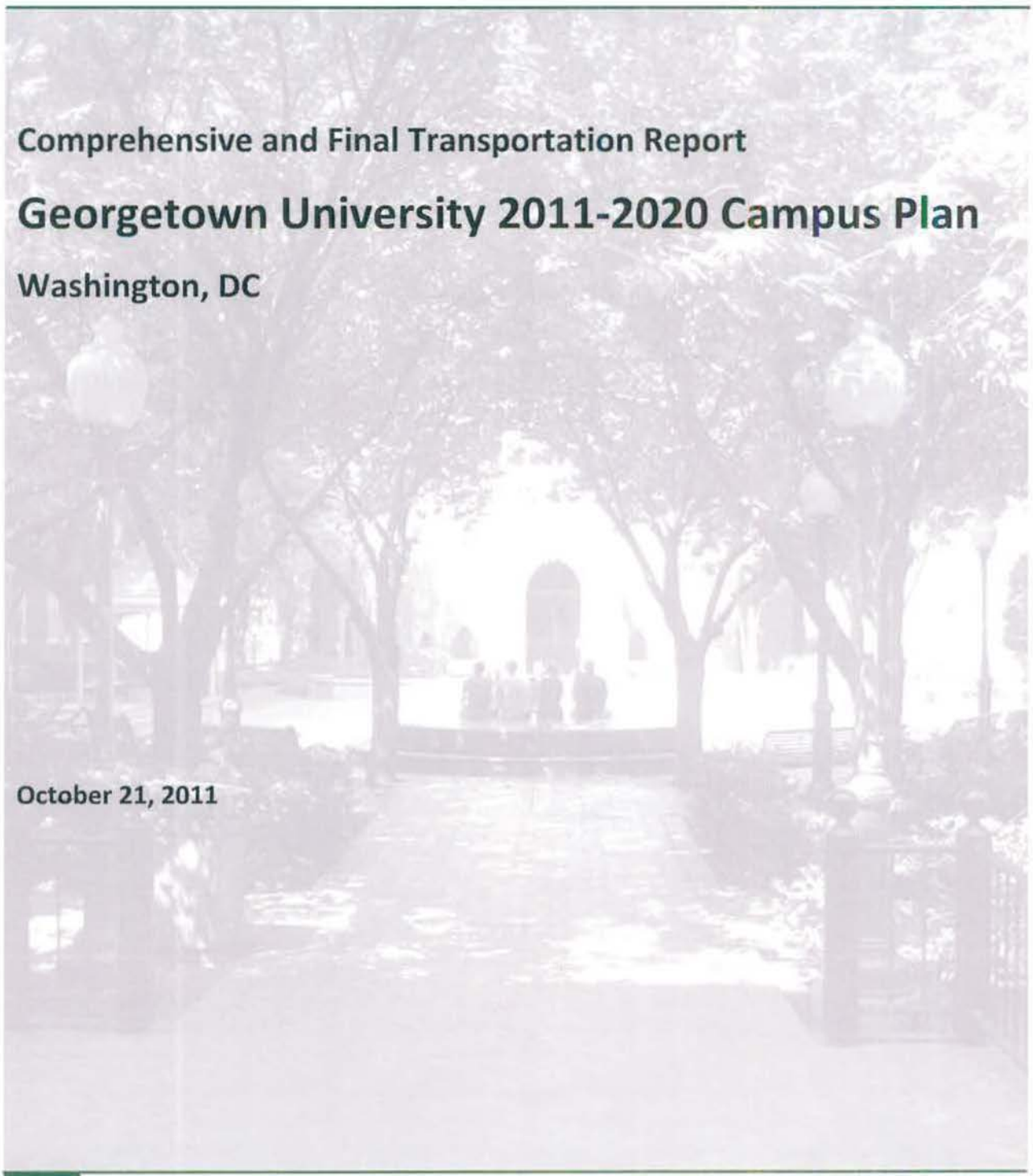
Comprehensive and Final Transportation Report

Georgetown University 2011-2020 Campus Plan

Washington, DC



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EXECUTIVE SUMMARY

The following report demonstrates that the proposed Georgetown University 2011-2020 Campus Plan will not have an objectionable impact on the surrounding residential neighborhoods due to traffic or parking. As is discussed in detail herein, both the University and the Hospital have been successful in implementing Transportation Demand Management ("TDM") programs that significantly reduce single-occupancy vehicle trips to and from campus by students, faculty, and staff. Multiple data points collected by the University and Gorove/Slade demonstrate this effectiveness.

- Mode split data demonstrates, across the board, that more students, faculty, and staff are using transit, biking, and other means to get to campus than driving. Transit use exceeds the regional average for the "inner ring" Washington area, which is particularly notable given that the campus is not located immediately adjacent to a Metrorail station.
- Key to this success is the Georgetown University Transportation System ("GUTS"), which carries over two million University and Hospital users per year and provides a direct, express, and free connection to two Metrorail stations as well as other key destinations.
- Trip generation from the southern side of campus has decreased over the last decade.

The proposed Campus Plan calls for continued implementation of these TDM efforts and incorporates significant additional enhancements that will further promote transit, walking, and biking use as well as deter single-occupancy vehicle use and its related traffic and parking impacts.

Overview of the Plan

The 2011 Campus Plan calls for modest physical development and population changes. University improvements include those intended to improve the on-campus student experience, improved athletic facilities, and critical facility improvements to the Medical Center (which is the academic center for research and teaching). Many of these improvements were previously approved in the prior Campus Plan and have been carried forward to the 2011 Plan. Hospital improvements consist solely of previously-approved developments located on the surface parking lots adjacent to the Hospital; these are also carried over from the prior Campus Plan.

The University and Hospital each anticipate a 10% growth in faculty and staff over the life of the Plan.

The University also proposes a targeted increase in the overall student enrollment, on a headcount basis, from approximately 14,033 students to approximately 15,000 students. In addition, the University proposes to locate 1,000 School of Continuing Studies (SCS) students at one or more satellite locations by December 31, 2013. These student population changes will have a positive transportation impact for the reasons discussed herein.

The Campus Plan also includes significant transportation changes that support the University and Hospital commitment to TDM and a pedestrian-friendly campus. Most prominent is a proposed on-campus turnaround for GUTS buses near Harbin Hall, which will allow for buses to turnaround on campus and improve service to campus populations. The turnaround will also permit GUTS routes to enter and exit campus from Canal Road, significantly reducing GUTS traffic on neighborhood streets compared to current operating conditions. The proposed turnaround directly addresses a major concern of ANC 2E and the Georgetown/Burleith neighborhoods, and its proposed location responds to ANC 3D and Foxhall's predominant critique of the Plan.

Transportation Analysis and Recommendations

The comprehensive technical analysis included herein concludes that the proposed campus plan will not have an adverse impact on the operation of the surrounding transportation network. The scope, methodology, and assumptions undergirding this analysis were developed in close consultation with and based on direction from DDOT over a series of meetings, calls, and correspondence during Summer 2011. All prior concerns raised by DDOT and other parties have been addressed in this analysis.

This report also provides detailed analysis of a number of key transportation initiatives related to the 2011 Campus Plan. Again, these evaluations were developed in collaboration with DDOT officials and meet or exceed the level of analysis ordinarily conducted at the campus planning stage. As is discussed herein, many of these initiatives will be further evaluated and refined during the transportation studies that will accompany the final approval of individual developments in the campus plan (i.e. "further processing" of the approved plan). Future studies will also include additional details on loading access, pedestrian accommodations, and vehicular and bicycle parking locations and amounts.

Three particular recommendations regarding the surrounding road network are highlighted and analyzed in the report. After DDOT completed its review of the report, it asked the University to consider certain actions related to these recommendations. The University is actively evaluating these requests, and will provide DDOT with a response in advance of the submission of its report to the Zoning Commission. In summary:

- **Canal Road AM Left Turns**. The positive transportation impact of the proposed Harbin Turnaround (i.e. the reduction in the number of GUTS trips on neighborhood streets) is discussed in the Report. Once the turnaround is completed, lifting the restriction on left turns during the AM peak period at the Canal Road entrance will allow for GUTS routes to use this exit at all times. This change will eliminate GUTS routes on Prospect Street and Q Street. As analyzed and discussed herein, removing the left-turn restriction will not have an adverse or negative impact on through traffic in the Canal Road corridor.

  In response to DDOT's request, the University has agreed to limit left turns during the AM peak period (6:15 AM to 10:15 AM) to GUTS vehicles only, and will implement operational measures to ensure that only GUTS vehicles are able to make left turns during this time period. DDOT has also indicated that, should it permit such turns on a pilot basis, it would require the University to assess the actual impact of the change through annual monitoring evaluations in order to confirm that the AM turning activity be permitted to continue.

- **38th Street/Gate #1 & Reservoir Road Intersection**. As requested by DDOT, the University has continued to evaluate the operation of the intersection of 38th Street/Gate 1 and Reservoir Road. The capacity analysis suggests that a westbound left turn lane at this intersection may be needed to accommodate turning traffic, and the current alignment of this off-set intersection could present potential safety concerns based on available crash data. The report calls for any future study to also address concerns regarding potential cut-through traffic related to the new aligned intersection.

  DDOT has asked the University to consider implementing the left turn lane within one year following the approval of the Campus Plan. DDOT has also asked the University to undertake annual evaluations of the intersection following the completion of the left turn lane in order to assess whether further improvements to the intersection may be required and, if they are required, implement those improvements. The University is evaluating these requests.

- **Gate #3 & Reservoir Road Intersection**. The capacity analysis in the report suggests that future growth could lead to unacceptable delays for traffic exiting the campus from Gate #3 onto Reservoir Road during the AM peak hour. These delays only impact University and Hospital-related traffic leaving the campus, which is heavily reliant on the availability of gaps in traffic along Reservoir Road to make turns. Because a capacity analysis is inherently unable to capture and assess the ability of drivers to use such gaps in traffic, the report also includes an analysis of simulations that modeled such activity. The simulations concluded that the forecasted delays may not actually materialize, because adequate gaps for traffic will be available.

  DDOT has asked the University to undertake annual evaluation of the intersection through a signal warrant analysis in order to determine whether signalization is required in the future and, if it is required, implement the design and construction of the signal. The University is evaluating this request.

In addition to the improvements discussed above, this report also addresses a number of policy and operational changes that have been included in the Campus Plan to promote the use of non-automobile modes of transportation and otherwise address neighborhood concerns. Key provisions include:

- Continuation of the current parking cap of 4,080 spaces on campus;
- Measures that minimize the parking impacts of students, including limits that do not permit daytime commuter students to park on campus, prohibit students who reside in University housing from bringing cars to campus or the surrounding neighborhood, and require students who reside off-campus near the University to adhere to District regulations regarding car ownership and registration;
- Operation of a new late-night weekend transportation shuttle from the commercial areas of Georgetown to campus that accesses the campus via the Canal Road entrance from M Street;
- Continue collaborative efforts with DDOT to establish Capital Bikeshare stations near campus as well as efforts to bring potential carsharing spaces to the campus;
- Continued efforts to manage the transportation impacts related to campus events; and
- Annual monitoring and reporting on key transportation data to assess the continued efficacy of these TDM measures.

Process

Immediately following the June 20 Public Hearing, University representatives met with DDOT to discuss and resolve the content, assumptions, schedule, and expectations for the final transportation report. Through a series of meetings, calls, and other exchanges over the summer, the University and DDOT reached agreement on all of these issues, including the overall scope and methodology for the capacity analysis as well as the level of detail for the analyses of related issues such as the Canal Road left turn and the 38th Street intersection alignment. The parties also agreed to the following schedule, intended to provide opportunity to review the detailed analysis and address concerns:

- Week of Sept. 19-23: Conduct revised counts.
- Friday, Oct. 7. GU to submit final transportation report and meet to review content.
- Monday, Oct. 17. DDOT submit comments on final report to GU and meets to review comments.
- Friday, Oct. 21. GU to submit revisions or amendments to final transportation report in response to DDOT, as needed. GU to a so submit report to the Commission and copy all parties

- Friday, Oct. 28. GU to provide final response / comments on proposed mitigation measures
- Thursday Nov. 17. Zoning Commission Public Hearing

The University submitted the transportation report to DDOT on October 7. On October 19, DDOT officials provided the University with comments on the report, which consisted of (1) minor clarifications of technical issues and (2) consideration of certain actions related to the key recommendations of the report, which are discussed in detail above. The University has addressed the minor clarifications in this report, submitted to DDOT on October 21. The University's response to DDOT's additional considerations will be provided to DDOT in memorandum form on October 28. Copies of both the report and the memorandum will be provided to the Zoning Commission and the parties at the same time as they are provided to DDOT.

1: INTRODUCTION & SITE REVIEW

This report presents the findings of a Transportation Impact Study (TIS) performed for the Georgetown University 2011-2020 Campus Plan. Georgetown University's (GU) main entrance is located at 3700 O Street, NW in Northwest Washington, D.C. Figure 1 shows the location of Georgetown University, within the Georgetown neighborhood of the District of Columbia, and across the Potomac River from the Rosslyn neighborhood of northern Virginia. The University's campus has approximately 14,033 students and 4,035 faculty/staff. Georgetown Hospital is located on the north side of campus, with 609 licensed beds (350 operating beds) and a population of approximately 4,269 staff. The proposed 2011 Campus Plan focuses on enhancements to the University campus intended to improve the on-campus student experience, including the creation of new student spaces, including a student center at New South, the expansion of Lauinger Library, and improved athletic facilities. The 2011 Campus Plan also calls for critical facility improvements to both the Hospital and the Medical Center, which is the academic center for research and teaching. Many of these improvements were previously approved under the prior Campus Plan and are being carried over to the 2011 Plan.

Figure 1: Location of Georgetown University

This report contains three sections as follows:

- *Introduction & Site Review*
  This section provides a summary of major transportation features near and adjacent to Georgetown University. This includes reviewing roadways, transit facilities, bicycle facilities, and pedestrian facilities. This section contains information on the site to help establish a reference for the following sections.

- *Overview of 2011 Campus Plan*
  This section provides a summary of the transportation components of the 2011 Campus Plan. This section is meant to supplement the details provided in the *Georgetown University 2010-2020 Campus Plan* application. Although many of the on-site details for each piece of development on the campus will be determined in further processing applications, this section reviews such items as the transportation infrastructure changes proposed in the 2011 Campus Plan and the Transportation Demand Management (TDM) program for the University and the Hospital.

- *Technical Analysis*
  This section provides a review of the potential impacts of the development of the 2011 Campus Plan on the surrounding transportation network. Included is an analysis of future roadway capacity, examination of on-street parking availability in the neighborhoods adjacent to the campus, and a review of crash data and potential impacts.

1.1 Site Location and Major Transportation Features

This section details the existing condition of transportation facilities and services at Georgetown University and the surrounding neighborhood. The University's main campus has approximately 14,033 students and 4,035 faculty/staff. Of these, over 5,000 undergraduate students live in University housing on or adjacent to the campus. In addition, over 1,000 additional undergraduate students live in the neighborhoods immediately adjacent to the campus. Georgetown Hospital is located on the north side of campus, with 609 licensed beds (350 operating beds) and a population of approximately 4,269 staff.

Georgetown University is located in the northwest portion of Washington, DC, in Ward 2. The University is located in an area of the district that is residential but also within short walking distance of the M Street/Wisconsin Avenue commercial corridor.

The location of the University, as shown previously in Figure 1, is primarily bounded by Reservoir Road on the north, Canal Road on the south, the Glover-Archbold Park on the west, and 37th Street on the east. The campus is served by the Whitehurst Freeway and several principal arterials, including MacArthur Boulevard, Canal Road, M Street, the Francis Scott Key Bridge, and Wisconsin Avenue. Additionally, the University is served by minor arterials, including Reservoir Road and Foxhall Road, and major collector roadways, including 37th Street, 35th Street, and Prospect Street. The University is also served by several public transportation sources, including Metrorail, Metrobus, and the DC Circulator. The University also provides free, direct, express, shuttle service to nearby Metrorail stations and other destinations through the Georgetown University Transportation System ("GUTS").

The campus is also served by a pedestrian network consisting of sidewalks and crosswalks along the local streets surrounding the campus. In addition to pedestrian accommodations, the campus is also served by the on- and off-street bicycle network, which consists of signed bicycle routes along local roadways and an existing multi-use trial.

Campus users arrive primarily by transit and to a lesser extent, by private automobile and neighborhood pedestrian and bicycle facilities. Pedestrian and bicycle demand and impacts are concentrated along neighborhood streets to the north and east of the campus, in particular Reservoir Road, and 35th, 36th, 37th, M, Prospect, N, O, and P Streets. Vehicular traffic demand is concentrated at the four north campus entrances on Reservoir Road, the south campus entrance on Canal Road, and a limited access entrance at Prospect Street. There is also some taxi and passenger pick-up and drop-off activity along 37th Street adjacent to the main gate and library.

Once on campus, nearly all persons rely on the pedestrian network to meet their mobility needs. Vehicular traffic between north and south access points is restricted by traffic control gates located in the center of campus and by the limited capacity and connectivity of the campus street network.

The University maintains an aggressive transportation demand management (TDM) program to reduce private automobile trips. Features of this program include the GUTS system, on-campus housing for the vast majority of undergraduate students, ample bicycle parking, benefits to encourage transit usage and carpooling, and satellite parking. Many amenities on-campus, such as restaurants, convenience stores, a bank, a bookstore, a coffee shop and student laundry rooms reduce the need to make off-campus trips. The Hospital also employs similar measures to reduce private automobile trips and encourage GUTS and transit use.

1.2 Roadways

As stated previously, the site is accessible via arterials, collector, and local streets. Regional access for the Georgetown University campus is provided primarily by Wisconsin Avenue, Whitehurst Freeway, Canal Road, and M Street. Local access is also provided by Foxhall Road, Reservoir Road, 39th Street, 38th Street, 37th Street, and Prospect Street. Figure 2 shows the street network hierarchy for the study area, as well as the average annual weekday traffic volumes for the most traveled roadways.

Gorove/Slade conducted field reconnaissance to obtain the existing lane usage and traffic controls at the intersections within the campus study area. The physical and service characteristics of the key roadways providing local site access are as follows:

- *Wisconsin Avenue*
  Wisconsin Avenue is a 4-lane arterial, with two to four travel lanes available at one time due to varying on-street parking regulations, located east of the Georgetown campus. DDOT classifies the roadway as a principal arterial north of M Street and a minor arterial south of M Street. Wisconsin Avenue has an average annual weekday volume of 19,800 vehicles north of M Street and 7,400 vehicles south of M Street. Within the limits of the study area, Wisconsin Avenue runs between Reservoir Road and M Street.

- *Whitehurst Freeway*
  Whitehurst Freeway is a 4-lane arterial located south of the Georgetown campus. DDOT classifies the roadway as a freeway/expressway with an average annual weekday volume of 31,200 vehicles. Within the limits of the study area, Whitehurst Freeway runs south from Canal Road.

- *Canal Road*
  Canal Road runs along the southern border of the Georgetown campus. Canal Road is a 4-lane arterial east of Foxhall Road and a 2-lane arterial west of Foxhall Road. DDOT classifies the roadway as a principal arterial with an

average annual weekday volume of 36,100 vehicles. Within the limits of the study area, Canal Road runs between Foxhall Road and Whitehurst Freeway.

- *M Street*

  M Street is a 6-lane arterial located along the southern border of the Georgetown campus. M Street operates with three eastbound lanes and two westbound lanes during the AM peak periods. During the PM peak periods, M Street operates with two eastbound lanes and three westbound lanes. During non-peak periods, parking is permitted in the outer lanes of M Street, thereby, reducing the number of travel lanes to four. DDOT classifies the roadway as a principal arterial with an average annual weekday volume of 24,200 vehicles. Within the limits of the study area, M Street runs between Whitehurst Freeway and Wisconsin Avenue.

- *Foxhall Road*

  Foxhall Road is a 4-lane arterial located west of the Georgetown campus; however, the majority of Foxhall Road operates as a 2-lane roadway due to on-street parking. At its intersections with Reservoir Road, MacArthur Boulevard, and Canal Road, on-street parking is restricted, thereby, providing an exclusive turning lane or an additional travel lane in each direction at these study intersections. DDOT classifies the roadway as a minor arterial with an average annual weekday volume of 19,800 vehicles south and 10,700 vehicles north of Reservoir Road. Within the limits of the study area, Foxhall Road runs between Reservoir Road and Canal Road.

- *Reservoir Road*

  Reservoir Road is a 4-lane arterial located along the northern border of the Georgetown campus. Generally, during the AM peak hour, Reservoir Road operates with two eastbound lanes and one westbound lane. During the PM peak hour, Reservoir Road operates with one eastbound lane and two westbound lanes. During non-peak periods, one lane of travel is available in each direction. DDOT classifies the roadway as a minor arterial. It has an average annual weekday volume of 17,700 vehicles west and 20,100 vehicles east of Foxhall Road. The average annual weekday volume is 17,800 vehicles between 39th Street and 38th Street and 9,700 vehicles east of 37th Street. Within the limits of the study area, Reservoir Road runs between Foxhall Road and Wisconsin Avenue.

- *39th Street*

  North of the Georgetown campus, 39th Street operates as a 2-lane roadway with an additional lane designated for on-street parking along the east side of the roadway. DDOT classifies the roadway as a local road. Within the limits of the study area, 39th Street runs north from Reservoir Road.

- *38th Street*

  North of the Georgetown campus, 38th Street operates as a 2-lane roadway with an additional lane on both the east and west sides of the roadway, which are designated for on-street parking. DDOT classifies the roadway as a local road. Within the limits of the study area, 38th Street runs north from Reservoir Road.

- *37th Street*

  North of the Georgetown campus, 37th Street operates as a 2-lane roadway with an additional lane designated for on-street parking along the east side of roadway. DDOT classifies the roadway as a collector road with an average annual weekday volume of 2,400 vehicles. Within the limits of the study area, 37th Street runs north from Reservoir Road.

- *Prospect Street*

  Prospect Street operates as a 2-lane roadway east of the Georgetown campus with an additional lane on both the north and south sides of the roadway, which are designated for on-street parking. DDOT classifies the roadway as a collector road with an average annual weekday volume of 3,200 vehicles. Within the limits of the study area, Prospect Street runs between 37th Street and Wisconsin Avenue.

