University *of* Virginia

Transportation Demand Management Plan

Submitted to: University of Virginia

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In Association with: *Land Planning and Design Associates, Inc.*

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EXECUTIVE SUMMARY

The University understands the need for safe and efficient transportation systems and the ability for all user groups – students, faculty, staff, patients, and visitors – to have multiple choices for movement around Grounds and to access the University as a destination. Transportation Demand Management (TDM) is the art of influencing travel behavior for the purpose of reducing the demand for single occupant vehicle use. To help achieve the University's transportation goals, this TDM Plan will examine existing modes of access to the University and Health System for different user types, to specifically address issues related to faculty and staff daily commutes, student access to classes, staff and patient access to Health System facilities, and public access to events. This TDM Plan was developed as a part of the update of the University's Master Plan to enhance Grounds planning decisions for improving mobility while respecting the context.

The TDM Plan for the University is a strategic plan providing recommendations for the transportation system improvements over 10-and 20-year planning horizons. This plan requires examining the future of Grounds from both a physical and user perspective, and recommends tools and mechanisms to better link transportation and land uses to affect a more efficient and sustainable transportation system.

A successful plan also needs the collaboration of all the user groups. The University established a Steering Committee to oversee the plan development process. Six focus groups provided a wealth of first-hand information on the strengths and weaknesses of the existing transportation system and ideas for the future. Through the steering committee, the focus groups, and discussions with senior leadership at the University, the following TDM Plan has been established.

EXISTING CONDITIONS

As part of the existing conditions assessment, a review of existing pedestrian, bicycle, parking, traffic, and transit accommodation was conducted. Existing commuting choices were also evaluated.

Pedestrians and Bicycles

In general, pedestrian travel is well accommodated within major precincts on Grounds. However, major roadways such as Emmett Street and University Avenue present a barrier to safe pedestrian travel. A good network of pedestrian pathways is provided internal to Grounds; however existing sidewalks and crosswalks leading to Grounds are always not placed strategically to suit existing pedestrian needs and lack the uniformity necessary to make them highly visible.

In many areas, signage and wayfinding for pedestrians is limited. The street network in Charlottesville is somewhat confusing due to the topography in the area, historic development patterns, railroad corridors, and other features. Also, there is a dense network of pathways through Central Grounds that does not necessarily correspond to desire lines between the Health System campus and the McCormick Road area.

The demand for bicycle access is greatest in Central and West Grounds, however, bicycle access through these areas is limited and the terrain in certain locations is steep for bicycles. Currently, bicycle racks are not well-located and bicycle parking is inadequate, as evidenced by bicycles locked to railings and signs.

Parking

Parking in and around Grounds and the Health System complex is accommodated through numerous surface lots and parking decks, as well as metered street locations scattered throughout the area. In general, the bulk of the parking provided for the University and related functions is located outside Central Grounds and requires a five to ten minute walk to reach most destinations. A large majority of the parking spaces require permits and can therefore only be used by staff, faculty, students, and other University affiliated users. Both the University and Hospital implement an extensive permit parking program in order to manage the daily use of this parking.

Traffic

Many of the roadways that serve as major access corridors to Grounds were constructed some time ago, and provide two-lane cross-sections in context with the historic framework of the area. These roadways experience congestion due to growth at the University, in the City of Charlottesville, and the region. Wide roadway cross-sections and large intersections with multiple turn lanes are not considered an appropriate context for the historic nature of Charlottesville or the University. To the extent practical, it is a priority of all parties to maintain the area's historic nature. This priority must also be balanced with providing safe and efficient operations to all transportation users.

Transit

Two transit services and multiple transit routes are readily available for those traveling to, from or within the University of Virginia Grounds and the Health System complex. These include seven fixed-routes operated by the University Transit Service (UTS) and five direct routes (no transfers) and three indirect routes (with transfers) by the Charlottesville Transit Service (CTS) operated by the City of Charlottesville. For students, faculty, and staff who have disabilities and who are unable to use the UTS fixed route buses, the Parking and Transportation Service provides UTS Demand and Respond Transportation Service (UTS DART). In addition, JAUNT provides demand-responsive transit services in the larger region surrounding Charlottesville.

Commute Options

The University and local and regional agencies operate numerous programs in order to encourage the use of alternative modes of transportation. Employees and students have access to transportation resources to help reduce the number of single occupancy vehicle trips associated with the University. These alternative modes are made more appealing to commuters through the following programs: RideShare, Carpooling, Bicycling/Walking, Teleworking, Vanpooling, Guaranteed Ride Home, Park and Ride Lots, Emmet/Ivy Parking Garage Occasional Parker Program, Rental Vehicles, JAUNT, and Greene County Transit.

TDM PLAN AND FUTURE CONDITIONS

One of the first steps toward defining a TDM plan for the University of Virginia was a review of TDM practices at other similar institutions. Once the range of TDM measures was identified, the team defined four different packages of TDM strategies reflecting different degrees of incentives and controls on travel behavior. The effectiveness of these strategies was then tested using the EPA Commuter Model v2.0 which estimates the likely change in travel behavior for different TDM programs. Finally, the impact of these travel behavior changes on the parking system at the University was considered. In this analysis, the amount of additional parking needed to meet future population projections was estimated.

Peer Analysis

Many colleges, universities and hospitals are implementing TDM programs. In general, these institutions are pursuing these policies for one of the following three reasons:

1. To comply with state or local development regulations,
2. To reduce the costs and physical impacts of providing parking facilities; or
3. Out of general environmental concern.

As part of this study, current practices at several universities were identified to help formulate the University of Virginia's program. The results of this survey are provides in Table ES-1.

Table ES-1 Peer Analysis Summary

	Mission	Key Features	Parking Fees ($)	Marketing	Funding
Virginia Tech	Promote and encourage alternatives to drive along commuting	Vanpool discounts, reserved parking, free transit	81 to 106	Website, email, direct mail	Information Unavailable
University of North Carolina	Reduce traffic congestion	Van/carpool reserved parking, discounts, free transit, car share	281 to 1,659	Website, events, email, transportation coordinators	State, parking permits
Harvard University	Reduce traffic and improve air quality	Van/carpool reserved parking, discounts	915 to 1,830	Website, email, events	University Human Resources
Cornell University	Reduce demand for parking, improve air quality	Van/carpool subsidies, bike lanes	0 to 690	Website, events, in person	Parking permits
Stanford University	Ease traffic congestion	Van/carpool subsidies, prizes, free car rental vouchers	216 to 552	Website, email, events, refer a friend	Information Unavailable
University of Wisconsin	Reduce vehicles driven to campus	Van/carpool discounts, extensive paths	445 to 1,035	Website, events,	Parking permits
University of Michigan	Reduce SOVs	Vanpool program	191 to 690	Website	Information Unavailable

Scenarios of TDM Program Implementation

Based on the input from the University of Virginia Steering Committee, the stakeholder workshops, and the peer analysis presented above, four potential TDM scenarios have been developed and compared to a baseline scenario. These include the following:

- Very Aggressive Scenario;
- Aggressive Scenario;
- Moderate Scenario; and
- Least Aggressive Scenario.

As summarized in Table ES-2, the TDM scenarios are focused on commuters to Grounds and the Health System. They do not focus on measures intended to reduce student-resident driving. The first scenario (Very Aggressive) includes all of the potential measures for consideration by the University. The subsequent scenarios include fewer or less aggressive implementation of the TDM measures.

Table ES-2 TDM Scenarios

TDM Measure		TDM Scenario: Very Aggressive	Aggressive	Moderate	Least Aggressive	Baseline
1.	No Parking Expansion	◆				
2.	Parking Price Increase	> 100 %	50 to 100 %	50 %	20 – 33 %	Minor
3.	Parking Permit Buyback	◆	◆			
4.	Student Parking Reduction[1]	◆	◆			
5.	Vanpool/Carpool Parking Location	Premium	Premium	Reserved	Reserved	
6.	Vanpool/Carpool Financial Incentive	Free & Bonus	Free & Bonus	Discount		
7.	Housing Incentives/Sponsorship	◆	◆			
8.	Bicycling Improvements	Lanes/Paths	Lanes/Paths	Racks, etc.		
9.	Pedestrian Improvements	◆	◆			
10.	Free-Ride Transit[2]	◆	◆	◆	◆	◆
11.	Commuter Membership Program	◆	◆			
12.	Member Spot-Rewards	◆	◆			
13.	Transportation Events	◆	◆			
14.	Transit Advocacy/Coordination	◆	◆	◆	◆	◆
15.	Park & Ride Implementation	◆	◆	◆		
16.	Pre-Tax Payment for Alternatives	◆	◆	◆		
17.	RideShare Marketing	◆	◆	◆		
18.	Ride Matching Assistance	◆	◆			
19.	Car-Sharing	◆	◆	◆	◆	
20.	Flexible Work Arrangements	◆				
21.	Occasional Parking	◆	◆	◆	◆	◆
22.	TDM Coordinator	◆	◆	◆	◆	◆
23.	Program Marketing	◆	◆	◆	◆	
24.	Website Enhancements	◆	◆	◆	◆	

1. Student changes are not modeled in the results discussed later, however an aggressive program would include changes to student parking policies and other measures to reduce automobile use by students.
2. UVA recently implemented a "Free-Ride" transit program, however, its effects are not included in the baseline.

◆ Program element included. Where appropriate, a level of program implementation is identified.

Mode Split Analysis

The United States Environmental Protection Agency's (EPA) Commuter Model (version 2.0) was used to test the effectiveness of the various TDM scenarios. The Commuter Model is a spreadsheet-based computer model that estimates the travel impacts of TDM programs. The results of the model for each TDM Scenario are presented in Table ES-3.

Table ES-3 TDM Scenario Mode Share Results

	TDM Scenario				
Mode Share	Very Aggressive	Aggressive	Moderate	Least Aggressive	(Existing) Baseline
Drive Alone	41 %	49 %	54 %	57 %	62 %
Carpool	21 %	17 %	13 %	12 %	10 %
Vanpool	2 %	2 %	2 %	1 %	0 %
Transit	7 %	7 %	7 %	6 %	5 %
Bicycle	4 %	3 %	2 %	2 %	2 %
Pedestrian	20 %	17 %	17 %	17 %	16 %
Other	5 %	5 %	5 %	5 %	5 %
Total	100 %	100 %	100 %	100 %	100 %

1. UVA recently implemented a "Free-Ride" transit program, however, its effects are not included in the baseline data

Parking Analysis

The changes in mode split were applied to future population estimates provided by the University to estimate the impact of the TDM scenarios on the amount of parking that will be needed in each condition to support planned institutional growth. The analysis is conducted for both a 2015 and a 2025 horizon year. The analyses also rely on a number of different assumptions described in the report.

The TDM programs discussed in this report do not reflect potential changes in student auto ownership or behavior. It is possible that further reductions in future parking needs could be realized through measures designed to influence student travel behavior. The results of the parking analysis are summarized in Table ES-4.

Table ES-4 – Summary of Parking Analysis

	2015	2025
Total Parking Demand Increase		
Baseline	*1,400*	*3,250*
Least Aggressive	975	2,725
Moderate	775	2,475
Aggressive	450	2,100
Very Aggressive	0	1,325
Net New Parking Needed[1]		
Baseline	*400*	*2,250*
Least Aggressive	0	1,725
Moderate	0	1,475
Aggressive	0	1,100
Very Aggressive	0	325
Percent Increase in Parking Needed	Total/Net	Total/Net
Baseline	*9 / 2*	*20 / 14*
Least Aggressive	6 / 0	17 / 10
Moderate	5 / 0	15 / 9
Aggressive	3 / 0	13 / 7
Very Aggressive	0 / 0	8 / 2

1 Approximately 1,000 parking spaces are currently available to accommodate increased demand

The table shows that a TDM plan can reduce the amount of parking that will be needed to support future growth in enrollment and employment. For example, with the baseline scenario, the University will need to significantly expand its commuter parking supply. With the very aggressive scenario, the University may be able dramatically reduce, or even eliminate, the need for additional commuter parking.

The University will need to balance its desire to avoid investment in new parking facilities with its ability to implement aggressive TDM measures to formulate a thoughtful TDM program that meets its existing and future needs. Additionally, the University will need to recognize the speculative nature of the TDM analysis and that future realities in terms of available data, travel behavior, program effectiveness, and institutional acceptance may necessitate a change of course in the future.

Steering Committee Direction

The steering committee discussed the appropriate level of TDM implementation. There was consensus that the University of Virginia should pursue TDM in a moderate to aggressive way. Members of the steering committee supported the implementation of a program that reduces single occupant vehicle travel as much as possible without creating disruption to employee's ability to complete work responsibilities and meet personal obligations. It was suggested that Phase 2 of this plan should consider the income and geographic impact of the TDM program on specific populations. Phase 2 should also ensure that the program is consistent with existing or modified human resource and benefit policies. The impacts on neighborhood parking around Grounds should also be assessed.

With implementation of the moderate to aggressive TDM program, University can expect a 3 percent reduction in automobile mode share (with an 8 percent shift from single occupant vehicle to carpooling) and a reduction in parking demand of between 625 and 775 spaces for the 2015 and 2025 scenarios, respectively when compared to the Baseline scenario. This reduction in parking needs is likely to result in substantial cost savings associated with the development of new parking resources. Rough estimates gauge this cost savings to be in the range of $15 to $27 million over the timeframe considered in this study.

Preliminary Conclusions

The analysis contained in this report shows that TDM can play a significant role in the development of the Grounds Plan and future growth. TDM can help reduce automobile traffic associated with growth in enrollment and employment at the University of Virginia and can help reduce or eliminate the need for an increase in the parking supply. The degree to which TDM can assist with these objectives will be determined based on the University's selected approach - determined through stakeholder participation, the rigor and success of program implementation, and the behavioral response of the University community.

PHYSICAL IMPROVEMENTS

To support the TDM plan, a range of physical improvements can encourage walking, bicycling, and the use of transit. Guidelines for implementation of these improvements are also provided in this report. There are two alternatives for including physical improvements on University Grounds. The University could decide to implement some or all improvements as a single grounds-wide construction project or improvements could be included in construction as plans as new facilities are developed. In either case, the goal of the improvements is to form a comprehensive system of measures that encourage University staff, students, and health system employees to seek alternate modes of transportation when destined to the University.

1.0 INTRODUCTION

The University of Virginia is located within the City of Charlottesville and the surrounding Albemarle County. As a leader among public institutions, the University supports research and scholarship in multiple academic disciplines including the health sciences. Current enrollment of undergraduate and graduate students is approximately 20,000. The University employs 11,600 permanent staff and faculty and is the largest employer in the Charlottesville area. The University Health System had 586 beds and served over 29,000 inpatients and 650,000 outpatient visits in fiscal year 2006. A map of University property is shown in Figure 1.

The Grounds of the University are nearly 1,135 acres of rolling terrain. The Grounds are a mix of historic buildings and new facilities built in the context of the historic framework initially established by Thomas Jefferson. Most of the road network that serves the University is owned and maintained by the City of Charlottesville or the Virginia Department of Transportation.

The University understands the need for safe and efficient transportation systems and the ability for all user groups – students, faculty, staff, patients, and visitors – to have multiple choices for movement around Grounds and to access the University as a destination. Transportation Demand Management (TDM) is the art of influencing travel behavior for the purpose of reducing the demand for single occupant vehicle use. To help achieve its transportation goals, this TDM Plan will examine existing modes of access to the University and Health System for different user types, to specifically address issues related to faculty and staff daily commutes, student access to classes, staff and patient access to Health System facilities, and public access to events. This TDM Plan is being developed as a part of the update of the University's Master Plan to enhance grounds-planning decisions for improving mobility while respecting the context.

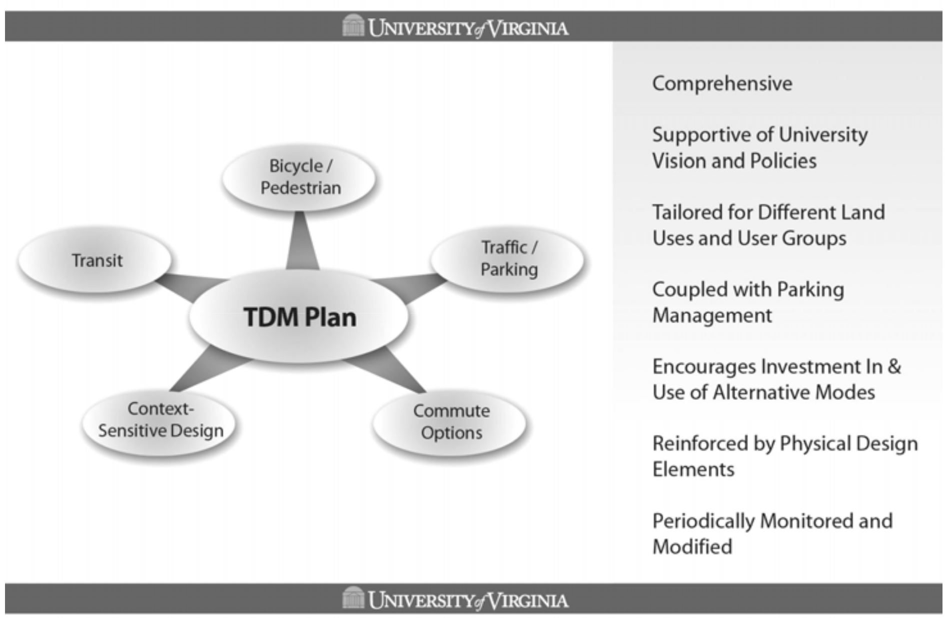
The TDM Plan for the University is a strategic plan providing recommendations for the transportation system improvements over 10-and 20-year planning horizons. This plan requires examining the future of Grounds from both a physical and user perspective, and will recommend tools and mechanisms to better link transportation and land uses to affect a more efficient and sustainable transportation system.

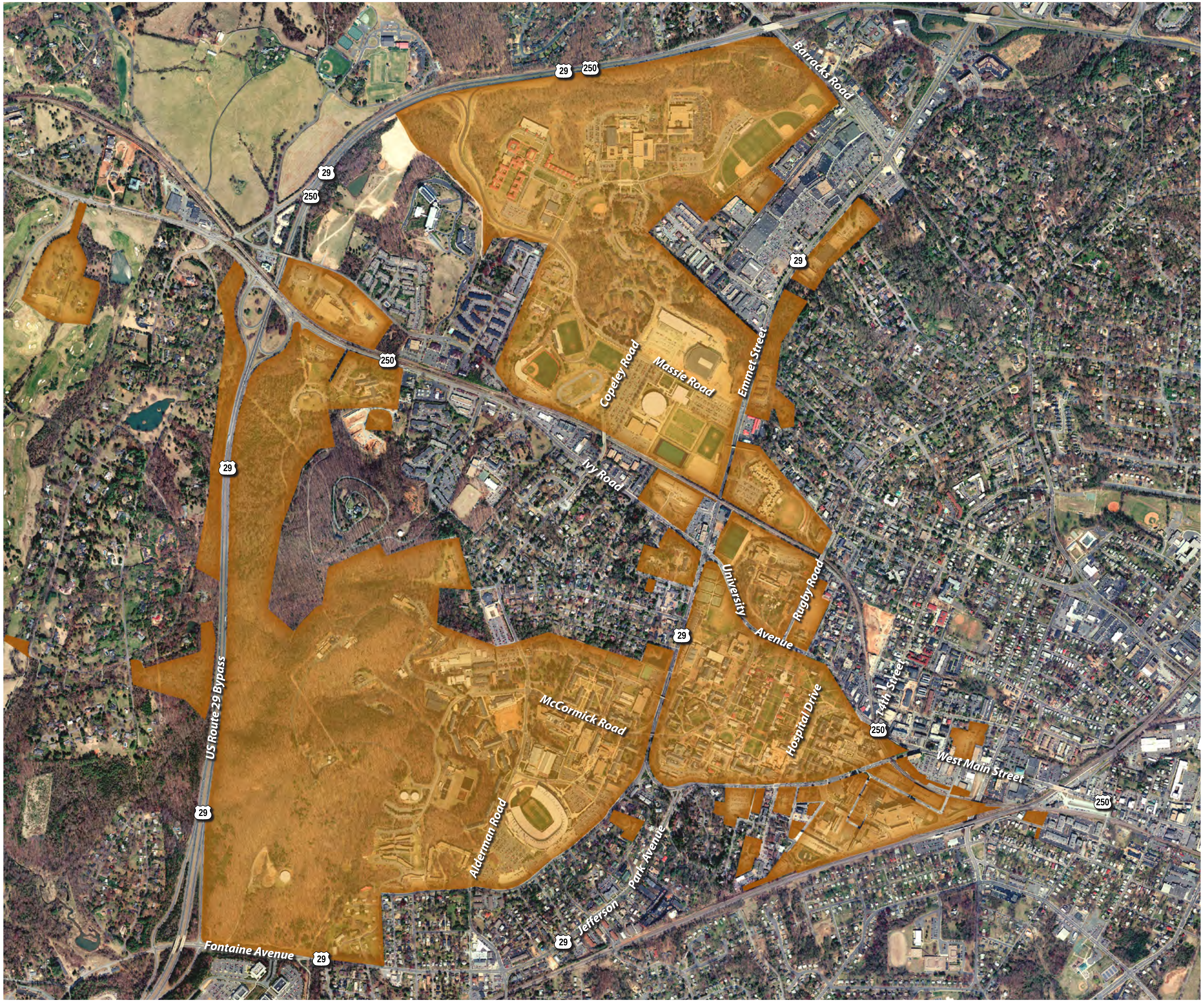
A successful TDM plan is:

- Comprehensive;
- Supportive of University vision and policies;
- Tailored for different land uses and user groups;
- Coupled with parking management;
- Encourages investment in and use of alternative modes;
- Reinforced by physical design elements; and
- Periodically monitored and modified.

A successful plan also needs the collaboration of all the user groups. The University has established a Steering Committee to oversee the plan development process. Six focus groups have provided a wealth of first-hand information on the strengths and weaknesses of the existing transportation system and ideas for the future.

There are challenges to modifying travel behavior. The University currently supports alternative modes to the single occupant vehicle, but those opportunities are often not chosen or not marketed well. The desire for convenient, reasonably priced parking can currently be satisfied for many. Until there are incentives or deterrents for altering behaviors, drivers will likely not change behaviors. The University's commitment to TDM is evident by the creation of a TDM Manager position to implement, manage, and monitor the plan strategies.





Legend

University of Virginia Property

0 600 1,200 Feet

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Figure 1

Site Location Map and
Definition of University of Virginia Boundaries

Transportation Demand Management Plan
Existing Conditions Report

2.0 EXISTING CONDITIONS

2.1 PEDESTRIANS

Like many campus environments, walking is a significant means of travel on Grounds and in the surrounding areas of Charlottesville. Students walk between residences and academic buildings, faculty and staff walk between offices and teaching locations, and many members of the community are able to walk to restaurants, shops, and other nearby services. In addition, some faculty, staff, and students commute to Grounds by walking. Many faculty, staff, and students walk because distances between origins and destinations on Grounds are generally short. Additionally, there is a University culture that supports walking. This section provides the following assessments of existing conditions for pedestrians:

- Access and connectivity;
- Safety and security; and
- Signage and way finding.

2.1.1 ACCESS AND CONNECTIVITY

Figure 2 depicts major pedestrian zones, barriers and important linkages for pedestrian travel on Grounds. In general, pedestrian travel is well accommodated within major precincts on Grounds. Within South Grounds, a strong pattern of north-south pedestrian travel exists in the Brandon Avenue-Monroe Avenue-15th Street area. Major roadways, such as Emmet Street, University Avenue, Jefferson Park Avenue, Stadium Road, and Alderman Road are significant barriers to pedestrian travel. In addition several intersections and crossing locations are particularly difficult for pedestrians. These include the following intersections:

- Jefferson Park Avenue at Emmet Street,
- Jefferson Park Avenue at University Avenue/West Main Street,
- Stadium Road at Emmet Street,
- Rugby Road at University Avenue, and most significantly
- Emmet Street at University Avenue/Ivy Road

The University's pedestrian facilities include pedestrian bridges to address some of the connectivity limitations imposed by the major roadways and intersections surrounding Grounds. Three pedestrian bridges link University Grounds:

- In the McCormick Road area, a bridge spans Emmet Street, linking the Curry School of Education at Ruffner Hall to Brown College.
- The McCormick Road bridge connects Central and West Grounds

- Farther north in North Grounds, Goodwin Bridge links the Arts Grounds to north Grounds, specifically, the Lambeth Field Residential Area and University Hall.

In addition, another grade-separated pedestrian facility crossing Jefferson Park Avenue is currently proposed as part of the “South Lawn” project located adjacent to Central Grounds at Venable Lane.

At the University Health System, two pedestrian bridges provide connections across Jefferson Park Avenue. A third pedestrian bridge connects the parking to the hospital across Lee Street.

Crosswalks and Intersections

In general, pedestrians cross streets at the narrowest locations and wide medians prompt pedestrians to cross at any point. According to the 2005 *University of Virginia Engineering and Science Transportation Initiatives Evaluation*, several crosswalks span McCormick Road in Central Grounds. However, not all are placed strategically to suit current pedestrian travel patterns. Crosswalks also exist further north in the University Hall and Athletic Fields area, connecting to the Emmet Street/Ivy Road parking garage. West of Central Grounds, high pedestrian volumes cross the Alderman Road-McCormick Road and Whitehead Road-Stadium Road intersections. Crosswalks are also found at most intersections on City streets within and surrounding the University. Unfortunately, there is not a consistent treatment or marking pattern for crosswalks on and around Grounds, which detracts from the effectiveness of the crosswalks provided.

Sidewalks

Most streets in and around Grounds include sidewalks, although not all are suited to the demands they serve. Existing sidewalks along McCormick Road and between Central Grounds and North Grounds’ intramural facilities are of inadequate width and are not characteristic of the social nature of University life. Through observation, it appears that students only use the south side sidewalk. Disabled students often use roadways because many of the University’s sidewalks are narrow and overcrowded at peak times. Important pedestrian connections between the Engineering School and Brown College (across Emmet Street) are lacking, limiting pedestrian connectivity in this area. Sidewalks are also lacking west of Central Grounds, in the Carl Smith Center, Alderman Road area, and near the Slaughter Recreation Center. Discontinuous sidewalk connections are problematic on Emmet Street near Stadium Road and Jefferson Park Avenue.

Pathways

A dense network of pedestrian pathways is provided within Central Grounds, and the McCormick Road academic and residential area. The pathways between Garrett Hall and the Amphitheater and Clark Hall and Bryan Hall in Central Grounds are heavily utilized by students within the academic year. In the McCormick Road area, Engineers Way links the engineering school buildings, beginning at Thornton Hall and ending at Olsson Hall and the Albert H. Small Building. In the student housing areas, networks of paved and sidewalk paths connect dorms within the McCormick Road, Alderman Road, Brown College, and Gooch/Dillard housing areas.

In addition, a path serves the Goodwin Bridge, which takes pedestrian and bicycle traffic over four lanes of Emmet Street vehicular traffic, linking North and Central Grounds between University Hall and Lambeth housing to Rugby Road. This pathway is the first phase of the proposed "Groundswalk" intended to better link North and Central Grounds with a consistent pedestrian network.

2.1.2 SAFETY AND SECURITY

There are some challenges for pedestrians within Central and West Grounds. Insufficient sidewalk widths along McCormick Road often force pedestrians into the roadway during class changes, increasing the likelihood of pedestrian-vehicle and pedestrian-bicycle conflicts. Crossing Jefferson Park Avenue is particularly challenging, as motorists do not often yield to pedestrians at crosswalk locations. Specific pedestrian and traffic issues recently identified by the University Safety and Security Committee include the portion of Midmont Lane turning north toward Zehmer Hall and the intersection of 15th Street and Lane Road.

Alderman Road's east side lacks adequate lighting between Whitehead and McCormick Roads. Concerns have also been expressed about lighting and vegetation in the area behind the Dell. The University Safety and Security Committee found inadequately lighted areas around the Facilities Management Building parking lot (along Alderman Road side and west side of lot), Zehmer Hall Annex parking lot, and Rugby Road "A6" parking lot. At Zehmer Hall, the portion of the Catholic Church driveway adjacent to the Midmont Lane was found to be poorly lighted.

In addition to the concerns above, motorists are a significant contributor to pedestrian safety concerns. Locations of high pedestrian/vehicles conflict include:

- Emmet Street
- Emmet Street and Ivy Road Intersection
- University Avenue
- West Main Street and Jefferson Park Avenue Intersection
- Emmet Street and Jefferson Park Avenue Intersection

Pedestrians have been struck as motorists bypass queues along Emmet Street. Focus group discussions revealed that drivers throughout the University sometimes do not stop for pedestrians. Additionally, security gates along McCormick Road are frequently inoperable due to vandals; resulting in increased traffic through a major pedestrian zone.

2.1.3 SIGNAGE AND WAY FINDING

Signage and wayfinding for pedestrians is very limited. The street network in Charlottesville is somewhat confusing due to the topography in the area, historic development patterns, railroad corridors, and other features. Also, there is a dense network of pathways through Central Grounds that does not necessarily correspond to desire lines between the Health System campus and the McCormick Road area. Wayfinding could improve the sense of orientation for pedestrian travel throughout Grounds. In addition to directional signage, warning signage to drivers regarding pedestrians is limited. A few small "Pedestrian Only" signs were observed near Dawson's Row, Minor Hall, and along Engineers Way.

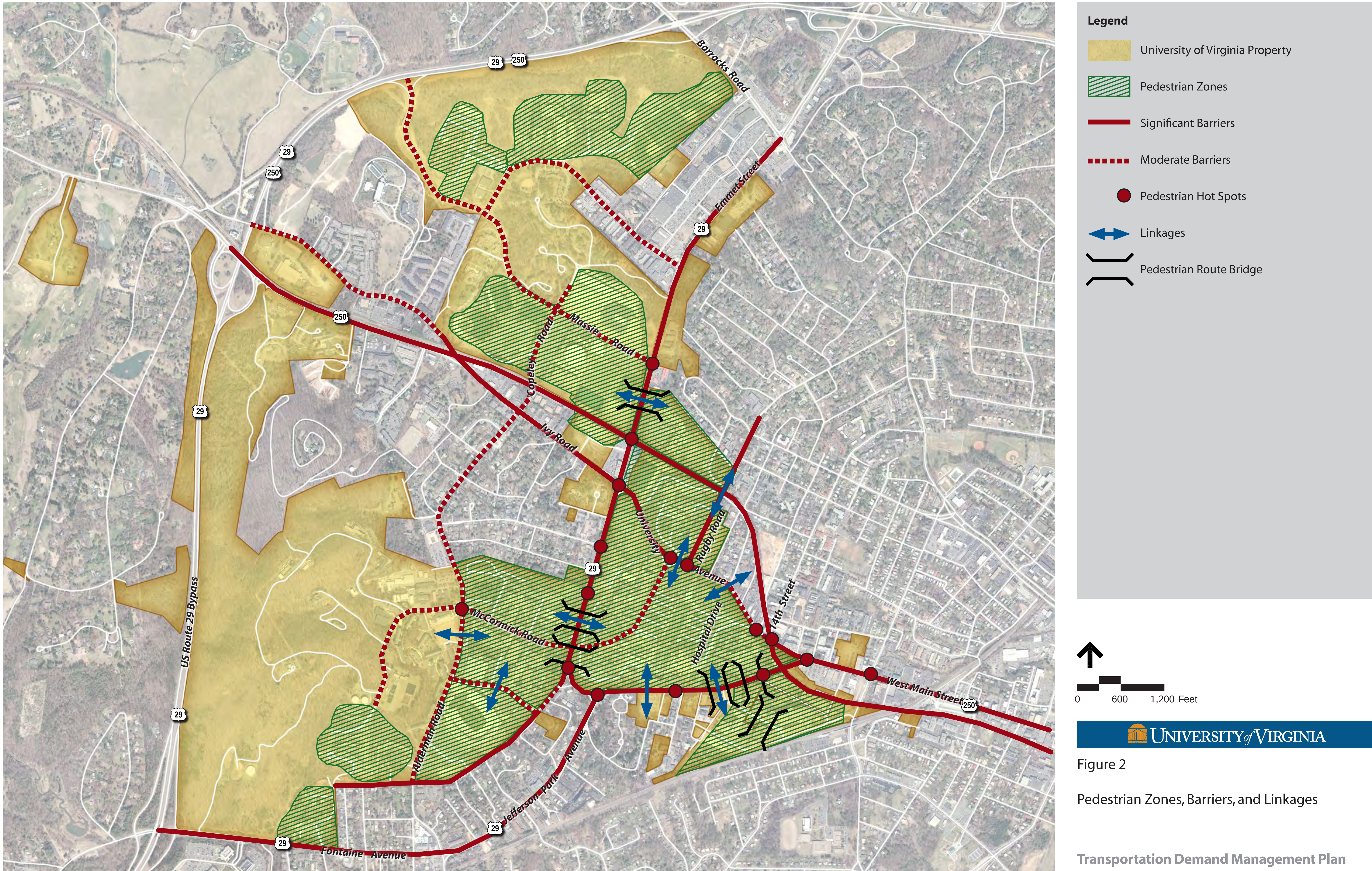

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Figure 2

Pedestrian Zones, Barriers, and Linkages

2.2 BICYCLES

Bicycling is an important means of transportation, primarily for students and faculty. The University has completed a draft 2007 *Bicycle Master Plan.* Both the City of Charlottesville and Albemarle County have recently completed bicycle plans as well. These plans propose the expansion of the existing network of bicycle facilities to better connect destinations. The existing and proposed system of bicycle routes supports bicycling as a way to travel to and from the University.

The *Draft Bicycle Master Plan* defines a framework of routes, support facilities, and programs to support bicycling. The University's bicycle facilities are primarily shared lane roads (in which bicyclists share the road with vehicular traffic) and multi-use paths (in which bicyclists and pedestrians share the path but vehicular access is prohibited). Existing multi-use paths consist of a variety of materials, including asphalt, brick, concrete and gravel.

2.2.1 CONNECTIVITY

The provision of dedicated bicycle lanes on streets in the University context is a helpful encouragement for bicyclists. However, this network of bicycle lanes is incomplete. In a few cases, such as Rugby Road to the north of the University, bicycle lanes are provided on only one side of the street. Gaps in the bicycle lane network create confusion for bicyclists, decrease the viability of bicycling, and lead to increased conflicts with vehicular traffic. Though the existing bicycle lanes are signed, other bicycle signage on Grounds is limited.

The demand for bicycle facilities is greatest in the University's Central and West Grounds. While bicycle lanes exist along portions of University Avenue, no lanes exist along Alderman and McCormick Roads, reducing connectivity to this section of Grounds. Although Jefferson Park Avenue is an important bicycle corridor experiencing a high volume of bicycle commuters, bicycle access is somewhat limited, as the area between Jefferson Park Avenue and Cabell Drive provides a bicycle lane on only one side of the roadway. Additionally, the area near University Avenue has steep terrain, difficult to navigate on a bicycle, and experiences high traffic volumes with little roadway width available for safe bicycling.

In North Grounds, bicycle lanes exist along portions of Arlington Boulevard and Ivy Road. However there are no facilities along Copeley Road, Massie Road, Millmont Street or Old Ivy

Road, making existing access around North Grounds difficult. However, within North Grounds, bicyclists have the advantage of additional space within the roadways, making bicycling a more advantageous option for the future. Bicycling is inconvenient between Central Grounds and North Grounds' intramural facilities.

In general, conditions for bicycling are favorable within South Grounds, which features on-road bicycle lanes and secondary routes. However, bicycling is challenging in the hospital area, especially during morning and evening rush hours.

