2011

University of Utah Bicycle Master Plan

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University of Utah Bicycle Master Plan

Acknowledgments

THE UNIVERSITY OF UTAH

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1 Introduction

Recent years have seen a dramatic shift in the attitudes of government agencies and the public towards bicycling. Salt Lake City has been part of this shift. Several new bikeways adjacent to the University of Utah have been constructed between 2009 and 2011. In 2011 alone, the City added or redesigned approximately 50 lane miles of on-road bikeways and 2.5 miles of shared-use path.. It is at this opportune time that the University has commissioned a Bicycle Master Plan to further encourage bicycling both to and within campus.

Public involvement efforts for the 2008 Campus Master Plan revealed strong community desires for bicycle facilities. The University of Utah has many transportation demand management measures currently in place, including excellent service provided by Utah Transit Authority (UTA) TRAX light rail and bus services as well as University-owned campus shuttle buses. The University is committed to encouraging bicycling as a major factor in its transportation toolbox. An increasing portion of University students, faculty and staff utilize bicycles to commute to campus.

While many inner portions of campus generally provide a pleasant bicycle experience, accessing the campus interior from elsewhere in Salt Lake City can be difficult. The University campus perimeter is surrounded by regional streets carrying heavy traffic. These streets act as barriers for bicyclists attempting to reach campus. The most significant barriers are Mario Capecchi Drive, North Campus Drive, South Campus Drive, and 500 South/Foothill Drive. Students coming to campus from off-site residential neighborhoods or satellite parking areas must cross these streets. In addition, the City-University transition often results in bicycle lanes on Salt Lake City streets dead-ending upon reaching campus, which requires bicyclists to either utilize shared-use interior pathways or poorly-adapted campus streets to reach their destinations. Transitions between city bikeways and campus pathways are often very difficult to make. Bicycle connections between transit stops and campus are not clearly defined and transit stop bicycle parking facilities need to be improved.

Walkways in the campus core are heavily utilized by bicyclists, pedestrians, skateboarders and other non-motorized users (as well as occasional motorized maintenance vehicles). This leads to conflicts between users, particularly bicyclists coming downhill at fast speeds and the pedestrians in their path. The University of Utah currently allows bicyclists on all pedestrian pathways and has a 10 mph speed limit. While the University Police Department can issue speeding tickets to bicyclists, this rarely occurs. Many bicyclists prefer not to use the pedestrian pathways and have expressed a desire for improved bicycle facilities such as dedicated bicycle lanes on University, City, and Utah Department of Transportation (UDOT) roadways.

This Bicycle Master Plan stands on the shoulders of previous planning efforts. It emphasizes both campus pathways and on-street facilities that connect the core campus area with surrounding neighborhoods. The Bicycle Master Plan gives recommendations for facilities and programs that are completely within the University's jurisdiction. It also provides recommendations for the University to work with external entities such as UDOT, UTA, and Salt Lake City to improve bicycling conditions in locations that are important to the campus environment, but which are not under the University's direct control.

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2 Goals & Objectives

The goals and objectives discussed in this chapter guided the development of this Bicycle Master Plan and will continue to guide bike facility implementation for years to come. Goals and objectives direct resource allocation, program operation and University prioritization. This section lays out a framework for how to create programs and facilities that increase bicycling to and within the University of Utah.

Goals and objectives should support the University's vision and describe the most important aspects of the University's programs, priorities and attitudes. Based on input from the project Steering Committee and Working Committee, the goals and objectives for the Bicycle Master Plan are broken down into the following six categories:

1. Health & Safety
2. Education & Encouragement
3. Enforcement
4. Transit Integration
5. Sustainability
6. Implementation
7. Evaluation

1. Health & Safety

Goal: Provide safe and accessible routes for bicyclists through campus.

Objectives:

a. Reduce crashes involving bicyclists, pedestrians and motor vehicles.
b. Provide bicycle and pedestrian facilities on campus that minimize/negate conflict between bicyclists and pedestrians.
c. Design facilities that encourage bicyclists to travel at safe speeds through campus, particularly in areas intersecting with pedestrian travel.
d. Promote safe bicycling.
e. Work with the medical school to promote the use of bicycles on campus as a healthier and less expensive alternative to driving.

2. Education & Encouragement

Goal: Implement comprehensive education and encouragement programs targeted at students, faculty and staff.

Objectives:

a. Educate students, faculty and staff on bicycle safety issues and encourage non-motorized transportation with programs that target pedestrians, bicyclists, public transit users and motorists.
b. Encourage campus residents (14% of students) to use a bicycle for travel within campus.
c. Install campus bikeway signage to assist with wayfinding and to increase awareness of bicyclists on campus.
d. Provide incentives and support facilities for individuals that commute by bicycle; grow the University of Utah bicycle culture.
e. Promote bicycling through University sponsored events.
f. Provide secure bicycle storage facilities and racks throughout campus.
g. Install showers, changing facilities and lockers for bicycle commuters.
h. Provide bikeway maps both online and in hard copy form.

3. Enforcement

Goal: Increase bikeway enforcement.

Objectives:

a. Increase attention by University Police and/or Commuter Services to bicycle-related violations by both motorists and bicyclists, and emphasize positive enforcement for safe bicycling behaviors.
b. Increase enforcement efforts to prevent the obstruction of dedicated bikeways and walkways.
c. Reduce aggressive and/or negligent behavior among drivers, bicyclists and pedestrians.
d. Ensure that all bicycle or pedestrian crashes are accurately recorded into a crash database for future analysis and monitoring.
e. Encourage bicyclists to report all crashes to University Police.
f. Reduce the number of bicycle thefts on campus.
g. Encourage students to register bicycles to aid in returning recovered bicycles if stolen.

4. Transit Integration

Goal: Improve the connection between bicyclists and transit on campus.

Objectives:

a. Provide convenient, covered and secure bicycle parking at TRAX stations and focal points on campus such as residence halls, instructional buildings and major campus employment centers.
b. Implement a bike sharing program on campus that is well integrated with UTA facilities.
c. Support UTA in increasing its bike capacity on all transit vehicles including TRAX and bus services.
d. Accommodate bicycles on all University-operated campus shuttles.

5. Sustainability

Goal: Support Campus Sustainability and Climate Action Plan.

Objectives:

a. Reduce commuting by single occupant vehicles to the University of Utah by increasing bicycle mode share.
b. Reduce emissions, energy consumption, and traffic congestion by increasing bicycle mode share.
c. Support the Climate Action Plan by accommodating campus expansion needs while reducing vehicular parking demand.

6. Implementation

Goal: Create a complete campus bikeway network that is integrated into existing and future external bicycle facilities.

Objectives:

a. Create a sustainable, dedicated source of bikeway funding within the annual University budget.
b. Update the overall University of Utah Campus Master Plan as appropriate to reflect recommendations contained within this Bicycle Master Plan.
c. Develop a continuous bicycle system with access to major activity areas and maintain the system so that it provides safe and convenient travel.
d. Eliminate bicycling barriers and hazards.
e. Avoid missed opportunities by ensuring all campus construction projects address projects and paths of travel as recommended in the Bicycle Master Plan.
f. Implement less-complicated and inexpensive projects first for efficiency.
g. Institutionalize bicycle transportation in all campus transportation planning, design, and construction activities.
h. Achieve silver-level Bicycle Friendly University status by 2016.
i. Achieve gold-level Bicycle Friendly University status by 2021.
j. Achieve platinum-level Bicycle Friendly University status by 2026 (information about requirements for obtaining the different degrees of the Bicycle Friendly University status is available at www.bikeleague.org).

7. Evaluation

Goal: Monitor implementation of the University of Utah Bicycle Master Plan.

Objectives:

a. Track the success of the Bicycle Master Plan as a percent completed of the total recommended bikeway system.
b. Track University mode share trends through expanded annual bicycle counts and commuter surveys.
c. Monitor bicycle and pedestrian crash data to reduce bicycle and pedestrian crash rates.

3 Summary of Existing Plans and Studies

The following plans and reports provided a baseline for the University of Utah Bicycle Master Plan due to their impact on campus growth and development:

- Campus Master Plan (2008, updated in 2010)
- University Design Standards (2011)
- Salt Lake City Bicycle & Pedestrian Master Plan (2004 and subsequent interim plans)
- Bicycle Initiatives at the University of Utah (1992)
- Utah Department of Transportation Pedestrian & Bicycle Guide (2008)
- Foothill Drive Corridor Study (2008)
- University of Utah Policy 2-323 (1995)
- Climate Action Plan (CAP) (2010)

3.1 University of Utah Campus Master Plan

The University of Utah is located in Salt Lake City just east of downtown. It has a combined total of 1,534 acres of land, including Main Campus, the Health Sciences Center, Historic Fort Douglas, Research Park and the Heritage Preserve. The University's mission is to serve the people of Utah and the world through the discovery and application of knowledge; through the dissemination of knowledge by teaching, publication, artistic presentation and technology transfer; and through community engagement.

The University of Utah Campus Master Plan was completed in 2008, with a mission to "guide efficient campus development for the next 20-year period in a way that gives physical form to the University's mission, vision, and academic program." The Campus Master Plan guides how the University as a physical entity interacts with its students, faculty, staff, and its surrounding community.

Several aspects of the Campus Master Plan's vision directly apply to bicyclists and expanding bicycle access to campus. The vision calls for:

- A lively campus that is a magnet for student, faculty, staff, and public life.
- A strong sense of entry and establishment of a distinct sense of place that is tied to the city and state.
- A campus that is a destination for the public, and which provides adequate facilities to support public activity, including parking and other services.
- Functional and sustainable transportation systems that better support bicycling on campus, including improved signage to promote safety and wayfinding.
- Capitalizing on the natural landscape setting, particularly reducing the visual and physical impact of surface parking.
- Integration of the principles of environmental, social, and economic sustainability into campus planning, design, and operations with the end goal of being leaders in environmental stewardship.

The statements above support the need for a visionary bicycle plan that can grow with the University and the community. The Campus Master Plan calls for a network of enhanced transportation connections, including a system to accommodate bicyclists. The University of Utah Bicycle Master Plan will be the culmination of that goal.

3.2 University of Utah Design Standards

The University of Utah Design Standards outline the policies, procedures and requirements for the construction of all new or remodeled facilities. As current bicycle facilities are upgraded and new bicycle facilities are recommended and built, they will have to conform to these standards. The following chapters of the Design Standards directly influence the Bicycle Master Plan.

- Chapter 3: Landscape Architecture
- Chapter 4: Civil Engineering
- Chapter 11: Campus Wayfinding

These chapters impact the Bicycle Master Plan in various ways. Chapters 3 and 4 outline the specific materials and construction methods that may be used for campus facilities. They will come into play when constructing new bike or shared-use paths that support and encourage intra-campus bicycle travel.

Chapter 11 is currently being revised. Wayfinding plays an important role in campus bikeway networks. In addition to providing relevant travel information such as distances and time to popular destinations, wayfinding advertises bike networks to potential users. Wayfinding also helps visitors and those who are new to campus orient themselves and find important campus locations.

3.3 Salt Lake City Bicycle & Pedestrian Master Plan (2004)

The University of Utah is directly influenced by the growth in bicycle infrastructure and culture in Salt Lake City. Likewise, campus bicycle facilities and policies have an effect on the city. Salt Lake City is rapidly expanding its bicycle network, particularly its network of on-street facilities. The city currently has 26 miles of shared-use paths, 168 lane-miles of bike lanes, 4.5 lane miles of green shared lane markings, and 58 lane-miles of signed shared roadways. Salt Lake City's ongoing bikeway development and encouragement of bicycle transportation will positively affect the University of Utah's bicycle accessibility and alleviate the pressure to expand campus car parking facilities.

The vision of the 2004 Salt Lake City Bicycle and Pedestrian Master Plan is to:

- Enhance the use of the bicycle for transportation and recreation, and walking for pleasure and mobility.
- Foster community respect for bicycling and walking.
- Promote bicycling and walking as ways to enhance personal health and improve the community environment.

The plan identifies the University of Utah as a significant activity node that generates high trip volumes. As such, it deserves special attention and consideration for supporting bicycle travel to the area. One action item from the 2004 Plan states that the city should "Develop a partnership with the University of Utah to better integrate City bicycle and pedestrian facilities and programs with campus planning and infrastructure." The University of Utah Campus Bicycle Master Plan will build on that effort by promoting coordination between the City and the University for the joint goal of getting people to and from campus by bicycle.

The City's 2004 Plan also mentions programs offered by the University of Utah's Lifelong Learning Program that focus on bicycle safety and maintenance. Programs play an important part in encouraging and promoting bicycling. Continued effort should be made to boost programmatic cooperation between the City and University.

3.4 Bicycle Initiatives at the University of Utah (1992)

This document is recognized as the University's first bicycle-specific planning document and was prepared by the Campus Bicycle Committee. Much has changed in the nearly 20 years since this document was produced. However, the themes are still equally important with additional improvement needed in each major recommendation . The major areas of recommendation contained within this document include Routes, Security, Maintenance and Education. The general proposals in the Bicycle Initiatives document include the following:

- Establish an extensive network of bicycle routes throughout the campus, making use of existing roadways (via striped bike lanes) wherever possible.
- Working together with Salt Lake City and the State of Utah, improve cycling access to and from the campus, and between different sections of the campus.
- Increase the number of bike racks and bike lockers on the campus so that bicycles can be securely stored once they arrive on the campus. Improve recovery of stolen bikes through a mandatory registration program.
- Establish mechanisms for direct reporting and repair of bicycle facilities.
- Initiate an aggressive education and safety program to develop and maintain a harmonious, mixed transportation system that includes cyclists, pedestrians, and motorists as equal partners.
- Develop a Bicycle Master Plan for the University and establish a standing committee to carry out and monitor the success of its proposals.

3.5 Utah Department of Transportation Pedestrian & Bicycle Guide (2008)

The Utah Department of Transportation (UDOT) has jurisdiction over all State roads, several of which serve the University of Utah and comprise most of the major roadways within and around the campus. These roads include:

- South Campus Drive.
- North Campus Drive from 100 South to Mario Capecchi Drive.
- Guardsman Way from Foothill Drive to South Campus Drive.
- Mario Capecchi Drive.
- Foothill Drive/500 South/400 South corridor.

UDOT Policy 07-117: *Routine Accommodations for Bicyclists and Pedestrians* is an important policy for the development of a balanced transportation system throughout the State of Utah. As new projects are developed or existing facilities are updated, the policy requires the projects to consider the needs of pedestrians and bicyclists. This policy could be key for developing bikeways within and surrounding the University given that many of the roads fall within UDOT's jurisdiction. The University should coordinate closely with UDOT on any new or modified State roads that travel within or nearby the University.

3.6 Foothill Drive Corridor Study (2008)

This study examines Foothill Drive between I-80 to the south and Rice-Eccles Stadium on the University of Utah's campus. The study found that Foothill Drive mostly serves regional travel to and from the University and its Research Park. The study calls for a "multi-modal approach" to "mitigate current and future peak traffic impacts." Among its recommendations are the addition of HOV/Transit lanes, additional turning lanes and various lane configurations to improve peak travel flow.

The project briefly addresses bicyclists' needs along this corridor, stating that bicyclists are "discouraged from using Foothill due to high traffic volumes and speeds" and that "alternative routes in the corridor are encouraged." The alternative routes identified are 2100 East and 2300 East. These routes have bike lanes that end between 0.5 and 1 mile south of the University. Recommendations in this study for the future accommodation of bicyclists along the corridor include:

- Improvement of parallel bicycle routes.
- Extension of the existing Parley's Crossing shared use path north to the Wasatch Drive/Broadmoor Street intersection.
- Construction of a new bike path through the Bonneville Golf Course to provide a more direct route from the Wasatch Drive bike route to Arapeen Drive.

3.7 University Policy 3-232: Operating Regulations for Bicycles, Skateboards, Roller Skates and Scooters

The purpose of University Policy 3-232 is "to set forth the regulations that govern the operation and use of bicycles, skateboards, roller skates and scooters on the campus of, or on other property owned, operated or controlled by, the University of Utah." This section outlines the proper speed at which bicyclists can ride their bikes when operating on a shared use facility (10 mph) and states that bicyclists must always yield to pedestrians. The policy aligns with all state laws pertaining to bicycling and also addresses proper bike parking procedures on campus. These procedures prohibit bicycles from being parked in public areas of buildings and from obstructing entrances or university thoroughfares.

3.8 Climate Action Plan

The Climate Action Plan provides a roadmap for the University of Utah to become carbon neutral by 2050 and establish itself as a leader in technology, policy and human solutions. Commuting to the University accounts for an estimated 30% of University related emissions (2007). Chapter 4D of the Climate Action Plan reviews sustainable transportation and envisions that by 2050 "Most people will rely on walking, bicycling, transit and carpooling rather than driving alone. The various academic, research, administrative, clinical, athletic, artistic and public venues of campus will connect by internal and regional public transit, bikeways, sidewalks and greenways." Strategies to realize this goal include:

- Promote all modes of alternative transportation, including carpooling, vanpooling, car sharing, bicycling and walking.
- Develop marketing campaign aimed at reinforcing positive benefits of using alternative modes of transportation; promote making a sustainable choice the norm.
- Educate new students, faculty, and staff regarding alternative transportation options and benefits.

- Work with ASUU, UTA, and Salt Lake City to upgrade and expand the U-Bike share/rental program.
- Improve walkability and universal access through environmental design. Work with the Center for Disability Services, Parking Committee, Bicycle Subcommittee and University of Utah Facilities Management Department to create accessible and safe routes throughout campus for all non-motorized users.
- Complete new bicycling master plan in fiscal year 2011 and improve bicycle routes to campus by integrating campus bicycle routes with Salt Lake City routes and improving gateways to campus.
- Design and construct new buildings with good bicycle parking, storage and bicycle rider amenities, and assess the need for new bicycle parking and secure storage at existing campus buildings using LEED-Neighborhood Design as a general guide.

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4 Summary of Existing Conditions

4.1 Introduction

This section presents the existing bicycling conditions at the University of Utah, as well as opportunities and constraints to improving bicycling on and off campus. It is organized into the following sections:

- Existing Bicycle Network
- Bicycle Parking & Utilization
- Multi-Modal Connections
- Bicycle Crashes & Safety
- Existing Bicycle Education & Programs
- Bicycle Counts
- Opportunities & Constraints

4.2 Existing Bicycle Network

This section presents the existing bicycle network within and surrounding the University of Utah. Bicycle facilities are categorized according to the facility types presented in the AASHTO *Guide for the Development of Bicycle Facilities*, plus three other types that are specific to the campus. Figures 4-3, 4-4 and 4-5 display the three bikeway classes defined by AASHTO. The three additional bikeway classifications are Bike Paths, On-Street Bike Paths, and Unpaved Shared-Use Trails.

4.2.1 Existing Facilities

Several types of bicycle facilities are available on or near campus. Each one is described in the following sections of this chapter. Table 4-1 displays the locations and lengths of the existing campus bikeways. Table 4-2 shows bikeways external to the campus. Most of the external bikeways extend well beyond the study area of this project. Lengths given for these facilities only include the parts within the defined study area. Map 4-1 shows the existing facilities.

Table 4-1: Existing University of Utah Bikeways

Facility Type	Segment	From	To	Length (feet)
Shared-Use Path	Foothill Drive	Sunnyside Avenue	Mario Capecchi Drive	3.800
Bike Lane	Wakara Way	Foothill Drive	Chipeta Way	3,000
	Arapeen Drive	Sunnyside Avenue	Wakara Way	2,950
	University Street	100 South	500 South	3,100
Bike Path	HPER Mall Path	Garff Business Building	HPER West Building	950
	Fort Douglas/HPER Mall Connector Path (temporary pilot project)	Heritage Center	HPER Mall Path	3,725
	North-South Path – Seg. 1 (temporary pilot project)	West end of Business Loop	Marriott Library	550
	North-South Path – Seg 2 (temporary pilot project)	HPER Mall Path	Olpin Union	850

Table 4-2: Existing External Bikeways

Facility Type	Segment	From	To	Length (feet)
Shared-Use Path	Popperton Park Trail	Virginia Street	Bonneville Shoreline Trail	3,500
Bike Lane	3rd Avenue	P Street	Virginia Street	2,400
	200 South	McClelland Street	University Street	2,400
	400 South	1300 East	University Street	400
	1100 East	500 South	700 South	1,500
	1300 East	600 South	Harvard Avenue	4,350
	800 South/Sunnyside Avenue	McClelland Street	Hogle Zoo	12,400
	Guardsman Way/ Greenwood Terrace	Foothill Drive	900 South	3,050
	1500 East	Michigan Avenue	Harvard Avenue	1,500
Signed Shared Roadway/Shared Lanes	Michigan Avenue/900 South	Greenwood Terrace	1500 East	650
	2000 East	Hubbard Avenue	Sunnyside Avenue	625
	South Temple	McClelland Street	University Street	2,380
	University Street	South Temple	100 South	775
Unpaved Shared-Use Trail	Bonneville Shoreline Trail	Popperton Park Trail	Approx. 2600 East	12,250

4.2.1.1 Unpaved Shared-Use Trail

The Bonneville Shoreline Trail runs along the foothills northeast of campus. Unpaved trails are typically used for recreational purposes. However, some bicyclists like to use them for commuting and transportation because of their scenic features and separation from vehicular traffic.

Figure 4-1: Unpaved Shared-Use Trail

4.2.1.2 Shared-Use Paths

Shared-use paths are paved facilities that typically accommodate bicyclists, pedestrians, and other users simultaneously. Conflicts can occur on shared-use paths because user types are not separated. Shared-use paths are popular with many bicyclists because they provide relief from vehicular traffic. A common point of conflict for path users occurs at intersections with roadways. Bridges and undercrossings at these intersections can help mitigate conflicts and improve overall path usability.

Bicycles are allowed access to all campus pathways; these paths are heavily used at peak times

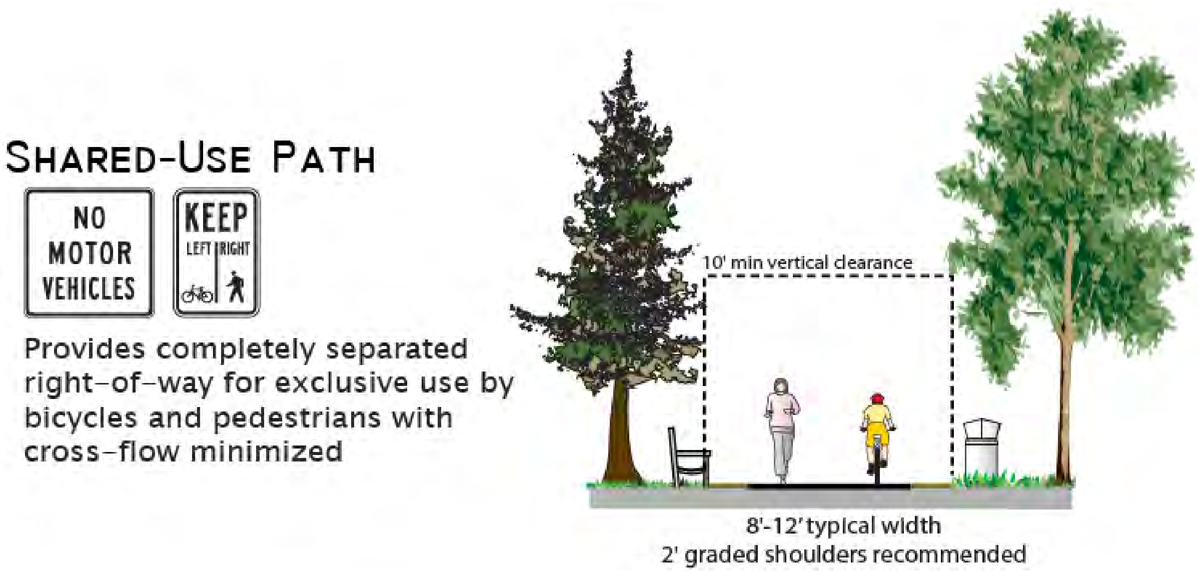
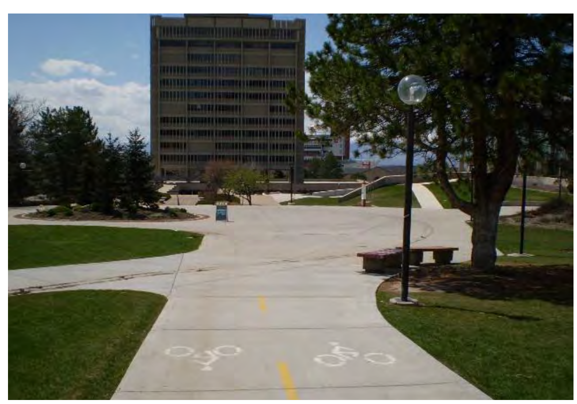


Figure 4-2: Shared-Use Path

4.2.1.3 Bike Paths

Bike paths operate and are designed similar to shared-use paths, but have a higher level of treatment indicating preferential intended use for bicyclists. The University of Utah has several bike paths on its campus that were developed in 2008 as a pilot program. In planning for bicycle transportation and movement through a campus, bike paths are favorable compared to shared-use paths because they can reduce conflict between bicyclists and pedestrians. In university environments, this conflict is present especially during passing periods, special events, and other times when campus activity is high.



The pilot bike paths were designed specifically for bicyclists

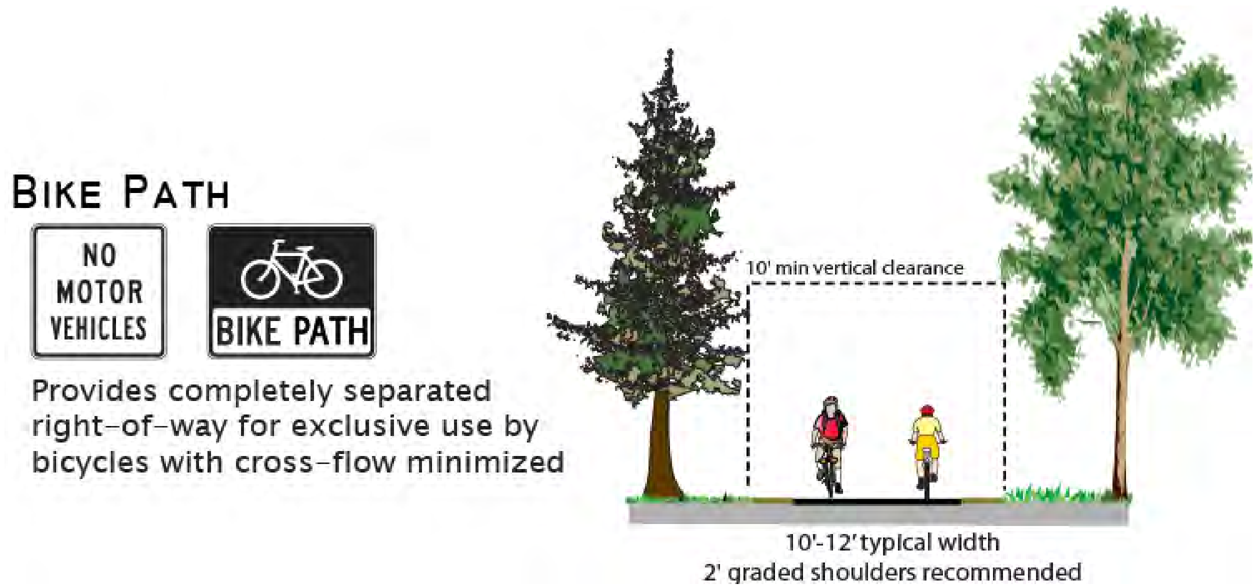


Figure 4-3: Bike Path

4.2.1.4 Bike Lanes

Bike lanes are on-street facilities that provide a separate operating space for bicyclists. Depending on the street configuration, bike lanes range between 4-7 feet in width. They are popular facilities for many bicyclists, though they require regular maintenance to remove road debris and snow during the winter months. Salt Lake City maintains several bike lanes adjacent to the campus core and within Research Park.

Bike lanes provide designated space for bicyclists to ride on the road, but can be hazardous if they are not regularly maintained

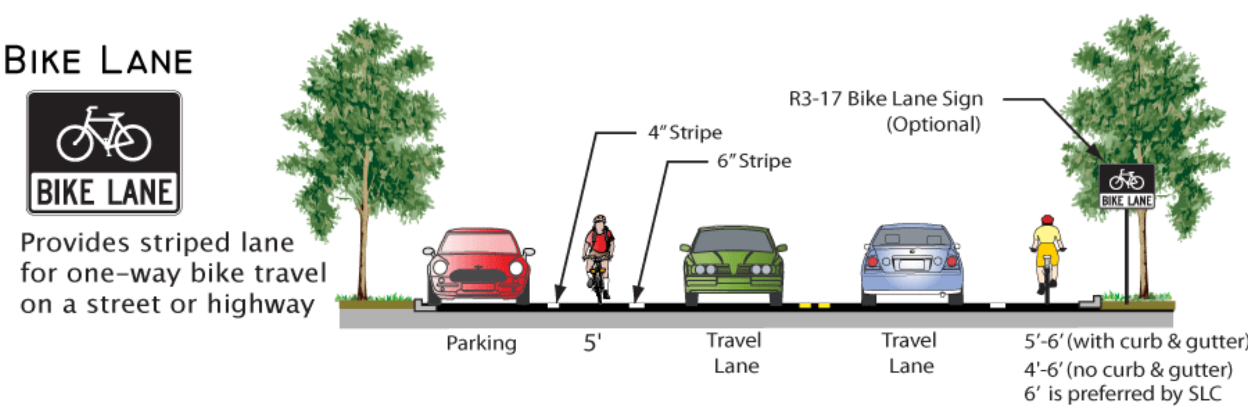


Figure 4-4: Bike Lanes

4.2.1.5 Signed Shared Roadways

These are facilities where bicyclists and motor vehicle drivers share the same roadway. Depending on the traffic volume on the individual roadway and skill level of the bicyclist, signed shared roadways vary in their efficacy as designated bikeways. Within the past few years, additional designs such as the Shared Lane Marking (i.e. "Sharrow") have been added to the Manual on Uniform Traffic Control Devices (MUTCD) to aid bicyclists and motorists on shared roadways. These markings are being used in Salt Lake City as a measure to correctly position bicyclists on roadways and to remind motorists that roads can be used safely and simultaneously. Salt Lake City also maintains several green shared lanes with a 4-foot-wide colored bicycle space within a vehicle travel lane.

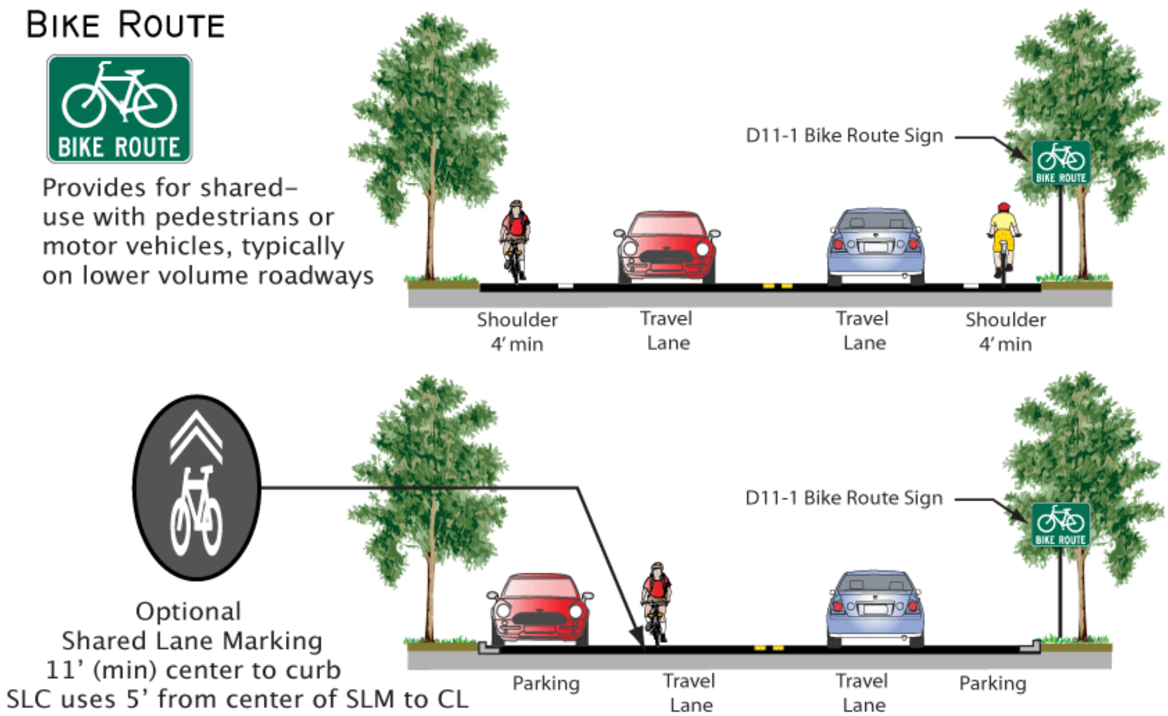
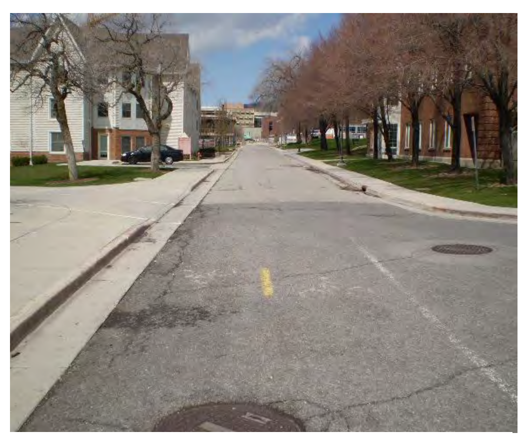


Figure 4-5: Bike Route

4.2.1.6 On-Street Bike Paths

The University of Utah also has an unconventional bike facility classified as an on-street bike path that was experimentally installed in 2008. It functions like a separated bike path, but is placed on a roadway where cars can also operate and drive over it when a bicyclist is not on the path. This type of facility is not standard according to federal, state or industry best practices, though it somewhat resembles a cycle track, which is an increasingly popular facility that many cities are using. If the University wants to improve the performance of this facility for bicyclists, it could consider upgrading it to a cycle track with improved markings and physical separation.



The on-street bike path pavement markings have faded since installation

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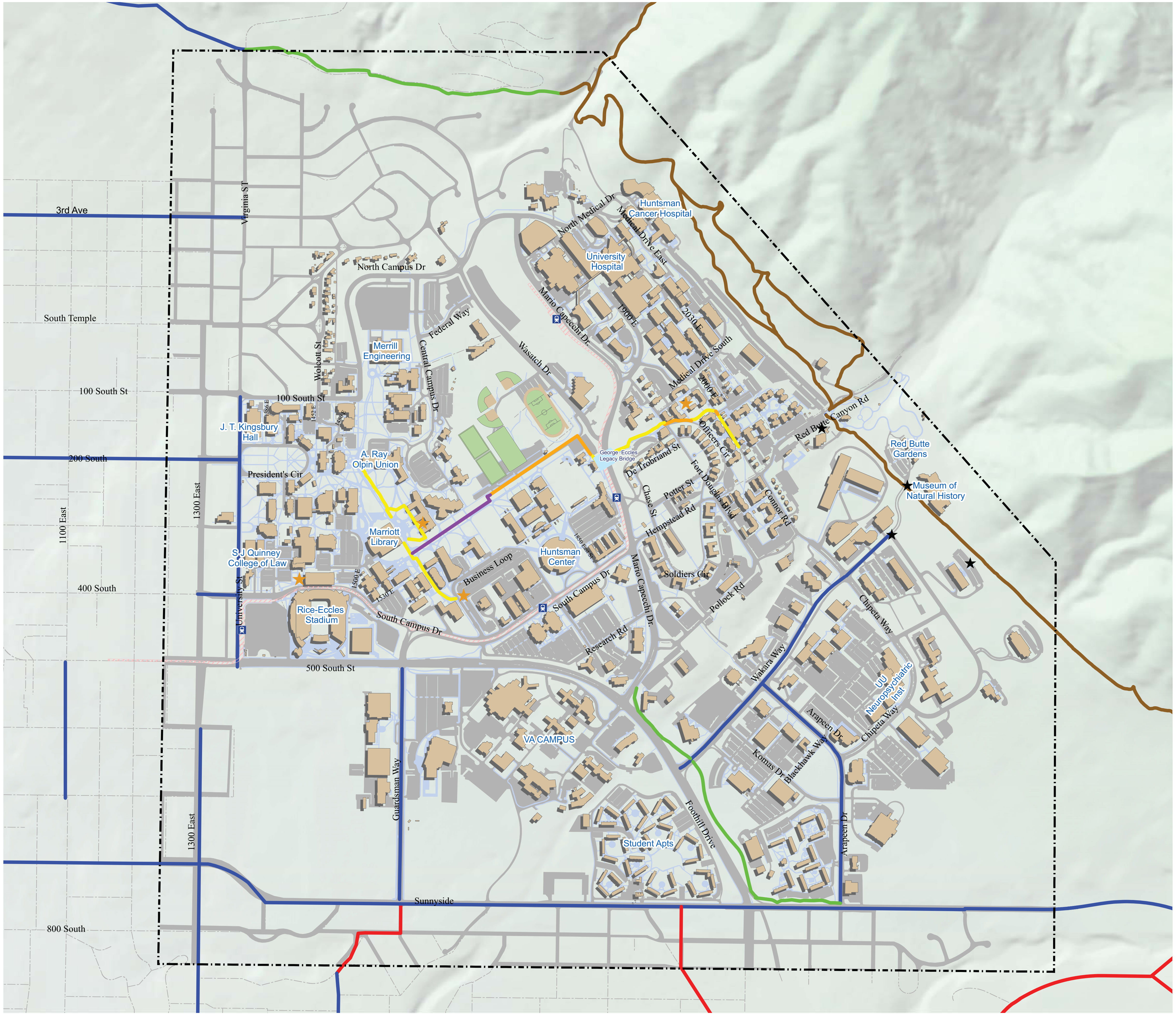

Legend

- Campus Study Boundary
- On-Street Bike Path -Temporary
- Paved Shared-Use Path
- Bike Path - Permanent
- Bike Path - Temporary
- Unpaved Shared Use Trail
- Salt Lake City Bike Lanes
- Salt Lake City Signed Shared Roadway
- Dero Fixit Stations
- Bonneville Shoreline Trailheads

N

0 500 1,000 2,000 ft

Date: October 14, 2011

Map 4.1

Existing Bicycle Facilities

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4.3 Bicycle Parking & Utilization

Bicycle parking on the University of Utah campus is provided through bicycle racks, lockers, and secure indoor storage spaces. The predominant bicycle rack type on campus is known as the "ribbon" or "wave" rack. This rack type was standardized in the late 1980s by the Director of Campus Design and Construction based on aesthetic, function, and cost factors[1]. At the time, the Campus Bicycle Committee endorsed this decision "with the knowledge that there are better options from a function standpoint". As of 2011, approximately 350 short-term bicycle parking locations currently exist on the main campus and medical campus. Short-term bicycle parking is meant to accommodate users who are expected to depart the rack within several hours of arriving. Based on the short-term bicycle parking inventory, the University of Utah has approximately 4,800 bicycle parking spaces.