1.2.1 Site Access and Circulation

Site access for the campus is provided by six gates that provide direct access to the campus. Figure 3 shows the primary access points on the GU campus. The primary access to the University is the Canal Road gate, which is located along the south side of campus. The gate is split into two roadways, with a stop-controlled outbound right-turn separated from a signalized intersection that provides full access inbound and a left-turn outbound from campus. Limited secondary access to the University is provided at the gate-controlled Prospect Street entrance, which is located at the southeast corner of campus. The nearby intersection at Prospect and 37th Streets is all-way stop-controlled. Access to the Hospital and the Medical Center is provided at four gates along the north side of campus along Reservoir Road. Gate # 1 is located at a signalized intersection that also regulates traffic from 38th Street, which is offset from the Gate #1 driveway. Gates #2, #3, and #4 are stop-controlled. North-south through traffic is not permitted on the campus. Drivers must enter on the side of the campus on which they plan to park.

The volume and routing of vehicles are constrained by the parking cap, traffic gates that restrict north-south through traffic, the campus' narrow streets and high pedestrian volumes. Figure 4 shows the internal roadway circulation and traffic controls for the Georgetown University campus.

Passenger and service drop-off and pick-up activity occurs throughout the campus. Figure 4 also identifies the most commonly used locations for passenger drop-off and pick-up and shipping and receiving facilities located throughout the campus. Deliveries to the University enter at Canal Road and deliveries to the Hospital and Medical Center enter from Reservoir Road. All deliveries take place within the current campus boundaries, on private streets. Trucks enter and exit the campus through the campus gates, requiring no stopping, quieting, or reverse maneuvers on public streets. No major changes to campus deliveries and servicing are included in the Campus Plan.

There are several locations and heavily used corridors where vehicular traffic and pedestrian flows intersect or overlap, such as Tondorf Road, North Road and along roadways adjacent to the Leavey Center and the Hospital.

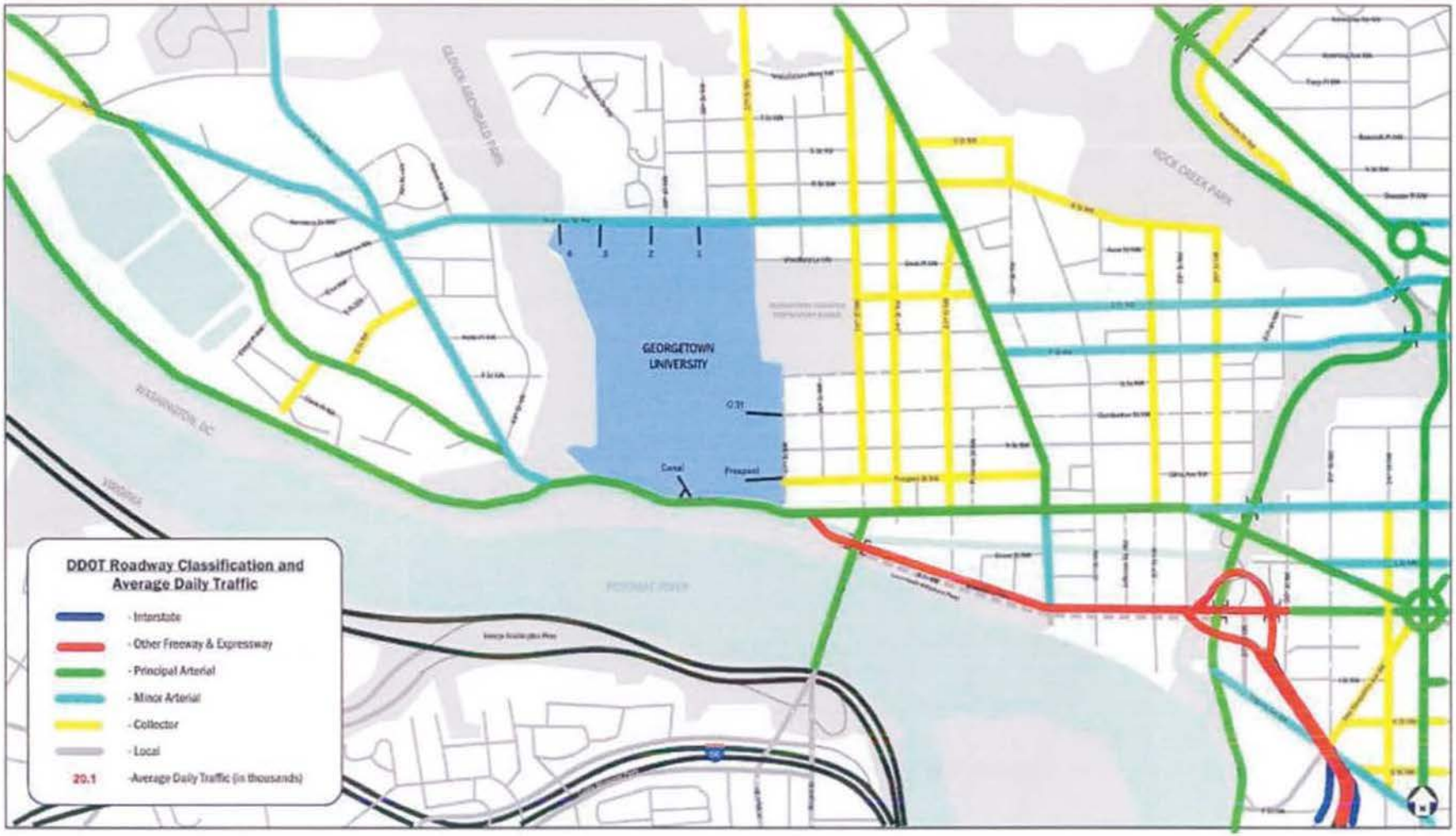

Figure 2: Functional Class and Average Annual Weekday Volumes

Figure 3: Site Access Locations for the GU Main Campus

Figure 4: Campus Circulation & Traffic Controls

1.3 Parking

The University and Hospital operate pursuant to a campus-wide parking cap that limits the total number of parking spaces to 4,080. The parking cap on campus is split between Hospital use (2,700 spaces) and University use (1,380 spaces). The cap was established in 1990 and has reduced the University and Hospital's traffic impact in the surrounding neighborhood by limiting the total number of cars that can travel to campus. Figure 5 identifies the location of major parking facilities on campus. Table 1 inventories the parking facilities on campus.

Table 1: GU Parking Facilities

Lot/Garage	Number of Spaces		Access Road
	University Use	*Hospital Use*	
3	43		Canal Road
6	20		P Street
8	16		Canal Road
9	78		Prospect Street
B-1	6		Reservoir Road
E	67		Reservoir Road
G	64		Reservoir Road
WM	10		Reservoir Road
Y	18		Canal Road
Garage 4	195		Canal Road
Leavey	398		Canal Road & Reservoir Road
Leavey		576	Reservoir Road
Southwest	465		Canal Road
Southwest		199	Canal Road
Garage 1		638	Reservoir Road
Garage 2		990	Reservoir Road
Lot A		169	Reservoir Road
Lot B		128	Reservoir Road
Total	**1,380**	**2,700**	

For the University, monthly parking fees for faculty and staff have increased significantly, 74% since the year 2000. The daily parking fee has also been increased, and is currently set at $18 for daily parking. No permits to park on-campus are provided to students and daytime commuter students must either take transit or park in off-campus satellite facilities (most take transit). Students attending evening classes are more likely to drive; they are charged only $3 to park on campus and the University has improved access to the Southwest Quad garage from Canal Road to encourage those evening students to park on campus rather than on neighborhood streets.

In order to gauge demand, parking surveys were performed of the University based parking facilities during a typical weekday during the spring 2011 semester. Table 2 shows the results of these surveys, including the peak demand observed for each lot by user type. Figure 6 shows a chart of University parking demand over a typical weekday. The Surveys demonstrated that, on a daily basis, the University parking approaches its practical capacity, defined as 90% of the total marked spaces. During times with high visitor activity, the University struggles to find parking locations for all of its guests.

Table 2: University Parking Demand

Parking Facility	Total Spaces	Peak Occupancy	Time at Peak
3	43	33	2pm
6	20	14	11am
W	10	13	7pm, 8pm
8	16	13	2pm
9	78	54	1pm
Lot Y	18	17	8am
Garage 4	195	145	2pm
Leavey (University Use)	398	344	2pm
SW (University Use)	465	416	12pm
Lot E	67	60	10am
Lot G	64	62	11am
Lot B1	6	6	3pm
Total	**1380**	**1136**	**2pm**

The Hospital has also undertaken and maintained successful efforts to manage its parking supply. Most notably, in response to changing patterns in employee and patient populations, the Hospital has established 14 satellite offices within the greater Washington area. This has, among other benefits, reduced the activity related to the physician's office building at the Hospital by 30%. The Hospital has also maintained relatively high parking rates for employees and visitors, which are currently among the highest rates for hospitals in the region, and has promoted non-auto alternatives such as GUTS and transit through its TDM efforts.

As a part of the campus planning process, the Hospital also measured its parking demand. The Hospital's spaces are distributed among four garages and two surface lots, which reduces the practical capacity and accessibility of the overall parking supply to approximately 75% of the total number of spaces. As with the University, the Hospital's peak parking demand exceeds its practical capacity, but the Hospital is able to address this shortfall through a carefully-managed valet system for patients and visitors, as well as temporary assignments of parking spaces for its employees. The effectiveness of the Hospital's parking management measures also correlate well with on-street parking supply near the Hospital, as reflected in parking usage survey results discussed in Section 3.2 of this report.

On-street parking in the residential neighborhoods adjacent to the campus is limited. The University and the Hospital have both developed policies and procedures to keep parking on nearby neighborhood streets related to campus activities to a minimum. These policies are discussed in detail on the TDM Matrix included with this report, and include pricing adjustments, improved gate access controls, and registration systems that ensure those eligible for campus parking can easily park on-campus.

In addition to University efforts to minimize on-street parking in the adjacent neighborhoods, District of Columbia residential parking restrictions limit the ability of University and Hospital populations to park in the neighborhood and therefore limit campus generated traffic on neighborhood streets. Most importantly, most of the residential neighborhood streets are marked as "Residential Permit Parking" only, which prohibits non-residents from parking on the street for more than two hours during the day and evening hours. These restrictions are strictly enforced to deter violators; according to data provided by DDOT and DPW, nearly 16,000 citations were issued in the West Georgetown and Burleith neighborhoods during a six-month period between October 1, 2010 and April 30, 2011. The streets immediately adjacent to the campus permit some metered parking. It should be noted that the close proximity of the West Georgetown neighborhood, in particular, to the retail and commercial corridors along M Street and Wisconsin Avenue also attract vehicles that park on neighborhood streets.

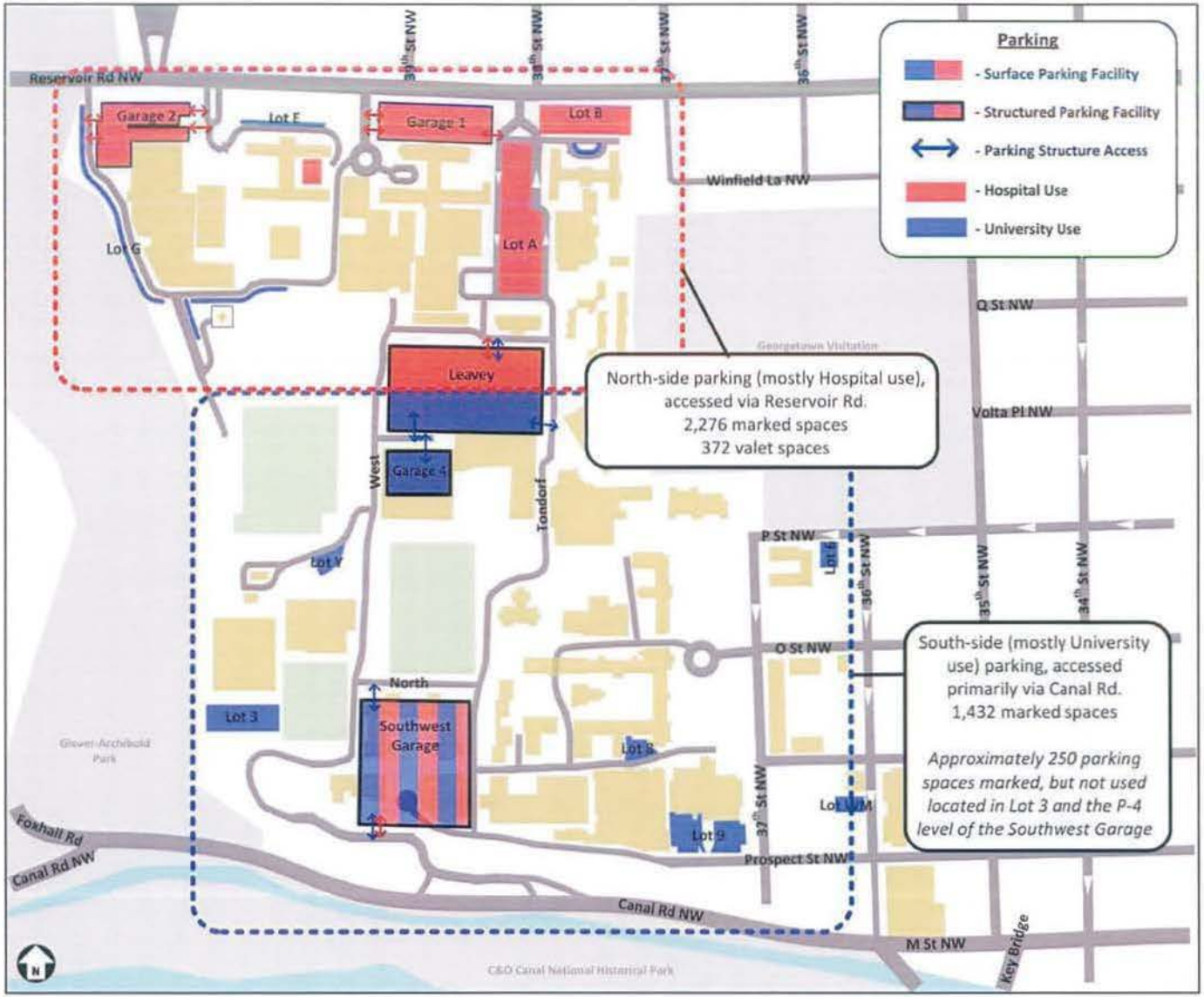

Figure 5: Existing Campus Parking Facilities

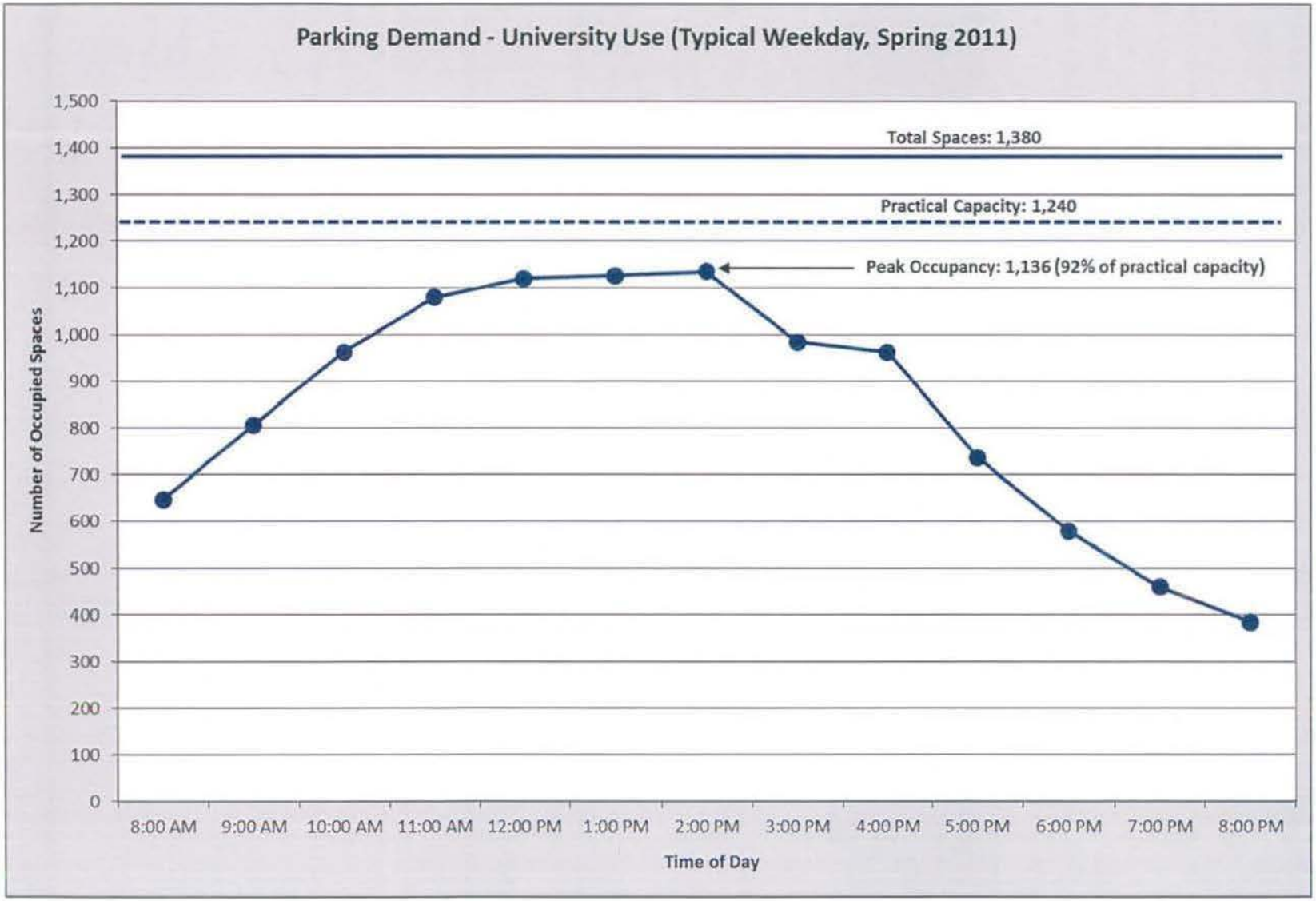

Figure 6: University Parking Demand

1.4 Mode Choice Survey

The University conducted a mode choice survey of the campus population during the spring 2011 semester. The survey was performed electronically and asked respondents about their travel patterns on a specific day. There were over 2,900 respondents. Table 3 summarizes the results of the survey.

The survey results demonstrate that campus populations using transit exceed the regional mode split. The 2010 State of the Commute Report identified the mode split for the "inner ring" of the DC area as 46% for "drive alone" and 34% for "transit." As shown below, GU employees have a mode split of 40% for transit (GUTS + Metrobus) and 46% for drive alone, which matches the regional split. GU students are even more likely to use transit, as over 66% identified GUTS and Metrobus as the mode of choice. This is **double** the regional average. Just as notably, only 21% of students identified "drive alone" as the mode of choice—less than **half** the regional average.

Table 3: Summary of Mode Choice Survey

Mode Split Breakdown	Automobile		Transit		Bike		Walk	Telework	Other
	Drive Alone	*Carpool, Drop-off & Taxi*	*GUTS (GUTS only or via other modes)*	*MetroBus*	*Bike*	*Capital Bikeshare*			
Overall Mode Choice	37.9%	5.0%	41.8%	6.9%	4.8%	0.3%	0.1%	0.8%	2.5%
Purpose on Campus									
Faculty/Staff	46.1%	6.9%	32.4%	7.2%	3.0%	0.2%	0.1%	1.3%	2.8%
Undergrad Student (commuters only*)	18.8%	1.0%	56.4%	9.9%	10.9%	1.0%	0.0%	0.0%	2.0%
Graduate Student	21.4%	3.1%	59.5%	7.4%	6.4%	0.2%	0.0%	0.2%	1.9%
Affiliation									
University	35.4%	3.7%	44.0%	7.9%	5.1%	0.3%	0.0%	0.9%	2.7%
Medical Center	41.3%	6.7%	40.9%	4.3%	4.3%	0.2%	0.2%	0.2%	1.8%

** Non-traditional undergraduates only; the vast majority of undergraduate students live on campus and most of the remaining students live in the adjacent residential neighborhoods and walk to campus.*

1.5 Georgetown University Transportation Shuttle

Georgetown University Transportation Shuttle (GUTS) was established in 1974 and provides express and limited-stop transit service for University and Hospital faculty/staff, students, patients and visitors. Shuttles travel between the campus and nearby Metrorail stations, Georgetown University Law Center, University off-campus offices, off-site parking, and North Arlington, VA. This service is provided free of charge and provides express service between campus and major destinations, which significantly reduces the travel time and contributes to high ridership. In 1990 GUTS provided 54,065 annual trips. Ridership has grown significantly since then; by 2000, ridership had increased to one million trips annually and in 2009, GUTS provided two million annual trips, which is comparable to Metrobus ridership along several corridors. Figure 7 illustrates annual ridership for each route between July 2008 and June 2009.

Combined with other TDM measures, GUTS significantly reduces private automobile trips to and parking demand at both the University and the Hospital, and removes approximately 7,750 vehicles per day from the road network. Figure 8 maps the neighborhood routes and stops and provides information on schedules and travel times for each route. Figure 9 maps the on-campus GUTS routes and stops.

Starting in Fall 2011, the University added a late night shuttle that provides transportation service from M Street commercial establishments back to the campus on Thursday, Friday, and Saturday nights. The shuttle route enters and exits campus from the Canal Road entrance, via M Street. The initial response has been very positive, and the shuttle is used by 400-500 students per night.

1.6 Transit

The Georgetown campus is served directly by several Metrobus routes as well as GUTS and is linked to Metrorail and other major destinations by these buses and shuttles. Figure 9 maps the Metrobus stops adjacent to the campus.

WMATA's Rosslyn Metrorail Blue and Orange Line station is located at 1850 N. Moore Street in Arlington, VA, approximately 1 mile from the Georgetown University Campus. The Dupont Circle Metrorail Red Line station is located approximately 1.5 miles from GU, adjacent to Dupont Circle. GUTS as well as Metrobus directly connect the campus to both Metrorail stations.

Several bus routes operated by WMATA and DDOT serve the study area surrounding GU. These bus routes connect the University with local WMATA Metrorail stations, downtown DC, and Virginia. Bus stops are located along Reservoir Road and at 37th and O Streets adjacent to the campus; they are also located along M Street and Wisconsin Avenue, south and east of the University, respectively.