2.2.2 ROUTES

The University bicycle plan categorizes existing bicycle facilities into main routes and quiet routes. Main routes generally carry a larger volume of vehicular traffic traveling at higher rates of speed. Quiet routes carry lower traffic volumes traveling at low speeds. Multi-use paths, which restrict vehicular traffic, are also considered quiet routes. Figure 3 depicts bicycle routes on the University Grounds and surrounding areas.

Main Routes

Main routes on the University's Central and West Grounds include the Rugby Road-McCormick Road-Alderman Road corridor. On the North Grounds, main routes include the Massie Road-Goodwin Bridge corridor. Finally, on the South Grounds, the main routes include the Jefferson Park Avenue-Lane Road-Crispell Drive corridor.

Quiet Routes

On Central Grounds, quiet routes include Newcomb Road, Cabell Drive, and the multi-use path in front of the Rotunda from the Rugby Road-University Avenue intersection to Hospital Drive (which is designated as a dismount zone on the route plan). On West Grounds, quiet routes include Stadium Road, Shamrock Road, and Whitehead Road south of the Aquatic and Fitness Center. Also on West Grounds, a partially gravel-surfaced route exists between Alderman Road and Emmet Street along the University Cemetery and the Dell. On North Grounds, quiet routes include Faulkner Way and Ivy Drive. On South Grounds, quiet routes include Valley Road and Crispell Drive.

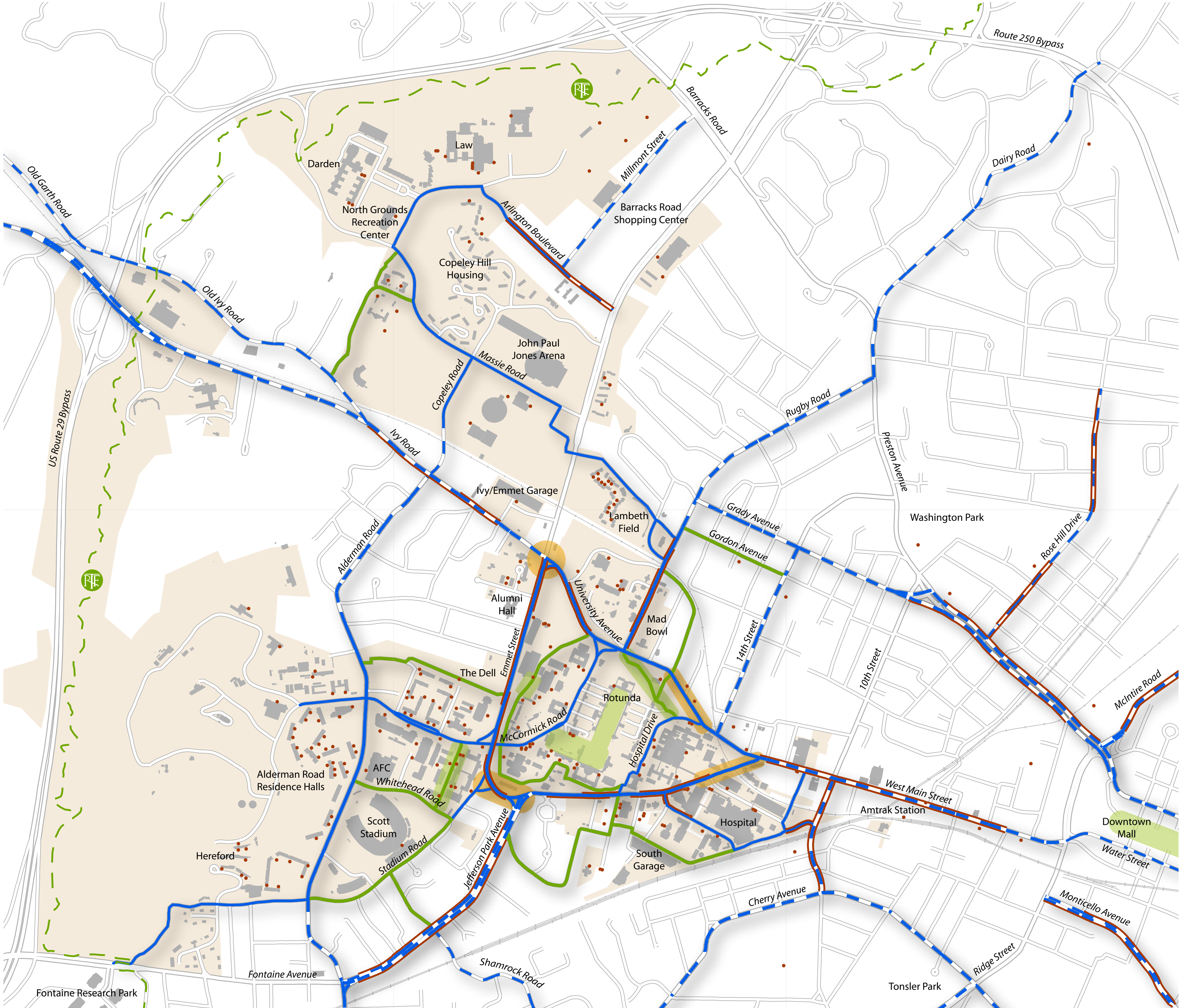
Dismount Zones

Dismount zones are areas where bicyclists are asked to walk their bicycles. These zones are typically designated in areas with high pedestrian activity. A few dismount zones are located on Central and West Grounds. While it appears that the dismount zones are appropriately located, bicycle storage is located within these areas, increasing the prevalence of riding through these areas.

2.2.3 SUPPORT FACILITIES AND PROGRAMS

Auxiliary elements include bicycle racks, showers, storage, and tire pumps. University Grounds include approximately 91 fixed bicycle racks and 126 mobile bicycle racks. Fixed racks can store an average of 14 bicycles. Mobile racks, an average of 15 bicycles. The draft bicycle master plan identifies guidelines for bicycle storage including the preferred rack configuration with an inverted "U" design that allows bicycles to be secured in two locations. The University is also adding bicycle storage in its new parking garage projects. Currently, bicycle racks are not well-located and bicycle parking is inadequate, as evidenced by bicycles locked to railings and signs. Though some bicycle racks are full during the day, the racks at residence halls and at Nameless Field are underutilized. Additionally, the Central Grounds' café area lacks adequate storage racks, as does the commercial area at the Corner.

At this time, the University does not have a formal program to encourage bicycling; however the draft bicycle master plan recommends that new building projects include showers and locker facilities to support bicycle commuting. The plan also advocates for safety, education and enforcement programs to support bicycling.



UVa Bicycle Map and Guide

Use this map to find bicycle friendly routes and bicycle racks around Grounds. Painted bicycle lanes are noted with red lines alongside the blue recommended routes. The green routes highlight roads and paths that provide a quieter alternative, but note that some of these routes are shared with pedestrians. The orange caution zones identify congested intersections and road segments, use extra care in these areas. University regulations require that you walk your bike in the green dismount areas.

- Main Bicycle Route
- Quieter Bicycle Route
- Route with Painted Lanes
- City/County Bicycle Route
- Bicycle Racks
- Use Caution Zone
- Dismount Area
- University Grounds
- Other Road

Bicycle Tips and Reminders

- When riding at night, cyclists must use proper lighting: white light in front, red in back.
- It is the cyclists' responsibility to be familiar with all State Laws and Regulations. A searchable database of these regulations is available at: http://leg1.state.va.us/000/src.htm
- Cyclists may be required to dismount in some areas. Remember that cyclists are prohibited from riding on sidewalks as well as the Lawn and adjoining pathways.
- Ride on the right side of the road, in the same direction as traffic.
- Watch for cars and buses turning right in front of you. It may be difficult for them to see you.
- Cyclists must yield to pedestrians in crosswalks
- Cyclists are prohibited from wearing earphones while riding.
- Bicycles should be parked and locked in the racks provided as indicated on the map.
- It is a good idea to register your bike with the University Police such that it may be returned to you if stolen. More information at: www.virginia.edu/uvapolice/

Source: University of Virginia Draft Bicycle Master Plan

UNIVERSITY of VIRGINIA

Figure 3

UVA Bicycle Map and Guide

2.3 PARKING

Parking in and around Grounds and the Health System complex is accommodated through numerous surface lots and parking decks, as well as metered street locations scattered throughout the area. University parking areas are highlighted in Figure 4. There are a total of 16,470 parking spaces allocated for University and Hospital use. The largest concentration of parking can be found at the South Hospital Parking Garage (1,388), the Emmet/Ivy Parking Garage (1,247) and the John Paul Jones Arena Parking Garage and surrounding surface lots (2,280). The remainder of the parking spaces are spread throughout numerous other lots and parking deck generally containing 400 parking spaces or less.

In general, the bulk of the parking provided for the University and related functions is located outside Central Grounds and requires a five to ten minute walk to reach most destinations. The exception to this is the Hospital Complex, in which 2,942 parking spaces (in three garages) are located. The South parking garage is fully reserved for staff only, and the East and West garages are oriented to patient and visitor parking, but have some staff presence.

A large majority of the parking spaces require permits and can therefore only be used by staff, faculty, students, and other University affiliated users. Both the University and Hospital implement an extensive permit parking program in order to manage the daily use of this parking.

Parking supply in the core areas of the University and Health System is very heavily used. However, when one considers the available parking at the perimeters of the University, it appears that the overall parking supply is adequate to support commuting and student parking needs. Hospital staff uses 850 dedicated parking spaces at the commuter lot near Scott Stadium; and non-dedicated spaces at the Emmet/Ivy Parking Garage, University Hall, and John Paul Jones Area Parking Garage. University staff, students, and faculty use Emmet/Ivy Parking Garage, University Hall, and the John Paul Jones Arena Parking Garage. Many parking areas serve multiple user types, with employee spaces converting to event parking on nights and weekends, and patient parking converting to off-shift employee parking.

2.3.1 VISITOR AND PATIENT PARKING

Parking oriented to the visitors of the University can be found in several locations, including the Central Grounds Parking Garage located on Emmet Street at the intersection with Thomson Road. Metered locations can also be found in Central and West Grounds to facilitate visits to the various areas at the University and at intramural recreation facilities. Short-term parking is available at the Athletic Ticket Office and the Cabell Hall and Culbreth Theater box offices.

Parking for patients and their visitors to the University Hospital is located on Lee Street across from the Primary Care Center and Emergency Department. There is additional patient parking off Jefferson Park Avenue just outside the entrance to the West Complex. Patient parking along Hospital Drive is available to support the Barringer Wing and private clinics.

2.3.2 PERMIT PARKING PROGRAM

With the exception of meters and attended lots, all staff, faculty, students, and other University affiliated personnel must purchase and display parking permits on their vehicles in order to park in University-controlled areas. There are over 16,000 permits issued to University related staff, faculty, and students. Eligibility for parking lots is determined based on one's affiliation with the University: 1) whether you are faculty/staff or student and 2) a student living on- or off-grounds. The Department of Parking & Transportation issues several different types of permits, including stickers, hangtags, dashboard permits, and gate cards/transponders. Parking Permit fees for 2006/2007 are listed in Table 1.

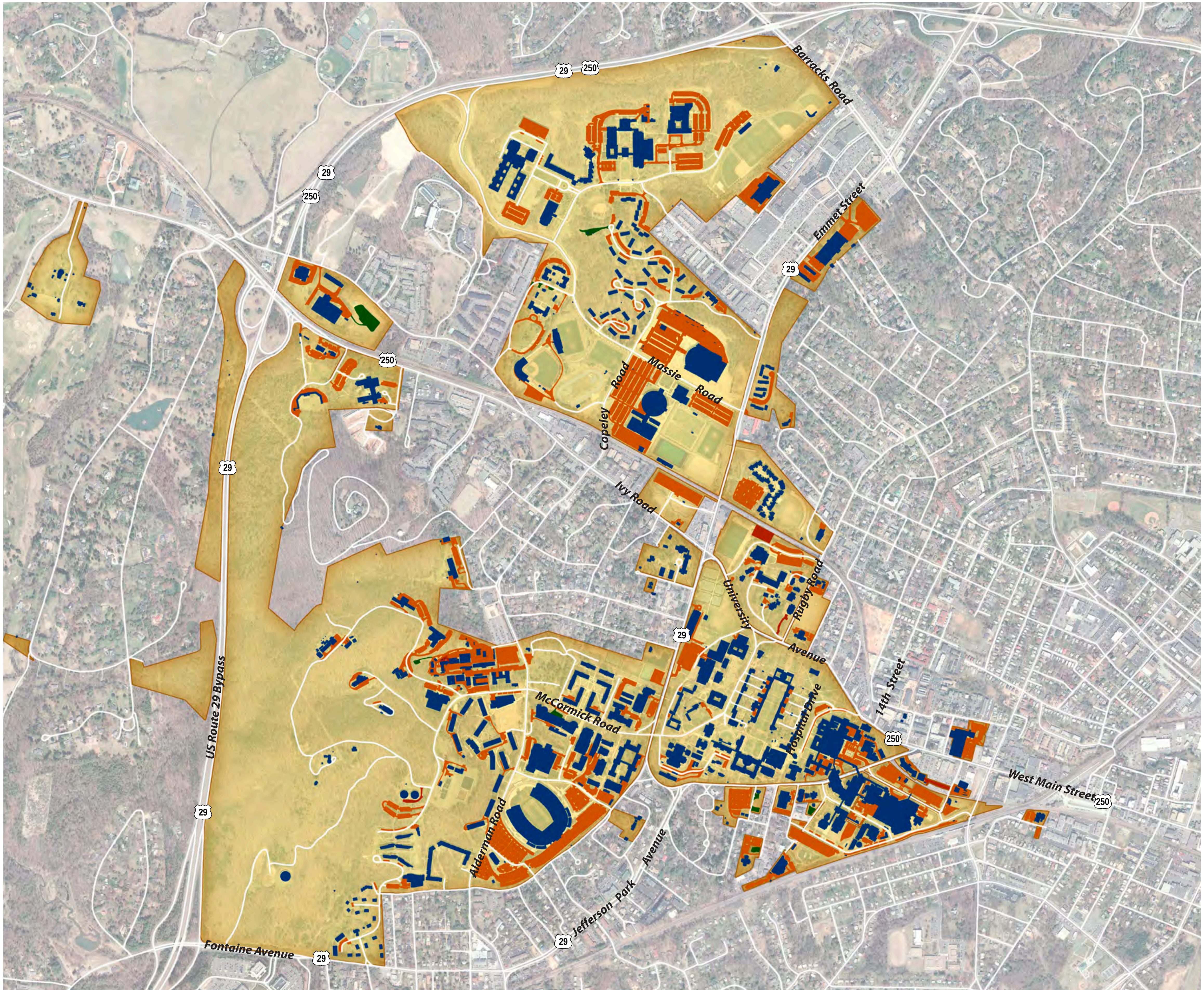
For an additional fee, a permit holder may obtain more than one permit for their respective lot (with the exception of gate card/transponder holders). The vehicle displaying this "second car permit" may not be parked on Grounds at the same time as the vehicle displaying the primary permit.

In addition, the University has implemented an occasional parker program for the Emmet/Ivy Parking Garage. This program provides a special permit valid in the garage that will allow the customer to park up to 20 times for a one-time charge. A specific gate at the garage is equipped with a reader that will tell the program participant how many uses they have remaining.

Table 1 Parking Permit Rates June 1, 2006 - May 31, 2007

Type of Permit	Rate
Student, Faculty/Staff Commuter	$14 per month or $168 per year
Student Resident – on-site storage	$30 per month or $360 per year
Student Storage – University Hall	$14 per month or $168 per year
Reserved: Green Premium	$43 per month or $516 per year
Reserved: Green Regular/Emmet/Ivy Garage	$33 per month or $396 per year
Commuter Blue or Red	$14 per month or $168 per year
Service Passes – University	$14 per month or $168 per year
Service Passes – Outside Vendor	$43 per month or $516 per year
Additional Car Permits	$20
Replacement Permits due to loss or theft	$20
Resident	$12 per month or $144 per year

Source: University of Virginia Department of Parking & Transportation Services



UNIVERSITY of VIRGINIA

Figure 4

UVA Parking Facilities

2.4 TRAFFIC

Throughout Grounds, intersection and roadway traffic volume information has been collected over the recent years as part of various transportation studies and data collection efforts. Consolidated for use as part of the Transportation Demand Management Plan, an inventory of vehicle turning movement count (TMC) and automated traffic recorder (ATR) count locations is provided in Figure 5. This inventory reflects traffic volume information obtained by the University within the last fine years.

Many of the roadways that serve as major access corridors to Grounds were constructed some time ago, and provide two-lane cross-sections and minimal turn-lane facilities in context with the historic framework of the area. These roadways experience congestion due to growth at the University, in the City of Charlottesville, and the region. Wide roadway cross-sections and large intersections with multiple turn lanes are not considered an appropriate context for the historic nature of Charlottesville or the University. To the extent practical, it is a priority of all parties to maintain the area's historic nature. This priority must also be balanced with providing safe and efficient operations to all transportation users.

Regional Gateways

The following summarizes corridors that serve as gateways to the University and have been identified as congested:

- Ivy Road/University Avenue, which bounds Central Grounds to the north,
- Emmet Street, which bounds Central Grounds to the west, and
- Jefferson Park Avenue, which bounds Central Grounds to the south and east.

Ivy Road (Route 250) provides access to the University for the majority of traffic approaching from the west. Ivy Road is predominantly a four-lane cross-section near Grounds and ultimately intersects with Emmet Street at a location critical to University traffic access. There is moderate congestion and delays to through traffic along Ivy Road throughout the average weekday. Ivy Road transitions to University Avenue east of its intersection with Emmet Street.

University Avenue (Route 250) is a two-lane roadway with on-street parking that is bounded to the west by Emmet Street and transitions to West Main Street at its intersection with Jefferson Park Avenue near the University Health System. Significant queuing and delays occur along University Avenue during peak traffic periods, particularly at its intersections with Emmet Street and Rugby Road. Traffic delays and vehicle queuing are sometimes made worse by on-street parking maneuvers and numerous bus stop locations.

Emmet Street (Route 29) is a major arterial to the north of the University that transitions down to a two-lane cross-section and runs north-south to the west of Central Grounds. Emmet Street accommodates a significant amount of both University and through traffic. The Emmet Street intersection with Ivy Road/University Avenue operates poorly throughout the day, and significant queuing occurs on both Emmet Street approaches. The two-lane cross-section precludes traffic from navigating around turning vehicles and buses picking up and dropping off passengers, which further increases delays along the corridor.

Jefferson Park Avenue is a two-lane roadway that connects Fontaine Research Park to Emmet Street south of Central Grounds and is designated as Route 29 in this section. At its intersection with Emmet Street, Jefferson Park Avenue branches east towards the University Health System and intersects with West Main Street. South of Emmet Street, Jefferson Park Avenue serves primarily residential properties for students. Frequent bus stops and on-street parking maneuvers contribute to traffic delays on Jefferson Park Avenue throughout the average weekday.

Local Roadways
Additionally, there are operational concerns on local roadways on and near University Grounds:

- The McCormick Road corridor experiences congestion during portions of the day. This is particularly evident at the intersection created by the ramp connector between McCormick Road and Emmet Street near the Engineering School.
- Gates that control the access of vehicle traffic through Grounds along McCormick Road prohibit through traffic for most of the day, which disrupts vehicle circulation on and around Grounds.
- The unique geometry of the intersection of McCormick Road with University Avenue causes driver uncertainty, and problems at this location are compounded by the poor traffic operations at the adjacent University Avenue/Rugby Road intersection.
- Traffic operations are often poor along Fontaine Avenue and Stadium Road during football games and along Copeley Road and Massie Road for events at the John Paul Jones Arena, and around North Grounds. Recent improvements to the Fontaine Avenue interchange and construction of Leonard Sandridge Road have enabled better event traffic management of special events.
- The railroad corridors to the north and south of Grounds impact the ability of local street traffic to navigate the roadway system. The locations of existing at-grade railway crossings can cause circuitous approach routes to Grounds, depending on trip orientation.

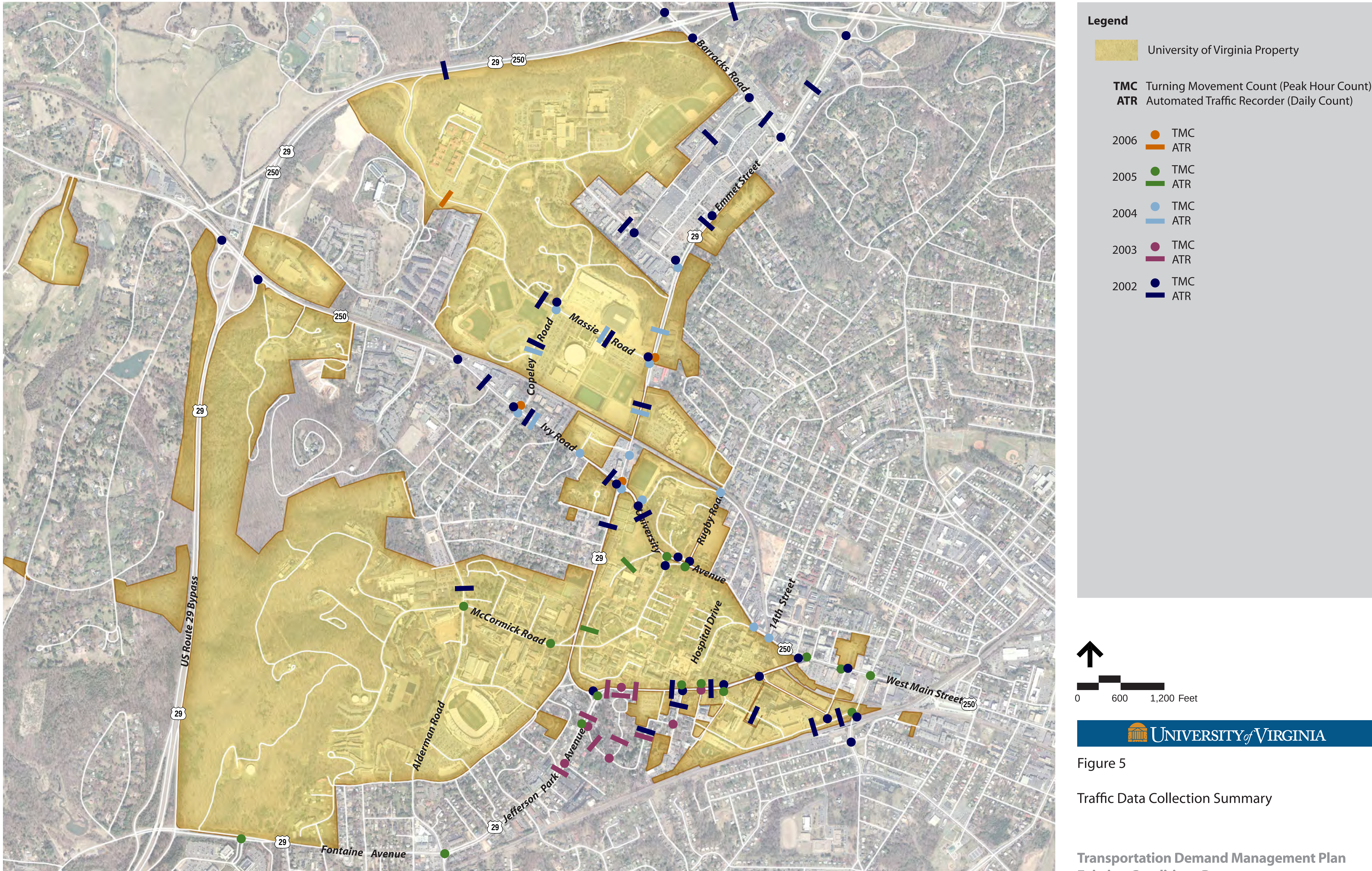


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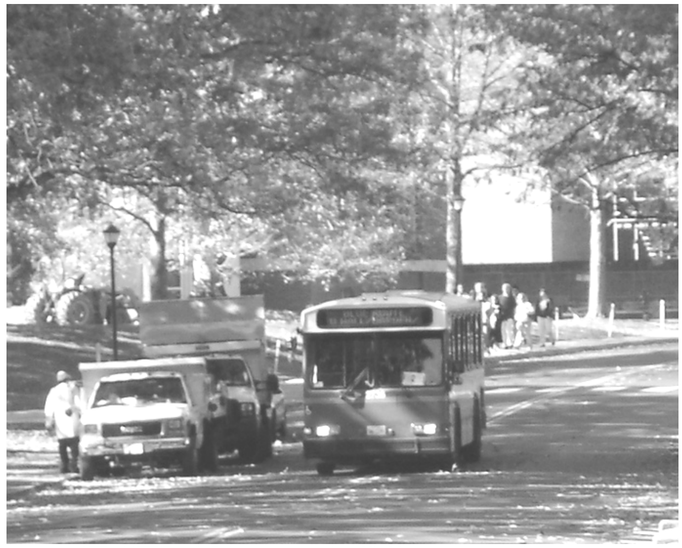
Figure 5

Traffic Data Collection Summary

2.5 TRANSIT



Two transit services and multiple transit routes are available for those traveling to, from or within the University of Virginia Grounds and the Health System complex. These include seven fixed-routes operated by the University Transit Service (UTS) and five direct routes (no transfers) and three indirect routes (with transfers) by the Charlottesville Transit Service (CTS) operated by the City of Charlottesville. UTS provides the University community with transportation services seven days a week, with a reduced schedule during the summer and on student holidays. CTS provides transportation services to the University and City during the weekdays and Saturday. Figure 6 illustrates the CTS and UTS routes that operate around Grounds. Table 2 shows service characteristics of the UTS and CTS routes while Table 3 shows the service span.

Table 2 Service Characteristics

Route	Operator	Days of Operation	Fare	Headway Min	Headway Max
Blue	UTS	M – F, Weekends[1], Holidays	Free[2]	10	20
Orange	UTS	M – F, Weekends[1], Holidays	Free[2]	10	20
Green	UTS	M – F (whenever clinics are open)	Free[2]	10	15
Stadium/Hospital Shuttle	UTS	M – F,(whenever clinics are open)	Free[2]	8	20
Grounds Loop	UTS	M – F[1]	Free[2]	20	20
Central Grounds Shuttle	UTS	M – F[1]	Free[2]	15	15
Holiday Special	UTS	M – F, Holidays	Free[2]	20	20
Free Trolley	CTS	M-Sa	Free	15	15
CTS Route 2	CTS	M-Sa	$0.75	60	60
CTS Route 3	CTS	M-Sa	$0.75	60	60
CTS Route 4	CTS	M-Sa	$0.75	30	60
CTS Route 7	CTS	M-Sa	$0.75	15	30

[1]During academic session only.

[2]Service is free to University Students, faculty, and staff.

Table 3 Service Span

		Service Hours					
		Weekday		Weekend		Student Holiday	
Route	Operator	Start	End	Start	End	Start	End
Blue	UTS	7:30 AM	12 :20 AM	12:00 PM	12:20 AM[2]	7:30 AM	6:00 PM
Orange	UTS	7:30 AM	12 :20 AM	12:00 PM	12:20 AM[2]	7:30 AM	6:00 PM
Green	UTS	5:59 AM	7:00 PM	None		None	
Stadium/Hospital Shuttle	UTS	6:00 AM	9:04 AM	None		6:00 AM	9:04 AM
		2:36 PM	8:04 PM			2:36 PM	8:04 PM
Grounds Loop	UTS	8:45 AM	6:00 PM	None		None	
Central Grounds Shuttle	UTS	6:00 AM	9:00 AM	None		6:00 AM	9:00 AM
		3:05 PM	6:30 PM			3:05 PM	6:30 PM
Holiday Special	UTS	None		None		6:35 PM	12:40 PM
Free Trolley	CTS	6:40 AM	11:57 PM	6:40 AM	11:57 PM[1]	None	
CTS Route 2	CTS	6:20 AM	6:42 PM	6:20 AM	6:42 PM[1]	None	
CTS Route 3	CTS	6:20 AM	6:42 PM	6:20 AM	6:42 PM[1]	None	
CTS Route 4	CTS	6:20 AM	10:05 AM	6:20 AM	10:05 AM[1]	None	
CTS Route 7	CTS	6:30 AM	11:42 PM	6:30 AM	11:42 PM[1]	None	

[1]Saturday service only.

[2]Extended service is provided on Friday and Saturday nights until 3:00 AM.

2.5.1 UNIVERSITY TRANSIT SERVICE (UTS)

UTS operates seven fixed-routes on the University of Virginia Grounds. These routes are the Blue Route, Orange Route, Green Route, Stadium/Hospital Shuttle, Grounds Loop, Central Grounds Shuttle and the Holiday Special. These routes are free for individuals who have a valid University IDs, including students, staff and faculty.

UTS is divided into three types of routes: full service, holiday service and commuter service.

- **Full Service**: operates during the spring and fall semesters and includes all of the routes except the Holiday Special.
- **Holiday Service**: operates during any student holiday (i.e., Winter, Spring, and Summer Break) and during the summer and includes all of the routes except the

Grounds Loop, though the Blue Route and Orange Route operate on reduced schedules. No service is provided on weekends.

- **Commuter Service**: operates between Christmas and New Year Day, when clinics are open and the University is closed. Since the University is out of session during these periods, this service is intended to provide employees access to work. Routes in operation include the Holiday Special, Green Route, Stadium/Hospital Shuttle and the Central Grounds Shuttle. Service is not provided on weekends.

The Blue and Orange Routes are circulator routes, providing transit accessibility to most University facilities and connections with the five other University-operated routes. The Green Route, the Stadium/Hospital Shuttle, the Ground Loop and the Central Grounds Shuttle are shorter routes that provide accessibility to specific destinations on Grounds. The Holiday Special operates in the evenings during student holidays.

One objective of UTS is to provide convenient and reliable service between areas on Grounds where parking is provided and other portions of Grounds including academic buildings and areas where large numbers of people are employed.

For students, faculty, and staff who have disabilities and who are unable to use the UTS fixed route buses, the Parking and Transportation Service provides UTS Demand and Respond Transportation Service (UTS DART). The service area is limited to that of the UTS fixed-route services, and typically the service has the same hours of operation as the UTS fixed routes. However, UTS DART is available 24 hours a day, 7 days a week, if necessary. The Parking and Transportation Service contracts with Yellow Cab and JAUNT to operate the vehicles for UTS DART.

Blue Route

The Blue Route operates from 7:30 AM to 12:20 AM on weekdays and from 12:00 PM to 12:20 AM on Saturday and Sunday, during the academic session. Also, during the academic session, extended service is provided on Friday and Saturday nights until 3:00 AM. Service frequencies are as follows:

- Weekday: 10 minute headways until 6:00 PM; 12 minute headways after 6:00 PM.
- Weekend: 20 minute headways from 12:00 PM to 6:00 PM, 12 minute headways from 6:00 PM to 12:20 AM
- Holiday/Summer: 20 minute headways from 7:30 AM to 12:20 PM
- Friday/Saturday: 15 minute headways from 12:30 AM to 3:00 AM

The Blue Route is the longest UTS route covering much of Grounds. It is the only route that serves all three commuter lots around University Hall and the commuter lots at The Park, Caruthers Hall and Scott Stadium. In addition, it provides service to the hospital, Alderman Library, the Law School, Darden School and the Emmet/Ivy Parking Garage. Along with the Orange Route it experiences the greatest ridership, with an annual average of 53 passengers per hour. The Blue Route is the only route that has transfer points to all of the other UTS Full Service routes. Transfers are provided with other routes as follows:

- Orange Route: Alderman Library, Madison/Preston Avenue, U-Heights, and the Chapel;
- Green Route: University Hall, Emmet/Ivy Parking Garage, and University Health System;
- Stadium/Hospital Shuttle: Scott Stadium and the University Health System;
- Grounds Loop: Length of McCormick Road; and
- Central Grounds Shuttle: Length of McCormick Road

Operationally, buses operating on the Blue Route continue on the Orange Route at the Madison Avenue/Preston Avenue and U-Heights stop. There are also locations along the Blue Route where transfers can be made to several CTS routes, including: the Free Trolley, Route 2, Route 3 and Route 7.

Orange Route

The Orange Route operates from 7:30 AM to 12:20 AM on weekdays and 12:00 PM to 12:20 AM on Saturday and Sunday. Also, during the academic session, extended service is provided on Friday and Saturday nights until 3:00 AM. Service frequencies are as follows:

- Weekday: 10 minute headways until 6:00 PM; 12 minute headways after 6:00 PM.
- Weekend: 20 minute headways from 12:00 PM to 6:00 PM, 12 minute headways from 6:00 PM to 12:20 AM
- Holiday/Summer: 20 minute headways from 7:30 AM to 6:00 PM
- Friday/Saturday: 15 minute headways from 12:30 AM to 3:00 AM

Primary stops along the Orange Route include the library, the Chapel and University Heights Apartment Complex. No commuter lots or parking garages are along the Orange Route. Transfers can be made to the Blue Route, the Grounds Loop and the Central Grounds Shuttle, all along McCormick Road. An additional transfer to the Grounds Loop can be made at the Madison Avenue/Preston Avenue stop. Transfers to CTS Free Trolley, Route 2 and Route 3 can be made from the Orange Route.

Green Route

The Green Route is a weekday service that runs when the University is in session and on holidays. The route begins at 5:59 AM and ends at 7:00 PM operating at 10 minute headways during peak periods and 15 minute headways during the rest of the day. The primary purpose of this route is to connect commuters who park around University Hall and in the Emmet/Ivy Parking Garage to the Hospital. Other key stops on this route are the Copeley Family Housing Complex and the hospital.

Transfer points from the Green Route to the Blue Route are provided at University Hall, Emmet/Ivy Parking Garage, and the hospital. Transfer to the Stadium/Hospital Shuttle is provided at the hospital and transfer to the Central Grounds Shuttle is provided at University Hall. Finally, transfer points for five CTS routes including the Free Trolley, Route 2, Route 3, Route 4 and Route 7 are located along the Green Route.

Stadium/Hospital Shuttle (SHS)

The purpose of this shuttle is to provide quick access between the stadium parking areas and the hospital for hospital employees. This route operates on weekdays and whenever clinics are open. The Morning Service for the SHS begins at the stadium at 6:00 AM and runs until 9:04 AM. The shuttle starts again at 2:36 PM and runs until 8:04 PM. The SHS runs with eight minute headways. Transfers can be made to the Blue Route at Scott Stadium.

While the primary purpose of this shuttle is to take hospital employees to and from the parking areas at Scott Stadium, this route makes several stops along the way. Most notably, the SHS stops at the Elson Student Health Center on Jefferson Park Avenue. Between 6:00 AM and 7:20 AM the SHS runs an alternate route on Maury Avenue and Jefferson Park Avenue as opposed to Stadium Road. Three additional stops are made on Jefferson Park Avenue during this period.

Transfers to the Blue Route are possible at the hospital and Scott Stadium. Transfers to the Green Route and the Free Trolley are possible at the hospital.

Grounds Loop

The Grounds Loop is a weekday service that runs from 8:45 AM to 5:55 PM and operates at 20 minute headways. The route overlaps the most densely traveled corridor and is designed to support the Blue and the Orange Route during periods when student demand for transit on Central Grounds is high. The Grounds Loop has stops near the Alderman Library, Scott Stadium, multiple dormitories, the Piedmont Family Housing Complex, and Hereford College. Transfer points to the Blue Route are located along McCormick Road and to the Orange Route at Madison Avenue/Preston Avenue, Alderman Library and the Chapel. There are locations along the Grounds Loop where transferring to the Free Trolley is also possible.

Central Grounds Shuttle (CGS)

The Central Grounds Shuttle is a weekday service provided in the morning and evening to transport university employees from the commuter lots at University Hall and the Emmet/Ivy Parking Garage to the Central Grounds of the University. The shuttle runs from 6:00 AM to 9:05 AM and 3:05 PM to 6:30 PM on 15 minute headways. The shuttle runs counter clockwise through Grounds during the morning service and clockwise during the evening service.