Existing short-term bicycle parking near the Marriott Library

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Long-term bicycle parking is meant to accommodate employees, faculty and students that are expected to leave their bicycle for more than several hours. This parking is typically provided in a secure, weather-protected location. Bike lockers are one example of long-term bicycle parking. These lockers are available for use in several locations on the University of Utah campus, one of which is managed by UTA. UTA provides bicycle lockers at the Stadium TRAX Station for up to six bicycles. Lockers are $70 per year, plus a $30 refundable key deposit. Table 4-3 summarizes long-term parking availability.

Various departments manage other on-campus locker locations independently. All require a subscription for access. Locations include the Union Building, the School of Medicine, the Heritage Center parking garage (for residents only) and the Health Sciences Education Building (HSEB) parking garage. Both the Emma Eccles Jones Medical Research Building & HSEB have dedicated interior secure bicycle storage for occupant use on each floor. These rooms are accessible with keys given to employees and students who work inside.

The parking garage beneath HSEB also has two locked cages for commuters to secure their bicycles. The cages have wall-mounted brackets for hanging bicycles, and cables for securing bicycles. Space is available for $30 per year (Jul 1 - Jun 30).

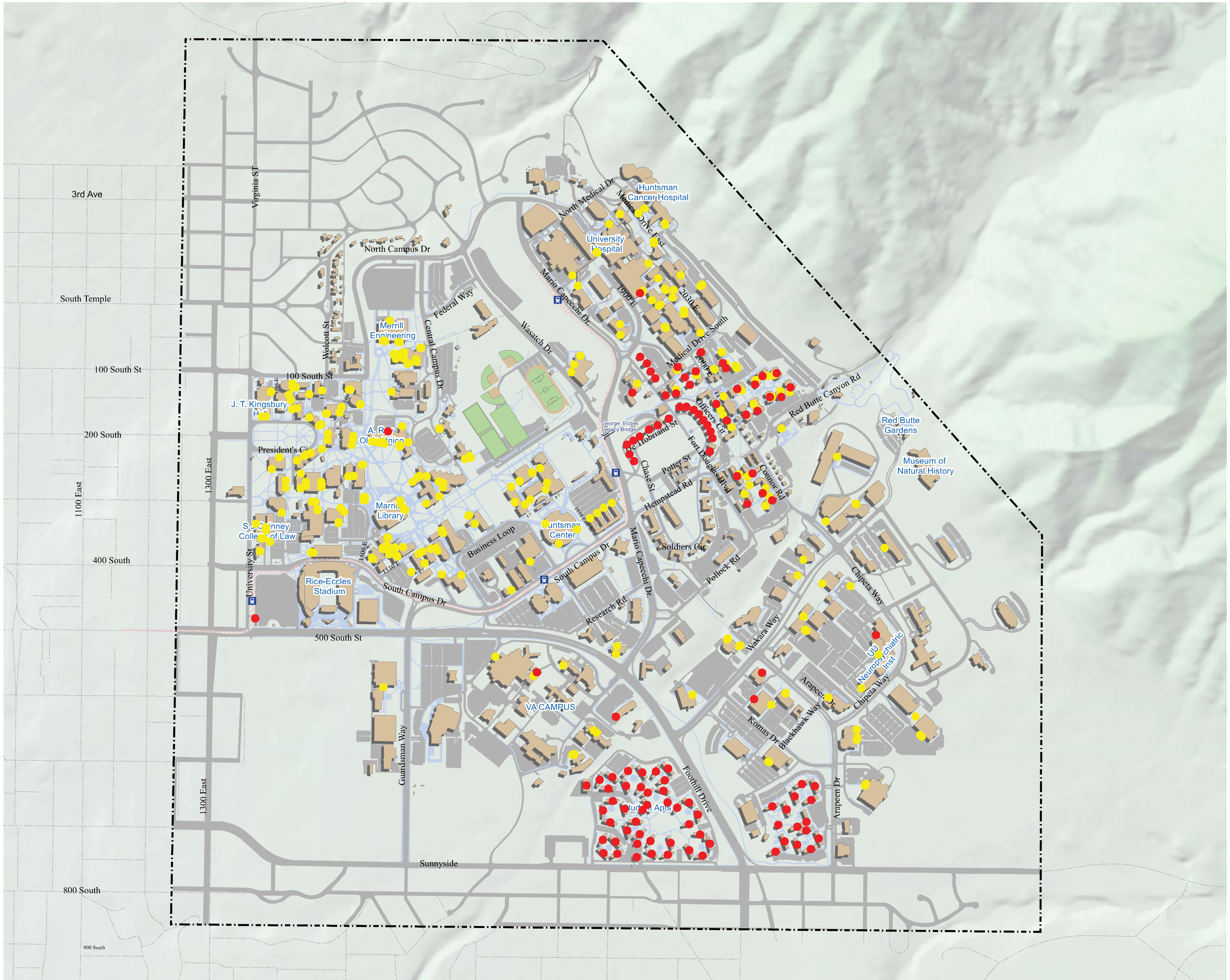
[1] "Bicycle Initiatives at the University of Utah", Campus Bicycle Committee, 1992

Bike lockers at the School of Medicine

Secure parking in the Heritage Center

Table 4-3: Existing Long-Term Bicycle Parking

Facility Type	Location	Capacity	Managed by
Lockers	UTA Stadium TRAX	6 bicycles	UTA
	Union Building (north side)	10 bicycles	Union Help Desk; (801) 581-5888
	Huntsman Cancer Inst. (Parking Lev. 3)	6 bicycles	
	School of Medicine (near loading dock)	10 bicycles	Christa Nemeth; (801) 581-4752
Secure Room	HSEB Garage	17 bicycles (hooks)	HSEB
	Heritage Center Garage	36 bicycles (hooks)	Flavio Lima; (801) 587-0857
	Ortho Parking Structure	17 bicycles (hooks)	
	Cardiovascular Research Training Institute		
	Emma Eccles Jones Medical Research Building		



Legend

- Inventoried Short Term Bicycle Parking
- Secured Bicycle Parking
- Campus Study Boundary

0 500 1,000 2,000 FT

N

Date: October 17, 2011

Map 4.2

Existing Bicycle Parking

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4.4 Multi-Modal Connections

The University of Utah is served by Utah Transit Authority's (UTA) TRAX light rail and fixed route bus transit. Students can ride all UTA trains and buses free with their UCard. The following four UTA TRAX stations on the University Red Line serve the campus community:

- Stadium (1349 East 500 South)
- University South Campus (1790 South Campus Drive)
- Fort Douglas (200 South Wasatch Drive)
- University Medical Center (10 North Medical Drive)

Of the four stations, all but Fort Douglas are served by a connecting bus route. Many different bus routes, including peak hour express routes, converge at the University and provide service to most of the Salt Lake Valley. All UTA buses accommodate bicycles via external racks. TRAX trains allow bicycles to be carried into the vehicles although no on-board racks exist.

Campus Shuttle

In addition to UTA's TRAX and bus services, a campus shuttle system runs throughout campus. These shuttles run from 6:00 am to 11:30 pm. There are six different routes differentiated by color. Live shuttle tracking and text message route locators allow students, faculty and staff to locate a desired shuttle and accurately predict waiting times. Currently, these shuttles do not have bike racks on them. However, if space is available students are allowed to bring their bicycles on board.

4.5 Bicycle Crashes & Safety

This section describes campus bicycle crash locations and contributing factors, as well as enforcement and educational programs to help the University improve bicycle safety. Safety is a major concern for both existing and potential bicyclists. For those who already bicycle, safety is typically an on-going concern. For those who do not bike, perceived lack of safety is one of the most frequently cited reasons for not riding. Identifying bicycle crash sites can draw attention to unsafe locations, particularly if multiple crashes occur at the same location and it is deemed problematic. Experience shows that bicycle crashes are typically underreported to the police. As such, the data below should not be considered to be comprehensive, but are still be useful for identifying locations where crashes frequently occur.

4.5.1 On-Campus Crashes

Table 4-4 describes campus bicycle crashes since the beginning of 2009 by injury type and location. The data are from the UPD, which collects information from all reported crashes.

Table 4-4: On-Campus Bicycle Crash Summary

Date	Injury	Location	Accident Notes
3-24-09	Bruises	Marriott Library	One bike sideswiped another bike. Only one person was injured.
7-9-09	Bruises	Marriott Library (West)	Single bicyclist drove into a marked construction hole.
8-11-09	Cuts and teeth loss	South Campus Drive & Guardsman Way	Bicyclist drove into a lowered train crossing guard arm.
8-17-09	Cuts and abrasions	N. Campus Drive (.13 miles north of Merrill Engineering)	13-year-old lost control of his bike after hitting a pothole.
10-27-09	No injury	Marriott Library Parking Lot	A car backed into a bicycle being used by a parking enforcement officer.
7-2-10	Bruises	Utah Museum of Natural History - Plaza	Bicyclist braked too hard on the front brakes and went over the top of his bike.
7-14-10	Cuts and head injuries	S. Campus Drive at Western side of Einar Nielsen Fieldhouse	Intoxicated man fell off his bike and hit his head.
7-16-10	Head injuries	SW Corner of Rice-Eccles Parking Lot	Bicyclist lost control of his bike and went down, hitting his head.
7-28-10	Broken collar bone	NW Corner of Rice-Eccles along S. Campus Drive	Bicyclist lost control of his bike and went down.
9-11-10	Bruises and abrasions	S. Campus Drive (130' SW of LDS Institute Building)	Bicyclist veered off sidewalk to avoid pedestrian, lost control of his bike and hit a pedestrian anyway. Pedestrian received a minor scrape to her knee and the bicyclist received a bruised hip.
9-14-10	Facial abrasions	Campus Bookstore Parking Lot	Bicyclist lost his front wheel and went down, hitting his face on the ground.
9-21-10	Bruises	South side of Orson Spencer Hall	Bicyclist lost control of his bicycle while riding on grass and went down, bruising his right side.
11-15-10	Bruises and brief loss of consciousness	SW corner of Jones Medical Science Building	Bicyclist lost control of her bike and went down in a parking lot.
12-06-10	No injuries	100 South & N. Campus Drive	Car/bicycle accident. Very minor damage. Cause and fault not determined.
2-22-11	No injuries	Mario Capecchi Dr. at Primary Children's Medical Center, Parking Lot entrance	Motorist drove into a bicyclist while exiting a parking lot.
3-23-11	No injuries	200 South and University Street	Bicyclist had a seizure and fell off his bike.

As the data in Table 4-4 demonstrate, bicycle crashes occur at varying places throughout campus. Reoccurring places on campus for crashes were parking lots, main roads running through campus, and places with high pedestrian activity. Reported crashes decreased from 2009 to 2010, and only two crashes have been reported for the current year to date. Also of note is that the bicyclist was at fault in all but three of the recorded campus crashes since the beginning of 2009.

4.5.2 Near-Campus Crashes

Roadways adjacent to the University are gateways to campus. Their level of comfort and safety influences individual decisions of whether to ride a bicycle or use other transportation modes. Table 4-5 displays the total number of reported crashes on Salt Lake City and UDOT roadways and intersections within a mile radius of the University of Utah Campus. The Salt Lake City Police Department (SLCPD) provided this data.

Table 4-5: Off-Campus Bicycle Crashes

Year	Crashes
2009	29
2010	14
2011 (through April)	2

The off-campus crash data reflect the same trend as the on-campus data, namely that the number of reported crashes decreased from 2009 to 2010. As mentioned earlier, this data must be examined with the understanding that bicycle crashes are historically underreported and that crash data is more useful in identifying trends or problematic parts of a city where multiple crashes have been reported.

In addition to tracking the location of off-campus bicycle crashes, the SLCPD data also recorded the date and time of day that the crashes occurred. The most common days for crashes were Wednesday and Thursday, with over 25% of all crashes happening on Wednesday. Two-thirds of all crashes occurred in the afternoon and 25% happened between the hours of 3-5 p.m. This coincides with the beginning of the afternoon commute when many students, faculty and staff are leaving campus.

Concentrations of reported crashes include:

- 8 along 900 East
- 6 along Sunnyside Avenue
- 6 along 500 South/Foothill Drive
- 5 at the intersection of Sunnyside Avenue & Foothill Drive
- 4 at the intersection of 900 East & 400 South

Map 4-3 displays all of the on-campus and off-campus bicycle crashes within the vicinity of the University. Off-campus bicycle crashes were frequent along streets with higher traffic volumes (Sunnyside, Foothill, etc.) and at intersections.

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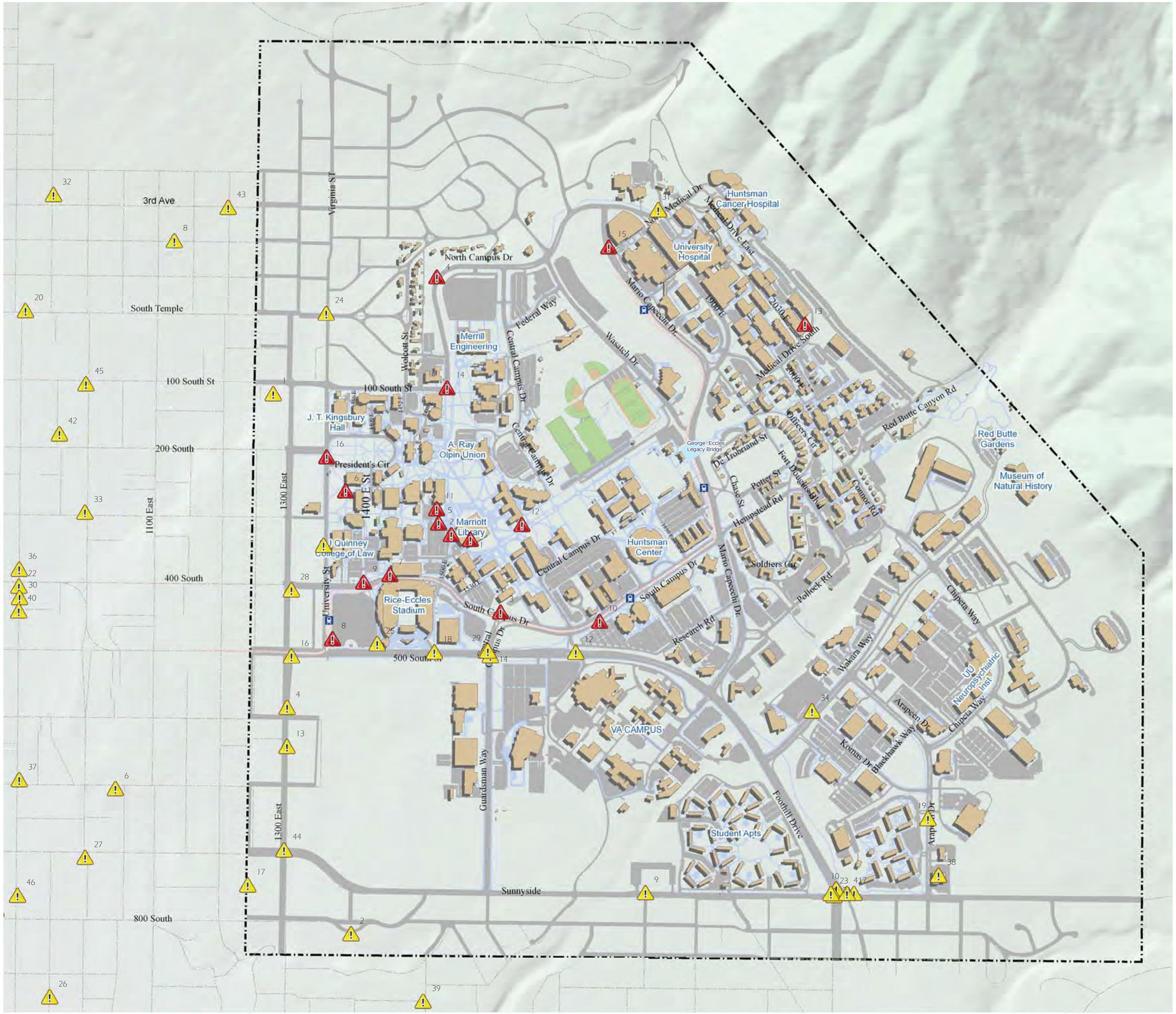

Legend

- Off Campus Collisions
- On Campus Collisions
- Campus Study Boundary
- Incident Reference

0 500 1,000 2,000 FT

Date: May 25, 2011

Map 4.3

Bicycle Collisions

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4.5.3 Enforcement

Each day hundreds of bicyclists travel through the University of Utah. To increase safety and reduce conflicts with pedestrians it is important to enforce proper riding practices to maintain a safe campus environment. Many bicyclists ride in an unsafe manner, including (but not limited to) the following behaviors:

- Riding in the wrong direction on roadways
- Riding on sidewalks next to roads where there is a dedicated bicycle facility available
- Disobeying traffic control devices such as traffic signals and stop signs
- Exceeding the bicycle speed limit (10 mph) on campus pathways

The UPD does not currently cite bicyclists on a large scale, but it does take a proactive approach to bicycle safety in several ways. One example is a child bike safety course taught at the University Student Apartment complex. The curriculum includes basic traffic safety and education about traffic signs and signals. The instruction also teaches parents how to properly fit a helmet on their child.

In 2011, the campus police also introduced their "Lock It or Lose It" campaign. Through the coordination of many university departments, the program provides a free lock to the first 200 students, faculty or staff who register for the program. ASUU has funded a second round of giveaways in 2012 though funding is not secure beyond this second round. Bicycle theft is an ongoing concern on campus. The UPD notes that the entire campus is at risk for bicycle theft and there are no locations with higher rates of theft.

Commuter Services can be empowered to issue bicycle-related citations in an effort to encourage compliance with campus rules and regulations.

4.6 Existing Bicycle Education & Programs

The University of Utah offers a diversity of bicycle-related educational opportunities and programs. From a recreational standpoint, the Outdoor Recreation Program rents mountain and town bicycles to students and others at a daily rate. Rates are competitive with local bicycle shops. Bike helmets and racks for vehicles can also be rented. In addition, mountain biking outings can be booked through the Outdoor Recreation Program.

The University offers the following classes through the Lifelong Learning Program:

Be a Bike Commuter

This class examines the practical challenges of bicycle commuting: bicycle, route, and clothing choice. It also discusses rules of the road, safety, emergency repair and making yourself presentable when you arrive at your destination.

Bicycle Repair Workshop I

This is a hands-on course that covers the basics of bicycle repair and maintenance. Tools and supplies are provided with the course fee. Class participants are expected to bring their own bike to work on.

Bicycle Repair Workshop II

This class is designed for more experienced mechanics and to prepare participants to address many of the maintenance issues that otherwise might require a visit to the bike shop.

Mountain Bike Progression for Women

Through firsthand experience, this class is designed to prepare individuals with better bike handling skills to improve safety and enjoyment while biking on off-street trails.

4.7 Bicycle Counts

The University and Salt Lake City performed bicycle counts in Fall 2010 with count forms provided through the National Bicycle and Pedestrian Documentation Project (http://bikepeddocumentation.org), but only Salt Lake City performed counts during the recommended week (second week in September) and the recommended time (5-7 p.m.). All three of Salt Lake City's count locations near the University (they conducted counts throughout the City) are duplicated between the two efforts. Both efforts tracked sidewalk riding and helmet usage. Map 4-4 shows the count locations for both efforts.

4.7.1 University Counts

The University conducted bicycle counts at seven locations between 7:30 and 9:30 am on October 5-6, 2010. In addition to tracking total numbers of bicyclists, the counts collected the number of bicyclists arriving on buses, riding on the sidewalk and wearing helmets. Table 4-7 highlights the major findings from the 2010 count effort.

Table 4-6: 2010 University Count Results

Location	Average weekday # of Cyclists	% Wearing Helmet	# On Buses	% On Road	% On Sidewalk
South Campus Dr @ Mario Capecchi Dr	50	41%	1	86%	14%
Legacy Bridge	78	25%	n/a	n/a	n/a
Sunnyside Ave @ Arapeen Dr	59	89%	2	93%	7%
Sunnyside Ave @ Guardsman Way	90	71%	12	87%	13%
100 South @ Wolcott St	21	33%	5	77%	23%
200 South @ University St	70	50%	17	86%	14%
400 South @ University St	64	48%	11	46%	54%

The count data provide a snapshot of bicycle activity within and surrounding campus during the morning peak travel time. There was a small decrease in bicycling from the October 5 to October 6, but otherwise much of the data proved to be consistent on both days. One noteworthy aspect is the relatively high percentage of bicyclists wearing helmets. College students are typically less likely to wear bicycle helmets than other demographic groups and many universities struggle with encouraging helmet use.

Subsequent count efforts should be conducted with additional locations added to capture greater perspective on bicyclists within and near campus. A bicyclist survey can add additional insight into the attitudes and behaviors of bicyclists, and may help identify issues that make biking to campus difficult. In September

4.7.2 Salt Lake City Counts

Salt Lake City conducted bicycle counts the week of September 14th, 2010. Counts were taken Tuesday, Wednesday and Thursday from 5 to 7 p.m. and on Saturday and Sunday from Noon to 2 p.m. This count effort was two weeks prior to the University's counts described in section 4.7.1 and experienced better weather. Counts are likely higher than those taken by the University because of the weather difference. They may also be higher because the p.m. peak period can be more pronounced than the a.m. peak. Salt Lake City's weekend counts displayed a slightly higher average degree of helmet use than during the week. Table 4-7 shows the results of Salt Lake City's counts near the University.

Table 4-7: 2010 Salt Lake City Count Results

Location	Weekday Avg	Weekend Avg	% Wearing Helmet	% On Road	% On Sidewalk
200 South @ University St	78	44	54%	74%	26%
Sunnyside Ave @ Guardsman Way	144	65	81%	79%	20%
Sunnyside Ave @ Arapeen Dr	162	96	95%	96%	4%

4.7.3 2011 Counts

In September of 2011, both the University of Utah and Salt Lake City conducted counts concurrently. Citywide, there was a 27.15 percent increase in bicycling measured. At the locations on and near the University of Utah campus, a much greater increase was recorded averaging 43 percent from 2010 to 2011 when weekday trips were averaged. Table 4-8 summarizes the weekday bicycle trips recorded on or near the University of Utah campus including a comparison to 2010 counts. Three sites were double counted in 2010, so Salt Lake City counts were references as they occurred in September.

Table 4-8: 2011 Weekday Count Average

Location	Weekday Average		
	2011	2010	% Increase
400 South & University St	131	64	105%
200 South & University St	90	63	43%
100 South & Walcott St	57	-	-
HPER-OSH	98	78	26%
Mario Capecchi & South Campus Dr	67	50	34%
Sunnyside Ave @ Arapeen Dr	184	162	13%
Guardsman Way & Sunnyside	174	144	22%
Totals	**802**	**560**	**43%**

4.8 Opportunities & Constraints

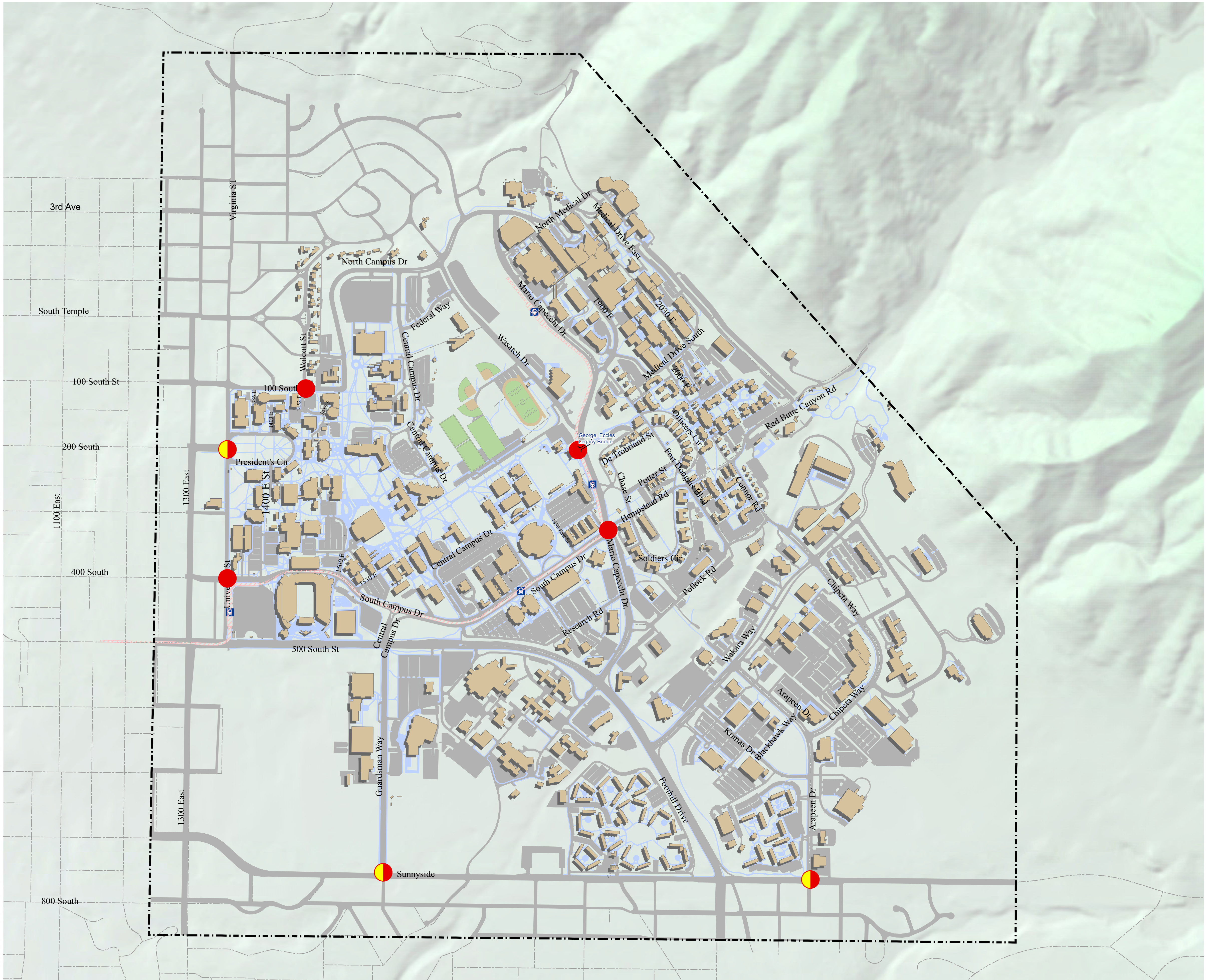
Fieldwork was conducted on and around the University campus in April-May 2011. This fieldwork, combined with examination of existing documents and research into the campus environment, has helped identify some opportunities and constraints that the University should anticipate as it implements this Bicycle Master Plan.

4.8.1 Opportunities

Opportunities exist for the University to create a safer, more convenient bicycling environment on campus. Some of these opportunities are described in the following sections.

4.8.1.1 Improved Connectivity

The University is located in a relatively bike-friendly city. Salt Lake City has been steadily providing more bicycle facilities on its streets in recent years, and there is at least one bike-friendly route to campus from all directions. In fact, the city was awarded a Silver Level Bicycle Friendly Community award in September 2010 in recognition of efforts to improve the safety and comfort of cyclists. However, many of these good bike facilities dead-end at or before the University. Opportunities exist to extend the routes through the campus and better connect them to one another, thus tying the campus areas to external bicycle facilities.



Legend

Count Locations

- University
- University & Salt Lake City
- Campus Study Boundary

0 500 1,000 2,000 FT

Date: June 21, 2011

MAP4.4

2010 Count Locations

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4.8.1.2 Bicycle Parking
Bicycle racks are spread throughout the campus. Some reach capacity while others stand empty. Opportunities exist at several sites to upgrade regular bicycle racks to high capacity racks or to racks that increase security by providing more points at which to lock a bicycle. Underutilized bicycle parking could be relocated to sites where additional parking is needed. Courtyards can be appropriate locations for installing additional bicycle racks that access high traffic buildings. Transit stations represent another bicycle parking opportunity. Increased bicycle parking at TRAX stations and bus stops would be a valuable asset to commuters by allowing them to leave their bicycle at the station, thus also freeing up space on the trains and buses.

4.8.1.3 Bicycling Culture
Many University students, faculty and staff already bicycle for fun, recreation or transportation. A large number of these people also are environmentally aware and are looking for ways to live more sustainably. This significant segment of the University population is likely to support efforts to make the campus environment more safe and comfortable for cyclists. Additionally, the University is located in a relatively bike-friendly city that provides good routes for commuters to get to the campus from virtually any direction.

4.8.1.4 Economic & Health Benefits
Increasing bicycle mode share to campus can have far reaching impacts on both the built environment and the wellbeing of students, staff and faculty. As the University expands and enrollment increases, it will be increasingly difficult and expensive to provide the necessary car parking accommodation commensurate with current mode share. Surface lot and structure parking spaces can exceed $10,000 and $35,000 per space including land costs respectively. Reducing parking demand will save the University valuable financial resources and conserve the finite buildable land for other purposes that further its mission.

4.8.1.5 Numerous Redevelopment Projects
A large amount of the University's property is currently under construction or will be in coming years. This is a wonderful opportunity to "piggyback" bicycle improvements on existing projects. It is usually cheaper to build bicycle infrastructure at the same time as larger construction projects than to build them as stand-alone projects. With careful planning, the University can remake itself into a more bike-friendly campus by coordinating appropriately with each of these projects.

4.8.1.6 University Environment
University environments are typically conducive to change and experimentation. The University of Utah is no different. The University wants to be a leader in sustainability and is open to ideas and projects that will establish them as leaders and pioneers for other institutions to follow. This mindset may lead to a greater willingness to adopt changes than would be present at less progressive institutions.

4.8.2 Constraints
Though there are many areas where the University of Utah has the opportunity to improve bicycling conditions, there are also constraints to safe and convenient cycling on campus. This section describes some of those constraints.

4.8.2.1 Gaps

Bikeway gaps exist in various forms, ranging from short missing links on a specific street or path corridor, to larger geographic areas with few or no bicycle facilities. Gaps can be organized based on length and other characteristics. Bikeway gaps can be classified into two main categories – spot gaps and connection gaps.

Spot Gaps

Spot gaps refer to point-specific locations lacking dedicated bicycle facilities or other treatments to accommodate safe and comfortable bicycle travel. They primarily include intersections and other vehicle/bicycle conflict areas posing challenges for riders. Examples include bike lanes on a major street "dropping" to make way for right turn lanes at an intersection, or a lack of intersection crossing treatments for bicyclists on a route or path as they approach a major street.

Connection Gaps

Connection gaps are missing segments (less than ¼ mile) on a clearly defined and otherwise well-connected bikeway. Major barriers standing between bicycle destinations and clearly defined routes also represent connection gaps. Examples include bike lanes on a major street dropping for several blocks to make way for on-street parking; a discontinuous off-street path; or a large road standing between a major bicycle route and campus.

A few connection gaps exist in and around campus. Examples include:

- 1,450 feet between the 200 South bike lanes and the North-South Pilot Path – Segment 2
- 1,000 feet between the Guardsman Way bike lanes and the North-South Pilot Path – Segment 1
- 1,000 feet between the Wakara Way bike lanes and the Bonneville Shoreline Trail
- 1,200 feet between the University Street and 1300 East bike lanes
- 1,950 feet between the University Street and Guardsman Way bike lanes
- 1,900 feet between the Fort Douglas/HPER Mall connector path and the Bonneville Shoreline Trail
- Gap in east-west travel west of the Marriott Library

4.8.2.2 Physical Barriers

Some sites are constrained by physical limitations that make providing bicycle facilities difficult. One such area is South Campus Drive between Rice-Eccles Stadium and the Fieldhouse. Walls on either side of the road allow for only two 12-foot roadway lanes and TRAX. Steep grades and pathways interrupted by stairways can also can act as barriers to bicyclists.

4.8.2.3 Inter-Agency Coordination

Most major roads within and surrounding the campus are owned by the State. Many of the secondary roads, especially in the Research Park area, are owned by Salt Lake City. Additionally, the Federal government owns the VA Hospital property and parts of Fort Douglas. This means that the University must partner with UDOT, the Federal government or Salt Lake City in order to affect change on most roadways.

4.8.2.4 Topography

The University campus is situated on a moderate-to-steep sloped bench, rising approximately 500 feet from University Street on the west to the Huntsman Cancer Institute on the east. This can be a barrier to casual riders that either lack the fitness to negotiate the terrain or simply do not want to arrive at their destinations sweaty.

Almost all of the medical facilities are located the furthest up the slope. These facilities provide large numbers of jobs, but many employees are likely discouraged from biking to work by a combination of the terrain and lack of a safe, convenient way to ride there. Currently, the University shuttles do not provide bike racks, so using TRAX is the only way to combine bicycling with transit in order to avoid riding up the hill to the medical facilities. Bicyclists arriving at the Medical TRAX station have no bicycle routes to reach destinations in the medical campus.

4.8.2.5 Commuter Campus

The University of Utah is more of a commuter campus than most other state schools of its size, meaning that fewer of its students live in on-campus housing. This puts added emphasis on connecting the campus to external bikeway networks. The commuter campus nature, coupled with lack of University ownership over most of the area roadways, makes providing bike-friendly routes to and within campus challenging. However, Salt Lake City has proven to be a good partner in the effort to provide good bikeways to campus.

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5 Needs Analysis

5.1 Introduction

The information for this chapter was collected through interaction with students, faculty and staff, and by reviewing other relevant documents and surveys. The chapter is organized into the following sections:

- Needs & Types of Bicyclists
- Master Plan Open House – May, 2011
- Master Plan Open House – August 2011
- Public Comments & Feedback
- Campus Bicycle Tour
- Demand & Benefits Analysis

5.2 Needs & Types of Bicyclists

Similar to motor vehicles, bicyclists and their bicycles come in a variety of sizes and configurations. This variation ranges from the type of bicycle a bicyclist chooses to ride (i.e. a conventional bicycle, a recumbent bicycle, or a tricycle) to the behavioral characteristics and comfort level of the bicyclist. Bicyclists by nature are much more sensitive to poor facility design, construction and maintenance than motor vehicle drivers. Bicyclists are more exposed to the elements and prone to physical injury due to the lack of protection of the bicycle compared to the automobile.

Bicyclist skill level also leads to a dramatic variance in expected speeds and behavior. Several systems of bicyclist classification are currently in use within the bicycle planning and engineering professions. These classifications can be helpful in understanding the characteristics and infrastructure preferences of different bicyclists. However, it should be noted that these classifications may change in type or proportion over time as infrastructure and culture evolve. Sometimes an instructional course can instantly change a less confident bicyclist to one that can comfortably and safely share the roadway with vehicular traffic. Bicycle infrastructure should be planned and designed to accommodate as many user types as possible with separate or parallel facilities considered to provide a comfortable experience for the greatest number of bicyclists.

The 1999 AASHTO Guide for the Development of Bicycle Facilities identifies bicyclists as being "Advanced or Experienced", "Basic or Less Confident" or "Children". These AASHTO classifications have been the standard for at least 15 years and have been found to be helpful when assessing people who currently bicycle. However, these classifications do not accurately describe all types of bicyclists, nor do they account for the population as a whole, especially potential bicyclists who are interested in riding but may not feel existing facilities are safe enough. Beginning in the Pacific Northwest in 2004, and then supported by data collected nationally after 2006, alternative categories have been developed to address the attitudes of Americans towards bicycling. Figure 5.1 illustrates the different viewpoints and their respective proportions.

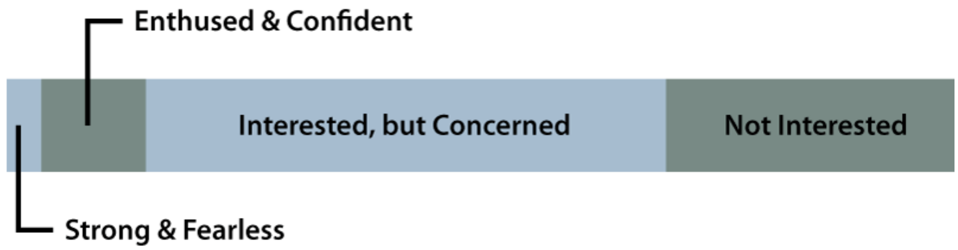


Figure 5.1: Bicyclist Types by Overall Population

Less than two percent of Americans comprise a group of bicyclists who are "Strong & Fearless". These bicyclists typically ride anywhere on any roadway regardless of roadway conditions or weather. They can ride faster than other user groups, prefer direct routes and will typically choose roadway connections – even if shared with vehicles – over separate bicycle facilities such as bicycle paths.

"Enthused & Confident" bicyclists encompass 10-13% of people. They are mostly comfortable riding on all types of bicycle facilities, usually prefer low traffic streets or shared-use pathways when available, and may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists including commuters, recreationalists, racers and utilitarian bicyclists.

The third group can be categorized as "Interested, but Concerned". They do not ride a bicycle regularly. 50-60% percent of the population falls into this category, which represents bicyclists who typically only ride on low traffic streets or bicycle paths under favorable conditions and weather. This group perceives traffic and safety as significant barriers that prevent them from bicycling more often. They may become more regular riders with encouragement, education and experience.

The remainder of the American population – 20-30% – are not bicyclists and perceive severe safety issues with riding in traffic. This group is classified as "Not Interested". Some people in this group may eventually give bicycling a second look and may progress to the user types above. However, a significant portion of them will never ride a bicycle under any circumstances.