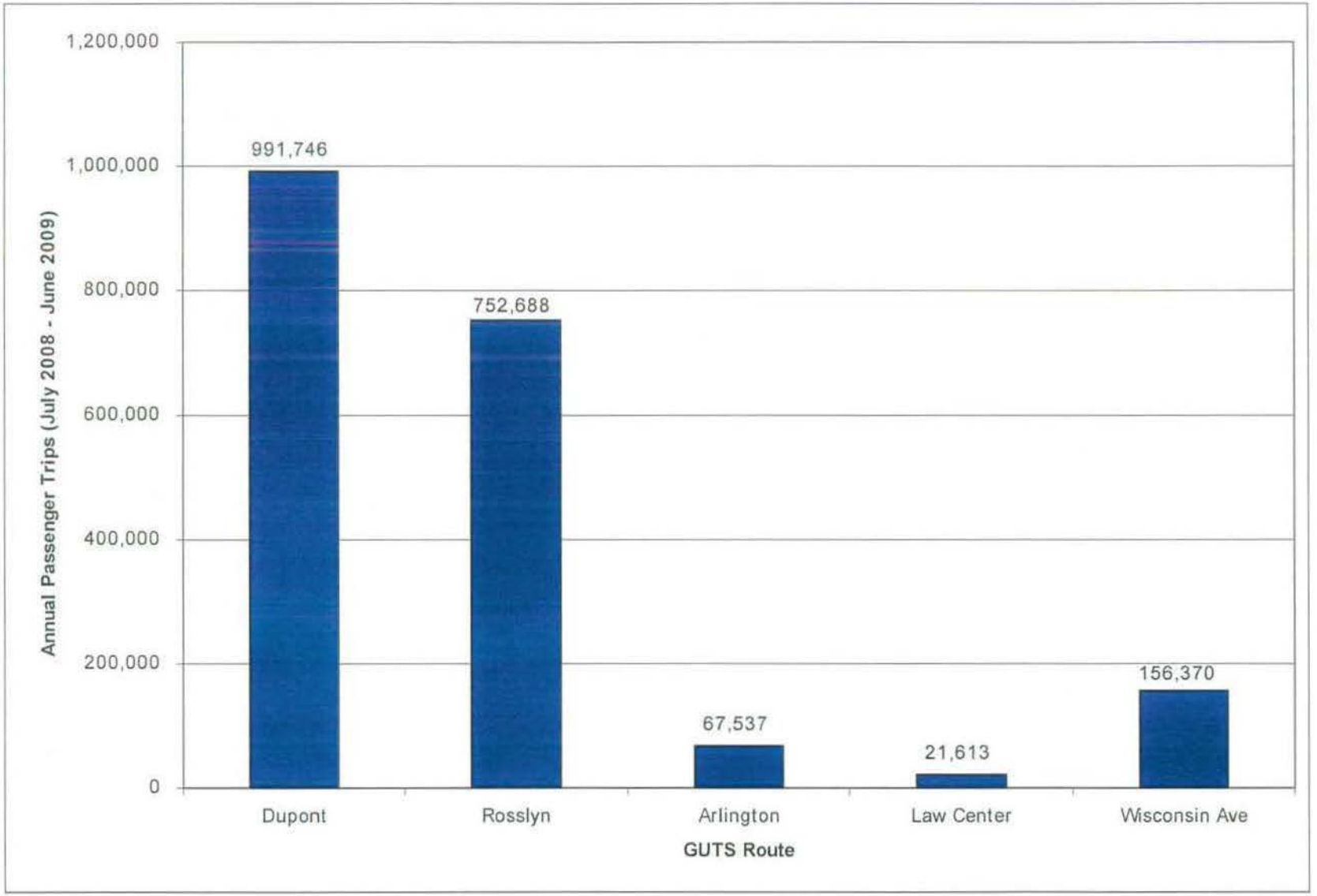

Figure 7: GUTS Ridership by Route

	Dupont Circle	Rosslyn	Wisconsin Avenue	Arlington Loop	Law Center
Days of Operation:	Mon-Sat	Mon-Sat	Mon-Fri	Mon-Fri	Mon-Fri
Headways:	5-20 minutes	5 minutes	10-20 minutes	5-7 minutes	60+ minutes
Route Time:	15-25 minutes	8 minutes	10 minutes	30 minutes	30 minutes
Annual Ridership:	991,700	752,700	156,400	67,500	21,600

Figure 8: GUTS Routes

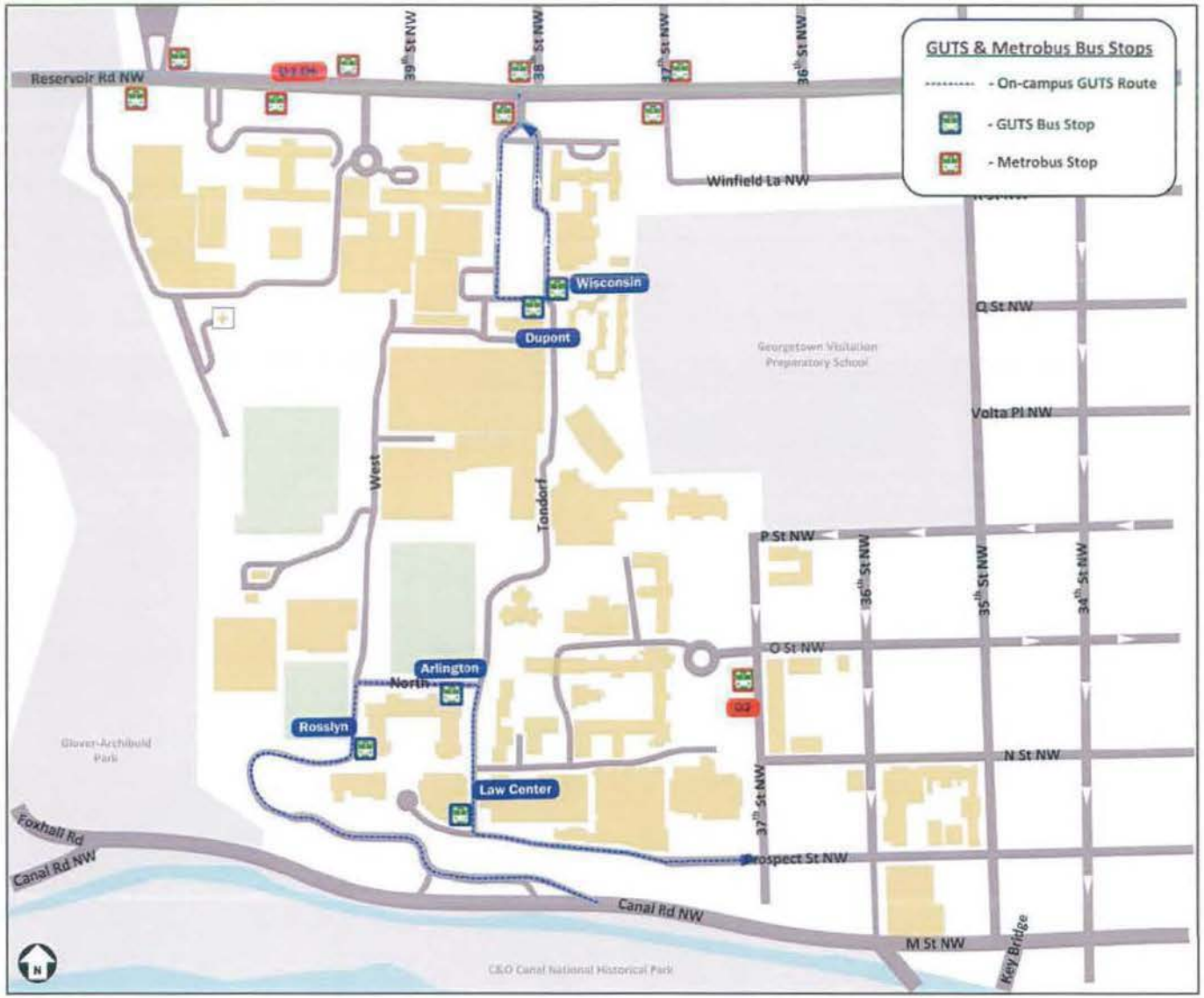

Figure 9: Bus Stops on and Near Campus

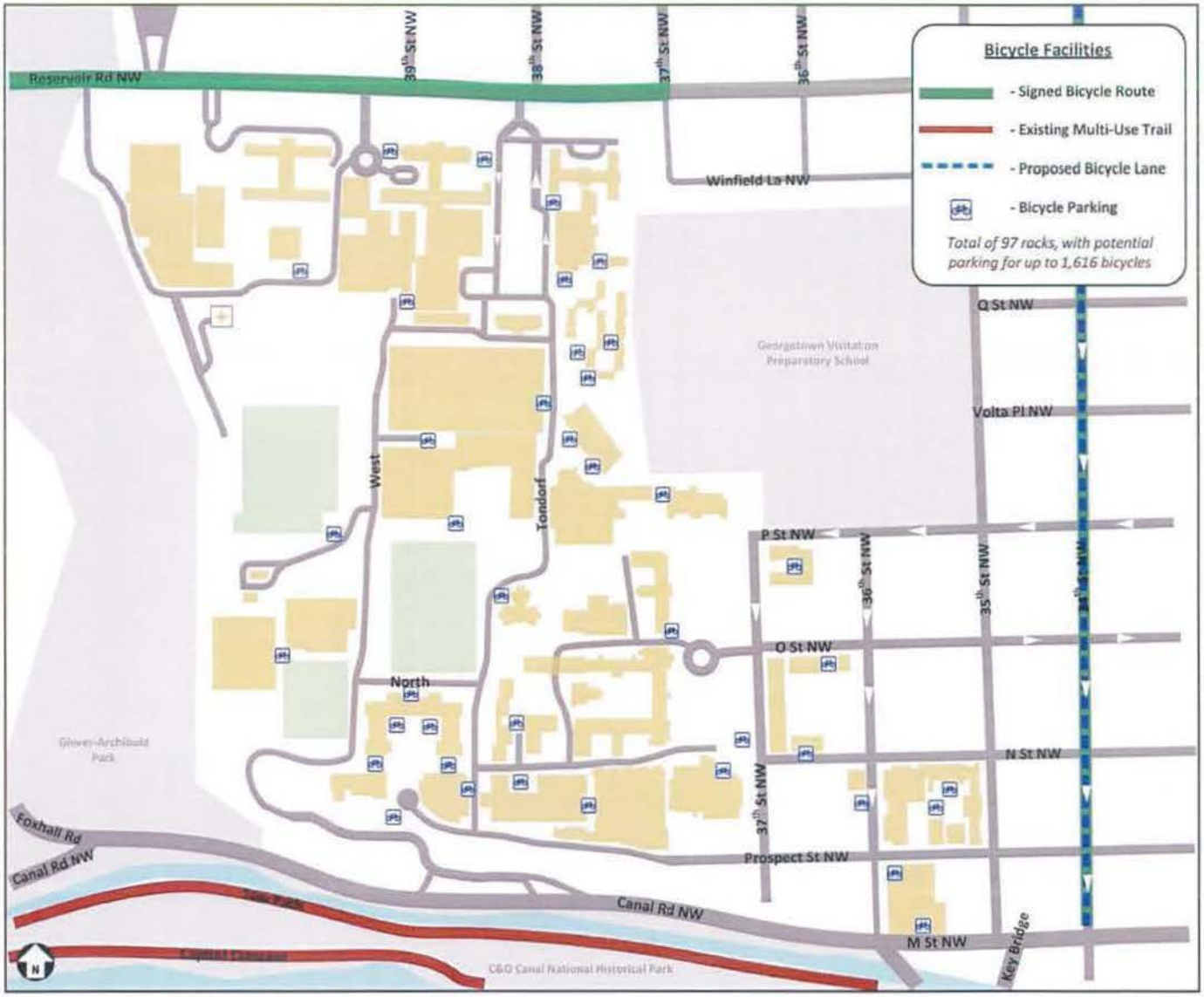

Figure 10: Bicycle Facilities on and Near Campus

To encourage transit use by employees, both the University and the Hospital offer WMATA SmartBenefits. This program enables employees to pay for monthly transit expenses with pre-tax dollars, up to $230 per month. Last year, 264 GU employees and 150 GUH employees took advantage of this program.

1.7 Bicycle Facilities

The University generates frequent bicycle traffic and high bicycle parking demand. Bicycling is an attractive travel option because of the compact size of the campus, the location and quantity of bicycle parking, and the proximity to neighborhood bicycle pathways, dedicated lanes, and off-street multiuse trails. Most bicycling is between campus and off-campus housing, retail, or recreational facilities. Figure 10 maps the bicycle routes serving campus and the location of bicycle parking on campus. (The bicycle routes are based on a 2008 District Department of Transportation District of Columbia Bicycle Map.)

Bicycle parking accommodating over 1,600 bicycles is located throughout campus, at all residence halls and at most other buildings. Some are located in covered parking garages, and the University also employs a bicycle registration program and allows use of recreation facility showers for commuting faculty and staff. The Hospital currently has 30 bicycle parking locations to accommodate the needs of its bicycle users.

The DC bike-sharing system, Capital Bikeshare, has one station located at GU outside the Main Gate at 37th and O Street NW and provides additional connectivity between the campus and major off-campus destinations for those who do not own a bicycle. Memberships to the Capital Bikeshare system are available on a yearly, monthly, or daily basis for a modest fee and the first 30 minutes of each trip on Capital Bikeshare is free. The University has subsidized a number of memberships as part of its Wellness programs.

1.8 Pedestrian Facilities

Georgetown University has a compact campus with high levels of pedestrian activity. Portions of the campus have excellent pedestrian facilities, such as the original, eastern area of campus and the recently completed Southwest Quadrangle. The pedestrian facilities in these areas provide dedicated pathways that give priority to pedestrians over vehicular traffic and provide direct links between pedestrian generators. Other sections of campus have inconsistent or incomplete pedestrian facilities and amenities, and conflicting uses and vehicular traffic reduce the quality and comfort of walking in these areas. Figure 11 maps pedestrian pathways on Campus.

1.9 Car Sharing

GU does not have car-sharing vehicles on-campus but there are several locations nearby with car-sharing provided by Zipcar. Six Zipcar vehicles are located near the Georgetown University Campus. GUTS provides direct service to the Rosslyn Metrorail station, where an additional four vehicles are available. Table 4 lists the car-sharing locations in the study area and the number of vehicles available.

Table 4: Carshare Location and Vehicles

Carshare Location	Number of Vehicles
Wisconsin Avenue & 33rd Street NW	1 vehicle
Wisconsin Avenue & O Street NW	5 vehicles
Rosslyn Metro at N. Lynn Street	4 vehicles
Total Number of Carshare Vehicles in Study Area	**9 vehicles**

Figure 11: Main Campus Pedestrian Paths

2: OVERVIEW OF 2011 CAMPUS PLAN

This section of the report summarizes the transportation components of the Georgetown University (GU) 2011-2021 Campus Plan, and lists the transportation recommendations of the plan including Transportation Demand Management (TDM).

Before presenting details on the campus plan, background information on the campus transportation is presented including the transportation constraints and trends since the prior Campus Plan. These constraints and trends helped form the basis for many of the strategies and recommendations contained within the Campus Plan.

2.1 Constraints

University and Hospital transportation facilities have developed under a series of physical and legal constraints that have impacted campus transportation facilities and services. These constraints consist of physical and historic conditions on-campus and in the neighborhood, legal conditions established by prior Board of Zoning Adjustment orders, and conditions implemented by the University based on interactions with the surrounding neighborhoods.

Key constraints include the following:

- *Topography*: The campus has two distinct elevations between east and north campus and south and southwest campus. The elevation change between these two sections of campus impacts transportation conditions for pedestrians.
- *Campus size (104 acres)*: Georgetown University is a compact, urban campus. The location and density of buildings results in limited space for transportation facilities such as bus turnaround locations but also creates opportunities to create a highly walkable campus.
- *On-campus roadway configuration and capacity*: The campus has a limited number of roadways, many of which are narrow or have other constraints that limit the mobility of vehicles on campus. Many roadways also have heavy pedestrian traffic, which slows vehicular traffic.
- *Left turn restriction*: Left turns are prohibited onto Canal Road from the south entrance during the morning commuter peak period (6:15 am – 10:15 am); this restriction requires that traffic exiting south campus and traveling east must use Prospect Street while this turn restriction is in place. This restriction currently limits options for routing vehicle traffic and shuttle routes during the AM peak period.
- *On-campus parking cap (4,080) and neighborhood parking restrictions*: The parking cap limits the volume of traffic traveling to the campus and caps the supply of parking. The cap also elevates the importance of other modes and services to ensure that there is effective and efficient access to the campus.
- *Restricted travel routes between north and south campus*: To deter traffic from traveling between Canal Road and Reservoir Road via campus roadways, the University has installed traffic control gates on all north-south roads. While this prevents cut-through traffic, it also impacts campus vehicle routing and circulation options.
- *Prospect Street must remain open as a campus entrance*: To ensure ingress and egress routes from the south, the University is required to have an entrance to the Campus on Prospect Street.
- *Restricted event schedules*: To prevent event traffic from affecting commuter traffic, the times for certain events are restricted.

2.2 Transportation Trends

Gorove/Slade has several sets of parking and traffic data collected at the Georgetown Campus, collected during this campus plan update process, during the previous campus plan update, and for other traffic studies performed for the GU Campus dating back to the 1980s. This section uses these data sets to review trends in the GU campus GUTS, traffic and parking patterns.

As discussed below, the trends indicate that the University's extensive TDM program has been successful in deterring single-occupancy vehicle trips to and from campus by students, faculty, and staff. Multiple data points collected by the University and Gorove/Slade demonstrate this effectiveness.

- A campus wide survey regarding mode choice demonstrates decreases across the board in the percentage of students, faculty, and staff that are driving to campus and increases in the percentage of students, faculty, and staff that are using transit, walking, biking, and other means to get to campus.
- The number of riders per year on the GUTS system has doubled from one million in 2000 to two million in 2010.
- Trip generation from the southern side of campus (i.e. the primary access point for University populations) has decreased over the last decade.
- Similar efforts by the Hospital have also been successful in increasing the use of alternatives to single-occupancy vehicles, particularly by Hospital staff.

2.2.1 Mode Split

The University conducted a mode split survey of its population during the spring 2011 semester. A description of the 2011 survey results is contained in the background information chapter of this report. The prior campus plan also conducted a mode split survey. Table 5 shows a comparison of the two.

Table 5: Comparison of 2000 and 2011 GU Mode Splits

Mode	Survey Results by Type of Respondent, for 2000 and 2011							
	Undergrad Student		Graduate Student		University Faculty/Staff		Medical Faculty/Staff	
	2000	*2011*	*2000*	*2011*	*2000*	*2011*	*2000*	*2011*
Car (Drive alone, Carpool, Drop-off & Taxi)	7%	4%	37%	24%	62%	51%	63%	52%
Transit (GUTS, Metrobus, Metrorail, DC Circulator)	2%	13%	18%	67%	29%	41%	28%	43%
Other (Bike, Walk, Telework, Lives on Campus)	91%	83%	45%	8%	9%	8%	9%	5%

The results of the mode choice survey show that GUTS has replaced driving alone as the primary mode choice for the campus population as a whole. No campus user-group has a drive alone mode choice over 50%. Each type of respondent had a decrease in automobile use, accompanied by an increase in transit use, which indicates that the TDM programs implemented on campus have allowed for growth in campus population without a corresponding increase in traffic and parking demand. The percentage of campus populations using transit also exceeds regional averages.

2.2.2 GUTS Ridership

In 2009, GUTS provided two million annual trips, which is comparable to Metrobus ridership along several corridors. The tremendous growth in GUTS ridership over the last twenty years indicates that the University and Hospital programs to reduce reliance on automobile traffic are working. GUTS has supplanted 'drive alone' as the top mode choice of the GU campus population.

2.2.3 Trip Generation

Figure 12 shows the total trip generation of the Georgetown campus from 2000 to 2011, based on data collected during the prior and current campus plan processes. The trip generation is presented as a total between the AM and PM peak hours, and shown as a cumulative total between the northern and southern driveways. Figure 13 shows trends in trip generation on the southern side of campus, generally served by University related traffic, since 1982, based on count data tracked over the past three decades.

These charts show that the overall number of vehicular trips generated by the campus that overlap with the commuter peak hours is nearly the same as it was in 2000. The proportion using southern driveways, generally University related, has been decreasing, which shows that the University's programs to reduce automobile use have been effective. The proportion using northern driveways (generally Hospital related) has been increasing. The mode split results for Hospital faculty and staff demonstrate, however, that the Hospital has been successful in reducing automobile use for its employees. The increase in the proportion of traffic using the gates on the hospital side of campus is likely attributable to an increase in the number of patients and visitors generated by the Hospital.

2.2.4 Parking Demand

The current typical weekday parking demand at the campus is 3,591 parking spaces. A similar count of typical weekday demand taken in 2000 for the prior campus plan found a typical demand of 3,596 spaces. Comparing these count results demonstrates that the amount of vehicles parking at the University has remained essentially the same between campus plans.

Note, however, that latent demand is not represented because the number of vehicles parking on campus is limited by the practical capacity of the parking supply. As detailed earlier in this report, parking demand at Hospital is regularly higher than the practical parking capacity, and the University does not have enough visitor parking available to handle special events or other days with high-visitor demand.