Along McCormick Road, Alderman Library, the Chapel, and the Facilities Management Building are a few of the stops along the CGS. Alderman Library and the Chapel are also transfer points to the Blue, Orange, and Grounds Loop Routes. University Hall is a transfer point for the Blue and Green Routes.

Safe Ride Program

The Safe Ride Program provides students with an alternative to walking home alone and is administered by the University Police Department. Operating hours are from 12:00 AM to 6:00 AM, Sunday through Thursday, and 3:00 AM to 6:00 AM on Saturday and Sunday mornings. At no expense, students can call Safe Ride to coordinate a pick up time or Yellow Cab if they feel unsafe or are in a hurry. One Safe Ride vehicle is devoted to pick up passengers at Alderman and Clemons Library, Sunday through Thursday mornings.

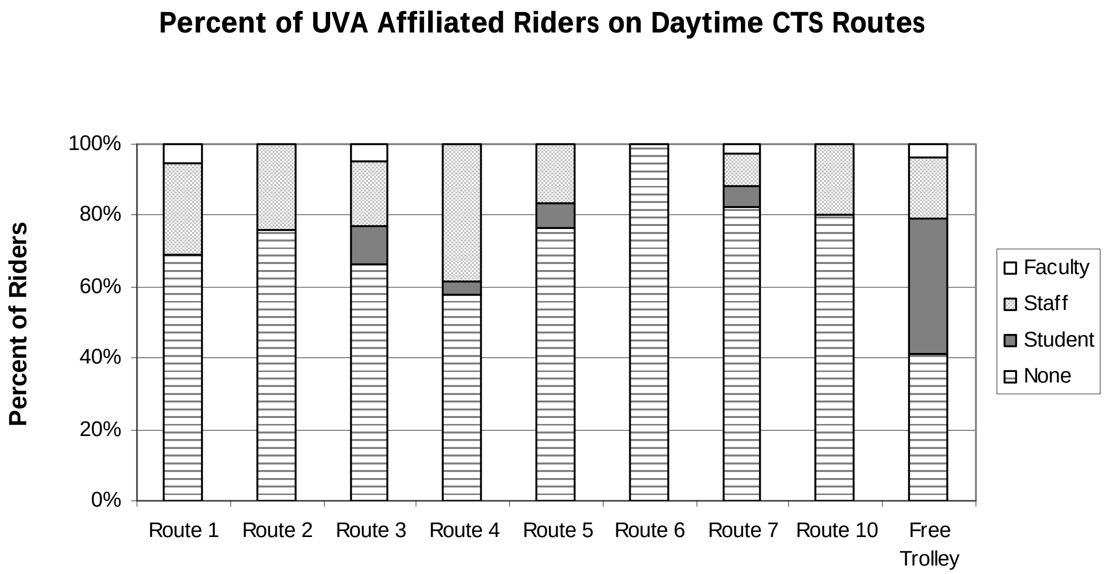
2.5.2 CHARLOTTESVILLE TRANSIT SERVICE

CTS currently operates 13 fixed routes on all weekdays and Saturday. Seven routes operate exclusively during the day, three routes operate exclusively during the night and two routes (the Free Trolley and Route 7) operate during both time periods. Day service operates from approximately 6:00 AM to 7:00 PM and night service operates from approximately 7:00 PM to midnight.

Over the past three years, the University has initiated month-long “open ridership” pilot projects in cooperation with CTS to allow University students, faculty, and staff to ride CTS buses free of charge. Claiming success in the pilot project phase, CTS started providing open ridership on a permanent basis beginning in April 2007 to all riders demonstrating a University identification card.

Fixed-route transit service is designed to operate on a “pulse.” All routes are scheduled to arrive and depart from a common location at approximately the same time. The logic behind this practice is to facilitate transfers between routes, especially since several routes operate infrequently at 60-minute headways. In practice, the “pulse” is often difficult to maintain, especially since traffic congestion and tight schedules can cause delay. Currently, transfers occur at bus stops on the Downtown Mall at both Market Street and 2nd Street NE and Water Street and 2nd Street SE. The primary location for transfers will be shifted to the Downtown Station, when it opens in 2007.

The Free Trolley, Route 2, Route 3, Route 4, and Route 7 provide service to the University without a transfer. In 2004, an on-board survey was conducted for CTS that determined the university affiliation of CTS riders. Overall, persons self identified as being affiliated with the University accounted for one-third of riders on CTS routes. The exhibit below presents UVA ridership statistics.



Free Trolley

The Free Trolley (also known as Route 11) provides service between the Downtown Mall and Grounds. The Trolley runs Monday through Saturday from 6:40 AM to 11:57 PM on 15 minute headways.

In addition to Grounds and the Downtown Mall, other stops along the Free Trolley Route are "The Corner", and both the Amtrak and Greyhound stations. While the Trolley only serves a portion of Grounds, it is accessible to students and staff via transfers from the UTS Blue, Orange, CGS, and SHS routes and is a complimentary service for all riders. There are a number of locations on Grounds along Jefferson Park Avenue and McCormick Road where the Free Trolley can be accessed.

There are over 1,200 boardings throughout the day and night, making the Trolley the most utilized CTS route. During the daytime, nearly 60 percent of riders on the Free Trolley were affiliated with the University.

Route 2

Running on hour long headways, Route 2 runs through Downtown Charlottesville connecting the Barracks Road Shopping Center via the University of Virginia Campus and Locust Avenue (north of downtown). The service begins at 6:20 AM and runs until 6:42 PM. Key stops along this route are the University Health System, the Downtown Mall, and Martha Jefferson Hospital. Transfers can be made from Route 2 to the UTS Blue and Green Routes and the Central Grounds Shuttle at multiple locations on Emmet Street and around University Hall.

There are nearly 200 riders on Route 2, during an average day. Of these, approximately 24 percent are affiliated with the University.

Route 3

Running on hour long headways, Route 3 runs from the Greenleaf Terrace area to Belmont Park. The service begins at 6:20 AM and runs until 6:42 PM. Greenleaf Terrace/Belmont. Key stops along this route are the Downtown Mall, the Health Department, Greenleaf Park, Madison Hall and the Woman's Center. The UTS Blue and Orange Routes and the Grounds Loop can be accessed from Route 3 at the Madison Avenue/Preston Avenue Stop. Route 3 has an average ridership of over 200 riders per day; 34 percent are affiliated with the University.

Route 4

Route 4 runs along the south side of Charlottesville between Cherry Avenue and Fry's Spring. The route begins at 6:20 AM and runs until 6:50 PM. The route runs at 30 minute headways during the morning and evening commute and one hour headways during the midday (10:05 AM to 3:05 PM). On Saturday, the route runs on hour long headways all day. Key stops on the route are the Downtown Mall, University Health System. Transfers can be made to Blue and Green Routes and the Stadium/Hospital Shuttle at the University Health System and along Jefferson Park Avenue. Route 4 serves approximately 300 riders per day, of which 24 percent are affiliated with the University.

Route 7

Route 7 is the backbone of CTS. It provides access to a number of commercial retail developments in Downtown Charlottesville and north on US Highway 29, Mondays through Saturdays. The route begins at 6:30 AM and runs to 11:45 PM. It operates with 15 minute headways during the day (up until 6:45 PM) and with 30 minute headways until the service ends at 11:45 PM. Key stops along this route are "The Corner," the Barracks Road Shopping Center, K-Mart, a post office and Fashion Square. There are multiple transfer points to Route 7 from the Blue, Green and CGS UTS routes.

With over 900 boardings on an average day and approximately 150 boardings at night, it comprises over 25 percent of daily ridership on CTS. Only 18 percent of riders on Route 7 during the day are affiliated with UVA

Other CTS Routes

Routes 5, 21, and 22 provide indirect access to the University with transfers. Route 5 begins at 6:15 AM and runs until 7:00 PM with 45 minute headways. Key stops along Route 5 include WalMart, Barracks Road Shopping Center, and Fashion Square Mall. Transfers can be made at

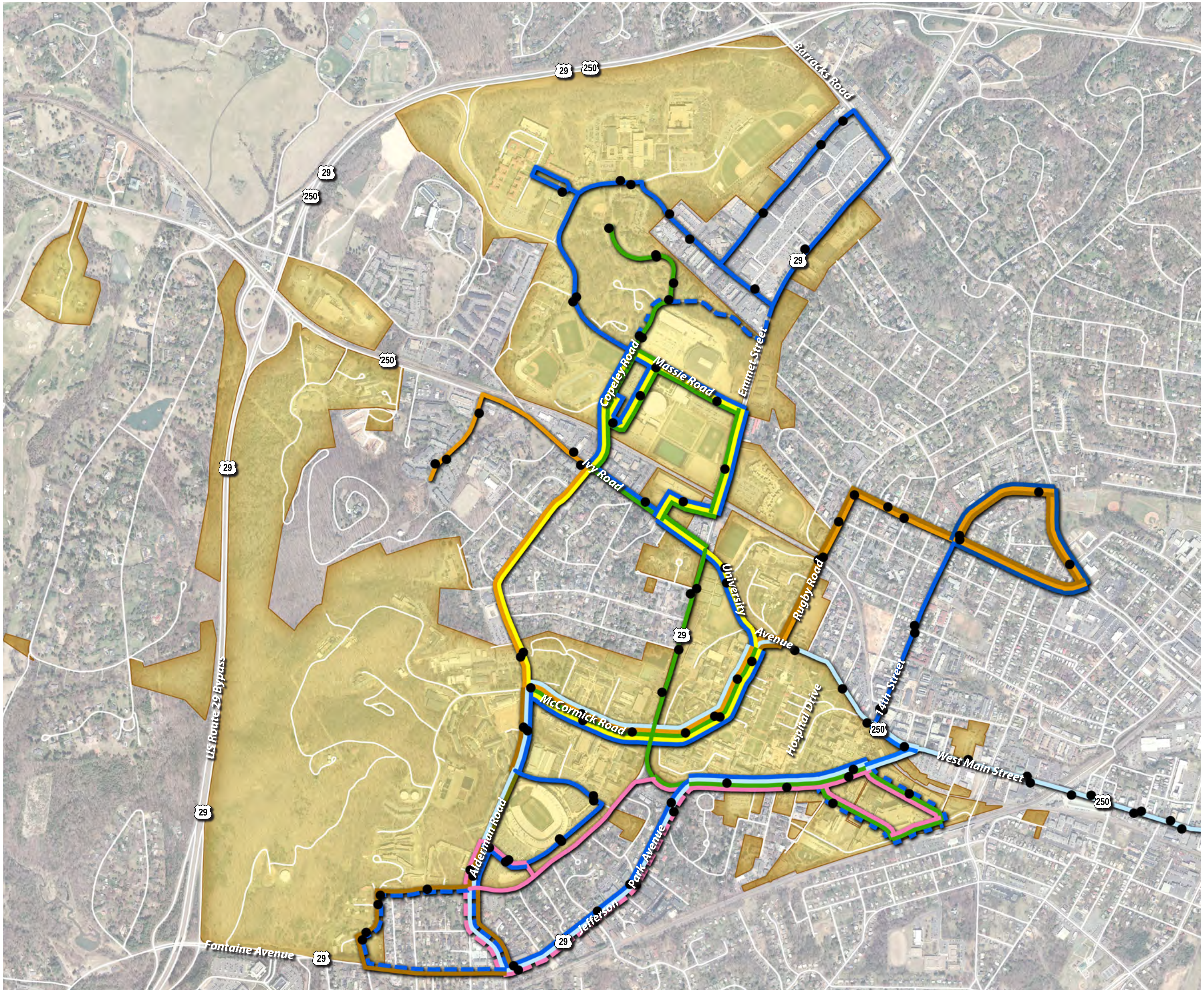
Barracks Road Shopping Center to the UTS Blue Route and to CTS Route 2 for access to Ivy Road and the University Health System.

Route 21 provides night-time only access from 6:45 PM to 11:42 PM, with 30 minute headways. Key stops include the Downtown Mall and Belmont Park. Transfers to Route 7 can be made Downtown, at the Water and 2nd Street SE bus stop.

Route 22 provides night-time only access from 6:45 PM to 11:42 PM, with 30 minute headways. Key stops include the Downtown Mall, Prospect Avenue, and Blue Ridge Commons. Transfers to Route 7 can be made Downtown, at the Water and 2nd Street SE bus stop.

2.5.3 OVERLAPPING SERVICE

Significant portions of Routes 2, 3, 4, 7 and the Trolley duplicate service provided by UTS. Concurrent service generally occurs in the vicinity of the University of Virginia Grounds, as well as Barracks Road Shopping Center and student housing near Grady Road.



Legend

- University of Virginia Property
- Bus Stops
- Blue
- Orange
- Green
- Grounds
- Central Grounds Shuttle
- Health System Shuttle
- Free Trolley

0 600 1,200 Feet

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Figure 6

UTS (University Transit Service) and CTS (Charlottesville Transit Service) Routes

Transportation Demand Management Plan
Existing Conditions Report

2.6 COMMUTE OPTIONS

The University and local and regional agencies operate numerous programs in order to encourage the use of alternative modes of transportation. Employees and students have access to transportation resources to help reduce the number of single occupancy vehicle trips associated with the University. These alternative modes are made more appealing to commuters through the following programs: RideShare, Carpooling, Bicycling/Walking, Teleworking, Vanpooling, Guaranteed Ride Home, Park and Ride Lots, Emmet/Ivy Parking Garage Occasional Parker Program, Rental Vehicles, JAUNT, and Greene County Transit. One of the roles of the University's Department of Parking and Transportation is to reduce traffic congestion, reduce fuel consumption and negative environmental impacts, and to improve the quality of life for commuters through savings on travel expenses, allowing better use of time during commuting hours, and by improving the health of the commuters. All of these programs are described in detail below.

2.6.1 RIDESHARE

The Thomas Jefferson Planning District Commission has implemented a program called RideShare which aims to reduce traffic congestion and works with employers to develop programs to increase the use of alternative modes of transportation. The University community may take advantage of the following programs through RideShare: Carpooling, Vanpooling, Guaranteed Ride Home, and the Park and Ride lots that RideShare markets. In addition, RideShare provides University commuters with information pertaining to walking/bicycling and telecommuting.

2.6.2 CARPOOLING

Through the RideShare Program, the University community may access a free commuter ridematching service available to its employees and students who live or work in Charlottesville, Albemarle, Fluvanna, Greene, Louisa, or Nelson counties. Commuters registered in this program are sent a list of commuters who travel in the same direction during the same time of day. The carpooling program is not binding and commuters may carpool everyday or just a few times a week. Carpools are flexible and may pick up each individual rider or alternatively, all of the members may meet in one location.

2.6.3 BICYCLING/WALKING

Employees and students within bicycling/walking distance of the University are accommodated via bicycle-friendly public transit services and infrastructure including bicycle paths, sidewalks and trails. Both the Charlottesville Transit System and JAUNT provide bicycle racks on all vehicles. The Alliance for Community Choice in Transportation supplies commuters with a high quality map of the greater Charlottesville area which depicts bicycle routes, bus routes and walking trails.

Bicycling/Walking information is abundantly available for employees and students through the University and RideShare.

2.6.4 TELEWORKING

When appropriate and approved by a supervisor, the University permits its employees the opportunity to telework. Teleworking allows employees to work from an alternative location than the office through the use of the telephone and computer.

2.6.5 VANPOOLING

For employees and students with a commute typically 35 miles or more, RideShare's Vanpool program provides a cost-effective commuting option. Vanpools are typically made up of seven to 15 commuters who all divide the cost of the van, maintenance, repairs, and insurance. The vanpool contains one primary driver/coordinator who volunteers to organize the vanpool. As an added benefit, this coordinator is able to utilize the van for personal use during nights and weekends at no additional cost. Typically, commuters of a vanpool meet in one designated location or may make several stops to pick up commuters. RideShare provides two programs to aid in the implementation and continuance of a vanpool: VanSave and VanStart. The VanSave program subsidizes existing vanpools that experience a sudden loss of riders until the vanpool is able to find replacement participants. VanStart provides a subsidy for empty seats when new vanpools are first formed. Vanpool commuters that need to stay late or have an emergency are accommodated with the Guaranteed Ride Home program which is described below.

2.6.6 GUARANTEED RIDE HOME PROGRAM

University commuters that utilize modes of transportation other than single occupancy vehicles for at least two days a week are eligible for RideShare's Guaranteed Ride Home program. Participants register for the program and receive a Member ID card, voucher, and survey form. In the event of an emergency or a request to stay late at work, members receive transportation service and must provide the voucher to the taxi or rental car upon arrival. The program funds up to five emergency related trips per calendar year. Eligible commuters include the following: carpoolers, vanpoolers, public transit users, walkers and bicyclists.

2.6.7 PARK & RIDE LOTS

The Charlottesville region offers twenty-two park and ride lots throughout the area to accommodate vanpools, carpools, CTS, and JAUNT. The lots are free and are conveniently located near highly-traveled roadways. Brochures are available for students and employees that wish to utilize the convenient park and ride lots. RideShare markets these lots as part of their program.

2.6.8 EMMET/IVY PARKING GARAGE OCCASIONAL PARKER PROGRAM

The Parking and Transportation Department at the University offers an Occasional Parker program at the Emmet/Ivy Parking Garage. Commuters may purchase a parking permit for $36.00 which allows them to park in the garage up to 20 times. This program is open to any students or employees with the exception of first-year students. The occasional parker program accommodates employees and students participating in lecture series, theater patrons, bicyclists/walkers and occasional visitors to the University. Each time the participant accesses the garage gate, they are notified to how many uses they have remaining.

2.6.9 RENTAL VEHICLES

The University retains a contract with Enterprise Virginia which allows employees and students to drive Enterprise Cars and Vans for local travel on University Business. Vehicles are guaranteed available, rental prices are low, and the University covers the insurance.

2.6.10 JAUNT

University commuters are provided with a local governmentally owned service which provides regional transportation in Charlottesville, Albemarle, Fluvanna, Louisa, Nelson, and Buckingham Counties. The program is made up of 70 vehicles which transport the general public, commuters, agency clients, the elderly and people with disabilities. Commuters are provided with fixed routes and are picked up at designated parking lots along the way.

2.6.11 GREENE COUNTY TRANSIT

The Greene County Transit Inc. is a privately owned publicly funded company which transports elderly, disabled, children and commuters. The Greene and Charlottesville County service operates on a demand-response basis and runs between the hours of 7:00 AM – 4:30 PM Monday through Friday and 9:00 AM – 4:00 PM on Saturday.

2.7 CONTEXT-SENSITIVE DESIGN

The Transportation Demand Management Plan is supported by improved and new multi-modal transportation facilities that will integrate into the University's infrastructure as the institution continues to grow. Context sensitive design refers to a process to ensure that important features, such as historic resources, aesthetic resources, and natural resources, are appropriately protected or enhanced through the design of a transportation project. The process requires an interdisciplinary approach to project design and careful selection of project elements and materials. Context sensitive design is appropriate for improvements to the University of Virginia transportation system given the historic and aesthetic sensitivity of Grounds. Figure 7 illustrates areas of high historic and aesthetic significance.

According to the Federal Highway Administration, context-sensitive design is an approach that "fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility." The evaluation offered below uses context-based design principles to evaluate how existing transportation facilities—such as parking lots, sidewalks, and bus stops—fit into the campus landscape. "Fit" can be described as whether the facility meets functional needs and whether it harmonizes with the surrounding cultural, natural, and historical environment.

Ultimately, the evaluation will serve as a basis for recommendations and decisions made during the master planning process. The ranking each facility receives will allow planners to determine its value within the larger transportation framework and whether the facility may be altered, removed, or preserved.

2.7.1 SCREENING METHODOLOGY

The following approach is formulated to identify key features of Grounds that may be impacted by proposed physical modification of transportation facilities. This approach is based on context-sensitive design principles offered by the Federal Highway Administration, the Online Resource Center for Context Sensitive Solutions, and other context-sensitive solution texts. The University of Virginia *Facilities Design Guidelines* (FDG) from November 2004 and Design Guide from January 2006 were also utilized to tailor the evaluation to standards already set by the University.

The evaluation framework is based on a matrix containing four categories of context-sensitive-based principles; the categories are:

- Current functionality;
- Physical condition;
- Visual character; and
- Presence of historic resources.

The matrix and scoring methodology are based on the following questions. The questions asked in association with each category will help rank facilities based on the scoring system described above.

Overall Function

- How easy is this facility to access or utilize for pedestrians, bicyclists, or vehicles?
- How efficient does this facility seem in serving its purpose?
- Is this facility safe for pedestrians, bicyclists, or motorists?

Physical Condition

- Is this facility in generally good, fair, or poor physical condition?
- How much effort would be required to return this facility back to good condition?
- Does the physical condition of this facility pose any danger to pedestrians, bicyclists, or motorists?

Visual Character

- Is this facility generally pleasing to the eye?
- Does the facility harmonize with its physical surroundings in terms of materials and design?
- Does the facility meet standards and guidelines set by the FDG and Design Guide?

Historic Resources

- Does this facility contain any important historic resources?
- Does this facility contain historic resources that give it a unique character or help it fit into the surrounding physical environment?

- Relative to other facilities, does this facility contain historic resources that are unusually significant or that would be sensitive to alterations?

These features will be given a score of 1 to 3, 1 being the lowest or most negative ranking and 3 being the best or most positive ranking. Once each facility has been scored by category, the four category scores will be added together and a final number will be assigned. An explanation of the final scoring is as follows:

- 4-6: The facility minimally represents any of the four categories and will require extensive effort in terms of repair, re-design, and/or historic preservation should it remain part of the University's transportation framework.

- 7-9: The facility generally represents any of the four categories and will require some effort in terms of repair, re-design, and/or historic preservation should it remain part of the University's transportation framework.

- 10-12: The facility well represents any of the four categories and will require little effort in terms of repair, re-design, and/or historic preservation should it remain part of the University's transportation framework.

Scoring will also be linked to facilities standards found in the University of Virginia *FDG* and *Design Guide*. For example, if the appearance of an existing brick sidewalk varies greatly from a standard set in the *FDG* or materials discussed in the *Design Guide*, it will receive a lower score. In addition, the evaluation will take into consideration the following objectives which the *FDG* states campus buildings and grounds should achieve.

- A hierarchical distinction between the parts revealing which are more important and which are less important in fulfilling the purpose of the whole;

- An appearance for each part that allows it to be distinct while also allowing it to appear as a part of the larger whole to which it belongs;

- A clear geometric scheme controlling the disposition of the parts and their relationships of one another and to the whole;

- A clear gradation of spaces and uses ranging from public to private;

2.7.2 SAMPLE APPLICATION

A sample application, provided below, of the proposed framework for site assessment is provided for the Hospital Drive entrance near the Corner.

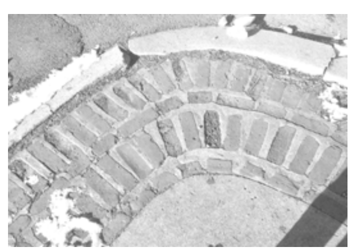
Hospital Drive at University Avenue

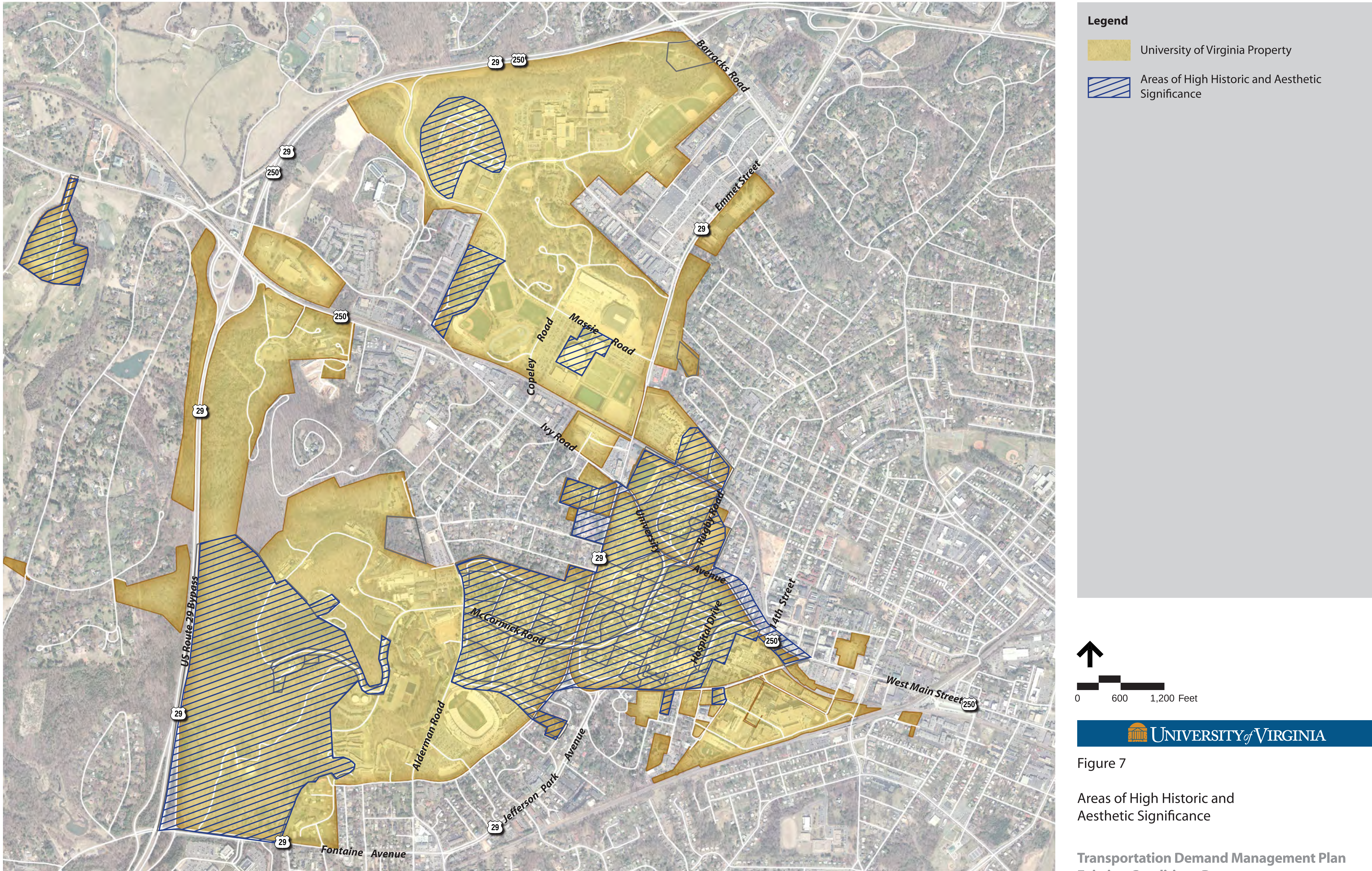
The intersection is deficient in terms of traffic flow, roadway geometrics and pedestrian accommodation. Sight lines from Hospital Road are poor and pedestrians must walk around a large intersection area due to the sharp angle of intersection. The physical condition is good, as there are no major condition or hazard issues that need to be immediately addressed. The visual character is degraded due to the number of traffic devices—signs, bollards, speed buttons, yellow curbing—necessary to make the intersection safe for motorists and pedestrians. However, the intersection has a unique character give the brick arches, brick inlay paving, and brick herringbone-pattern sidewalks leading up to the intersection. The arches and brick details help the intersection fit in with the surrounding context of Central Grounds and the nearby Lawn features. The arches are the sole historic resource of consequence within the intersection, although the brick details may be reminiscent of patterns and materials that existed in the past.

	Category				
Evaluation Site	Overall Function	Physical Condition	Visual Character	Historic Resources	TOTAL
Hospital Drive at University Avenue	1	3	2	3	9

This example illustrates that the transportation functions are not well served at this location. However, development of alternatives needs to be cognizant of the important visual character and historic resources at this location. Also, the existing physical condition of this site is generally good. The condition assessment is particularly useful in the prioritization of physical improvements to a number of sites.





UNIVERSITY of VIRGINIA

Figure 7

Areas of High Historic and Aesthetic Significance

3.0 TDM PLAN AND FUTURE CONDITIONS

This chapter describes different levels of TDM implementation and their potential impact on travel behavior and parking needs at the University of Virginia. One of the first steps toward defining a TDM plan for the University of Virginia was a review of TDM practices at other similar institutions. Once the range of TDM measures was identified, the team defined four different packages of TDM strategies reflecting different degrees of incentives and controls on travel behavior. The effectiveness of these strategies was then tested using the EPA Commuter Model v2.0 which estimates the likely change in travel behavior for different TDM programs. Finally, the impact of these travel behavior changes on the parking system at the University was considered. These analyses are described in detail in the remainder of this chapter.

3.1 STEERING COMMITTEE PROCESS

The University established a steering committee to help guide the selection of appropriate TDM measures. The steering committee met on several occasions during the first half of 2007 to review proposed TDM measures. This steering committee consisted of representatives from the following offices and organizations:

- Human Resources
- Housing
- Health System
- Provost's Office
- Athletics
- Student Affairs
- Parking and Transportation, and
- The Office of the Architect.

In addition to the steering committee, the TDM plan was discussed in a number of stakeholder meetings with broad representation from the University community. A list of participants and summaries of the focus group discussions are included in the Appendix to this report. Finally, the TDM plan and its potential implications for the Grounds Plan were discussed with representatives of senior administration during a session in April 2007.

3.2 PEER ANALYSIS

Many institutions were contacted to identify current practices regarding TDM. The following sections provide examples of institutional implementation of different categories of measures. This information was gathered through interviews with University officials and through information available on the respective institutions' websites. A summary of the peer analysis is provided in Table 4 and the subsequent sections provide a more detailed description of the offerings by each institution.

Table 4 Peer Analysis Summary

University	Students	Faculty/ Staff	Parking Pricing	Student Parking	Carpool/ Vanpool	Ride Matching	Transit	Park and Ride	Car Share	Guaranteed Ride Home	Flexible Parking	Marketing
University of Virginia	19,500	12,500	$144 to $516	First year students excluded	No formal program	External databases	100 % subsidy	No	No	Yes (external program)	20 pass purchase program	Web site information available, but an aggressive marketing campaign is not in place
Virginia Tech	26,000	6,000	$81 to $106	All allowed.	Discounted permits, preferential parking	Internal assistance	100% subsidy	No	No	Yes	10 passes annually	Email and websites emphasize cost savings and ecological benefits. Direct mail used to reach some staff.
University of North Carolina at Chapel Hill	27,500	16,000	$210 to $1,659	No freshmen Complex lottery for others.	Discounted permits, preferential parking	External databases	100% subsidy	Yes	Zipcar	Yes	9 passes annually	Email and websites emphasize cost savings and ecological benefits. Staff present at campus events. Transportation coordinators inform their departments. Prize drawings, merchant discounts also offered.
Cornell University	19,562	10,000	$0 to $690	All allowed.	Discounted permits, cash subsidies, preferential parking	Internal assistance	100% subsidy	Yes	No	Yes	10 passes annually	Event attendance, in person visits, websites, email.

Table 4 Peer Analysis Summary (Continued)

University	Students	Faculty/ Staff	Parking Pricing	Student Parking	Carpool/ Vanpool	Ride Matching	Transit	Park and Ride	Car Share	Guaranteed Ride Home	Flexible Parking	Marketing
Harvard University	17,000	15,000	$915 to $1830	Mostly prohibited.	Discounted permits, preferential parking	Internal assistance	50% subsidy	Yes	Zipcar	Yes	No	Website, email, and print articles highlight financial and ecological benefits. Staff present at employee orientations. Kiosks to be constructed on campus.
Stanford University	17,747	9,771	$216 to $552	No freshmen.	Discounted permits, cash subsidies, preferential parking	Internal assistance	100% subsidy	Yes	Enterprise	Yes	8 passes monthly	Website, events, email newsletters, 12 free hourly car rental vouchers, member events, prize drawings.
University of Wisconsin-Madison	41,000	24,000	$445 to $1035	All discouraged, but may enter lottery.	Vanpools receive preferential parking, no permit discounts	Internal assistance	100% subsidy	Yes	Community Car	Yes	25% discount off regular rate	Website, employee orientations, in person at transportation office.
University of Michigan	34,000	28,000	$191 to $690	No freshmen or sophomores.	Vanpools are organized by external contractor, UM pays the fees	External databases	100% subsidy	Yes	Zipcar	Yes	No	Website and email.

3.2.1 VIRGINIA TECH

Blacksburg, VA
Students: 26,000
Faculty/Staff: 6,000

I. TDM Mission

The mission of Virginia Tech's alternative transportation program is to promote and encourage the use of alternative modes of transportation (i.e.: bicycling, walking, vanpooling, carpooling, riding transit) to get to, from, and around campus instead of a single occupancy vehicle (SOV).

II. Transportation Environment

Virginia Tech is located in a small town in southwest Virginia, surrounded by a rural county. While there is no regional transit authority, Blacksburg does have a local bus system. Approximately 97% of the bus ridership is from the university community. Virginia Tech estimates that of the 97% ridership, 95% are students who ride fare free. Almost all faculty and staff drive to campus despite the free bus passes that are provided to them. Due to the region's cost of housing, faculty and students tend to live closer to campus, while lower-paid staff lives farther out. It is challenging to provide adequate alternative transportation options for these employees, but the university attempts to offer new alternatives.

III. Program Features

Virginia Tech first implemented TDM strategies in 1999. At the time, the University was not facing problems with congestion, but wanted to avoid the construction of new parking that would be necessary with planned growth. Their program, Commuter Alternatives Program (CAP) and its options are still not utilized heavily, but have received more attention in the last couple years as fuel prices have climbed.

Virginia Tech offers faculty, staff, and students special carpool permits, at about two-thirds of the cost, that allow established carpools to park on campus in designated lots. Participants can split the cost of the parking permit among carpool riders. Carpool parking permits cost $70 yearly for faculty and staff and $54 yearly for students. To help establish carpools, staff utilizes a university database to link people to others that live nearby.

A pilot vanpool program will be launched shortly. This program will utilize Virginia Tech's own fleet vehicles. Participants will be able to purchase discounted fuel from the university and will receive special designated parking. All vanpool costs will be payroll deductible, pre-tax from employees' earnings.

The university offers a guaranteed ride home option for people who take alternative transportation to campus. It was found this feature helps alleviate participants' worries about being stuck in case of various family emergencies, but that it is used very rarely. The CAP also offers participants 10 day-use parking permits per person for days when a carpool, vanpool, or cycling is not convenient for them. Virginia Tech does not have a carsharing program on campus.

IV. Program Management

Virginia Tech employs one full-time staff person to manage and market its CAP program. The position undertakes a wide variety of alternative transportation responsibilities within the Facilities Department at Virginia Tech. Pursuing greater coordination with regional authorities, monitoring pedestrian and bicycle amenities across campus, managing an alternative transportation education program, and representing the university at events are a few of the responsibilities of the position.

V. Program Marketing

The CAP is marketed to the university community primarily through email. Most email messages contain links to websites explaining program options and contain information about other transportation options in the Blacksburg area. To reach university staff that is not accessible through email, direct mailings have been successful at increasing awareness of transportation options.

Virginia Tech has not emphasized the ecological benefits of alternative transportation, but will soon do so to try to further reduce single-occupancy vehicles that travel to campus.

VI. Parking

Parking at Virginia Tech costs $106 a year for faculty or staff to park in one of the campus's perimeter lots. Students currently pay $81 a year for the same commuter permit. There are no restrictions for resident students to park on campus.

VII. References

Deborah Freed, Alternative Transportation Manager, was interviewed on February 15, 2007. The Virginia Tech website was also used to gather this information.