University campuses offer a special environment that can vary significantly in modal trends from the rest of the nation and even the general population within the same city. Students, faculty and staff on university campuses typically walk and bicycle in much higher numbers than their counterparts elsewhere. Individuals commuting to campuses choose alternative means of transportation for varying reasons – to save money, to avoid the hassle of parking, for convenience and because it's more environmentally-friendly than driving alone. These factors support the University of Utah's desire to increase levels of bicycling and will ultimately assist the university in achieving this objective.

5.3 Master Plan Open House – May 2011

An open house was held for the Bicycle Master Plan on May 3, 2011 in front of the Olpin Union from 10 a.m. to 12 p.m. The objective of the open house was to speak to as many students, faculty and staff as possible and receive comments regarding existing bicycling conditions on the campus. This open house was advertised in an email sent to all students, faculty and staff, on a banner displayed over the main entrance to the Olpin Union and through the University Bicycle Subcommittee. This date was somewhat problematic because it fell during finals week, but it was the earliest possible date that could be scheduled due to the timing of the project initiation. Attendance was estimated at approximately 40 participants. At the open house, the project team provided two maps of campus. The first map showed existing bicycle facilities. The second map was blank so that participants could make notes on it. In addition, half-page surveys were distributed for students to take and return later with additional feedback on existing campus conditions. Laminated cards were also distributed to attendees and passersby with directions for how to comment via the project email address (ubikeplan@psomas.com) and Facebook page.

Open house participants discuss campus bicycling concerns with the project team

The mapping exercise proved popular with attendees who contributed a wealth of information about preferred routes, barriers, and concerns. Open house participants also filled out brief surveys that asked what issues on campus were limiting and what should be improved.

5.4 Master Plan Open House – August 2011

A second open house was held one week after the beginning of Fall semester classes in the Olpin Union from 4-7 p.m. More than 100 students, faculty, staff and local residents attended. Boards were displayed around the room displaying draft bicycle facility and program recommendations. Attendees were given the opportunity to help prioritize program-related recommendations by placing numbered dots on the boards. Comment forms were distributed and collected with many being returned the week following the open house. A full summary of open house and other comments can be found in Appendix E.

Open house participants view draft bicycle facility recommendations

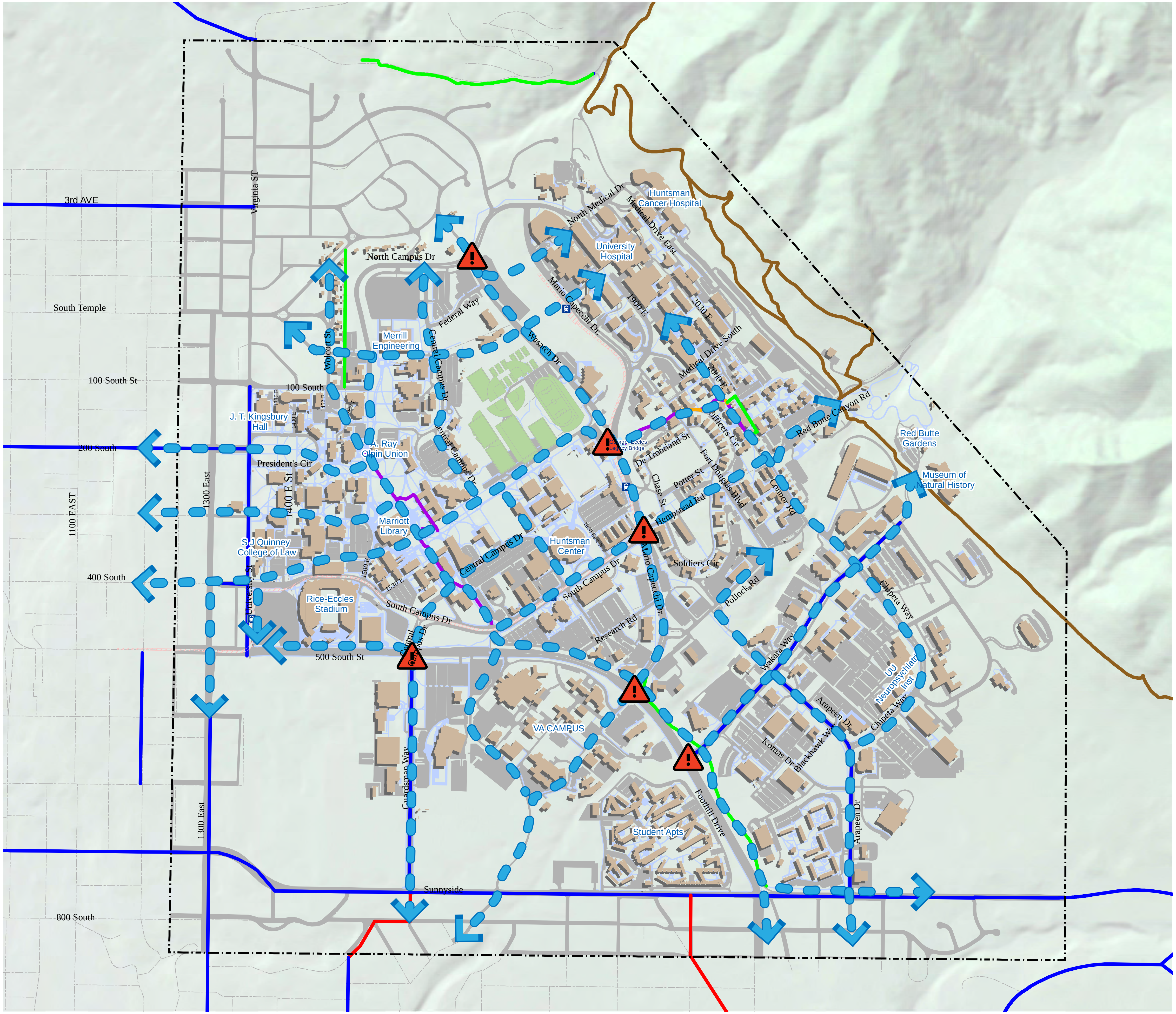
5.5 Public Comments & Feedback

Following both open houses, comments were received through the project email address, Facebook page and additional comment cards left on campus. A full summary of comments received can be found in Appendix E. Since there were no submission guidelines, the project email and Facebook comments were open-ended and covered a wide variety of themes. The completed comment cards provide the best comparison of concerns and issues with the bicycle system on campus. The majority of the concerns relate to the lack of a complete and accessible bicycle route system. Campus stairways were also noted repeatedly as a source of difficulty for bicyclists. The lack of bicycle signage and wayfinding, concerns about bicycles constituting a danger to pedestrians and various other concerns related to bicycle parking round out the subjects receiving the most comments. Table 5-1 summarizes the main themes contributed by the public.

Table 5-1: Summary of Public Feedback by Theme

# of Respondents	Themes Within Category
62 Total	Accessibility
16	Issues with lack of bikeways
15	Issues with stairs
15	Desire for better integration with city bikeways
13	Desire for better connections across campus
	• From lower campus to upper campus
	• From central campus to hospital areas and Research Park
11	Thought bikeable paths were plentiful
8	Issues with lack of wayfinding signs
	• To identify where bike paths go and to avoid trouble areas
32 Total	Safety
13	Conflicts with pedestrians
12	Safe routes to campus
	• Issues with traffic, intersection design, presence of routes
	• Foothill Dr, 1300 East, 400 South
18 Total	Convenience
12	Happy with amount of bike racks present
6	Need more room on transit
	• UTA Buses, TRAX, and even campus shuttle buses
5	Issues with lack of covered racks
4	Issues with lack of racks
	• South OSH, stadium, JFB, North Union
12 Total	Security
12	Want more secure parking
5	Satisfied with lockers here

Map 5-1 shows the bicycle desire lines that were evident from public feedback at the May open house and subsequent electronic submissions. These desire lines indicate where bicyclists would like to see continuous bicycle facilities or routes to both reach campus and circulate within it.



Legend

- Campus Study Boundary
- Existing University On-Street Bike Path
- Existing Paved Shared Use Path
- Existing University Bike Route-Pilot Project
- Existing Un-Paved Shared Use Trail
- Existing Salt Lake City Bike Lanes
- Existing Salt Lake City Signed Shared Route
- Campus Bicycle Desire Line
- Difficult Intersection

N

0 500 1,000 2,000

Date: May 27, 2011

Map 5.1

Campus Bicycle Desire Lines

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5.6 Campus Bicycle Tour

On May 4, 2011 the project consultant team joined representatives from the Working and Steering Committees on a bicycle tour of the University campus. Participants visited 24 locations that ranged from examples of successful bicycle facilities to areas with needed improvements. Several themes emerged during the tour. A brief summary is provided in the following sections according to these themes.

5.6.1 Bicycle and Pedestrian Conflicts

One of the most common themes is the issue of conflicts between bicyclists and pedestrians. This is visible in locations throughout campus including existing ADA ramps, high-speed downhill corridors like the HPER Mall and lower campus near President's Circle. Despite perceived concerns and stories of near crashes, only one pedestrian-bicycle crash has been reported to University Police from 2009-2011 (as of May 2011). Bicyclists also sometimes encounter conflicts with maintenance vehicles and golf carts.

5.6.2 Conflicts with Stairs

Bicyclists riding through campus must negotiate a web of pathways shared with pedestrians, many of which have substantial staircases with no accommodation for bicyclists. Where alternative ADA ramps exist, these routes frequently have narrow passages with railings that put bicyclists in conflict with pedestrians when both want to use the facility concurrently. There are numerous stair conflicts on campus, including but not limited to the Legacy Bridge, northwest corner of the Einar Nielsen Fieldhouse, the Marriott Library, the HPER Mall and the Huntsman Center.

Grass is worn by bicyclists bypassing the stairs just weeks after installation.

5.6.3 Steep Grades

The campus rises nearly 500 feet from University Street to the Medical Campus. Experience shows that many bicyclists use circuitous routes to gain elevation in order to keep the grade to a minimum. These routes are often complex and result in shortcuts that require illegal riding behavior. The campus bicycle tour followed several such routes. Future bicycle routes on campus should minimize grade, manage bicyclist speed and provide direct connections between campus destinations.

Pedestrians walking on the new HPER Mall Bike Path

5.6.4 Busy Roadways

Foothill Drive, North Campus Drive, South Campus Drive, Mario Capecchi Drive and Wakara Way are all busy roadways recognized as difficult corridors to ride a bicycle or to cross. Many of these roadways experience severe peak hour volumes with relatively uncongested non-peak periods. Formalizing alternate routes that largely avoid many of these corridors was recognized as a key strategy for attracting greater numbers of bicyclists. Providing bicycle accommodation along or on these roadways should be a long-term goal even if it is not found to be feasible in the near term. Table 5-2 summarizes the characteristics of roadways on and near the University of Utah campus.

Table 5-2: Busy Roadways

Roadway	Jurisdiction	Average Daily Traffic (2009)	Bicycle Accommodation
Foothill Dr	UDOT	45,000 (down from 51,000 in 1999) south of Sunnyside; 32,920 north of Sunnyside	No
Mario Capecchi Dr	UDOT	24,405 south of South Campus Drive; 32,630 north of South Campus Drive	No
Wakara Way	SLC	15,645	Yes – Bike Lanes
North Campus Dr	UDOT	12,540	No
South Campus Dr	UDOT	12,250	No
Arapeen Dr	SLC	4,858 (in 2008)	Yes – Bike Lanes
Sunnyside Ave	SLC	15,330	Yes – Bike Lanes
Guardsman Way	SLC	7,605	Yes – Bike Lanes

5.6.5 Getting to Campus

Routes to the University campus are not always clear or continuous for commuters. An example is Guardsman Way, which has a good bicycle lane south of campus, but which terminates at 500 South (Foothill Drive) with no obvious way to safely enter campus. Similarly, the highly used 200 South bike lanes end at University Street with no clear pathway from there into the heart of campus. For commuters bringing bicycles onto TRAX, little guidance is provided at stations to enable them to reach other destinations once they've disembarked from the train.

Bicyclists using TRAX must stand with their bicycles on board the vehicles

5.6.6 Substandard Existing Bikeways

In several instances, even if a designated bikeway exists, it does not meet contemporary engineering standards. Examples include narrow bike lanes, severe deterioration in the pavement seam in the center of the bike lane, faded bikeway or other pavement markings and challenging roadway crossings.

(Left) The Foothill Drive shared-use path crosses six lanes of dense traffic on Wakara Way to reach a refuge area; finding a gap is difficult during peak periods (Right) the Sunnyside Avenue bike lanes are narrower than AASHTO minimum widths and have a deteriorating gutter seam

5.7 Demand & Benefits Analysis

A key goal of the University of Utah Bicycle Master Plan is maximizing the number of bicyclists accessing campus. By increasing bicycle trips, the University can realize multiple benefits including improved health, reduced traffic congestion and optimization of existing campus land use (including parking facilities). In order to achieve this, a better understanding of the existing modal split to campus is needed. A bicycle and pedestrian model was developed to estimate usage based on empirical data and, where lacking, assumptions based on regional or national statistics.

This model uses data from the University and UTA. Basic data used for this model include enrollment numbers, employment figures and mode share information gathered from the 2007 UTA-University of Utah Commuter Survey.

Current walking, biking and transit mode shares were estimated from these data. Additionally, the model predicts the following benefits to the University and its surrounding community:

- Reduction of vehicle trips and miles driven
- Air quality benefits

Using growth projections provided by the University, the demand model was used to project future commuting statistics. The model can be manipulated according to more moderate or aggressive growth figures to predict future levels of walking, biking, transit use, vehicle trip/mile reduction and air quality benefits. Table 5-3 displays the current levels of daily transit usage and bicycling at the University.

Table 5-3: Existing Campus Bicycle Trips

Variable	Value	Source
Students (Graduate & Undergraduate)	30,819	http://www.obia.utah.edu/content/fastfacts.pdf
Faculty	2,759	http://infact.utah.edu/?page_id=13
Staff	16,910	http://infact.utah.edu/?page_id=13
Bike-to-campus mode share - student	1.5%	2007 UTA Survey
Bike-to-campus mode share - faculty	9.0%	2007 UTA Survey
Bike-to-campus mode share - staff	2.5%	2007 UTA Survey
Student bike commuters	462	student population * student bike mode share
Faculty bike commuters	248	faculty population * faculty bike mode share
Staff bike commuters	423	staff population * staff bike mode share
Total bike commuters	**1,133**	
Student transit-to-campus mode share	27.5%	2007 UTA Survey
Faculty transit-to-campus mode share	12.0%	2007 UTA Survey
Staff transit-to-campus mode share	20.5%	2007 UTA Survey
Transit bicycle commuters	1,227	Assumes 10% of transit riders access transit by bicycle
Total number of bike commuters	2,361	bike commuters + transit bicycle commuters
Campus bicycling trips subtotal	**4,721**	Total bicycle commuters x 2 (for round trips)

Based on the available data, an estimated 2,360 students, faculty and staff commute by bicycle daily to the University of Utah Campus. This is equivalent to approximately 4.7 percent of all trips to and from campus when including transit bicycle commuters. Both faculty and staff had substantially higher rates of bicycling to campus compared to students. However, the available data do not address the approximately 2,400 students who currently live on campus who may use bicycles internally for transportation. The above figures may also slightly under represent existing levels of bicyclists because the most recent survey data is from 2007, prior to the substantial increase in gasoline prices in 2008 and 2011, and prior to several new on-street bicycle facilities installed by Salt Lake City. The 2007 survey also asked respondents what modes of transportation they have used. In response, 4.3% of students indicated they had used a bicycle. This statistic reveals that nearly three times the number of students that primarily bicycle do so at least occasionally.

Tables 5-4 and 5-5 outline the current vehicle trip reduction and air quality benefits, respectively, that bicycle investments bring to the University.

Table 5-4: Current Estimated Benefits of Bicycling

Variable	Value	Source
Reduced Vehicle Trips per Weekday	3,040	Assumes 64% of bicycle trips replace vehicle trips based on existing mode share (2007 UTA Survey)
Reduced Vehicle Trips per Year	793,568	Reduced number of weekday vehicle trips multiplied by 261 (weekdays in a year)
Reduced Vehicle Miles per Weekday	13,786	Assumes average round trip travel length of 8 miles for adults/college students
Reduced Vehicle Miles per Year	3,598,167	Reduced number of weekday vehicle miles multiplied by 261 (weekdays in a year)
Reduced Number of Parking Spaces Needed	506	Assumes 33% of reduced vehicle arrivals on campus would require a parking space (Commuter Services)
Reduced Capital Expenditure if Spaces are Surface	$1,500,000	Assumes $3,000 average per space (does not include cost of land) (Commuter Services)
Reduced Capital Expenditure if Spaces are in Garages	$11,140,000	Assumes $22,000 average per space (does not include cost of land) (Commuter Services)
Estimated Reduced Capital Expenditure if Spaces Conform to Existing Ratio of Surface vs. Garage	$3,540,000	Currently 14,085 (79%)surface spaces and 3,851 (21%) garage spaces
Reduced Acreage Required for Surface Parking	5	Assumes 110 parking spaces per acre

The reduced vehicle trips to campus have a tangible financial benefit to the University because they translate into a reduction in the number of vehicle parking spaces needed to accommodate commuters. The University estimates the construction cost of a surface parking space to be between $2,500 and $3,500 and between $19,000 and $25,000 for a parking garage space. Based on existing statistics, it is reasonable to estimate that current levels of bicycling have reduced the need for the University to supply approximately 500 parking spaces, representing 5 acres of developable campus property. The financial benefit to the University from reduced parking demand is estimated at approximately $3.5 million. As bicycling levels increase, the University can expect to save even more money from parking reductions.

Table 5-5: Current Estimated Air Quality Benefits of Bicycling

Variable	Value	Source
Reduced PM10 (tons/weekday)	254	Daily mileage reduction multiplied by 0.0184 tons per reduced mile
Reduced NOX (tons/weekday)	6,876	Daily mileage reduction multiplied by 0.4988 tons per reduced mile
Reduced ROG (tons/weekday)	1,001	Daily mileage reduction multiplied by 0.0726 tons per reduced mile
Reduced CO2 (lb/weekday)	12,628	Daily mileage reduction multiplied by 0.916 lb per reduced mile
Reduced PM10 (tons/year)	66,206	Yearly mileage reduction multiplied by 0.0184 tons per reduced mile
Reduced NOX (tons/year)	1,794,766	Yearly mileage reduction multiplied by 0.4988 tons per reduced mile
Reduced ROG (tons/year)	261,227	Yearly mileage reduction multiplied by 0.0726 tons per reduced mile
Reduced CO2 (lb/year)	3,295,996	Daily mileage reduction multiplied by 0.916 lb per reduced mile

Source: EPA Report 420-F-05-022 "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks", 2005.

The Demand Model can also be used by the University to explore the impact of future modal split scenarios based on increases in bicycling. For example, increases in on-campus student housing units, students and faculty residing closer to campus, provision of safer and more attractive bicycle facilities, or changes in University policy could all contribute to higher bicycling rates. Table 5-6 provides a 2030 estimate of daily bicycle trips to and within the campus based on future enrollment and employment projections (based on April 2011 University Demand Analysis) within several aggregate bicycle mode share scenarios. Even a modest increase in bicycle mode share – well within existing figures at other public universities – could have a dramatic impact on campus circulation and reduce future demand for vehicle parking spaces.

Table 5-6: Future Bicycle Mode Share Projections

Aggregate Bicycle Mode Share	Number of Estimated Bicycle Commuters	Number of Daily Bicycling Trips	Percent Increase Over Current
Current – 4.7%	2,360	4,700	N/A
2030 – 7.5%	5,074	10,148	215%
2030 – 10%	6,765	13,530	287%
2030 – 15%	10,148	20,296	430%

Table 5-7 illustrates future parking implications of increased campus bicycle mode share. If the mode share reaches an aggregate 15% by 2030, the University will eliminate the need to construct more than 1,600 additional parking spaces (2,176 total with the current savings) as compared to demand projections based on existing mode share. This equates to nearly $12 million in today's dollars. The savings will likely be much higher because a greater percentage of future parking development will likely be structures rather than surface lots. Providing less parking saves the University valuable capital, while also preserving land for instructional or research facilities.

Table 5-7: Future Campus Parking Benefits (2011 Dollars)

Aggregate Bicycle Mode Share	Number of Estimated Bicycle Commuters	Number of Equivalent Campus Parking Spaces	Capital Savings to University
Current – 4.7%	2,360	506	$3,537,686
2030 – 7.5%	5,074	1,088	$7,605,987
2030 – 10%	6,765	1,451	$10,141,316
2030 – 15%	10,148	2,176	$15,211,975

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6 Infrastructure Recommendations

A primary objective of the University of Utah Bicycle Master Plan is improving the connectivity and quality of the on-campus bicycle network and support facilities. Additional on- and off-street bicycle facilities, safety improvements, and improved connections are needed to enable bicyclists to reach key destinations in a convenient and safe manner. This chapter presents the recommended bikeway, intersection, and bicycle support facility improvements that will create a comprehensive bicycle network on the University of Utah campus.

6.1 Bikeways

The bikeways recommended in this master plan consist of strategic routes that interact with the existing system to provide a high quality user experience and enable access to key destinations on and around campus. The bikeways are comprised primarily of the following classifications: shared-use paths, bike paths, bike lanes, and shared lanes. Spot improvements are also included in the recommendations to enhance the linear bikeways. A key objective in the planning process was providing bicyclists with key direct cross-campus bike paths, while reserving most of the existing system of campus pathways for local connections to buildings just as they are today.

The following subsections describe the bikeway recommendations for each classification. Each classification is further broken down into short-term, medium-term, and long-term recommendations. Short-term recommendations are those that could generally be completed within three years. They consist of facilities that can be constructed through re-striping of existing roads or pathways, striping of new paths on current campus pathways, inclusion within campus redevelopment projects that are expected to be complete by 2014, or new construction that does not require major modification of existing infrastructure.

Medium-term recommendations consist of facilities that could be constructed within four to nine years. They require moderate changes to existing infrastructure, longer coordination times, environmental review, higher costs relative to short-term facilities, or could be constructed along with campus redevelopment projects planned for the 2015-2020 time period. Long-term recommendations are those that would require major changes to existing infrastructure, significant funding, or could be accomplished through currently undefined campus redevelopment projects that likely would not occur before 2020. The anticipated time horizon for long-term recommendations is 10 years or longer.

Maps 6-1, 6-2, and 6-3 show the recommended short-, medium-, and long-term bikeways, respectively. In each of these maps, the two scenarios not being highlighted are shown in the background as dashed gray lines. For example, on Map 6-1 the colored lines represent short-term bikeways, whereas the medium- and long-term bikeway recommendations are shown as dashed gray lines. Existing bikeways and bikeways proposed for the near future by Salt Lake City are also shown on these maps. Map 6-4 shows all scenarios superimposed.

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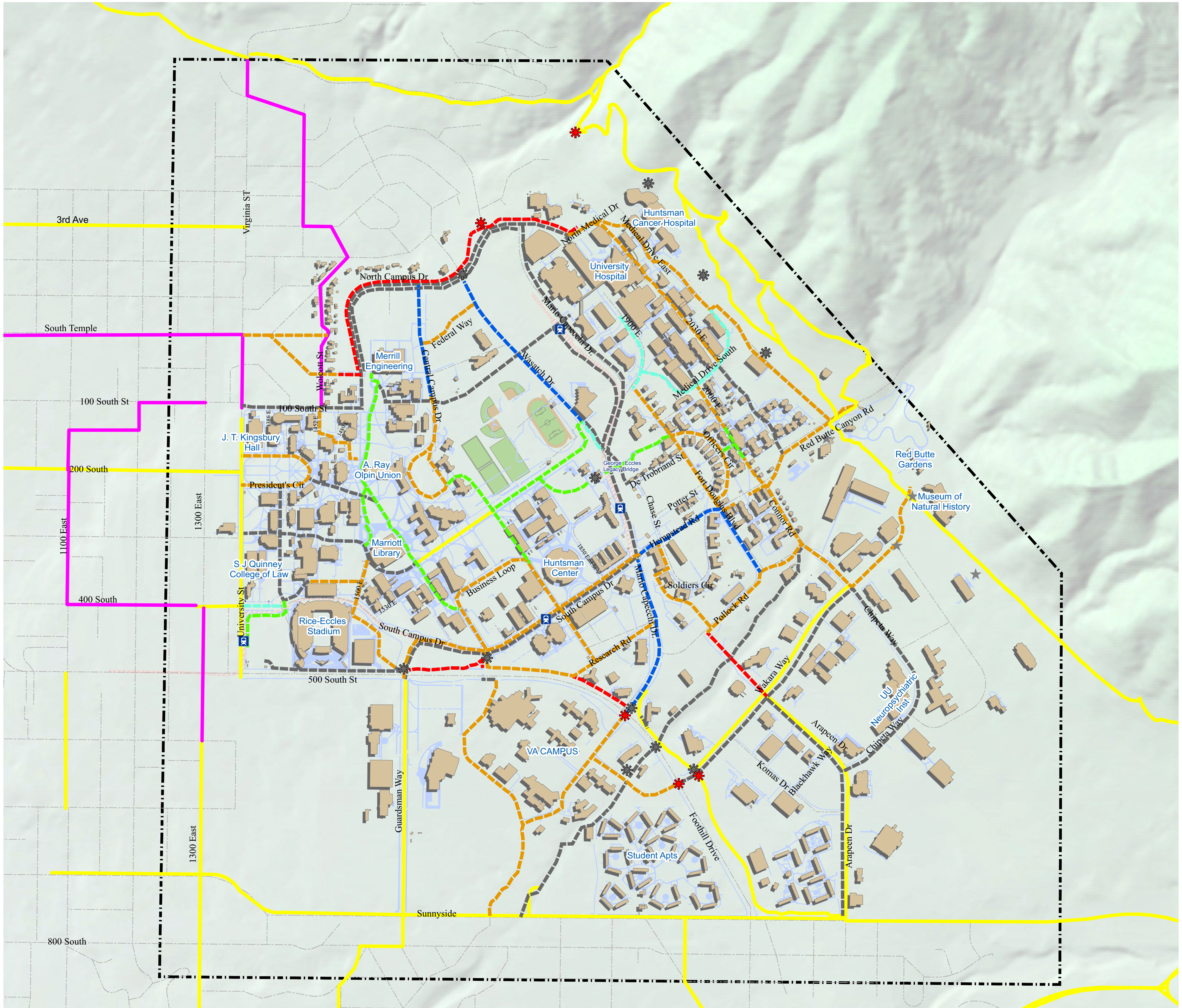

Legend

Existing and Proposed Bikeways

- Existing Bikeways
- Proposed SLC Bikeways
- Existing Bonneville Shoreline Trailheads

Recommended Bikeways - Short-Term

- Shared Lane
- Bike Lane
- Bike/Shared Lane Combo
- Bike Path
- Shared Use Path

Recommended Bikeways - Medium/Long-Term

- Medium/Long-term Bikeways

Recommended Spot Improvements

- Short-Term
- Medium/Long-term

N

0 500 1,000 2,000 ft

Date: October 14, 2011

Map 6.1 Recommended Short Term Bicycle Facilities (2011-2014)

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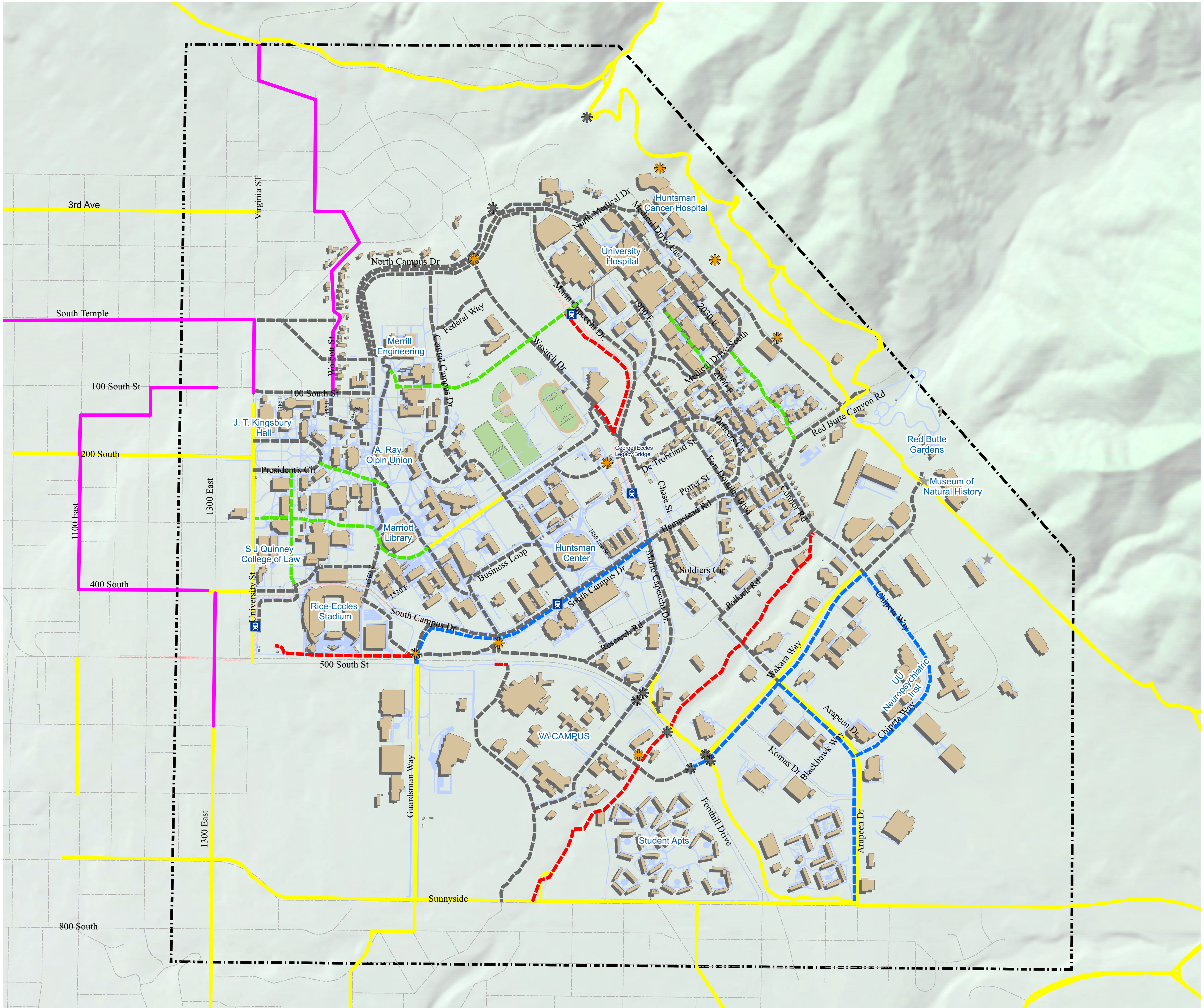

Legend

Existing and Proposed Bikeways

- Existing Bikeways
- Proposed SLC Bikeways
- Existing Bonneville Shoreline Trailhead

Recommended Bikeways - Medium-Term

- Bike Lane
- Bike Path
- Shared Use Path

Recommended Bikeways - Short/Long-Term

- Short/Long-term Bikeways

Recommended Spot Improvements

- Medium-Term
- Short/Long term

0 500 1,000 2,000 ft

Date: October 14, 2011

Map 6.2
Recommended Medium Term Bicycle Facilities (2015-2020)

University of Utah Bicycle Master Plan

The University of Utah

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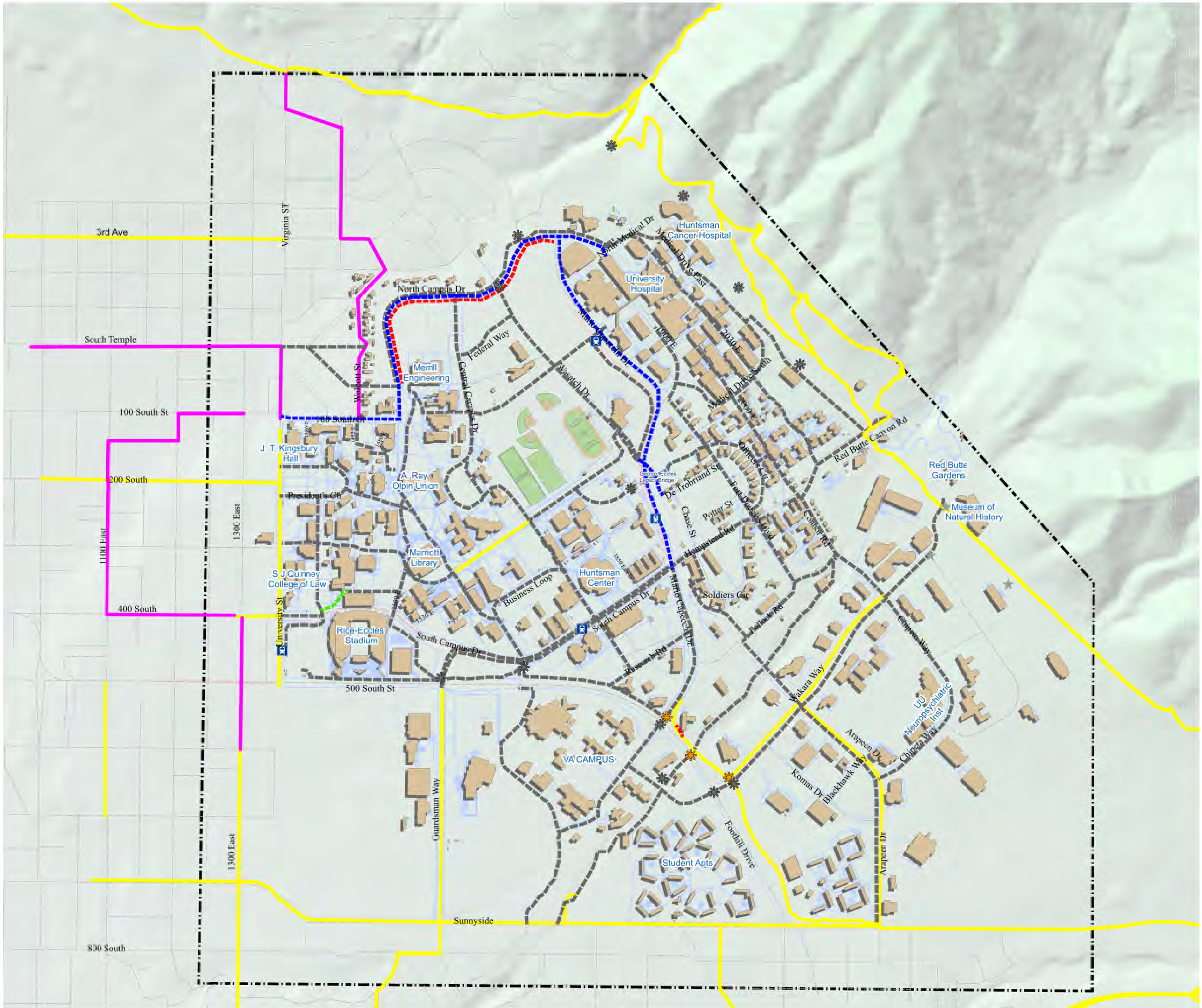

Legend

Existing and Proposed Bikeways

- Existing Bikeways
- Proposed SLC Bikeways
- Existing Bonneville Shoreline Trailheads

Recommended Bikeways - Long-Term

- Bike Lane
- Bike Path
- Shared Use Path

Recommended Bikeways - Short/Medium-Term

- Short/Medium-term Bikeways

Recommended Spot Improvements

- Long-Term
- Short / Medium-Term

Map 6.3

Recommended Long Term Bicycle Facilities (Later than 2020)

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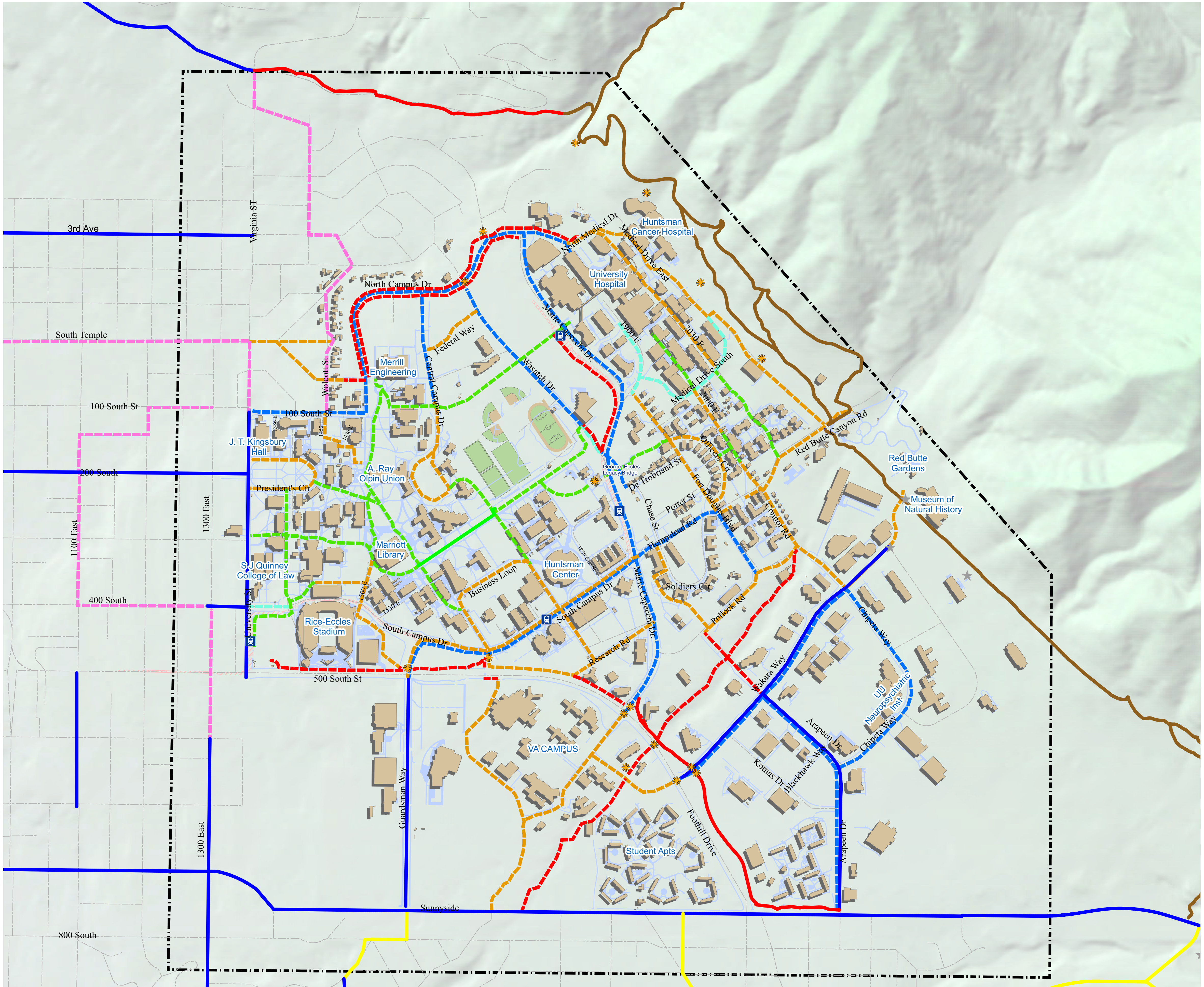

Legend

Existing Bikeways

- Signed Shared Roadway
- Shared Lane
- Bike Lane
- Bike Path
- Shared Use Path
- Unpaved Shared Use Path
- Bonneville Shoreline Trailheads

Recommended Bikeways

- Proposed SLC Bikeways
- Shared Lane
- Bike Lane
- Bike/Shared Lane Combo
- Bike Path
- Shared Use Path

Recommended Spot Improvements

N

0 500 1,000 2,000 ft

Date: October 14, 2011

Map 6.4

Cumulative Bicycle Facilities

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6.1.1 Bicycle Paths

The University has potential to establish a few dedicated bicycle paths that create direct and continuous routes through campus. Figure 4-3 in Chapter 4 illustrates a typical bike path facility. Tables 6-1, 6-2, and 6-3 describe the recommended bicycle paths for the short-, medium-, and long-term horizons, respectively. These facilities are recommended primarily for corridors within the heart of campus where relatively high concentrations of bicycles and pedestrians create the desire for mode separation in a few key locations.