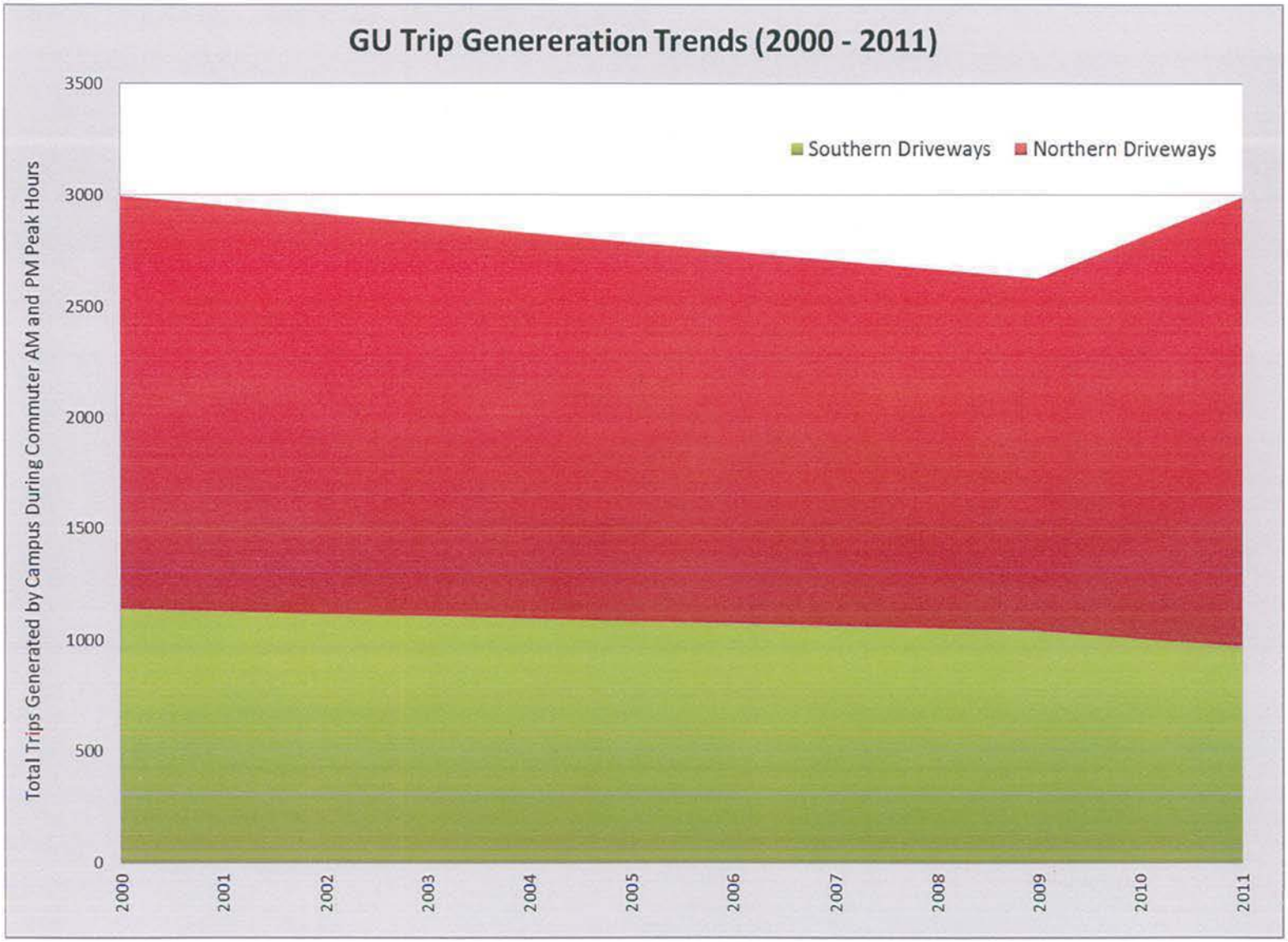

Figure 12: Trip Generation Trends (2000 to 2011)

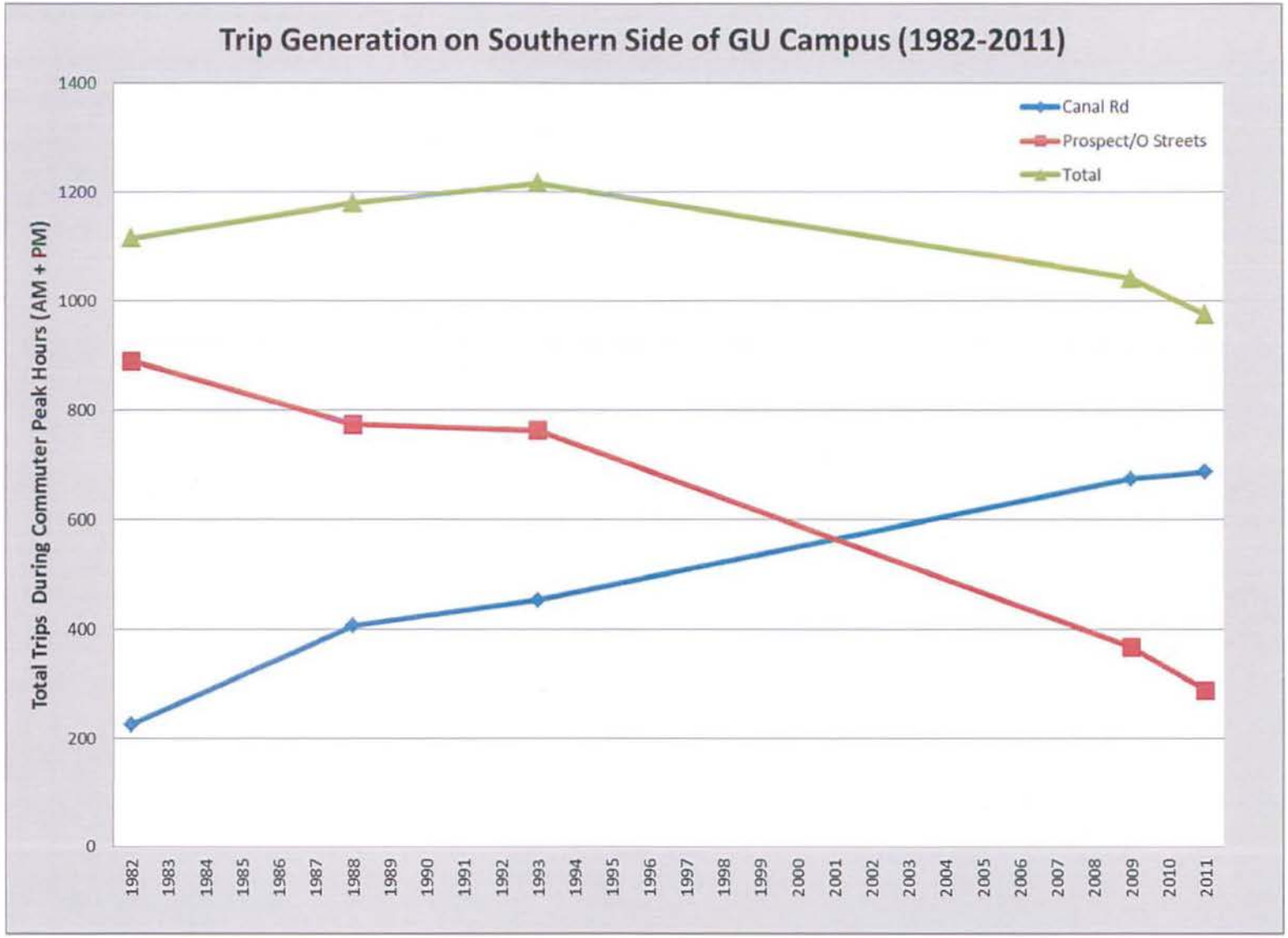

Figure 13: Trip Generation Trends, Southern Side of Campus (1982-2011)

2.3 Summary of Campus Plan

2.3.1 Campus Development

The 2011 Campus Plan focuses on improvements to the University campus intended to improve the on-campus student experience, including the creation of new student spaces, including a student center at New South, the expansion of Lauinger Library, improved athletic facilities, and critical facility improvements to the Medical Center (which is the academic center for research and teaching).

The Campus Plan also calls for important facility improvements to the Hospital on surface parking lots adjacent to the Hospital, which were previously approved in concept and are carried over from the prior Campus Plan. They are identified as MHC-6, MHC-7, MHC-8, and MHC-9 on the Campus Plan. An additional development site identified as MHC-5, which called for infill development on the site of the Hospital itself, was removed from the Campus Plan in response to concerns raised by agency and community groups.

The *Georgetown University 2010-2020 Campus Plan* provides a more detailed description of the proposed developments.

2.3.2 Population Changes

As a part of the Plan, the University proposes a targeted increase in the overall student enrollment, on a headcount basis, from approximately 14,033 students to approximately 15,000 students. Within this amount, the University will freeze traditional undergraduate growth and medical student growth at currently-permitted levels. In addition, the University will locate 1,000 School of Continuing Studies (SCS) students at one or more satellite locations by December 31, 2013. This shift will reduce vehicular trips to the Main Campus, particularly during the PM peak period, as SCS students tend to come to campus for class after work in the late afternoon and evening, and are more likely to drive. Any additional trips generated by the overall increase in headcount will be more than offset by the reduction in trips from moving SCS students off campus. Moreover, any new trips will be dispersed throughout the day, rather than concentrated during the PM peak period as they are with SCS.

The University and Hospital each anticipate a 10% growth in faculty and staff.

2.3.3 Infrastructure Changes

The campus plan includes significant transportation infrastructure changes. Figure 14 shows an overview of these improvements, which include:

- Construct a new central facility for GUTS buses near Harbin Hall, which will allow for buses to turnaround on campus and improve service to campus populations. The turnaround will also permit GUTS routes to enter and exit campus from Canal Road, significantly reducing GUTS traffic on neighborhood streets.
- The campus plan recommends reexamining the restriction on left turns during the AM peak period to allow for GUTS routes to use the Canal Road gate in the AM peak periods as well. With this change, GUTS use of Prospect Street and Q Street will be eliminated. An analysis of this concept is contained in Section 3.1.6.
- In conjunction with the construction of the GUTS facility near Harbin Hall, construct pedestrian improvements to minimize conflicts and provide a quality pedestrian environment for passengers and pedestrians. Pursue other pedestrian-friendly improvements to nearby portions of the campus.

- Examine the realignment the intersection of 38th Street/Gate 1 and Reservoir Road to address safety concerns. The safety section of this report (Section 3.4) reviews the crash data at this intersection. In addition, the capacity analysis presented later in this report shows a potential need for a westbound left turn lane at this intersection to handle increased turns into the Hospital. This report calls for any future study to also address concerns regarding potential cut-through traffic related to the new aligned intersection.

  As requested by DDOT, this recommendation continues to be evaluated. DDOT has asked the University and the Hospital to consider implementing the left turn lane within one year following the approval of the Campus Plan. DDOT has also asked the University and the Hospital to undertake annual evaluations of the intersection following the completion of the left turn lane in order to assess whether further improvements to the intersection may be required and, if they are required, implement those improvements. The University and the Hospital are evaluating these requests.

2.3.4 Policy Changes

In addition to the population changes and infrastructure improvements discussed above, the 2011 Campus Plan includes policy and operational changes to help encourage use of non-automobile modes of transportation. The following recommendations section of the report contains details on recommendations for each mode of travel and for TDM programs.

The submittal does not include any development sites for further processing. Details on the transportation elements of the development sites will be included within the further processing applications that occur during the span of the 2011 Campus Plan. These details will include loading access, pedestrian accommodations, and vehicular and bicycle parking locations and amounts.

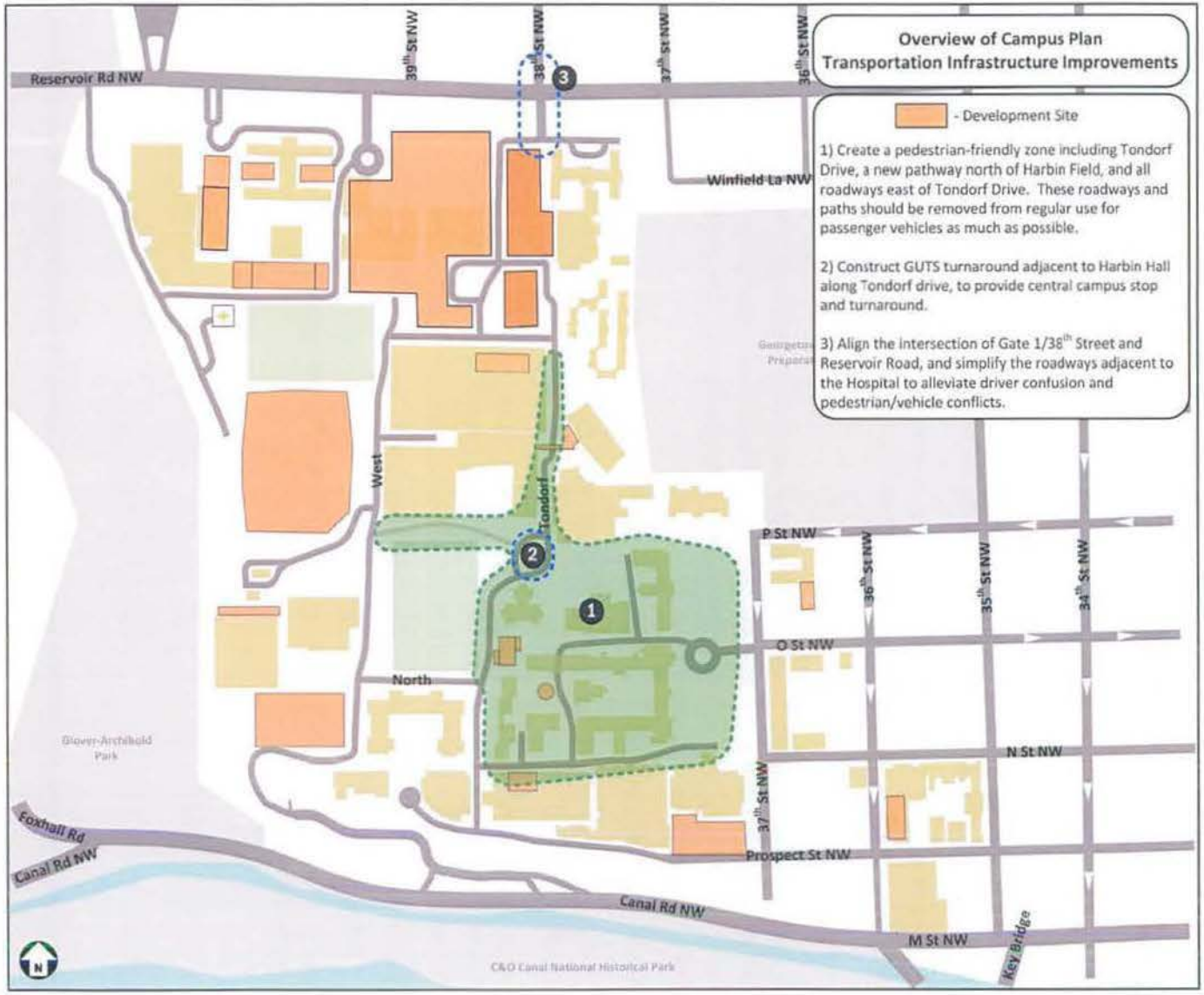

Figure 14: Summary of Campus Plan

2.4 Recommendations

This section of the report reviews recommendations assembled by the Campus Plan team to address both existing issues and to minimize the impact to the transportation network generated by development of the campus plan.

2.4.1 Pedestrians

As discussed above, Georgetown University has a compact campus with high levels of pedestrian activity. The following improvements are recommended to enhance the pedestrian environment for sections of campus that have incomplete or inconsistent pedestrian facilities:

- Incorporate extensive landscaping and pedestrian treatments along Tondorf Road as well as on roadways east of Tondorf Road and along a new east-west path north of the Multi-Sport Facility.
- Limit Tondorf Road to pedestrian traffic as much as possible, with exception for GUTS buses and other University service vehicles.
- Perform a design review during further processing applications for development sites that examines pedestrian impacts, including connections, crosswalks, location of building access points, and width of sidewalks.
- Carefully design new GUTS on-campus stop locations, once the new GUTS circulation patterns are established, to allow for sufficient queuing space for passengers not to disrupt pedestrian flow on adjacent sidewalks.

2.4.2 Bicycles

While the campus currently provides University and Hospital users with ample bicycle parking and facilities, and also features a Capital Bikeshare location at the Main Gates, some improvements are possible that could encourage more bicycling, such as enhanced parking facilities, additional amenities for bicycle commuters, and greater connectivity between the campus and neighborhood. These include:

- Provide additional and improved parking options for bikes on campus.
- Provide GU specific bicycle route maps showing recommended campus access routes and routes between campus and major off-campus destinations.
- Work with DDOT to develop and improve bike lanes leading to campus as proposed in the 2005 DDOT Bicycle Master Plan. The plan recommends installing on-street bike lanes along 33rd and 34th Streets and an on-street separated bicycle facility along M Street between 28th Street, NW And 6th Street, NE.
- Work with DDOT to locate additional bike-sharing stations on or near campus. If additional stations are located on campus, GU agrees to fund their installation.
- At the Hospital, provide additional parking spaces, increase the number of shower facilities and market bicycle commuting to potential users.

2.4.3 Georgetown University Transportation Shuttle

Although GUTS effectively provides access and mobility between campus and transit hubs and other major destinations for both University and Hospital populations, areas for further improvement include:

- Quality of Service. Current routes terminate at the north and south ends of campus, away from the final destination of many passengers, and require riders to navigate changes in topography across campus. The quality and safety of existing stops on campus is also a concern.
- Bus/Passenger Vehicle Conflicts. The geometry of 38th Street, NW campus entrance (Gate 1) makes right turns difficult for GUTS buses and other large vehicles
- Neighborhood Impacts. GUTS must use neighborhood streets (Q Street and Prospect Street) to exit the campus due to (1) the lack of an on-campus turnaround facility and (2) restrictions on left-turns from Canal Road during the AM peak period. Some neighbors have requested that the University re-route the buses to minimize their impacts in the surrounding neighborhood. The limited impact of current GUTS service on neighborhood streets is demonstrated in Table 6:

Table 6: Existing Outbound and Inbound GUTS Volumes (Daily)

Route	Outbound Volume	Inbound Volume
Reservoir Road to 35th Street	112	112
Reservoir Road to Q Street	46	46
Canal Road	0	127
Prospect Street	127	0
Total	**285**	**285**

As a part of the Campus Plan and in direct response to requests from ANC 2E the Georgetown neighborhood, the University agreed to create an on-campus turnaround for GUTS buses in order to permit the reduction in the number of buses that use neighborhood streets. In response to concerns from ANC 3D and the Foxhall neighborhood about its initial proposed "loop road" concept, the University has amended its plan to create an on-campus turnaround at the center of the campus, near Harbin Hall.

The proposed Harbin Turnaround facility is a win-win-win for all parties: it will improve GUTS service on campus for the University populations yet also address the concerns of both ANC 2E/Georgetown and ANC 3D/Foxhall. Figure 15 shows the resulting GUTS on-campus routing and stops. Possible future GUTS routes are depicted in Figure 16.

As shown in Table 7, the Harbin Turnaround will eliminate the use of Prospect Street and Q Street by GUTS buses, assuming that left turns are permitted on Canal Road during the AM peak hour. (As discussed in Section 3.1.6, such a change can be accommodated without an adverse impact on through traffic.)

Table 7: Proposed GUTS Volumes, with AM Left Turn (Daily)

Route	Outbound Volume	Inbound Volume
Reservoir Road to 35th Street	57	57
Reservoir Road to Q Street	0	0
Canal Road	228	228
Prospect Street	0	0
Total	**285**	**285**

Note that the proposed Harbin Turnaround does not require the AM peak hour left turn in order to greatly reduce the number of buses on Q Street and Prospect Street by 66% each day. As shown below in Table 8, even if left turns are not permitted on Canal Road during the AM peak hour, the Harbin Turnaround will still significantly reduce the number of trips on neighborhood streets.

Table 8: Proposed GUTS Volumes, No AM Left Turn (Daily)

Route	Outbound Volume	Inbound Volume
Reservoir Road to 35th Street	57	57
Reservoir Road to Q Street	0	0
Canal Road	153	228
Prospect Street	75	0
Total	**285**	**285**

The Wisconsin Avenue GUTS route will continue to use Reservoir Road to 35th Street. Note that the routing map reflects the current on-campus circulation plan for this route. The route may be adjusted to accommodate future Hospital improvements.

Other recommended improvements related to GUTS include the following:

- *Continue the commuter shuttle to Montgomery County and investigate feasibility of adding routes.*
- Provide passenger amenities such as bus shelters at the new on-campus turnaround location and at intermediary stops. As the routes change, update the information on the University web site.

2.4.4 Transit

To continue to promote transit and take advantage of the unused capacity on the Metrobus routes that pass by campus, the following improvements are recommended:

- Continue the SmartBenefits program and encourage greater usage.
- Continue to promote the sale of WMATA fare cards on campus and explore partnership opportunities with WMATA for student discounts.
- Continue to work with WMATA and DDOT to ensure integration of Georgetown's plan into a total transit program to reduce single occupant vehicle trips to and from the campus.
- Increase marketing of Metrobus routes through efforts such as creating specific GU-oriented maps for the G2, D3 and D6 routes, providing more information on the web site, and making SmarTrip cards available on campus (including a possible GU branded SmarTrip card and a kiosk on campus to load funds). These efforts would need to be coordinated with WMATA.