3.2.2 UNIVERSITY OF NORTH CAROLINA

Chapel Hill, NC
Students: 27,500
Faculty/Staff: 16,000

I. TDM Mission

UNC states that "in an effort to reduce traffic congestion and the number of vehicles parked on campus, the Commuter Alternatives Program is designed to reward UNC faculty, staff and students who do not drive a Single Occupancy Vehicle (SOV) to commute to campus. The program is free and only requires that the CAP registrant commute to school or work and not hold a SOV permit. The Commuter Alternatives Program encourages all forms of alternative transportation including, bicycling, walking, transit, park and ride, carpool and vanpool. "

II. Transportation Environment

The University of North Carolina at Chapel Hill is located in a suburban setting, in the state capital region, home to several universities. There is extensive, fare-free bus service offered in the city of Chapel Hill and throughout surrounding cities. The service has comprehensive coverage across the city, linking popular housing complexes to the university campus and to the regional bus system. UNC is planning growth for its educational program, but will not create additional parking in the near term.

III. Program Features

The CAP program offers a wide array of options for faculty, staff, and students to travel to and from campus. The CAP is an integral part of the UNC Master Plan which aims, among other things, to reduce single occupancy vehicle travel by increasing on-campus housing, creating park and ride lots, and enhancing local and regional transit. Elements of this TDM program have proven popular, but it has been found that whenever a parking permit is surrendered by someone joining CAP, there are many people anxious to start driving to campus. The university has, however, avoided the costly construction of new lots and parking garages that are often necessary outcomes of growth.

The Commuter Alternatives Program offers transportation options to augment the city's and region's extensive bus service. Chapel Hill's local bus is currently free to all riders. The service has comprehensive coverage across the city, linking popular housing complexes to the university campus and to the regional bus system.

The University coordinates nine park and ride lots in Chapel Hill. Anyone may park in five lots on a first-come, first-served basis. However, four lots are reserved for the exclusive use of people enrolled in the CAP program. Frequent bus routes connect the lots to the university campus.

A vanpool program, comprised of nine vehicles, transporting approximately 130 people, is offered as an alternative to driving to campus. The average cost is $20 per month per participant, but the driver rides free. Unlike the program at Virginia Tech, there is no additional discount on fuel or an emergency ride home option

The university's TDM coordinator directs those interested in ridesharing options to websites with online databases of people looking to carpool, like www.sharetheridenc.com.

UNC has a Zipcar program that is gaining popularity. Four cars are located across the campus. While the cars are available for anyone 21 and older, this transportation option does nothing to reduce single occupancy vehicles from traveling to campus. The program helps serve people who need to run off campus for a short trip.

One unique feature of UNC's CAP is that members receive merchant discounts at over twenty area shops and restaurants. University staff is working to expand this to make the program more attractive and visible to the university community. The CAP program also has occasional drawings and prize giveaways.

IV. Program Management

UNC has a full time transportation demand management coordinator. The professional position is staffed in the university's Department of Public Safety.

V. Program Marketing

UNC undertakes extensive marketing for their program. In addition to subscriber listserves and emails out to the university community, they maintain informative websites, print flyers, and advertise on campus. UNC's transportation staff holds several events during the year to market their programs. Some locations include setting up a booth at back to school orientations in August and January, and joining campus events with other departments, like Information Technology. The TDM office usually partners with Chapel Hill's local and regional transportation providers at these events.

UNC frames their program around the ecological benefits that alternative transportation can help provide. There are several excellent websites devoted to this topic. They are seen to have a great impact on the community. University staff said that many people who could afford a parking permit forgo it to join the CAP program.

The University is continually seeking better tools and methods to target students for carpooling programs. One challenge with students is their variable schedules. However, UNC has been fairly successful reaching students by using online promotions and offering merchant discounts if they join the CAP program. They are also fortunate that many students live in housing developments connected to the campus by the local bus system.

VI. Parking

48% of faculty and staff do not have campus parking privileges. UNC's policy is to leave decisions up to individual departments. Each department is allotted a certain number of parking permits; who gets each permit is up to them.

Parking permit rates, for faculty and staff, are based on salaries. There is a wide variance in parking rates based on the lot location and the employee's salary. The least expensive parking fee for the 2006-2007 school year for an employee who makes less than $25,000 is $281. At the same salary level, a more premium lot would cost $905. A faculty member earning over $100,000 can expect to pay $514 to $1,659 depending on the location. A significant fee increase is planned for the 2007-2008 school year.

Commuter students, who live more than two miles away from campus, may enter a lottery to purchase a yearly commuter parking permit, at $210 - $365, depending on the lot location. After their freshman year, resident students may enter a lottery for an on-campus parking permit. UNC makes 2,514 parking spaces available to resident students. The university and its student government decide the allocation process for the spaces.

VII. References

Claire Kane, Transportation Demand Manager and Deborah Freed, former UNC TDM manager were interviewed on February 16, 2007. The UNC website also provided information.

3.2.3 CORNELL UNIVERSITY

Ithaca, NY
Students: 19,562
Faculty/Staff: 10,000

I. TDM Mission

The primary goal of the TDM program is to reduce commuter demand for parking spaces by providing efficient, cost-effective, and environmentally friendly alternatives to commuting via single-occupancy, personal vehicles. The Cornell TDM program concentrates on the commuting habits of faculty and staff, because it is their commuting habits that can be most impacted. The university funds TDM programs out of human resources overhead.

II. Transportation Environment

Ithaca is home to Cornell in a rural county in upstate New York. A small college town with a large university, Ithaca and surrounding Tompkins County coordinate a bus system that provides dependable service throughout the region. Cornell has worked with transit authorities to establish new bus routes and ensure the system will attract new riders. A consolidated transit organization was created between Cornell, the city, and the county to help simplify local transit and make options more clear for Cornell commuters.

III. Program Features

Cornell boasts of having 2,600 fewer cars on campus today than it did in 1990. The university's transportation demand management program gets credit for this reduction. One year after the program was launched, the number of parking permits issued declined by 25%. Cornell estimates that it has saved nearly $37 million over the course of 12 years in avoided parking construction, infrastructure improvements, and transportation costs. The university strives to change the habits of its faculty and staff by providing a combination of options- from financial incentives to convenient alternative commutes. An estimated 33% of faculty and staff commute to campus in a mode other than an SOV.

Cornell's students live largely on or adjacent to the campus, so they are not a major target of TDM efforts. The school would like to offer more options for graduate students, but does not have a funding source. Currently, if a student buys a commuter parking pass they also get a bus pass.

To suit the commuting needs of employees, they are offered a program called OmniRide that builds on resources provided by the regional government. The university offers 100% subsidized rides on local and county buses for its employees, Monday through Friday, with the option to pay a small fee for an everyday pass. The program currently has 1,500 members. Cornell staff manages the program to integrate local transportation providers. OmniRide members may ride local transit for free anytime within Tompkins County. Cornell has an arrangement with adjacent counties to partially subsidize travel there.

Cornell encourages use of municipal park and ride lots, but has struggled to get employees to utilize them. These lots are connected to campus by the local bus system. The university is working with local city and transportation authorities to relocate park and ride lots closer to the urban core, hoping they will be more enticing for people to give up their on-campus parking.

A carpool option reduces the cost of parking on campus depending on how many people are involved. Cornell has 1,350 signed up for ride sharing. Discounts are provided for campus parking with the most premium parking lots requiring the largest number of riders in order to qualify for a free permit. However, a carpool of two employees does qualify for a free, reserved parking space in many parts of campus. A stipend of up to $350 may be received if four people carpool, but only about 30-40 people receive this bonus. Overall, carpool incentives range from reduced cost premium lot parking to a reserved space plus a rebate. Cornell urges employees to use online matching systems to find a ride partner.

Enhancements to the current TDM program will be the addition of a car sharing program, like Zipcar, and organized vanpools. Cornell's staff admits both additions will be challenging because vanpools only function if employees live in the same general area and work similar hours. The university will offer a financial incentive for vanpooling, but the level of this has yet to be determined. A car sharing program is being created that would benefit both the university and the Ithaca community. The program would provide short-term car access for people who commute to campus in alternative modes. Cornell was approached by Zipcar, but including a few cars on campus would not be financially feasible unless it were expanded to include access to citizens of Ithaca.

Cornell provides a safety net for commuters who come to campus without their own vehicle. Emergency rides home are offered in case of emergency, though this service is only used a few times a month. Ten one-day parking permits are provided for members of ride shares. These passes may be used when it is not convenient for employees to take their usual mode to the university. The university estimates that approximately 100 people are enrolled in their occasional parker program, meaning they must walk or ride a bicycle to get to campus on other days.

IV. Program Management

Cornell employs a manager in their commuter and parking services department to coordinate their TDM program, however, they emphasize how TDM strategies are integrated throughout the parking and transportation department. Several employees are responsible for working on different pieces of the program. Coordination with local and regional transportation agencies is a very important function of TDM program management at Cornell. In order to maintain enrollment levels and eventually expand the program further, this relationship must be maintained.

V. Program Marketing

University websites emphasize the ecological benefits of reducing vehicle travel and keeping the campus green by halting the construction of new surface parking lots. Savings on auto maintenance, fuel, and parking permits are also highlighted online. The greater the program focuses on saving people money and ensuring convenience, the greater likelihood Cornell has had getting people to make an alternative commute. Cornell stressed how important it is to get the campus community to feel good about the alternative commute program. While they initially tried to market options as benefiting the environment, highlighting the actual cost of commuting, in terms of fuel costs and parking permits, helped increase program enrollment. The ecological benefits of not driving to campus are seen as secondary benefits. With the university community continually in flux, marketing TDM programs can be a challenge. Cornell's approach is to communicate TDM strategies through their transportation and parking department. If someone visits the office to obtain a parking permit or pay a citation, they will discuss alternative commuting options. Events have been held in the past, but the university did not find they gained many new members for OmniRide or carpooling.

VI. Parking

The employee parking permit system is structured into six tiers. As one gets closer to the center of campus, the cost of parking increases. The priciest parking permits cost $690 annually, while the lots on the edge of campus are free. Cornell raises parking fees incrementally each year to avoid a contentious battle over large hikes every three to five years. University staff believes that parking fees must be raised in order to provide additional incentive for the Cornell community to consider TDM. However, as with any university, the cost of parking can become controversial. Cornell does not provide any free parking to students. Students may purchase annual permits for $645 to park adjacent to their residence halls or if they commute to school from off-campus.

VII. Reference

The Cornell University website and US EPA website were used as references. The TDM coordinator, David Lieb, was interviewed on March 20, 2007.

3.2.4 HARVARD UNIVERSITY

Cambridge/Boston, MA
Students: 17,000
Faculty/Staff: 15,000

I. TDM Mission

Harvard's CommuterChoice Program is committed to providing the best commuting information and planning services to employees. Whether one is a new employee, changing jobs within the university, or moving to a new home, CommuterChoice can assist in planning a commute. The program will also strive to improve air quality and reduce traffic congestion, to reduce demand for parking and improve commuting options for those who travel to the Cambridge and Allston campuses, and to increase the number of registered carpool participants.

II. Transportation Environment

Harvard University is located on three campuses: one in Cambridge and two in Boston. Being located in a dense, urban area affords Harvard students, faculty, and staff the opportunity to take a wide variety of public transportation options to campus. Most parts of campus are linked to the regional subway and all locations may be reached via bus.

III. Program Features

Harvard launched its CommuterChoice program in 2000 in a bid to reduce the number of single occupancy vehicles traveling to campus. Besides offering faculty and staff a 50% discount on monthly transit passes (5,800 take advantage of that option) Harvard coordinates ride matching to encourage car and vanpooling. A website offers information to enable commuters to locate people willing to share their ride. University staff is available to assist commuters looking for a match.

Discounted, preferential permit parking is available for people who rideshare five days a week to Harvard. Vanpools currently receive parking, free of charge. All carpool spaces are creatively marked to draw attention to the program. Since Harvard does not have the capability to enforce irregular use of its parking facilities, parking permit discounts are only available to commuters who travel to campus five days a week. One of the main challenges with ridesharing programs, besides coordinating flexible schedules, is they require some enforcement of ridesharing after benefits are granted. Another challenge relates to vanpools. It has been difficult to make vanpools useful to Harvard's faculty and staff since people have different work schedules and come from different locations.

An emergency ride home option, though used only rarely, is included in the CommuterChoice program for those who commute via rideshare. The CommuterChoice program stresses the overall convenience of using alternative transportation to get to Harvard. Harvard has found that while the ecological and financial benefits of not driving a car to campus are important, making a commute convenient makes the greatest difference.

Zipcars made an early presence on Harvard's campus. Nine cars are currently located on campus and in many areas in Boston and Cambridge. Members of the Harvard community receive a discount for joining Zipcar, but they must be 21 or older. There are currently 3,570 Zipcar members affiliated with Harvard.

IV. Program Management

Harvard established an office devoted to the CommuterChoice program. The office employs two full-time people- a program manager and an administrator. Responsibilities include program implementation, the posting and distribution of marketing materials, including the website, holding promotional events on alternative transportation, program monitoring and evaluation, and acting as a central resource providing transit schedules and program information. The CommuterChoice office has a strong customer-service function. Staff explains all of their programs and tries to fit employees to their own best commuting option. Harvard has also trained 141 transportation coordinators representing all departments on campus. These individuals disseminate materials on commuting options and collect issues, comments, and questions for the university's transportation staff.

V. Program Marketing

The website, www.commuterchoice.harvard.edu is the main resource for program marketing, information, and registration. CommuterChoice manages kiosks with schedules, rates, and transportation routes at the graduate schools, libraries, and other major campus buildings. The program's coordinators select one "commuter of the month" to receive a prize thanking them for their alternative transportation choice. Events are held in conjunction with university orientations and other fairs to spread information about the program, in addition to the materials contained in employee orientation packets. The CommuterChoice office has a good relationship with Harvard media outlets to get frequent press coverage.

VI. Parking

Parking at Harvard University is scarce and expensive. There is currently a waitlist for parking in Cambridge and Boston. Parking applicants are told to expect to wait up to 36 months for a spot to open. The cost of parking varies depending on the location of the lot, whether or not it is underground, and if a space is reserved. The cost of a yearly underground, reserved permit is approximately $1,830 while an unreserved surface space costs $915. Students get a marginal discount, paying $1,585 for a garage space, but the permits are extremely limited.

VII. Reference

Holly Parker, TDM program manage, was interviewed on February 22, 2007. The CommuterChoice website also provided information.

3.2.5 STANFORD UNIVERSITY

Palo Alto, CA
Students: 17,747
Faculty/Staff: 9,771

I. TDM Mission

Stanford has committed itself to offering a comprehensive alternative transportation program as part of an effort to ease parking pressure and minimize traffic congestion (which dramatically impacts their campus and surrounding communities). The university community is urged to make a significant contribution to this effort by utilizing at least one of the many forms of efficient, cost-effective alternatives to driving alone, not purchasing a Stanford parking permit, and joining the Stanford University Commute Club—the club which joins together Stanford individuals who care about reducing pollution, who help the university by reducing the number of vehicles coming in and out of campus, and who benefit financially by not driving alone.

II. Transportation Environment

Stanford University is located in suburban Palo Alto, north of San Jose. In the center of a large urbanized area, Stanford benefits from easy access to local and regional bus and rail service. The university's shuttle connects campus locations with external transit providers to put the Stanford community within reach of all locations in the Bay Area.

III. Program Features

Stanford created its Commute Club program to help its community find alternative ways to travel to campus and receive incentives for helping to reduce congestion and improve the environment. Members of the program commit to using an alternative means of traveling to campus other than a single occupancy vehicle. In exchange, members receive a wide array of benefits, including:

- Up to $216 a year in cash
- Free travel on regional buses and light rail
- Pretax payment for other local and regional transit passes
- Reserved parking spaces for carpools/vanpools
- Complimentary daily parking passes for carpoolers
- Vanpool subsidies
- Ride matching service
- Ability to purchase up to eight daily parking permits a month
- Rewards for recruiting new members
- Guaranteed ride home
- 12 free hourly car rental vouchers, available to anyone age 18 or older
- Membership appreciation events
- Prize drawings

The Enterprise rental program has proven to be a popular way to solve some transportation worries. Commute Club members who need to leave campus for a few hours for an errand or appointment, may utilize an hourly rental from Enterprise, similar to the way Zipcar works.

IV. Program Management

The Commute Club program is managed in Stanford's Parking & Transportation Services office by one full time staff member. The program is constantly under revision and requires full time attention, as well as aid from office administrators.

V. Program Marketing

Stanford promotes the ecological and financial benefits of alternative transportation. The $216 grant from the Commute Club is a good incentive, but people will not join if the alternative modes are not convenient. New students and employees receive orientation materials on the commuting program. The TDM staff will meet with individuals to go over what the best commuting options are for them- to make it cost effective and convenient for them.

VI. Parking

The supply of parking is ample at Stanford. There are only two different tiers of lots. Lots located on the campus perimeter are less expensive than those near the center. For 2007, parking in the premium lots costs $552 and in the other lots it is $216.

Freshman students are not permitted to bring their cars to Stanford. Upperclassmen who obtain an on-campus parking permit will pay either $216 or $552 for parking privileges.

VII. Reference

Stephanie Manning, Marketing and TDM Outreach Manager was interviewed on February 20, 2007. The Stanford University website was also referenced.

3.2.6 UNIVERSITY OF WISCONSIN-MADISON

Madison, WI
Students: 41,000
Faculty/Staff: 24,000

I. TDM Mission

The purpose of the alternative transportation program is to reduce the number of vehicles driven to campus on a daily basis, reduce environmental pollutants, traffic congestion, fuel costs, and the building of new parking garages on campus.

II. Transportation Environment

The University is located in the center of capital city of Madison. The large campus is connected to the city by a network of well-utilized bicycle and pedestrian pathways and an extensive bus system. Currently, all students receive free bus passes to enable them access to campus from anyplace in Madison. Faculty and staff also get a free local bus pass. The bus system's schedule enables the university community to access the campus for a wide variety of work schedules and is also free to use on weekends. The price of parking is adjusted periodically to keep giving the campus community an incentive to not drive to campus. UW staff believes this cost, along with convenient TDM options, help give the university one of the best mode splits outside a very large city. Currently, over 90% of students and 50% of faculty and staff travel to campus using alternative methods. The university is aiming to make small gains on the faculty and staff mode split and hold the student rate stable.

III. Program Features

Alternative transportation, in particular bicycling, is part of the culture at UW. Besides efforts to get the campus community to utilize the local bus system and pathway network, the transportation office offers programs to encourage ridesharing and urges interested employees to use an online database to partner up with others. Vanpools are offered preferential on-campus parking, but carpools are not. UW staff believes there would be enforcement issues if they started offering special parking for their numerous carpools.

UW also offers a park and ride option for commuters who can access a lot on the west side of Madison, but charges an annual $175 fee to park there. In addition, the Madison area transit organization coordinates a series of park and ride lots coming into the city.

A flex parking feature is offered to full-time commuters who commit to alternative transportation to campus, but need the flexibility to be able to drive their cars to work two times a week or less. Flex parkers pay daily rates to park, but get a 25% discount off the standard lot meter rate. This option helps provide peace of mind to commuters who want to use other modes to travel, but need to drive for personal reasons, like medical appointments and childcare.

IV. Program Management

A full-time TDM manager is employed in the university's transportation department. The position works with the campus community to explain commuting options, coordinates with city and regional transportation authorities, and produces a yearly assessment of campus commuting patterns.

V. Program Marketing

The program is marketed through websites, email messages, and brochures. The TDM program shares its offices with the parking departments, so people coming to get information on parking their car or paying violations, will also receive information on alternative commutes. While they have not spent much time doing it in the past, the university plans to get more involved with employee orientations to provide information on TDM when people start working.

VI. Parking

The cost of parking at UW varies depending on the location of the lot. The least expensive parking, $175 annually, is offered to commuters who use Park and Ride facilities. On-campus parking ranges from $445 for perimeter lots to $1,035 for central lots and garage parking.

Parking for is extremely limited at the university and students are strongly discouraged against bringing cars to campus. However, commuter students who live outside Madison and those with frequent off-campus employment are able to obtain parking privileges. Students pay the same rates as faculty and staff.

VII. References

University websites were used to gather information. The University of Wisconsin-Madison's TDM coordinator, Rob Kennedy, was interviewed on March 21, 2007.

3.2.7 UNIVERSITY OF MICHIGAN

Ann Arbor, MI
Students: 34,000
Faculty/Staff: 28,000

I. TDM Mission (Unavailable)

II. Transportation Environment

The University of Michigan is located in Ann Arbor, Michigan, a medium-sized city located to the west of Detroit. Ann Arbor is provided with bus service by the Ann Arbor Transportation Authority.

III. Program Features

Michigan's TDM program is centered on the provision of bus passes to faculty, staff, and students. The local transit authority, AATA, saw a 40% increase in bus ridership once the university instituted the free pass program in 2004. Park and ride lots are connected via bus services to different areas of campus. More than 1,800 employees utilize the lots to access their workplaces. With frequent bus connections from the lots and campus parking rates continually on the rise, the university hopes this commuting option becomes more popular. Faculty and staff are encouraged to establish carpools in order to share parking permit and fuel expenses. The university contracts with an outside agency to organize vanpools and pays the monthly fee for each rider. Employees only pay the fuel costs associated with each trip. More than 300 people commute to Ann Arbor via vanpool and take advantage of reserved parking spaces.

IV. Program Management

TDM at Michigan is managed in the parking and transportation department.

V. Program Marketing (Unavailable)

VI. Parking

Michigan has a complex parking policy, but provides options for faculty, staff, and students at various levels. Staff working more than half-time, research scientists, physicians and nurses, and most faculty may purchase parking permits. The university charges annual rates of $191 - $690 annually depending on the location of the lot.

VII. Reference

University of Michigan websites.

3.2.8 SELECTED UNIVERSITY TDM WEBSITES

Many universities have web pages devoted to ecological sustainability and transportation options. Here are some examples of websites at peer institutions.

University of North Carolina

Sustainable Transportation

http://sustainability.unc.edu/index.asp?Type=Mobility&Doc=transportationDemandManagement2

Commuter Alternatives Program

http://main.psafety.unc.edu/dps/alternatives/commuter_alternatives_program.htm

Stanford University

http://transportation.stanford.edu/alt_transportation/AlternateTransportation.shtml

Harvard University

http://www.commuterchoice.harvard.edu/

Cornell University

Sustainable Transportation

http://www.sustainablecampus.cornell.edu/gettingaround/gettingaround.html

RideShare Program

http://www.parking.cornell.edu/tms3_rideshare.html

University of Wisconsin-Madison

http://www2.fpm.wisc.edu/trans/TDM/index.htm

3.3 POTENTIAL TDM PROGRAMS

Based on the input from the University of Virginia Steering Committee, the stakeholder workshops, and the peer analysis presented above, four potential TDM scenarios have been developed. These include the following:

- Very Aggressive Scenario;
- Aggressive Scenario;
- Moderate Scenario;
- Least Aggressive Scenario; and
- Baseline Scenario.

The TDM scenarios are focused on commuters to Grounds and the Health System. They do not focus on measures intended to reduce student-resident driving. The first scenario (Very Aggressive) includes all of the potential measures for consideration by the University. The subsequent scenarios include fewer or less aggressive implementation of the TDM measures. A Baseline condition is also presented to illustrate the conditions without expansion of the University's TDM program. The elements of the scenarios are summarized in Table 5 and a description of each measure is provided after the table. Table 5 also notes those cases where the measures are implemented to a different degree. For example, ranges of parking price increase are indicated in the first row of the table. Rows that include a diamond symbol indicate implementation of a program that does not have an easily identifiable range of variability.

Although particular measures are included in each of the TDM scenarios, it is important to recognize that the degree of commitment to TDM indicated by the scenario is a more important determinant of success than the specific combination of programs. Also, some programs have a higher direct impact on travel behavior (e.g. parking pricing) while others support people's understanding of and willingness to use alternatives (e.g. TDM marketing program). A robust combination of these types of measures will provide the most effective program.

Table 5 TDM Scenarios

TDM Measure		TDM Scenario: Very Aggressive	Aggressive	Moderate	Least Aggressive	Baseline
1.	No Parking Expansion	◆				
2.	Parking Price Increase	> 100 %	50 to 100 %	50 %	20 – 33 %	Minor
3.	Parking Permit Buyback	◆	◆			
4.	Student Parking Reduction[1]	◆	◆			
5.	Vanpool/Carpool Parking Location	Premium	Premium	Reserved	Reserved	
6.	Vanpool/Carpool Financial Incentive	Free & Bonus	Free & Bonus	Discount		
7.	Housing Incentives/Sponsorship	◆	◆			
8.	Bicycling Improvements	Lanes/Paths	Lanes/Paths	Racks, etc.		
9.	Pedestrian Improvements	◆	◆			
10.	Free-Ride Transit[2]	◆	◆	◆	◆	◆
11.	Commuter Membership Program	◆	◆			
12.	Member Spot-Rewards	◆	◆			
13.	Transportation Events	◆	◆			
14.	Transit Advocacy/Coordination	◆	◆	◆	◆	◆
15.	Park & Ride Implementation	◆	◆	◆		
16.	Pre-Tax Payment for Alternatives	◆	◆	◆		
17.	RideShare Marketing	◆	◆	◆		
18.	Ride Matching Assistance	◆	◆			
19.	Car-Sharing	◆	◆	◆	◆	
20.	Flexible Work Arrangements	◆				
21.	Occasional Parking	◆	◆	◆	◆	◆
22.	TDM Coordinator	◆	◆	◆	◆	◆
23.	Program Marketing	◆	◆	◆	◆	
24.	Website Enhancements	◆	◆	◆	◆	

1. Student changes are not modeled; however an aggressive program could include changes to student parking policies and other measures to reduce automobile use by students.
2. UVA recently implemented a "Free-Ride" transit program, however, its effects are not included in the baseline.

◆ Program element included. Where appropriate, a level of program implementation is identified.

3.3.1 TDM MEASURE DESCRIPTIONS

A different set of TDM measures are implemented for the scenarios illustrated above. The Very Aggressive scenario includes all of the TDM measures listed below which the least aggressive includes a small number of the potential measures.

1. **No Parking Expansion**
   The University would maintain its current parking supply and not create additional spaces which would accommodate increased parking demand.

2. **Parking Price Increase**
   An aggressive pricing approach would help the University decrease the number of single-occupancy vehicles that travel to Grounds. The scenario includes varying initial and incremental increases thereafter to reinforce use of alternatives to driving. It is expected that a range of permit prices would continue to be available and that pricing for each category would be adjusted to continue to provide a market-driven balance of supply and demand for the various permit categories.

3. **Parking permit Buyback**
   A permit buyback program would reward current parking permit holders for surrendering their parking permit and choosing an alternative commute- be it rideshare, transit, bicycling, or walking. The issue of benefits to employees who do not currently hold a permit may or may not need to be addressed. Additionally, the program could be implemented with a grace-period, so that the employee can transition into other modes, improving their comfort with accepting the buyback.

4. **Student Parking Reduction**
   Students living in off-grounds housing comprise a significant component of the automobile commuter population and parking demand. Most of the TDM strategies included in this plan are focused on employee trips; however, the University could also restrict parking permits for students using a variety of criteria. For example, students living within walking distance of Grounds could be ineligible for a parking permit, second-year students could be ineligible for parking, or students living on a CTS bus route serving Grounds could be ineligible. The TDM analysis discussed in this report do not reflect potential changes in student commuting.

5. **Vanpool/Carpool Parking Location**
   Reserved parking spaces in premium lots would be provided adjacent to handicapped ones for the convenience of rideshare commuters. This benefit is a common strategy to make ridesharing more appealing.

6. Vanpool/Carpool Financial Incentives

The University would reward rideshare participants by giving them a free parking permit on Grounds. A more aggressive approach to increasing rideshare participation would be to offer a financial incentive to get commuters to carpool together. The University would offer a stipend in the range of $100 – 200 annually, to commuters who take van/carpools to Grounds. The program could have varied bonus depending on how many people are in the van/carpool and which lot is selected. A perimeter lot might get a larger stipend than a central, premium lot.

7. Housing Incentives

The University would become involved with the creation or financing of housing within walking, bicycling or transit access of Grounds. This would address the need for faculty and staff to live beyond walking, bicycling, or transit distance from the University due to the high cost of housing in Charlottesville.

8. Bicycling Improvements (pathways, intersections, showers, racks)

The University would address concerns about traffic and bicycle conflicts at certain intersections near Grounds. Bike paths should be constructed on and off roads. These improvements would help improve the safety and convenience of commuting by bicycle. At the less aggressive end of the range, bicycle amenities, like secured storage and access to shower facilities also would aid bicycle commuters.

9. Pedestrian Improvements (sidewalks, signal priority, street trees, etc.)

Improvements to the pedestrian environment would be implemented aggressively. These improvements are essential to getting more commuters to consider walking a viable alternative to driving to Grounds. Wide, continuous sidewalks provide room and safety to walkers, while improved crosswalks and crossing signals would help reduce vehicle conflicts. Other features, like additional street trees, add shade and visual appeal to streetscapes.

10. Free-Ride Transit

The University would maintain its arrangement to pay employees' fares on the CTS and JAUNT systems.

11. Commuter Membership Program

An alternative commuter program would be created, so the University can track participation, commuting behavior, and market program updates. The program could provide rewards, prize drawings, and refer-a-friend bonuses to help increase participation. A financial reward, of approximately $150 annually would be provided for people who commute to Grounds by bicycle or walking. This reward could either be a direct cash reward, or could be provided through an outside service provider through a sponsored reward program. For an example of this type of program, visit www.nuride.com.

12. Member Spot-Rewards
Providing spot rewards as overall transportation milestones are achieved would help maintain interest in alternative commuting and possibly lure new participants while encouraging the University community to work together on achieving mode split or parking goals.

13. Transportation Events
University events, like employee and new student orientations provide great forums to communicate commuting options before people have already developed a travel pattern. The TDM manager would emphasize the cost savings and ecological benefits of alternative commutes, while providing guidance to individuals wondering what the most appropriate option is for them.

14. Transit Advocacy/Coordination
The University would continue to assess commuters' satisfaction with the CTS and JAUNT and suggest route changes to serve University commuters. The University would also advocate for improved funding and service for these agencies.

15. Park & Ride Implementation
RideShare's park and ride lots have varying popularity. The University would survey its commuters to determine the best locations for park and ride lots and coordinate with UTS, CTS and/or JAUNT to provide shuttles to Grounds from there.

16. Pre-tax payment for Alternatives
Alternative transportation expenses- rideshare parking permits, vanpool fuel and fees, etc., would be payable by employees on pre-tax, payroll basis.

17. Rideshare Marketing
RideShare offers a variety of alternative commuter services that would be useful for University employees. Providing a guaranteed ride home option relieves anxiety about transpiration options in case of emergencies or illness. The University could aggressively market the programs available through the regional Rideshare organization.

18. Ride Matching Assistance
A key function of the TDM coordinator's position should be to help commuters find appropriate ride share partners. RideShare maintains a regional database of participants and the University could help their efforts by providing supplemental service and more personalized attention than the regional service.

19. Car-Sharing
The establishment of a car sharing service, like Zipcar, would provide the University community with short term car rental options in case someone needed a car to leave Grounds for hauling something, or for personal reasons.

20. Flexible Work Arrangements

Telecommuting has the clear benefit of taking commuters off the road. Permitting flexible schedules would help shift commuters to different time schedules and may help reduce congestion at the typical peak hours.

21. Occasional Parking Program

A flexible parking program provides an option for alternative commuters to take their personal vehicle to campus, a few times a month or so, when their non-single occupancy vehicle commute is not convenient for them. Certain lots and rates would continue to be designated to accommodate these parkers.

22. TDM Coordinator

A full-time TDM coordinator will continue to be necessary to coordinate changes with local and regional transpiration authorities, assist commuters with their options, program marketing, and assessment.

23. Program Marketing

Frequent communications, including email newsletters, articles in student and faculty newspapers, print advertisements, banners, and involvement University events would help increase the recognition and benefits of alternative commuting.

24. Website Enhancements

The TDM website would present clear, concise format for the displaying different commuting options. Attention would be given to the various resources available to help people make decisions and the ecological and economic benefits of non-single occupancy vehicle commutes.

3.4 TDM SCENARIO MODE SPLIT ANALYSIS

The United States Environmental Protection Agency's (EPA) Commuter Model (version 2.0) was used to test the effectiveness of the various TDM scenarios. The Commuter Model is a spreadsheet-based computer model that estimates the travel impacts of TDM programs. The program considers the impact of many different types of programs on travel behavior, such as:

- Transit fare incentives;
- Transit service improvements;
- Ridesharing programs including financial incentives and preferential parking;
- Parking pricing;
- Pedestrian and bicycle improvements; and
- Flexible work arrangements.

The model allows the analyst to consider the impact on mode share from a variety of combinations of programs using a LOGIT mode-choice methodology, commonly employed my more complex regional travel demand models.

This model was used to estimate the impacts of the TDM scenarios on mode choice and parking demand. Several assumptions were employed in this analysis including:

- Existing Journey-to-Work mode split data for City of Charlottesville;
- Population forecasts for faculty, staff, and students provided by the Office of the Architect;
- Employment and patient activity level projections based on historic trends for the Health System;
- Parking supply and utilization information provided by Parking and Transportation;
- Housing projections available on the University's website;
- A mid-size City (Santa Cruz, CA) city characteristics (one option available in the Commuter Model); and
- Numerous model-default travel characteristics such as: work trip length, peak period duration, percent of trips during the peak period, etc.

With the above assumptions and information held constant, inputs reflecting the TDM programs were employed in the model. The results of the model for each TDM Scenario are presented in Table 6. Examples of the model input and output are provided in the Appendix.

Table 6 TDM Scenario Mode Share Results

	TDM Scenario				
Mode Share	Very Aggressive	Aggressive	Moderate	Least Aggressive	(Existing) Baseline
Drive Alone	41 %	49 %	54 %	57 %	62 %
Carpool	21 %	17 %	13 %	12 %	10 %
Vanpool	2 %	2 %	2 %	1 %	0 %
Transit	7 %	7 %	7 %	6 %	5 %
Bicycle	4 %	3 %	2 %	2 %	2 %
Pedestrian	20 %	17 %	17 %	17 %	16 %
Other	5 %	5 %	5 %	5 %	5 %
Total	100 %	100 %	100 %	100 %	100 %

1. UVA recently implemented a "Free-Ride" transit program, however, its effects are not included in the baseline data

The table shows that Charlottesville currently has a relatively low drive-alone mode share, reflective of the higher density of the City and the existing programs in place to encourage alternative modes of travel. The 62 percent drive-alone mode share for Charlottesville compares with a nationwide average of 76 percent and a Virginia average of 77 percent.

The table also shows that the TDM scenarios have increasing impact on a shift from drive alone commuting to other options. For example, the Least Aggressive scenario shows a five-percent reduction in drive alone commuting from the Baseline condition. This change increases to eight percent in the Moderate scenario, thirteen percent in the Aggressive scenario and 21 percent in the Very aggressive scenario.

The table also indicates that the most significant shift is to Carpooling, reflecting the need for many people to commute by automobile, even if not their own, personal vehicle. As a result, the total reduction in parking needs is not as significant as the change in mode split as it would be if the shift were to a non-automobile mode. The Very Aggressive scenario also shows a significant increase in pedestrian access to work, reflecting more aggressive assumptions about residential location of employees. The overall change in automobile commuting is summarized in Table 7 below.

Table 7 – Automobile Commuting Mode Shares

Scenario	Drive Alone	Vanpool/ Carpool	Auto	Non-Auto	Change in Auto Mode Share
Baseline	*62*	*10*	**72**	**28**	**-**
Least Aggressive	*57*	*13*	**70**	**30**	**-2 %**
Moderate	*54*	*15*	**69**	**31**	**-3 %**
Aggressive	*49*	*19*	**68**	**32**	**-4 %**
Very Aggressive	*41*	*23*	**64**	**36**	**-8 %**

The results shown above were applied to employee commuters to identify the impacts on parking needs at the University of Virginia. These results are described in the following section.