Bicycle paths differ from shared-use paths and undesignated campus pathways because they provide exclusive space for bicycles. Shared-use paths are meant to accommodate both bicycles and pedestrians, and are typically at least 10 feet wide. Golf carts currently use many campus pathways. New bicycle paths should be 12 feet wide where golf cart use is expected. Undesignated campus pathways may also be used by both bicycles and pedestrians, but are not necessarily as wide. They are primarily meant for pedestrians, with bicycles welcome at reasonable speeds that do not threaten pedestrian traffic.

Although bicycle paths are meant for the exclusive use of bicycles, it should be acknowledged that some pedestrians will also inevitably use the space. As more bicyclists use the paths, however, the paths will become increasingly self-enforcing as they become less comfortable places for pedestrians. It should be noted that the recommended bicycle paths will cross pedestrian plazas where high-speed bicycle traffic is undesirable. In these locations, the character of the path may change to signal to bicyclists that they are entering shared space where they need to exhibit caution and respect pedestrians. Decisions at this level of detail will be made on a case-by-case basis as individual projects move through the design process.

Table 6-1: Recommended Short-Term Bicycle Paths

Segment	From	To	Length (ft)	Notes
Connor/Fort Douglas Connector	Parking lot SW of Connor	Parking lot NE of Fort Douglas Blvd	160	Could probably also be a shared use path
Heritage Center Path	Parking lot SE of Heritage Center	Road NW of Heritage Center	475	Part of existing pilot project
Heritage/Officers Connector	Heritage Center Path	Officers Circle	175	Existing stairs at SW end of this proposed path
Legacy Bridge Path	Fort Douglas Blvd	SW end of Legacy Bridge	950	Part of existing pilot project
Student Life Connector	Legacy Bridge	HPER Mall Path	660	
HPER Mall Path	Ballif Road	Junction SE of library	1,515	Part of existing pilot project
HPER Mall Bisect	Business Loop	Central Campus Dr Loop	1,500	Coordinate with HPER Mall and shuttle bus projects
North-South Path	Business Loop	Merrill Building	3,300	Part of existing pilot project
1500 East/Olpin Union Connector	Marriott Library	Proposed North-South Path	715	
Stadium Connector	Stadium TRAX Station	Top of tunnel ramp north of South Campus Dr	1,050	Dismount zone at top of ramps on both sides of tunnel.

Table 6-2: Recommended Medium-Term Bicycle Paths

Project	From	To	Length (ft)	Notes
Student Housing Path	Red Butte Canyon Rd	S. Medical Dr	1,270	
2000 East Extension	S. Medical Dr	School of Medicine	880	
Interdisciplinary Mall	Primary Children's Hospital	Merrill Building	2,670	In conjunction with USTAR and Ambulatory Care projects
Lower Campus East-West Path	Junction SE of library	University Street/ 300 South	2,270	Stairs on SE side of library would likely require code-compliant bike wheel trough
Middle Campus East-West Connector	North-South Path	President's Circle	820	
Stadium/President's Circle Connector	Top of tunnel ramp north of South Campus Dr	President's Circle	1,185	Create dismount zone at top of ramps down to tunnel on both sides.

Table 6-3: Recommended Long-Term Bicycle Paths

Project	From	To	Length (ft)	Notes
Fieldhouse Path	Stadium Connector Path (Prop.)	Fieldhouse/ Library Connector (Prop.)	500	

6.1.2 Shared-Use Paths

All interior campus pathways currently serve pedestrians and bicyclists. Shared-use paths differ from these campus pathways because they usually are at least 10 feet wide (may be up to 14 feet wide where high concentrations of people are expected) and are specifically designated as shared pedestrian and bicycle space. Bicyclists expect a certain level of quality on shared-use paths relative to undesignated sidewalks and campus pathways. This quality difference typically manifests itself through bicycle route signage and treatments at roadway crossings. Maintenance vehicles should be discouraged from using these paths unless they are maintaining the path itself. The recommended shared-use paths are primarily located along commuter routes at the periphery of campus. Figure 4-2 shows a typical shared-use path facility. Tables 6-4, 6-5, and 6-6 describe the recommended shared-use paths for the short-, medium- and long-term time horizons.

Table 6-4: Recommended Short-Term Shared-Use Paths

Segment	From	To	Length (ft)	Notes
Research Park Connector	Wakara Way	Pollock Rd	980	Requires coordination with the Army to re-open access
Foothill Dr Path #1	Mario Capecchi Dr	Research Rd	700	Most useful with Institute Loop short-term shared lane recommendation
North Campus Path #1	Federal Way/1450 East	Jewish Community Center	4,100	Most useful in conjunction with intersection modifications at Penrose and Federal Heights Dr
1500 East Connector	Guardsman Way	1500 East parking lot	565	
Foothill Dr Path #2	Foothill mid-block crosswalk	Guardsman Way	1,075	Most useful in conjunction with moving stop bars back on Guardsman and 1725 East

Table 6-5: Recommended Medium-Term Shared-Use Paths

Segment	From	To	Length (ft)	Notes
Red Butte Creek Trail – Segment 1	Existing path north of Sunnyside	VA road that lines up opposite Wakara	1,600	Requires clearing and earthwork; may require environmental review; requires coordination with Salt Lake City
Red Butte Creek Trail – Segment 2	VA road that lines up with Wakara	Foothill Dr	425	Requires coordination with owners of buildings SE of Foothill and possibly with the VA
Red Butte Creek Trail – Segment 3	Foothill Dr	Proposed Research Park Connector	1,250	Space available on bench above west side of the creek; may require coordination with the Army
Red Butte Creek Trail – Segment 4	Proposed Research Park Connector	Chipeta Way	1,700	Sensitive biological area; may require coordination with the Army
Mario Capecchi Path	Ballif Rd	Interdisciplinary Mall Path	2,120	Would run adjacent to TRAX most of the way
Foothill Dr Path #3	Westernmost VA road	Foothill mid-block crosswalk	180	
Foothill Dr. Path #4	Guardsman Way	Stadium TRAX Station	1,640	Potential utility conflicts; most useful in tandem with moving stop bars back on Guardsman

Table 6-6: Recommended Long-Term Shared-Use Paths

Segment	From	To	Length (ft)	Notes
Foothill Dr. Path #5	End of existing shared-use path	Future bridge over Mario Capecchi	120	
North Campus Path #2	North-South Path at Merrill Building	Mario Capecchi Dr	3,120	Need to mitigate concerns of high-speed bicycles coming downhill in opposite direction of traffic

6.1.3 Bicycle Lanes

Streets both within and adjacent to the University of Utah campus can be retrofitted to accommodate bicyclists in dedicated on-street bicycle lanes. One of the tools used to analyze the potential for bike lane retrofits is Alta Planning + Design's StreetPlan model. This model is used to determine how an existing roadway cross-section can be modified to include bike lanes. It includes information such as number and width of lanes, median conditions, turn lanes, and parking conditions. More information about the model, including its results, is provided in Appendix C. Engineering judgment, Steering and Working Committee input, and public comments were used in conjunction with the StreetPlan model to recommend bicycle lanes. Figure 4-4 illustrates a typical bicycle lane facility. Tables 6-7, 6-8, and 6-9 describe the recommended bicycle lanes for the three time horizons.

Table 6-7: Proposed Short-Term Bicycle Lanes

Segment	From	To	Length (ft)	Notes
Mario Capecchi Dr	Foothill Dr	South Campus Dr/Hempstead Rd	1,950	Most useful along with phasing/access changes at Foothill intersection
Hempstead Rd	Mario Capecchi Dr	Fort Douglas Blvd	1,080	Most effective in tandem with shared lanes or bicycle lanes on South Campus Dr
Fort Douglas Blvd	Hempstead Rd	Pollock Rd	880	
Wasatch Dr	Ballif Rd	North Campus Dr	2,140	
Central Campus Dr #1	Warnock Building	North Campus Dr	1,250	Lane conversion from four traffic lanes to two traffic lanes, a center lane, and bicycle lanes

Table 6-8: Proposed Medium-Term Bicycle Lanes

Segment	From	To	Length (ft)	Notes
Arapeen Dr	Sunnyside Ave	Wakara Way	2,935	Bringing existing bicycle lanes up to standard; may require roadway reconstruction
Chipeta Way	Arapeen Dr	Wakara Way	2,740	May be done through lane conversion or reconstruction
Wakara Way	Foothill Dr	Chipeta Way	2,975	Bringing existing bicycle lanes up to standard; may require roadway reconstruction
South Campus Dr	Guardsman Way	Mario Capecchi	2,940	May be done through lane conversion or reconstruction
Guardsman Way	Foothill Dr	South Campus Dr	450	May be done through lane conversion or reconstruction

Table 6-9: Proposed Long-Term Bicycle Lanes

Segment	From	To	Length (ft)	Notes
Mario Capecchi Dr	South Campus Dr/Hempstead Rd	North Campus Dr	4,350	May require major reconstruction
Shuttle Route Bicycle Lanes	Fort Douglas Blvd	Wasatch Dr	525	Would likely only occur as part of undefined shuttle bus project
North Campus Dr	100 South	Jewish Community Ctr	4,370	May require major reconstruction
100 South	University Street	North Campus Dr	1,400	May require lane reduction; alternative could be use of shared lane markings

6.1.4 Shared Lanes

Shared lanes are an on-street bikeway alternative most often used to accommodate bicyclists within constricted rights-of-way that have relatively low speed limits (35 mph or less, with 25 mph or less being the most desirable) and/or daily traffic volume. They give bicyclists guidance on proper lateral positioning within the traffic lane and reinforce to motorists a bicyclist's right to use the full lane, but do not restrict other vehicles from using the lane.

Shared lanes usually do not require roadway reconstruction or modifications to existing striping. For this reason, they are some of the easiest and least expensive bikeways to implement. However, they do not provide the same level of accommodation as dedicated bicycle lanes, bike paths, or shared-use paths on streets with traffic traveling above 25 mph. Figure 4-5 shows a typical shared lane facility. Table 6-10 describes the recommended shared lanes. All shared lane recommendations occur in the short-term horizon, largely because they are relatively easy to implement.

Table 6-10: Proposed Short-Term Shared Lanes

Segment	From	To	Length (ft)	Notes
Wakara Way	Chipeta Way	Red Butte Gardens	1,400	
Chipeta Way/Connor Rd	Wakara Way	Red Butte Canyon Rd	1,580	Chipeta west of Wakara could have bike lanes with a lane reduction
Pollock Rd	Connor Rd	Proposed Research Park Connector	1,570	
Army Rd	Pollock Rd	Hempstead Rd	1,415	
Officers Circle	Fort Douglas Blvd	Fort Douglas Blvd	1,300	Markings placed only in one direction since it is a one-way road.
Stover St #1	Fort Douglas Blvd	Proposed Connor-Fort Douglas Connector	220	
Stover St #2	Proposed Connor-Fort Douglas Connector	Connor Rd	145	
2000 East #1	Stover St/Connor Rd	Proposed Heritage Center Bike Path	415	
2000 East #2	Proposed Heritage Center Bike Path	S. Medical Drive	530	
Red Butte Canyon Rd	Connor Rd	Bonneville Shoreline Trail	1,220	Uphill bike lane/downhill shared lane combo is desirable, but would require widening
Fort Douglas Blvd	Hempstead Rd	S. Medical Dr	1,715	
Northeast Parking Lot	Red Butte Canyon Rd	North Campus Dr	3,920	
2030 East	S. Medical Dr	North Campus Dr	2,175	
VA Western Route	Sunnyside Ave	Foothill Dr	2,100	South VA gate is locked on weekends and weekdays from 8:00 p.m. to 5:00 a.m.
VA Central Route	VA Western Route	Foothill Dr	2,960	Most useful along with phasing/access changes at Foothill intersection
VA Eastern Route	VA Central Route	Foothill Dr	1,200	Most useful along with phasing/access changes at Foothill intersection
South Campus	Guardsman Way	Mario Capecchi Dr.	2,940	

Segment	From	To	Length (ft)	Notes
Guardsman Way	Foothill Drive	South Campus Drive	450	
Institute Loop	South Campus Dr	South Campus Dr	2,060	
Research Rd	Institute Loop	Mario Capecchi Dr	775	Eastern part of this segment may be wide enough for bike lanes
Business Loop	South Campus Dr	South Campus Dr	2,270	Could be converted to bicycle lanes in future as development occurs
1500 East	Proposed 1500 East Connector Path	Proposed Middle Campus East-West Connector	1,280	
Fieldhouse/ Library Connector	Fieldhouse Path (Prop.)	1500 East	525	
Central Campus Dr #2	Warnock Building	Warnock Building	2,100	Could be converted to bicycle lanes in future as development occurs
Wolcott Extension	100 South/Wolcott	North-South Path	915	
South Temple	University Street	Wolcott St	960	Extension of existing shared lane markings on South Temple
Federal Way	South Temple	1450 East	1,000	Markings placed only in one direction since it is a one-way road.
Presidents Circle	University Street	University Street	1,725	Markings placed only in one direction since it is a one-way road.
Exploration Way	Central Campus Drive	Wasatch Drive	800	

6.1.5 Bike Lane/Shared Lane Combinations

On certain roadways, it makes sense to have bike lanes on one side of the street and shared lanes on the other. This usually occurs on streets wide enough for bicycle lanes in only one direction and grades steep enough to result in downhill bicycle speeds approaching the posted speed limit. Bike lanes are placed in the uphill direction to give faster vehicles the ability to safely pass slower cyclists. Shared lane markings are placed in the downhill direction to direct bicyclists to position themselves in line with other traffic. As with regular shared lane treatments, these facilities should only be used when the speed limit is 35 mph or less – ideally no more than 25-30 mph. Tables 6-11 describes the recommendations. No such facilities are recommended in the medium- or long-term time horizons.

Table 6-11: Proposed Short-Term Bike Lane/Shared Lane Combinations

Segment	From	To	Length (ft)	Notes
S. Medical Dr	Mario Capecchi Dr	Proposed Northeast Parking Lot Shared Lane	2,090	
1900 E/ Med School Access	S. Medical Dr	School of Medicine	740	
Wasatch Dr	Mario Capecchi Dr	Ballif Rd	415	
South Campus Dr	400 South	Prop. Stadium TRAX Bike Path	450	Use wayfinding signage to direct cyclists from bike lane onto Stadium TRAX Bike Path

6.1.6 Spot Treatments

Some non-linear spot treatments are recommended to support the bikeways described in previous sections. Examples of spot treatments are grade separations (bridges, tunnels), intersection modifications (hardscape or signal phasing), and enhanced crosswalks. The following three tables show the proposed spot treatments for the three time horizons.

Table 6-12: Proposed Short-Term Spot Treatments

Treatment	Location	Notes
Shared-Use Path Crossing Modification	Wakara Way northeast of Foothill Dr	SLC-owned right-of-way; realign existing crossing further uphill to give motorists coming around the free right turn more sight distance to see and stop for path users; consider user-activated warning flashers; consider enhancing median refuge area
Intersection Modification	Foothill Dr/Wakara Way	UDOT-owned intersection with VA interests; work with UDOT/VA to let bicycles make through movement from VA to Wakara
Intersection Modification	Foothill Dr/Mario Capecchi Dr	UDOT-owned intersection with VA interests; work with UDOT/VA to let bicycles make through movement from VA to Wakara
Intersection Modification	North Campus Dr/Federal Heights Dr	UDOT-controlled intersection, but Federal Heights Dr is a city street; work with UDOT/SLC to provide safe bicycle access; consider diverter islands (with SB left turn for bikes) on Federal Heights Dr rather than center median on North Campus Dr.
Bonneville Shoreline Trail (BST) Signage	BST north of Jewish Community Center (JCC)	Coordinate with SLC to install wayfinding signage on the south side of Dry Creek to encourage people to use the JCC access road to access the trail rather than the dirt road that drops straight onto North Campus; boulders may be desirable on the dirt road south of the 180-degree bend to keep bicyclists from using it

Table 6-13: Proposed Medium-Term Spot Treatments

Treatment	Location	Notes
Red Butte Path Crossing #1	VA road that lines up with Wakara	May not be a high-cost crossing; may only require signage, striping, and curb cuts; higher-level crossing would cost more
Bridge Ramp	West end of Legacy Bridge	A spiral ramp or other facility to allow bicyclists to easily transition from the bridge to the Student Life Connector and HPER Mall bike paths; would be expensive, but very useful
Intersection Modification	North Campus Dr/Penrose Dr/Wasatch Dr	UDOT-controlled intersection, but Penrose Dr is a city street; work with UDOT and SLC to provide safe bicycle access; location may be signalized in the future, which would provide an opportunity to provide safe bicycle access
Stop Bar Relocation & Bike Box	South Campus Dr/LDS Institute Loop Rd	UDOT-controlled intersection; work with them to move stop bar back and create a bike box on the south leg in order to give bicyclists on Foothill Drive Path #2 the ability to queue up in the northbound traffic lane and proceed into the Business Loop with traffic flow rather than going the "wrong way" in the crosswalk
Stop Bar Relocation & Bike Box	Guardsman Way/Foothill Drive	Same as above, except that the stop bar relocation would occur on the southbound approach and it would benefit cyclists on Foothill Path #2, Foothill Drive Path #4 and the 1500 East Connector
Trailhead	BST behind Huntsman Cancer Hospital	Recommendation from the Heritage Preserve Management Plan
Trailhead	Parking lot SE of Huntsman Cancer Hospital	Recommendation from the Heritage Preserve Management Plan
Trailhead	Parking lot NW of Red Butte Canyon Rd	Recommendation from the Heritage Preserve Management Plan

Table 6-14: Proposed Long-Term Spot Treatments

Treatment	Location	Notes
Grade Separation	Foothill Shared-Use Path crossing of Wakara	SLC and/or UDOT rights-of-way; could be a tunnel or a bridge; grades would probably allow for either option; would be an expensive cost item
Red Butte Path Crossing #2	Foothill Dr crossing of Red Butte Creek	UDOT and private rights-of-way involved; tunnel or bridge could technically be feasible, but bridge would probably work better; would require tight engineering on southwest side; high cost item
Grade Separation	Mario Capecchi Dr northeast of Foothill Dr	UDOT and potentially Army rights-of-way; would provide a continuous shared use path from Sunnyside into campus (in conjunction with other identified recommendations) without having to interact with Foothill traffic; may need to purchase a corner of right-of-way from the Army

6.2 Support Facilities

6.2.1 Short-Term Bicycle Parking

Section 4.3 defines short-term bicycle parking facilities as those that are designed to accommodate trips several hours in duration. However, many campus bicyclists (particularly students) use short-term bike parking for their entire time on campus. The historical standard for short-term bike parking is the “ribbon” or “wave” rack though the university has recently adopted the “Inverted U”. While the wave rack is easy to use and recognizable, it is less space-efficient and secure. The University should be commended for updating its short-term bike parking standards to incorporate the Inverted U as its standard bike parking solution.

Inverted U bicycle racks provide enhanced stability and security by supporting the bicycle frame at two points

All of the existing wave/ribbon racks should eventually be replaced with the Inverted U design. In order to accomplish this, the University should begin a gradual retrofit of all wave/ribbon racks as funding becomes available or according to regular maintenance schedules and procedures. Areas of campus with high bike rack demand should be prioritized when considering rack replacement. The university should establish a retrofit schedule and budget.

An often-overlooked component of short-term bike parking is proper installation. Proper installation of bike racks allows bicyclists to lock their bikes to the rack without infringing on adjacent pedestrian walkways or other surrounding uses.

Figure 6-1 shows a plan view diagram for installing Inverted U racks.

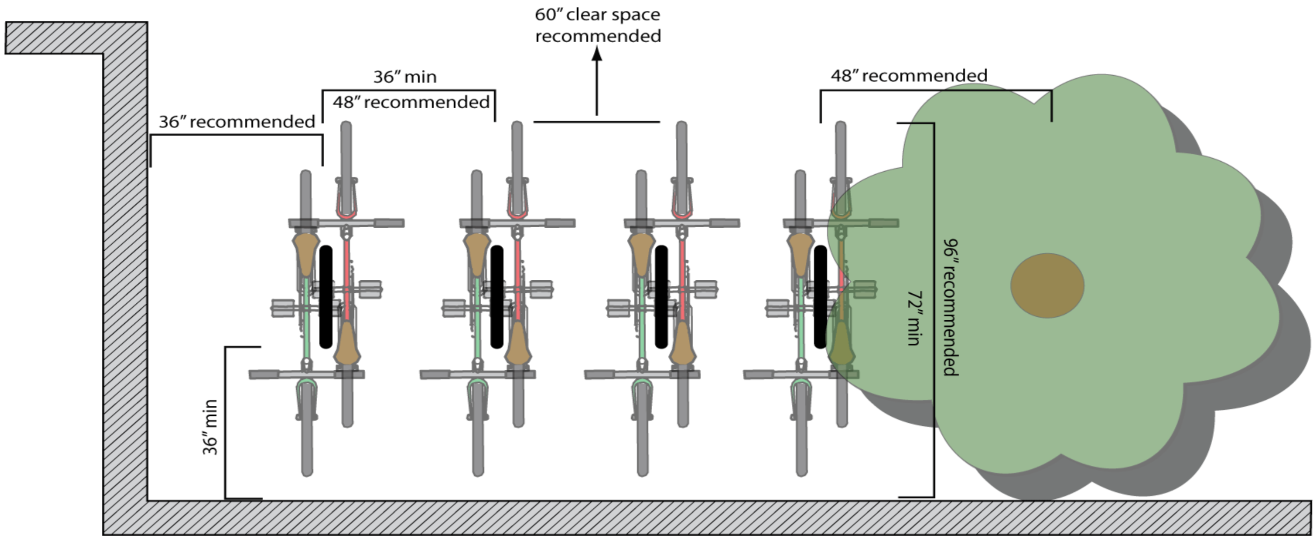


Figure 6-1: Short-Term Bike Parking Installation Guidelines

Covered Bike Parking

The University can also improve short-term parking by providing shelter over groups of bike racks. Covered parking encourages bike use by protecting bicycles from the sun, rain and snow, making bicycling a more attractive option during inclement weather. The University may consider incorporating covered bike parking into new building construction through the provision of overhangs.

Installation Guidelines

Proper bicycle rack installation also involves situating them appropriately with respect to buildings. Racks should be installed within 50 feet (or as close as possible) of main entrances to buildings in well-lit, visible parts of campus with high pedestrian volumes to deter theft and enhance the racks' overall convenience.

Bike Parking Requirements

Some universities have adopted guidelines to ensure proper bike rack supply throughout their campus growth and expansion. These guidelines can take many forms, but most of them associate a fixed number of racks or bike parking spaces with a given size or use of the building. This allows the university to estimate usage and place racks where the greatest demand is likely to occur. In practice, additional bicycle parking may be needed or relocated to meet actual demand. The Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guide recommends using the guidelines shown in Table 6-15 for colleges and universities to estimate bike parking demand.

Table 6-15: Sample Bike Parking Requirements

Long-Term Bike Parking	Short-Term Bike Parking
1 space for each 10 employees	1 space for each 10 students of planned capacity (minimum 2 spaces)
1 space for each 10 students of planned peak capacity	
1 space for each 20,000 s.f. of floor area	

Abandoned Bicycles

Abandoned bicycles will appear on bike racks seasonally, especially as students transition and leave unwanted bicycles behind. Abandoned bicycles take up valuable rack space, are unattractive, and discourage use by making the rack look unsafe or neglected. The University should adopt a guideline for removing neglected bicycles on all bike racks. The APBP Bicycle Parking Guide recommends:

> *Posting a notice on the bicycle at least two weeks in advance of removing the bicycle. The notice should state that the bicycle will be removed by a certain date and provide the name and contact information for the owner to contact in case the bicycle is mistakenly identified as abandoned.*

Abandoned bicycle with notice attached (City of Chicago)

Many campuses such as UCLA, Stanford and the University of Texas have strict policies for removing abandoned or inoperable bicycles frequently. We recommend that Commuter Services impound abandoned bicycles at the end of each month. In addition, Commuter Services officials can remove bicycles locked to surfaces other than University-installed bike racks, as well as bicycles believed to be inoperable at anytime. Inoperable bicycles are defined as those without air in the tires, those missing key components (seats, wheels, etc.), those in a state of considerable disrepair, and those that have been parked in the same location for more than a month. Each bicycle should be tagged and then removed two weeks after tagging if it is still there. Impounded bicycles should be stored for 90 days to provide bicycle owners the opportunity to reclaim their bicycle. Bicycles that go unclaimed should be donated to the Salt Lake City or University Bicycle Collectives.

6.2.2 Long-Term Bicycle Parking

The University of Utah provides several forms of long-term bicycle parking on campus. Section 4.3 defines long-term bicycle parking as a facility designed for trips longer than several hours. It can take varying forms, ranging from bicycle lockers to secure storage rooms. Another type of long-term bike parking is the "Bikestation" model that combines a secure bike parking room with optional access to bike repair facilities, parts, supplies and shower facilities.

Long-term bike parking is a valuable amenity a university can provide its students, faculty and staff. Some individuals would like to ride their bicycle to campus, but have reservations about leaving it locked to a short-term bicycle rack. Long-term bike facilities generally provide a more secure parking environment, and offer patrons greater control over the type of environment in which they store their bike. At present, there are several options for long-term bike parking on Campus. The bike lockers adjacent to the Stadium TRAX Station are maintained by UTA. The on-campus secure bike parking rooms and lockers are run independently through each building's maintenance and administration personnel.

Currently, finding information about existing secure bicycle parking is challenging for potential users. Facilities are often managed by a building employee. Students have few existing options to securely store their bicycles. Running all secure bicycle parking operations through a single administrative organization such as Commuter Services would improve usage and convenience. Doing so would centralize all maintenance and utilization information, thereby allowing secure bike parking to function more efficiently, similar to other campus-wide programs. Locations of existing secure bicycle parking can be found in Chapter 4.

Additional secure bike parking should be considered at the following locations:

- Student Union
- Honors Housing
- Married Student Housing
- Marriott Library
- University Hospital
- Outdoor Program
- Benchmark Plaza
- Health Sciences Building
- Business Building
- Research Park

Long-term secure bike parking is more costly than short-term parking, but unlike bike racks, it can generate revenue through registration and user fees. Using University funds for bicycle infrastructure and support facilities may require consensus building among the various University departments. However, as shown in Table 6-16, bicycle and pedestrian investments are fiscally attractive when compared to funds spent on other commute modes.

Table 6-16: Annual Cost Per Commuter

Commuter Type	Annual Cost
Surface Parking (physical costs only)	$300
Surface Parking (including land costs)	$3,000
Structured Parking	$2,000
Transit	$200
Bike/Ped Improvements	$50

Source: California Polytechnic State University, San Luis Obispo – Parking estimates include maintenance staffing and utilities.

Given the low cost of supporting bicycle commuters coming to campus relative to other modes, bicycle improvements are an attractive option for the University of Utah to accommodate the growth of the student, faculty and staff populations while not straining physical or fiscal limitations.

6.2.3 Bicycle Stair Channels

The University of Utah campus features prominent pathways that support significant levels of bicycle and pedestrian traffic. To accommodate the changing topography, many of these pathways also include stairways for pedestrians. These stairways present significant barriers to bicyclists and individuals with limited mobility. Many bicyclists choose to ride around staircases, thereby damaging grass areas and other landscaping.

Bike "channels" or "troughs" allow bicyclists to walk their bicycles up/down staircases as opposed to carrying them.

To avoid this behavior and to encourage higher levels of bicycling, staircases should be avoided within identified bikeway corridors where bicycle connectivity is prioritized. It is desirable from a bicycling standpoint to also limit the use of stairs in other areas where bicycle use is expected. When staircases are constructed, they should accommodate bicycles through the use of a channel that allows bicyclists to push their bicycle up or down the staircase without the need to carry it. The University will need to determine an acceptable design that meets state code and can be used within future projects. Signage should be placed at the stairs to inform bicyclists of the trough location and purpose. Figure 6-2 provides a design that may comply with Utah code and would be a possible solution to retrofit or provide bicycle channel with new construction.

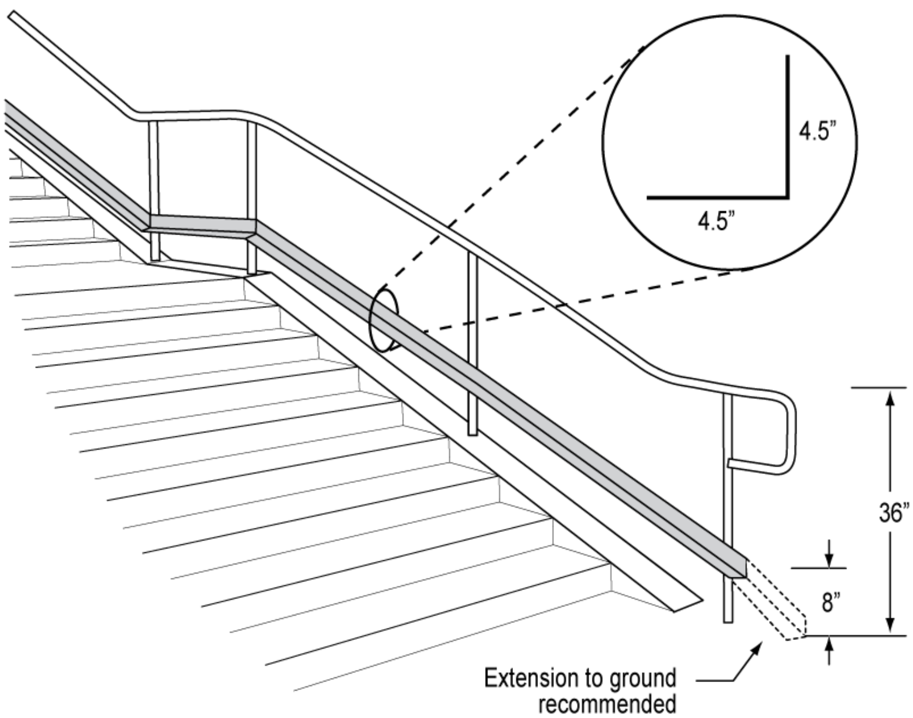


Figure 6-2: Possible Bicycle Channel Retrofit Design

6.2.4 Bicycle Station

A bicycle station provides a number of valuable amenities, typically in focal points of bicycle activity or near transit nodes. Bicycle stations serve existing populations of cyclists, and also encourage new bicyclists by providing services that overcome barriers cited by many as a reason that they do not bicycle more. Bicycle stations can provide any or all of the following services:

- Bicycle repair (self-serve or staffed)
- Bicycle rental
- Retail sales of bicycle-related equipment and accessories
- 24-hour secure and covered bicycle parking
- Restrooms, showers and/or changing facilities
- Coffee shop
- Convenient access to public transportation

(Left) Existing Bike Station in Long Beach, California; (Right) Example of indoor secure bicycle parking at a bike station

The University of Utah Campus Master Plan recommends bicycle stations be included with the proposed Engineering Mall, Health Sciences Campus and Research Park. We endorse this recommendation.

6.3 Wayfinding and Signage

6.3.1 Introduction

Signage and wayfinding can be important elements of the University of Utah bikeway network. Signs advertise the network to those unfamiliar with bicycle transportation and help bicyclists navigate efficiently, effectively, and safely through campus on preferred corridors. They can also help reduce conflicts between bicyclists and pedestrians by more clearly delineating the bikeways. Signs can also advertise safety messages, popular campus locations, as well as distance and estimated time of travel. All of these components support the bicycle network by making it more robust, visible and convenient to use.

The following three sign types are recommended for the University of Utah bikeway network:

- Wayfinding Signs
- Guidance Signs
- Directional Pavement Markings

The following sections discuss the three sign types, including their appropriate uses and how they contribute to the overall campus bikeway network.

Wayfinding Signs

Wayfinding signs provide orientation and emphasize the connectivity between campus and the surrounding community. Traditional elements of a wayfinding system include signs, pavement markings, and maps. Interactive web mapping and hand held digital devices are also becoming popular tools. Benefits of a wayfinding system include:

- Greater ease of travel between campus destinations
- Greater sense of security and comfort
- Ability to create a unique and memorable bicycle network
- Passive marketing
- Increased numbers of bicyclists

Wayfinding elements are cost-effective and highly visible treatments that improve the bicycling environment. They also act as a passive marketing tool to increase bicycle network awareness. Table 6-17 describes the three types of wayfinding signs.

Table 6-17: Wayfinding Sign Types

Sign Type	Purpose	Information	Placement
Confirmation Sign	Indicate to bicyclists that they are on a designated bikeway. Make motorists and/or pedestrians aware of the bikeway (if applicable).	Can include destinations and distance/time. Does not include arrows.	Every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g. within 150 ft of a turn or decision sign). Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred bikeway.
Turn Sign	Indicate where a bikeway turns from one path/street onto another path/street. Can be used with pavement markings.	Includes destinations and arrows.	Near side of intersections where bikeways turn (e.g. where the path/street ceases to be a bikeway or does not go through). Pavement markings can also indicate the need to turn.
Decision Signs	Mark the junction of two or more bikeways. Inform bicyclists of the designated bikeway to access key destinations.	Destinations and arrows, distances, and travel times are optional but recommended.	Near side of intersections in advance of a junction with another bikeway. Along a bikeway to indicate a nearby destination. Signs may be placed 50-200 feet in advance of the intersection depending on the number of lane changes required.

*Source: NACTO Urban Bikeway Design Guide

Distinctive campus bicycling system signs should be installed throughout the designated bikeway system, similar to the conceptual bike wayfinding signs depicted in Figure 6-3. The conceptual signs reiterate the color schemes that associate varying colors with the differing campus neighborhoods, as outlined in the University of Utah Campus Wayfinding Signage, Final Drawing Package (2005). Bikeway signage that conforms to existing wayfinding guidelines (i.e. neighborhood colors) will contribute to consistent messaging norms and be easier for users to understand. Salt Lake City is developing a standardized wayfinding system for their streets based on the Manual on Uniform Traffic Control Devices (MUTCD). UDOT also uses the

MUTCD as their standard. Bikeways on Salt Lake City and UDOT roads will use the MUTCD signage system and will complement the internal university-specific signs being proposed in this master plan.

Wayfinding signs can also provide distance and estimated travel time information. Signs with this information are beginning to be included in city bikeway signs as well as university plans. Time and distance information advertises bicycling's convenience and dispels its misconceptions as compared to other transportation modes. Considerable attention must be given to the effect of grade when developing time estimates for the University of Utah bicycle wayfinding.

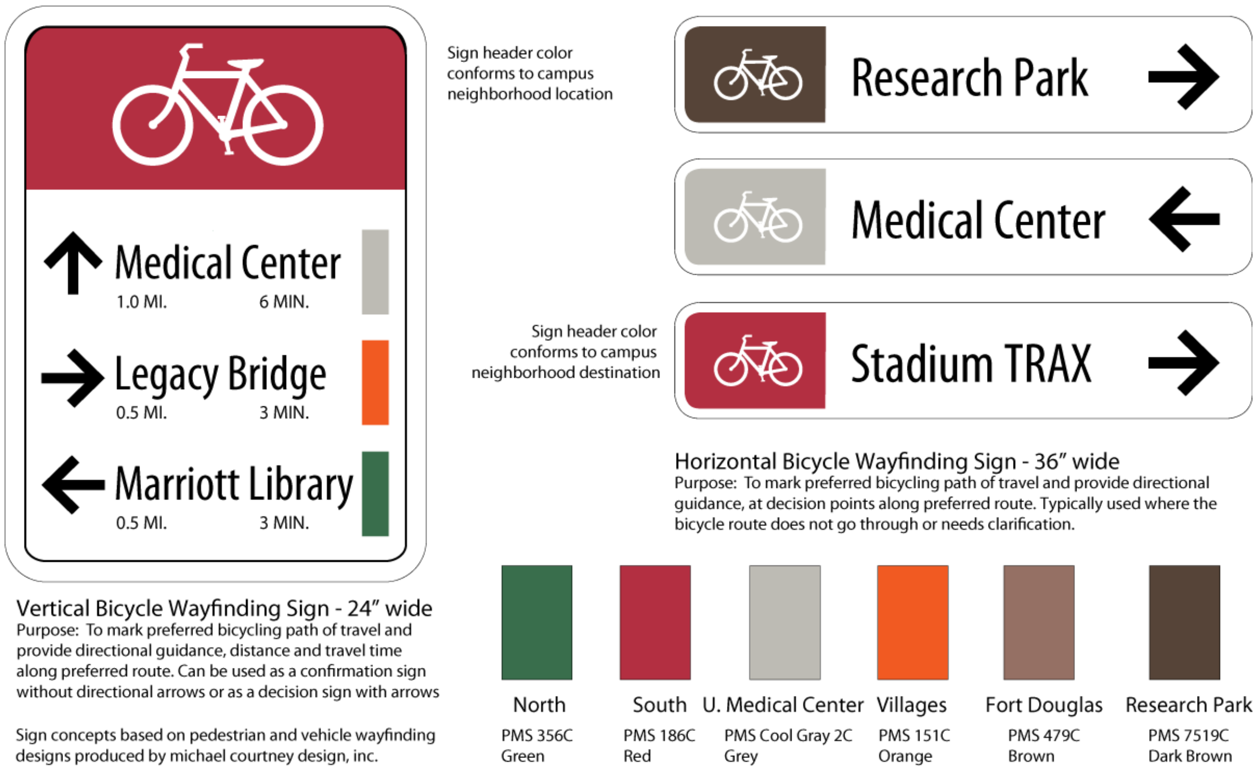


Figure 6-3: Conceptual Wayfinding Sign System

Proper sign installation and location is just as important as the design. Signs should be placed to compliment campus aesthetics and give bicyclists enough time to process sign information before making safe maneuvers. This is most critical in advance of intersecting bikeways, where bikeways change type, and where pedestrian conflicts are anticipated. Installing signs at least 7 feet above the ground (see Figure 6-4) promotes visibility, discourages vandalism, and reduces the chances of a bicyclist hitting the underside of the sign panel.