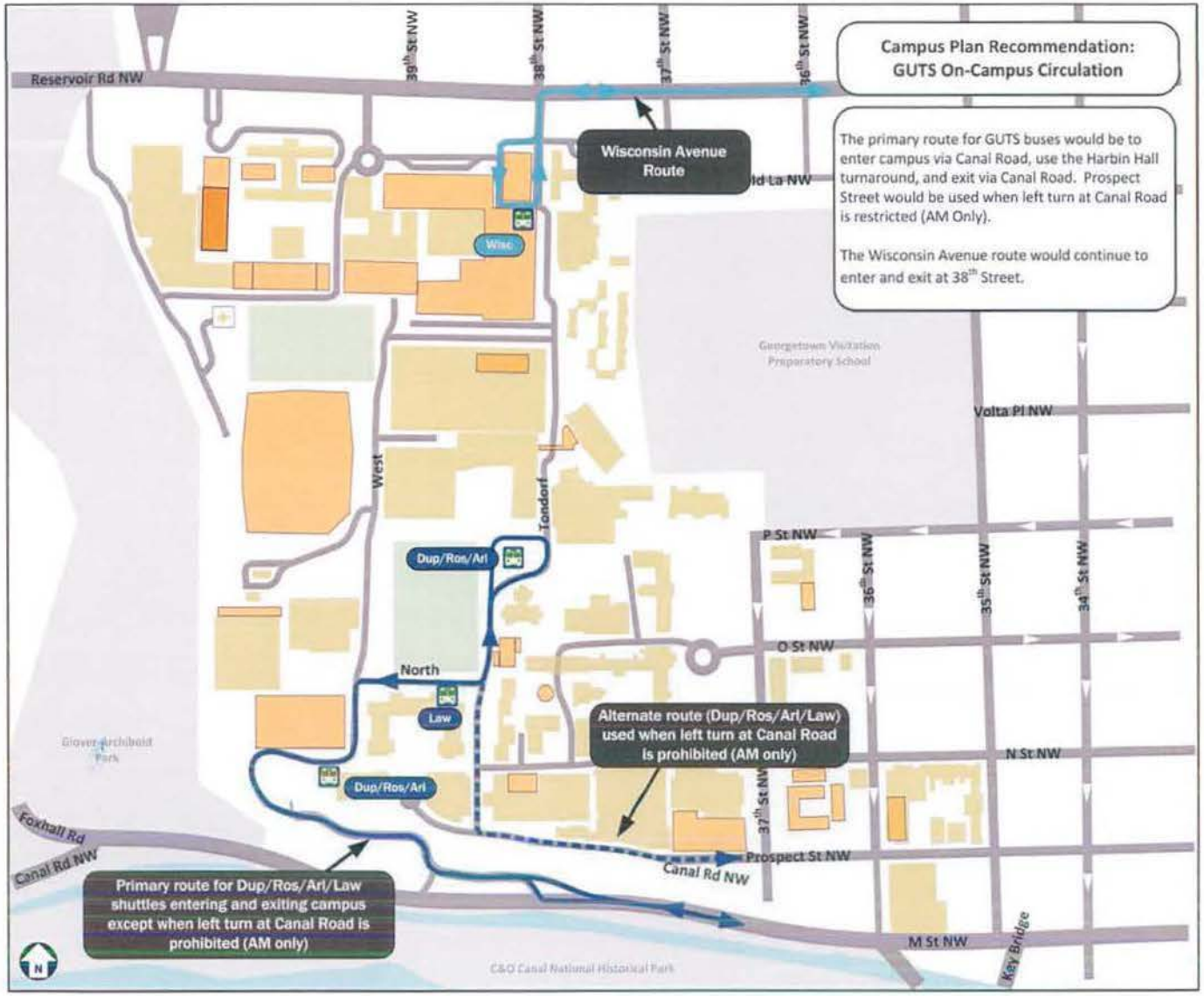

Figure 15: Campus Plan Recommendations - On Campus GUTS Routing

Figure 16: Potential Future GUTS Routes

2.4.5 Parking

As discussed above, the University and Hospital operate under a parking cap, and both implement a number of policies and procedures to limit impacts related to parking. The following additional improvements are recommended for parking:

- Implement the following proposed conditions to address parking impacts related to students who live on or near campus:
  - Students who reside in University housing shall be prohibited from bringing cars to campus or the surrounding neighborhood. Violations of this policy will be grounds for discipline under the code of conduct, and violators shall be sanctioned.
  - Students who reside off-campus shall be required to adhere to University policy and District regulations regarding car ownership and registration. Again, violations of this policy will be grounds for discipline under the code of conduct, and violators shall be sanctioned. Furthermore, the University shall keep license plate and vehicle information for cars of undergraduate students.
  - Notices of these restrictions will be provided to students and to the parents of undergraduate students
- Continue parking restrictions that do not permit daytime commuter students to park on campus and require their use of satellite garages.
- Implement the proposed establishment of a satellite location or locations for School of Continuing Studies evening programs, which will relocate 1,000 evening students that would otherwise come to the Main Campus.
- Continue measures detailed in the TDM Matrix, including the use of price to discourage single occupancy vehicles, the satellite-parking program, and financial incentives for employees who carpool.
- Encourage use of alternative modes by Hospital patients/visitors through marketing and promotions.

2.4.6 Roadways

The existing intersection at Gate 1/38th Street and Reservoir Road is not aligned and is difficult to maneuver through. The Technical Analysis supports further evaluation of the realignment of the intersection of 38th Street/Gate 1 and Reservoir Road.

The capacity analysis suggests that a westbound left turn lane at this intersection may be needed to accommodate turning traffic, and the current alignment of this off-set intersection could present potential safety concerns based on available crash data. The report calls for any future study to also address concerns regarding potential cut-through traffic related to the new aligned intersection.

DDOT has asked the University and the Hospital to consider implementing the left turn lane within one year following the approval of the Campus Plan. DDOT has also asked the University and the Hospital to undertake annual evaluations of the intersection following the completion of the left turn lane in order to assess whether further improvements to the intersection may be required and, if they are required, implement those improvements. The University and the Hospital are evaluating these requests.

The capacity analysis in the report suggests that future growth could lead to unacceptable delays for traffic exiting the campus from Gate #3 onto Reservoir Road during the AM peak hour. These delays only impact University and Hospital-

related traffic leaving the campus, which is heavily reliant on the availability of gaps in traffic along Reservoir Road to make turns. Because a capacity analysis is inherently unable to capture and assess the ability of drivers to use such gaps in traffic, the report also includes an analysis of simulations that modeled such activity. The simulations concluded that the forecasted delays may not actually materialize, because adequate gaps for traffic will be available.

DDOT has asked the University and the Hospital to undertake annual evaluation of the intersection through a signal warrant analysis in order to determine whether signalization is required in the future and, if it is required, implement the design and construction of the signal. The University and the Hospital are evaluating this request.

2.5 Transportation Demand Management

GU does more than other DC-based universities to manage traffic demand and promote a broad range of travel options. These efforts are successful, as evidenced by the fact that campus populations exceed regional averages for transit use. Table 9 shows the campus TDM Matrix, which contains a summary of all existing and proposed TDM measures.

GU TDM measures not already discussed above include the following:

- Transportation Coordinator: GU coordinates all transportation programs through the Office of Transportation Management (OTM) while GUH coordinates transportation programs through the Office of the Assistant Vice President for Safety Management / Environmental Quality.
- Marketing: GU's OTM website provides information on all campus transportation initiatives and programs while GUH TDM marketing initiatives are somewhat informal.
- Carpooling: GU provides preferred parking spaces and lower permit prices for carpool participants. This year, 169 faculty/staff are participants in 72 carpools. (This represents an 18% increase in carpool users from the prior year.) GUH has some carpooling in place but it is self-organized and with non-formal incentives.

The following improvements are recommended for the University and Hospital TDM programs:

- Maintain successful elements from the existing TDM program:
  - Continue to work with local transportation agencies to widely disseminate regional transportation information.
  - Continue and expand the carpool program, promoting the web-based matching service for Georgetown faculty and staff and offering significantly reduced parking fees as incentive.
  - To the extent possible, continue to schedule events so the start time does not coincide with local traffic rush hours. GU currently discourages driving and parking for events, and will continue to provide transportation information in the marketing of special events. The University will also explore transit subsidies for event ticket sales, but notes that few events include such ticket sales. Maintain all University TDM programs under the purview of a single department to assure integration within the campus and with public programs. Work with MedStar to integrate management of the Hospital and University TDM programs.
- Work with DDOT and ZipCar to provide access to car-share vehicles closer to campus. The University is currently discussing the possibility of approximately 3 Zipcars spaces on campus.
- Develop and implement a comprehensive marketing program and campaign for all TDM strategies.

- Incorporate information on transportation options into new employee orientation and new hire information packets. The GU will hold semi-annual transportation fairs to increase awareness of available transportation options.
- Regional Guaranteed Ride Home will continue to be provided to any employee taking any alternative transportation option, not just carpooling. This free option will be marketed to all employees to increase biking, walking, and transit as well as carpooling.
- Develop a means of monitoring the comprehensive TDM program to collect performance data, which will be used to identify both effective and wasteful strategies, to determine additions and deletions to the program and to show progress from year to year. As part of the monitoring program, GU will provide DDOT with annual performance reports including but not limited to annual employee or student (traditional, non-traditional, and continuing education students) commuter survey to be provided to DDOT, OP, the ANC and be made available to the public. The annual performance reports include the following information:
    - Mode split surveys of the campus population, broken down by students (including traditional, non-traditional, and continuing education students) and employees
    - Current parking inventory and occupancy on a typical weekday
    - Number of monthly parking permits sold per year
    - Parking availability on surrounding neighborhood streets
    - Number of registered carpools
    - Zipcar and Capital Bikeshare usage data (to the extent available)
    - Number of people signed up for SmartBenefits
    - GUTS ridership by route
    - Inventory and occupancy of bike racks on campus

Table 9: TDM Matrix

TDM Program	Georgetown University (GU)		Georgetown University Hospital (GUH)	
	Faculty/Staff	Students	Employees (nurses, DRs, staff), 8-5 & 7-7 shifts	Patient/Visitors
On-site Transportation Coordinator	Existing: All TDM coordinated through the Office of Transportation Management (OTM) GU – 2010 Plan Initiatives: OTM will maintain coordination responsibilities.		Existing: All TDM currently coordinated through Office of the Asst Vice President for Safety Management / Environmental Quality GUH – 2010 Plan Initiatives: GUH will designate one additional staff to support the Campus Transportation Coordinator.	
	GU and GUH Combined – 2010 Plan Initiatives: Establish a formal program to coordinate and combine TDM efforts, including monitoring and reporting, among GU and GUH coordinators.			
TDM Marketing	Existing: • Comprehensive OTM website provides information on all campus initiatives, including GUTS service, alternatives to parking, carpooling, and parking policies and rates. • OTM website features, including GUTS schedules, easily accessible from smartphones and other personal devices GU – 2010 Plan Initiatives: Enhance transportation website with improved materials on TDM initiatives and direct links to real time transit information.		Existing: Current activities are somewhat informal. GUH – 2010 Plan Initiatives: GUH will formalize and emphasize this activity through its various media (website, monthly newspaper - The Georgetown Star, brochures, on-site postings, etc.) Employees making major contribution will be recognized (for example, 4-person carpools would be publicized, "bike rider" articles would be featured on the website and other media, DDOT bicycle program manager would be invited to write feature articles and to make site visits/presentation if practicable.)	
	GU Faculty – 2010 Plan Initiatives: Provide "Commuting Options" information to faculty and staff (attached).	GU Students – 2010 Plan Initiatives: Provide "Getting Around the DC Area" information to incoming students on or before first move-in (attached).	GUH Staff – 2010 Plan Initiatives: Establish website targeted to employees, with improved materials on TDM initiatives and direct links to realtime transit information.	GUH Patients – 2010 Plan Initiatives: Establish website targeted to patient/visitors, with improved materials on TDM initiatives and direct links to realtime transit information.
GUTS	Existing: GUTS currently provides free, direct, express connections to multiple locations for over 2 million riders per year (doubled from 1 million/year in 2000). GUTS takes the equivalent of approximately 7,750 vehicles per day off neighborhood streets. 2010 Plan Initiatives Already Underway – Creation of on-campus loop to expand GUTS service to both ends of campus and facilitate rerouting of GUTS buses off neighborhood streets to Canal Road (GU) GU and GUH Combined – 2010 Plan Initiatives: • Enhance on-campus stops, signage, and amenities to improve passenger experience and provide appropriate schedule for GUTS service at bus stops. • Improve marketing of GUTS on population-specific TDM websites, including maps of routes and travel information on GUTS service.			
	GU Combined– 2010 Plan Initiatives : Capitalize on loop to improve use of Dupont Circle shuttle by University populations concentrated at south end of campus and use of Rosslyn and Arlington shuttles by University populations concentrated at north end of campus.		Existing: Significant GUTS ridership, particularly by administrative staff, but noticeably by patients and visitors as well. GUH – 2010 Plan Initiatives: • Capitalize on loop to improve use of Rosslyn and Arlington Loop shuttles by Hospital staff, patient, and visitor populations concentrated at north end of campus. • Provide maps and schedules to physicians referring patients to GUH.	
		GU Students – 2010 Plan Initiatives: • Provide maps and schedules to incoming students upon move-in and/or registration.		
Transit	Existing: • GU has approximately 246 employees who utilize SmartBenefits (pre-tax transit deduction). • GUTS provides connections to Rosslyn and Dupont Circle Metrorail stations as well as DC Circulator • Metrobus routes stop near both north and mid campus (G2@ 37th & O, D6 @ Reservoir Road) DC Circulator Union Station Route travels near campus along Wisconsin and M Streets GU Combined – 2010 Plan Initiatives: • Improve information on websites, including maps of specific routes that serve campus and information on connections via GUTS and other services. • Encourage greater participation in Smartbenefits. • Coordinate with WMATA on making SmarTrip cards available on campus.		Existing: • GUH has approximately 150 employees who utilize SmartBenefits. GUH – 2010 Plan Initiatives: • GUH will strongly promote transit ridership. • The employee transportation survey will identify measures to further incentivize transit usage.	
		GU Students – 2010 Plan Initiatives • Provide detailed information on transit options to incoming students during move-in orientation (attached) • Explore partnership opportunities with WMATA for student discounts (internships, Verizon Center, etc)		

TDM Program	Georgetown University (GU)		Georgetown University Hospital (GUH)	
	Faculty/Staff	Students	Employees (nurses, DRs, staff), 8-5 & 7-7 shifts	Patient/Visitors
Carpooling	Existing: • Carpools get preferred spaces & lower prices; $49/month (2-person); $33/month (3-person); free for 4-person or more • OTM runs matching service • Approx. 169 participants in 72 carpools. **GU Faculty – 2010 Plan Initiatives:** • **Promote registration with Commuter Connections Guaranteed Ride Home program to encourage greater participation.** • **Improve marketing of program.**	**GU Students – 2010 Plan Initiatives:** • **Bring Zipcar closer to campus to encourage student carsharing.**	Existing: • Some carpooling in place but self-organized basis and with no formal incentives • Approximately 112 participants. **GUH Staff – 2010 Plan Initiatives:** • **Will provide financial incentives through reduction of parking costs for ride-sharing. Incentives will range from $45 for 2-person parkers to free for 4-person and more** • **Issues and constraints related to healthcare providers, work schedules, and the pressing need for easy access to vehicles in responding to emergency situations.**	Existing: • The nature of the healthcare service has built-in levels of shared ridership, with significant drop-off and support by family members particularly during visitation. • The parking rates for non-medical visits are quite high ($10 first hour to $25 per day). These rates are comparable and generally higher than charges within downtown area of DC. **GUH Patients – 2010 Plan Initiatives:** • **Issues and constraints related to patient profiles and mobility/access needs.**
	GU and GUH Combined – 2010 Plan Initiatives: Coordinate matching between GU and GUH populations.			
Car-Sharing; Electric Cars	Existing: Car-sharing services available in Rosslyn with free shuttle service between campus and Zipcar site. 765 members of GU community registered as Zipcar users. **GU – 2010 Plan Initiatives:** • **Reach out to Zipcar/other services to identify projected demand and location for cars based on campus and off-campus populations. Identify location for and set aside minimum number of spaces on campus. (ongoing)** • **Monitor usage and expand or shrink capacity over time to respond to actual utilization.**		Existing: • GUH provides spaces for taxis, assists patients in accessing taxis and Metro Access vehicles, and encourages ride-sharing by patients wherever circumstances make it practical. **GUH – 2010 Plan Initiatives:** • **GUH is prepared to initiate contact with ZipCar, and will allocate high-visibility locations for use within the campus.** • **GUH will publish these features on website.** • **GUH will promote shared car usage by employees as part of the carpool initiatives**	
	GU Faculty – 2010 Plan Initiatives: • **Toyota Electric Vehicle Research Initiative: make available two plug-in Prius hybrid cars for three-month test-drives.** • **Level 2 Electric Charging stations (already in Garage 4).**	**GU Students – 2010 Plan Initiatives:** • **Worked with Zipcar to reduce rates/waiver of application or membership fees for students (completed)** • **Aggressively market Zipcar as alternative to private automobile use by students living near campus.**		
Bicycle Parking and Policies	Existing: • **1,616 parking spaces throughout campus, some covered in parking garages** • Bicycle registration program • Allow use of recreation facility showers for commuting faculty/staff.			
	GU Faculty – 2010 Plan Initiatives: • **Upgrade frequently used bike parking locations with covered parking spaces.** • **Market bicycle commuting program on website. Publish GU-specific bicycle route maps showing major commuting corridors to campus.**	GU Students – Existing Initiatives: access to showers either at residence halls or at Yates Recreation Facility. **GU Students – 2010 Plan Initiatives:** • **Upgrade bike parking facilities at residence halls to include covered, secure bike parking.** • **Upgrade bike parking in front of major student destinations.** • **Create maps of bicycle routes and facilities targeted to students, publish on website and include in packet to incoming students.**	Existing: • GUH currently has bike rack locations accommodating approximately 30 bicycles. **GUH – 2010 Plan Initiatives:** • **GUH has initiated procurement for approximately 100 bike rack locations. (These will meet DDOT's design guidelines and will be dispersed at various locations to provide convenience and visibility.)** • **GUH will increase shower facilities to 8 locations within different buildings of the hospital complex.** • **GUH will market a bicycle commuting program on website and publish local area bicycle route maps showing major commuting corridors to campus.** • **GUH will provide bike valet services for patients/visitors.**	
Bike-Sharing	GU Ongoing and 2010 Plan Initiatives: • Rack located on campus at 37th and O Streets, NW • Promote use of bikesharing by GU community; work with Capital Bikeshare to investigate additional potential locations on or near campus.			

TDM Program	Georgetown University (GU)		Georgetown University Hospital (GUH)	
	Faculty/Staff	Students	Employees (nurses, DRs, staff), 8-5 & 7-7 shifts	Patient/Visitors
	GU Faculty – 2010 Plan Initiatives: Information distribution on Bikeshare through the Blue and Gray (bi-weekly faculty and staff newsletter) and broadcast email messages.	GU Students – 2010 Plan Initiatives: Capital Bikeshare participates in New Student Orientation; similar outreach to be arranged for returning student populations. Marketing in residence halls.		
Parking Policies and Pricing	Existing : • On-Campus Permits: $135-$147/month • Satellite Lots: $55 - $110/month • Carpools: reduced rates range from $0 for 4-person to $49/month for 2-person • Only tenured/tenure track faculty are guaranteed parking on campus. GU Faculty – 2010 Plan Initiatives: • Maintain discounted rates for satellite parking to increase use and open up on-campus spaces for visitors. • As needed, shift current on-campus permit parkers to satellite facilities to open up on-campus spaces for visitors.	Existing: • On-campus students are prohibited from bringing cars. • No on-campus parking permits are issued to students; commuter student permits limited to satellite lots. • Evening students can park on campus after 5 PM for $3; access from Canal Road improved to facilitate ease of access. • All students can park on campus on weekends for free to discourage parking on residential streets GU Students – 2010 Plan Initiatives: • Discourage all students from bringing cars. • Provide Zipcars as alternatives to car ownership.	Existing: • Permits: $68-$120/month • Some carpooling in place but self-organized basis and with no formal incentives GUH Staff – 2010 Plan Initiatives: • Will provide financial incentives through reduced parking costs for ride-sharing Incentives will range from $45 for 2-person parkers to free for 4-person and more • Issues and constraints related to healthcare providers, work schedules, and the pressing need for easy access to vehicles in responding to emergency situations.	Existing: • $2/hour or $6/day for patients and immediate families • $10 first hour to $25 per day maximum for visitors GUH Patients – 2010 Plan Initiatives: • Encourage use of alternative modes (GUTS, biking, Metro bus, SmartBike, ZipCar) through promotions on GUH website and information dissemination during scheduling of visits. • Issues and constraints related to patient profiles and mobility/access needs.
	GU Combined – 2010 Plan Initiatives: • Improve parking allocation and management to maximize utilization of existing supply. Potential technologies include electronic monitoring of available capacity and electronic messaging to identify location of available spaces in SWQuad. • Monitor and analyze parking utilization during peak periods of use to establish need for additional visitor parking. • With additional parking spaces, maintain same ratio of faculty and staff to parking permits as exists currently, leaving remainder of spaces for guests and evening students.		GUH Combined – 2010 Plan Initiatives: • Conduct transportation usage surveys to identify opportunities for improved allocation and management of permits to maximize utilization of existing supply. • Investigate potential technology upgrades including electronic monitoring of space availability along with electronic messaging to facilitate greater efficiency and increase practical capacity.	
Satellite Parking, Commuter Lots, and Satellite Locations	Existing: • Rosslyn – parking spaces secured for regular satellite parkers. Additional spaces secured as-needed based on demand (approx. 40-50 spaces currently leased) • Wisconsin Ave (Harris Bldg) – approx. 27 park in Harris bldg; approx. 100 spaces available but not yet used except for large-scale events. • Commuter lot in Montgomery County served by GU commuter bus service (Free parking; $49/mo for bus) GU Faculty – 2010 Plan Initiatives: • Promote and maximize use of Harris bldg satellite parking with additional incentives and communication. • Identify additional opportunities for satellite parking, and encourage greater participation through pricing and other incentives.	Existing: • Commuter students limited to permit for satellite parking lots (Daily students park on-campus for evening and weekend classes and events.) GU Students – 2010 Plan Initiatives: • Locate some SCS programs off-campus to reduce evening demand or identify satellite parking for evening students. • Require ALL daily student parkers to park in satellite lot during the day.	Existing: GUH/MedStar currently operates over a dozen satellite offices supporting the Georgetown University Hospital. These are favorably distributed within suburban Maryland and northern Virginia suburbs, where large portions of GUH employee reside. These sites accommodate approximately 330 employees and 650 patients per day. GUH Staff – 2010 Plan Initiatives: • Based on the healthcare delivery pattern indicated in the narrative, GUH faces constraints in locating medical staff in satellite offices. The existing sites serve primarily administrative staff.	Existing: Ten of eleven existing satellite offices provide for medical and surgical care. This is in line with MedStar policy of enhancing convenience to clients wherever practical. GUH Patients – 2010 Plan Initiatives: • As part of MedStar strategic planning opportunities for expanding off-site facilities will be examined.
	GU and GUH Combined – 2010 Plan Initiatives: • Coordinate to maximize efficiency and utilization of satellite or commuter parking lots and related shuttle routes. • Capitalize on improved shuttle bus access to campus as a result of Loop Road. • Monitor initiatives over fixed trial period and make utilization information publicly available as a precursor to new parking on campus.			

3: TECHNICAL ANALYSES

This section of the report identifies the potential impacts of the Georgetown University 2011-2020 Campus Plan on the surrounding transportation network. Contained within are analyses of the impact of the Campus Plan on roadway capacity and operations, non-vehicular modes, and safety at intersections within the study area, all of which have been conducted in accordance with procedures, assumptions, and methodologies based on input from DDOT. The findings and recommendations reached in this section of the report guided the recommendations contained in the section 2.4.