3.5 TDM SCENARIO PARKING ANALYSIS ASSUMPTIONS

The changes in mode split were applied to future population estimates provided by the University to estimate the impact of the TDM scenarios on the amount of parking that will be needed in each condition to support planned institutional growth. The analysis is conducted for both a 2015 and a 2025 horizon year. The analyses also rely on a number of different assumptions, described below:

3.5.1 PARKING ASSUMPTIONS

Key parking related assumptions that support the analysis include:

- There are approximately 16,475 parking spaces managed by the University.
- The attended/metered/convenience parking supply will increase to support patient/visitor growth at the health system (estimated at 2.5% per year);
- Service, departmental, miscellaneous, motorcycle, and student-resident parking will be maintained at current levels;
- Changes in disabled parking requirements/supply are not included;
- An operational reserve of 500 spaces in the Emmet-Ivy Garage will be maintained;
- There are approximately 1,000 additional unoccupied (but useable) spaces within the existing inventory;

- Student-resident storage parking outstrips the designated supply at most residential locations. It is assumed that approximately 75% of eligible student-residents park a car on Grounds (this is consistent with University Parking and Transportation data showing a 40 percent permit-sales to dormitory resident ratio), resulting in approximately 1,000 stored cars outside the residential areas. Over time, student resident demand may decrease as the number of first-year students (ineligible for parking) increases since these students are most likely to live in University housing.

3.5.2 POPULATION ASSUMPTIONS

Key population-related assumptions were derived from the *University of Virginia Space Needs Projection Planning Scenario 1: Steady State Model B* report with the additional assumptions:

- Health System Employment (FTE) will increase at approximately 3 percent per year.

- On-Grounds housing was held constant at 6,474 student residents (Data Digest Fall 2006 Students Living in University Housing data). Additional on-grounds housing will further reduce parking demand compared to the results presented in this report.

- First year students are ineligible for a parking permit.

3.5.3 TRAVEL BEHAVIOR ASSUMPTIONS

Key travel behavior assumptions made as part of this analysis include:

- The 2000 U.S. Census Bureau Journey to Work Mode Split data for the City of Charlottesville is generally representative of travel behavior for employees of the University of Virginia and its Health System

- Commuting students are one-half as likely to drive to class as University and Health System employees are to drive to work (i.e. 72 % automobile divided by 2 equals 36 percent automobile).

- Student auto-ownership and travel behavior will remain unchanged.

The population parameters supporting the parking analysis are summarized in Table 8.

Table 8 – Population and Parking Set Aside Parameters for Parking Analysis

	2005	2015	2025
Population			
Employees	12,700	15,000	17,800
Students	19,500	21,000	22,700
Total	32,200	36,000	40,500
Existing Parking Supply	16,475	16,475	16,475
Parking Set-Asides[1]	6,400	6,625	6,925
Resident Overflow Storage	1,000	650	425
Available Commuter Parking	9,075	9,200	9,125

1 Set Asides increase over time to accommodate growth in Health System patient/visitor parking needs.

2 Student Resident demand decreases over time as the number of first year students increases (first year students are ineligible for parking).

The TDM programs discussed in this report do not reflect potential changes in student auto ownership or behavior. It is possible that further reductions in future parking needs could be realized through measures designed to influence student travel behavior.

3.6 TDM SCENARIO PARKING ANALYSIS RESULTS

The mode split results from the Commuter model and the assumptions provided above were considered in the analysis of future parking implications for the University. The detailed calculations and assumptions supporting this analysis are attached as an Appendix. The results of this analysis are described below.

3.6.1 BASELINE SCENARIO

The baseline scenario identifies the parking needs for the University and Health System if current travel behavior trends continue. The results of this scenario are provided in Table 9.

Table 9 – Baseline Scenario Parking Results

	2005	2015	2025
Commuting Parking Demand			
Employees	8,500	10,075	11,950
Students	4,275	4,850	5,425
Total	12,775	14,925	17,375
New Spaces Needed[1]			
Total Spaces	-	1,400	3,250
Net New Spaces[2]	-	400	2,250
Percent Change			
Total Spaces	-	9 %	20 %
Net New Spaces	-	2 %	14 %

1 New spaces added at the current ratio of 0.71 spaces per commuting demand (mode adjusted population).

2 Use of 1,000-space surplus capacity in John Paul Jones Arena area assumed.

Note: Construction of "new" parking will also be needed to replace spaces lost to expansion of other facilities.

The key results of this scenario include:

- To satisfy the estimated 2015 parking needs, the University will consume the existing parking availability (approximately 1,000 spaces) around John Paul Jones (JPJ) Arena, will require replacement of any spaces lost to other activities, and will require approximately 400 spaces of additional commuter parking.
- To satisfy the estimated 2015 to 2025 parking needs, the University will need a total of 2,250 new spaces.

3.6.2 LEAST AGGRESSIVE SCENARIO

The least aggressive scenario identifies the parking needs for the University and Health System if a modest TDM program is implemented, resulting in a slight shift in travel behavior. The results of this scenario are provided in Table 10.

Table 10 – Least Aggressive Scenario Parking Results

	2005	2015	2025
Commuting Parking Demand			
Employees	8,500	9,475	11,250
Students	4,275	4,850	5,425
Total	12,775	14,325	16,675
New Spaces Needed[1]			
Total Spaces Demanded	-	975	2,725
Net New Spaces[2]	-	0	1,725
Percent Change			
Total Spaces	-	6 %	17 %
Net New Spaces	-	0 %	10 %

1 New spaces added at the current ratio of 0.71 spaces per commuting demand (mode adjusted population).

2 Use of 1,000-space surplus capacity in John Paul Jones Arena area assumed.

Note: Construction of "new" parking will also be needed to replace spaces lost to expansion of other facilities.

The key results of this scenario include:

- To satisfy estimated 2015 parking needs, the University will consume the existing parking availability (approximately 1,000 spaces) around JPJ Arena, and will require replacement of any spaces lost to other activities. If desired, the University could avoid construction of additional new parking spaces.
- To satisfy the estimated 2015 to 2025 parking needs, the University will need 1,725 new parking spaces.

3.6.3 MODERATE SCENARIO

The moderate scenario identifies the parking needs for the University and Health System if a moderate TDM program is implemented, resulting in a moderate shift in travel behavior. The results of this scenario are provided in Table 11.

Table 11 – Moderate Scenario Parking Results

	2005	2015	2025
Commuting Parking Demand			
Employees	8,500	9,175	10,900
Students	4,275	4,850	5,425
Total	12,775	14,025	16,325
New Spaces Needed[1]			
Total Spaces Demanded	-	775	2,475
Net New Spaces[2]	-	0	1,475
Percent Change			
Total Spaces	-	5 %	15 %
Net New Spaces	-	0 %	9 %

1 New spaces added at the current ratio of 0.71 spaces per commuting demand (mode adjusted population).

2 Use of 1,000-space surplus capacity in John Paul Jones Arena area assumed.

Note: Construction of “new” parking will also be needed to replace spaces lost to expansion of other facilities.

The key results of this scenario include:

- To satisfy estimated 2015 parking needs, the University will consume much of the existing parking availability (about 225 empty spaces will remain) around JPJ Arena, and will require replacement of any spaces lost to other activities. If desired, the University could likely avoid construction of additional new parking spaces.
- To satisfy the estimated 2015 to 2025 parking needs, the University will need 1,475 new parking spaces.

3.6.4 AGGRESSIVE SCENARIO

The aggressive scenario identifies the parking needs for the University and Health System if an aggressive TDM program is implemented, resulting in a significant shift in travel behavior. The results of this scenario are provided in Table 12.

Table 12 – Aggressive Scenario Parking Results

	2005	2015	2025
Commuting Parking Demand			
Employees	8,500	8,700	10,350
Students	4,275	4,850	5,425
Total	12,775	13,550	15,775
New Spaces Needed[1]			
Total Spaces Demanded	-	450	2,100
Net New Spaces[2]	-	0	1,100
Percent Change			
Total Spaces	-	3 %	13 %
Net New Spaces	-	0 %	7 %

1 New spaces added at the current ratio of 0.71 spaces per commuting demand (mode adjusted population).

2 Use of 1,000-space surplus capacity in John Paul Jones Arena area assumed.

Note: Construction of "new" parking will also be needed to replace spaces lost to expansion of other facilities.

The key results of this scenario include:

- To satisfy estimated 2015 parking needs, the University will consume about one-half of the existing parking availability (about 550 empty spaces will remain) around John Paul Jones Arena. Alternatively, the University could avoid replacement of parking lost to other activities and consume the surplus at the JPJ Arena. If desired, the University could likely avoid construction of additional new parking spaces.

- To satisfy the estimated 2015 to 2025 parking needs, the University will need 1,100 new parking spaces.

3.6.5 VERY AGGRESSIVE SCENARIO

The very aggressive scenario identifies the parking needs for the University and Health System if a very aggressive TDM program is implemented, resulting in a very significant shift in travel behavior. The results of this scenario are provided in Table 13.

Table 13 – Very Aggressive Scenario Parking Results

	2005	2015	2025
Commuting Parking Demand			
Employees	8,500	7,825	9,275
Students	4,275	4,850	5,425
Total	12,775	12,675	14,700
New Spaces Needed[1]			
Total Spaces Demanded	-	0	1,325
Net New Spaces[2]	-	0	325
Percent Change			
Total Spaces	-	0 %	8 %
Net New Spaces	-	0 %	2 %

1 New spaces added at the current ratio of 0.71 spaces per commuting demand (mode adjusted population).

2 Use of 1,000-space surplus capacity in John Paul Jones Arena area assumed.

Note: Construction of "new" parking will also be needed to replace spaces lost to expansion of other facilities.

The key results of this scenario include:

- To satisfy estimated 2015 parking needs, the University will continue to have a significant number of available spaces around JPJ Arena. Alternatively, the University could avoid replacement of parking lost to other activities and consume the surplus at the JPJ Arena. If desired, the University could likely avoid construction of additional new parking spaces.

- To satisfy the estimated 2015 to 2025 parking needs, the University will need 325 new parking spaces. It is likely that the University could manage this scenario without construction of additional parking spaces through loss of the Emmet/Ivy operational buffer, or other changes in parking assignment/management policies to reduce the amount of spaces set-aside for particular functions.

3.6.6 ADDITIONAL GAINS

The TDM programs discussed in this report do not reflect changes in student housing, car ownership, and parking privileges. It is possible that significant additional reductions in parking needs and trip generation by the University could be gained to implementing programs to reduce student use of single-occupant vehicles. Examples of such programs, among others, include:

- A policy to prohibit on-grounds parking by students living within one-half to one mile of Grounds;
- A policy to extend the on-grounds parking prohibition to second-year students; and
- Provision of frequent bus service to home-locations a significant portion of the student population.

3.7 STEERING COMMITTEE FEEDBACK AND TDM PROGRAM SELECTION

The steering committee discussed the appropriate level of TDM implementation. There was consensus that the University of Virginia should pursue TDM in a moderate to aggressive way. Members of the steering committee supported the implementation of a program that reduces single occupant vehicle travel as much as possible without creating disruption to employee's ability to complete work responsibilities and meet personal obligations. It was suggested that Phase 2 of the study should consider the income and geographic impact of the TDM program on specific populations. Phase 2 should also ensure that the program is consistent with existing or modified human resource and benefit policies. The impacts on neighborhood parking should also be assessed.

With implementation of the moderate to aggressive TDM program, University can expect a 3-percent reduction in automobile mode share (with an 8-percent shift from single occupant vehicle to carpooling) and a reduction in parking demand of between 625 and 775 spaces for the 2015 and 2025 scenarios, respectively when compared to the Baseline scenario. This reduction in parking needs is likely to result in substantial cost savings associated with the development of new parking resources. Rough estimates gauge this cost savings to be in the range of $15 to $27 million over the timeframe considered in this study.

4.0 PHYSICAL IMPROVEMENTS

Physical improvements to Grounds provide an important compliment TDM strategies and encourage use of alternate modes of transportation. These improvements can range from uniform wayfinding signage to intersection treatments that enhance pedestrian accommodation and enhanced bicycle accommodations. There are two alternatives for including physical improvements on Grounds. The University could decide to implement some or all improvements as a single grounds-wide construction project or improvements could be included in construction as plans as new facilities are developed. In either case, the goal of the improvements is to form a comprehensive system of measures that encourage University staff, students, and health system employees to seek alternate modes of transportation when destined to the University.

4.1 CAMPUS WAYFINDING

Wayfinding strategies are useful to determine key routes through and/or around Grounds. Unified signage, maps, and colored pavement are treatments that can be used to identify building and parking locations, academic areas, and connections to the surrounding neighborhood. Signage can be tailored to make direct paths more visible and provide directions to highly frequented locations.

Signage used should be easily identifiable and consistent in appearance throughout all areas of Grounds. Campus maps should be placed at parking structures and strategic campus locations. Although informational signage is not directly addressed by the Americans with Disabilities Act, wayfinding signage is required to meet Federal ADA guidelines. The ADA provides guidelines for typeface, size, contrast, and the use of symbols. State and local sign codes vary considerably and should also be considered. ADA guidelines should also be consulted before deciding on colored pavement enhancements.

Wayfinding Signage, Northern Virginia

Wayfinding signage can also be incorporated throughout the City of Charlottesville. Clearly marking paths to Grounds from strategic areas of the City, as well as providing safe pedestrian and bicycle accommodation between the areas, can increase bicycle and pedestrian access to the University.

4.2. PEDESTRIANS MEASURES

Providing safe and efficient pedestrian accommodation is imperative in increasing the number of users accessing the University on foot. Unified, highly visible crosswalk treatments, minimal crossing distances, and short wait times for pedestrians are all key measures in enhancing pedestrian accommodation.

4.2.1 CROSSWALKS

Crosswalks are important for designating the appropriate path of travel for a pedestrian through an intersection. At all intersections, reducing the time pedestrians are in the crosswalk improves pedestrian safety and motor vehicle and bicycle movement. At signalized intersections, reducing the pedestrian crossing distance can improve capacity for both motor vehicles (shorter stopped time) and for pedestrians (shorter DON'T WALK interval).

To increase visibility and unify pedestrian crossings throughout Grounds, a single crosswalk treatment should be implemented at all crossing locations. A crosswalk pattern that provides a high degree of visibility and uniformity is the "continental" striping pattern. This crosswalk treatment alternates a two-foot wide white stripe with a two-foot wide asphalt strip. Crosswalk marking material should generally be either thermoplastic or retroreflective tape to maximize longevity and visibility. Both thermoplastic and retroreflective tape are longer lasting than paint and more visible at night. Stamped or colored asphalt are alternate crosswalk treatments and provide visibility through texture and color. Crosswalk treatments using brick pavers are not desirable due to cost, ADA compliance, and maintenance issues.

4.2.2 CURB EXTENSIONS

Marked or unmarked, crosswalks should be as short as possible. Curb extensions shorten the crossing distance, provide additional space at the corner, allow pedestrians to see motor vehicles and to be seen by motor vehicle drivers before entering the crosswalk, and keep parking away from crosswalks. Curb extensions can also benefit vehicular traffic, by moving the stop bar on the approach lanes further into the intersection, thereby reducing the intersection size and signal clearance intervals. The reduced intersection size can, in some instances, solve sight-distance deficiencies on the intersection approaches. Curb extensions can prevent parking close to intersections, and thus improve sight distance from cross streets. Also, curb extensions frequently reduce the "wasted" pavement at intersections (i.e., areas of pavement unusable by either vehicles or pedestrians near the corners). Fire hydrants are often located near intersections so that curb extensions result in no loss of legal parking. In general, curb extensions should be offset at least two feet from the edge of the travel or bicycle lane to reduce the hazard posed to motor vehicle or bicycle traffic. They should also be long enough to provide a suitable ramp and landing for crosswalk ramps.

4.2.3 CROSSING ISLANDS AND MEDIANS

Pedestrian crossing islands may be located at intersection or midblock locations. These islands allow pedestrians (and bicyclists) to cross only one traffic stream at a time and provide some degree of protection from the vehicular traffic while waiting for a gap to finish their crossing. In general, islands should not be provided as a substitute for signal timing that allows pedestrians to cross the entire street in one movement. Rather, they should provide an added degree of protection and comfort for pedestrians making this crossing.

Pedestrian islands should include raised curbs with a cut-through at the pavement level for wheelchair users. The cut-through should be graded to drain quickly and should also have special provisions to assist the visually impaired in identifying the refuge island. The pedestrian crossing island should be at least 6 feet wide from the face of the curb to the face of the curb. The island should not be less than 12 feet long or the width of the crosswalk, whichever is greater.

4.2.4 MIDBLOCK CROSSINGS

Midblock crossing locations are often needed to provide for safe accommodation. Where practical, crossings can be integrated into signalized intersections; however, most midblock locations will not warrant signal control on the crossing street. Midblock crossings should be narrowed to the extent practical using crossing islands and curb extensions.

In general, midblock crossings should be located between at least 200 feet from adjacent intersections, but preferably between 300 and 600 feet, to facilitate traffic movement, allow appropriate warning and control signage spacing, and allow transitions to crossing locations from the normal street cross-section, while providing adequate connectivity across the street. Additionally, placing these crossings in areas where traffic lane transitions occur or queue spillback is anticipated should be avoided to the extent possible.

Crossings should only be implemented where sight distance is adequate for all users – vehicular traffic on the street being crossed, as well as pedestrians and bicyclists using the crossing. To increase visibility, on-street parking should be removed in the vicinity of a midblock crossing.

4.2.5 OTHER CROSSING TREATMENTS

Raised crosswalks and raised intersections are examples of other crossing treatments appropriate for use internal to Grounds. These treatments are better suited to areas that have high pedestrian volumes. Raised crosswalks consist of an at least 10-foot flat top speed hump with six-foot approach and departure ramps. The flat top portion of the speed hump can be extended to cover the entire intersection when useful. When used, raised crosswalks and intersections help establish a feeling of pedestrian primacy.

4.2.6 SIDEWALK WIDTH

Sidewalks should be sufficiently wide to accommodate the expected flow of pedestrian traffic. In many instances, an 8-foot sidewalk is adequate for areas with moderate pedestrian activity. Wider sidewalks (12 to 16 feet) are suitable for heavily-traveled areas. The width of the sidewalk should also account for obstructions within the sidewalk, such as signs, lighting, trees, etc. Additionally, shy distances from building faces, moving traffic and other features should also be considered when determining the appropriate sidewalk width.

4.3 BICYCLES

Where possible, efforts should be made to provide a complete bicycle network throughout Grounds and surrounding area. Due to the developed nature of Charlottesville, there are many challenges in providing a comprehensive bicycle network. However, there are merits to providing a complete system. In combination with other measures, such as provision of bike racks on transit vehicles (described below) and increased wayfinding signage, a comprehensive system of bicycle paths and accommodations will encourage staff and students to chose this mode of transportation.

4.3.1 BICYCLE PARKING SUPPLY AND DESIGN GUIDELINES

Critically important to the success in getting people to rely on bicycle transportation is the provision of bicycle parking and other amenities. The University should strive to provide bicycle parking for five percent of all full time equivalent occupants and 15 percent or more of all residential occupants. Shower and locker facilities for 0.5 percent of all full time equivalent occupants are also recommended. Those spaces designated for shorter-term (outdoor) use should be provided within 50-feet of main building entrances. A review of parking guidance from other college cities and towns nationwide show parking requirements as aggressive as one space for every three residential beds (Charleston, South Carolina), 1 space for every 4 employees (Madison, Wisconsin), and 1 space for every 3,300 square feet of development (San Francisco, California).

Uniformity in bicycle parking is important for identification purposes throughout campus. When selecting the type of bicycle rack to install, the following should be considered:

- The part of the rack that supports the bicycle should be well anchored to the ground;
- The rack should support the bicycle upright on its frame;
- The rack should prevent the bike wheel from tipping over;
- The rack should provide a two-point support system for the bicycle and allow the user to securely lock the frame and wheels;

- The rack should resist being cut or damaged by common hand tools such as bolt or pipe cutters;
- Front-in parking should allow a U-lock to lock the front wheel and the bicycle frame;
- Back-in parking racks should allow a U-lock to lock the rear wheel and seat tube of the bicycle;
- For parallel storage, rack elements should be arranged 30 inches on center to allow space for two bicycles to be secured to each rack element;
- Where two or more racks are provided at the same location, six feet should be allowed for each row of bicycles, with four foot aisle width between bicycle rows;
- The placement of racks should not interfere with the sight lines of pedestrians or motorists; and
- Racks should be separated from the following physical features by at least the prescribed minimum distance:
    - Corners – 20 feet;
    - Pedestrian ramps and fire hydrants – 10 feet;
    - Building or curb (parallel) – 1 foot; and
    - Minimum sidewalk clearance – 4 feet.

If bicycle parking is to be located inside a building, careful consideration must be given to bicycle access and egress. It is preferable to have access and egress points located at or near bicycle path facilities. At a minimum, locations should provide ease of use for the cyclist and seek to minimize potential conflicts with pedestrians and vehicles. Indoor areas should be well lit, locked, and located near security personnel. Bicycle lockers should be considered, as appropriate.

While there are several types of bike racks that fit these criteria, the "inverted U" style rack is recommended for Grounds.


An example of the "Inverted U" style bicycle rack

4.3.2 SIGNAGE, PAVEMENT AND PATH MARKINGS

- Unified signage and striping plans aid bicyclists in navigating paths and trails and help to establish the right of way for conflicting modes of transportation. Path design should include regulatory, warning, and informational signage and markings consistent with the *Manual on Uniform Traffic Control Devices*.

4.4 TRANSIT ACCOMMODATION

It is desirable to integrate bus stops with the adjoining pedestrian system (sidewalks, shared use paths and crosswalks) and also with any adjoining bike path/lane system. However, transit stops less than 1,500 feet apart (about a five minute walk) should be avoided when possible so that potential riders choose to walk these shorter distances.

Route identification is an important element of the acceptance of transit as an alternative to driving. Passengers should feel comfortable with the route system and should be able to clearly identify the route they are looking for. An example of route identity is the CTS downtown trolley. By using a different vehicle, the CTS has been able to create a clear identity for this route for passengers. In this regard, it would be helpful if the UTS bus routes were more distinctively branded. A good example of this approach is the “Hop”, “Skip”, and “Jump” (among other) bus routes serving the University of Colorado in Boulder. More information on this program is available at www.bouldercolorado.gov.

5.0 DATA NEEDS AND NEXT STEPS (PHASE 2)

To date, the TDM Plan has identified the potential effectiveness of a wide range of possible TDM implementation. Much of the analysis in this report is based on rough estimates of travel behavior and parking utilization gathered from readily available data. Refinement of these data is critical to refining the analysis and ensuring that expectations for the success of a TDM program are appropriate. The following sections identify some of the critical data needs and next steps to the TDM Plan. As part of Phase 2, significant data collection and analysis is necessary to confirm the findings of the TDM study:

- ***Existing Mode Split Survey***. This analysis is based on mode split information provided by the local planning district for the City of Charlottesville. The data is not sufficiently described to understand which populations are directly represented. It is likely that this data does not capture the unique commuting characteristics of the University employees and students (the largest employer is a census tract is usually excluded from the data to protect confidentiality of individual employers). As part of Phase 2, the University should conduct a detailed survey of travel behavior by different populations. This survey would allow the University to characterize and calibrate the mode split and parking need projections.
- ***Detailed Parking Utilization Study***. The analysis is based on rough estimates of parking occupancy provided by the University for its parking facilities. These data represent current understanding of how the parking supply is used, but do not include detailed data on utilization. In many cases, there are surprising findings about parking resulting from a detailed utilization study. These types of data impact characteristics of the analysis such as the ratio of parking spaces per commuting employee.
- ***Detailed Population Profile***. The analysis is based on information regarding the on-grounds/off-grounds split of the student population should be confirmed. Additionally, more detailed information on car-ownership by students and employees, and permit sales by population and permit category would help refine the analysis. For example, knowing the split of commuter permit sales between students and employees would help improve the understanding of and the ability to tailor programs to these populations. This population profile, coupled with the parking utilization study would allow the University to understand the parking needs by population group at a detailed level.
- ***Coordination with Regional Transportation Modeling***. The EPA Commuter Model uses a similar methodology to a regional transportation model. However, the regional transportation model for the University of Virginia area includes much more detailed and specific data about travel options, income, residential locations, work location, traffic congestion and other features. The University should consider whether it is worthwhile to coordinate the Thomas Jefferson Planning District Commission to use the regional model for testing of the TDM Plan.

- ***Health System Growth Plans***. The analysis is based on a straight-line projection of growth trends at the Health System. As part of Phase 2, a more detailed assessment of the anticipated growth in different types of patient activity and staff requirements would help improve the assessment of future parking needs for these important populations.

- ***Detailed Development Plans***. The TDM Plan should be refined to account for the detailed development plans of the University, to be documented as part of the Grounds Plan. These plans should identify the number of parking spaces to be lost with implementation of various projects and strategies to either supplant the demand for parking with alternatives, to accommodate the parking within the existing supply, or to identify replacement opportunities for the parking.

- ***Detailed Planning for TDM Implementation***. Phase 2 should use the improved data described above to develop a detailed implementation plan for the selected TDM measures, including Geographic Information Systems (GIS) analysis of the likely capture rate for ridesharing, pedestrian, bicycle, and transit alternatives.

- ***Monitoring Program***. Phase 2 should develop the framework for ongoing program monitoring. This monitoring could include periodic mode split surveys, parking utilization counts, and trip generation counts. The purpose of the monitoring is to measure progress toward achieving the TDM plan and to allow modification of physical plans to respond to actual outcomes.

- ***Cost Estimating and Budgeting***. Phase 2 should prepare cost estimates for implementation of the selected and refined TDM plan. Phase 2 should also consider the cost-efficiencies of providing a TDM program compared with the parking needs of the baseline scenario.

- ***Neighborhood Parking Impacts***. Phase 2 should evaluate the potential for neighborhood parking spillover and identify areas where mitigation might be required to reduce external impacts from the TDM program.

- ***Human Resources/Benefits Consistency***. When the TDM program is moving toward implementation, the University needs to carefully review its consistency with other benefits programs.

- ***Location Specific Physical Recommendations***. Phase 2 should develop location specific recommendations based on the context sensitive design guidelines in Section 2 and the generalized physical improvement guidelines in Section 4.

6.0 SUMMARY AND CONCLUSIONS

This report reviews TDM programs currently offered by a number of institutions around the country. These institutions, and many others, have established aggressive TDM programs and have claimed substantial results. Additional research has identified reductions in drive-alone commuting through implementation of TDM programs. The peer analysis indicates that the University of Virginia could realize significant benefits through the implementation of an expanded TDM program.

In order to quantify the benefits of different program combinations, the EPA Commute model was employed. This model identifies potential shifts in travel behavior based on the elements of a TDM program. The model indicates that a shift from drive-alone to – most significantly – carpooling and walking.

The shifts also have a significant impact on the future parking needs of the University. With the baseline scenario, the University will need to significantly expand its commuter parking supply. With the very aggressive scenario, the University may be able dramatically reduce, or even eliminate, the need for additional commuter parking.

Based on a moderate to aggressive TDM program, the University can expect a reduction in future parking needs between 625 and 775 spaces. With ever-increasing costs for structured parking, a significant financial savings may be realized by reducing parking demand. Using a construction cost-per-space range of $25,000 to $35,000, the University could realize a savings of $15 to $27 million in new parking facilities, not counting operations and maintenance costs. The costs of a TDM program are generally very small when compared to the cost of providing parking.

The University will need to balance its desire to avoid investment in new parking facilities with its ability to implement aggressive TDM measures to formulate a thoughtful TDM program that meets its existing and future needs. Additionally, the University will need to recognize the speculative nature of the TDM analysis and that future realities in terms of available data, travel behavior, program effectiveness, and institutional acceptance may necessitate a change of course in the future.

Appendix

UNIVERSITY of VIRGINIA
OFFICE OF THE ARCHITECT FOR THE UNIVERSITY

Office of the Architect for the University, in coordination with Parking and Transportation, has selected a consultant to develop a Transportation Demand Management Plan for UVA. While this effort will inform the Grounds master planning effort, it is also an important step for UVA in planning for improved future campus transportation. The purpose in developing this plan is to look for options for alleviating issues related to congestion and parking in and around Grounds. A fuller description of the planning effort is provided below. We have selected a small group of key constituents as representatives for our Steering Committee. There will be two Steering Committee meetings between January and March of 2007. We are requesting your attendance at these meetings, the first of which will be scheduled this week for January 8th. We thank you in advance for your contribution to this important step in improving our campus environment.

TDM Steering Committee Membership

Human Resources	Susan Carkeek
Housing	Marshall Hunt
Hospital	Tom Harkins
Provost's Office	Wynne Stuart
Athletics	Jason Bauman
Student Affairs	Christina Morell
P & T	Becca White, Andy Mansfield
OAU	David Neuman, Julia Monteith, Andrew Greene

PURPOSE

To develop a TDM plan to meet the transportation needs associated with future growth, integrating vehicular circulation and parking with bus transit, bicycle and pedestrian routes across the University Grounds, including the Health System. Plans should accommodate access by students, faculty, staff, visitors and patients on a daily basis and for special event traffic.

Transportation Demand Management or TDM is reducing demand for single-occupant vehicle use by encouraging the change in the choices for travel. TDM is used increasingly by campus planners to affect the rate at which new development attracts cars and increases the need for new or expanded roadways. Examples of TDM measures include the following:

- Including or improving pedestrian oriented design elements, such as short pedestrian crossings, better lighting, wide sidewalks, and street trees.
- Including and improving transit infrastructure, such as transfer points to regional transit, improve transit stops with shelters, and trip planning infrastructure.
- Subsidizing transit costs for employees or residents.
- Bicycle-friendly facilities, including improved bicycle lanes, secure storage areas and showers.
- Offering alternative work schedules that may stimulate the choice of other travel methods.

Transportation Demand Management Focus Groups
February 1-2, 2007
(F) Faculty (AF) Administrative Faculty (S) Staff (GS) Graduate Student (US) Undergraduate Student (O) Other

Session	Session 1		Session 2		Session 3	
Type	**General**		**Operations**		**Operations**	
Date	Feb. 1		Feb. 1		Feb. 1	
Time	10:30 - 12:00		10:30 - 12:00		1:30 - 3:00	
Location	Rotunda-Board Room		Rotunda-North Oval		Rotunda-Board Room	
OA/PT	RW / AG		JM / AM		RW / AG	
	PARTICIPANTS	DEPARTMENT	PARTICIPANTS	DEPARTMENT	PARTICIPANTS	DEPARTMENT
	Alex Linthicum (GS)	Engineering	Jason Bauman (AF)	Athletics/Recreation	Jay Klingel (AF)	FM
	Becky Campbell (S)	Police	Jim Fitzgerald (S)	Community Affairs	Marshall Hunt (S)	Housing
	Brad Brown (F)	Int. Res. College	Sandy Carter	Police	Fred Missel (S)	UVA Foundation
	Kathy Cacciola (GS)	A-School	Mike Goddard (S)	P & T	Susan Carkeek (AF) (?)	Human Resources
	Danny Kwan (GS)	A-School	Katie Sullivan (US)	UTS Bus Driver	Patricia Romer	Housing
	Brooke Yamakoshi (GS)	Engineering	Ron Price (S)	Darden-Hum. Resources		
	Chris Gist (S)	Library/GIS				
	Phoebe Crisman (F)	A-School				
	Susan Harris (AF)	Office of COO				
	Len Schoppa (F)	Politics/Gov. Affairs				
	Rich Hopkins (S)	FM-Landscape				

Session	Session 4		Session 5		Session 6	
Type	**Hospital**		**Management**		**General**	
Date	Feb. 1		Feb. 2		Feb. 2	
Time	1:30 - 3:00		9:00 - 10:30		10:30 - 12:00	
Location	Rotunda-North Oval		Rotunda-North Oval		Rotunda-Board Room	
OA/PT	JM / AM		JM / RW		RW / AM / AG	
	PARTICIPANTS	DEPARTMENT	PARTICIPANTS	DEPARTMENT	PARTICIPANTS	DEPARTMENT
	Tom Harkins (S)	Health System	Wynne Stuart (AF)	Provost	Helen Wilson (S)	OAU-Landscape
	Ruby Curnish (S)	Health System	Christina Morell (AF)	Student Affairs	Nancy Takahashi (F)	A-School
	Luis Carrazana (AF)	OAU- HS	Adam Daniel (AF)	College of A & S	Darius Nabors (US)	Student Council
	Mark Stanis (S)	FM-Project Manager	Anna Towns (S)	College of A & S	David Phillips (F)	A-School
	Virginia Rorrer (S)	Garage Operations	Bill Bergen (AF)	Law School	Adam Jortner (GS)	A & S
	Richard Allen (S)	SOM	Dean Aylor (F)	Engineering Dean	Randy Salzman (US)	
			Jackie Cooke (GS)	Employee Relations	Rosemarie Moxley (US)	A-School
			Mark Fletcher (AF)	Athletics/Recreation	Amanda Shofield (US)	A-School
					Richard Brownlee	Darden - Batten Inst.
					Brian Poulson (GS)	A-School
					Noreen McDonald (F)	A-School
					Kimberly Powell	A & S
					Harry Hibbits (GS)	A-School

User Group Meeting Summary

Six group meetings were held on February 1 and 2, 2007 to discuss transportation strengths and weaknesses at the University of Virginia. The groups also discussed individual travel choices for different types of trips including commuting and midday travel. The six groups represented four categories of users:

- General Population (student and faculty)
- Operations
- Health Sciences
- Management

Discussions were facilitated by the Office of the Architect, Parking and Transportation, and the VHB/Vanasse Hangen Brustlin, Inc. project team. Each group was given an introduction to transportation demand management (TDM) and was asked to comment on six different areas of transportation:

- Pedestrian
- Bicycle
- Parking
- Transit
- Commute Options
- Traffic

The first section of this report provides a consolidated assessment of strengths and weaknesses for each of the topics listed above. In some cases, one group may have identified strengths that another group may have considered weaknesses. The groups were also asked for ideas of potential transportation demand management (TDM) options that could influence travel behavior on and around the University. The second section of this report provides a list of these ideas. The third section provides the detailed notes from each group meeting. The consolidated assessment component of this document provides a good overview of the feedback received. However, the detailed notes provide useful insights into the varying perspectives and opinions on transportation conditions at the University.

1.0 Consolidated Assessment

Each of the major topics is discussed below.

Pedestrian

The majority of participants indicated that walking is an effective means of travel when weather conditions and schedules permit. For the most part, the Central Grounds are perceived as very walkable. Most participants indicated that walking becomes more challenging in the more remote areas of the University such as the North Grounds and Medical Center. Walking is not considered an option for most when traveling to areas such as the Fontaine Research Park, the shopping areas on the fringes of Charlottesville, or even for travel between the University and downtown Charlottesville. A summary of the strengths and weaknesses mentioned during the group meetings is provided below.

Strengths	***Weaknesses***
The Central Grounds is walkable	McCormick Road sidewalks are narrow and pedestrians are forced into the road
Students move across to HS easily	Emmet Street is a barrier
Weather	UVA Shuttles make not walking easy
Crosswalks are well marked	Crossing the Rugby/University intersection is challenging
There is culture that supports walking within the University community.	Some areas lack sidewalks (Old Ivy. JPA)
	Wayfinding could be improved
	Challenge of walkers and joggers on Rugby
	Conflict with service vehicles and pedestrians
	Difficult to walk to North Grounds and Fontaine

Bicycle

Like many Universities, bicycling is an important means of travel for many different types of users. Based on the discussions in the meetings, it appears that faculty and students rely on bicycling more substantially than staff. Most of those who indicated that bicycling is an important means of transportation appear to live within the immediate vicinity of the University, within the City of Charlottesville. A summary of the strengths and weaknesses mentioned during the group meetings is provided below.