Bicycle wayfinding signs should be installed on a large scale initially and then supplemented incrementally with the development of each additional bicycle facility. The University may wish to wait until the bikeway network has had some development over 2011 conditions before installing the first group of wayfinding signs. The signs should be carefully placed according to Table 6-17.

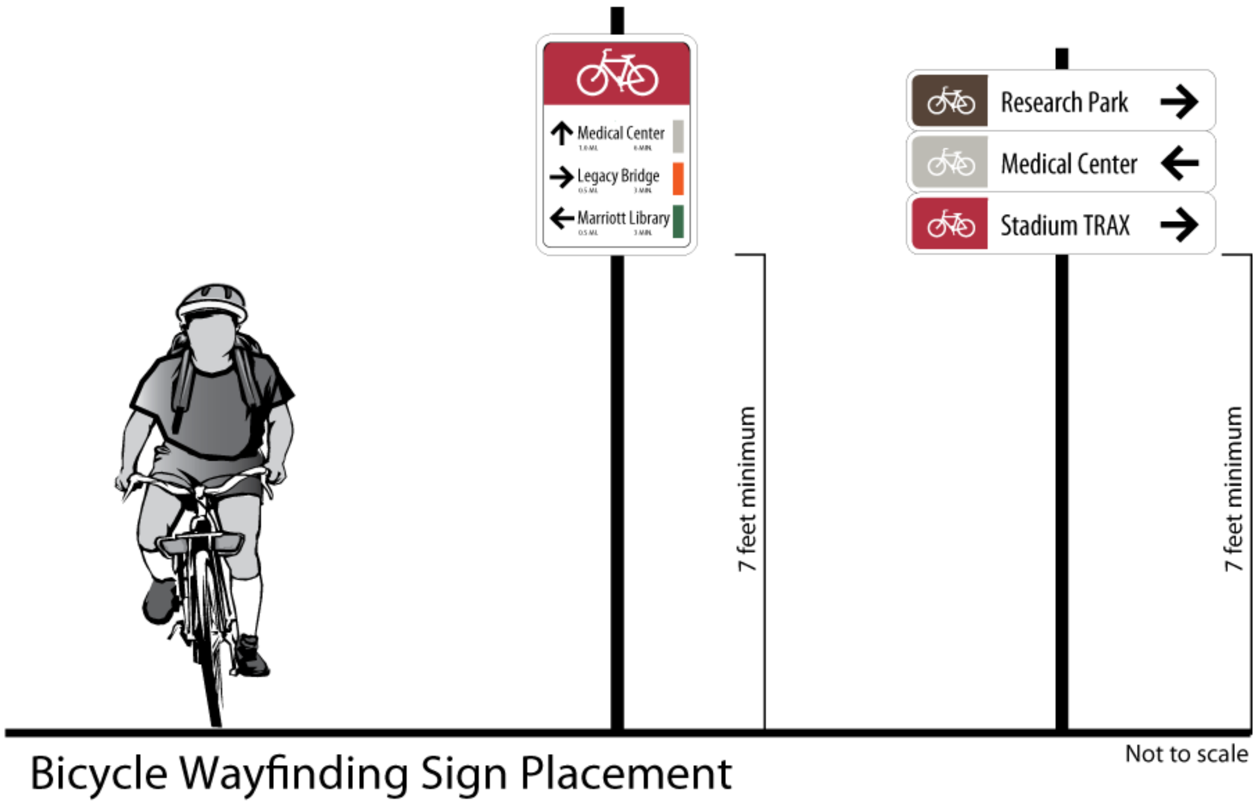


Figure 6-4: Wayfinding Sign Installation Guidelines

Guidance Signs

Guidance signs provide information related to campus policy and regulations. These signs can be installed to address many behaviors, such as when to yield, dismount zones, parking guidance and other information. Guidance signs should be posted at major campus entrances, if applicable, and along major campus bikeways or bikeway intersections depending on the targeted guidance messaging.

Guidance Sign Examples

Directional Pavement Markings

Directional pavement markings are a type of wayfinding that helps bicyclists continue on a facility when it comes to an intersection, crosses a pedestrian area, or changes bikeway type (e.g. an on-street bike lane transitioning to a bike path). Markings should be used in conjunction with wayfinding signage, with the "bike dot" stencil pictured below only used for off-street applications. Shared lane markings with angled chevrons can also be used as on-street wayfinding directing bicyclists towards changes in routing


Shared lane marking (street) and "bike dot" (off-street) stencil examples

Pavement markings such as the ones pictured above can be utilized strategically on campus depending on the needs of the specific bikeway. They should be used to reinforce bikeway continuity when merging with other campus pathways and to instruct bikeway users on proper directional travel. Pavement markings can be customized to include University-specific accents that make the bikeway system unique, informative and enjoyable.

The University can also use pavement markings to convey informational messages to bicyclists such as legends that say "SLOW" or "YIELD" along campus bicycle paths. In areas where dismounting from a bicycle is recommended, a symbol can be added to the pavement surface. One potential location for this treatment would be the underpass beneath South Campus Road near the stadium.

Suggested dismount pavement marking

6.4 Bicycles and Transit

Integrating bicycles with transit combines the long-distance coverage of bus or rail travel with the door-to-door service of bicycling. Transit can overcome large obstacles to bicycling, including distance, hills, riding on busy streets, night riding, inclement weather and breakdowns. Providing space for bicycles on transit vehicles increases the feasibility of transit in lower-density suburban areas where transit stops are beyond walking distance of many residences. People are often willing to walk only ¼ to ½ mile to a transit stop, whereas they might bike two or more miles to reach it.

6.4.1 Campus Shuttle Recommendations

Commuter Services operates a free weekday internal shuttle service over seven fixed routes (and two night routes) within the campus perimeter. Currently, these shuttles do not have bike racks. The shuttles could be an attractive alternative for bicyclists to navigate campus, particularly between areas that are not currently well served by bicycle facilities or which have steep grades. Examples include traveling between the main campus and the medical campus or VA Hospital. We recommend that Commuter Services install front-mounted bicycle racks with capacity for three bicycles on each existing and future shuttle vehicle.

6.4.2 UTA Bus Recommendations

Typical equipment for UTA bike-on-bus accommodation is a rack mounted to the front of the bus with capacity for two bicycles. When the rack is full, the bicyclist typically has to wait for the next bus. This problem has led several transit agencies to explore different options, such as three-bike racks, rear-mounted racks, and allowing bicycles on the bus. Each of these options comes with considerations. We recommended that UTA install newer bicycle racks capable of holding three bicycles to new buses being placed into service.

For buses serving the University of Utah, UTA should consider adding a second rear-mounted bicycle rack to bring the capacity of each bus to a maximum of six bicycles. Rear-mounted bike racks raise concerns about user safety and vandalism. The buses should be deployed with mirrors or rear-view cameras to allow the driver to see a bicyclist mounting a bicycle. A dashboard light can show the driver when the rack has been deployed. In addition, passengers should be taught to speak with the driver, to warn him that they will be using the rear rack. Drivers should continue the current system of handing a bike card to anyone getting on the bus with a bicycle. This practice helps ensure that the driver does not drive off with the bicycle when the passenger alights.

6.4.3 Capital Costs

The capital costs of a bike-on-bus program typically include only the purchase of the rack units. The cost of equipping bicycle racks on buses is between $600 and $1,000 per rack per bus. Purchasing bike racks on new buses reduces the labor cost of retrofitting the racks. Maintenance of the bike racks is minimal – about $50 to $100 per rack per year. They need to be replaced after 6-7 years, often due to rust or colliding with other objects.

6.4.4 UTA TRAX Recommendations

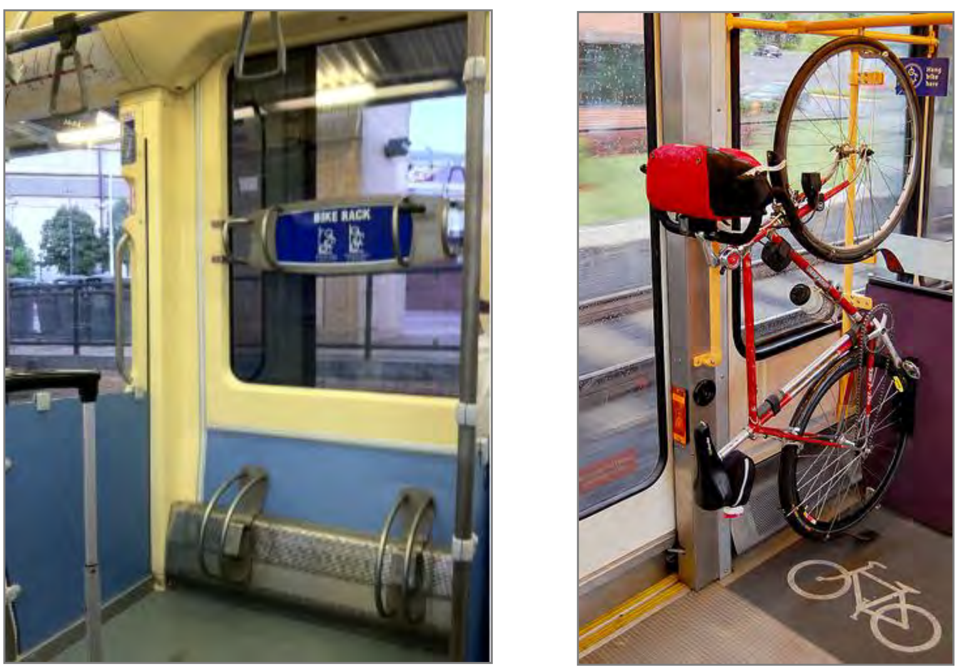
UTA operates TRAX light rail to the University of Utah, serving four stations on campus. This service has proved very popular and accounts for approximately 16 percent of trips to campus according to a 2007 UTA survey. The survey also stated that approximately 80 percent of students have a UTA Ed Pass and more than 60 percent of them use it at some point during the semester. TRAX's popularity has caused overcrowding of bicycles on trains, particularly during the a.m. commute period. In August 2011, UTA switched to Avanto S70 low-floor vehicles for the University Line. Each of these new vehicles can legally accommodate four bicycles, which means that a three-car train (which is typical) can legally carry 12 bicycles. Bicycles frequently exceed the regulated limit, thereby causing blocked exits and conflicts with other passengers. The Avanto vehicles also do not have bicycle racks and should be retrofitted with them to enhance the safety of all passengers. Passengers holding freestanding bicycles can lose balance during acceleration, deceleration, and cornering.

UTA faces challenges accommodating bicyclists traveling to the University of Utah. The campus elevation makes combining bicycling and TRAX an attractive option, with many students, faculty and staff wishing to bring their bicycle to campus on the train. This leads to high demand. Salt Lake City frequently receives requests from the public for bike racks in TRAX cars.

Table 6-18 summarizes onboard bicycle accommodation policies in North America. In some situations, a designated area for bicycles is provided in the train car. In other cases, bicyclists share space with other passengers. The hours bicycles are allowed, number of bicycles permitted per car, and charge to bring a bicycle on the train vary by system.

Some light rail and/or commuter train designs have designated space with a hook or rack system for bicycles to hang or mount. These systems remove the need for passengers to stand with their bicycles and free up valuable horizontal space by using less valuable vertical space instead. They also remove bicycles from doorway areas that can become difficult for passengers to enter and exit when two or more bicycles are squeezed into the space. However, the inability of certain passengers to lift their bicycles onto the hook presents problems for this system. Several transit systems with hook or rack accommodations allow passengers to use unoccupied seating areas or doorway platform space if the racks are full. Alternatively, passengers may choose to wait for the next train with available hooks.

Some commuter rail systems have a car specifically dedicated to bicycles. Examples of this are UTA's FrontRunner and the San Francisco Bay Area's Caltrain system. The benefit of dedicated bicycle cars is many bicycles being allowed on a train. This also removes bicycles from typical passenger cars where they may constitute a nuisance to other passengers. FrontRunner allows 12 bicycles in the bicycle car with an additional four spaces in each conventional car.



(Left) Bicycle racks on the Hiawatha Line in Minneapolis, MN; (Right) Bicycle racks on MAX light rail line in Portland, OR

Table 6-18: North American Rail Vehicle Onboard Bicycle Accomodation

City	Agency	Name	Bike Capacity Per Car	Accommodation Type	Peak Hour Restrictions	Notes
Salt Lake City	UTA	TRAX (LRT) FrontRunner (Commuter)	TRAX: 4 FrontRunner: 12 in dedicated bicycle car, plus 4 per passenger car	TRAX: None (hold bike) FrontRunner: wheel tray and bars	None	TRAX: In older-style vehicles, bikes not allowed at end of first car nearest the train operator Currently (2011) working on retrofit to increase bicycle capacity by removing one seat per car
Vancouver	TransLink	SkyTrain	1 per car (Canada Line) 2 per car (Millenium and Expo Lines)	None (hold bike), at end of car	Canada Line: None Millenium and Expo Lines: Directional restrictions, 7:30-9:00 AM and weekdays	Bikes prohibited at Metrotown Station
Charlotte	CATS	LYNX	4 (2 at each end of car)	Vertical rack (hook, with wheel tray, perpendicular to aisle)	None	
Toronto	TTC	(Various Streetcar/ Subway Lines)	No stated capacity, subject to availability; bikes must yield to other passengers	None (hold bike)	Bikes prohibited 6:30-10:00 AM and 3:30-7:00 PM weekdays	
Edmonton	ETS	ETS LRT	No stated capacity	None (hold bike), at center of car	Bikes prohibited 7:30-9:00 AM and 4-5:30 PM weekdays	
Chicago	CTA	L	2 per car	None (hold bike), at end of car	Bikes prohibited 7-9 AM and 4-6 PM weekdays; also prohibited July 3-4 (holiday)	Bikes not allowed on train cars with folding doors Bikes prohibited at some stations
Seattle	SoundTransit	Link (LRT) Sounder (Commuter)	Link: 4 per car Sounder: 4 per car	Link: 2 vertical racks (hook, perpendicular to aisle), 2 additional with no accommodation (hold bike) Sounder: 2 tie-downs, 2 additional with no accommodation (hold bike)	None	
Portland	TriMet	MAX (LRT) WES (Commuter)	MAX: 4 per car, 2 at each end WES: 2 dedicated spaces per car; 4 additional subject to availability	MAX: Vertical rack (hook, with wheel tray, parallel to aisle) WES: 2 vertical racks; 4 additional spaces available in priority seating area (up to 2 bikes each at 2 areas, equipped with straps)	None	
San Francisco Bay Area	BART	BART	No stated capacity, subject to availability; bikes must yield to other passengers	None (hold bike)	Directional restrictions, 7:05-8:50 AM and 4:25-6:45 PM weekdays	Bikes not allowed in first car of each train Folded bikes allowed at all times Bikes restricted at several routes and stations
San Francisco Bay Area	Caltrain	Caltrain (Commuter)	40 per train, in one dedicated bicycle car on Gallery trains 48 per train, 24 in each of two dedicated bicycle cars on Bombardier trains	Racks with bungee cord, capacity of four bikes per rack	None	Gallery trains will be equipped with two bike cars by the end of 2011, allowing for 80 bikes per train Folding bikes are allowed at all times, to be stored in luggage bins
Los Angeles	Metro	Metro Rail	No stated capacity; varies by line	None (hold bike), placement in car varies by line	None (restrictions recently rescinded)	
San Diego	SDMTS	San Diego Trolley (LRT) COASTER (Commuter)	Trolley: 2 per car COASTER: 4 per car	Trolley: None (hold bike), at back end of car COASTER: Velcro straps	Trolley: 1 bike per car limit COASTER: None	
Minneapolis	MetroTransit	Hiawatha Line	4 per car, at center of car	Vertical rack (hook, with wheel tray, perpendicular to aisle)	None	Bike racks are located near the doors at the center of each car
Denver	RTD	RTD Light Rail	4 per car, 2 at each end	None (hold bike), at end of car	None	Bikes not allowed at end of first car nearest the train operator
Calgary	Calgary Transit	CTrain	4 per car, 2 at each end	None (hold bike), at end of car	Bikes prohibited 6:30-9:00 AM and 3-6 PM weekdays	

We recommend that UTA retrofit existing TRAX vehicles with dedicated space onboard vehicles so that bicycles no longer block boarding doors. Hook or rack systems similar to Portland's MAX and Minneapolis's Hiawatha lines are preferable. Since this recommendation only addresses operations and would not increase capacity, it is also recommended that UTA consider retrofitting some of their older vehicles as bicycle cars to be attached to AM commute trains traveling to the university. This car could be removed from service after peak conditions subside. With the recent influx of new low-floor vehicles, UTA may have surplus LRVs that could be dedicated to this purpose. Bicycle demand can be monitored and the bicycle-specific car can be put in and out of service in response to that demand.

6.4.4.1 Capital Costs

The cost of adding bicycle racks to trains and creating bicycle-rail policies is relatively small. TriMet (the regional transit agency in Portland, Oregon) spent $35,000 to retrofit twenty-seven rail cars with hooks to accommodate four bicycles per car. Drafting bicycle-rail policies requires staff time to coordinate approval among stakeholders.

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7 Non-Infrastructure Strategies

The infrastructure recommendations presented in Chapter 6 are one tool for increasing bicycle mode share at the University of Utah. Chapter 7 presents non-infrastructure strategies that compliment and strengthen the infrastructure recommendations. Non-infrastructure strategies include procedural changes, programs, staff hiring and other methods proven to be effective in instituting commute mode shifts.

7.1 Introduction

Universities across the country have developed procedures and programs that aim to promote bicycling, walking, and transit trips to campus while reducing single occupancy vehicle (SOV) use. These activities are typically undertaken with some combination of the following principles in mind:

- Promote sustainability by reducing carbon footprint of commuting to campus
- Save money by shifting commuters to non-SOV modes and reducing the need for parking
- Provide incentives for using alternative modes of transportation
- Provide affordable transportation options to the campus community
- Create a greater quality of life for the campus community
- Establish the university as a national leader

7.1.1 University of Utah Climate Action Plan

With the University of Utah's 2010 Climate Action Plan, the groundwork has been laid to pursue more aggressive measures that encourage bicycling to and within campus and address SOV commuting. The Climate Action Plan identifies various policies, procedures and programs that the University can pursue to encourage bicycling and reduce SOV commuting. Table 7-1 shows the recommendations from this plan that relate to bicycling.

The Climate Action Plan provides guidance for many of the critical components that will help the University of Utah reduce its reliance on SOVs and grow its bicycle commuting mode share. The University should build off of its Climate Action Plan policies directed towards reducing SOV travel and pursue additional procedures and programs that reduce these trips. Other colleges and universities throughout North America are facing these same challenges.

In 2008, the National Wildlife Federation (NWF) conducted a large study on the sustainability of higher education in the United States. This study, entitled *State of the Campus Environment 2008: A National Report Card on Sustainability in Higher Education*, surveyed over 1,000 colleges and universities. The surveyed schools reported:

- 10% offer incentives not to drive alone
- 5% have campus-wide bike lanes
- 31% have campus-wide adequate and protected bicycle racks
- 26% offer free/discounted transit passes to students
- 20% offer free/discounted transit passes to faculty/staff

Table 7-1: Selected Climate Action Plan Recommendations

Bike-Related CAP Recommendations
Promote behavior strategies to influence the use of alternative modes of transportation.
Conduct enhanced biannual Commuter Transportation Survey to track commuting patterns, needs, and methods of travel.
Promote all modes of alternative transportation, including carpooling, vanpooling, car sharing, bicycling and walking.
Improve walkability and universal access through environmental design. Work with the Center for Disability Services, the Parking Committee, Bicycle Subcommittee and Facilities Management Department to create accessible and safe routes throughout campus for all non-motorized users.
Educate new students, faculty, and staff regarding alternative transportation options and benefits.
Work with ASUU, UTA, and Salt Lake City to upgrade and expand the U-Bike share/rental program.
Design and construct new buildings with good bicycle parking and storage and bicycle rider amenities, and assess the need for new bicycle parking and secure storage at existing campus buildings using LEED-Neighborhood Design as a general guide.
Enhance connectivity between major campus destinations and on-campus intermodal hubs, including pedestrian, bicycle, and shuttle routes.
Work with Salt Lake City and the Wasatch Front Regional Council to encourage high-density development within walking/biking distance of campus and at UTA transit nodes.
SOV-Related CAP Recommendations
Pursue more aggressive measures by 2012-2014 if SOV commuting has not reduced
Re-evaluate parking permit fees through the lens of price sensitivity, fairness, and an auxiliary unit self-funding business model to seek optimum fee levels to meet SOV plan reduction goals.

The trends identified in the NWF study identify some of the primary ways in which the University can address SOV reduction and increase bicycle commuting. The most basic ways to address bicyclist needs are to provide bikeway facilities that connect with the existing area bikeway network, and to provide safe, secure and convenient places to lock a bicycle. These recommendations are provided in Chapter 6.

7.1.2 Peer University Review

The University of Utah is not alone in striving to reduce SOV travel to campus in an effort to increase overall campus sustainability. Universities elsewhere have adopted practices and policies to help them become more sustainable by discouraging SOV travel. Table 7-2 summarizes some of these efforts.

Table 7-2: University Policies to Reduce SOV Travel

University	Action	Details
Utah State University	Strategy	Adopted the American College & University Presidents Climate Commitment to "Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible."
University of British Columbia	Policy	To reduce 24-hour single occupant vehicle (SOV) traffic volumes to and from UBC by 30% per person below 1997 levels; and to maintain overall vehicle volumes at or below 1997 levels.
UC Davis	Parking Strategy	Freshmen living on campus cannot purchase parking permits. Construction of academic, recreational and housing facilities is a higher campus priority than the maintenance of large parking areas. This policy reflects an overall trend at UC campuses. Most campuses now restrict parking permit availability for on-campus residents. Some also limit parking permit sales to those living outside walking or biking distance of the central campus.
UC Santa Barbara	Parking Strategy	Students must live more than 2 miles from campus to be eligible for a parking permit.
University of Washington	Parking Strategy	Parking rates are regularly increased to reflect market rates. Subsidized U-PASS is available, which provides transit access.
University of Colorado – Boulder	Incentive Program	Students pay a transportation registration fee to get access to RTD transit service and fund bicycle programs through the university, such as on-campus bike stations and a bicycle share program.
Stanford University	Incentive Program	The Clean Air Cash program provides financial incentives to not drive to school for full-time students living off campus. Students are paid $24 for each month that they do not drive to campus. Other incentives exist for referring friends, using car sharing, car/van pool use, etc.
Stanford University	Parking Strategy	Freshmen restricted from purchasing parking permits.
University of Buffalo	Parking Strategy	Freshmen restricted from purchasing parking permits.
University of Miami	Parking Strategy	First year, full time resident students are restricted from purchasing parking permits.
University of Pittsburgh	Incentives	Students with student ID can ride local transit free. Carpool/vanpools qualify for courtesy parking.
University of West Virginia	Pricing	Cost increase in parking. Vanpool information distributed at time of parking renewal. Vanpool receives preferred parking.
University of Chicago	Program	Recycles – free bikeshare/rental program to students with valid ID.
University of North Carolina	Policy	The University shall develop and implement a comprehensive, multimodal transportation plan designed to reduce carbon emissions and dependency on single occupant vehicles.

The above examples can provide the University of Utah with guidance and precedent to develop actions and strategies that address the goals of the Climate Action Plan, increase bicycle commuting and decrease SOV travel to campus.

7.2 Guiding Principles

The following guiding principles will help the University maximize bicycling on and to campus and reach its sustainability goals. The principles address the entire spectrum of the University transportation system including bicycles, parking, and transit. Some of the principles do not directly address bicycling, but nevertheless support increased bicycle mode share directly or indirectly. Specific program recommendations to support bicycling have been included in Section 7.3.

7.2.1 Relationship with Climate Action Plan

The Climate Action Plan identifies a significant set of goals for increasing the efficiency and convenience of the University of Utah's bikeway system. To reach these goals, we recommend creation of performance measures that embody the Climate Action Plan and allow the University to track its progress towards sustainability. This is discussed further as part of the Bicycle Report Card program in Section 7.3.

7.2.2 Design & Construction Review

Fulfilling the overall Campus Master Plan will require many years of site development on almost every portion of campus. With this transformation comes the opportunity to integrate bicycling infrastructure within funded projects. Ensuring that these projects adhere to the Bicycle Master Plan and other guiding documents and policies is critical to future campus mobility. Missed opportunities become difficult and expensive to retrofit when accommodations are not made up front. Concept and site plans should be reviewed for compliance with the Bicycle Master Plan as well as additional opportunities for bicycle linkages, parking locations, and showers or changing facilities not identified within the Bicycle Master Plan. This review should be done by a staff member familiar with the Bicycle Master Plan as well as general bicycle issues, designs, and plans. Lack of education or training often results in costly oversights. The concept of a designated Bicycle Coordinator is explored in Section 7.3. If hired, such a person would be the logical person to task with construction project review.

7.2.3 Parking Permit Prices

A variety of parking permit types are currently offered on the University of Utah campus. Most permits range in price from approximately $70 to $140 annually, with some premium permits exceeding $270. These prices are considered low in comparison with many other universities throughout the west. Increasing permit prices may encourage some commuters to use alternative transportation modes, and will also provide increased revenue for Commuter Services for the maintenance, construction and administration of new facilities including roads, parking lots, and bicycle facilities. The mode shift to alternative transportation will also support the Climate Action Plan.

7.2.4 On-Campus Resident Parking Alternatives

As outlined in Table 7-2, many universities already restrict their students from driving to campus. Restrictions can be based on factors such as their year in school and proximity of residential address to campus. Many universities find it easiest to restrict freshmen living on campus from purchasing parking permits. Exceptions to this restriction can be made based on need, but should require a verifiable reason. Another alternative is a special parking pass that allows freshmen to park in lots near their residences, but not on campus, thus discouraging them from using their cars for intra-campus trips but enabling them to still make longer-distance trips.

The University of Utah does not require freshmen to live on campus, but it can still change parking procedures to dictate that on-campus freshmen not purchase parking permits. Campus housing data show that there were 1,241 freshmen living on-campus during the 2010-2011 academic year with nearly 2,400 students in total living on campus. It is possible that after initial restrictions on freshmen parking, greater restrictions could be expanded to other or all students living on campus. This may allow conversion of parking lots to other uses, saving the University the expense of constructing new facilities elsewhere to meet future demand.

On campus parking restrictions are good for many universities that must face the issue of competing physical and financial resources. The University of Utah's ability to expand and grow depends on physical space for housing and educational facilities.

7.2.5 On-Campus Resident Transportation Alternatives

On-campus students are often the least impacted by parking restrictions. Access to TRAX and UTA bus routes gives freshmen regional transportation options and access to many of the major destinations in the Salt Lake Valley and beyond. More TRAX and FrontRunner lines will open over the next several years, providing an even wider range of accessibility.

The University can help freshmen remain mobile by providing incentives for car sharing. Free car sharing registration or a yearly stipend in lieu of a parking pass may be considered. Including a bicycle as part of yearly registration fees is another alternative that can be considered to help on-campus students get around without a car. Improving secure long-term bicycle parking in on-campus housing complexes is also recommended. All of these alternatives can be later expanded to other campus groups if they prove successful with freshmen. This expansion could manifest itself either through mandatory restrictions or voluntary opt-in programs.

7.2.6 Off-Campus Parking Permit Alternatives

The University should also explore the possibility of parking permit restrictions based on residential proximity to campus. While these restrictions may be viewed as punitive, they can also be accompanied with incentive programs that reward students for opting for more sustainable methods of transportation such as walking and bicycling. One caution is that implementing this recommendation can lead to parking pass fraud. However, it has been successfully implemented on other campuses. Utility bills or current lease agreements can be used as proof of residence within a pre-determined cordon around campus. UC Santa Barbara uses a 2-mile cordon around campus to define the area where students are ineligible to purchase a student parking permit.

7.2.7 Alternate Commute Mode Incentives

In conjunction with restrictions, the University should also offer incentives to individuals who could drive to the University, but instead choose an alternative. Incentives beyond the UTA Ed Pass that students, faculty, and staff are already eligible for may include prizes, activities, or monetary reimbursement depending on the frequency of use. UC San Diego offers a simple monthly breakfast to campus bicycle commuters, which proved to be very popular. Stanford University's "Clean Air Cash" Program provides qualifying participants up to

$280 during the academic year by not driving to campus. Additional incentive program recommendations are included in the following section.

7.3 Recommended Programs

Efforts to improve bicycle circulation and safety at the University of Utah should include programmatic efforts designed to promote and encourage safe and courteous campus bicycling. This chapter presents recommendations for education, encouragement, enforcement, and evaluation programs that the university can implement to improve conditions for bicyclists and other campus users.

The purpose, target audience (where applicable), potential partners, time frame, and sample programs (where available) are listed for each program type. A description of how the program should be implemented is also provided.

These programs can work together to maximize university resources and efforts in order to reach students, faculty, staff, and visitors effectively. The programs can be implemented individually, but the university will likely see the best results when programs are coordinated concurrently.

Staff a Bicycle & Pedestrian Coordinator Position	
Purpose	Centralize bicycle-related responsibilities within a Bicycle Program Coordinator position
Target	University bicycling issues
Potential partners	Salt Lake City Bicycle Coordinator, UDOT Bicycle Coordinator, Office of Sustainability, Commuter Services, Facilities Planning
Time frame	Ongoing
Sample programs	University Bike Program Resources: http://www.universitybikeprograms.org/ Michigan State University, MSU Bikes Service Center Manager, Tim Potter: http://www.bikes.msu.edu/ University of Minnesota: http://www.bikewalktwincities.org/news-events/news/interview-university-minnesota-campus-bicycle-coordinator-steve-sanders UC Davis: http://taps.ucdavis.edu/bicycle/ Stanford University: http://transportation.stanford.edu/alt_transportation/BikingAtStanford.shtml Emory University: http://bike.emory.edu/

A number of universities around the country staff a part- or full-time Bicycle Program Coordinator position. To take full advantage of current bicycle planning and safety efforts and to assist with implementation of university bicycling programs, the University of Utah should prioritize creating and staffing an ongoing bicycle position that could also be expanded to encompass pedestrian issues (i.e. a Bicycle and Pedestrian Coordinator). In addition to supporting existing programs, such as provision of bike parking and education activities, job duties may include the following:

- Monitoring facility planning, design, and construction that impacts bicycling
- Staffing bicycle advisory committee meetings

- Implementing Bicycle Master Plan projects and programs as well as seeking funding sources to do so
- Identifying new projects and programs that would improve the university's bicycling environment and improve safety for bicyclists, pedestrians, and motorists
- Evaluating projects and programs
- Coordinating bicycle counts

Currently, the responsibility for bicycle issues is shared between the Facilities Department that does bikeway planning and Commuter Services that maintains existing facilities. We recommend that the University integrate the bicycle coordinator position within Commuter Services to centralize bicycle issues and also empower the position to work closely with other departments. We further recommend that other bicycle-related programs and functions be integrated within Commuter Services.

Due to current budget challenges, it may be necessary to have the bicycle coordinator fulfill other responsibilities as well. However, the University should dedicate a full-time employee to the bicycle coordinator position as resources allow. If funding the position proves to be a challenge, is may be possible to broker a deal between various departments such as the Office of Sustainability, Commuter Services, and Facilities Management Department to each provide a portion of the money required. The following is a brief list of anticipated benefits associated with having a dedicated bicycle coordinator:

- Single point of contact to assume responsibility for implementing bicycle projects and programs
- Improved coordination of bicycle issues on capital projects
- Increased bicycle mode share
- Reduced motor vehicle parking demand from attracting vehicle commuters to bicycling modes. This has two primary benefits:
  - Saves the university from adding additional parking capacity at high cost
  - Allows the university to allocate land to purposes other than vehicle parking
- Commitment to sustainability and reducing the university's carbon footprint
- Campus appreciation for having someone dedicated to bicycling issues
- University would be seen as a regional leader by dedicating the resources to this position
- University would be well positioned to apply for Bicycle Friendly University (BFU) recognition through the League of American Bicyclists (LAB)

The Bicycle Coordinator should chair the Bicycle Subcommittee and sit on the Parking and Transportation Committee as the official representative for University bicycle transportation. To maximize effectiveness, the position should coordinate with the following departments (and other stakeholders as appropriate):

- **Facilities Planning**: this department provides official representation for the Campus Master Plan. The Bicycle Master Plan is considered an addendum to the Campus Master Plan. Planners within this department can provide the viewpoint of the overall Campus Master Plan when considering new bicycle infrastructure and advise if approval is needed for a proposed variation to the approved Bicycle Master Plan. The University should consider designating a point person into be the Bicycle Coordinator's main contact in the department. This point person could advise the Bicycle Coordinator of upcoming plans that will affect bicycling on campus and provide opportunities to implement Bicycle Master Plan goals.

- **Campus Design & Construction**: the Bicycle Coordinator should be involved with campus construction projects. Individual project managers can assist with implementation of bikeways that fit within their projects.
- **Plant Operations**: this department oversees utility and grounds projects that may allow for the inclusion of new bicycle infrastructure.

When issues that require coordination arise, such as implementing new bicycle infrastructure, the Bicycle Coordinator should conduct meetings or email discussions with the assigned representatives from the three offices. When issues requiring approval arise, whether resolving conflict on existing bikeways or proposed changes to the Bicycle Master Plan, the Bicycle Coordinator can meet with representatives from each office to discuss the approach and present proposed solutions to the Facilities Management Review Committee (FMRC). Commuter Services may contact the Executive Secretary from the Associate Vice President for Facilities Management office to get on the schedule once the preliminary discussions and suggested solutions have taken place.

Develop a University Bicycling Website

Purpose	Make bicycling information easier to find by providing resources, maps, safety information, events, group listings, etc. in one central place
Target audience	Current and potential bicyclists
Potential partners	University Police Department, University Bicycle Subcommittee, University Cycling Team, student and staff volunteers
Time frame	Ongoing
Sample programs	University of California Santa Barbara: http://www.as.ucsb.edu/bikes/index.html Bike Long Beach (CA): http://www.bikelongbeach.org/

The Commuter Services website does not currently offer adequate information about bicycling to or on campus. Current and potential bicyclists do not have an easy-to-find place to turn to for information about bicycling on campus, including rights and responsibilities, bicycling tips, security, groups or events. The University of Utah should develop a “one-stop shopping” website expanding on the existing Commuter Services website with comprehensive campus bicycling information.

A University bicycle website will provide information about bicycling on campus.

The website should include the following:

- PDF of the University of Utah Bicycle Master Plan
- A campus bicycle map (both online and print-friendly versions) and other bicycling resources, including bicycle parking locations (link to Google map), Salt Lake City bike map, UTA bike information, secure locking instructions, etc
- Event postings, including clinics or workshops, group rides, campus-wide events, volunteer opportunities, and dates when students, faculty, and staff are encouraged not to drive

- Information on how to safely and courteously bike on campus, including rights and responsibilities, pedestrian courtesy, and safety tips
- Information about the Bicycle Subcommittee, including how to get involved, meeting times and dates
- Link to the University Bike Collective website
- A list of local bike shops, including phone number and addresses
- A list of local bicycling groups, including the University of Utah Cycling Team (http://www.utahcycling.org), other clubs and advocacy groups
- Links to laws and statutes relating to bicycling
- Contact information for the Bicycle Program Coordinator or staff liaison
- Registrations for bike count volunteers

The website may also feature:

- Bike Buddy or Bicycle Ambassador programs
- Repair tutorials
- Message boards
- Blog featuring stories and news
- Photo galleries from events and submitted by readers
- Popular bikeway information, such as how to get to the Bonneville Shoreline Trail
- University Police Department bike registration information
- Information and/or a forum for buying/selling bicycles
- Stolen bike registry

A one-stop bike website will not be difficult to set up, but it will only be successful if the site is both easy to use and updated regularly. All content should be reviewed regularly for accuracy. If hired, the Bicycle Coordinator should keep the website updated with the help of students and staff volunteers. Further, the Bicycle Subcommittee should consider adding a standing agenda item to discuss website changes or updates.

Bike Orientation for Incoming Students	
Purpose	Introduce bicycling as a convenient form of campus transportation; disseminate information to incoming students about safe and courteous bicycling, including where and how to ride, how to securely lock a bike, etc.
Target audience	New faculty, incoming freshmen and other new students
Potential partners	Bicycle Subcommittee, University Cycling Team, University Police Department, Bicycle Collective
Time frame	August, annually
Sample programs	Stanford University New Student Orientation: http://transportation.stanford.edu/nso-bike/

A Bike Orientation for all incoming students can introduce bicycling on campus to freshmen and transfer students, and offer a refresher to returning students. A variety of outreach methods and materials can address important topics such as rights and responsibilities, proper security measures, etc. The University should hold a Bike Orientation for new students at the beginning of each school year. The orientation can be coordinated by the Bicycle Coordinator or shared between the Facilities Management Department and Commuter Services.