3.1 Roadway Capacity and Operations

This section details the vehicular trips generated in the study area along the vehicular access routes, defines the analysis assumptions, analyzes the vehicular impacts of the proposed Campus Plan, and makes recommendations for improvements where needed.

3.1.1 Scope of Analysis

The purpose of the vehicular capacity analysis is to determine the existing conditions of the intersections located in the immediate vicinity of the Georgetown University campus. The set of intersections consists of the nearest intersections along Reservoir Road and Canal Road/M Street near the Campus and several significant signalized intersections several blocks from the Campus. As agreed to by DDOT and based on community concerns about the potential impacts of the proposed Campus Plan, the following intersections were chosen for analysis:

1. Reservoir Road NW & Foxhall Road NW
2. Reservoir Road NW & GUH Gate #4
3. Reservoir Road NW & GUH Gate #3
4. Reservoir Road NW & GUH Gate #2
5. Reservoir Road NW & 39th Street NW
6. Reservoir Road NW & 38th Street NW/GUH Gate #1
7. Reservoir Road NW & 37th Street NW/Winfield Lane
8. Reservoir Road NW & 35th Street NW
9. Foxhall Road NW & MacArthur Boulevard NW/44th Street
10. Foxhall Road NW & MacArthur Boulevard NW
11. Foxhall Road NW & Canal Road NW
12. Canal Road NW & GU Canal Road Gate (Unsignalized)
13. Canal Road NW & GU Canal Road Gate (Signalized)
14. Canal Road NW/M Street NW & Whitehurst Freeway/36th Street
15. M Street NW & Key Bridge
16. M Street NW & 34th Street NW
17. M Street NW & 33rd Street NW

18. M Street NW & Wisconsin Avenue NW
19. Prospect Street NW/GU Gate & 35th Street NW

These intersections are shown on Figure 17.

Intersection capacity analyses were performed for the existing conditions at each intersection within the study area during the morning and afternoon peak hours, as well as for future conditions with and without the proposed Campus Plan. An additional ten-year horizon condition was analyzed, following DDOT's request. The study scenarios are as follows:

- Existing Conditions (2011)
- Future Conditions (2021) without the Campus Plan
- Future Conditions (2021) with the Campus Plan
- Horizon Year (2031) with the Campus Plan

The *Synchro, Version 7.0* software package was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. The *Synchro* model was compiled using signal timings provided by DDOT and with lane configurations and traffic volumes collected by Gorove/Slade. The scope of analysis and proposed methodology was agreed to by DDOT over the course of several meetings leading up to the assembly of this report. The following sections review the assumptions made for the technical analyses, as summarized in Table 13.

3.1.2 Traffic Volume Assumptions

The following section reviews the traffic volume assumptions made and methodologies used in the roadway capacity analyses, summarized in Table 13.

Existing Conditions (2011)

The overall purpose of this study is to show the impact of the Georgetown University 2011-2020 Campus Plan will have on the transportation system in the study area. The existing conditions in and around the University are characterized in order to provide a foundation for assessing the transportation implications of the Campus Plan. This is determined by examining the peak traffic hours, which are directly associated with the peaking characteristics of the area transportation system. The peaking characteristics of the adjacent transportation system are determined through analysis of existing count data.

DDOT and National standards require that traffic counts be conducted on a weekday, not including Monday or Friday, when traffic conditions can be described as "typical". This includes the consideration for adjacent uses, such as retail, special events, and recreation facilities and for major traffic generators, such as the area public school system or any large public or private institutions.

The traffic counts conducted on "typical" day are used to determine the AM and PM "peak hour" of traffic within the study area. The "peak hour" represents the worst-case scenario, when the system traffic volumes are the highest. The use of a "typical" weekday and AM and PM peak hours are used to ensure that conclusions regarding adverse impacts and their respective mitigation measures would apply to the vast majority of time roadways are used in the study area. Although there may be times when volume flows exceed these conditions, such as during special events, holiday weekends, or other times depending on the study area and site location, it is the industry standard to design transportation infrastructure for the peak times during "typical" weekdays.

In order to ensure that the data collected contains the peak hour, traffic counts are taken for a period of several hours during the morning and afternoon peak periods. From these peak periods, a peak hour is derived for both the AM and the PM. According to the Transportation Impact Analyses for Site Development manual published by the Institute of Transportation Engineers (ITE), data is generally collected during the weekday morning (7:00 to 9:00 AM) and afternoon (4:00 to 6:00 PM) peak hours. Although this is the standard, Gorove/Slade usually collects data for a three-hour long period to ensure that the peak hour is contained within the data collection timeframe.

The peak period counts are analyzed to determine the one hour during the morning period and the one hour during the afternoon period that contain the highest cumulative directional traffic demands. From each peak period count, the morning and afternoon "peak hours" are determined by summing up the four fifteen-minute consecutive time periods in the study area that experience the highest cumulative traffic volumes. These morning and afternoon "peak hours" are analyzed for the system of intersections investigated, choosing the "peak hour" of the entire system instead of each individual intersection.

Following the above guidelines, traffic counts were performed on Tuesday-Wednesday, September 20-21, 2011 and on Tuesday, September 27, 2011 from 6:30 to 9:30 AM and from 4:00 to 7:00 PM. The existing traffic volumes for the intersections contained within the study area are shown on Figure 21 and Figure 22. Analysis of the existing traffic data determined that the morning peak hour is from 7:45 to 8:45 AM, and the afternoon peak hour is from 5:00 to 6:00 PM. The existing turning movement counts are included in the Technical Appendix.

Future Conditions (2021) without Campus Plan

The future conditions without the proposed Georgetown University 2011-2021 Campus Plan include any traffic generated by background developments (i.e. approved but unbuilt developments) located near the University and inherent growth on the roadways. Growth from these two sources is added to the existing traffic volumes in order to determine the traffic projections for the future without the Campus Plan. No background developments are included in the future traffic volumes because there are no approved background developments located within the study area.

Because no background developments are included in the analysis, traffic increases due to inherent growth were accounted for by applying a 1% per year growth rate over the 10-year period of analysis (2011 to 2021), compounded annually. This growth rate was applied to all turning movements, with the exception of the movements entering and exiting the University.

The original background growth concept, developed during scoping meetings with DDOT, was to base the growth rate on historical volumes. Using DDOT's AADT/AAWV maps a rate of 0.29% per year was calculated. This rate was based on a comparison of data points at the same location on the maps between years. Due to the large variations at some map locations, an overall average for the study area to keep the growth rates feasible. After further discussion with DDOT, data older than 2007 was eliminated, and a rate of 0.87% was calculated using the same methodology.

After further discussions with DDOT, Gorove/Slade was provided the actual count data that the DDOT AADT/AAWV maps are based on. This data was in the form of dozens of spreadsheets containing tube count data, and is from 2005-2010 (with minimal data from 2005). The raw data was searched to identify pairs of data points at the same locations from different times to determine growth rates. Unfortunately, pairs of data points at the same location and the same time of year could not be identified, and irregularities in some of the data were discovered when reviewing the files. Thus, the raw count data could not be used to calculate a more reliable growth rate

Therefore, this study adopted a 1% growth per year in the study area. This is the industry standard, especially for an urban built-out area, and is regularly used in District of Columbia traffic impact studies. It is also close to—but more conservative than—the 0.87% growth rate calculated using the daily volume maps, and since the data on hand cannot be used to calculate something more representative of the study area, the standard was considered preferable.

The traffic volumes generated by the inherent growth were added to the existing (2011) traffic volumes in order to establish the future (2021) traffic volumes without the proposed Campus Plan. The traffic volumes for the future conditions without the Campus Plan are shown on Figure 23 and Figure 24.

Future Conditions (2021) with Campus Plan

In order to determine the impact of the proposed changes of the Campus Plan, vehicular trips were generated based on changes due to the anticipated growth of the Georgetown student and faculty/staff populations. The amount of vehicular traffic generated by the Campus Plan was calculated using a methodology discussed with DDOT staff. It uses trip generation rates contained within the Institute of Transportation Engineers' *Trip Generation*, 8th Edition, adjusted for the actual modal choices of the more urban Georgetown University campus populations. The trip generation analysis consisted of two steps: (1) establishing assumptions using the existing gate counts and (2) performing similar calculations with future numbers to determine the net increase in trips generated.

ITE rates were used to develop base trip generation numbers. The rates used were a combination of University (ITE Land Use Code 550) and Hospital (ITE Land Use Code 610). Within each of these rates, several different independent variables can be used to determine trip generation, *students* and *employees* for University, and *beds*, *employees* and *square feet* for Hospital. The existing trip generation was calculated for the six different combinations presented and compared to the existing gate counts on campus, to determine which variables most closely aligned with actual conditions and therefore should be used as a basis for the trip generation for the future scenarios. To be conservative, only methods that returned a result higher than actual gate counts were selected.

ITE rates do not account for the significant use of non-vehicular modes in urban environments such as the GU Campus. Therefore, each of the six alternative calculations for existing trip generation was adjusted to account for this non-vehicular mode split that, as discussed in earlier sections of this report, is the leading choice for campus populations. A composite rate for the various users of the University and Hospital was calculated based on their individual mode splits according to surveys of the various campus populations, and then further adjusted to account for the percentage of students and faculty/staff arriving or departing during the peak hours based on data collected during the GWU Foggy Bottom campus plan transportation analyses. Table 10 shows the calculations for the mode split assumptions.

After comparing the six different combinations of ITE variables, two sets provided similar results to the existing gate counts: (1) using *students* for University and *employees* for Hospital, and (2) using *students* for University and *square feet* for Hospital. This analysis selected the second set of variables (students for the University and square feet for the Hospital) because it provided the most conservative results. The Hospital plans include a 0% increase in beds, a 10% increase in employees, and a 43% increase in square feet; accordingly, basing the future Hospital trip generation in square feet assumes the highest number of trips and therefore a more conservative analysis, even though the increase in square footage will largely be decompression space, consistent with industry trends for hospitals. During the transportation analyses that accompany the further processing applications for the Hospital, these assumptions should be revisited based on further details regarding the Hospital's expansion plans. The results from the following vehicular analyses should be reviewed with the knowledge that they represent the most conservative assumptions for potential new traffic related to the Campus Plan, and likely overestimate impacts within the study area.

After confirming the assumptions by comparing the calculations to existing conditions, the same calculations were performed with the future campus plan variables (numbers of students and employees for the University, and the increased square feet for the Hospital). The net difference between the two sets of calculations was the assumed trip generation of the Campus Plan, 343 new vehicular trips in the morning and 307 new vehicular trips in the PM peak hour. Table 11 and Table 12 show the details of the calculations.

Trip distribution was also developed based on the existing count data for the University gates and nearby intersections. Based on existing traffic patterns, roadway configurations, and the separation of academic and medical uses within the University, separate trip distributions were calculated for the academic and medical parking spaces. These calculations assumed that the new trips generated by the Hospital would use Gate #1 on Reservoir Road to enter the Hospital, and the new trips generated by the University would enter via a combination of the Canal Road Gate and the Prospect Street Gate depending on the desired parking area. Figure 18 shows the directions of approach and routing for the Hospital, and Figure 19 shows the directions of approach and routing for the University. The trips generated by the proposed Campus Plan were distributed through the study area intersections based on these trip distributions, as shown on Figure 25 and Figure 26.

In addition to the site-generated trips, the redistribution of GUTS trips proposed in the campus plan was also included in the analysis of the Future Conditions (2021) with Campus Plan. The proposed Harbin Turnaround and associated changes to GUTS routes will result in shifts of both inbound and outbound trips associated with the GUTS Dupont Circle from Gate #1 to the Canal Road gate, resulting in a net decrease of 11 trips during the AM peak hour and 10 trips during the PM peak hour for both inbound and outbound traffic. Under the current Canal Road Gate left turn prohibition, these displaced buses would be required to exit campus along Prospect Street; however, with the proposed AM GUTS left turn these bus trips could be routed directly out onto Canal Road and onto M Street in such a way as to avoid disrupting neighborhood activities and traffic present along Prospect Street. The GUTS traffic volumes as implemented in the analysis are further discussed in Section 2.4.3.

The traffic volumes for the future conditions with the Campus Plan were calculated by adding the site-generated vehicular trips to the future without the Campus Plan traffic volumes. The future traffic volumes with the proposed Campus Plan are shown Figure 27 and Figure 28.

Horizon Year (2031) with Campus Plan

In addition to the ten-year analysis for the Campus Plan, an additional horizon year analysis was performed to project the potential traffic conditions ten years after the proposed Campus Plan is implemented. The horizon year volumes include the traffic generated by inherent growth on the roadways. Growth from these two sources is added to the future traffic volumes with the Campus Plan in order to determine the traffic projections for the horizon year. No background developments are included in the future traffic volumes because there are no approved background developments located within the study area.

Traffic increases due to inherent growth were accounted for by applying the same industry-standard 1% per year growth rate over the 10-year period of analysis (2021 to 2031), compounded annually. Similar to the future conditions without the Campus Plan, this growth rate was applied to all turning movements, with the exception of the movements entering and exiting the University.

The traffic volumes generated by the inherent growth were added to the future (2021) with the Campus Plan traffic volumes in order to establish the horizon year (2031) traffic volumes. The traffic volumes for the horizon year are shown on Figure 29 and Figure 30.

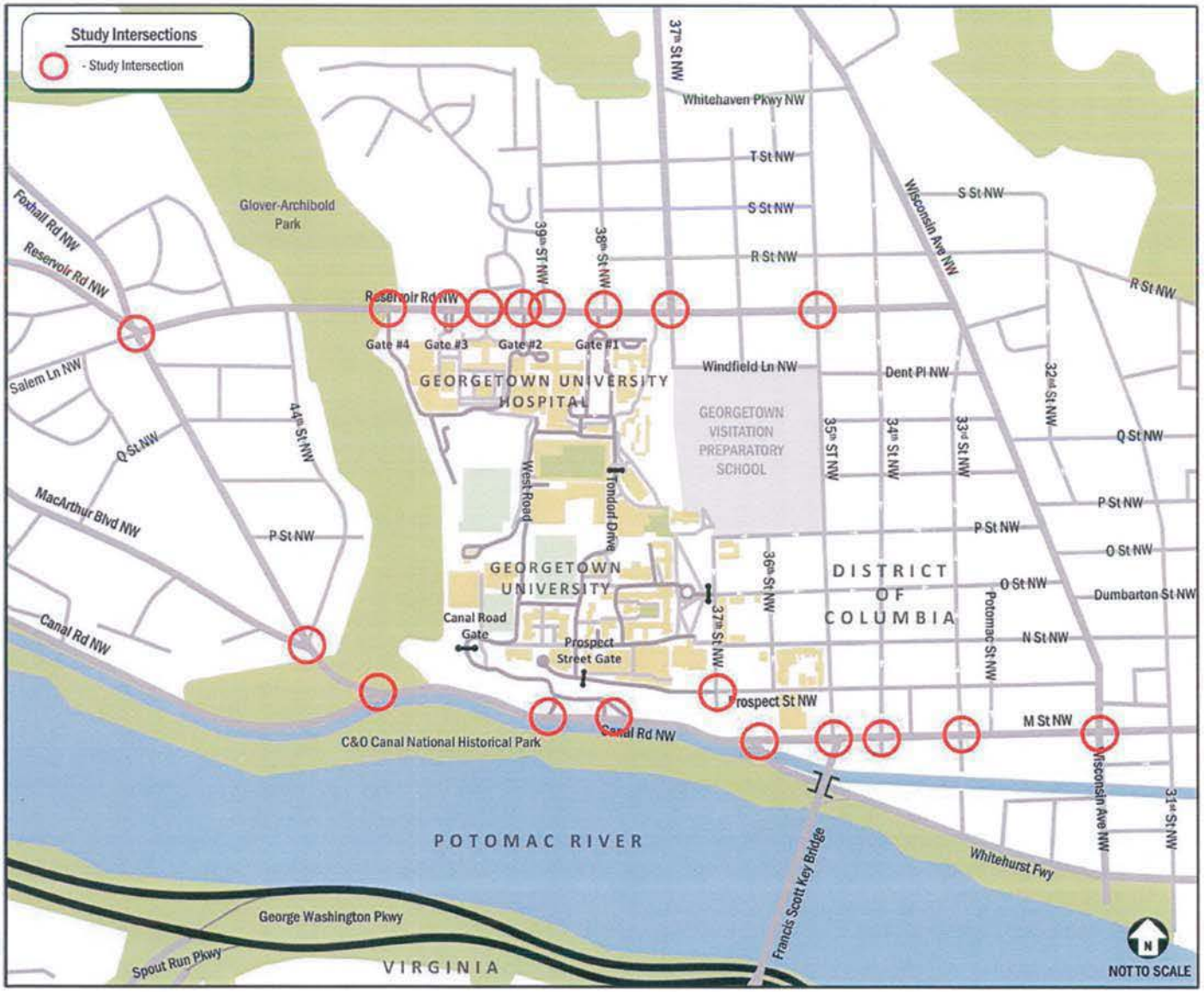

Figure 17: Study Intersections

Table 10: Mode Split Assumptions

Mode Split Assumptions

University - AM Peak Hour (Existing Conditions)

Class	Population	Percent arriving/departing in AM Peak Hour[1]	Percent of AM peak hour traffic	Mode Splits[2] Drive	Walk & Bike	Transit	Other[3]
Students	14,033	10%	50.6%	13.0%	8.2%	69.5%	9.3%
Faculty/Staff	4,035	34%	49.4%	51.4%	3.8%	38.1%	6.7%
Composite	---	---	100%	32.0%	6.0%	54.0%	8.0%

University - PM Peak Hour (Existing Conditions)

Class	Population	Percent arriving/departing in PM Peak Hour[1]	Percent of PM peak hour traffic	Mode Splits[2] Drive	Walk & Bike	Transit	Other[3]
Students	14,033	15%	62.7%	23.0%	7.3%	66.8%	2.9%
Faculty/Staff	4,035	31%	37.3%	51.4%	3.8%	38.1%	6.7%
Composite	---	---	100%	33.6%	6.0%	56.1%	4.3%

University - AM Peak Hour (Future Conditions)

Class	Population	Percent arriving/departing in AM Peak Hour[1]	Percent of AM peak hour traffic	Mode Splits[2] Drive	Walk & Bike	Transit	Other[3]
Students	15,000	10%	49.8%	13.0%	8.2%	69.5%	9.3%
Faculty/Staff	4,439	34%	50.2%	51.4%	3.8%	38.1%	6.7%
Composite	---	---	100%	32.3%	6.0%	53.7%	8.0%

University - PM Peak Hour (Future Conditions)

Class	Population	Percent arriving/departing in PM Peak Hour[1]	Percent of PM peak hour traffic	Mode Splits[2] Drive	Walk & Bike	Transit	Other[3]
Students	15,000	15%	62.1%	23.0%	7.3%	66.8%	2.9%
Faculty/Staff	4,439	31%	37.9%	51.4%	3.8%	38.1%	6.7%
Composite	---	---	100%	33.8%	6.0%	55.9%	4.3%

Hospital - AM Peak Hour (Existing + Future Conditions)

Class	Percent of AM peak hour traffic[4]	Mode Splits[2] Drive	Walk & Bike	Transit	Other[3]
Employees	59%	48.4%	2.2%	43.2%	6.2%
Patient/Visitors	41%	90.0%	0.0%	10.0%	0.0%
Composite	100%	65.4%	1.3%	29.6%	3.7%

Hospital - PM Peak Hour (Existing + Future Conditions)

Class	Percent of PM peak hour traffic[4]	Mode Splits[2] Drive	Walk & Bike	Transit	Other[3]
Employees	58%	48.4%	2.2%	43.2%	6.2%
Patient/Visitors	42%	90.0%	0.0%	10.0%	0.0%
Composite	100%	65.8%	1.3%	29.3%	3.6%

(1) Based on survey results from GWU Campus Plan

(2) Based on mode split survey of the University population. To be conservative, student mode split reflects the mode split for students who commute to campus only, and does not account for the large numbers of students who live on or near the campus.