Strengths	***Weaknesses***
The distances to downtown and other attractions are minimal	Bicycle lanes are not continuous and provide a challenge for bicycling as a regular means of travel.
The University is putting bike storage facilities in new parking structures	The University shuttle service is too good reducing the need to bike
Bike user groups have been established to discuss ways to improve conditions.	Night riding is challenging due to lack of street lighting
	More uniform and secure bicycle storage is needed.
	The topography provides a significant challenge for bicycling.
	Employees/staff live too far away to bike

Parking

The general perception of parking is that the supply of parking is adequate to support commuting trips. Many participants discussed challenges with parking to support mid-day travel for meetings and other work-related needs. Many participants also discussed the challenges and inconvenience associated with parking displacements during special events at John Paul Jones Arena. Some also commented on the inconvenience of the larger, intercept parking facilities (Emmit/Ivy Garage, U-Hall Lot, Fontaine Research Park) to the Central Grounds and Medical Center. A major aspect of this inconvenience was unreliable travel times on the UVA Shuttle due to traffic congestion on the roadways around the Grounds. A summary of the strengths and weaknesses mentioned during the group meetings is provided below.

Strengths	*Weaknesses*
Parking costs are perceived as fair and reasonable.	People have a sense of entitlement to close, convenient parking.
Vanpool opportunities exist to serve outlying communities.	Cost to build new parking is high
Significant parking is available at Fontaine Research Park and on the North Grounds	Lack of convenient daycare requires employees/staff to drive
Flexible parking is useful	Need better enforcement
Free parking is provided for patients and visitors to hospital	New parking will increase single occupant vehicle use
	Convenience of parking supply
	Event parking is a challenge

Transit

Nearly every group discussed the strength of the UTS system. The faculty and staff focus groups mentioned that the shuttle is used primarily by students for all aspects of travel other than connections to remote parking. On the other hand, only a few participants had experience with the CTS system, other than the trolley to downtown Charlottesville. Overall, few participants felt that they have a good understanding of the routing and schedules of either system as a whole and tend to rely on it only for repeat, frequent trips. Many participants also mentioned the challenge faced by the UTS due to traffic congestion on the major roads around the University. A summary of the strengths and weaknesses mentioned during the group meetings is provided below.

Strengths	***Weaknesses***
UTS works well around grounds	Traffic congestion causes UTS reliability problems
Good use of trolley	CTS headways are too long
Transit use increases on inclement weather days	CTS schedule limits employee flexibility
	Faculty do not use transit
	No service is provided to Fontaine Research Park
	Little route identification maps at stops
	UTS buses can get crowded
	No service is provided to the North Grounds
	Bus Shelters/Amenities need improvements

Commute Options

Overall, meeting participants did not seem to have a high degree of awareness about existing commute options programs at the University. Many also discussed the varying demands of jobs at the University and the need to provide for staff flexibility. A summary of the strengths and weaknesses mentioned during the group meetings is provided below.

Strengths	***Weaknesses***
Rideshare through Jaunt exists	UVA should be more involved in influencing behavior
Some new housing developments provide shuttles	No longer 8-5 jobs
The Health System provides shuttles to parking on call	No viable alternative for people who live to the west of the University.
	Carpooling difficult with children in day care

Traffic

Traffic is viewed as a major issue by most members of the University community. By and large, people view traffic as a result of significant regional growth in the Charlottesville area, and not associated specifically with University operations. Varying perspectives were provided about whether roadways should be expanded to accommodate the growth in traffic or if growth should be managed to reduce new traffic. Specifically, participants focused on the impacts of traffic on the area around the University grounds. A summary of the strengths and weaknesses mentioned during the group meetings is provided below.

Strengths	***Weaknesses***
University Roads are mostly safe and drivers generally respect pedestrian crossings around the Grounds.	Congestion on major roadways around the University.
Pedestrian crossings of major roadways interrupt traffic flow.	Event traffic causes major congestion
	Signals/signal timing improvements needed
	Students exhibit poor driving behavior
	Rotunda is the Castle – Roads are the Moat (University/JPA/Emmet) – students live outside moat

2.0 Potential TDM Options

The groups were asked for their ideas for TDM options. A variety of ideas including employee benefit programs, enhancements to infrastructure and services, and housing options were discussed. The following is a list of ideas divided into program enhancements and physical improvements.

Programs	***Physical Improvements***
Hire TDM coordinator	Close McCormick Road to non-authorized vehicles
Marketing of existing TDM programs	Rugby Road bicycle improvements
Facilitate service and rideshare improvement with Jaunt and other local transportation authorities	Real-time bus service information system
Integration of transportation options into overall University sustainability programs	Reconfigure bicycle and pedestrian circulation in the vicinity of railroad tracks
Education campaign on transportation safety, including paying close attention at intersections	Improve Emmet/Ivy Intersection
Flex time, particularly at the Health Center	Increase remote parking/reduce central parking
New bus routes to outlying areas (Crozet/Route 250 west)	Better infrastructure for bicycles, including indoor bicycle storage and shower facilities
Preferential parking for vanpools and carpools	Reduced parking overall
Implementation of a car sharing program such as Zipcar or FlexCar	Kiosks for information on travel/commute options
Increased travel options education/campaigns	Close streets
Increased transit frequency, especially on the CTS system	Wider sidewalks

Provision of financial incentives for any alternative transportation	Wayfinding improvements
More UVA involvement in housing options, including programs to help staff afford to live shorter distances to Grounds	Improve lighting and visibility for pedestrians and cyclists
Commuter choice options with cash out of parking benefits	
More differentiation in parking costs	
Provide fare free rides on CTS system for faculty, staff, and students	
Guaranteed ride home program	

3.0 Detailed Workshop Notes

Session 1 - General

Pedestrian:

- Central grounds, dense development and able to get classes
- Emmet/Ivy, 2 Crossings, 1/3 wiling to walk from E/I to Central Gounds
- Student hit on Emmet every year
- New improvement at entrance to North Grounds is helpful
- Accidents happen in heavy traffic
- Too many buses make not walking too easy
- Bus stops are social
- Engineers Way has many bike/pedestrian conflicts
- Emmet is better than used to be
- No good links to hospital from remote parking
- Underpass on Emmet at McCormick very uncomfortable, no sidewalks and perception of bike and pedestrians is unhelpful
- Not a critical mass of bikes in Charlottesville to make biking safe
- Crowding of pedestrians on sidewalks pushes bikes into road, and into cars and buses
- Wheelchair users are forced into road due to infrastructure and crowding

Bicycle:

- Bike racks and routes are located properly
- Bikes are brought to Grounds but students tire of riding soon
- Bikes aren't needed on grounds housing, but JPA and other off-ground housing attracts bikes
- Congestion on streets and on-street parking has increased conflicts
- Huge opportunities for bike commuting
- Network is not continuous on perimeter of the University
- Rugby Road is safe for biking
- Would be good to have steel channel at staircases to walk bikes up
- JPA could use improvements
- JPA and Fontaine intersection very dangerous
- Bike rack supply is inadequate and takes a long time to remove abandoned bikes
- Rack design is inconsistent and sometimes problematic
- Enforcement is not clearly defined
- Should scooter parking be provided
- For long-distance commuters there is no good place for overnight bike parking. Bicyclists do not want to leave bikes on exposed racks prone to damage from other bikers, leaf blowers

- Many faculty bring bikes to their offices
- People will lock to rails instead of racks
- Nicer storage needed
- Regulations prevent bike storage in dorm rooms, but the areas under staircases offer good storage
- Dismount zone in front of new Cabell doesn't make sense
- Minor-Maury area has many bike/pedestrian conflicts
- Gates are a big choke point

Parking:

- There is an opportunity for intercept garage facility west of UVA on 250, that would offer lower priced option
- Parking cash out for users of alternate transportation could help reduce SOV
- Richmond Vanpool works pretty well, Ride-Home Program will provide rental car in emergencies.
- Day care limits commuting options
- UVA day care is very expensive and has a long waitlist, forcing many to use further away day care that requires car to access by closing time
- Opportunity exists in Buckingham and other areas for multiple vanpools, with multiple times, State Farm also has a strong vanpool program
- Parking cost is utmost in the minds of drivers. Most will react to higher costs and may consider alternatives
- Traffic conditions in town vary considerably during summer and winter break
- Parking at Lambeth is ripe for carsharing to reduce need for car
- Many students don't know of options to get home on weekends other than car
- Free night parking and available car make car obvious choice for students

Transit:

- Need 2 users groups, most undergrads live near bus, graduate students less so, faculty and staff not really
- City and regional transit do not meet schedules
- City routes have such long headways that not viable option for many, given parking price
- CTS unreliable, off-schedules, sometimes doesn't show up
- Real-time info would help
- Fare free would help improve options
- Broader UVA effort for transit alternatives is needed

Commute Options:

- Connection between Emmet and McCormick is dangerous
- Closing McCormick would reduce student drop-offs
- Commuter choice program with cash out

- Increase sidewalk widths
- Enforcement of pedestrian laws among drivers
- Better infrastructure for bikes and pedestrians
- Perception, culture changes via marketing?
- Zip or Flex Car and travel options education
- Bike storage improvements, better
- Encourage 1st-years to ride bikes for culture
- More infrastructure for walkers, bridge over Emmet
- Shrinking parking space numbers on CG to all but 0
- Improve pedestrian/bikers about safety, headphones/phone
- Stop building parking/limit parking/Flex Cars
- Double frequency of trolley and/or alternate with 7

Traffic:

No Comments

TDM Options:

No Comments

Participants:

Alex Linthicum – Graduate Student
Becky Campbell – Staff
Brad Brown – Faculty
Kathy Cacciola – Graduate Student
Danny Kwan – Graduate Student
Harry Hibbits – Graduate Student
Chris Gist – Staff
Phoebe Crisman – Faculty
Susan Harris – Administrative Faculty
Len Schoppa – Faculty
Rich Hopkins – Staff
Brooke Yamakoshi – Graduate Student

Session 2 – General

Pedestrian:

No Comments

Bicycle:

- Very few bikers in North Grounds

Parking:

- UVA Employees park on community streets. Darden has plenty of parking.
- Look at incentives vs. disincentives to influence behavior.
- Example, education can create conflicts with parking.
- People use the North Grounds parking lots and use UTS to come into work
- Events impact parking patterns
- Lots of parking at Fontaine research Park
- Need for cultural affairs to have parking facilities

Transit:

- Very few users in North Grounds
- Does not occur to North Grounds users to take UTS
- Openness to trying commuting to work on CTS
- Fare on transit is incidental
- Student athletes are not using transit, they are driving
- Bus shelters / amenities need improvement
- No CTS options in North Grounds
- Limited service from Fontaine – Needed as regular scheduled service
- Jaunt is larger regional service

Commute Options:

- Do we want to encourage mopeds?
- What about zip-car for moving around?
- Enthusiastic about effort to share with community
- As #1 employer – the University needs to be involved with influencing behavior
- BRT direct routes from University staff residences needed

Traffic:

- Darden is very self contained
- ATH/REC employees commute in SOV – Schedule
- All community affairs employees are SOV
- Extreme concern with JPJ arena impacts
- Issue with student developments in outlying areas
- Event parking/traffic – signals needed –
- Issues are JPJ, Stadium (6 games)
- Basketball games are manageable – other events not
- Effort to close Lynchburg, JPA bridge closing

TDM Options:

- Employee residence locations have direct relationship to pay range
- Impact of more finely grained parking permit system?
    - Not very much, system already as such
    - Over – subscription already in use
- City/County involvement with traffic issues?
    - UVA encourages the City and County to be primary contact to address traffic issues
- Options for providing increased staff housing?
    - Could be useful to manage more effectively with van pools
    - If so, the University needs to be involved with the development of those communities to make it effective – "be at table"
    - Perception that the University has "deep pockets"
    - Potential related to full on/off for N.G. connector

Participants:

Jason Bauman Administrative Faculty
Jim Fitzgerald - Staff
Sandy Carter
Mike Goddard - Staff
Katie Sullivan - Undergraduate Student
Ron Price - Staff
Susan Carkeek - Administrative Faculty

Session 3 – Operations

Pedestrian:

- McCormick Road sidewalks are too narrow
- McCormick Road drivers go too fast when gates down
- Intersection of McCormick and Alderman, high vehicle and high pedestrian usage
- Foot traffic pushes some people off sidewalks, and bikes into traffic
- Current gate locations are not effective, gates broken frequently, no human face
- Roads leading to McCormick are narrow, even though dead end, still an issue
- Whitehead and Stadium unsafe, Emmet and Stadium, Emmet at Memorial
- Ivy/Emmett area, some mid-block crossings now with garage and more in future
- Goodwin Bridge cut down on mid-block
- Rugby/University intersection is problematic
- No direct route from Hereford & Gooch to central grounds, same goes for Lambeth Housing
- Rugby Road by Fayerweather and Gilmer sidewalks work best, seemingly due to separation of sidewalk with road
- Fontaine was not seen as walkable when built, but is now used and considered part of grounds
- No sidewalks by Slaughter rec. and EH & S
- No sidewalks on Old Ivy
- McCormick Road sidewalk adjacent to Academical Village in poor condition due to service parking
- Need to provide for service vehicle spaces, but balance with other space needs

Bicycle:

- Lanes are not continuous or not present, need to dedicate lanes
- Need to coordinate planning with city, county, and UVA
- Distance to downtown is minimal on a bike, but awareness as an option is needed
- Emmet is dangerous to ride on
- No regulations on bicycle use on paths
- Transit service is good, so less need to bike
- UVA Transit serves dense off ground housing, 1/3 of ridership
- 1/3 of ridership is dedicated to moving people from one end of McCormick to the other
- Bicycles that come with first year students often are never used, upperclass housing has less bike storage, but higher percentage of riders
- Disposing of bikes (abandoned) is a heavy demand on manpower
- Fontain R.P. does not charge for parking
- Some use Fontaine as park & ride and ride into grounds
- Culture at UVA is used to parking at place of work
- A lot of staff lives very far from grounds, too far to bike

- Jaunt partnership to target UVA staff in remote counties
- Rail line (CSX) runs through UVA staff areas in Waynesboro and Staunton

Parking:

- Parking is a recruiting tool, ads offer free parking
- Cost of parking is up to 38K per spot since all new parking must be structured
- Experience from Toledo where all parking was removed, bad at first but better long-term, better quality of life
- Don't' realize spouses riding together is carpool and at a reduced rate, more attractive now
- Sense of entitlement for close parking
- Parking fees related to salary is a growing issue
- Amount of construction traffic and parking is significant in this heavy building period

Transit:

No Comments

Commute Options:

- Second year preference two years ago led to more second years and drop in third and forth years on grounds
- Housing does not anticipate building apartment style housing due to overpopulation in private apartments
- Close-in housing have the highest occupancy rates
- Mix of new housing off grounds, some pedestrian distance, some provide shuttles
- Only health system remote parking and H.S. third shift
- Newcomb offers bank, food, so no need to have car during the day
- To change parking entitlement, may require significant shift, such as removing grounds parking
- State Farm vanpool is strong and popular
- #1 suggestion: Shut down McCormick Road,
- Survey staff (service, housekeeping) about what would work,
- Incentives for employees

Traffic:

- Employees who drive state vehicles have a different behavior than the employees who don't drive state vehicles during the day.
- Students don't have good behavior when driving
- University roads are mostly safe
- Driver behavior changes during summer, people are less conscientious

TDM Options:

No Comments

Participants:

Jay Klingel – Administrative Faculty
Marshal Hunt – Staff
Fred Missel – Staff
Susan Carkeek – Administrative Faculty

Session 4 – Health System

Pedestrian:

- Health System interactions with central grounds increasing
- Students move back and forth from HS grounds for lectures – and with research growing
- Sidewalks are not continuous, but often faster to walk – crosswalks and intersections need improvement
- Wayfinding could be improved to help people throughout grounds
- Promote walking/biking with better wayfinding around grounds
- Issue with Emmet/Ivy crossing

Bicycle:

- Discontinuous bike lanes are a problem
- Now putting bike facilities in new buildings
- Bike riders are not safe without marked lanes
- The topography is significant for bikes
- Better bike lane system

Parking:

- Parking managed for HS by Parking and Transportation
- Dual parking for researchers is a challenge
- Free parking for patients / visitors – unscheduled
- Employees are scheduled
- Parking cost paid by HS
- Wayfinding for patients is a problem.
- West garage will decant to North garage directly
- Patient valet parking is offered, but does not work well
- Event parking has become a big problem for parkers
- North garage is going to complicate problems

Transit:

- HS absorbs the cost of CTS system for staff
- UTS used to get from parking to HS – Not for moving around grounds- most walk
- CTS is not heavily used – Headways are long and distances are short
- More ridership with fare free pilot program
- Viable option if efficient – location-effective
- Only works if you live in the city

Commute Options:

- Shuttles to parking facilities are on call
- Consideration of continuous service
- No commute options from Earlysville
- Commutes early and needs SOV with schedule
- Long work hours make SOV necessary

Traffic:

- Transport headways for staff shuttle are lengthy – at peak times – signal timing (big HR issue)
- Crosswalks, pedestrian pattern interrupts traffic flow
- Large population of visitors each day causes problems with traffic flow – No understanding of locations
- Events have become additional traffic impact

TDM Options:

- Look at opportunities to facilitate interactions between research functions: HS, McCormick Road area and Fontaine Research Park
- Introduce flex-time to alleviate traffic issue
- Flex-time may help, but biggest issue is commute
- Consider feasibility of managed street approach within Charlottesville
- Consider flex-schedule for administrative staff at UVA
- Bus route needed from 250 West area.
- Improve Emmett-Ivy intersection for cars and pedestrians – consider cross directional crossing
- Vanpools, with preferential parking
- Reliable public transportation
- Remote parking at Fontaine with Light Rail on track for quick connection
- Housing costs are to high to locate close-in
- Make transportation connections with dense out-lying areas

Participants:

Tom Harkins – Staff
Ruby Curnish – Staff
Luis Carrazana – Administrative Faculty
Mark Stanis – Staff
Susan Carkeek - Administrative Faculty

Session 5 – Management

Pedestrian:

- Emmett – JPA – Stadium Rd intersection is dangerous – sidewalks needed
- Emmett at Thompson – Greatly improved with better lighting, signs
- Pedestrians are tuned out with technology (phones, music, etc.)

Bicycle:

- A problem at night without lighting
- Lack of lighting on streets

Parking:

- Most parkers at Emmit/Ivy walk vs. UTS
- Attitude of "entitlement" to parking
- Close access needed to improve faculty/student interaction
- Lack of space limits access
- Maintain a sense intimacy
- Faculty have irregular schedules – issues vary on disciplines – labs vs. office
- Possible to differentiate parking based on priority – issue of hunting
- Issue of overselling – should be lower percentage for smaller lots
- Policy making – Do we need better enforcement?
- How do parking issues relate to security?

Transit:

- Location of the park on North Groudns– well supported by UTS
- Busses get caught in congestion
- Dependency on bus service is limited
- Faculty do not utilize transit systems
- Buses work well around grounds – UTS
- UTS serves campus better than CTS
- Transit can limit employees flexibility

Commute Options:

- Transportation duration is an impact
- Rideshare through Jaunt exists
- Managing demands of childcare limits options – night events
- Carpool does not allow for flexibility with children
- Faculty population is aging and is less mobile
- Scheduling of classrooms is maxing out

- No longer "8-5" jobs

Traffic:

- Congestion is increasing
- Rotunda as castle – Moat is roads
    - University
    - Emmet
    - JPA
- Students live outside Moat
- Problematic that city owns streets
- Lighting needs to be improved

TDM Options:

- Groundswalk – what happened?
- Pedestrian ways are not direct, wayfinding is poor, need make pedestrian experience unified – There are too many barriers
- Scheduling does not always allow for walking – 15 minute max
- People need education on UTS routes
- Carpooling, bus, signage, maps – kiosks are helpful
- Educational campaigns are effective
- Education process is needed with the city and county – they do not take proper responsibility for an integrated transportation system
- We need to address the transportation problems with a broader approach – not just traffic
- A bicycle-sharing system could be considered
- Housing should be improved and additionally supplied in North Grounds
- Suggest prioritization(based on needs) of parking:
    - Students: Arch, engineering, Cabell researchers (recruitment) needs to be regimented, incentivised
- Carpooling should get funding break and priority position
- More differentiation in parking costs
- Get people to understand E- Ivy as priority location
- We have plenty of parking – x factor is the poaching – enforcement and education
- Parking hunting impacts pedestrian experience
- Advocate for perimeter parking
- Education about pedestrian and bicycle safety is needed
- How many faculty and staff actually move around
- Departmental cars for use – state but can not be used for personal use
- Will not walk to Fontaine / Carruthers

Participants:

Wynne Stuart – Administrative Faculty
Christina Moarell – Administrative Faculty
Adam Daniel – Administrative Faculty
Anna Towns – Staff
Bill Bergen – Administrative Faculty
Dean Aylor – Faculty
Alan Cohn – Administrative Faculty
Mark Fletcher

Session 6 – General

Pedestrian:

- Rugby road crossings are problematic
- JPA – W. Main intersection lacks sidewalks
- No Connection between Darden and Rivianna Trail, easy to fix
- Emmet Street is dangerous, frustrating for pedestrians
- JPA at Emmet, no crossing
- Presumption that pedestrian with IPOD is in the wrong
- Striping and crosswalks signs are effective at identifying ground as caution area
- Conflict between joggers and pedestrians on Rugby Road
- Corner narrowness reminds drivers to stop, not the case with Emmet, JPA
- Commuter lot storage of bikes, lockers

Bicycle:

- Very few routes to grounds just for bicycles, requires need to use pedestrian paths
- Should be a bike safety course when registering bikes
- Good street lighting
- Different bike user groups, novice to advanced
- Advanced riders won't rely on transit
- Riding on Rugby Road is scary, with speeders and discontinuous lanes
- Lack of connections in area
- Bike infrastructure is in poor shape and sends negative image to bikers
- Need to look at childcare as important influence on TDM
- Tempting for students to get rides to central grounds
- Road design is conventional auto centric layout on grounds
- Seems that changing bike culture is possible
- Conflict between transit and bikes, buses pass bikers then cut in front to bus stops
- UVA is long behind in TDM, should look toward other Universities for ideas
- This TDM needs to become integral into the mindset of UVA, along with sustainability, need to think differently
- Opportunity to use UVA as testing ground for cutting edge vehicles, fuel cell busses
- Improve the Corner for bicycles

Parking:

- Awareness of flexible parking is low
- Flex parking permit is very useful
- Balance of parking assignments not clear
- Lots seem far away
- More motorcycle and scooter parking needed
- Lack of parking ease means more use of bike/transit, same with enforcement

- Service parking, Too many grass & sidewalk permits to vendors, also need to carpool and combine service trips
- New parking will increase S.O.V. use, parking rate at UVA is already very high

Transit:

- Little awareness of CTS system free travel on trolley
- UTS slows down at class change and becomes unreliable
- First years do use trolley
- Off-grounds students find trolley less useful, cumbersome loop route
- Street-car would change balance of trolley
- Trolley is useful as alternative to driving for daily tasks
- At Ivy/Emmet, UTS headway is short enough that awareness of schedule isn't needed
- No bus service to Fontaine, even though students and others need to visit
- In inclement weather, increased transit use leads to crowding and delays
- Summer UTS schedule slows and requires more planning
- Spread of community to North, Pantops, etc. requires multi-transit solutions
- No visible map for UTS and CTS routes and schedules
- Need to carry notebooks, materials makes transit difficult

Commute Options:

- Timer at bus stops and real information at bus stops increase use suggestion
- Need a viable alternative for commuting from west, less emphasis on auto in central ground
- Incentives for Faculty/Staff to carpool,
- Make bike use more visible, reduce undergrad cars
- Coordinate with community to give students more options
- Make UVA more friendly towards bikes
- Economics incentives for cultural change, make commute different
- Address R.R. crossings for pedestrians
- Communication, marketing to get people out of car
- KC – More frequent service to Barracks Road, other areas
- Events are cause of significant cause of congestion, better awareness of pulse of UVA in transit planning

Traffic:

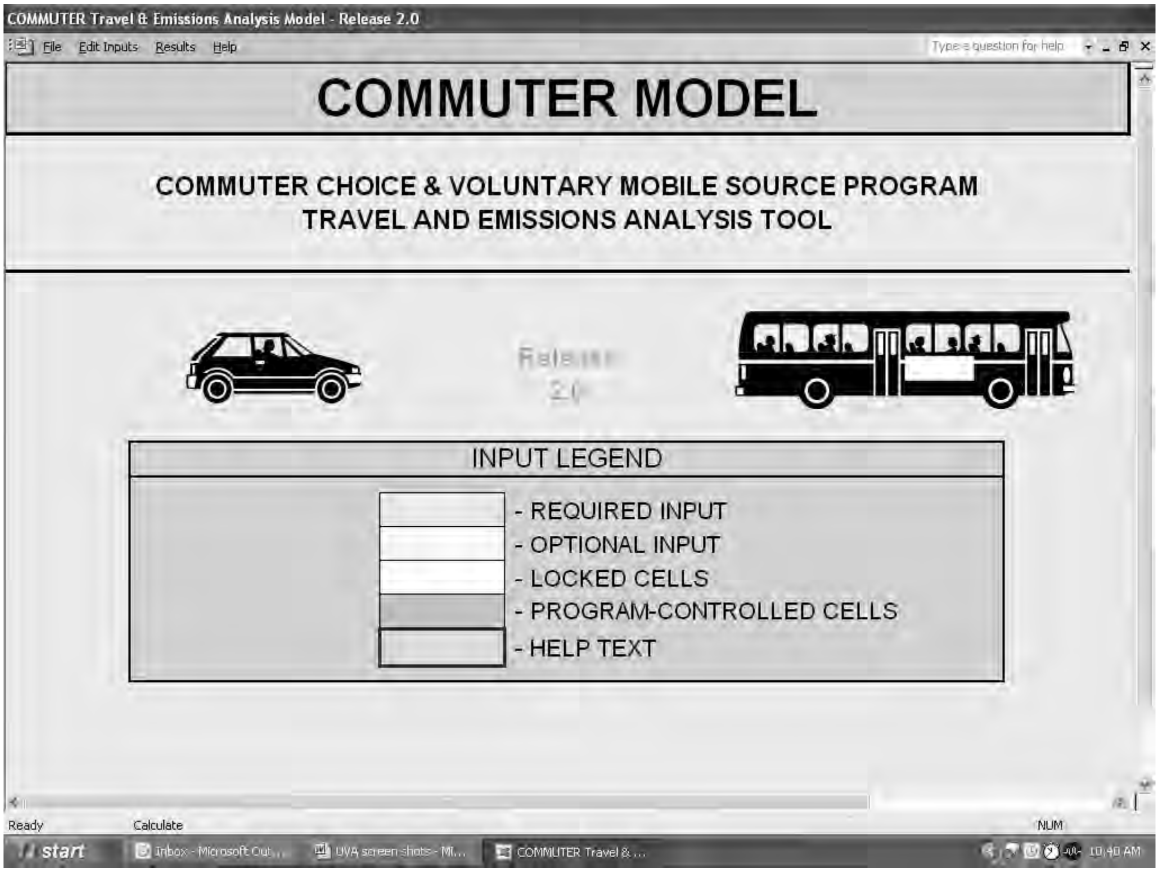
No Comments

TDM Options:

No Comments

Participants:

Helen Wilson – Staff
Nancy Takahashi – Faculty
Darius Nabors – Undergraduate Student
David Phillips – Faculty
Adam Jortner – Graduate Student
Randy Salzman – Undergraduate Student
Rosemarie Moxley – Undergraduate Student
Amanda Shofield – Undergraduate Student
Richard Brownlee
Brian Poulson – Graduate Student


COMMUTER Travel & Emissions Analysis Model - Release 2.0
File
Edit Inputs
Results
Help
COMMUTER MODEL
COMMUTER CHOICE & VOLUNTARY MOBILE SOURCE PROGRAM
TRAVEL AND EMISSIONS ANALYSIS TOOL
INPUT LEGEND
- REQUIRED INPUT
- OPTIONAL INPUT
- LOCKED CELLS
- PROGRAM-CONTROLLED CELLS
- HELP TEXT
Ready
Calculate
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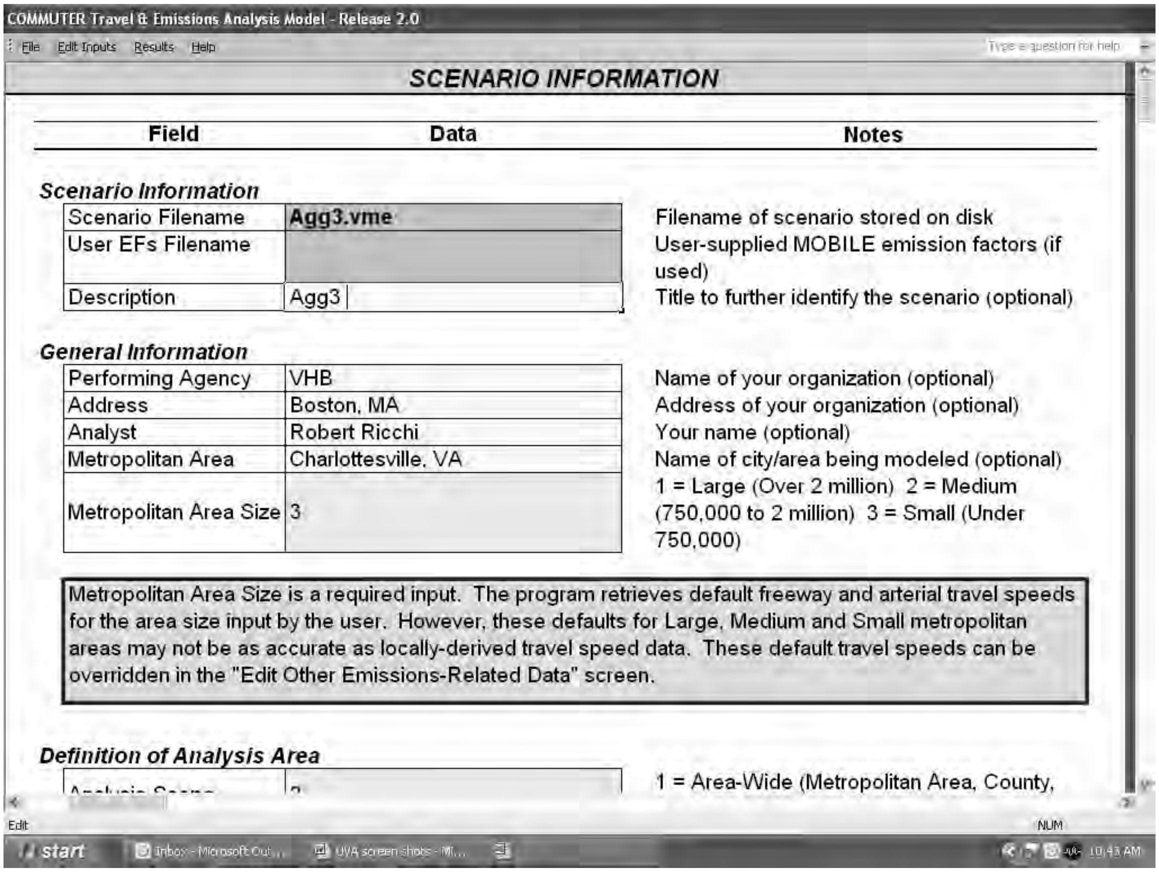
COMMUTER Travel & Emissions Analysis Model - Release 2.0
File
Edit Inputs
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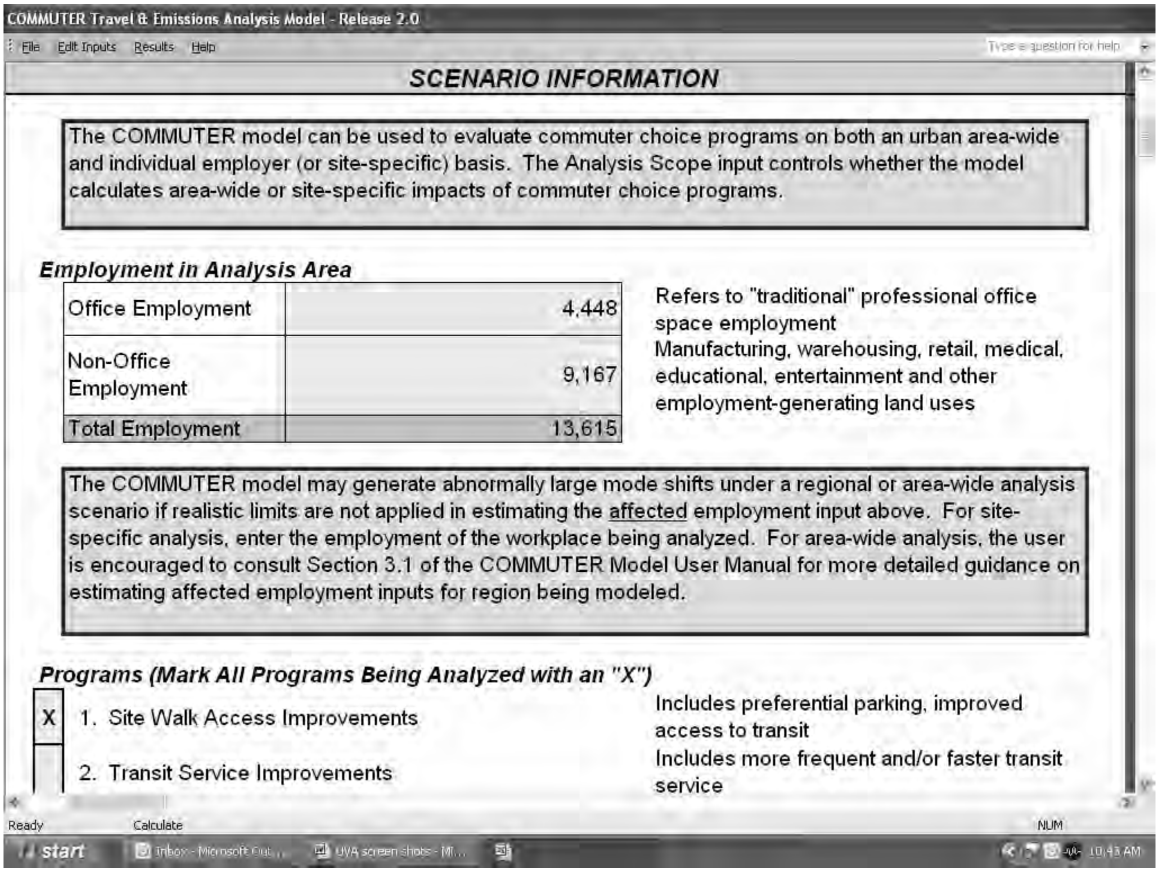
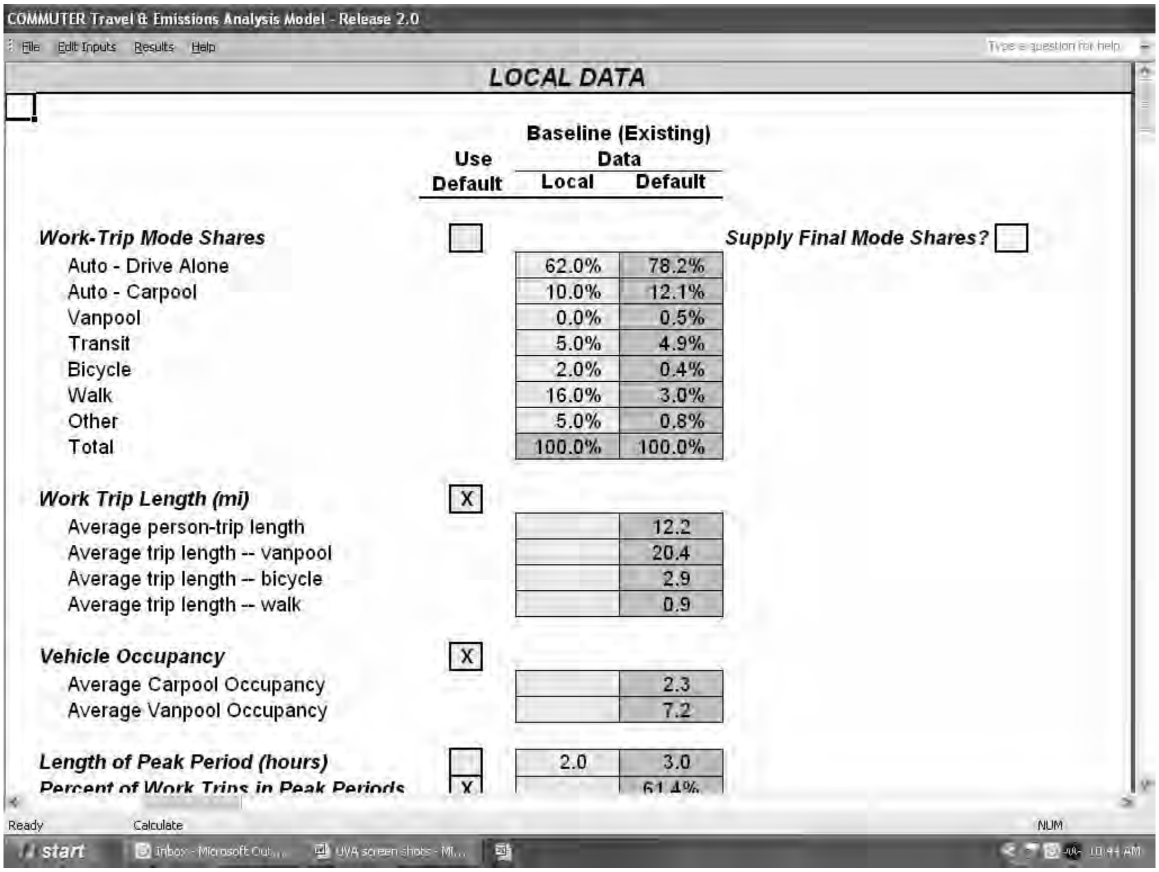
SCENARIO INFORMATION
Field
Data
Notes
Scenario Information
Scenario Filename
Agg3.vme
Filename of scenario stored on disk
User EFs Filename
User-supplied MOBILE emission factors (if used)
Description
Agg3
Title to further identify the scenario (optional)
General Information
Performing Agency
VHB
Name of your organization (optional)
Address
Boston, MA
Address of your organization (optional)
Analyst
Robert Ricchi
Your name (optional)
Metropolitan Area
Charlottesville, VA
Name of city/area being modeled (optional)
Metropolitan Area Size
3
1 = Large (Over 2 million) 2 = Medium (750,000 to 2 million) 3 = Small (Under 750,000)
Metropolitan Area Size is a required input. The program retrieves default freeway and arterial travel speeds for the area size input by the user. However, these defaults for Large, Medium and Small metropolitan areas may not be as accurate as locally-derived travel speed data. These default travel speeds can be overridden in the "Edit Other Emissions-Related Data" screen.
Definition of Analysis Area
1 = Area-Wide (Metropolitan Area, County,
Edit
NUM
start


