska Avenue & New Mexico Avenue: Afternoon peak hour overall LOS degraded from LOS C in 2000 to LOS D in 2008.

Changes in LOS between the 2000 and 2008 capacity analyses could be due to several factors, including changes in traffic volumes and traffic patterns, as well as changes to signal timings. Volume increases are generally shown along Nebraska Avenue south of Ward Circle, New Mexico Avenue east of Nebraska Avenue, and Rockwood Parkway east of Nebraska Avenue. Volume decreases are generally shown along Massachusetts Avenue west of Ward Circle and Rockwood Parkway west of Nebraska Avenue.

Changes in LOS at Glover Gate can be attributed to the construction of the Katzen Arts Center Parking Garage. Changes in LOS for Ward Circle appear to be due to a general decrease in volume within the circle on both Massachusetts Avenue and Nebraska Avenue, as well as an improvement to the signal timings. It is also noted that all left-turns within Ward Circle have been prohibited. This improves the flow of the traffic circle by directing all vehicles executing left-turns around the circle.

<u>Comparison of 2008 and 2005 Capacity Analysis Results</u>

The results of the existing capacity analysis show some changes from the capacity analyses performed for the 2005 SIS Parking Study. The SIS Parking Study consisted of 4 study intersections near campus. The changes in LOS are outlined below.

- Massachusetts Avenue & Glover Gate/Katzen Arts Center: Afternoon peak hour overall LOS degraded from LOS B in 2005 to LOS C in 2008.
- Nebraska Avenue & New Mexico Avenue: Afternoon peak hour overall LOS degraded for LOS C in 2005 to LOS D in 2008.
- Nebraska Avenue & Rockwood Parkway: Afternoon peak hour overall LOS improved from LOS C in 2005 to LOS B in 2008.

Changes in LOS between the 2005 and 2008 capacity analyses could be due to several factors, including changes in traffic volumes and traffic patterns, as well as changes to signal timings. Similar to the capacity analysis performed for the 2000 Master Plan, the LOS at Massachusetts Avenue and Glover Gate/Katzen Arts Center degraded in the afternoon peak hour from LOS B in 2005 (and 2000) to LOS C in 2008. This is most likely due to the construction of the Katzen Arts Center Parking Garage. Also similar to the 2000 capacity analysis, LOS at the intersection of Nebraska Avenue and New Mexico Avenue for the afternoon peak hour degraded from LOS C in 2005 (and 2000) to LOS D in 2008, which could be due to volume increased on Nebraska Avenue and New Mexico Avenue.