(3) Telecommuters, carpool passengers and surveys responses marked 'other'

(4) Derived from information contained within *Transportation Management Plan for Georgetown University Hospital,* by OR George Associates

Table 11: Trip Generation Calculations (Existing Conditions)

Trip Generation Calculations - Existing Conditions

Component	Amount	AM In	AM Out	AM Total	PM In	PM Out	PM Total	
University - Existing	14,033 Students	2302	576	2878	836	1949	2785	(ITE Land Use Code 550)
	Drive	736	184	920	281	654	935	
	Walk & Bike	139	35	174	50	117	167	
	Transit	1242	311	1553	469	1094	1563	
Hospital - Existing	1,100,000 Square Feet	643	447	1090	439	606	1045	(ITE Land Use Code 610)
				with Mode Split Assumptions				
	Drive	421	292	713	289	399	688	
	Walk & Bike	8	6	14	6	8	14	
	Transit	190	132	322	128	177	305	
Total - Existing		2945	1023	3968	1275	2555	3830	
				with Mode Split Assumptions				
	Drive	1157	476	1633	570	1053	1623	
	Walk & Bike	147	41	188	56	125	181	
	Transit	1432	443	1875	597	1271	1868	

Double-Check of Existing Counts		
Existing Calculated Drivers	1633	1623
Counts at Gates (from data collection)	1512	1444
Difference	121	179

Table 12: Trip Generation Calculations (Future Conditions)

Trip Generation Calculations - Future Conditions

Component	Amount	AM In	AM Out	AM Total	PM In	PM Out	PM Total	
University - Future	15,000 Students	2465	616	3081	891	2078	2969	(ITE Land Use Code 550)
				with Mode Split Assumptions				
	Drive	795	199	994	301	698	999	
	Walk & Bike	148	37	185	53	125	178	
	Transit	1325	331	1656	498	1166	1664	
Hospital - Future	1,573,000 Square Feet	886	615	1501	594	820	1414	(ITE Land Use Code 610)
				with Mode Split Assumptions				
	Drive	580	402	982	391	540	931	
	Walk & Bike	12	8	20	8	10	18	
	Transit	262	182	444	174	240	414	
Total - Future		3351	1231	4582	1485	2898	4383	
				with Mode Split Assumptions				
	Drive	1375	601	1976	692	1238	1930	
	Walk & Bike	160	45	205	61	135	196	
	Transit	1587	513	2100	672	1406	2078	
Net New Trips - University	Drive	59	15	74	20	44	64	= Future - Existing
	Walk & Bike	9	2	11	3	8	11	*Notes: Future University vehicle trips are assigned to the Canal Road Gate*
	Transit	83	20	103	29	72	101	
Net New Trips - Hospital	Drive	159	110	269	102	141	243	= Future - Existing
	Walk & Bike	4	2	6	2	2	4	*Notes: Future Hospital vehicle trips are assigned to Reservoir Road/Gate 1*
	Transit	72	50	122	46	63	109	
Net New Trips - Total	Drive	218	125	343	122	185	307	= Future - Existing
	Walk & Bike	13	4	17	5	10	15	
	Transit	155	70	225	75	135	210	

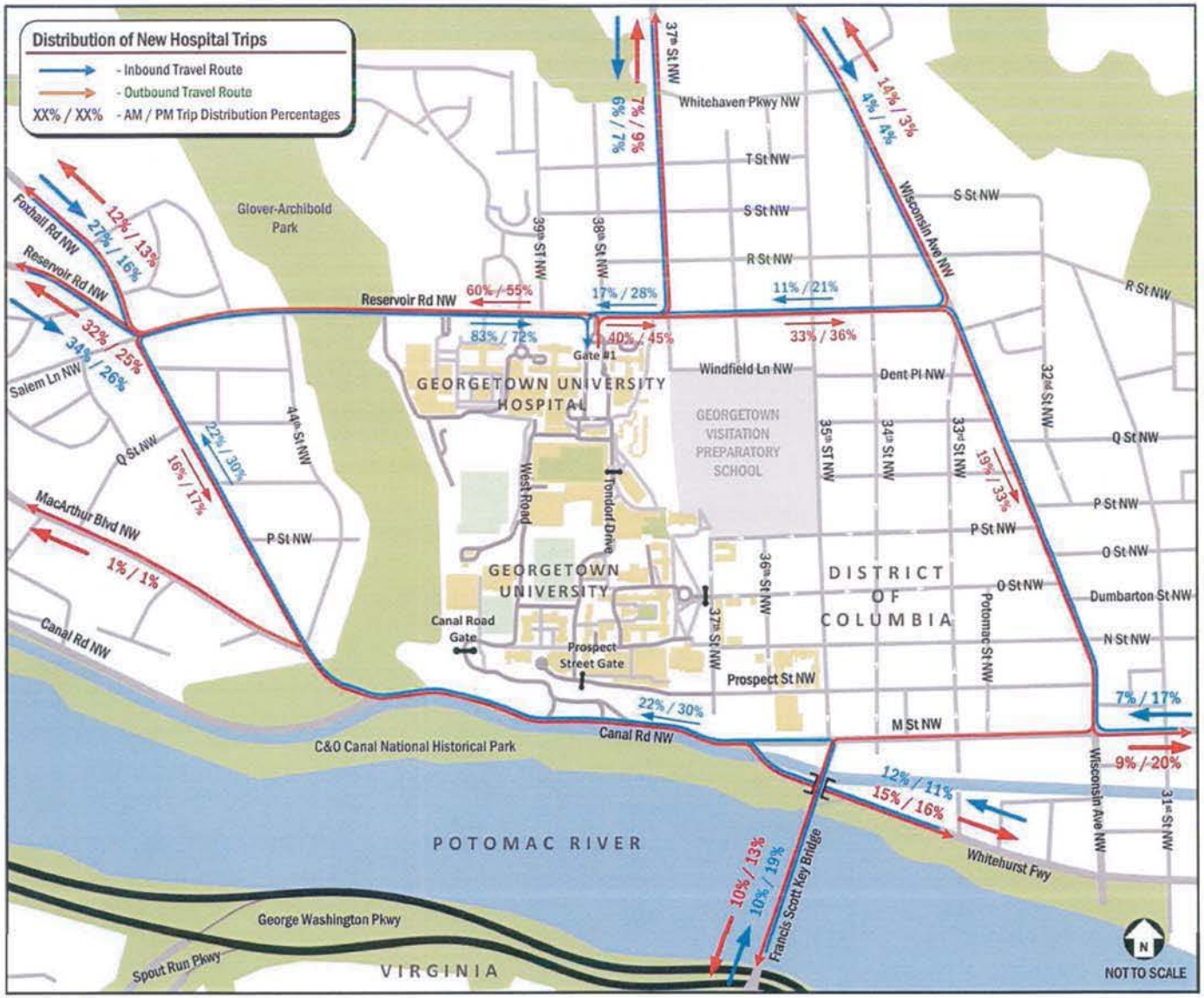

Figure 18: Distribution and Routing of New Trips Generated by GUH

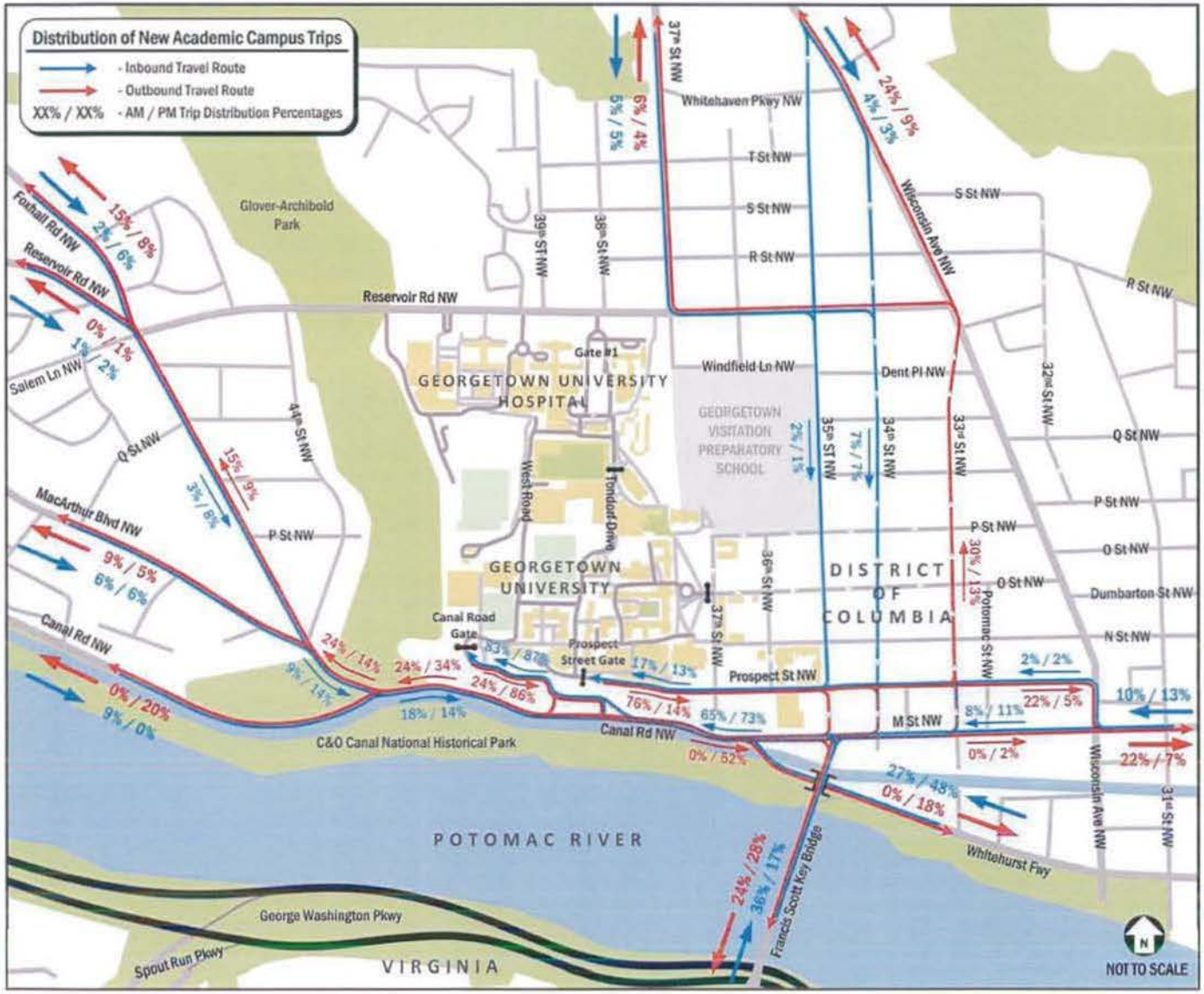

Figure 19: Distribution and Routing of New Trips Generated by the University

3.1.3 Geometry and Operations Assumptions

The following section reviews the roadway geometry and operations assumptions made and methodologies used in the roadway capacity analyses, summarized in Table 13.

Gorove/Slade conducted field reconnaissance to confirm the existing lane configurations and traffic controls at the intersections within the study area, shown on Figure 31 and Figure 32. Existing signal timings and offsets were obtained from DDOT and confirmed during field reconnaissance.

No changes to the existing lane configurations and traffic controls were assumed for the future (2021) scenarios with and without the Campus Plan, as well as the horizon year (2031) scenario. No signal timing changes are assumed for the future and horizon year scenarios.

3.1.4 Vehicular Analysis Results

Intersection capacity analyses were performed for the four scenarios outlined in Section 3.1.1 at the intersections contained within the study area during the morning and afternoon peak hours. *Synchro, Version 7.0* was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. 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 E is typically used as the acceptable LOS threshold in the District; although LOS F is sometimes accepted in urbanized areas.

The capacity analyses were based on: (1) the peak hour volumes outlined in Section 3.1.2; (2) the lane use and traffic controls outlined in Section 3.1.3; and (3) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). An average delay (of each approach) and LOS is shown for the signalized intersections, as well as an overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments. Table 13 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). The capacity analysis results are also shown on the following figures:

- Existing Conditions (2011) - Figure 33 and Figure 34
- Future Conditions (2021) without the Campus Plan - Figure 35 and Figure 36
- Future Conditions (2021) with the Campus Plan - Figure 37 and Figure 38
- Horizon Year (2031) with the Campus Plan - Figure 39 and Figure 40

Table 13: Summary of Vehicular Capacity Analysis Assumptions

Existing Conditions
• Dates of data collection: Tuesday-Wednesday, September 20-21, 2011 (count sheets in Appendix) • System Peak: 7:45 – 8:45 AM, 5:00 – 6:00 PM • Geometries and lane configurations based on existing conditions • Signal timings/phasings/offsets provided by DDOT
2021 Future without Campus Plan (Background Conditions)

• Background developments: None assumed
• Background growth percentage:
  • One percent per year compounded annually over 10 years
  • Applied to all turning movements except those entering and exiting the University
• No signal timing or infrastructure changes assumed

2021 Future with Campus Plan (Total Future Conditions)

• Site trip generation and mode split assumptions are detailed in Section 3.1.2 of report
• Total AM peak hour trips: 343 ; Total PM peak hour trips: 307
• Trip distribution based on analysis of existing traffic patterns, results shown on Figure 25 and Figure 26
• No signal timing or infrastructure changes assumed
• Additional scenarios include:
  • Allow southbound left-turn from GU Canal Road Gate, exiting the University, during the morning peak hour to GUTS busses only
  • Optimize all intersections and offsets based on existing minimum signal timing parameters

2031 Future with Campus Plan (Horizon Year)

• 2021 with Campus Plan scenario with added background development traffic
• Background developments: None assumed
• Background growth percentage:
  • One percent per year compounded annually over 10 years
  • Applied to all turning movements except those entering and exiting the University
• No signal timing or infrastructure changes assumed

Table 14: Vehicular Levels of Service Results

Intersection		Approach	Existing Conditions (2011)				Future (2021) without Campus Plan				Future (2021) with Campus Plan				Horizon Year (2031)			
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Reservoir Road & Foxhall Road	Overall	114.4	F	76.4	E	155.0	F	95.8	F	176.7	F	106.3	F	224.1	F	133.2	F
		Eastbound	85.1	F	53.5	D	112.2	F	58.7	E	153.3	F	74.2	E	190.0	F	89.0	F
		Westbound	56.1	E	51.2	D	65.1	E	66.4	E	79.7	E	95.8	F	93.2	F	125.2	F
		Northbound	116.2	F	20.8	C	167.6	F	24.0	C	184.8	F	25.1	C	244.2	F	29.3	C
		Southbound	161.8	F	196.3	F	214.7	F	248.3	F	238.1	F	242.8	F	297.8	F	300.3	F
2	Reservoir Road & GUH Gate #4	Westbound Left	1.3	A	0.5	A	1.5	A	0.5	A	1.8	A	0.5	A	2.2	A	0.5	A
		Northbound	54.1	F	27.5	D	75.3	F	32.8	D	155.3	F	44.4	E	364.5	F	58.3	F
3	Reservoir Road & GUH Gate #3	Westbound Left	6.0	A	0.5	A	6.9	A	0.5	A	8.6	A	0.5	A	10.6	B	0.5	A
		Northbound	31.7	D	26.1	D	41.3	E	30.9	D	68.0	F	40.9	E	118.5	F	53.9	F
4	Reservoir Road & GUH Gate #2	Westbound Left	4.9	A	1.7	A	5.8	A	1.7	A	7.6	A	1.7	A	9.7	A	1.7	A
		Northbound	91.8	F	19.4	C	174.7	F	21.5	C	453.1	F	25.6	D	3326.4	F	29.6	D
5	Reservoir Road & 39th Street	Overall	10.8	B	8.1	A	11.5	B	8.4	A	12.7	B	8.5	A	15.2	B	9.2	A
		Eastbound	10.1	B	4.7	A	11.1	B	5.3	A	12.7	B	6.0	A	14.8	B	7.1	A
		Westbound	7.3	A	3.5	A	7.3	A	3.5	A	8.7	A	4.1	A	12.3	B	4.2	A
		Southbound	31.6	C	43.6	D	31.8	C	44.2	D	31.8	C	44.2	D	32.1	C	46.3	D
6	Reservoir Road & 38th Street/ GUH Gate #1	Overall	62.4	E	32.7	C	86.6	F	32.4	C	302.0	F	70.2	E	404.8	F	58.7	E
		Eastbound	4.1	A	11.8	B	4.2	A	13.2	B	14.1	B	11.4	B	18.7	B	12.9	B
		Westbound	166.5	F	11.6	B	237.7	F	12.3	B	963.3	F	13.2	B	1276.8	F	14.2	B
		Northbound	44.6	D	81.6	F	45.2	D	82.6	F	53.8	D	194.4	F	54.5	D	162.9	F
		Southbound	34.1	C	24.5	C	34.3	C	24.6	C	26.1	C	24.6	C	26.3	C	24.7	C
7	Reservoir Road & 37th Street/Winfield Lane	Overall	34.9	C	21.3	C	43.0	D	31.2	C	49.6	D	43.2	D	57.2	E	73.3	E
		Eastbound	2.5	A	14.1	B	3.1	A	26.2	C	3.3	A	46.4	D	5.4	A	92.7	F
		Westbound	2.3	A	3.0	A	2.4	A	3.0	A	2.5	A	2.9	A	2.5	A	3.0	A
		Northbound	43.5	D	40.0	D	44.0	D	40.1	D	44.1	D	40.1	D	45.4	D	40.3	D
		Southbound	267.5	F	105.0	F	329.1	F	137.2	F	372.9	F	150.7	F	430.4	F	204.3	F
8	Reservoir Road & 35th Street	Overall	52.6	D	38.1	D	67.7	E	46.7	D	67.5	E	46.1	D	86.2	F	56.8	E
		Eastbound	13.2	B	26.7	C	15.0	B	28.6	C	16.7	B	28.5	C	18.9	B	29.1	C
		Westbound	14.3	B	17.3	B	15.0	B	17.7	B	15.2	B	17.9	B	16.0	B	18.4	B
		Northbound	87.2	F	28.2	C	112.8	F	33.3	C	112.8	F	33.3	C	144.0	F	41.0	D
		Southbound	138.1	F	86.9	F	184.7	F	118.2	F	184.7	F	118.2	F	243.6	F	160.4	F
9	Foxhall Road & MacArthur Boulevard/44th Street	Overall	14.1	B	22.9	C	23.5	C	23.5	C	24.5	C	23.7	C	30.4	C	25.2	C
		Westbound	44.6	D	37.0	D	46.2	D	37.2	D	46.2	D	37.2	D	48.6	D	37.3	D
		Northbound	7.7	A	5.4	A	21.2	C	5.9	A	22.7	C	5.9	A	30.9	C	7.5	A
		Southbound	22.9	C	50.9	D	23.5	C	52.0	D	23.8	C	52.3	D	24.5	C	53.7	D
10	Foxhall Road & MacArthur Blvd	Overall	10.2	B	3.9	A	11.5	B	4.0	A	11.4	B	3.9	A	14.1	B	4.1	A
		Eastbound	27.7	C	12.9	B	31.3	C	13.2	B	31.5	C	13.2	B	39.3	D	13.7	B
		Northbound	0.4	A	0.2	A	0.4	A	0.2	A	0.4	A	0.2	A	0.5	A	0.2	A
		Southbound	4.0	A	2.2	A	4.2	A	2.3	A	4.2	A	2.4	A	4.5	A	2.5	A

Intersection		Approach	Existing Conditions (2011)				Future (2021) without Campus Plan				Future (2021) with Campus Plan				Horizon Year (2031)			
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
11	Foxhall Road & Canal Road	**Overall**	**21.7**	**C**	**48.5**	**D**	**32.0**	**C**	**65.4**	**E**	**33.2**	**C**	**69.8**	**E**	**56.8**	**E**	**91.9**	**F**
		Eastbound	26.0	C	**154.7**	F	34.8	C	**210.4**	F	37.9	D	**224.7**	F	68.4	E	**287.4**	F
		Westbound	0.4	A	5.1	A	0.4	A	6.2	A	0.4	A	6.0	A	0.5	A	11.5	B
		Northbound	39.6	D	*not permitted*		62.4	E	*not permitted*		63.9	E	*not permitted*		**105.3**	**F**	*not permitted*	
12	Canal Road & GU Canal Road Gate (Unsignalized)	Southbound	12.2	B	21.1	C	12.5	B	21.2	C	12.5	B	20.9	C	12.7	B	20.9	C
13	Canal Road & GU Canal Road Gate (Signalized)	**Overall**	**2.8**	**A**	**23.0**	**C**	**2.7**	**A**	**44.7**	**D**	**3.1**	**A**	**58.4**	**E**	**3.0**	**A**	**91.0**	**F**
		Eastbound	0.6	A	16.8	B	0.5	A	19.0	B	0.2	A	20.1	C	0.4	A	22.3	C
		Westbound	6.6	A	24.0	C	6.5	A	56.5	E	7.9	A	76.8	E	7.4	A	**126.1**	F
		Southbound	*not permitted*		50.5	D	*not permitted*		50.5	D	*not permitted*		51.8	D	*not permitted*		51.8	D
14	Canal Road/M Street & Whitehurst Freeway/36th Street	**Overall**	**28.3**	**C**	**55.5**	**E**	**51.9**	**D**	**72.8**	**E**	**53.4**	**D**	**78.0**	**E**	**100.3**	**F**	**109.9**	**F**
		Eastbound	29.7	C	77.9	E	75.4	E	**80.7**	F	79.2	E	**83.9**	F	**170.6**	F	**101.4**	F
		Westbound	0.6	A	43.5	D	1.2	A	57.3	E	1.7	A	63.7	E	3.6	A	**99.6**	F
		Northbound	45.5	D	48.3	D	41.6	D	75.7	E	41.7	D	**81.6**	F	35.6	D	**121.2**	F
		Southbound	48.3	D	45.7	D	50.3	D	46.6	D	50.3	D	46.6	D	51.3	D	47.9	D
15	M Street & Key Bridge	**Overall**	**46.1**	**D**	**66.2**	**E**	**71.3**	**E**	**96.9**	**F**	**76.7**	**E**	**101.2**	**F**	**111.0**	**F**	**139.0**	**F**
		Eastbound	15.6	B	**152.7**	F	14.2	B	**205.1**	F	14.2	B	**209.6**	F	14.5	B	**269.2**	F
		Westbound	77.1	E	53.8	D	**119.3**	F	**91.2**	F	**126.9**	F	**95.5**	F	**177.6**	F	**140.3**	F
		Northbound	52.5	D	23.0	C	**87.1**	F	30.5	C	**94.1**	F	34.9	C	**142.2**	F	49.1	D
16	M Street & 34th Street	**Overall**	**11.7**	**B**	**26.9**	**C**	**12.9**	**B**	**28.9**	**C**	**13.6**	**B**	**29.2**	**C**	**19.7**	**B**	**33.4**	**C**
		Eastbound	4.5	A	5.5	A	4.3	A	5.9	A	4.3	A	6.0	A	6.6	A	6.4	A
		Westbound	30.2	C	43.2	D	34.9	C	44.3	D	37.1	D	44.6	D	56.3	E	45.8	D
		Northbound	34.7	C	35.4	D	34.7	C	35.5	D	34.7	C	35.5	D	34.7	C	35.6	D
		Southbound	11.1	B	31.4	C	11.4	B	36.8	D	12.3	B	37.2	D	12.5	B	50.4	D
17	M Street & 33rd Street	**Overall**	**19.7**	**B**	**15.6**	**B**	**28.5**	**C**	**19.4**	**B**	**31.3**	**C**	**19.5**	**B**	**44.6**	**D**	**29.3**	**C**
		Eastbound	0.9	A	9.1	A	0.9	A	16.1	B	1.2	A	16.4	B	1.2	A	35.5	D
		Westbound	69.9	E	17.4	B	**103.6**	F	18.2	B	**112.2**	F	18.2	B	**161.7**	F	19.5	B
		Northbound	37.7	D	52.1	D	37.9	D	56.0	E	37.9	D	56.0	E	38.0	D	62.1	E
18	M Street & Wisconsin Avenue	**Overall**	**33.8**	**C**	**54.1**	**D**	**40.1**	**D**	**65.6**	**E**	**42.3**	**D**	**72.1**	**E**	**61.1**	**E**	**93.6**	**F**
		Eastbound	19.6	B	42.2	D	27.1	C	59.2	E	28.1	C	59.2	E	56.0	E	**101.2**	F
		Westbound	38.3	D	69.9	E	40.4	D	**84.3**	F	42.3	D	**101.0**	F	46.1	D	**118.3**	F
		Northbound	40.8	D	50.4	D	41.9	D	54.9	D	41.9	D	54.9	D	43.4	D	62.3	E
		Southbound	54.0	D	48.6	D	63.7	E	51.8	D	68.4	E	56.7	E	**89.8**	F	65.1	E
19	Prospect Street/GU Gate & 37th Street	**Overall**	**7.6**	**A**	**7.9**	**A**	**7.8**	**A**	**8.1**	**A**	**7.9**	**A**	**8.1**	**A**	**8.0**	**A**	**8.3**	**A**
		Eastbound	7.8	A	8.3	A	7.9	A	8.5	A	8.1	A	8.6	A	8.3	A	8.8	A
		Westbound	7.6	A	7.5	A	7.7	A	7.6	A	7.8	A	7.6	A	8.0	A	7.8	A
		Northbound	7.3	A	7.7	A	7.3	A	7.8	A	7.4	A	7.9	A	7.5	A	8.0	A
		Southbound	7.5	A	7.9	A	7.6	A	8.0	A	7.7	A	8.1	A	7.8	A	8.2	A

In addition to the scenarios presented previously, an additional scenario for the future conditions with the Campus Plan was investigated. This "Signal Timing Optimization" scenario was performed in order to compare the signal timings used in the original analysis to alternative signal timings obtained by optimizing the future scenarios in *Synchro*. The purpose of this comparison was to determine where delay is most affected by the signal timing strategies employed by DDOT to prioritize commuting volumes traveling through the study area. Capacity analysis results are compared between the two scenarios to determine if signal timing optimization improves the overall delay at the study area intersections. An intersection where the optimization improves the LOS indicates that adding turn lanes or other improvements may not be necessary. Instead, these intersections could be investigated by DDOT to determine if the signal timing should be changed.