COMMUTER Travel & Emissions Analysis Model - Release 2.0
File
Edit Inputs
Results
Help
SCENARIO INFORMATION
The COMMUTER model can be used to evaluate commuter choice programs on both an urban area-wide and individual employer (or site-specific) basis. The Analysis Scope input controls whether the model calculates area-wide or site-specific impacts of commuter choice programs.
Employment in Analysis Area
Office Employment
4,448
Refers to "traditional" professional office space employment
Non-Office Employment
9,167
Manufacturing, warehousing, retail, medical, educational, entertainment and other employment-generating land uses
Total Employment
13,615
The COMMUTER model may generate abnormally large mode shifts under a regional or area-wide analysis scenario if realistic limits are not applied in estimating the affected employment input above. For site-specific analysis, enter the employment of the workplace being analyzed. For area-wide analysis, the user is encouraged to consult Section 3.1 of the COMMUTER Model User Manual for more detailed guidance on estimating affected employment inputs for region being modeled.
Programs (Mark All Programs Being Analyzed with an "X")
X
1. Site Walk Access Improvements
Includes preferential parking, improved access to transit
2. Transit Service Improvements
Includes more frequent and/or faster transit service
Ready
Calculate
NUM
start


COMMUTER Travel & Emissions Analysis Model - Release 2.0
File Edit Inputs Results Help
Type a question for help
LOCAL DATA
Use Default
Baseline (Existing) Data
Local Default
Work-Trip Mode Shares
Supply Final Mode Shares?
Auto - Drive Alone 62.0% 78.2%
Auto - Carpool 10.0% 12.1%
Vanpool 0.0% 0.5%
Transit 5.0% 4.9%
Bicycle 2.0% 0.4%
Walk 16.0% 3.0%
Other 5.0% 0.8%
Total 100.0% 100.0%
Work Trip Length (mi) X
Average person-trip length 12.2
Average trip length -- vanpool 20.4
Average trip length -- bicycle 2.9
Average trip length -- walk 0.9
Vehicle Occupancy X
Average Carpool Occupancy 2.3
Average Vanpool Occupancy 7.2
Length of Peak Period (hours) 2.0 3.0
Percent of Work Trips in Peak Periods X 61.4%
Ready Calculate NUM
start

COMMUTER Travel & Emissions Analysis Model - Release 2.0

File Edit Inputs Results Help

FINANCIAL INCENTIVES AND PARKING COSTS

	Change In Daily Cost:			
Mode:	Parking Cost ($/vehicle)	Fare Cost ($/ person/RT)	Other Financial Cost ($/ person/RT)	Total Change ($/ person/RT)
Drive Alone	$ 0.75		$ -	$ 0.75
Carpool	$ -1.00		$ -	$ -0.44
Vanpool	$ -1.00		$ -	$ -0.14
Transit		$ -	$ -	$ -
Bicycle			$ -	$ -
Pedestrian			$ -	$ -

Employer Participation Rate:	100%

"Financial incentives and parking costs" may include higher parking charges for single-occupant vehicles, reduced parking fees for carpools or vanpools, transit subsidies such as free monthly passes, or other financial incentives for specific modes. A decrease in cost is entered as a negative number. For example, provision of a transit pass valued at $30 a month would be entered as a change in fare cost of -$1.50 ($30 / 20 days). The cost change inputs are entered on a daily basis.

"Employer participation rate" refers to the percent of employers in the analysis area offering these incentives to their employees. (This option is not required for site-specific analysis because the "participation rate" is 100%.)

Ready Calculate NUM

COMMUTER Travel & Emissions Analysis Model - Release 2.0

File Edit Inputs Results Help

EMPLOYER SUPPORT PROGRAMS FOR ALTERNATIVE MODES
SITE-SPECIFIC ANALYSIS

Entry Format (check one only):
[X] Specify Program Level
[ ] Specify Mode Share Increase

"Program Level" and "Mode Share Increase" input options are mutually exclusive. You enter input data for either one or the other based on which Entry Format box you check to the left. See the help box below for an explanation of each input.

Specify Program Level:

Program	Existing	New
Carpool	1	4
Vanpool	0	3
Transit	1	4
Bicycle	0	3

Specify Mode Share Increase:

Program	Existing	Increase	New
Carpool	10.0%		10.0%
Vanpool	0.0%		0.0%
Transit	5.0%		5.0%
Bicycle	2.0%		2.0%

"Employer Support Programs" include programs such as provision for an on-site transportation coordinator, ridematching, transit information, and other actions aside from time and cost incentives which encourage employees to utilize alternative modes. Two entry options are available for site-specific analysis:

Ready Calculate NUM

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COMMUTER Travel & Emissions Analysis Model - Release 2.0

File Edit Inputs Results Help

COMMUTER MODEL RESULTS

SCENARIO INFORMATION

Description	Agg3
Scenario Filename	Agg3.vme
Emission Factor File	
Performing Agency	VHB
Analyst	Robert Ricchi
Metropolitan Area	Charlottesville, VA
Area Size	3 - Small (under 750,000)
Analysis Scope	2 - Site or Employer-Based
Analysis Area/Site	UVA
Total Employment	13,615

PROGRAMS EVALUATED

[X] Site Walk Access Improvements
[ ] Transit Service Improvements
[X] Financial Incentives
[X] Employer Support Programs
[ ] Alternative Work Schedules

[ ] User-Supplied Final Mode Shares

MODE SHARE IMPACTS

Mode	Baseline	Final	%Change
Drive Alone	62.0%	48.9%	-13.1%
Carpool	10.0%	17.9%	+7.9%
Vanpool	0.0%	2.2%	+2.2%
Transit	5.0%	6.7%	+1.7%
Bicycle	2.0%	2.9%	+0.9%
Pedestrian	16.0%	16.8%	+0.8%
Other	5.0%	4.6%	-0.4%
No Trip	-	0.0%	+0.0%
Total	100.0%	100.0%	-

TRAVEL IMPACTS (relative to affected employment)

Quantity	Peak	Off-Peak	Total
Baseline VMT	168,144	105,706	273,850
Final VMT	149,200	93,797	242,997
VMT Reduction	18,943	11,909	30,853
% VMT Reduction	11.3%	11.3%	11.3%
Baseline Trips	11,109	6,984	18,093
Final Trips	9,555	6,007	15,562
Trip Reduction	1,554	977	2,531
% Trip Reduction	14.0%	14.0%	14.0%

Ready Calculate NUM

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Scenario 1: Baseline

Parking Supply	2005	2015	2025	Notes
Starting Total Parking	**16,470**	**16,470**	**16,470**	Lot Space Inventory Spreadsheet
Parking Set-Asides				
Attended/Meter/Convenience	1,560	1,795	2,096	Increase at 2.5% on current hosp visitor supply (840 spaces)
Handicap	415	415	415	Static
Service/Departmental	474	474	474	Static
Misc/Leased to Others	715	715	715	Static
Motorcycles	32	32	32	Static
Residential	1,693	1,693	1,693	Static
Operational Set-Aside/Emmet-Ivy	500	500	500	Static
Known JPJ Vacancy	1,000	1,000	1,000	Static
Total Set-Asides	**6,389**	**6,624**	**6,925**	
General Commuting Supply	**9,077**	**9,208**	**9,129**	Total Parking subtracting set-asides + Residential Overflow to JPJ
FTE Population				
Faculty	2,212	2,516	2,717	Program Sheet
Staff	5,743	6,163	6,608	Program Sheet
Health System	4,719	6,342	8,523	3 % per year growth (trend analysis)
Total Employment (FTE)	**12,674**	**15,021**	**17,848**	Sum of above categories
Employee Commuting Demand	**8,492**	**10,064**	**11,958**	0.67 (Census Drive Alone 62 % Drive Alone+ (10%) / VOR of 2)
Student Population				
Undergraduate	13,017	14,117	15,324	Program Spreadsheet
On-Campus	6,380	6,135	6,135	Housing Information for Data Digest/Change from 2005 to 2006 then static
Off-Campus	6,637	7,982	9,189	Difference between above rows
First Year (Ineligible for Parking)	3,112	3,367	3,662	Program Spreadsheet
Eligible On-Campus	3,268	2,768	2,473	Assumes 1st Year on Campus
Graduate	6,453	6,854	7,329	Program Spreadsheet
On-Campus	328	339	339	Housing Information from Data Digest
Off-Campus	6,125	6,515	6,990	Difference between above rows
Total Students	**19,470**	**20,971**	**22,653**	Sum of Undergraduate and Graduate
On-Campus	**6,708**	**6,474**	**6,474**	Sum of Undergraduate and Graduate on campus
Off-Campus	**12,762**	**14,497**	**16,179**	Sum of Undergraduate and Graduate off campus
Residential Parking Demand	2,697	2,330	2,109	Asssume 75 Percent of Grad and Eligible Undergrad Own Cars
Residential Overflow to JPJ	1,004	637	416	Residential Demand - Storage Spaces
Student Commuting Demand	4,275	4,856	5,420	Assume 50 % (Census (0.67 (Census 62+ (10/2)) / 2)
Total Commuter Demand	12,767	14,921	17,378	Sum of Student and Employee Commuter Demand
Supply/Demand Ratio	0.71	0.62	0.53	If no supply is added
Population to Parking Ratio	0.51	0.50	0.49	Sum of Student and Employee Population divided by Increased Parking Supply
Necessary Additional Supply	0	10,608	12,356	Application of current ratio to new demand
New Parking Needed from 2005	0	1,400	3,227	Additional parking needed to maintain operations
Health System Demand Increase				
Health System Visitor		235	536	Increase in Convenience Parking
Health System Employee		492	1285	Increase in Employment adjusted by factors
Total Health System		**727**	**1,821**	Sum of two rows above
University Demand Increase		**673**	**1,406**	Total New Parking Needed minus Total Health System Demand Increase
Total Demand Increase		**1,400**	**3,227**	Sum of Health System and University Employee Increase
Use of JPJ Surplus		**1,000**	**1,000**	
Net New Spaces Needed		**400**	**2,227**	
Percent Increase on Supply Needed		8.5%	19.6%	New spaces needed divided by total supply
Percent Increase on New Supply		2.4%	13.5%	Increase on total supply with use of JPJ surplus

Scenario 2: Least Aggressive TDM Program

Parking Supply	**2005**	**2015**	**2025**	**Notes**
Starting Total Parking	**16,470**	**16,470**	**16,470**	Lot Space Inventory Spreadsheet
Parking Set-Asides				
Attended/Meter/Convenience	1,560	1,795	2,096	Increase at 2 5% on current hosp visitor supply (840 spaces)
Handicap	415	415	415	Static
Service/Departmental	474	474	474	Static
Misc/Leased to Others	715	715	715	Static
Motorcycles	32	32	32	Static
Residential	1,693	1,693	1,693	Static
Operational Set-Aside/Emmet-Ivy	500	500	500	Static
Known JPJ Vacancy	1,000	1,000	1,000	Static
Total Set-Asides	**6,389**	**6,624**	**6,925**	
General Commuting Supply	**9,077**	**9,208**	**9,129**	Total Parking subtracting set-asides + Residential Overflow to JPJ
FTE Population				
Faculty	2,212	2,516	2,717	Program Sheet
Staff	5,743	6,163	6,608	Program Sheet
Health System	4,719	6,342	8,523	3 % per year growth (trend analysis)
Total Employment (FTE)	**12,674**	**15,021**	**17,848**	Sum of above categories
Employee Commuting Demand	**8,492**	**9,463**	**11,244**	0 63 (EPA Drive Alone 57 % + Carpool (12%) / VOR of 2)
Student Population				
Undergraduate	13,017	14,117	15,324	Program Spreadsheet
On-Campus	6,380	6,135	6,135	Housing Information for Data Digest/Change from 2005 to 2006 then static
Off-Campus	6,637	7,982	9,189	Difference between above rows
First Year (Ineligible for Parking)	3,112	3,367	3,662	Program Spreadsheet
Eligible On-Campus	3,268	2,768	2,473	Assumes 1st Year on Campus
Graduate	6,453	6,854	7,329	Program Spreadsheet
On-Campus	328	339	339	Housing Information from Data Digest
Off-Campus	6,125	6,515	6,990	Difference between above rows
Total Students	**19,470**	**20,971**	**22,653**	Sum of Undergraduate and Graduate
On-Campus	**6,708**	**6,474**	**6,474**	Sum of Undergraduate and Graduate on campus
Off-Campus	**12,762**	**14,497**	**16,179**	Sum of Undergraduate and Graduate off campus
Residential Parking Demand	2,697	2,330	2,109	Asssume 75 Percent of Grad and Eligible Undergrad Own Cars
Residential Overflow to JPJ	1,004	637	416	Residential Demand - Storage Spaces
Student Commuting Demand	4,275	4,856	5,420	Assume 50 % (Census (0.67 (Census 62+ (10/2)) / 2)
Total Commuter Demand	12,767	14,320	16,664	Sum of Student and Employee Commuter Demand
Supply/Demand Ratio	0.71	0.64	0 55	If no supply is added
Population to Parking Ratio	0.51	0.48	0.47	Sum of Student and Employee Population divided by Increased Parking Supply
Necessary Additional Supply	0	10,181	11,848	Application of current ratio to new demand
New Parking Needed from 2005	0	973	2,719	Additional parking needed to maintain operations
Health System Demand Increase				
Health System Visitor		235	536	Increase in Convenience Parking
Health System Employee		311	1042	Increase in Employment adjusted by factors
Total Health System		**547**	**1,579**	Sum of two rows above
University Demand Increase		**426**	**1,141**	Total New Parking Needed minus Total Health System Demand Increase
Total Demand Increase		**973**	**2,719**	Sum of Health System and University Employee Increase
Use of JPJ Surplus		**1,000**	**1,000**	
Net New Spaces Needed		**-27**	**1,719**	
Percent Increase on Supply Needed		5.9%	16 5%	New spaces needed divided by total supply
Percent Increase on New Supply		-0.2%	10.4%	Increase on total supply with use of JPJ surplus

Scenario 3: Moderate TDM Program

Parking Supply	2005	2015	2025	Notes
Starting Total Parking	**16,470**	**16,470**	**16,470**	Lot Space Inventory Spreadsheet
Parking Set-Asides				
Attended/Meter/Convenience	1,560	1,795	2,096	Increase at 2.5% on current hosp visitor supply (840 spaces)
Handicap	415	415	415	Static
Service/Departmental	474	474	474	Static
Misc/Leased to Others	715	715	715	Static
Motorcycles	32	32	32	Static
Residential	1,693	1,693	1,693	Static
Operational Set-Aside/Emmet-Ivy	500	500	500	Static
Known JPJ Vacancy	1,000	1,000	1,000	Static
Total Set-Asides	**6,389**	**6,624**	**6,925**	
General Commuting Supply	**9,077**	**9,208**	**9,129**	Total Parking subtracting set-asides + Residential Overflow to JPJ
FTE Population				
Faculty	2,212	2,516	2,717	Program Sheet
Staff	5,743	6,163	6,608	Program Sheet
Health System	4,719	6,342	8,523	3 % per year growth (trend analysis)
Total Employment (FTE)	**12,674**	**15,021**	**17,848**	Sum of above categories
Employee Commuting Demand	**8,492**	**9,163**	**10,887**	0.61 (EPA Drive Alone 54 % + Carpool (13%) / VOR of 2)
Student Population				
Undergraduate	13,017	14,117	15,324	Program Spreadsheet
On-Campus	6,380	6,135	6,135	Housing Information for Data Digest/Change from 2005 to 2006 then static
Off-Campus	6,637	7,982	9,189	Difference between above rows
First Year (Ineligible for Parking)	3,112	3,367	3,662	Program Spreadsheet
Eligible On-Campus	3,268	2,768	2,473	Assumes 1st Year on Campus
Graduate	6,453	6,854	7,329	Program Spreadsheet
On-Campus	328	339	339	Housing Information from Data Digest
Off-Campus	6,125	6,515	6,990	Difference between above rows
Total Students	**19,470**	**20,971**	**22,653**	Sum of Undergraduate and Graduate
On-Campus	**6,708**	**6,474**	**6,474**	Sum of Undergraduate and Graduate on campus
Off-Campus	**12,762**	**14,497**	**16,179**	Sum of Undergraduate and Graduate off campus
Residential Parking Demand	2,697	2,330	2,109	Asssume 75 Percent of Grad and Eligible Undergrad Own Cars
Residential Overflow to JPJ	1,004	637	416	Residential Demand - Storage Spaces
Student Commuting Demand	4,275	4,856	5,420	Assume 50 % (Census (0.67 (Census 62+ (10/2)) / 2)
Total Commuter Demand	12,767	14,019	16,307	Sum of Student and Employee Commuter Demand
Supply/Demand Ratio	0.71	0.66	0.56	If no supply is added
Population to Parking Ratio	0.51	0.48	0.47	Sum of Student and Employee Population divided by Increased Parking Supply
Necessary Additional Supply	0	9,967	11,594	Application of current ratio to new demand
New Parking Needed from 2005	0	759	2,466	Additional parking needed to maintain operations
Health System Demand Increase				
Health System Visitor		235	536	Increase in Convenience Parking
Health System Employee		221	921	Increase in Employment adjusted by factors
Total Health System		**456**	**1,458**	Sum of two rows above
University Demand Increase		**303**	**1,008**	Total New Parking Needed minus Total Health System Demand Increase
Total Demand Increase		**759**	**2,466**	Sum of Health System and University Employee Increase
Use of JPJ Surplus		**1,000**	**1,000**	
Net New Spaces Needed		**-241**	**1,466**	
Percent Increase on Supply Needed		4.6%	15.0%	New spaces needed divided by total supply
Percent Increase on New Supply		-1.5%	8.9%	Increase on total supply with use of JPJ surplus

Scenario 4: Aggressive TDM Program

Parking Supply	2005	2015	2025	Notes
Starting Total Parking	**16,470**	**16,470**	**16,470**	Lot Space Inventory Spreadsheet
Parking Set-Asides				
Attended/Meter/Convenience	1,560	1,795	2,096	Increase at 2.5% on current hosp visitor supply (840 spaces)
Handicap	415	415	415	Static
Service/Departmental	474	474	474	Static
Misc/Leased to Others	715	715	715	Static
Motorcycles	32	32	32	Static
Residential	1,693	1,693	1,693	Static
Operational Set-Aside/Emmet-Ivy	500	500	500	Static
Known JPJ Vacancy	1,000	1,000	1,000	Static
Total Set-Asides	**6,389**	**6,624**	**6,925**	
General Commuting Supply	**9,077**	**9,208**	**9,129**	Total Parking subtracting set-asides + Residential Overflow to JPJ
FTE Population				
Faculty	2,212	2,516	2,717	Program Sheet
Staff	5,743	6,163	6,608	Program Sheet
Health System	4,719	6,342	8,523	3 % per year growth (trend analysis)
Total Employment (FTE)	**12,674**	**15,021**	**17,848**	Sum of above categories
Employee Commuting Demand	**8,492**	**8,712**	**10,352**	0.58 (EPA Drive Alone 49% + Carpool (18%) / VOR of 2)
Student Population				
Undergraduate	13,017	14,117	15,324	Program Spreadsheet
On-Campus	6,380	6,135	6,135	Housing Information for Data Digest/Change from 2005 to 2006 then static
Off-Campus	6,637	7,982	9,189	Difference between above rows
First Year (Ineligible for Parking)	3,112	3,367	3,662	Program Spreadsheet
Eligible On-Campus	3,268	2,768	2,473	Assumes 1st Year on Campus
Graduate	6,453	6,854	7,329	Program Spreadsheet
On-Campus	328	339	339	Housing Information from Data Digest
Off-Campus	6,125	6,515	6,990	Difference between above rows
Total Students	**19,470**	**20,971**	**22,653**	Sum of Undergraduate and Graduate
On-Campus	**6,708**	**6,474**	**6,474**	Sum of Undergraduate and Graduate on campus
Off-Campus	**12,762**	**14,497**	**16,179**	Sum of Undergraduate and Graduate off campus
Residential Parking Demand	2,697	2,330	2,109	Asssume 75 Percent of Grad and Eligible Undergrad Own Cars
Residential Overflow to JPJ	1,004	637	416	Residential Demand - Storage Spaces
Student Commuting Demand	4,275	4,856	5,420	Assume 50 % (Census (0.67 (Census 62+ (10/2)) / 2)
Total Commuter Demand	12,767	13,569	15,772	Sum of Student and Employee Commuter Demand
Supply/Demand Ratio	0.71	0.68	0.58	If no supply is added
Population to Parking Ratio	0.51	0.47	0.46	Sum of Student and Employee Population divided by Increased Parking Supply
Necessary Additional Supply	0	9,647	11,213	Application of current ratio to new demand
New Parking Needed from 2005	0	439	2,085	Additional parking needed to maintain operations
Health System Demand Increase				
Health System Visitor		235	536	Increase in Convenience Parking
Health System Employee		86	739	Increase in Employment adjusted by factors
Total Health System		**321**	**1,276**	Sum of two rows above
University Demand Increase		**117**	**809**	Total New Parking Needed minus Total Health System Demand Increase
Total Demand Increase		**439**	**2,085**	Sum of Health System and University Employee Increase
Use of JPJ Surplus		**1,000**	**1,000**	
Net New Spaces Needed		**-561**	**1,085**	
Percent Increase on Supply Needed		2.7%	12.7%	New spaces needed divided by total supply
Percent Increase on New Supply		-3.4%	6.6%	Increase on total supply with use of JPJ surplus

Scenario 5: Very Aggressive TDM Program

Parking Supply	**2005**	**2015**	**2025**	**Notes**
Starting Total Parking	**16,470**	**16,470**	**16,470**	Lot Space Inventory Spreadsheet
Parking Set-Asides				
Attended/Meter/Convenience	1,560	1,795	2,096	Increase at 2.5% on current hosp visitor supply (840 spaces)
Handicap	415	415	415	Static
Service/Departmental	474	474	474	Static
Misc/Leased to Others	715	715	715	Static
Motorcycles	32	32	32	Static
Residential	1,693	1,693	1,693	Static
Operational Set-Aside/Emmet-Ivy	500	500	500	Static
Known JPJ Vacancy	1,000	1,000	1,000	Static
Total Set-Asides	**6,389**	**6,624**	**6,925**	
General Commuting Supply	**9,077**	**9,208**	**9,129**	Total Parking subtracting set-asides + Residential Overflow to JPJ
FTE Population				
Faculty	2,212	2,516	2,717	Program Sheet
Staff	5,743	6,163	6,608	Program Sheet
Health System	4,719	6,342	8,523	3 % per year growth (trend analysis)
Total Employment (FTE)	**12,674**	**15,021**	**17,848**	Sum of above categories
Employee Commuting Demand	**8,492**	**7,811**	**9,281**	0.52 (EPA Drive Alone 41% + Carpool (22%) / VOR of 2)
Student Population				
Undergraduate	13,017	14,117	15,324	Program Spreadsheet
On-Campus	6,380	6,135	6,135	Housing Information for Data Digest/Change from 2005 to 2006 then static
Off-Campus	6,637	7,982	9,189	Difference between above rows
First Year (Ineligible for Parking)	3,112	3,367	3,662	Program Spreadsheet
Eligible On-Campus	3,268	2,768	2,473	Assumes 1st Year on Campus
Graduate	6,453	6,854	7,329	Program Spreadsheet
On-Campus	328	339	339	Housing Information from Data Digest
Off-Campus	6,125	6,515	6,990	Difference between above rows
Total Students	**19,470**	**20,971**	**22,653**	Sum of Undergraduate and Graduate
On-Campus	**6,708**	**6,474**	**6,474**	Sum of Undergraduate and Graduate on campus
Off-Campus	**12,762**	**14,497**	**16,179**	Sum of Undergraduate and Graduate off campus
Residential Parking Demand	2,697	2,330	2,109	Asssume 75 Percent of Grad and Eligible Undergrad Own Cars
Residential Overflow to JPJ	1,004	637	416	Residential Demand - Storage Spaces
Student Commuting Demand	4,275	4,856	5,420	Assume 50 % (Census (0.67 (Census 62+ (10/2)) / 2)
Total Commuter Demand	12,767	12,667	14,701	Sum of Student and Employee Commuter Demand
Supply/Demand Ratio	0.71	0.73	0.62	If no supply is added
Population to Parking Ratio	0.51	0.45	0.44	Sum of Student and Employee Population divided by Increased Parking Supply
Necessary Additional Supply	0	9,006	10,452	Application of current ratio to new demand
New Parking Needed from 2005	0	-202	1,324	Additional parking needed to maintain operations
Health System Demand Increase				
Health System Visitor		235	536	Increase in Convenience Parking
Health System Employee		-185	376	Increase in Employment adjusted by factors
Total Health System		**51**	**912**	Sum of two rows above
University Demand Increase		**-253**	**411**	Total New Parking Needed minus Total Health System Demand Increase
Total Demand Increase		**-202**	**1,324**	Sum of Health System and University Employee Increase
Use of JPJ Surplus		**1,000**	**1,000**	
Net New Spaces Needed		**-1,202**	**324**	
Percent Increase on Supply Needed		-1.2%	8.0%	New spaces needed divided by total supply
Percent Increase on New Supply		-7.3%	2.0%	Increase on total supply with use of JPJ surplus

Transportation
Land Development
Environmental
Services

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Memorandum

To: Julia Monteith, AICP, LEED AP
Office of the Architect
University of Virginia

Date: Revised: April 7, 2010
Original: December 15, 2009

Project No.: 32921.01

Project Name: UVA TDM Study Phase 2

From: Christopher Conklin
Susan Sloan-Rossiter

Re: Tech Memo #2

This memorandum is divided into four parts. The first part shows which program alternatives are most effective at reducing drive alone trips, and how they can be packaged to guide an overall TDM program. The second part identifies specific TDM strategies and estimates their impact on mode share, using the EPA Commuter 2.0 model and price elasticity's. The third part estimates the vehicle miles traveled (VMT) and greenhouse gas (GHG) emission reduction associated with the elimination of the CTS fares for UVA affiliated persons and proposed TDM program. The fourth part of this memorandum discusses the costs associated with implementing the proposed TDM program. This memo represents the status of the project teams thinking and analysis as of December 15, 2009 unless otherwise noted.

1 Mode Shift Packages

This section of the memo identifies six drive alone reduction packages based on a reasonable assessment of each alternative mode's ability to reduce drive alone trips. It involves quantifying the market potential of several alternatives to drive alone commuting, including carpooling, transit, walking, bicycling, long-distance transit (JAUNT), and teleworking, and then determining the share of each market that would need to be captured to achieve specific drive alone mode share reductions. Six drive alone reduction packages are developed by combining reasonable mode share reduction targets, based upon the ability of each mode to induce drive alone commuters to switch to alternatives.

1.1 Identification of Market Potential for Alternative Transportation

Potential markets were established to quantify the number of UVA employees that could potentially be induced to switch their commute mode from driving alone to alternative forms of transportation. The size of these potential markets, measured by the number of UVA employees that hold a UVA parking permit and that live within a defined catchment area, was investigated for carpooling, local transit, walking, bicycling, and long-distance transit. The catchment area for each mode was defined as follows:

- Carpool: employees that live a mile or more beyond the UVA Grounds
- Local Transit: employees that live within one-quarter mile of a UTS or CTS transit route
- Walk: employees that live within one mile of the UVA Grounds
- Bicycle: employees that live within three miles of the UVA Grounds

- Long Distance Transit: employees that live beyond existing park-and-ride lots on four corridors: 29 North, 29 South, I-64 East, and I-64 West

As only 5% of students drive to Grounds, the focus of the TDM program definition and this potential market analysis is on faculty and staff.

Potential markets were quantified using the 2009 geo-coded residences of UVA employees. This dataset, which contains records for 15,812 employees, indentifies the type of parking permit each employee holds (if any) and the straight-line distance between each employee's residence and the UVA Grounds. For example, of the 15,812 employees contained in the geo-coded residential data, 8,698 met the conditions for potential carpoolers, representing 55.0% of UVA employees. The potential carpool market offers by far the greatest potential for reducing drive alone trips, as indicated in Table 1. No other mode has a market potential exceeding 17%. It should be noted that employees may fall into more than one of the catchments below.

Table1: Market Potential

Market	Catchment Area	Potential Market	# of UVA Employees	% of UVA Employees
Carpool	Permit holders that live beyond 1 mile of Grounds	8,698	15,812	55.0%
Local Transit	Permit holders within 1/4 mile of CTS/UTS route	2,036	15,812	12.9%
Walk	Permit holders within 1 mile of Grounds	349	15,812	2.2%
Bicycle	Permit holders within 3 miles of Grounds	2,577	15,812	16.3%
Long Distance Transit – 29N	Permit holders that live beyond 29N Park & Ride	1,604	15,812	10.1%
Long Distance Transit – 29S	Permit holders that live beyond 29S Park & Ride	308	15,812	1.9%
Long Distance Transit – 64E	Permit holders that live beyond I-64E Park & Ride	474	15,812	3.0%
Long Distance Transit – 64W	Permit holders that live beyond I-64W Park & Ride	442	15,812	2.8%

While the geo-coded residential dataset indicated that there were 15,812 employees, assumptions provided by UVA indicated that there were 13,605 full-time and part-time employees, or 12,856 full-time equivalents (FTEs). The discrepancy in the employee counts may be related to a number of factors, including the inclusion of temporary employees and research assistants, but cannot be fully explained by existing data. Therefore, an adjusted market potential was calculated by multiplying the market potential percents in Table 1 by the 12,856 FTEs. The results are shown in Table 2.

While approximately 9.0% of employees carpool, most do not take advantage of the relatively modest (10%) discount for joining the CavPool (UVA carpool program) program, and continue to purchase regular parking permits that they can split with their carpooling partner. In addition, some carpoolers continue to keep their permits for flexibility. Therefore, the potential carpool market was adjusted to remove existing carpoolers. After removing the estimated 1,157 existing carpoolers, or 9.0% of employees, the potential carpool market was reduced to 5,915 people, or 46.0% of UVA employees. As the geo-coded data used to define the potential market is comprised of parking permit holders only, the other existing alternative mode markets did not need to be adjusted.

A potential telework market was estimated assuming that 44% of employees are eligible to telework and that they could telework up to 1.5 days per week. This resulted in a telework market equivalency of 13.2% employees (44% of employees x 1.5 days per week / 5 days per week).

Table 2: Adjusted Market Potential

Market	Catchment Area	Market	Employees	Percent
Carpool	Permit holders that live beyond 1 mile of Grounds	5,915	12,856	46.0%
Local Transit	Permit holders within 1/4 mile of CTS/UTS route	1,655	12,856	12.9%
Walk	Permit holders within 1 mile of Grounds	284	12,856	2.2%
Bicycle	Permit holders within 3 miles of Grounds	2,095	12,856	16.3%
Long Distance Transit – 29N	Permit holders that live beyond 29N Park & Ride	1,304	12,856	10.1%
Long Distance Transit – 29S	Permit holders that live beyond 29S Park & Ride	250	12,856	1.9%
Long Distance Transit – 64E	Permit holders that live beyond I-64E Park & Ride	385	12,856	3.0%
Long Distance Transit – 64W	Permit holders that live beyond I-64W Park & Ride	359	12,856	2.8%
Telework	44% of employees teleworking 1.5 days per week	1,697	12,856	13.2%

1.2 Establish Reasonable Mode Shift Targets

The next step was to identify the share of each potential market that would have to be induced to shift from drive alone to an alternative mode in order to generate specific mode shifts. While not intended to prescribe specific actions, this analysis was intended to identify the mode shifts that could be reasonably achieved with incentive programs, marketing and any necessary infrastructure improvements. This analysis determined the percent of the potential carpool market that would need to switch from driving along to other modes to generate mode shifts of 0.5%, 1.0%, 2.0%, 2.5%, 3.0%, 4.0%, 5.0%, 6.0%, 7.0%, 8.0%, 9.0%, and 10.0%.

Table 3 shows the number of employees that would need to switch from drive alone to other modes to achieve specific mode share reductions. For example, to generate a 1% mode shift, 129 additional employees would need to commute by an alternative mode, whereas 643 additional employees would need to shift to an alternative mode to achieve a 5% drive alone reduction.

The challenge in achieving significant mode shifts is put into perspective when reviewing Table 4. It shows the percent of each market's potential that is needed to shift from drive alone to achieve specific drive alone mode share reductions. For example, to achieve a 5% mode shift from drive alone to carpool, 10.9% of the carpool market would have to be captured. This was calculated by dividing 643 commuters (a 5% mode share reduction) by the potential carpool market (5,915 commuters). Since the potential transit market is much smaller than the carpool market, 38.8% of the transit potential market would have to switch from drive alone to transit to generate a 5% mode shift. With a potential market of only 284 employees, the maximum mode shift that can be achieved by walking is approximately 2%, if nearly all employees that live within one mile of the UVA Grounds can be induced to walk to work. In this light is becomes apparent that any significant drive alone reductions must include a substantial carpool component.