The Bike Orientation could include:

- Distribution of information to students at the beginning of the year through school information packets, including campus riding etiquette, locations of secure bike parking, campus and city bike maps, instructions on how to lock your bicycle, and how to share the road with cars
- Bicycle tours of campus and/or Salt Lake City
- Demonstration of how to store your bicycle on UTA buses and TRAX.
- Bike repair clinics and other activities with the University of Utah Cycling Team and/or the Outdoor Recreation Program, advertised through flyers, email, bulletin boards, and the campus newspaper
- Information tabling at campus events, prominent locations (e.g. bookstore), and at the Olpin Union during the first few weeks of instruction
- Promotion of the University of Utah Bicycling website, a resource for all bicycling related news and information on campus
- At-cost or low-cost bike lights and helmets sold at tabling events and through the campus bookstore
- Distribution of free items that promote safe and courteous bicycle use on campus
- Promotion of helmet use

Bicycle lights can be sold or given away at a Bike Orientation.

Bicycle Safety Media Campaign

Purpose	Promote safety by educating all road users through a high-profile campaign
Target audience	Students, faculty, staff, and visitors
Potential partners	University Police Department, University of Utah Cycling Team, Bike Utah, UTA, Salt Lake City, UDOT, local media outlets
Time frame	One-time, annually, or ongoing
Sample program	University of Minnesota Helmet and Headlights Campaign: http://www1.umn.edu/pts/bikers/H&H.html Stanford Sprocket Man: http://transportation.stanford.edu/alt_transportation/Sprocketman.shtml

A high-profile marketing campaign that highlights bicycle safety is an important part of helping all road users – including motorists and bicyclists – understand their roles and responsibilities on campus roads. It is an effective way to raise the profile of bicycling and improve safety for bicyclists, pedestrians, and motorists.

A well-produced safety campaign will be memorable and include clean, clear graphics in a variety of media, such as print or audio/video advertisements, the distribution of free promotional items, and email or in-person outreach. This type of campaign is particularly effective when kicked off in conjunction with other bicycling events or at the beginning of each academic term. It is recommended that the University of Utah develop and launch a bike safety campaign specific to campus users.

The University can also use the safety campaign to help brand all of the bicycling-related efforts on campus. Safety campaign messages can use similar graphics and colors used on bike orientation materials, bicycle-related campus signs, flyers for events, and promotional items, in order to create a cohesive message among all materials.

The bicycle safety campaign should address the following safety issues:

- Safe bicycling skills and secure locking practices
- Pedestrian courtesy
- How to share the road (for both motorists and bicyclists)
- Light and helmet use
- Bicyclist rights and responsibilities

The University can promote bicycle safety through a media campaign.

Apply to Become a Bicycle Friendly University	
Purpose	Highlight and get national recognition for bicycling initiatives, track progress
Target audience	University of Utah administration, students, faculty, and staff
Potential partners	Bicycle Subcommittee, students, faculty, and staff
Time frame	One-time, with regular updates; can happen at any time
Program information	League of American Bicyclists: www.bikeleague.org/programs/bicyclefriendlyamerica/bicyclefriendlyuniversity/index.php

The League of American Bicyclists has a well-respected Bicycle Friendly Community award program (Salt Lake City has achieved a Silver designation), and they have also recently launched a Bicycle Friendly University program. Universities fill out an application that covers the five Es: engineering (facilities), education, encouragement and promotion, enforcement, and evaluation. The award is designed to recognize progress that has been made, as well as assist universities in identifying priority projects and programs to improve bicycling conditions in the future. Receiving the award is a media-worthy event and may give the University of Utah the opportunity to receive positive media coverage.

We recommend that the University apply for Bicycle Friendly University status as bicycle projects and program efforts are implemented. If a Bicycle Coordinator is hired, that person should lead the effort and help determine when the university is ready to apply.

Bicycle Report Card

Purpose	Assess progress towards achieving the goals of the Bicycle Master Plan
Target audience	University administration, staff, students and faculty
Potential partners	Office of Sustainability, Commuter Services, Facilities Planning
Time frame	On-going
Sample program	City of New York (NY): http://www.nyc.gov/html/dcp/pdf/transportation/bike_survey.pdf City of San Francisco (CA): http://www.sfbike.org/download/reportcard_2006/SF_bike_report_card_2006.pdf

Reports should be shared with the public to demonstrate the University's commitment to improving bicycling

In order to assess the effectiveness of the University of Utah Bicycle Master Plan, it is important to track accomplishments and whether the plan is meeting its stated timelines and objectives.

An annual report should include relevant cycling metrics (bicycle count results, new on-street and off-street bikeway miles, major completed projects, crashes) and may also include information on user satisfaction, public perception of safety, or other qualitative data that have been collected related to bicycling. Cumulative bikeway mileage should be shown to demonstrate long-term progress in improving infrastructure.

In addition, a report assessing completion of plan goals and objectives should be included (e.g. progress towards Objective 4C – "Support UTA in increasing its bike capacity on all transit vehicles including TRAX and bus services").

The annual report should be shared with administration, stakeholders, decision makers, and the general public.

Bike Light Campaign

Purpose	Encourage and enforce the use of bike lights
Target audience	Campus bicyclists
Potential partners	University Police Department, Salt Lake City, Mayor's Bicycle Advisory Committee, University Bicycle Subcommittee
Time frame	Fall, annually
Sample programs	Bicycle Transportation Alliance Bike Light Videos (Portland, OR): http://www.bta4bikes.org/btablog/2011/01/24/new-bta-video-wear-pants-use-lights/ http://vimeo.com/19678357 "See & Be Seen" Campaign (Portland, OR): http://www.portlandonline.com/transportation/index.cfm?&c=deibb&a=bebfjh

Many bicyclists, especially students, are unaware that a front headlight and rear light or reflector are required by state law, or they simply do not purchase lights. Research shows that bicyclists who do not use lights at night are at much greater risk of being involved in bike-car crashes.

The University Police Department (UPD) already conducts a "Lock It or Lose It" program that supplies Kryptonite locks to a limited number of students who register. This proposed program would function similarly. The goal of a bike light campaign is to encourage light use through marketing, outreach, and on-the-spot installation of free or low-cost bike lights. This multi-pronged outreach effort should take place every fall, as the days are getting shorter and as students are returning to school. UPD staff and student volunteers could lead the outreach efforts and the Bicycle Coordinator could coordinate the campaign.

A bike light campaign will help promote safety

The bike light campaign should include the following elements:

- Well-designed graphic ads throughout campus; could be included as part of a safety campaign
- Outreach to students, faculty, staff, and visitors through tabling, orientation, the bicycle website, etc.
- Continued enforcement of bike light laws
- Discounted or free bike lights and reflective gear distributed on campus and available at local bike shops during the beginning of the academic year or term (some companies such as Planet Bike are known to donate lights for initiatives such as this)

Host Campus Bicycling Activities

Purpose	Encourage bicycling by hosting group rides and events, and offering incentives and rewards,
Target audience	Bicyclists and potential bicyclists
Potential partners	University of Utah Cycling Team, Mayor's Bicycle Advisory Committee, Salt Lake City, Office of Sustainability
Time frame	On-going or in conjunction with other events, such as Earth Day or Bike to School Day
Sample program	Michigan State University bicycling events and community activities: http://www.bikes.msu.edu/content/news_events.html San Francisco Bicycle Coalition Chain of Events: http://www.sfbike.org/?chain

Bicycling to campus is a great way to exercise, save money, and reduce pollution. Many students, faculty, and staff bicycle to campus for these reasons, but bicycling is also a fun, social activity that builds community. Cities, universities, and schools across the country participate in National Bike Month and Bike to School Day or host bike-related events throughout the year. We recommend that the University host activities such as group rides, contests, and incentive programs throughout the year to encourage safe and courteous bicycling.

Possible activities and promotions could include the following, and could be incorporated into many of the other programs recommended here:

- Continued and expanded Bike Month (http://utahbikemonth.org) events: morning commute energizer stations with food, encouragement, information, and sponsored goodies for participants; rally or celebration with raffles, food, and vendors.
- Group rides to destinations around Salt Lake City
- Commuter Challenge: students, faculty, and/or staff take part in friendly competition by recording how far they bike over a given time period; bicycle commuters receive recognition through press, trophies or plaques, raffles/prizes, and a final celebration
- Discounts at campus and local merchants for bicycle commuters
- Giveaways/discounts that promote safety such as free or discounted bike lights and helmets
- Create National Bike Month events (held annually in May)
- Coordination with existing campus events, such as Earth Day, to promote the benefits of bicycling and encourage safe and courteous bicycling on campus

Campus Bike Fleet	
Purpose	Encourage bicycling by university staff within campus; reduce daytime auto trips
Target audience	University staff
Potential partners	Office of Sustainability, Facilities, Administration, Commuter Services, UPD, Outdoor Recreation Program
Time frame	On-going or as initial expenditure with potential expansion
Sample program	Mississippi State University: http://www.msstate.edu/web/media/detail.php?id=4443 http://www.collegebikes.com/

The University of Utah maintains a diverse fleet of vehicles for staff to use around campus, including traditional cars and trucks, low- and zero-emission vehicles, and carts. Many cities (including Salt Lake City) are starting to see the benefits of establishing bike fleets for employee use during the day. They can be used for errands, meetings, or recreational rides during lunch. Many daytime trips, particularly those within campus, are easily completed by bicycle. Bike fleets reduce dependence on automobile fleets or personal vehicles and associated reimbursements.

University of Utah fleet bikes should have racks and fenders, and should be available for check out from various locations around campus. Consideration may be given to establishing separate fleets in the upper and lower campus areas because of the grade difference. Periodic safety checks and necessary maintenance could either be assigned to a University employee with appropriate skills and interest or contracted with a local bike shop.

Valet Event Bicycle Parking

Purpose	Encourage bicycling by event attendees
Target audience	University staff, students, faculty, visitors
Potential partners	Office of Sustainability, The University Bicycle Collective (www.ubike.org), University of Utah Cycling Team
Time frame	On-going
Sample program	Salt Lake City Bicycle Collective: www.slcbikecollective.org University of Arizona: parking.arizona.edu/bikevalet/ University of Maryland: bikeumd.wordpress.com/2011/02/23/job-posting-bike-valet-coordinator/

Events can bring lots of traffic into the University. The Huntsman Center and Rice-Eccles Stadium draw tens of thousands of visitors per event and place a strain on campus parking facilities. The Salt Lake City Bicycle Collective has been providing bicycle valet services at a number of events within the city including the Downtown Farmers Market and the Red Butte Garden Outdoor Concert Series. It would make sense for the University to reach out to the Bicycle Collective to gauge their interest.

Bicycle valet provides a unique service to University events

The University of Utah Cycling Team is also another potential partner for valet parking. The Cycling Team could use the event as a fundraiser and to increase awareness of the organization. The University may wish to pilot bicycle valet in the late summer, then extend it into fall and spring events as the program matures.

Bicycle Count Improvements

Purpose	Increase efficiency and data clarity for university bicycle counts
Target audience	University administration, staff, students and faculty
Potential partners	Salt Lake City
Time frame	On-going
Sample program	National Bicycle and Pedestrian Documentation Project: bikepeddocumentation.org

In 2010, both the University of Utah and Salt Lake City embarked on bicycle count efforts. Both efforts used count forms provided through the National Bicycle and Pedestrian Documentation Project (NBPDP), but only Salt Lake City performed counts during the recommended week (second week in September) and the recommended time (5-7 p.m.). All three of the Salt Lake City count locations near the University are duplicated between the two efforts. Both efforts tracked sidewalk riding and helmet usage. Map 4-4 in Chapter 4 shows the count locations for both efforts in 2010.

We recommend that the University modify its count practices to coincide with Salt Lake City's efforts as set forth in Table 7-3. By doing so the University can:

- Capture higher levels of bicycling during the evening peak period from 5-7 PM for weekday counts (note: these hours may not capture campus bicycling peak times), and 12-2PM on weekends.
- Redistribute counts from duplicate locations and take advantage of Salt Lake City's efforts.
- Perform counts in September when the weather is more likely to be free of precipitation and capture higher levels of bicycling
- Have data comparable to other communities by following guidance from the NBPDP

Table 7-3: University Count Location Recommendations

Location	Agency	Recommendation for University
100 South & Wolcott St	U of U	Keep location
University Street & South Campus Dr	U of U	Keep location
Legacy Bridge	U of U	Keep location
South Campus Dr & Mario Capecchi Dr	U of U	Keep location
University St & 200 South	SLC & U of U	Abandon location since SLC currently counts here
Sunnyside & Guardsman Wy	SLC & U of U	Abandon location since SLC currently counts here
Sunnyside & Arapeen Dr	SLC & U of U	Abandon location since SLC currently counts here
HPER Mall and OSH/Library Mall	U of U	New location to count internal campus trips
North Campus Dr & Central Campus Dr	U of U	New location to capture bike trips on the north of campus.
Wakara Way & Arapeen Dr	U of U	New location to capture Research Park bicycle traffic
HPER Mall Path near Humanities Plaza	U of U	New location to count internal campus trips

Bike Sharing

Purpose	Provide improved transportation options at the University of Utah
Target audience	University, staff, students, faculty and visitors
Potential partners	Salt Lake City, UTA, Downtown Alliance
Time frame	Future / Ongoing
Sample program	Capital Bike Share: www.capitalbikeshare.com Boston Hubway: www.cityofboston.gov/news/default.aspx?id=5075 Denver B-Cycle: www.denverbikesharing.org

Bike share programs, such as systems in Montreal, Minneapolis, Denver, Washington DC, and Boston help increase cycling mode share, complete gaps in the public transit system, reduce a city's travel-related carbon footprint and provide additional "green" jobs for system management and maintenance. In North America, many additional cities are considering bike share programs, including Salt Lake City.

Bicycle sharing systems use automated stations that release bicycles for use by the public

Bike sharing could be used on the University of Utah campus to provide better integration from TRAX stations to internal points on campus and facilitate cross-campus trips. Because of the challenging topography, bicycles would need to have sufficient gearing and be as light as possible.

The fleet size and number of stations would depend on the target population, the chosen system model, and the amount of funding available. A full feasibility study should be completed to define system parameters.

Encouragement/Incentive Campaign	
Purpose	Encourage desired bicycling behavior and increase campus safety by rewarding bicyclists with incentives.
Target audience	Individuals bicycling on campus
Potential partners	UPD
Time frame	Ongoing
Sample programs	Brigham Young University: www.ksl.com/index.php?sid=17275208&nid=1010

Many universities struggle with improving safety on campus. When discussing safety, the conversation frequently focuses on enforcement measures like dismount zones, citations/tickets, fines, or other "sticks". An encouragement/incentive program provides "carrots" that may more effectively reach target audiences. Campus police departments often administer these programs. Officers reward bicyclists for exhibiting desired behaviors. Sample behaviors could include:

- Walking a bike in dismount zones
- Helmet use
- Riding on the correct side of the street/facility
- Coming to a full stop at stop signs/traffic signals

"Catching" bicyclists displaying desired behaviors encourages them to repeat the behavior, and can spread quickly within the university community via word of mouth, or formally as a part of an official campaign. Example incentives could include:

- Coupons at a local bike shop
- Free/discounted food items at campus/local stores
- Bike related products (water bottles, bells, lights, helmets, locks)
- University of Utah merchandise

This type of campaign can be a valuable component to an overall, balanced approach to improving campus safety. To maximize the effectiveness of the campaign, rewards should be distributed sporadically during the school year. The program should be introduced sometime during the beginning of the year to reach new students, staff and faculty, and then throughout the year during times of nice weather or other events where high bike traffic is expected.

7.3.1 University Bike Collective

The University Bike Collective exists as an affiliate of the Salt Lake City Bike Collective. It provides refurbished bicycles and educational programs to the community. We recommend that the University Bike Collective be organized within Commuter Services because the Collective's mission is to promote cycling as an effective form of transportation. Also, if the Bicycle Coordinator position will be housed within Commuter Services as well, it would make sense to locate the Bike Collective in the same place.

8 Implementation

Implementation of the University of Utah Bicycle Master Plan will take place incrementally through small steps taken over many years, depending on available funding and coordination with external agencies. The following strategies and action items can guide the University toward developing the projects identified in this plan.

The project prioritization matrices found in this section are one tool to help the University dedicate resources towards campus bicycle facilities. They are based partially on the feedback and priorities of the project Steering and Working Committees, with the goal of keeping the evaluation criteria as objective and quantifiable as possible. The Campus Bicycle Subcommittee is encouraged to periodically revisit this chapter and make adjustments when new projects are completed or when other conditions change.

Ideally, the University should complete higher-priority projects found within the short-, medium- and long-term lists in Chapter 6 in the general order that they appear in the prioritization matrix. However, many opportunities will likely arise over the years that will make lower priority projects feasible either through efforts of an external agency (e.g. UDOT's resurfacing of South Campus Drive in 2012), or through on-campus construction projects such as the future Ambulatory Care Complex.

8.1 Cost Estimates

The planning-level cost estimates presented in this chapter are based on an understanding of general project components, rather than on a detailed design. They should be considered as "Order of Magnitude" in accuracy. American Society for Testing and Materials (ASTM) Standard E2620 defines Order of Magnitude as being accurate to within plus 50% or minus 30%. This broad range of potential costs is appropriate given the level of uncertainty in the design at this point in the process. Many factors can affect final construction costs, including:

- Final construction phasing
- Revisions to the design as required by local, state and federal permitting agencies
- Additional requirements imposed by property owners as a condition of granting property rights (e.g., fencing, vegetated buffers, etc.)
- Fluctuations in commodity prices during the design and permitting processes
- Selected construction materials
- Type and quantity of amenities (e.g., benches, lighting, bike racks, etc.)
- Extent of landscaping desired

As projects progress through preliminary and final design phases, these uncertainties begin to diminish. With each round of refinement, the range of expected construction costs will become more accurately known. Design costs are not represented in these estimates because this service could be provided by the University, Salt Lake City, UDOT or private consultants. Typically design costs range from 3-5% for simple projects to 30% or higher for more substantial projects that require extensive design services such as structural, geotechnical, or environmental engineering.

Each project cost estimate includes a 3% mobilization estimate and a 30% contingency. Project costs were also estimated using the highest quality materials such as thermoplastic stenciling for maximum durability and reduced maintenance costs for the University. Where possible, material costs were derived from specific unit costs for similar projects both at the University and within the Salt Lake City area. Costs are provided in current (2011) dollars. Since the projects recommended in this plan will be completed over many years, the University will need to factor in inflation and other considerations at the time it embarks on a particular project. Detailed breakdowns of costs are provided in Appendix D.

8.2 Project Prioritization Criteria

The proposed bikeway network will make intra-campus travel more convenient for bicyclists. Ranking criteria were developed to provide implementation guidance since all projects cannot be constructed simultaneously. The following criteria were used to score proposed bikeway projects:

- Campus Connectivity
- TRAX Connectivity
- Existing Campus Bikeway Connectivity
- Existing City Bikeway Connectivity
- Network Gap
- Crashes

8.2.1 Campus Connectivity

The University of Utah's campus is divided into major sections, including campus housing, the medical campus, Research Park, and lower (main) campus. Travelling between these parts of campus can be difficult for bicyclists. Facilities that connect various parts of campus are valuable to the network and qualify for this scoring criterion.

8.2.2 TRAX Connectivity

Multi-modal commuting is popular among students, faculty and staff, especially during inclement weather. Providing bikeway access to TRAX stations makes multi-modal commuting a more viable option and encourages people who otherwise might not do so to give it a try. Bikeways that connect to campus TRAX stations qualify for this scoring criterion.

8.2.3 Existing Campus Bikeway Connectivity

Designated facilities make campus bicycle travel easier. It is important for bikeways to connect at strategic locations in order to form a useful system. Projects that connect to existing campus bikeways qualify for this scoring criterion in order to expedite connectivity. Currently, the only officially recognized permanent campus bikeway is the HPER Mall bike path that was constructed in September 2011. The HPER Mall path serves as the east-west spine of the campus bikeway system and connects with several proposed projects. Proposed bikeways that tie into the HPER Mall path would provide value to the overall network.

8.2.4 Existing City Bikeway Connectivity

Bikeways that connect to the Salt Lake City network make travel between campus and the city more convenient. Proposed facilities that accomplish this goal qualify for this scoring criterion.

8.2.5 Network Gap

It is desirable for the campus bikeway network to grow through new connections to existing facilities. This criterion provides additional emphasis on projects that connect two existing bikeways or connect one existing bikeway to another proposed bikeway

8.2.6 Crashes

Crashes may be indicative of hazardous conditions. They may also be attributed to bicyclist error or lack of education. Crashes were identified and examined by using the data provided by UPD and SLCPD. In order to address hazards and improve bicyclist safety, projects that travel through campus crash locations will qualify for this scoring criterion. Table 8-1 summarizes the scoring criteria and points awarded for certain characteristics.

Table 8-1: Facility Scoring Criteria

Criterion	Points	Description
Campus Connectivity	2	Bikeway connects two parts of campus that are not currently connected
	1	Bikeway provides secondary connectivity between two parts of campus
	0	Bikeway does not connect two different parts of campus
TRAX Connectivity	2	Bikeway provides direct connectivity to a campus TRAX station
	1	Bikeway provides secondary connectivity to a campus TRAX station
	0	Bikeway does not connect to a campus TRAX station
Existing Campus Bikeway Connectivity	2	Bikeway connects to an existing campus bikeway
	1	Bikeway provides secondary connectivity to an existing campus bikeway
	0	Bikeway does not connect to an existing campus bikeway
Existing City Bikeway Connectivity	2	Bikeway connects to an existing city bikeway
	1	Bikeway provides secondary connectivity to an existing city bikeway
	0	Bikeway does not connect to an existing city bikeway
Network Gap	2	Bikeway connects two existing city/campus bikeways
	1	Bikeway connects an existing and proposed bikeway
	0	Bikeway does not connect to an existing bikeway
Crashes	2	Bikeway will travel through campus locations where multiple crashes have occurred
	1	Bikeway will travel through campus locations where one crash has occurred
	0	Bikeway does not travel through a campus location where a crash has occurred

8.3 Project Summary Tables

The proposed projects listed in Chapter 6 were scored based on the criteria found in Table 8-1. Tables 8-2 through 8-4 contain all recommended linear bikeway projects for the short-, medium- and long-term scenarios, respectively, ranked from highest to lowest. Project cost estimates are also listed in these tables.

Spot improvement rankings are located in Table 8-5. These rankings are based on the sum of the total scores of all proposed linear bikeways that tie into the given spot improvement.

Table 8-2: Short-Term Project Prioritization

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization						
								Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Guardsman Way	Foothill Dr	South Campus Dr	Shared Lane	450	$2,200	UDOT		2	2	0	2	2	1	9
South Campus Drive	Guardsman Way	Mario Capecchi	Shared Lane	2,940	$14,500	UDOT		2	2	0	2	2	1	9
Stadium Connector	Stadium TRAX Station	Top of north tunnel ramp	Bicycle Path	1,050	$20,300	U of U	Dismount zone at top of ramps on both sides of tunnel	2	2	0	1	2	1	8
North Campus Path #1	Federal Way	JCC Access Road	SUP	4,100	$145,500	U of U	Most useful in conjunction with intersection modifications at Penrose and Federal Heights Dr	2	1	0	1	2	1	7
North-South Path	Business Loop	Merrill Building	Bicycle Path	3,300	$94,800	U of U	Part of existing pilot project	2	1	2	0	1	1	7
Northeast Parking Lot	Red Butte Canyon Rd	North Campus Dr	Shared Lane	3,920	$19,250	U of U		2	0	0	2	2	1	7
1500 E Connector	Guardsman Way	1500 East Parking Lot	SUP	565	$3,900	UDOT		1	0	0	2	2	1	6
Foothill Dr Path #2	Foothill mid-block crosswalk	Guardsman Way	SUP	1,075	$7,300	UDOT	Most useful in conjunction with moving stop bars back on Guardsman and 1725 East	1	0	0	2	2	1	6

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization						
								Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
HPER Mall Path	Wasatch Dr	End of existing HPER Mall path	Bicycle Path	1,515	$208,000	U of U	Part of existing pilot project	2	1	2	0	0	1	6
VA Western Route	Sunnyside Ave	Foothill Dr	Shared Lane	2,100	$10,300	VA, Salt Lake City	South VA gate is sometimes locked (mainly weekends and evenings)	2	0	0	2	1	1	6
Chipeta Way/Connor Rd	Wakara Way	Red Butte Canyon Rd	Shared Lane	1,580	$7,750	U of U	Chipeta west of Wakara could have bike lanes with a lane reduction	2	0	0	2	0	1	5
Federal Way	South Temple	1450 E	Shared Lane	1,000	$4,900	Salt Lake City	Markings placed only in one direction since it is a one-way road.	0	0	0	2	1	2	5
Fieldhouse/ Library Connector	Prop. Fieldhouse Path	1500 East	Shared Lane	525	$2,600	U of U		2	1	0	1	1	0	5
HPER Mall Bisect	Business Loop	Central Campus Dr	Bicycle Path	1,500	$193,200	U of U	Coordinate with HPER Mall and shuttle bus projects	1	1	2	0	0	1	5
Legacy Bridge Path	Fort Douglas Blvd	SW End of Legacy Bridge	Bicycle Path	950	$23,800	U of U	Part of existing pilot project	2	2	1	0	0	0	5

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization						
								Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Mario Capecchi Dr	Foothill Dr	South Campus Dr/ Hempstead Rd	Bicycle Lane	1,950	$45,000	UDOT	Most useful along with phasing/access changes at Foothill	2	0	0	2	0	1	5
Presidents Circle	University Street	University Street	Shared Lane	1,725	$8,500	U of U	Markings placed only in one direction since it is a one-way road.	0	0	0	2	2	1	5
Red Butte Canyon Rd	Connor Rd	Bonneville Shoreline Trail	Shared Lane	1,220	$6,000	U of U	Uphill bike lane/downhill shared lane combo is desirable, but would require widening	2	0	0	2	0	1	5
Research Park Connector	Wakara Way	Pollock Rd	SUP	980	$62,900	Army; Marri-ott Hotel; Salt Lake City	Requires coordination with the Army to re-open access	2	0	0	2	0	1	5
South Temple	University St	Wolcott St	Shared Lane	960	$4,700	Salt Lake City	Extension of existing shared lane markings on South Temple	0	0	0	2	1	2	5
Student Life Connector	Legacy Bridge	HPER Mall Path	Bicycle Path	660	$85,000	U of U		2	2	1	0	0	0	5

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization						
								Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
VA Eastern Route	VA Central Route	Foothill Dr	Shared Lane	1,200	$6,000	U of U	Most useful along with phasing/access changes at Foothill intersection	2	0	0	2	0	1	5
2030 E	South Medical Dr	North Campus Dr	Shared Lane	2,175	$10,700	U of U		2	0	0	0	2	0	4
Business Loop	South Campus Dr	South Campus Dr	Shared Lane	2,270	$11,000	U of U	Could be converted to bicycle lanes in future along with development	0	2	0	1	1	0	4
Institute Loop	South Campus Dr	South Campus Dr	Shared Lane	2,060	$10,000	LDS Insti-tute		1	2	0	0	1	0	4
VA Central Route	VA Western Route	Foothill Dr	Shared Lane	2,960	$14,500	U of U	Most useful along with phasing/access changes at Foothill intersection	2	0	0	1	1	0	4
Wolcott Extension	100 South/ Wolcott	Prop. North-South Path	Shared Lane	915	$5,000	U of U		1	0	0	2	0	1	4
1500 E/Olpin Union Connector	1500 East	Proposed North-South Path	Bicycle Path	715	$18,000	U of U		1	0	0	0	2	0	3
1500 East	Prop. 1500 East Connector Path	Prop. Middle Campus East-West Connector	Shared Lane	1,280	$6,300	U of U		1	0	0	0	2	0	3

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization: Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Hempstead Rd	Mario Capecchi Dr	Fort Douglas Blvd	Bicycle Lane	1,080	$7,700	U of U	Most effective along with shared lanes or bicycle lanes on South Campus	2	1	0	0	0	0	3
South Medical Dr	Mario Capecchi Dr	Prop. NE Parking Lot Shared lane	Bicycle Lane/ Shared Lane	2,090	$15,000	U of U		1	1	0	0	1	0	3
Wakara	Chipeta Way	Red Butte Gardens	Shared Lane	1,400	$6,800	Salt Lake City		0	0	0	2	0	1	3
Wasatch Dr	Ballif Rd	North Campus Dr	Bicycle Lane	2,140	$15,282	U of U		1	1	1	0	0	0	3
Wasatch Dr	Mario Capecchi Dr	Ballif Rd	Bicycle Lane/ Shared Lane	415	$3,000	U of U		1	1	1	0	0	0	3
2000 E #2	Prop. Heritage Center Path	S. Medical Dr	Shared Lane	530	$2,600	U of U		2	0	0	0	0	0	2
Ctrl Campus Dr #2	Warnock Building	Warnock Building	Shared Lane	2,100	$10,300	U of U	Could be converted to bicycle lanes in future as development occurs	1	0	1	0	0	0	2
Medical School Access	S. Medical Dr	School of Medicine	Bicycle Lane/ Shared Lane	740	$5,400	U of U		1	1	0	0	0	0	2

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization: Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Pollock	Connor Rd	Prop. Research Park Connector	Shared Lane	1,570	$7,700	Army		2	0	0	0	0	0	2
2000 E #1	Stover St	Prop. Heritage Center Path	Shared Lane	415	$2,000	U of U		1	0	0	0	0	0	1
Army Rd	Pollock Rd	Hempstead Rd	Shared Lane	1,415	$7,000	Army		1	0	0	0	0	0	1
Central Campus Dr #1	Warnock Building	North Campus Dr	Bicycle Lane	1,250	$9,000	U of U	Lane conversion from four traffic lanes to three plus bicycle lanes	1	0	0	0	0	0	1
Connor-Fort Douglas Connector	Parking lot SW of Connor	Parking lot NE of Fort Douglas Blvd	Bicycle Path	160	$20,600	U of U	Could probably also be a shared use path	1	0	0	0	0	0	1
Foothill Dr Path #1	Mario Capecchi Dr	Research Rd	SUP	700	$44,900	UDOT; Boy Scouts; LDS Institute	Most useful with Institute Loop short-term shared lane recommendation	1	0	0	0	0	0	1
Fort Douglas Blvd	Hempstead Rd	Pollock Rd	Bicycle Lane	880	$6,300	U of U		1	0	0	0	0	0	1
Fort Douglas Blvd	Hempstead Rd	S. Medical Dr	Shared Lane	1,715	$8,400	U of U		1	0	0	0	0	0	1
Heritage Center Path	Parking lot SE of Heritage Center	Road NW of Heritage Center	Bicycle Path	475	$12,000	U of U	Part of existing pilot project	1	0	0	0	0	0	1

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization: Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Heritage/ Officers Circle Connector	Proposed Heritage Center Path	Officers Circle	Bicycle Path	175	$18,000	U of U	Existing stairs at SW end of this proposed path	1	0	0	0	0	0	1
Stover St #1	Ft Douglas Blvd	Prop. Connor-Ft Douglas Connector Path	Shared Lane	220	$1,000	U of U		1	0	0	0	0	0	1
Stover St #2	Prop. Connor-Ft Douglas Cnctr. Path	Connor Rd	Shared Lane	145	$700	U of U		1	0	0	0	0	0	1
Exploration Way	Central Campus Dr	Wasatch Dr	Shared Lane	800	$4,000	U of U		0	0	0	0	0	0	0
Officers Circle	Fort Douglas Blvd	Fort Douglas Blvd	Shared Lane	1,300	$6,400	U of U	Markings placed only in one direction since it is a one-way road	0	0	0	0	0	0	0
Research Rd	Institute Loop	Mario Capecchi Dr	Shared Lane	775	$3,800	Salt Lake City	Eastern part of this segment may be wide enough for bike lanes	0	0	0	0	0	0	0

Table 8-3: Medium-Term Project Prioritization

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization: Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Lower Campus East-West Path	Junction SE of Library	University Street/300 South	Bicycle Path	1,270	$127,600	U of U	Stairs on SE side of library would likely require code-compliant bike wheel trough	2	0	2	2	2	2	10
Guardsman Way	Foothill Dr	South Campus Dr	Bicycle Lane	450	$3,200-$27,200	UDOT	May be done through lane conversion or reconstruction	2	2	0	2	2	1	9
South Campus Dr	Guardsman Way	Mario Capecchi Dr	Bicycle Lane	2,940	$21,000-$179,400	UDOT	May be done through lane conversion or reconstruction	2	2	0	2	2	1	9
Arapeen	Sunnyside Ave	Wakara Way	Bicycle Lane	2,935	$177,200	Salt Lake City	Bringing existing bicycle lanes up to standard; may require roadway reconstruction	1	0	0	2	2	2	7
Mario Capecchi Path	Ballif Rd	Prop. Inter-disciplinary Mall Path	SUP	2,120	$136,000	U of U	Would run adjacent to TRAX most of the way	2	2	1	0	0	0	5
Red Butte Creek Trail – Seg. 3	Foothill Dr	Prop. Research Park Connector	SUP	1,250	$80,200	Army	Space available on west side of the creek	2	0	0	2	0	1	5
Stadium/ President's Circle Connector	Top of north tunnel ramp	President's Circle	Bicycle Path	1,185	$91,200	U of U	Dismount zone at top of ramps on both sides of tunnel	2	1	0	1	1	0	5

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization: Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Chipeta	Arapeen Dr	Wakara Way	Bicycle Lane	2,740	$165,400	Salt Lake City	May be done through lane conversion or reconstruction	0	0	0	2	0	2	4
Red Butte Creek Trail – Seg. 1	Existing path north of Sunnyside	VA road across from Wakara	SUP	1,600	$102,600	Salt Lake City	Requires clearing and earthwork; may require environmental review	1	0	0	2	0	1	4
Wakara	Foothill Dr	Chipeta Way	Bicycle Lane	2,975	$179,600	Salt Lake City	Bringing existing bicycle lanes up to standard; may require roadway reconstruction	0	0	0	2	1	1	4
Foothill Dr Path #3	Western-most VA road	Foothill mid-block crosswalk	SUP	180	$1,200	UDOT		0	0	0	2	0	1	3
Foothill Dr Path #4	Guardsman way	Stadium TRAX Station	SUP	1,640	$12,000-$105,200	UDOT	Potential utility conflicts; most useful in tandem with moving stop bars back on Guardsman	0	2	0	0	1	0	3
Interdisciplinary Mall	Primary Children's Hospital	Merrill Building	Bicycle Path	2,670	$136,200	U of U	In conjunction with USTAR and Ambulatory Care projects	2	0	0	0	1	0	3
Red Butte Creek Trail – Segment 4	Prop. Research Park Connector	Chipeta Way	SUP	1,700	$109,000	Army	Sensitive biological area	2	0	0	1	0	0	3

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization						
								Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Student Housing Path	Red Butte Canyon Rd	S. Medical Dr	Bicycle Path	1,270	$124,100	U of U		1	0	0	0	1	0	2
Middle Campus East-West Connector	North-South Path	President's Circle	Bicycle Path	820	$20,600	U of U		1	0	0	1	0	0	2
2000 East Extension	South Medical Dr	School of Medicine	Bicycle Path	880	$31,900	U of U		1	0	0	0	0	0	1
Red Butte Creek Trail – Segment 2	VA road across from Wakara	Foothill Dr	SUP	425	$27,300	VA; building owners SE of Foothill		0	0	0	0	0	0	0

Table 8-4: Long-Term Project Prioritization

Project	From	To	Bikeway Type	Length (ft)	Cost Estimate	Outside Coordination	Notes	Prioritization: Campus Connectivity	TRAX Connectivity	Existing Bikeway/ Campus	Existing Bikeway/ City	Crashes	Network Gaps	Score Total
							Weight	1	1	1	1	1	1	
Fieldhouse Path	Top of north tunnel ramp	Parking lot north of Fieldhouse	Bicycle Path	500	$49,000	U of U		2	2	0	1	2	0	7
Mario Capecchi Dr	South Campus Dr/Hempstead Rd	North Campus Dr	Bicycle Lane	4,350	$31,000-$187,300	UDOT; UTA	May require major reconstruction	2	2	1	0	1	0	6
100 South	University St	North Campus Dr	Bicycle Lane	1,400	$10,000	Salt Lake City	May require lane reduction; alternative is shared lane markings	1	0	0	2	1	1	5
North Campus Dr	100 South	Mario Capecchi Dr	Bicycle Lane	4,370	$264,000	UDOT	May require major reconstruction	2	1	0	0	2	0	5
North Campus Path #2	End of prop. N/S Path at Merrill Bldg	Hospital area	SUP	3,120	$250,000	U of U	Need to mitigate high-speed bicycles coming downhill in opposite direction of traffic	2	1	0	0	2	0	5
Shuttle Route Bicycle Lanes	Fort Douglas	Wasatch Dr	Bicycle Lane	525	Unk.	UDOT; UTA	Would likely only occur as part of undefined shuttle bus project	2	1	1	0	0	0	4
Foothill Dr Path #5	End of existing SUP	Prop. bridge over Mario Capecchi	SUP	120	$7,700	UDOT	Facility only makes sense in conjunction with bridge over Foothill	1	0	0	2	0	0	3

Table 8-5: Spot Improvement Project Prioritization

Project	Notes	Timeline	Associated Projects	Sum of Associated Project Scores
Stop Bar Relocation and Bike Box on North Side of Guardsman Way at Foothill Drive	Purpose is to help bicyclists move more predictably between on-street facilities and shared-use paths	Medium term	1500 East Connector SUP; Foothill Drive SUP #2; Foothill Drive SUP #4; Guardsman Way SLM Route; Guardsman Way Bike Lanes	33
Stop Bar Relocation and Bike Box on South Side of 1725 E at South Campus Drive	Purpose is to help bicyclists move more predictably between on-street facilities and shared-use path	Medium term	Institute Loop SLM Route; Business Loop SLM Route; South Campus SLM Route; South Campus Bike Lanes	26
Bonneville Shoreline Trail (BST) Signage north of Jewish Community Center (JCC)	Coordinate with SLC; install wayfinding signage on south side of Dry Creek to encourage people to use the JCC access road rather than the dirt road that drops straight onto North Campus; boulders across the dirt road may be desirable	Short term	North Campus Dr bike lanes; North Campus Path #1; Northeast Parking Lot Shared Lanes; 2030 E Shared Lanes	23
North Campus/ Penrose/Wasatch Dr Intersection Modifications	Reconfigure intersection to allow north-south through movement for bicycles	Medium term	North Campus Dr bike lanes; North Campus Path #1; North Campus Path #2; Wasatch Dr bike lanes	20
North Campus/ Federal Heights Dr Intersection Modifications	Reconfigure intersection to allow southbound bicyclists to turn left	Short term	North Campus Dr bike lanes; North Campus Path #1; North Campus Path #2	17
Foothill Dr/Mario Capecchi Dr Intersection Modifications	Reconfigure intersection to allow north-south through movement for bicycles	Short term	Mario Capecchi Short-term Bike Lane; VA Central SLM Route; Foothill Drive SUP #1	10
Legacy Bridge Ramp	Spiral ramp or other accommodation to connect the bridge path with the Student Life Connector	Medium term	Legacy Bridge Bike Path; Student Life Connector	10
Mario Capecchi Crossing	Grade separated crossing of Mario Capecchi NE of Foothill	Long term	Mario Capecchi Short-term Bike Lane; VA Central SLM Route; Foothill Drive SUP #1	10

Project	Notes	Timeline	Associated Projects	Sum of Associated Project Scores
Foothill Dr/Wakara Way Intersection Modifications	Reconfigure intersection to allow through movement for bicycles across Foothill	Short term	Wakara bike lanes; VA Eastern SLM Route	9
Red Butte Path Crossing #1	Across VA Eastern Shared Lane Route	Medium term	Red Butte Creek Trail – Segments 1&2; VA Eastern SLM Route	9
Wakara Way Grade Separation	Existing SUP crossing of Wakara Way east of Foothill Drive.	Long term	Wakara Bike Lane; VA Eastern SLM Route	9
Wakara Way SUP Xing Modifications	Reconfigure/relocate existing path crossing NE of Foothill to improve bike/ped safety	Short term	Wakara bike lanes; Red Butte Creek Trail – Segment 3	9
BST Trailhead at Parking Lot SE of Huntsman Cancer Hospital	Recommendation from the Heritage Preserve Management Plan	Long-term	Northeast Parking Lot Shared Lanes	7
BST Trailhead at Parking Lot NW of Red Butte Canyon Rd	Recommendation from the Heritage Preserve Management Plan	Long-term	Northeast Parking Lot Shared Lanes	7
Red Butte Path Crossing #2	Grade separated crossing of Foothill Drive	Long-term	Red Butte Creek Trail – Segments 2&3	3
BST Trailhead Behind Huntsman Cancer Hospital	Recommendation from the Heritage Preserve Management Plan	Long-term	None	0

8.4 Funding

Chapters 6 and 7 of the Bicycle Master Plan propose a large number of projects and programs for the University of Utah to implement. Implementing the Bicycle Master Plan will require new sources of funding to be identified and focused on bicycle transportation improvements. Universities typically draw upon the following sources of funding to construct bicycle and pedestrian facilities and supporting infrastructure:

- User Fees
- Campus General Funds
- Sustainable Campus Initiative Fund
- Capital Improvement Funds
- Student Fees/Referendum
- Various Grant Funding Sources
- Alumni Donor/Gifts
- Federal Funding Sources

8.4.1 User Fees

User fees are a common source of revenue for universities. They can be generated from campus parking costs (permits, daily use, etc.), parking citations, or as a charge to private entities utilizing university facilities. These funds can then be used for construction and maintenance of campus bikeway facilities. University of Utah student parking permits range between $70-$140, depending on the area of campus and duration (semester/year) that the permit is valid. Parking permits could be increased, with a certain percentage of that increase going towards bicycle, pedestrian and transit improvements at the University.