In order to perform this analysis, the *Synchro* software was used to "optimize" all the signal timings at the study area intersections during the morning and afternoon peak hours for the future conditions (2021) with the Campus Plan. Optimizing the signal timings in Synchro automatically sets the timings for all the phases at the intersection based on the minimum timing settings, which were provided in the signal timings obtained from DDOT. The strategy *Synchro* uses to optimize the signal timings is to provide enough green time to serve the 90th percentile traffic flow. By attempting to serve the 90th percentile traffic, *Synchro* programs timings that will clear the queue for 90% of all the cycles in the peak hour. If there is not enough time in the cycle to meet this objective, *Synchro* attempts to serve the 70th percentile traffic and then the 50th percentile traffic. This percentile optimization gives short phases a few extra seconds to process an occasional extra vehicle. Longer phases are also given extra time, although it is less as a proportion of the total time allocated by *Synchro*. At intersections where volume exceeds capacity, *Synchro* attempts to balance the volume-to-capacity ratios for each phase, while respecting the minimum times programmed in to each intersection.

In addition to optimizing the signal timings, the intersection offsets were also optimized by *Synchro*. Optimizing the intersection offsets compares all possible offsets and chooses the timing plan for each intersection that minimizes the delays on links between the intersection and its immediate neighbors. While optimizing the signal timings and offsets, no cycle lengths were changed. Table 15 presents the results of this analysis, comparing the results for the future (2021) scenario with the Campus Plan previously presented in Table 14 to a scenario with all signal timings and offsets optimized.

Signal timing improvements could alleviate some delays at the following intersections, as shown in Table 15:

- *Reservoir Road & Foxhall Road*
  Optimizing the signal timings in the morning peak hour could redistribute the delay across all movements, decreasing the delay on the eastbound and southbound approaches. In the afternoon peak hour, signal timing adjustments could alleviate the unacceptable overall delay.

- *Reservoir Road & 38th Street/GUH Gate #1*
  Optimizing the signal timings in the morning peak hour could alleviate a significant amount of the westbound approach delay. However, this is at the detriment of the northbound approach. In the afternoon peak hour, adjusting the signal timings could allow the northbound approach to operate under acceptable conditions.

- *Reservoir Road & 37th Street/Winfield Lane*
  Optimizing the signal timings could allow the southbound approach to operate under acceptable conditions during the morning peak hour.

- *Reservoir Road & 35th Street*
  Optimizing the signal timings in the morning peak hour could allow the northbound approach to operate under acceptable conditions and alleviate a significant amount of delay on the southbound approach. For the afternoon peak hour, optimized signal timings could allow the southbound approach to operate under acceptable conditions.

- *Foxhall Road & Canal Road*
  Optimizing the signal timings could allow the eastbound approach to operate under acceptable conditions during the afternoon peak hour.

- *Canal Road & GU Canal Road Gate*
  Optimizing the signal timings could improve service quality to east-west commuter traffic along Canal Road. However, in improving the overall LOS there would be a significant increase in delay to traffic exiting the university.

- *Canal Road/M Street & Whitehurst Freeway/36th Street*
  Optimizing the signal timings in the morning and afternoon peak hours could improve the overal intersection delay during both peak periods, alleviating the eastbound delay during the morning peak hour and the northbound delay during the afternoon peak hour. However, this would be at the detriment of the small volume of traffic exiting the gas station that feeds the southbound approach during both peak hours.

- *M Street & Key Bridge*
  Optimizing the signal timings in the morning peak hour could allow the intersection to operate under acceptable conditions.

- *M Street & 33rd Street*
  Optimizing the signal timings in the morning peak hour could alleviate the unacceptable delay on the westbound approach.

- *M street & Wisconsin Avenue*
  Optimizing the signal timings in the afternoon peak hour would alleviate the unacceptable delay on the westbound approach. However, the optimization process only shifts the delay around and causes the eastbound approach to operate under unacceptable conditions.

This report does not recommend retiming the signals in the study area. The above information is presented to demonstrate that existing signal timing strategies in the corridor, which have been employed by DDOT prioritize commuting volumes along the Reservoir Road and Canal Road / M Street corridors, is responsible for creating several of the significant delays observed in the study area. The delays are not due to other factors, such as lack of roadway capacity or heavy volumes on side streets. The decision on whether to change signal timings in the study area should be made by DDOT.

Table 15: Vehicular Levels of Service with Optimized Signal Timings and Offsets

Intersection		Approach	Future with Campus Plan				Future with Campus Plan With Optimized Timings & Offsets			
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	**Reservoir Road & Foxhall Road**	**Overall**	**176.7**	**F**	**106.3**	**F**	**174.0**	**F**	**69.6**	**E**
		Eastbound	**153.3**	**F**	74.2	E	**168.8**	**F**	74.2	E
		Westbound	79.7	E	**95.8**	**F**	**98.2**	**F**	57.0	E
		Northbound	**184.8**	**F**	25.1	C	**237.1**	**F**	**84.8**	**F**
		Southbound	**238.1**	**F**	**242.8**	**F**	**148.0**	**F**	68.6	E
2	**Reservoir Road & GUH Gate #4**	Westbound Left	1.8	A	0.5	A	1.8	A	0.5	A
		Northbound	**155.3**	**F**	44.4	E	**127.7**	**F**	44.4	E
3	**Reservoir Road & GUH Gate #3**	Westbound Left	8.6	A	0.5	A	8.6	A	0.5	A
		Northbound	**68.0**	**F**	40.9	E	**61.3**	**F**	39.1	E
4	**Reservoir Road & GUH Gate #2**	Westbound Left	7.6	A	1.7	A	7.6	A	1.7	A
		Northbound	**453.1**	**F**	25.6	D	**349.1**	**F**	24.9	C
5	**Reservoir Road & 39th Street**	**Overall**	**12.7**	**B**	**8.5**	**A**	**9.6**	**A**	**10.0**	**A**
		Eastbound	12.7	B	6.0	A	8.6	A	9.5	A
		Westbound	8.7	A	4.1	A	5.6	A	5.4	A
		Southbound	31.8	C	44.2	D	37.0	D	39.0	D
6	**Reservoir Road & 38th Street/ GUH Gate #1**	**Overall**	**302.0**	**F**	**70.2**	**E**	**167.5**	**F**	**35.6**	**D**
		Eastbound	14.1	B	11.4	B	15.2	B	30.0	C
		Westbound	**963.3**	**F**	13.2	B	**460.6**	**F**	26.4	C
		Northbound	53.8	D	**194.4**	**F**	**164.3**	**F**	52.8	D
		Southbound	26.1	C	24.6	C	34.2	C	14.1	B
7	**Reservoir Road & 37th Street/Winfield Lane**	**Overall**	**49.6**	**D**	**43.2**	**D**	**20.9**	**C**	**44.5**	**D**
		Eastbound	3.3	A	46.4	D	14.0	B	49.9	D
		Westbound	2.5	A	2.9	A	17.9	B	1.4	A
		Northbound	44.1	D	40.1	D	29.6	C	40.1	D
		Southbound	**372.9**	**F**	**150.7**	**F**	57.5	E	**150.7**	**F**

Intersection		Approach	Future with Campus Plan				Future with Campus Plan With Optimized Timings & Offsets			
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
8	Reservoir Road & 35th Street	**Overall**	**67.5**	**E**	**46.1**	**D**	**40.9**	**D**	**35.8**	**D**
		Eastbound	16.7	B	28.5	C	24.1	C	25.9	C
		Westbound	15.2	B	17.9	B	22.3	C	18.6	B
		Northbound	**112.8**	**F**	33.3	C	56.1	E	36.8	D
		Southbound	**184.7**	**F**	**118.2**	**F**	**80.3**	**F**	66.7	E
9	Foxhall Road & MacArthur Boulevard/44th Street	**Overall**	**24.5**	**C**	**23.7**	**C**	**30.1**	**C**	**18.1**	**B**
		Westbound	46.2	D	37.2	D	31.0	C	36.2	D
		Northbound	22.7	C	5.9	A	26.5	C	13.1	B
		Southbound	23.8	C	52.3	D	39.3	D	24.9	C
10	Foxhall Road & MacArthur Blvd	**Overall**	**11.4**	**B**	**3.9**	**A**	**13.7**	**B**	**8.1**	**A**
		Eastbound	31.5	C	13.2	B	35.9	D	31.8	C
		Northbound	0.4	A	0.2	A	0.4	A	0.2	A
		Southbound	4.2	A	2.4	A	8.5	A	1.4	A
11	Foxhall Road & Canal Road	**Overall**	**33.2**	**C**	**69.8**	**E**	**30.4**	**C**	**32.8**	**C**
		Eastbound	37.9	D	**224.7**	**F**	29.7	C	70.4	E
		Westbound	0.4	A	6.0	A	0.4	A	17.3	B
		Northbound	63.9	E	*not permitted*		63.9	E	*not permitted*	
12	Canal Road & GU Canal Road Gate (Unsignalized)	Southbound	12.5	B	20.9	C	12.5	B	26.0	D
13	Canal Road & GU Canal Road Gate (Signalized)	**Overall**	**3.1**	**A**	**58.4**	**E**	**0.6**	**A**	**37.8**	**D**
		Eastbound	0.2	A	20.1	C	0.2	A	10.6	B
		Westbound	7.9	A	76.8	E	1.2	A	39.5	D
		Southbound	*not permitted*		51.8	D	*not permitted*		**186.1**	**F**
14	Canal Road/M Street & Whitehurst Freeway/36th Street	**Overall**	**53.4**	**D**	**78.0**	**E**	**45.3**	**D**	**58.4**	**E**
		Eastbound	79.2	E	**83.9**	**F**	56.1	E	46.2	D
		Westbound	1.7	A	63.7	E	1.3	A	79.4	E
		Northbound	41.7	D	**81.6**	**F**	54.0	D	53.8	D
		Southbound	50.3	D	46.6	D	**136.2**	**F**	**149.7**	**F**

Intersection		Approach	Future with Campus Plan				Future with Campus Plan With Optimized Timings & Offsets			
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
15	**M Street & Key Bridge**	**Overall**	**76.7**	**E**	**101.2**	**F**	**41.6**	**D**	**117.0**	**F**
		Eastbound	14.2	B	**209.6**	**F**	21.9	C	**103.1**	**F**
		Westbound	**126.9**	**F**	**95.5**	**F**	53.7	D	**158.0**	**F**
		Northbound	**94.1**	**F**	34.9	C	48.6	D	75.4	E
16	**M Street & 34th Street**	**Overall**	**13.6**	**B**	**29.2**	**C**	**12.8**	**B**	**14.0**	**B**
		Eastbound	4.3	A	6.0	A	6.0	A	3.0	A
		Westbound	37.1	D	44.6	D	16.9	B	8.8	A
		Northbound	34.7	C	35.5	D	35.5	D	36.4	D
		Southbound	12.3	B	37.2	D	31.2	C	34.9	C
17	**M Street & 33rd Street**	**Overall**	**31.3**	**C**	**19.5**	**B**	**10.0**	**A**	**21.7**	**C**
		Eastbound	1.2	A	16.4	B	10.1	B	30.8	C
		Westbound	**112.2**	**F**	18.2	B	8.1	A	8.5	A
		Northbound	37.9	D	56.0	E	39.0	D	61.6	E
18	**M Street & Wisconsin Avenue**	**Overall**	**42.3**	**D**	**72.1**	**E**	**43.5**	**D**	**76.6**	**E**
		Eastbound	28.1	C	59.2	E	34.2	C	**114.9**	**F**
		Westbound	42.3	D	**101.0**	**F**	33.8	C	68.5	E
		Northbound	41.9	D	54.9	D	43.7	D	54.9	D
		Southbound	68.4	E	56.7	E	68.4	E	48.8	D
19	**Prospect Street/GU Gate & 37th Street**	**Overall**	**7.9**	**A**	**8.1**	**A**	**7.9**	**A**	**8.1**	**A**
		Eastbound	8.1	A	8.6	A	8.1	A	8.6	A
		Westbound	7.8	A	7.6	A	7.8	A	7.6	A
		Northbound	7.4	A	7.9	A	7.4	A	7.9	A
		Southbound	7.7	A	8.1	A	7.7	A	8.1	A

3.1.5 Summary of Analysis Results & Mitigation Measures

Generally, speaking, the Campus Plan is considered to have an impact at an intersection within the study area if the capacity analyses show an LOS F condition in the Future with Campus Plan scenario where one does not exist in the Future without Campus Plan scenario. This occurs in four locations within the study area, which are discussed in detail below. Note that in three of the four cases, the delays are attributable in large part to the signal timing priority given to commuting traffic. Therefore, in these situations mitigation measures other than signal timing adjustments are inappropriate. In general, this report does not recommend retiming the signals in the study area, and recognizes that the determination to either adjust signal timings to address the potential impact or maintain current timings to prioritize the existing traffic pattern should be made by DDOT. Both the adjustment of timings and the maintenance of the status quo have been recognized by DDOT as acceptable means of addressing potential impacts in past Campus Plan proceedings.

- *Reservoir Road & Foxhall Road*

  At this intersection, the westbound approach during the PM Peak hour reaches LOS F in the Future with Campus Plan scenario where it did not in the Future without Campus Plan scenario. As described above, these delays can be mitigated through optimizations to signal timings and offsets, which would decrease and/or alleviate the unacceptable delays, but the determination should be left to DDOT.

- *Reservoir Road and GUH Gate #3*

  The vehicular capacity analyses all show lengthy delays for traffic exiting the campus onto Reservoir during the AM peak hour at the three unsignalized driveways, Gates 2 through 4. Delays to traffic exiting Gate #3 reaches LOS F conditions in the Future with Campus Plan scenario where it did not in the Future without Campus Plan scenario. These delays only affect University and Hospital-related traffic leaving the campus.

  Traffic exiting the campus is heavily reliant on the availability or lack of gaps within traffic on Reservoir Road, but the capacity analysis discussed above does not adequately capture and assess the ability of drivers to use such gaps. Therefore, Gorove/Slade conducted a simulation using SimTraffic to see if similar results occurred. These simulations are able to model drivers turning onto traffic using gaps created by nearby traffic signals and more accurately assess the likelihood of potential delays based on the availability of such gaps.

  Table 16 provides a comparison of HCM and simulation results for the projected delays for these existing movements during the AM peak Hour for the Future scenario with the Campus Plan (2021). The simulation analysis indicates that the HCM method's conservative approach resulted in forecasted delays that are not likely to actually materialize, because adequate gaps for exiting traffic will be available.

  A signal warrant analysis was also conducted for Gate #3 based on existing volumes, details of which are provided in the technical appendix. The analysis concludes that no signal warrants are met at this intersection based on existing volumes.

  Accordingly, this report recommends that the analysis of these gates be updated in conjunction with the transportation studies that accompany further processing approval of development sites at the Hospital and Medical Center, as appropriate. While it is unlikely that the amount of traffic volumes at these gates would warrant a traffic signal, this report also recommends that warrant analyses be performed as a part of the further processing review for any campus gate on Reservoir Road that demonstrates a poor LOS result in the updated capacity analysis. This report concludes that no other mitigation effort is required at this time.

Table 16: Comparison of HCM and Simulation Results at Gate 2 through Gate 4

	Intersection	Movement	AM Peak Hour				PM Peak Hour			
			HCM		*SimTraffic 7*		*HCM*		*SimTraffic 7*	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
2.	**Reservoir Rd & Gate #4**	Westbound Left	1.8	A	11.1	B	0.5	A	4.9	A
		Northbound	**155.3**	**F**	12.5	B	44.4	E	24.0	C
3.	**Reservoir Rd & Gate #3**	Westbound Left	8.6	A	18.5	C	0.5	A	5.2	A
		Northbound Left	**666.8**	**F**	**78.8**	**F**	**59.6**	**F**	23.6	C
		Northbound Right	38.4	E	9.1	A	18.3	C	6.4	A
4.	**Reservoir Rd & Gate #2**	Westbound Left	7.6	A	10.8	B	1.7	A	5.8	A
		Northbound Left	**1331.4**	**F**	37.2	E	35.5	E	20.3	C
		Northbound Right	17.8	C	12.4	B	16.3	C	16.2	C

After review of the above findings, DDOT has recommended that the University undertake annual evaluations of Gate #3 through a signal warrant analysis, in order to determine whether signalization is required in the future. The University is evaluating this request.

- *Reservoir Road & 38th Street/GUH Gate #1*

  At this intersection, the LOS for the overall intersection and westbound approach during the AM Peak hour experience significant delays, in part due to the impact of additional Hospital-related trip generation. Note, however, that the capacity analysis does not account for the fact that westbound through traffic along Reservoir Road is able to maneuver around vehicles waiting to make a left turn. Similar to the limitation regarding gaps in traffic discussed above, the capacity analysis is limited and overstates the level of delay for the westbound travel lane during the AM peak hour. (During the PM peak hour, parking is restricted along Reservoir Road, effectively creating a through travel lane and a left turn lane, and the westbound approach operates at an acceptable level of service (LOS B). Again, Gorove/Slade conducted a simulation using SimTraffic to evaluate the operation of the intersection. These simulations are able to model vehicles maneuvering around other vehicles waiting to make a left turn, and therefore more accurately assesses the likelihood of potential delays based on the availability of room for such movement.

  Table 17 provides a comparison of HCM and simulation results *at this intersection*. The simulation analysis indicates that the HCM method's approach resulted in forecasted delays that are not likely to actually materialize.

  One potential mitigation measure for the delay would be the addition of a dedicated westbound left turn lane along Reservoir Road. This would allow for westbound through traffic along Reservoir Road to more easily bypass campus-bound vehicles turning left into the campus, and would provide more capacity for these movements. Signal timing updates would then redistribute green time to other approaches to alleviate delay. Table 18 compares the capacity analysis results for this intersection with and without the turn lane.

Table 17: Comparison of HCM and Simulation Results at Gate 1

Intersection	Approach	Existing Conditions (2011)				Future Conditions (2021) without Campus Plan				Future Conditions (2021) with Campus Plan			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
HCM 2000 Methodology													
6. Reservoir Rd & GUH Gate #1 38th St	**Overall**	**62.4**	**E**	**32.7**	**C**	**86.6**	**F**	**32.4**	**C**	**302.0**	**F**	**70.2**	**E**
	Eastbound	4.1	A	11.8	B	4.2	A	13.2	B	14.1	B	11.4	B
	Westbound	166.5	F	11.6	B	237.7	F	12.3	B	963.3	F	13.2	B
	Northbound	44.6	D	81.6	F	45.2	D	82.6	F	53.8	D	194.4	F
	Southbound	34.1	C	24.5	C	34.3	C	24.6	C	26.1	C	24.6	C
Average of 10 SimTraffic 7 Simulations													
6. Reservoir Rd & GUH Gate #1 38th St	**Overall**	**11.6**	**B**	**14.0**	**B**	**13.0**	**B**	**13.8**	**B**	**37.0**	**D**	**18.9**	**B**
	Eastbound	5.3	A	7.6	A	5.4	A	8.2	A	7.0	A	9.2	A
	Westbound	19.0	B	7.6	A	22.7	C	7.8	A	98.4	F	10.5	B
	Northbound	32.0	C	30.4	C	30.9	C	30.0	C	30.1	C	40.0	D
	Southbound	11.7	B	7.5	A	14.1	B	7.2	A	14.4	B	7.4	A

Table 18: Analysis of Potential Left-Turn Lane

Intersection	Approach	Existing Conditions (2011)				Future Conditions (2021) without Campus Plan				Future Conditions (2021) with Campus Plan			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Existing Intersection Lane Configuration													
6. Reservoir Rd & GUH Gate #1 38th St	**Overall**	**62.4**	E	**32.7**	C	**86.6**	**F**	**32.4**	C	**302.0**	**F**	**70.2**	E
	Eastbound	4.1	A	11.8	B	4.2	A	13.2	B	14.1	B	11.4	B
	Westbound	166.5	F	11.6	B	237.7	F	12.3	B	963.3	F	13.2	B
	Northbound	44.6	D	81.6	F	45.2	D	82.6	F	53.8	D	194.4	F
	Southbound	34.1	C	24.5	C	34.3	C	24.6	C	26.1	C	24.6	C
With Added Westbound Left Turn Lane and Reconfigured Signal Timings													
6. Reservoir Rd & GUH Gate #1 38th St	**Overall**	**10.6**	B	**22.2**	C	**10.4**	B	**22.3**	C	**31.7**	C	**38.7**	D
	Eastbound	2.9	A	14.2	B	2.3	A	14.3	B	8.3	A	38.0	D
	Westbound	8.7	A	12.1	B	8.0	A	12.6	B	55.6	E	26.4	C
	Northbound	54.4	D	42.8	D	60.6	E	44.5	D	75.0	E	52.8	D
	Southbound	36.0	D	19.9	B	36.9	D	20.2	C	28.5	C	14.1	B