Table 3: Additional Employees Needed to Shift to Alternative Modes to Achieve Specific Drive Alone Mode Share Reductions

UVA Affiliation	FY 2009 Drive Alone	FY 2009 Population	Drive Alone Mode Share Reduction											
			0.5%	1%	2%	2.5%	3%	4%	5%	6%	7%	8%	9%	10%
Faculty	78.7%	2,990	15	30	60	75	90	120	150	179	209	239	269	299
Staff	78.0%	9,866	49	99	197	247	296	395	493	592	691	789	888	987
Total		**12,856**	**64**	**129**	**257**	**321**	**386**	**514**	**643**	**771**	**900**	**1,028**	**1,157**	**1,286**

Table 4: Percent of Market Capture Needed to Shift to each Mode to Achieve Drive Alone Mode Share Reduction

Market	Drive Alone Mode Share Reduction											
	0.5%	1%	2%	2.5%	3%	4%	5%	6%	7%	8%	9%	10%
Carpool	1.1%	2.2%	4.3%	5.4%	6.5%	8.7%	10.9%	13.0%	15.2%	17.4%	19.6%	21.7%
Local Transit	3.9%	7.8%	15.5%	19.4%	23.3%	31.1%	38.8%	46.6%	54.4%	62.1%	69.9%	77.7%
Walk	22.7%	45.3%	90.6%									
Bicycle	3.1%	6.1%	12.3%	15.3%	18.4%	24.5%	30.7%	36.8%	43.0%	49.1%	55.2%	61.4%
Long Distance Transit – 29N	4.9%	9.9%	19.7%	24.6%	29.6%	39.4%	49.3%	59.1%	69.0%	78.9%	88.7%	98.6%
Long Distance Transit – 29S	25.7%	51.3%										
Long Distance Transit – 64E	16.7%	33.4%	66.7%	83.4%								
Long Distance Transit – 64W	17.9%	35.8%	71.5%	89.4%								
Telework	3.8%	7.6%	15.2%	18.9%	22.7%	30.3%	37.9%	45.5%	53.0%	60.6%	68.2%	75.8%

Note: Cells that are shaded require a drive alone reduction in excess of 100%, and are therefore impossible to achieve.

1.3 Drive Alone Reduction Packages

Using the results of the previous section, six drive alone reduction packages were identified, employing different combinations of mode shifts to achieve between a 9.5% and 11.0% drive alone reduction. Each package sought to maximize the potential shift mode shift for one mode.

- Package 1: Maximizes carpooling at 7.0%.
- Package 2: Maximum of Long-Distance Transit mode shift (1.0%)
- Package 3: Maximum of Local Transit mode shift (3.0%)
- Package 4: Maximum of Walk mode shift (0.5%)
- Package 5: Maximum of Bicycle mode shift (2.0%)
- Package 6: Maximum of Telework (2.5%)

A summary of the mode shifts associated with each strategy is identified in Table 5.

Table 5: Drive Alone Reduction Packages

Package	Mode Shift %						
	Drive Alone	Carpool	Long-Distance Transit	Local Transit	Walk	Bicycle	Telework
Package 1	-11.0%	7.0%	0.5%	1.0%	0.5%	1.0%	1.0%
Package 2	-9.5%	5.0%	1.0%	1.0%	0.5%	1.0%	1.0%
Package 3	-10.0%	4.0%	0.5%	3.0%	0.5%	1.0%	1.0%
Package 4	-9.0%	5.0%	0.5%	1.0%	0.5%	1.0%	1.0%
Package 5	-10.0%	5.0%	0.5%	1.0%	0.5%	2.0%	1.0%
Package 6	-10.5%	5.0%	0.5%	1.0%	0.5%	1.0%	2.5%

A 7.0% mode shift to carpooling was estimated as follows. Based on experience at other institutions, VHB assumed that a maximum of 30% of the carpool market (defined as both existing and potential carpoolers) could be expected to carpool in the best conditions with an aggressive package of financial incentives, TDM support programs, marketing and infrastructure. Of the total carpool market of 7,072 people (1,157 existing carpoolers plus 5,915 potential carpoolers, See Table 2) 1,157 currently carpool, which is 16.4% of the total carpool market. As shown in Table 6, this means that an additional 13.6% of the carpool market could be induced to carpool, or 962 additional employees. According to Table 4, an additional 13.6% of the potential carpool market equates to between a 6.0% to 7.0% mode shift to carpooling.

Table 6: Maximum Additional Carpoolers from the Potential Carpool Market

	Employee	Carpoolers	% of Total Carpool Market
Total Carpool Market	**7,072**	**2,119**	**30.0%**
Existing Carpoolers	1,157	1,157	16.4%
+ Potential Additional Carpool Market	5,915	962	13.6%

After a review of these packages, UVA identified a preference for Package 3, followed by Package 1 and Package 2. As shown in Table 4, for transit to achieve a 3% increase in mode share, 23.3% of the potential transit market would need to shift to commuting by transit. Based on this information, the UVA project team shifted to a higher preference for Package 1.

2 TDM Strategies

This section of the memo assembles a package of TDM strategies that approximate the mode shifts achieved by Package 3. Two methods were used to determine mode shifts, including the EPA Commuter 2.0 model and price elasticities.

2.1 Mode Shift Due to Non Financial Incentives Using the EPA Commuter Model

The EPA Commuter 2.0 model is a spreadsheet application that quantifies the impacts of TDM programs on mode share, vehicle miles traveled (VMT), and emissions. It was used to evaluate the combined drive alone mode share reduction of several non-financial incentives. These incentives include:

- Reduction in average CTS headway of 2 minutes (Route 4 headway is reduced to 15 minutes during peak periods).
- In-house carpool matching service
- Personalized carpool candidate get-togethers
- Preferential parking for carpools
- Policy of flexible work schedules to accommodate carpools
- Guaranteed Ride Home (existing)
- Full time transportation coordinator
- Increased telework eligibility from 44% of employees to 64% of employees.

This combination of TDM measures would result in a 3.4% reduction in drive alone trips, including a 2.9% increase in carpooling and a 0.5% increase in transit as shown in Table 7. The non-financial package of TDM measures was developed after considering 16 TDM scenarios. See the spreadsheets attached in the appendix to this memorandum.

Table 7: Mode Shift due to Non-Financial Incentives

Mode	Mode Shift
Drive Alone	-3.4%
Carpool	2.9%
Vanpool	0.0%
Transit	0.5%
Bicycle	-0.1%
Walk	0.0%
Other	0.0%
No Trip	0.2%

2.2 Mode Shift Due to Financial Incentives Using Price Elasticities

Based on input from UVA team, VHB looked at how a reduction in carpool fees would affect mode share. Due to economic conditions and the sensitivity around raising parking fees, it was determined that it would be more likely that a carpool parking permit fee reduction could be implemented than a SOV parking permit fee increase.

A price-elasticity model was used to estimate the effect of a reduction in carpool permit fees. Price elasticity of demand is defined as the responsiveness of the quantity demanded of a good or service to a change in its price. For the UVA TDM program, it is used to determine how a change in the carpool parking permit fee affects mode share.

TCRP Report 95 – Chapter 13, which synthesizes existing studies on parking price elasticities, reports that most parking price elasticities are between -0.1 and -0.3. That is, for every 10% increase in parking price there is a 1% to 3% reduction in parking. For the purposes of this study, it is assumed that these elasticities also apply to carpooling; a 10% reduction in the carpool permit price will result in a 1% to 3% increase in carpooling.

Table 8 shows the carpool mode share associated with varying permit discounts. For example, this analysis shows that the ability to split a parking permit fee with a partner, even if there is no discount provided by UVA, could result in between a 5.2% and a 15.7% carpool mode share (or an average of 10.5%). With an existing carpool mode share of 9.0%, UVA is within this range, and just below the average price elasticity of 10.5%[1]. A 50% carpool permit discount would result in a mode shift of 2.4% to 7.1% to carpooling (average of 4.8%), for a mode share of 7.6% to 22.9% (average of 15.2%).

Table 8: Carpool Mode Shares Associated with Carpool Permit Discounts

Carpool Permit Discount Scenario	Parking Permit Fee		% Reduction per Person	Carpool Mode Share			Carpool Mode Shift		
	Per Vehicle	Per Person		Low (0.1)	Avg (0.2)	High (0.3)	Low (0.1)	Avg (0.2)	High (0.3)
No Carpooling	$45.89	$45.89	0.0%	0.0%	0.0%	0.0%	-	-	-
No Discount (base)	$45.89	$21.85	52.4%	5.2%	10.5%	15.7%	-	-	-
10% Discount	$41.30	$19.67	57.1%	5.7%	11.4%	17.1%	0.5%	1.0%	1.4%
20% Discount	$36.71	$17.48	61.9%	6.2%	12.4%	18.6%	1.0%	1.9%	2.9%
30% Discount	$32.12	$15.30	66.7%	6.7%	13.3%	20.0%	1.4%	2.9%	4.3%
40% Discount	$27.53	$13.11	71.4%	7.1%	14.3%	21.4%	1.9%	3.8%	5.7%
50% Discount	$22.95	$10.93	76.2%	7.6%	15.2%	22.9%	2.4%	4.8%	7.1%
60% Discount	$18.36	$8.74	81.0%	8.1%	16.2%	24.3%	2.9%	5.7%	8.6%
70% Discount	$13.77	$6.56	85.7%	8.6%	17.1%	25.7%	3.3%	6.7%	10.0%
80% Discount	$9.18	$4.37	90.5%	9.0%	18.1%	27.1%	3.8%	7.6%	11.4%
90% Discount	$4.59	$2.19	95.2%	9.5%	19.0%	28.6%	4.3%	8.6%	12.9%
100% Discount	$0.00	$0.00	100.0%	10.0%	20.0%	30.0%	4.8%	9.5%	14.3%

New carpool trips would not be drawn exclusively from commuters that drive alone. An additional financial incentive to carpool would likely induce transit commuters to carpool as well. For this study it is assumed that 90% of new carpoolers would shift from driving alone and 10% would shift from transit, somewhat diluting the benefit of a carpool subsidy. Table 9 shows how the average mode share would shift to carpooling and away from driving alone and transit at each level of carpool permit discounts. There is no impact on walking or bicycling. With a 50% carpool permit fee discount, carpooling would increase by 4.8%, driving alone would decrease by -4.3%, and transit would decrease by 0.5%.

[1] Note: Even though the CavPool program provides a 10% discount to carpoolers, few employees have signed up for the program. Therefore, it is appropriate to compare existing conditions with a 0% discount scenario.

Table 9: Change in Mode Share

Carpool Permit Discount Scenario	Change in Mode Share						
	Drive Alone	Carpool/ Vanpool	Transit	Ped	Bicycle	Other	Total
No Discount (base)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10% Discount	-0.9%	1.0%	-0.1%	0.0%	0.0%	0.0%	0.0%
20% Discount	-1.7%	1.9%	-0.2%	0.0%	0.0%	0.0%	0.0%
30% Discount	-2.6%	2.9%	-0.3%	0.0%	0.0%	0.0%	0.0%
40% Discount	-3.4%	3.8%	-0.4%	0.0%	0.0%	0.0%	0.0%
50% Discount	-4.3%	4.8%	-0.5%	0.0%	0.0%	0.0%	0.0%
60% Discount	-5.1%	5.7%	-0.6%	0.0%	0.0%	0.0%	0.0%
70% Discount	-6.0%	6.7%	-0.7%	0.0%	0.0%	0.0%	0.0%
80% Discount	-6.9%	7.6%	-0.8%	0.0%	0.0%	0.0%	0.0%
90% Discount	-7.7%	8.6%	-0.9%	0.0%	0.0%	0.0%	0.0%
100% Discount	-8.6%	9.5%	-1.0%	0.0%	0.0%	0.0%	0.0%

The final mode shares are shown in Table 10. On average, a 50% carpool permit discount would reduce drive alone mode share from 78.1% to 73.8%.

Table 109: Average Mode Shares Associated with Carpool Permit Discounts

Carpool Permit Discount Scenario	Average Fee per Person	Mode Share						
		Drive Alone	Carpool/ Vanpool	Transit	Ped	Bicycle	Other	Total
No Discount (base)	$21.85	78.1%	10.0%	7.7%	1.9%	1.6%	0.7%	100.0%
10% Discount	$19.67	77.2%	11.0%	7.6%	1.9%	1.6%	0.7%	100.0%
20% Discount	$17.48	76.4%	11.9%	7.5%	1.9%	1.6%	0.7%	100.0%
30% Discount	$15.30	75.5%	12.9%	7.4%	1.9%	1.6%	0.7%	100.0%
40% Discount	$13.11	74.7%	13.8%	7.3%	1.9%	1.6%	0.7%	100.0%
50% Discount	$10.93	73.8%	14.8%	7.2%	1.9%	1.6%	0.7%	100.0%
60% Discount	$8.74	73.0%	15.7%	7.1%	1.9%	1.6%	0.7%	100.0%
70% Discount	$6.56	72.1%	16.7%	7.0%	1.9%	1.6%	0.7%	100.0%
80% Discount	$4.37	71.2%	17.6%	6.9%	1.9%	1.6%	0.7%	100.0%
90% Discount	$2.19	70.4%	18.6%	6.8%	1.9%	1.6%	0.7%	100.0%
100% Discount	$0.00	69.5%	19.5%	6.7%	1.9%	1.6%	0.7%	100.0%

Parking supply management through pricing is another TDM strategy and increasing SOV parking permit fees could generate the same mode shifts as carpool parking permit fee reductions. Table 11 shows the SOV parking permit fees that would be required to generate the same mode share reductions as carpool permit fee discounts. For example, to generate a 2.4% to 7.1% mode shift reduction would require raising the average parking permit fee by 30.5%, or to $59.88 per month.

Table 11: SOV Parking Permit Fee Increase Needed to Generate Similar Level of Mode Shift as Carpool Subsidy

Carpool Mode Shift Effect	SOV Fee	Fee Chg	Mode Share			Mode Shift		
			Low (0.1)	Avg (0.2)	High (0.3)	Low (0.1)	Avg (0.2)	High (0.3)
Carpool No Discount (base)	$45.89	0.0%	78.10%	78.10%	78.10%	0.0%	0.0%	0.0%
Carpool with 10% Discount	$48.69	6.1%	77.62%	77.15%	76.67%	0.5%	1.0%	1.4%
Carpool with 20% Discount	$51.49	12.2%	77.15%	76.20%	75.24%	1.0%	1.9%	2.9%
Carpool with 30% Discount	$54.28	18.3%	76.67%	75.24%	73.81%	1.4%	2.9%	4.3%
Carpool with 40% Discount	$57.08	24.4%	76.20%	74.29%	72.39%	1.9%	3.8%	5.7%
Carpool with 50% Discount	$59.88	30.5%	75.72%	73.34%	70.96%	2.4%	4.8%	7.1%
Carpool with 60% Discount	$62.68	36.6%	75.24%	72.39%	69.53%	2.9%	5.7%	8.6%
Carpool with 70% Discount	$65.48	42.7%	74.77%	71.43%	68.10%	3.3%	6.7%	10.0%
Carpool with 80% Discount	$68.27	48.8%	74.29%	70.48%	66.67%	3.8%	7.6%	11.4%
Carpool with 90% Discount	$71.07	54.9%	73.81%	69.53%	65.24%	4.3%	8.6%	12.9%
Carpool with 100% Discount	$73.87	61.0%	73.34%	68.58%	63.81%	4.8%	9.5%	14.3%

2.3 TDM Program and Mode Share Shift Estimate

Table 12 shows the mode shifts resulting from the combined TDM programs financial incentives (estimated using price elasticities) and non-financial incentives (estimated using the EPA Commuter 2.0 model). This program would include:

Financial Incentive analyzed through price elasticity information:

- A 50% carpool permit subsidy

Non-financial incentives included in the EPA commuter model :

- Route 4 Headway/ Route 5 Connection Improvement - Route 4 headway is reduced to 15 minutes during peak periods and the Route 5 has a better connection with the UTS system. Operating cost for increased Route 4 headways is approximately $146,000 per year
- In-house carpool matching service
- Personalized carpool candidate get-togethers
- Preferential parking for carpools
- Policy of flexible work schedules to accommodate carpools
- Guaranteed Ride Home (existing)
- Full time transportation coordinator

Overall there is approximately a 7.7% reduction in drive alone commuters.

Table 12: Mode Share

Mode	Existing Mode Share (FY 2009)	Mode Shift			Mode Share (FY 2010+)
		Non-Financial Incentives	Financial Incentives	Total	
Drive Alone	78.1%	-3.4%	-4.3%	-7.7%	70.4%
Carpool	9.0%	2.9%	4.8%	7.7%	16.7%
Vanpool	1.0%	0.0%	0.0%	0.0%	1.0%
Transit	7.7%	0.5%	-0.5%	0.0%	7.8%
Bicycle	1.9%	-0.1%	0.0%	-0.1%	1.8%
Walk	1.6%	0.0%	0.0%	0.0%	1.6%
Other	0.7%	0.0%	0.0%	0.0%	0.6%
No Trip	0.0%	0.2%	0.0%	0.2%	0.2%
Total	100.0%	0.0%	0.0%	0.0%	100.0%

Note: Non-financial incentives estimated using the EPA Commuter 2.0 Model and financial incentives estimated using price elasticities.

Table 13 shows how mode share is affected by the TDM program for faculty and staff[2]. FY 2009 represents existing mode share, before the TDM program is applied. FY 2010 represents mode share after the TDM program is fully applied. In reality, the full TDM program may be implemented over several years.

Table 13: Mode Share for Faculty, Staff, and Students

Mode	FY 2009			TDM Program Reductions	FY 2010		
	Faculty	Staff	Students		Faculty	Staff	Students
Drove Alone	78.7%	78.0%	4.8%	-7.7%	71.0%	70.3%	4.8%
Carpool/ Vanpool	9.4%	10.2%	5.4%	7.6%	17.0%	17.8%	5.4%
Transit	8.3%	7.6%	25.0%	0.0%	8.3%	7.6%	25.0%
Bike	2.4%	1.7%	15.5%	-0.1%	2.3%	1.6%	15.5%
Walk	1.2%	1.7%	48.5%	0.0%	1.2%	1.7%	48.5%
Other	0.0%	0.9%	0.9%	0.0%	0.0%	0.9%	0.9%
No Trip	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**

[2] While student mode share is shown, it is assumed the TDM program would have no affect them due to the high use of alternative modes.

3 Greenhouse Gas Reduction

Clean Air Cool Planet V6.3 is a spreadsheet application that estimates institutional greenhouse gas (GHG) emissions using assumptions about mode share, travel distance, and other travel characteristics. The spreadsheet was initially completed by UVA for FY 2008. This section updates the spreadsheet to reflect GHG reductions related to: 1) the elimination of CTS fares for UVA affiliated persons (FY 2009), and 2) the GHG reductions associated with the TDM program defined in this memorandum (FY 2010 and beyond).

Table 14 shows the reduction to emissions in FY 2009 and FY 2010. Between FY 2008 and FY 2009, commute emissions generated by employees and students were reduced due to the elimination of CTS fares for UVA affiliated persons. This reduction in emissions was described in Technical Memorandum #1. Between FY 2009 and FY 2010 emissions are further reduced for employees only, reflecting the TDM program defined above.

Table 14: Reduction to Scope 3 Emissions

Year	Faculty / Staff Commuting	Student Commuting	Solid Waste	Wastewater	Scope 2 T&D Losses	Total
FY 2008	36,502.2	1,443.8	1,416.7	2.1	17,877.6	57,242.5
FY 2009	35,797.8	1,436.4	1,416.7	2.1	17,877.6	56,530.7
FY 2010	34,133.9	1,436.4	1,416.7	2.1	17,877.6	54,866.8

As shown in Table 15, emissions generated by faculty and staff are reduced by 6.5% between FY 2008 and FY 2010. Scope 3 emissions, which include faculty, staff, and student commuting, solid waste, wastewater, and Scope 2 T&D losses, are reduced by 4.2% between FY 2008 and FY 2010.

Table 15: Percent Reduction to Scope 3 Emissions

Year	Faculty / Staff Commuting	Student Commuting	Solid Waste	Wastewater	Scope 2 T&D Losses	Total
FY 2008	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FY 2009	1.9%	0.5%	0.0%	0.0%	0.0%	1.2%
FY 2010	6.5%	0.5%	0.0%	0.0%	0.0%	4.2%

Overall emissions generated by UVA are reduced by 0.7% between FY 2008 and FY 2010 as shown in Table16.

Table 16: Impacts on Scope Emissions

Year	Total Scope 1	Total Scope 2	Total Scope 3	Total Emissions
FY 2008	86,989.2	180,762.3	57,242.5	324,994.0
FY 2009	86,989.2	180,762.3	56,530.7	324,282.3
FY 2010	86,989.2	180,762.3	54,866.8	322,618.3

4 TDM Program Cost Estimates

Table 17 summarizes the cost of each TDM program activity included in the mode share shift analysis and potential annual decrease in parking revenues. This table was updated on January 5, 2010.
As shown in Table 17 below, an estimated annual cost for each TDM program has been developed to formulate a TDM program unit cost per UVA faculty and staff persons.

Table 17: TDM Program - Estimated Annual Costs (updated January 5, 2010)

TDM Program Activity	Estimate of Annual Cost
Carpool 50% Subsidy Program	$280,700 annual subsidy
Full Time UVA Transportation Coordinator (TC)	$40,000 ($30,000 salary + benefits)
CTS Reciprocal Fare Program for UVA affiliated persons	*$200,000 per year (already committed)*
Route 4 Headway/ Route 5 Connection Improvement	$150,000 per year in operating costs
Occasional Parking Program	NA
ZipCar Program	+ $7,000
In-house carpool matching service	Transp. Coordinator & Rideshare
Personalized carpool candidate get-togethers	Transp. Coordinator& Rideshare
Flexible parking for carpools	Parking Office
Policy of flexible work schedules to accommodate carpools	Transp. Coordinator & HR promotion
Guaranteed Ride Home	Transp. Coordinator & Rideshare
Marketing	Transp. Coordinator, CTS, Jaunt, Rideshare & TJPDC
Marketing/ Prize TDM Program Budget	$10,000
Biennial Employee/ Staff Commuter Survey	$10,000/ in-house through CSR
Total Cost	*$683,700 ($483,700 of new investment)*

The cost of forgone parking revenue due to carpool permit fee reduction and the provision of the non-financial TDM programs listed above is approximately $47,000 per month, or $564,000 per year (see Table 18).

Table 10: Cost of Forgone Parking Revenue Due to both financial and non-financial TDM Programs

	Mode Share		# of Commuters		Monthly Permit Fee		Revenue per Month		
	Drive Alone	Carpool	Drive Alone	Carpool	Drive Alone	Carpool	Drive Alone	Carpool	Total
Existing	78.1%	9.0%	10,041	1,157	$45.89	$21.85	$460,760	$25,284	$486,044
Final	70.4%	16.7%	9,052	2,141	$45.89	$10.93	$415,381	$23,391	$438,771
Change	**-7.7%**	**7.7%**	**-989**	**984***					**$47,273**

*A small percentage of drive alone switch to transit, walk, bicycle and other.

The cost of forgone parking revenue due to the financial incentive of a 50% carpool permit subsidy only is approximately $31,000 per month, or $372,000 per year (See Table 19).

Table 19: Cost of Forgone Parking Revenue due to 50% Carpool subsidy

	Mode Share		# of Commuters		Monthly Permit Fee		Revenue per Month		
	Drive Alone	Carpool	Drive Alone	Carpool	Drive Alone	Carpool	Drive Alone	Carpool	Total
Existing	78.1%	9.0%	10,041	1,157	$45.89	$21.85	$460,760	$25,284	$486,044
Final	73.8%	13.8%	9,490	1,769	$45.89	$10.93	$435,476	$19,331	$454,807
Change	**-4.3%**	**4.8%**	**-551**	**612***					**$31,237**

* Some transit riders as well as drive alone commuters shift to carpooling

TDM Program Unit Cost

The unit cost of the TDM program noted in Table 17, separate from lost parking revenue, is $34.23 per faculty and staff member. ($440,000 divided by 12,856 faculty/ staff = $34.23 unit TDM cost) This cost could be off-set several ways including an increase in SOV parking rates as well as future growth in the demand for parking reflective of overall campus growth in faculty, staff and students. If the lost parking permit revenue is included, the unit cost increases by $28.94 to $63.17. However, the lost revenue may not materialize in the long-term due to institutional growth, or may be realized through loss of parking capacity or other changes in the demand for parking.

5 TDM Scenarios Tested Using the EPA Commuter Model

In addition to the price elasticity modeling approach, VHB also used the EPA Commuter 2.0 model to evaluate 16 TDM scenarios for UVA. Inputs that define each scenario are identified in Table20. The first scenario (#1) represents existing conditions. The next 10 scenarios (#2 - #11) apply a subsidy for carpool permits, ranging from 10% to 100% carpool subsidy. An additional carpool subsidy scenario (#12) looks at a 50% permit subsidy plus several programs to improve transit service. The remaining four scenarios (#13 - #16) look at non-financial TDM programs, including a 20% increase in employee eligibility for teleworking(#13), improved employer support for transit (#14), an reducing the headway on CTS Route 4 to a 15 minutes during peak periods (#15), and a combined scenario that combines all of the non-financial programs into one (#16).

The effect on mode share and the reduction in vehicle miles traveled (VMT) is shown in Table21 for each scenario. Using the EPA commuter model, a 50% carpool permit discount (Scenario #6) would result in a 1.2% drive alone mode share reduction and a 0.7% reduction in VMT. On the other hand, the combined non-financial incentives (Scenario #16) would result in a 3.4% drive alone mode share reduction and a 2.6% reduction in VMT. The EPA Commuter 2.0 model inputs assumed by VHB are attached for background information.

After a review of the results provided by the EPA Commuter 2.0 model, the consultant team concluded that the mode shifts associated with carpool subsidies were overly conservative. Therefore, the team decided to only use the EPA Commuter 2.0 model results associated with the combined non-financial scenario (#16).

Table20: EPA Commuter Model Inputs

Scenario Number:	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16
	Baseline	Carpool + 10% Discount	Carpool + 20% Discount	Carpool + 30% Discount	Carpool + 40% Discount	Carpool + 50% Discount	Carpool + 60% Discount	Carpool + 70% Discount	Carpool + 80% Discount	Carpool + 90% Discount	Carpool + 100% Discount	Carpool + 50% Discount & Transit	Telework Only	Transit Employee Support	Transit Headway Improve	Non Financial
Site Access & Transit Improvements																
Changes in Walk Access Time (min):																
Drive Alone																
Carpool																-2
Vanpool																
Transit																
Employer Participation Rate																100%
More Frequent Transit Service:																
Change in average headway (min)															-2	-2
Employment Served (% of area)															100%	100%
Faster Transit Service:																
Increase in daily VMT by Transit															3,000	3,000
Avg speed of affected transit vehicles																
Financial Incentives																
Changes in Monthly Cost:																
Drive Alone																
Carpool		$0.00	-$4.59	-$9.18	-$13.77	-$18.36	-$22.95	-$27.53	-$32.12	-$36.71	-$41.30	-$18.36				
Vanpool																
Transit																
Employer Participation Rate		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%				
Employer Support Programs																
Program Level (0 to 4 scale)																
Carpool	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	4
Vanpool	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transit	3	3	3	3	3	3	3	3	3	3	3	4	3	4	3	4
Bicycle	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Telecommute Avg Days per Week	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Flextime (% trips shift from peak)	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%
Alternative Work Schedule Programs																
Eligibility for Participation																
Flex Time	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Compressed 4/40	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Compressed 9/80	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Staggered Hours	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Telecommute	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	64%	44%	44%	64%
Not Eligible	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	36%	56%	56%	36%

Table21: EPA Commuter Model Results

Scenario Number:	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16
	Baseline	Carpool + 10% Discount (Existing)	Carpool + 20% Discount	Carpool + 30% Discount	Carpool + 40% Discount	Carpool + 50% Discount	Carpool + 60% Discount	Carpool + 70% Discount	Carpool + 80% Discount	Carpool + 90% Discount	Carpool + 100% Discount	Carpool + 50% Discount & Transit	Telework Only	Transit Employee Support	Transit Headway Improve	Non Financial
Mode Share Change																
Auto - Drive Alone	78.1%	0.0%	-0.3%	-0.6%	-0.9%	-1.2%	-1.5%	-1.9%	-2.2%	-2.5%	-2.9%	-3.8%	-0.2%	-0.4%	-0.3%	-3.4%
Auto - Carpool	9.0%	0.0%	0.3%	0.7%	1.0%	1.4%	1.8%	2.2%	2.6%	3.0%	3.4%	3.9%	0.0%	0.0%	0.0%	2.9%
Vanpool	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transit	7.7%	0.0%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.2%	-0.2%	-0.3%	-0.3%	0.1%	0.0%	0.5%	0.3%	0.5%
Bicycle	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	-0.1%
Walk	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Other	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
No Trip	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%
Vehicle Miles Traveled																
Baseline	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108	354,108
Reduction	0	0	634	1,286	1,957	2,613	3,321	4,047	4,792	5,556	6,339	9,080	705	1,758	1,255	9,236
Final	354,108	354,108	353,474	352,822	352,151	351,495	350,787	350,061	349,316	348,552	347,769	345,028	353,403	352,350	352,854	344,872
% Reduction	0.0%	0.0%	0.2%	0.4%	0.6%	0.7%	0.9%	1.1%	1.4%	1.6%	1.8%	2.6%	0.2%	0.5%	0.4%	2.6%

EPA Commuter 2.0 Model Inputs

General Info:

- Metropolitan Area Size 3
- Analysis Scope 2
- Analysis Area Type 2
- Office Employment 4,285
- Non-Office Employment 8,571

Mode Share

- Auto - Drive Alone 78.1%
- Auto - Carpool 9.0%
- Vanpool 1.0%
- Transit 7.7%
- Bicycle 1.9%
- Walk 1.6%
- Other 0.7%
- Total 100.0%

Trip Length (miles)

- Average person-trip length 16.3
- Average trip length -- vanpool 21.5
- Average trip length -- bicycle 2.6
- Average trip length -- walk 0.9

Occupancy

- Average Carpool Occupancy 2.1
- Average Vanpool Occupancy 7.2

Peak Periods

- Length of Peak Period (hours) 2
- Percent of Work Trips in Peak Periods 69.3%

Mode Coefficient

- Metropolitan Planning Organization Charlottesville
- In-Vehicle Travel Time – All Modes (min): -0.025
- Out-of-Vehicle Travel Time – Walk Time (min): -0.049
- Out-of-Vehicle Travel Time – Transit Wait (min): -0.049
- Cost – Auto Parking (cents): -0.005
- Cost – Transit Fare (cents): -0.005

Transportation
Land Development
Environmental
Services

Vanasse Hangen Brustlin, Inc.

99 High Street
Boston, MA 2110
617 728-7777
Fax 617 728-7782

Memorandum

To: Julia Monteith, AICP, LEED AP
Office of the Architect
University of Virginia

Date: 04/07/2010

Project No.: 32921.01

Project Name: UVA TDM Study Phase 2

From: Christopher Conklin
Susan Sloan-Rossiter

Re: Tech Memo #3

This memorandum summaries opportunities to partner with other organizations in the greater Charlottesville area for implementation of an expanded TDM program at the University of Virginia. A series of outreach meetings and teleconferences were conducted in the fall of 2009 with the following organizations:

- Charlottesville Transit System (CTS)
- The Thomas Jefferson Planning District Commission (TJPDC)
- Rideshare
- The City of Charlottesville, and
- Jefferson Area United Transportation (JAUNT).

The potential of each to support the UVA TDM program is summarized in the following sections.

Charlottesville Transit System (CTS)

CTS operates fixed route transit service within the City of Charlottesville and Albemarle County. The service is supported by funding contributions from the City and County based on the amount of service provided. The service area for CTS is largely within the City limits, serving a large number of UVA employees and students. CTS services are focused on the downtown transit center, but provide many connections to the UVA hospital area and Grounds.

There is currently an ongoing partnership with CTS to provide reciprocal-fares between CTS and UTS allowing fare-free rides for UVA ID holders. Expansion of this partnership is possible, but may require additional financial support to CTS by the University. There are several potential areas of partnership with CTS to support the TDM program. These include:

- Evaluation of CTS routes to identify potential service extensions to UVA within the existing hours of service operated by CTS (i.e. through improved efficiency/reduced layover)
- Evaluation of expanded routes and increased frequency
- Advocacy for greater state and federal funding for CTS operations.

Thomas Jefferson Planning District Commission (TJPDC)

The TJPDC serves as the metropolitan planning organization for Charlottesville, Albemarle County, Fluvanna County, Greene County, Louisa County, and Nelson County. Discussion with the TJPDC focused on the limited funding for new transportation facilities and services in the region and on the

Places 29 planning initiative. As part of this discussion, opportunities for park & ride and direct transit service along routes parallel to Route 29 were explored. The TJPDC does not operate transportation services in the region, but does help establish priorities for future investment. Areas for potential partnership with the TJPDC include:

- Advocacy for smart growth development strategies in regional planning,
- Advocacy for pedestrian, bicycle and transit improvements within the region, and
- Coordination of campus and regional sustainability initiatives

Rideshare

RideShare is a program of the TJPDC in cooperation with the Central Shenandoah Planning District Commission, working to reduce traffic congestion and increase mobility throughout Central Virginia and the Central Shenandoah Valley. Rideshare offers free carpool matching, vanpool coordination, and a Guaranteed Ride Home program. RideShare also works with employers to develop and implement traffic reduction programs. UVA currently coordinates with Ridershare to offer the benefits listed above. As such there is currently an effective partnership between Ridershare and the University. Areas for potential partnership with the TJPDC include:

- Increased presence of Ridehare at campus transportation events to market the programs available,
- "Behind the scenes" technical support for UVA's CavPool program, and
- Collection and distribution of information regarding vanpool and park & ride opportunities. Identification of Market Potential for Alternative Transportation.

City of Charlottesville

The City of Charlottesville owns and maintains many of the roadways on the east side of grounds. The City also has a plan for pathways and bikeways within the community. Discussions with the City of Charlottesville focused on the plans for these pathways and bikeways. Based on these discussions, it did not appear that new pathways and bikeways will reach Grounds within next few years. Areas for potential partnership with the TJPDC include:

- Advocacy for improvements to City streets including items such as pedestrian crossings, sidewalks, and bike routes,
- Advocacy for transit signal options such as transit priority on key transit corridors.
- Advocacy for local funding of CTS operations.

Jefferson Area United Transportation (JAUNT)

JAUNT operates a regional paratransit system including medical transportation, transportation for the disabled, service to distant regional park & rides, and home-to-work transportation. Initial discussions with JAUNT indicated the potential for expanded long-distance transit service for UVA employees. Areas for potential partnership with JAUNT include:

- Potential operator for long-distance commute/ park & ride service to UVA, and
- Advocacy for greater state and federal funding for JAUNT operations.

Summary

As described above, there is substantial opportunity for collaboration between UVA and regional transportation agencies and operators. The agency that presents the greatest opportunity appears to be Rideshare which is operating a TDM program at the regional level and already supports the UVA program. Greater marketing coordination and increased technical support are the key opportunities with Rideshare. There are longer-term opportunities for collaboration with the other agencies, but it does not appear that immediate cost savings or operational gains are likely with the majority of the agencies given the current funding environment. The opportunities outlined in this memorandum inform the analysis described in Technical Memorandum #2 and the TDM program matrix.