Portland State University uses its revenue from parking permits and citations to fund bicycle projects. After covering its operating costs, remaining revenue is used to install bicycle racks and secure bike parking facilities. It has also been used to develop an instructional maintenance shop (PSU Bike Hub) where the university community can repair their bicycles.

8.4.2 Campus General Funds

Once built into the budget, campus general funds can be a regular source of funding for bikeways. Allocating a consistent level of annual funding to bikeways, supporting facilities and programs is the most dependable way to ensure the continued implementation of the Bicycle Master Plan.

8.4.3 Sustainable Campus Initiative Fund (SCIF)

This existing fund collects $2.50 from each student and goes towards projects that help the University of Utah become more sustainable. SCIF funds are available to students to start a sustainability project or on-campus business that has a positive environmental impact and educates people about how their choices affect the environment. Furthermore, SCIF projects are encouraged to combine economic, social and scientific means for the purpose of becoming more sustainable. Though led by students, SCIF projects require collaboration between faculty and staff for oversight and real world experience. In 2010, the program funded student-led projects with budgets between $1,000 and $13,500. Projects that target bicycle encouragement and education may be a good fit for SCIF funds.

8.4.4 Capital Improvement Funds (CIP)

The University uses CIP funds to construct new buildings and facilities. These funds can also be used to build bikeway facilities when they are linked to the growth and evolution of the University's future. Construction and expansion of new buildings often impact desired bicycle corridors. Such construction provides an opportunity to implement the bicycle recommendations included in this master plan on a piecemeal basis within individual site designs. Requests for CIP funding are tracked and rated by the Facilities Management group. Facilities Management then submits proposals to the State Division of Facilities Construction and Management (DFCM). The State Building Board manages and distributes DFCM funds, with project costs typically not exceeding $2.5M. Student fees are one supplemental source of DFCM funds.

8.4.5 Student Fees/Referendum

At the beginning of the school term, in conjunction with tuition costs, students pay various mandatory and optional fees. These fees often support many programs run within the university. A mandatory fee could be added to the annual list of student fees that would provide a stable source of bikeway funding. This type of fee would need the support of the voting/student body in order to be implemented. In 2010, The University of Utah had 29,300 students enrolled (including full and part time students). Even a modest $10 bicycle transportation fee would yield nearly $300,000 annually.

8.4.6 Grant Funding

Grants are a popular source of funding for bicycle facilities and programs. They are available from both public and private funding sources. Grant funding cycles and amounts vary widely by source and may require matching funds. Some potential grant funding sources for the University are described in following sections.

8.4.6.1 Bikes Belong Community Partnership Grants

These grants are designed to foster and support partnerships between city or county governments, non-profit organizations, and local businesses to improve the environment for bicycling in the community. Grants primarily fund the construction or expansion of bicycle facilities such as bike lanes, trails, and paths. The grants committee also considers advocacy projects that promote bicycling as a safe and accessible mode of transportation. The organization submitting the grant application must be a non-profit organization with IRS 501(c)(3) designation or a government entity (city or county government office).

8.4.7 Alumni Donations/Gifts

Alumni donations and gifts are common sources of funding for universities. While these funds may not be as regularly accessible as those obtained through grants or student fees, they can often be the largest source of funding available to the University. Alumni generosity can be acknowledged through various forms of recognition, including naming rights, plaques, ceremonies, programs and other events. These efforts can be coordinated through the University of Utah Alumni Association.

8.4.8 Federal Funding Sources

The University should explore the various federal funding sources, which are distributed by state transportation agencies (such as UDOT) and metropolitan planning organizations (such as WFRC). Universities can be eligible for federal transportation funds, but it is recommended that the university partner with Salt Lake City to demonstrate partnership and improve the chance of success. Doing so will also establish greater continuity between City and University bikeways. Bikeway projects possessing mutual benefits to the City and the University would be likely be strong candidates for federal funding sources.

The University of Utah can open itself to various funding sources including Transportation Enhancements (TE) and Congestion Mitigation and Air Quality (CMAQ). To access these funds it is first necessary to place the project on WFRC's Transportation Improvement Program (TIP). It is recommended that the university contact WFRCC with suggestions for CMAQ projects.

8.4.8.1 Transportation Enhancements

The Transportation Enhancements (TE) program is a federally funded program for projects that "enhance the cultural, aesthetic and environmental aspects of the nation's intermodal transportation system." Provisions for bicyclists and pedestrians are one of the 12 qualifying categories for TE funds. TE funds are distributed at the state level by UDOT. Projects funded by TE typically range between $100,000 and $500,000 with 20% local matching funds required.

8.4.8.2 CMAQ

The Congestion Mitigation and Air Quality (CMAQ) Program provides a flexible funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Eligible projects include transit improvements, bikeways and walkways.

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University of Utah Bicycle Master Plan

Appendix A: Bicycle Facility Design Guide

Prepared for:

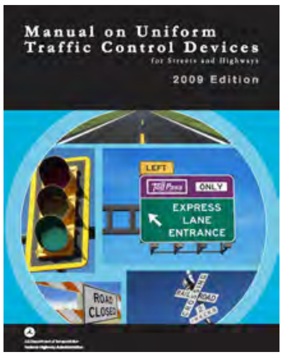
University of Utah

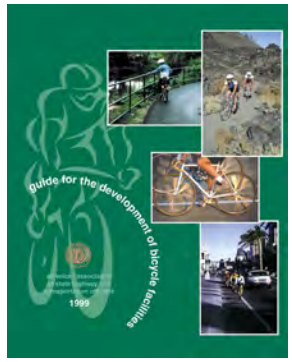
Prepared by:

Alta Planning + Design

Introduction

This technical handbook is intended to assist the University of Utah in the selection and design of bicycle facilities. The following chapters pull together best practices by facility type from public agencies and municipalities nationwide. Within the design chapters, treatments are covered within a single sheet tabular format relaying important design information and discussion, example photos, schematics (if applicable), and existing summary guidance from current, or upcoming draft standards. Existing standards are referenced throughout, and should be your ultimate source of information when seeking to implement any of the treatments featured here.





National Standards:

The Federal Highway Administration's **Manual of Uniform Traffic Control Devices** (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.

To further clarify the MUTCD, the FHWA created a table of contemporary bicycle facilities that lists various bicycle-related signs, markings, signals, and other treatments and identifies their status (e.g., can be implemented, currently experimental) in the 2009 version of the MUTCD. See **Bicycle Facilities and the Manual on Uniform Traffic Control Devices.**[1]

Bikeway treatments not explicitly covered by the MUTCD are often subject to experiments, interpretations and official rulings by the FHWA. The **MUTCD Official Rulings** is a resource that allows web site visitors to obtain information these supplementary materials. Copies of various documents (such as incoming request letters, response letters from the FHWA, progress reports, and final reports) are available on this web site.[2]

American Association of State Highway and Transportation Officials (AASHTO) **Guide for the Development of Bicycle Facilities** last updated in 1999 provides detailed guidance on dimensions, use, and layout of specific facilities.

The standards and guidelines presented by AASHTO go beyond the MUTCD to provide basic information about the design of bicycle and pedestrian facilities, such as minimum sidewalk widths, bicycle lane dimensions, more detailed striping requirements and recommended signage and pavement markings. An update to this guide is in progress, and is likely to provide revised guidance on standard facilities, and new entries for more contemporary bikeway designs.

The National Association of City Transportation Officials' (NACTO) 2011 **Urban Bikeway Design Guide** is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs. The intent of the guide is to offer substantive guidance for cities seeking to improve bicycle transportation in places where competing demands for the use of the right of way present unique challenges. The NACTO Urban Bikeway Design Guide was endorsed officially by Mayor Becker and Division of Transportation in Salt Lake City.

Some of these treatments are not directly referenced in the current versions of the AASHTO Guide to Bikeway Facilities or the Manual on Uniform Traffic Control Devices (MUTCD), although many of the elements of these treatments are found within these documents. In all cases, we encourage engineering judgment to ensure that the application makes sense for the context of each treatment, given the many complexities of urban streets.

1 *Bicycle Facilities and the Manual on Uniform Traffic Control Devices. (2011). FHWA. http://www.fhwa.dot.gov/environment/bikeped/mutcd_bike.htm*

2 *MUTCD Official Rulings. FHWA. http://mutcd.fhwa.dot.gov/orsearch.asp*

Design Needs of Bicyclists

The purpose of this section is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more sensitive to poor facility design, construction and maintenance than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, the facility designer can provide the highest quality facilities and minimize risk to the bicyclists using them.

Bicycle as a Design Vehicle

Similar to motor vehicles, bicyclists and their bicycles come in a variety of sizes and configurations. This variation can occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle, or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). Any bikeway undergoing design should consider reasonably expected bicycle types on the facility and design with that set of critical dimensions in mind.

Figure 2-1 shows the operating space and physical dimensions of a typical adult bicyclist, which is the basis for typical facility design. The bicyclist requires clear space to operate within a facility; this is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five feet or more operating width, although four feet is minimally acceptable.

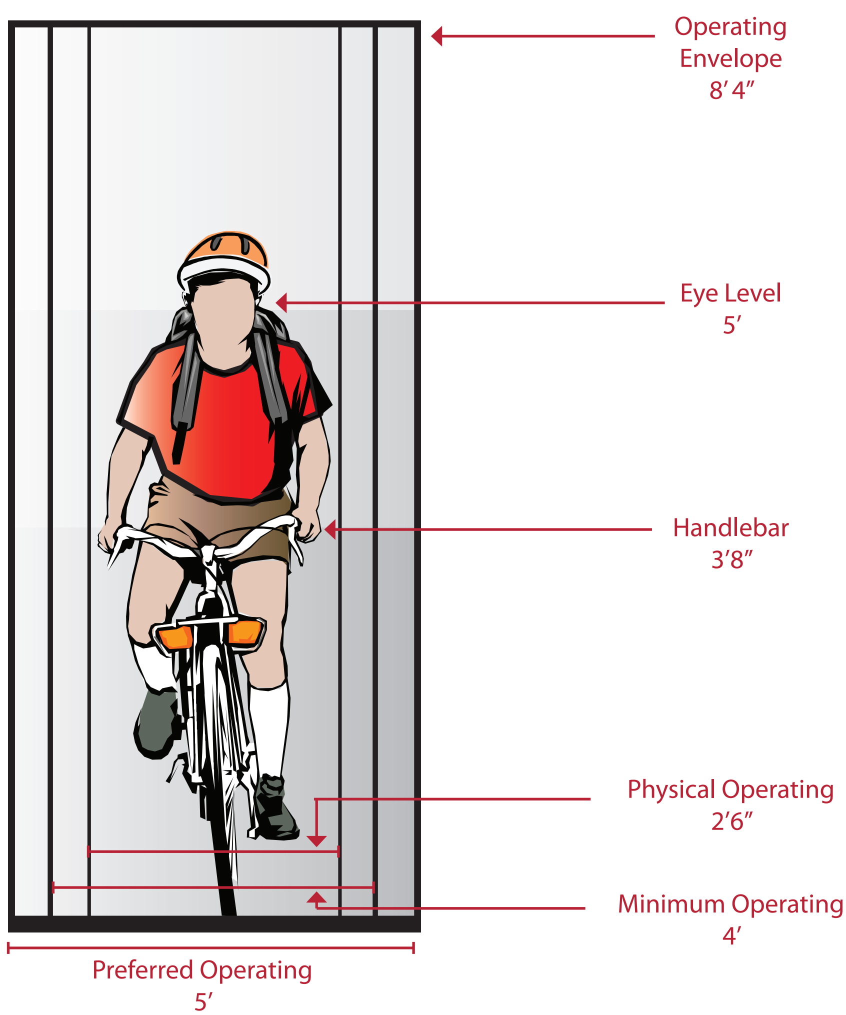


Figure 2-1 Standard Bicycle Rider Dimensions

Source: AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition

Outside the design dimensions of a typical bicycle, there are many commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. Figure 2-2 and Table 2-1 summarizes the typical dimensions for typical bicycle designs.

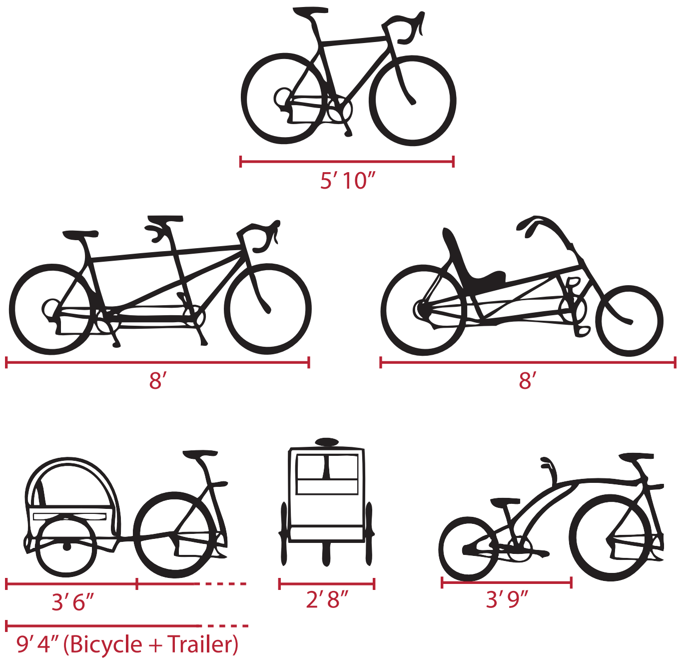


Figure 2-2 Bicycle as Design Vehicle - Typical Dimensions

Source: AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition *AASHTO does not provide typical dimensions for tricycles.

Table 2-1 Bicycle as Design Vehicle - Typical Dimensions

Bicycle Type	Feature	Typical Dimensions
Upright Adult Bicyclist	Physical width	2 ft 6 in
	Operating width (Minimum)	4 ft
	Operating width (Preferred)	5 ft
	Physical length	5 ft 10 in
	Physical height of handlebars	3 ft 8 in
	Operating height	8 ft 4 in
	Eye height	5 ft
	Vertical clearance to obstructions (tunnel height, lighting, etc)	10 ft
	Approximate center of gravity	2 ft 9 in - 3 ft 4 in
Recumbent Bicyclist	Physical length	8 ft
	Eye height	3 ft 10 in
Tandem Bicyclist	Physical length	8 ft
Bicyclist with child trailer	Physical length	10 ft
	Physical width	2 ft 6 in

Design Speed Expectations

The expected speed that various types of bicyclists can maintain under various conditions can also influence the design of facilities such as shared use paths. Table 2-2 provides typical bicyclist speeds for a variety of conditions.

The skill level of the bicyclist also provides a dramatic variance on expected speeds and expected behavior. There are several systems of classification currently in use within the bicycle planning and engineering professions. These classifications can be helpful in understanding the characteristics and infrastructure preferences of different bicyclists.

However, it should be noted that these classifications may change in type or proportion over time as infrastructure and culture evolve. Often times an instructional course can instantly change a less confident bicyclist to one that can comfortably and safely share the roadway with vehicular traffic. Bicycle infrastructure should be planned and designed to accommodate as many user types as possible with separate or parallel facilities considered to provide a comfortable experience for the greatest number of bicyclists.

Table 2-2 Bicycle as Design Vehicle - Design Speed Expectations

Bicycle Type	Feature	Typical Speed
Upright Adult Bicyclist	Paved level surfacing	15 mph
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

*Tandem bicycles and bicyclists with trailers have typical speeds equal to or less than upright adult bicyclists.

Types of Bicyclists

It is important to consider bicyclists of all skill levels in creating a non-motorized plan. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of bicyclists.

The bicycle planning and engineering professions currently use several systems to classify the population, which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. The most conventional framework classifies the "design cyclist" as *Advanced*, *Basic*, or *Child*[1]. A more detailed understanding of potential bicyclist classifications is illustrated in Figure 2-3. Developed by planners at the City of Portland, OR[2] and supported by data collected nationally since 2005, this classification provides the following alternative categories to address the Americans' 'varying attitudes' towards bicycling:

- **Strong and Fearless** (Very low percentage of population) – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as multi-use trails.

- **Enthused and Confident** (5-10% of population) -This user group encompasses the 'intermediate' bicyclists who are mostly comfortable riding on all types of bicycle facilities but will usually prefer low traffic streets or multi-use trails when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists including commuters, recreationalists, racers, and utilitarian bicyclists.

- **Interested but Concerned** (approximately 60% of population) – This user type makes up the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable conditions and weather. These bicyclists perceive significant barriers towards increased use of cycling, specifically traffic and other safety issues. These bicyclists may become "Enthused & Confident" with encouragement, education and experience.

- **No Way, No How** (approximately 30% of population) – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually give cycling a second look and may progress to the user types above. A significant portion of these people will never ride a bicycle under any circumstances.

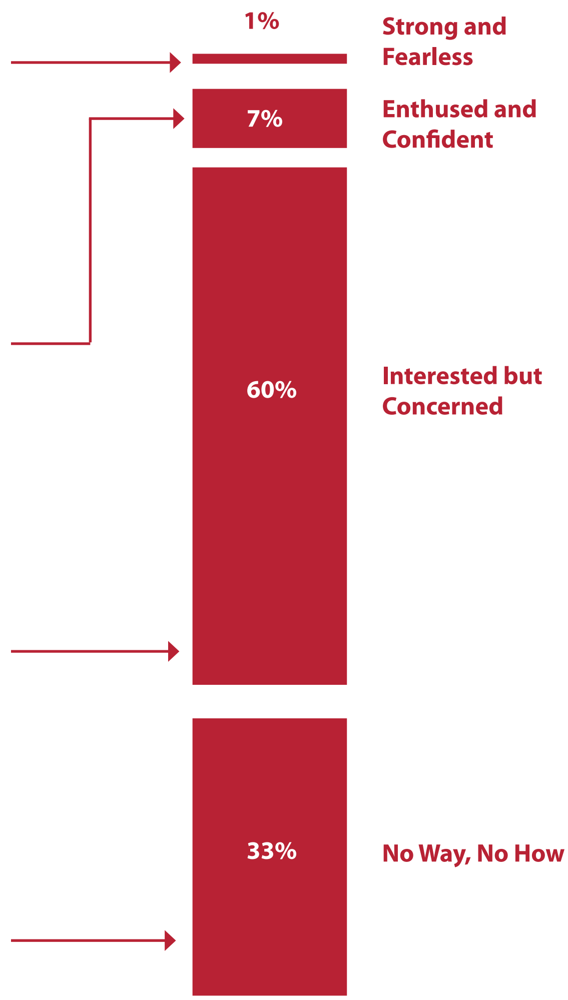


Figure 2-3 Typical distribution of bicyclist types

1 *Selecting Roadway Design Treatments to Accommodate Bicycles. (1994). Publication No. FHWA-RD-92-073*

2 *Four Types of Cyclists. (2009). Roger Geller, City of Portland Bureau of Transportation. http://www.portlandonline.com/transportation/index.cfm?&a=237507*

Shared Roadways


Marked Shared Roadway

Shared roadways mix bicyclists with motor vehicles within the same roadway space. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or with shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Shared roadways can employ a large variety of treatments from simple signage and shared lane markings to complex treatments including directional signage, traffic diverters, chicanes, chokers, and /or other traffic calming devices to reduce vehicle speeds or volumes.

This Section Includes:

Shared Lane Marking

- Marked Shared Roadway

Marked Shared Roadway

Guidance

Preferred placement in constrained conditions is in the center of the travel lane to minimize wear and promote single file travel.

Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 5 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet the SLM should be moved further out accordingly.

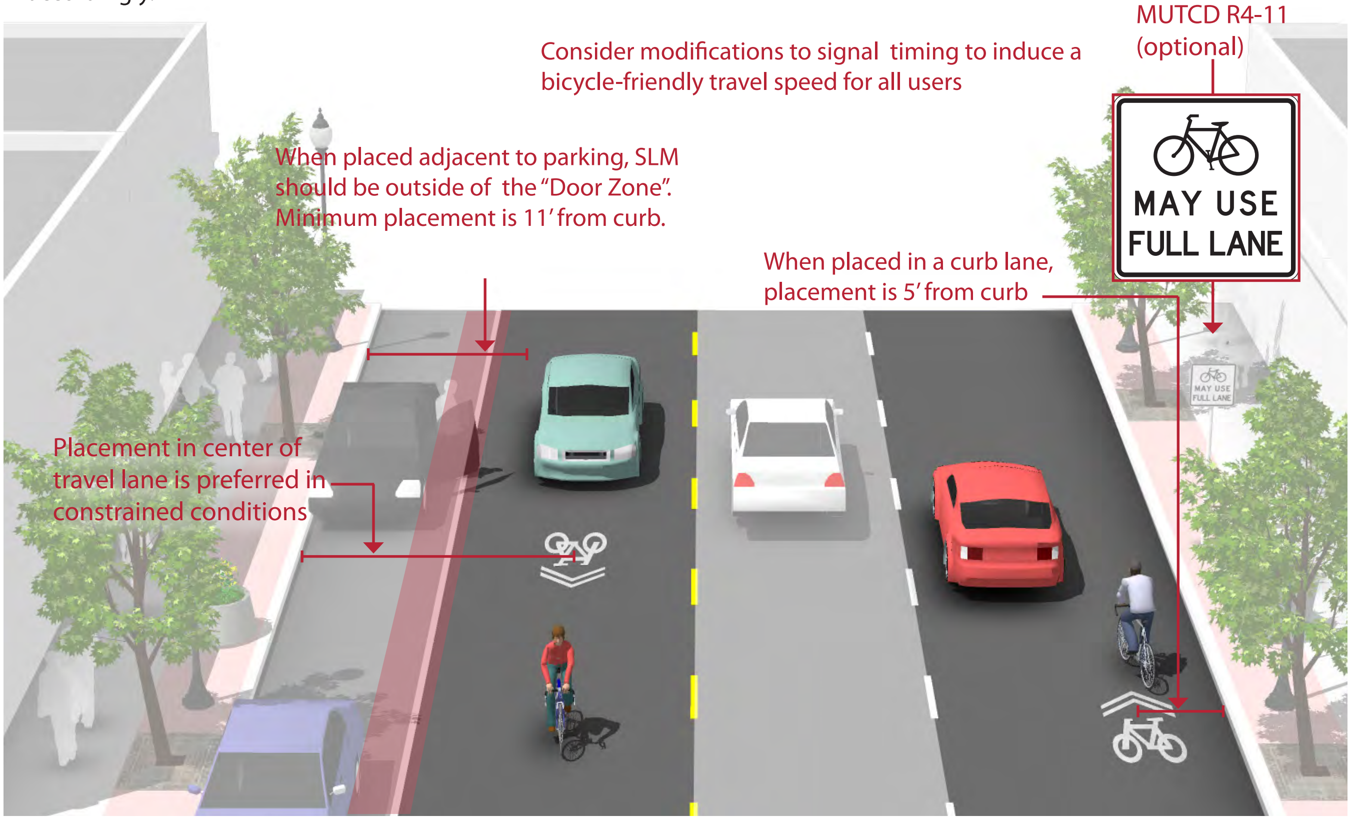
Description

A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.

In constrained conditions, the SLMs are placed to discourage unsafe passing by motor vehicles.

On a wide outside lane, the SLMs can be used to promote bicycle travel next to (to the right of) motor vehicles.

Under all conditions, SLMs should be placed outside of the door zone of parked cars.



Discussion

Bike lanes should be considered on roadways with outside travel lanes wider than 15 feet, or where other lane narrowing or removal strategies may provide adequate road space.

Shared Lane Markings shall not be used on **shoulders**, in designated **bicycle lanes**, or to designate **bicycle detection** at signalized intersections. (MUTCD 9C.07 03)

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Placing the SLM markings between vehicle tire tracks will increase the life of the markings and minimize the long-term cost of the treatment.

Separated Bikeways

Designated exclusively for bicycle travel, separated bikeways are segregated from vehicle travel lanes with striping, and can include pavement stencils and other amenities. Separated bikeways are most appropriate on arterial and collector streets where higher traffic volumes and speeds warrant greater separation.

Separated bikeways can increase safety and promote proper riding by:

- Defining road space for bicyclists and motorists, reducing the possibility that motorists will stray into the bicyclists' path
- Discouraging bicyclists from riding on the sidewalk
- Reminding motorists that bicyclists have a right to the road.

This Section Includes:

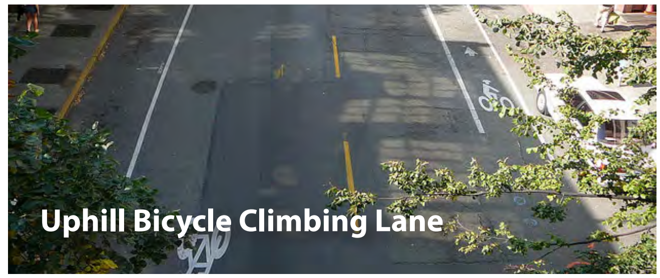
Conventional Bike Lanes

- Bike Lane With No On-Street Parking
- Bike Lane Next to Parallel Parking
- Bike Lane Next to Diagonal Parking

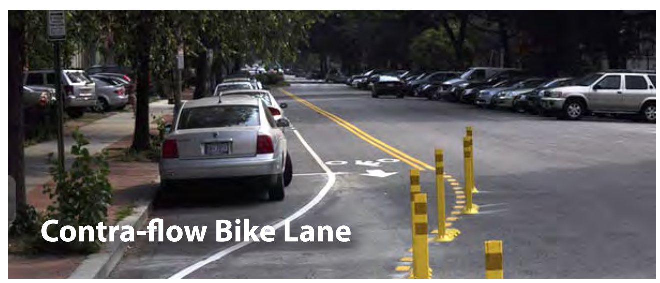
Enhanced Bikeways

- Uphill Bicycle Climbing Lane
- Contra-Flow Bike Lane on One-Way Street
- Colored Bike Lanes
- Buffered Bike Lanes
- Shared Use Paths Along Roadways

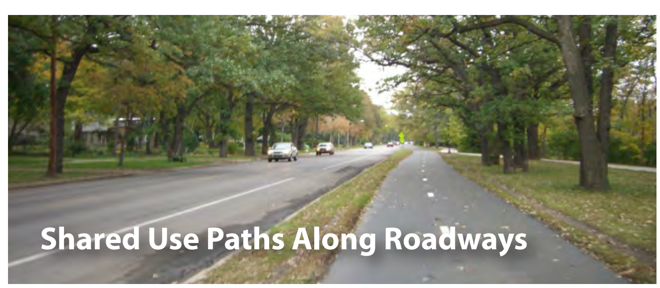

Conventional Bicycle Lanes


Uphill Bicycle Climbing Lane


Colored Bike Lanes


Contra-flow Bike Lane


Buffered Bike Lanes


Shared Use Paths Along Roadways

Bike Lane with No On-Street Parking

Guidance

4 foot minimum when no curb & gutter is present

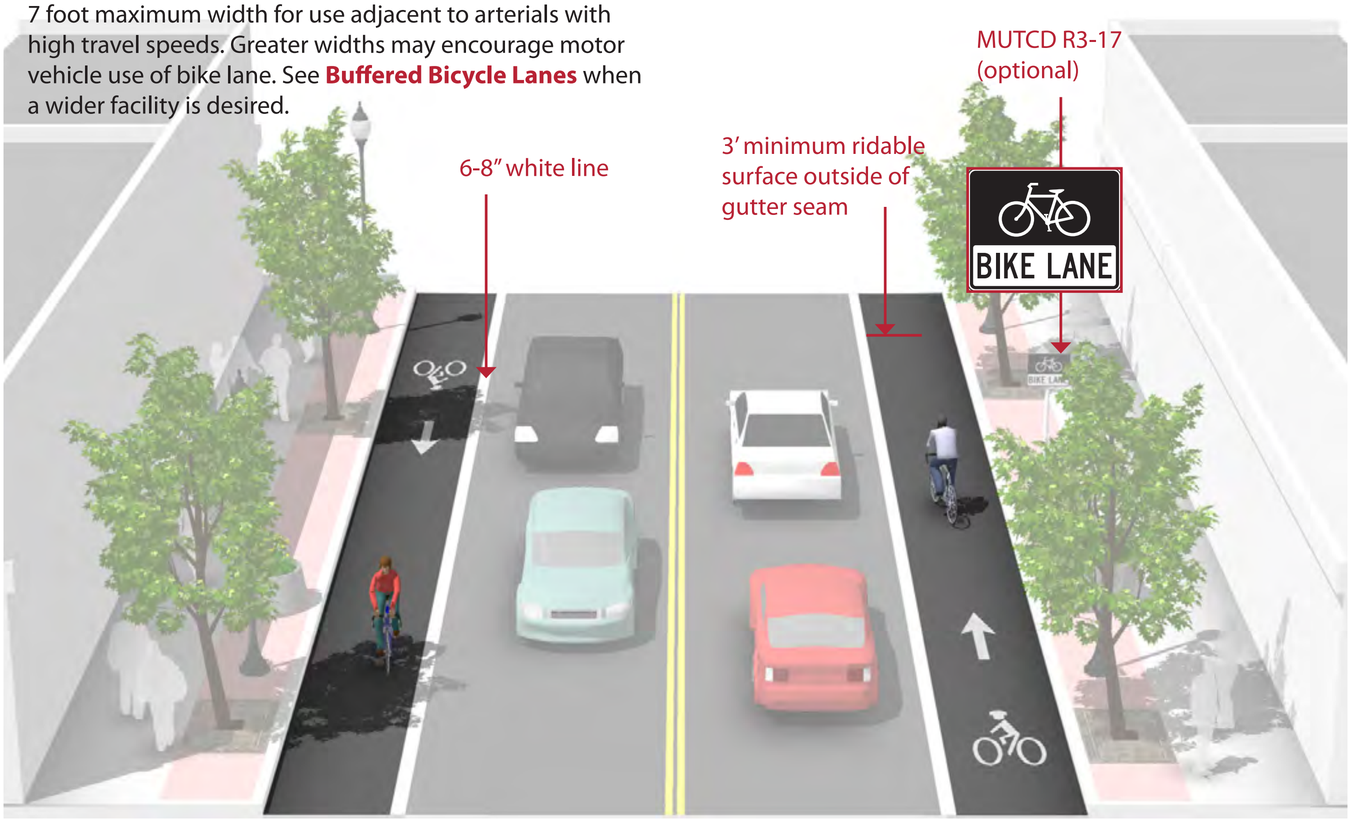
5 foot minimum when adjacent to curb and gutter or 3′ more than the gutter pan width if the gutter pan is wider than 2′. Salt Lake City prefers 6 foot minimums adjacent to curbs as the gutter lip can become rough over time.

7 foot maximum width for use adjacent to arterials with high travel speeds. Greater widths may encourage motor vehicle use of bike lane. See **Buffered Bicycle Lanes** when a wider facility is desired.

Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is typically located on the right side of the street, between the adjacent travel lane and curb and flows in the same direction as motor vehicle traffic.

A bike lane width of 7 feet makes it possible for bicyclists to ride side-by-side or pass each other without leaving the bike lane, increasing the capacity of the lane.



Discussion

Wider bicycle lanes are desirable in certain circumstances such as on higher speed arterials (45 mph+) where a wider bicycle lane can increase separation between passing vehicles and bicyclists. Appropriate signing and stenciling is important with wide bicycle lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane. Consider **buffered bicycle lanes** when further separation is desired.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be included in routine snow removal operations. The R3-17 Bike Lane sign is beneficial when snow obstructs lane line visibility.

Bike Lane Adjacent to On-Street Parallel Parking

Guidance

12 foot minimum from curb face to edge of bike lane.

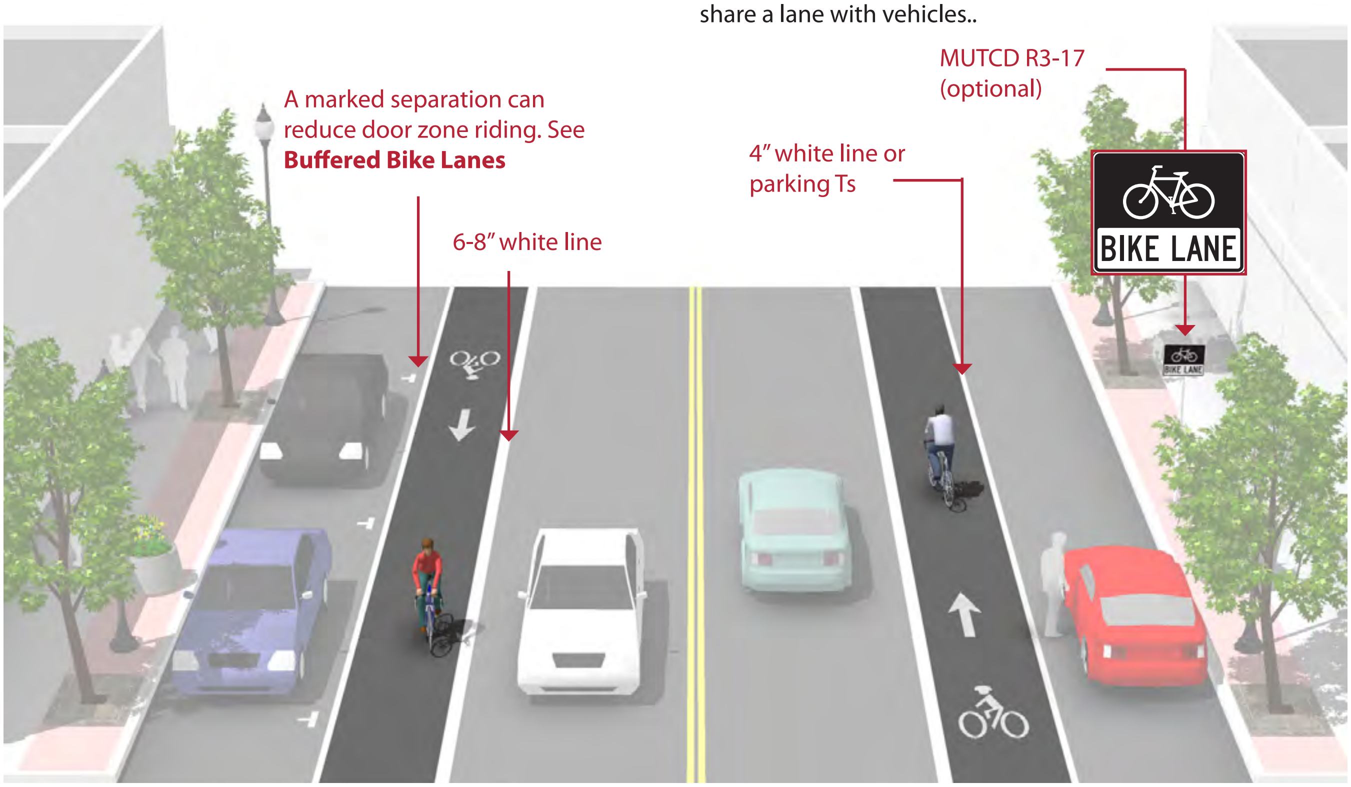
14.5 foot preferred from curb face to edge of bike lane.

7 foot maximum for marked width of bike lane. Greater widths may encourage vehicle loading in bike lane. See Buffered Bicycle Lanes when a wider facility is desired.

Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and typically flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane.

Many bicyclists, particularly less experienced riders, become more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles..



Discussion

Bike lanes adjacent to on-street parallel parking require special treatment to avoid crashes caused by a suddenly opened vehicle door. The bike lane should have sufficient width to allow bicyclists to say out of the door zone, while not encroaching into the adjacent vehicular lane. Parking stall markings, such as parking "Ts" and double white lines create a type of parking side buffer to encourage bicyclists to ride farther away from the door zone.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be included in routine snow removal operations. The R3-17 Bike Lane sign is beneficial when snow obstructs lane line visibility.

Bike Lane Adjacent to On-Street Diagonal Parking

Guidance

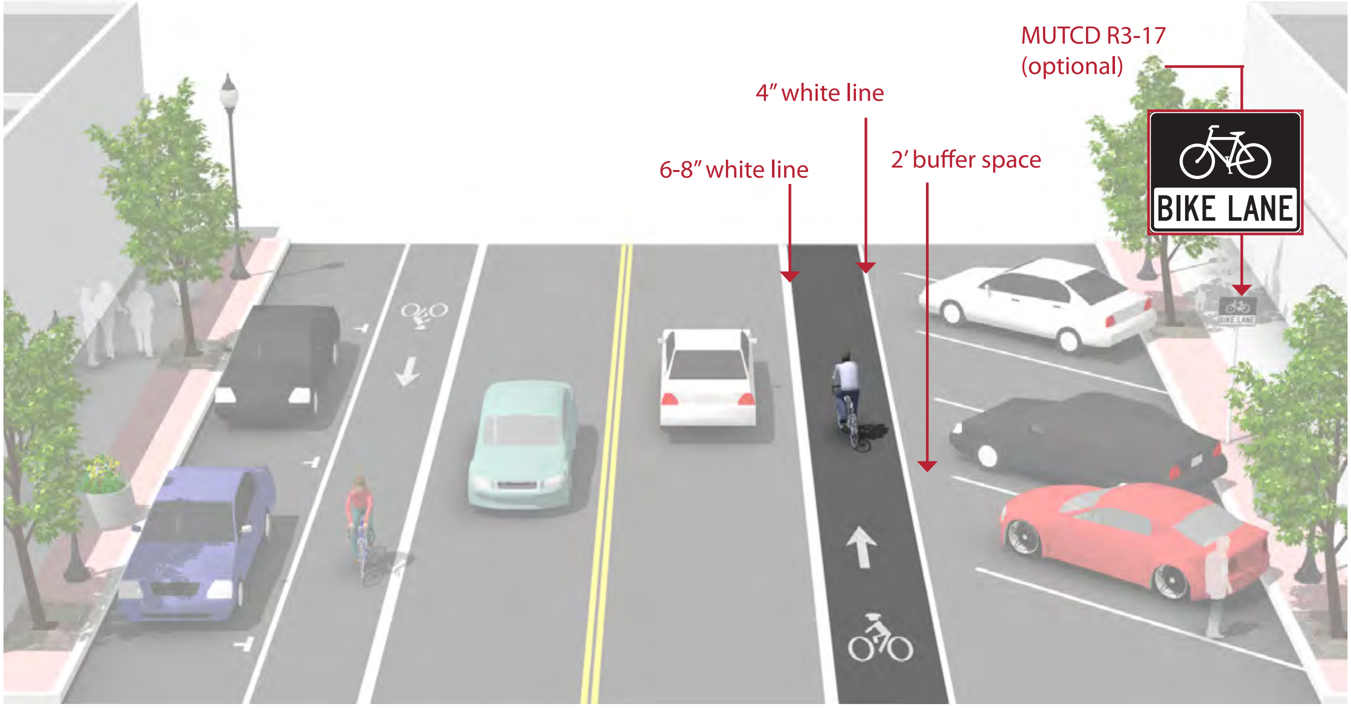
5 foot minimum marked width of bike lane.

Parking bays are sufficiently long to accommodate most vehicles (so vehicles do not block bike lane).

Description

In certain areas with high parking demand such as urban commercial areas diagonal parking can be used to increase parking supply.

Back-in diagonal parking improves sight distance between drivers and bicyclists when compared to conventional head-in diagonal parking. Back-in diagonal parking has other benefits to vehicles including: loading and unloading of the trunk occurs at the curb rather than in the street, passengers (including children) are directed by open doors towards the curb, there is also no door conflict with bicyclists. While there may be a learning curve for some drivers, using back-in diagonal parking is typically an easier maneuver than conventional parallel parking.



Discussion

Conventional front-in diagonal parking is not compatible or recommended in conjunction with high levels of bicycle traffic or with the provision of bike lanes as drivers backing out of conventional diagonal parking have poor visibility of approaching bicyclists.

Additional References and Guidelines

There is no currently adopted Federal or State guidance for this treatment. This treatment is currently slated for inclusion in the next edition of the AASHTO Guide for the Development of Bicycle Facilities

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be included in routine snow removal operations. The R3-17 Bike Lane sign is beneficial when snow obstructs lane line visibility.

Uphill Bicycle Climbing Lane

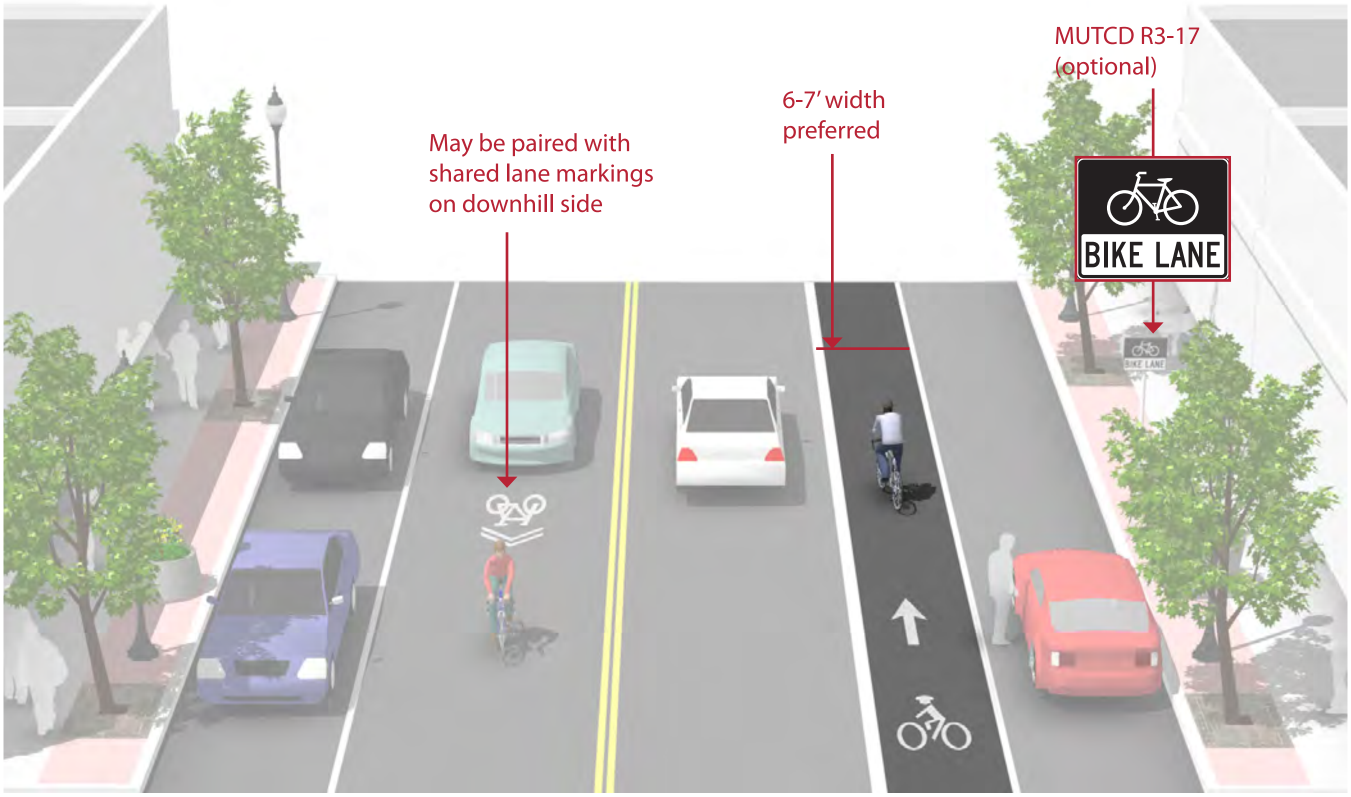
Guidance

Uphill bike lanes should be 6-7 feet wide (wider lanes are preferred because extra maneuvering room on steep grades can benefit bicyclists).

Can be combined with Shared Lane Markings for downhill bicyclists who can more closely match prevailing traffic speeds.

Description

Uphill bike lanes (also known as "climbing lanes") enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes.



Discussion

This treatment is typically found on retrofit projects as new roads should provide adequate space for bicycle lanes in both directions of travel. Accommodating an uphill bicycle lane often includes delineating on-street parking (if provided), narrowing travel lanes, and/or shifting the centerline if necessary.

Additional References and Guidelines

NACTO. (2011). Urban Bikeway Design Guide.

Partial Guidance:
AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be included in routine snow removal operations. The R3-17 Bike Lane sign is beneficial when snow obstructs lane line visibility.

Contra-flow Bike Lane on One-way Street

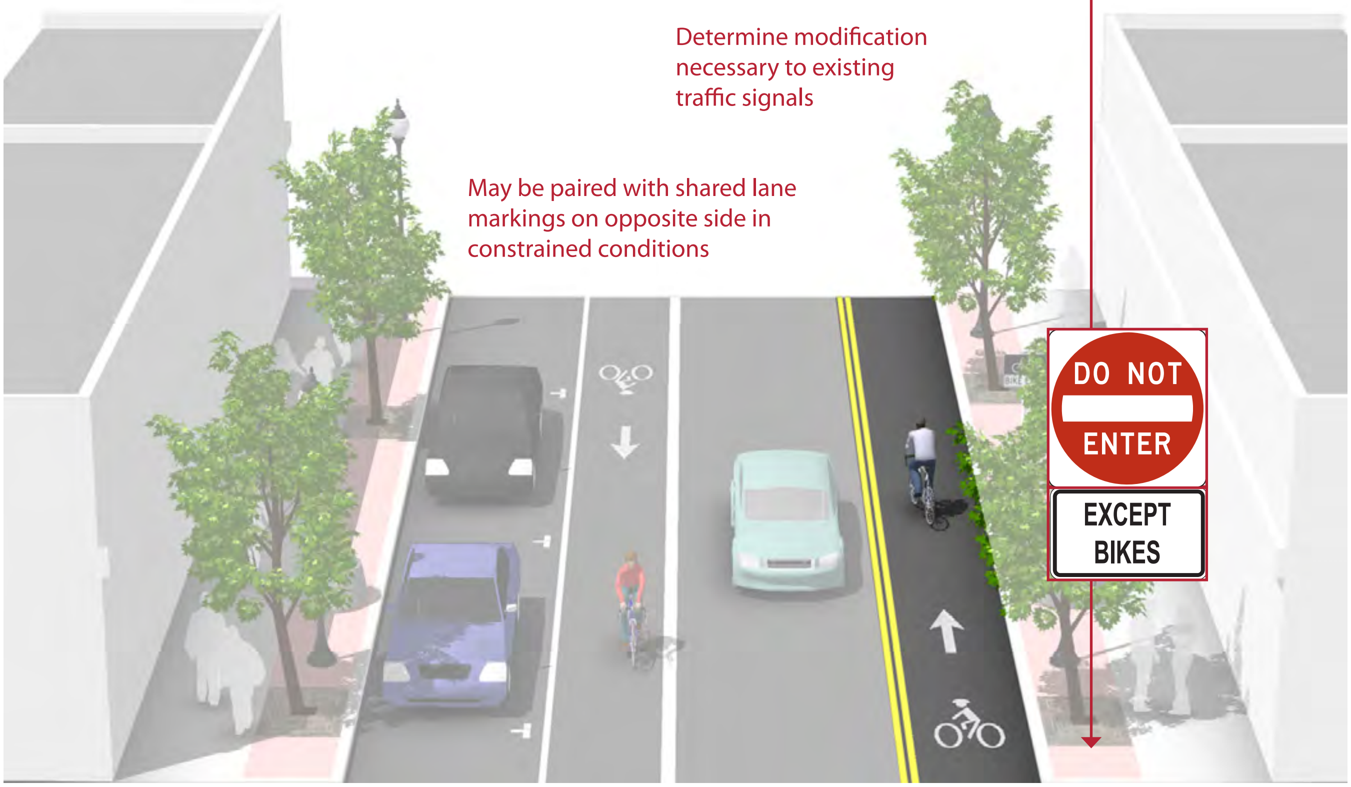
Guidance

The contra-flow lane should be 5-7 feet and marked with a solid double yellow line and appropriate signage. Bike lane markings should be clearly visible to ensure that contra-flow lane is exclusively for bicycles. **Coloration** should be considered on the bike lane.

Signage specifically allowing bicycles at the entrance of the contra flow lane is recommended.

Description

Contra-flow bike lanes provide bidirectional bicycle access along a roadway that is one-way for automobile traffic. This treatment can provide direct access and connectivity for bicyclists, avoiding detours and reducing travel distances for bicyclists. Contra-flow bike lanes can also be used to convert two-way automobile traffic to one-way to reduce traffic volumes where it is desired.



Discussion

Because contra-flow travel increases the speed differential between cars and bicyclists, a **buffered bike lane** or separated **cycle track** configuration should be considered if space permits.

Additional References and Guidelines

FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

Colored Bike Lanes

Guidance

The color green has been given interim approval by the Federal Highways Administration in March of 2011. See interim approval IA-14 for specific color standards.

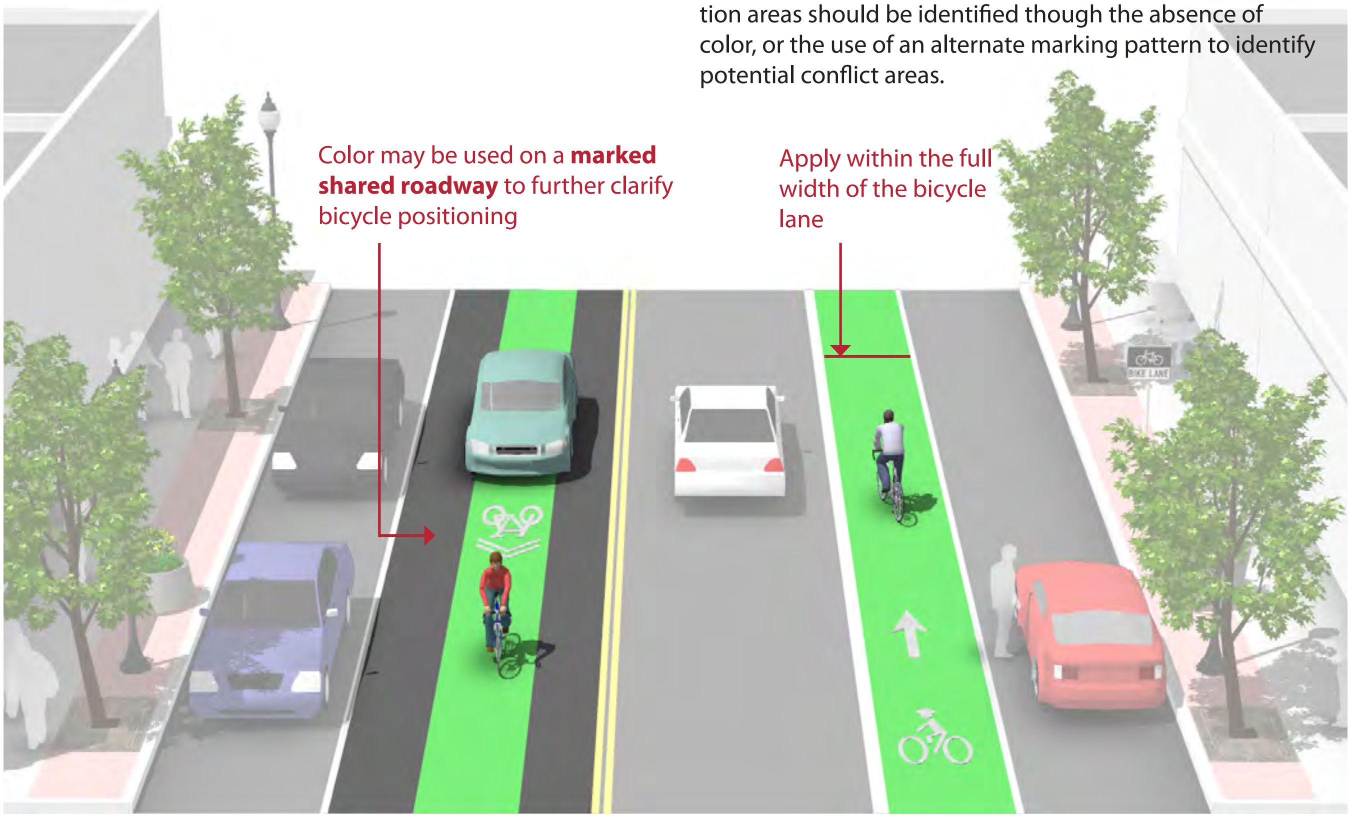
The colored surface should be skid resistant and retro-reflective.

Description

Colored pavement within a bicycle lane increases the visibility of the bicycle facility. Use of color is appropriate for use in areas with pressure for illegal parking, frequent encroachment of motor vehicles, clarify conflict areas, and along enhanced facilities such as **contra-flow bicycle lanes** and **cycle tracks**.

Color has also been used in conjunction with shared lane markings to create a "lane within a lane" to further clarify proper bicyclist positioning on shared roadway streets.

When applied along full corridors, driveway and intersection areas should be identified though the absence of color, or the use of an alternate marking pattern to identify potential conflict areas.



Discussion

Colored pavement is also used to identify potential areas of conflict, and reinforces priority to bicyclists in these conflict areas. See **Colored Bike Lanes in Conflict Areas** for more guidance.

Additional References and Guidelines

FHWA. (2011). Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

There are many materials in use in cities throughout the U.S. from a variety of vendors. Take care in choosing a product to meet durability and cost requirements.

Buffered Bike Lanes

Guidance

Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.

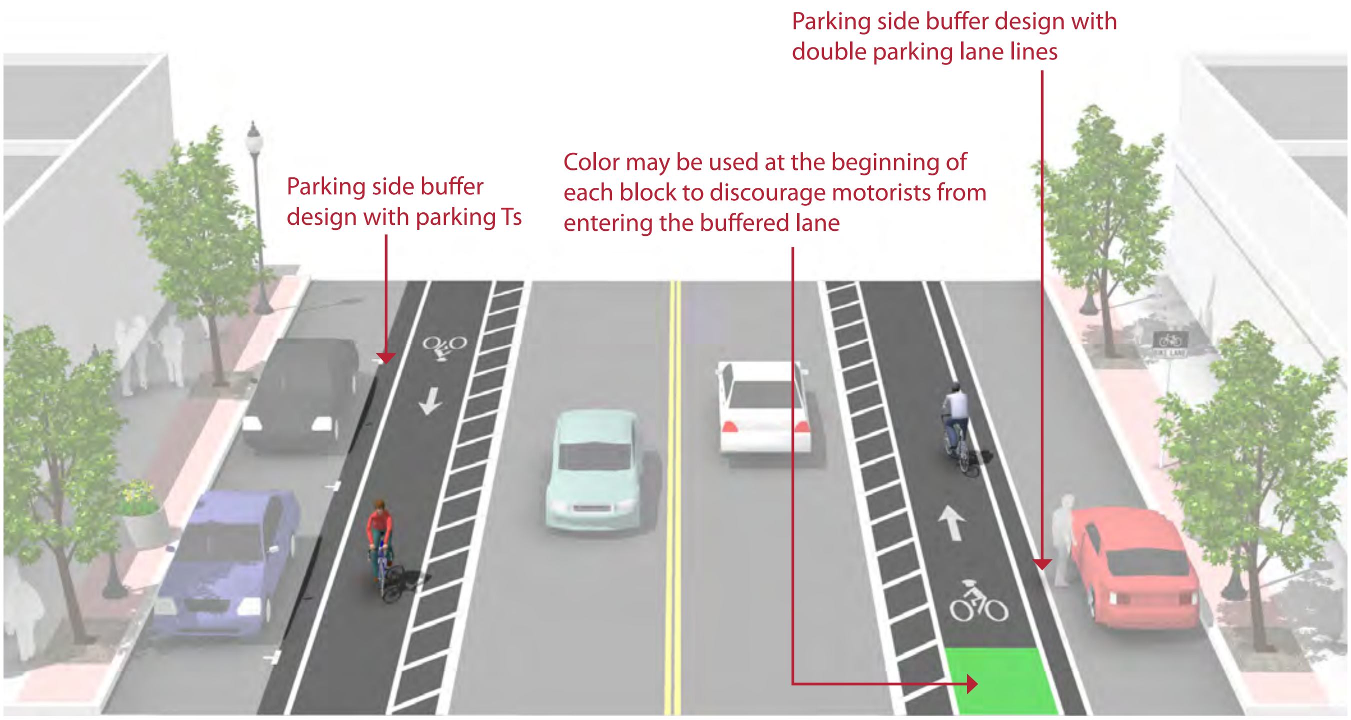
Buffers should be at least 2 feet wide. If 3 feet or wider, mark with diagonal or chevron hatching. At driveways or minor street crossings, consider dashing the inside buffer boundary where cars are expected to cross for clarity.

Double parking edge lines or other buffer designs may be used to discourage riding in the "door zone".

Description

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes are allowed as per MUTCD guidelines for buffered preferential lanes (section 3D-01).

Buffered bike lanes are designed to increase the space between the bike lanes and the travel lane or parked cars. This treatment is appropriate on bike lanes with high automobile traffic volumes and speed, bike lanes adjacent to parked cars, and bike lanes with a high volume of truck or oversized vehicle traffic.



Discussion

Frequency of right turns by motor vehicles at major intersections should determine whether continuous or truncated buffer striping should be used approaching the intersection. Commonly configured as a buffer between the bicycle lane and motor vehicle travel lane, a parking side buffer may also be provided to help bicyclists avoid the 'door zone' of parked cars.

Additional References and Guidelines

FHWA. (2009). Manual of Uniform Traffic Control Devices. (3D-01)
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be included in routine snow removal operations. The R3-17 Bike Lane sign is beneficial when snow obstructs lane line visibility.

Shared Use Paths Along Roadways

Description

A shared-use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles.

Along roadways, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding where bicyclists enter or leave the path.

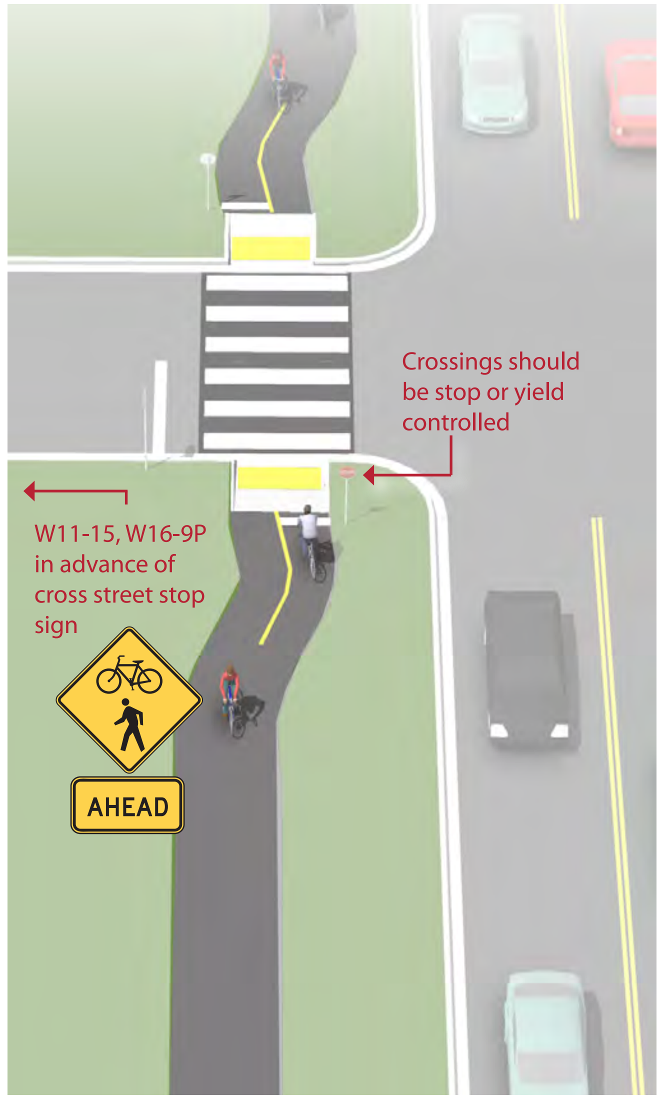
The AASHTO Guide for the Development of Bicycle Facilities generally recommends against the development of shared-use paths directly adjacent to roadways.

Guidance

- 8 feet is the minimum allowed for a two-way bicycle path and is only recommended for low traffic situations.
- 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users such as joggers, bicyclists, rollerbladers and pedestrians. A separate track (5' minimum) can be provided for pedestrian use.

Bicycle lanes should be provided as an alternate (more transportation-oriented) facility whenever possible.

Pay special attention to the entrance/exit of the path as bicyclists may continue to travel on the wrong side of the street



Discussion

When designing a bikeway network, the presence of a nearby or parallel path should not be used as a reason to not provide adequate shoulder or bicycle lane width on the roadway, as the on-street bicycle facility will generally be superior to the "sidepath" for experienced bicyclists and those who are cycling for transportation purposes.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
NACTO. (2011). Urban Bikeway Design Guide. See entry on Raised Cycle Tracks.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete surfacing for paths has proven to be more durable over the long term

Separated Bikeways at Intersections

Intersections are junctions at which different modes of transportation meet and facilities overlap. An intersection facilitates the interchange between bicyclists, motorists, pedestrians, and other competing modes in order to advance traffic flow in a safe and efficient manner. Designs for intersections with bicycle facilities should reduce conflict between bicyclists (and other vulnerable road users) and vehicles by heightening the level of visibility, denoting clear right-of-way, and facilitating eye contact and awareness with competing modes. Intersection treatments can resolve both queuing and merging maneuvers for bicyclists, and are often coordinated with timed or specialized signals.

The configuration of a safe intersection for bicyclists may include elements such as color, signage, medians, signal detection, and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, the adjacent street function and land use.

This Section Includes:

- Bike Box
- Bike Lanes at Right Turn Only Lanes
- Colored Bike Lanes in Conflict Areas
- Shared Bicycle/Right Turn Lane
- Intersection Crossing Markings
- Bicycle Detection at Intersections
- Bicycle Signal Heads

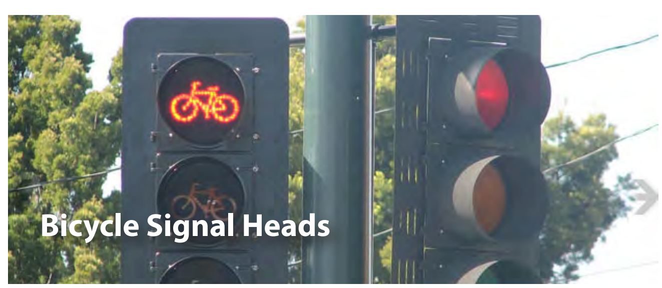

Bike Box


Colored Bike Lanes in Conflict Areas


Bike Lanes at Right Turn Only Lanes

Shared Bicycle/Right Turn Lane


Intersection Crossing Markings


Bicycle Signal Heads

Separated Bikeways at Intersections

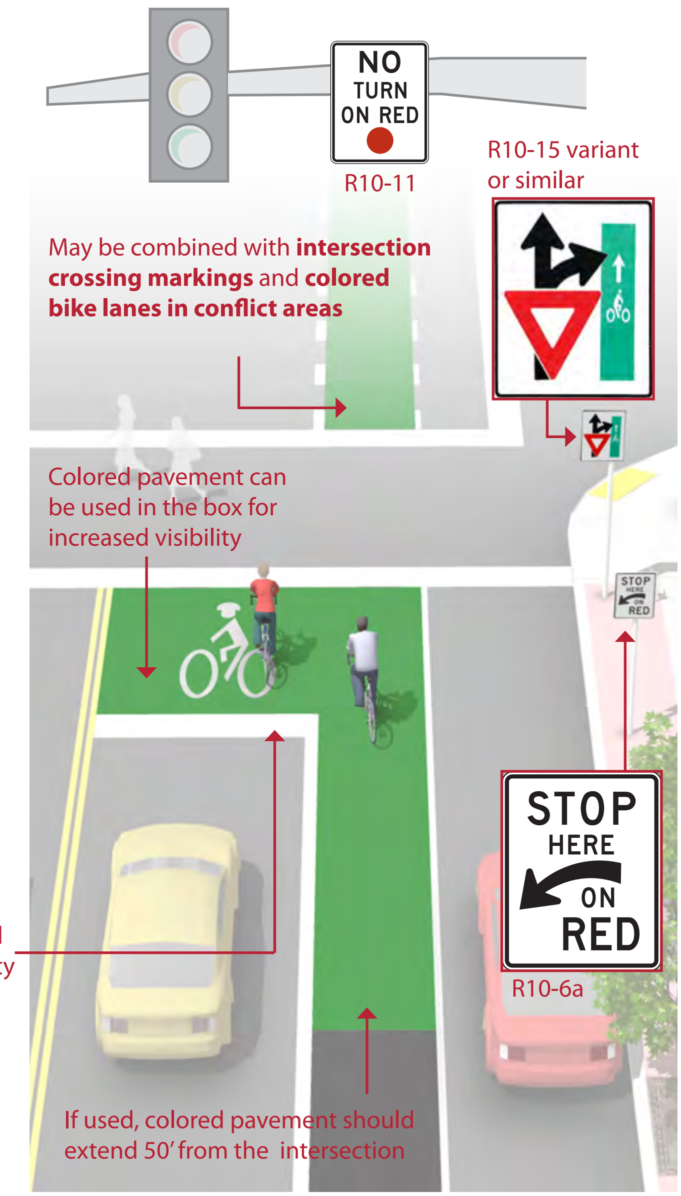
Bike Box

Description

A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Motor vehicles must stop behind the white stop line at the rear of the bike box.

Guidance

- 14' minimum depth of bicycle storage area
- A "No Turn on Red" (MUTCD R10-11) sign shall be installed overhead to prevent vehicles from entering the Bike Box.
- A "Stop Here on Red" sign should be post-mounted at the stop line to reinforce observance of the stop line.
- A "Yield to Bikes" sign should be post-mounted in advance of and in conjunction with an egress lane to reinforce that bicyclists have the right-of-way going through the intersection.
- An ingress lane should be used to provide access to the box.



Discussion

Bike boxes should occur at signalized intersections only, and right turns on red shall be prohibited for motor vehicles. Bike boxes should be used in locations that have a large volume of bicyclists, and are often utilized in central areas where traffic is usually moving slowly. Prohibiting right turns on red improves safety for bicyclists and does not significantly impede motor vehicle travel.

Additional References and Guidelines

NACTO. (2011). Urban Bikeway Design Guide.
FHWA. (2011). Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

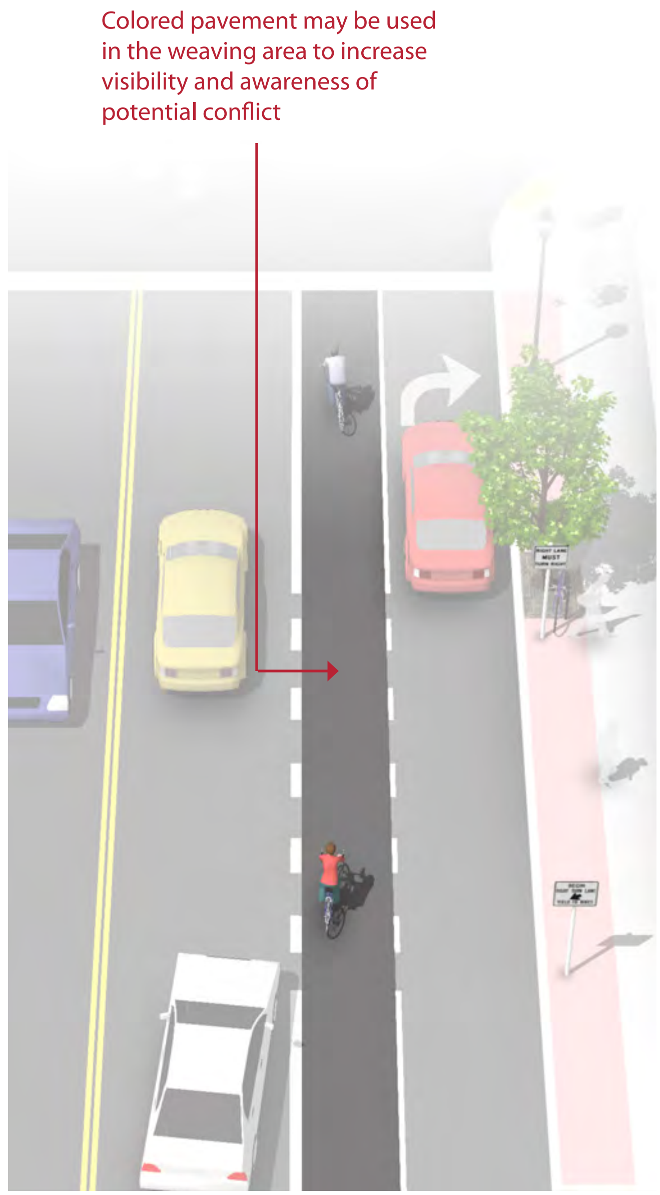
Separated Bikeways at Intersections

Bike Lanes at Right Turn Only Lanes

Description

The appropriate treatment at right-turn lanes is to place the bike lane between the right-turn lane and the right-most through lane or, where right-of-way is insufficient, to use a **combined bike lane/turn lane**.

The design (right) illustrates a bike lane pocket, with signage indicating that motorists should yield to bicyclists through the conflict area.



Guidance

Continue existing bike lane width; standard width of 5 to 6 feet or 4 feet in constrained locations.

Use signage to indicate that motorists should yield to bicyclists through the conflict area.

Consider using **colored conflict areas** to promote visibility of the mixing zone.

Discussion

For other potential approaches to provide accommodations for bicyclists at intersections with turn lanes, please see **combined bike lane/turn lane**, **bicycle signals**, and **colored bike facilities**.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

Separated Bikeways at Intersections

Colored Bike Lanes in Conflict Areas

Description

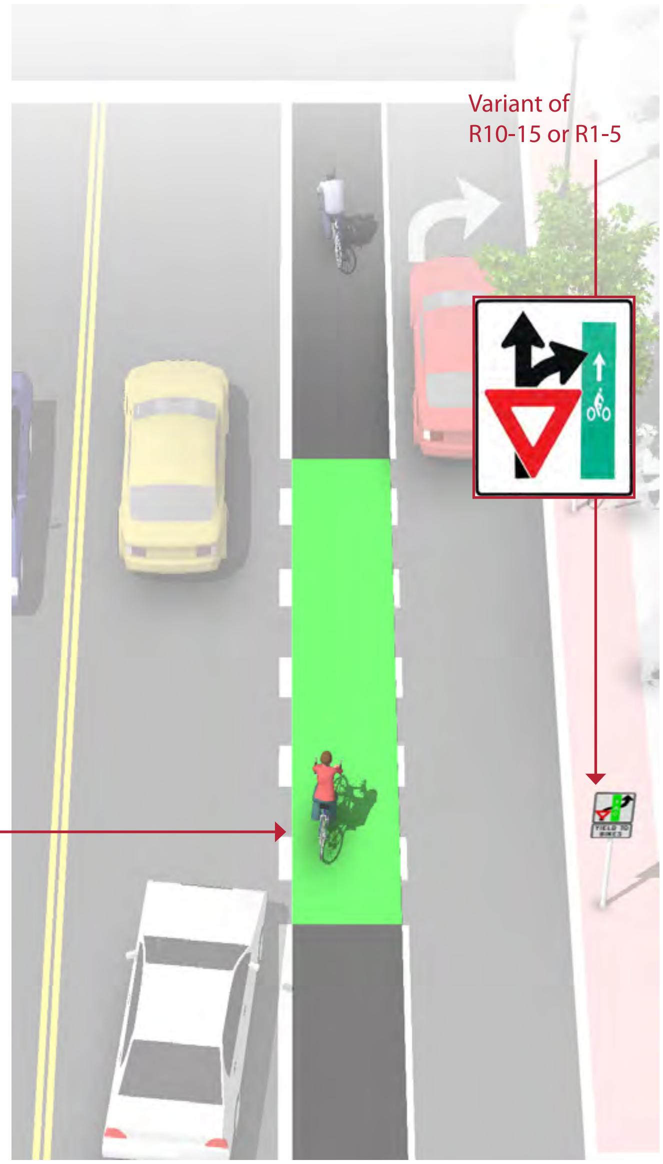
Colored pavement within a bicycle lane increases the visibility of the facility to identify potential areas of conflict, and reinforces priority to bicyclists in conflict areas.

Guidance

Green has been given interim approval by the Federal Highways Administration in March of 2011. See interim approval for specific color standards.

The colored surface should be skid resistant and retro-reflective.

A "Yield to Bikes" sign should be used at intersections or driveway crossings to reinforce that bicyclists have the right-of-way at colored bike lane areas.



Discussion

Evaluations performed in Portland, Oregon, St. Petersburg, Florida and Austin, Texas found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the application of the colored pavement.

Additional References and Guidelines

FHWA. (2011). Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

Separated Bikeways at Intersections

Shared Bike Lane/ Turn Lane

Description

The shared bicycle/right turn lane places a standard-width bike lane on the left side of a dedicated right turn lane. A dashed strip delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positing within the lane.

This treatment is recommended at intersections lacking sufficient space to accommodate a standard **through bike lane** and right turn lane.

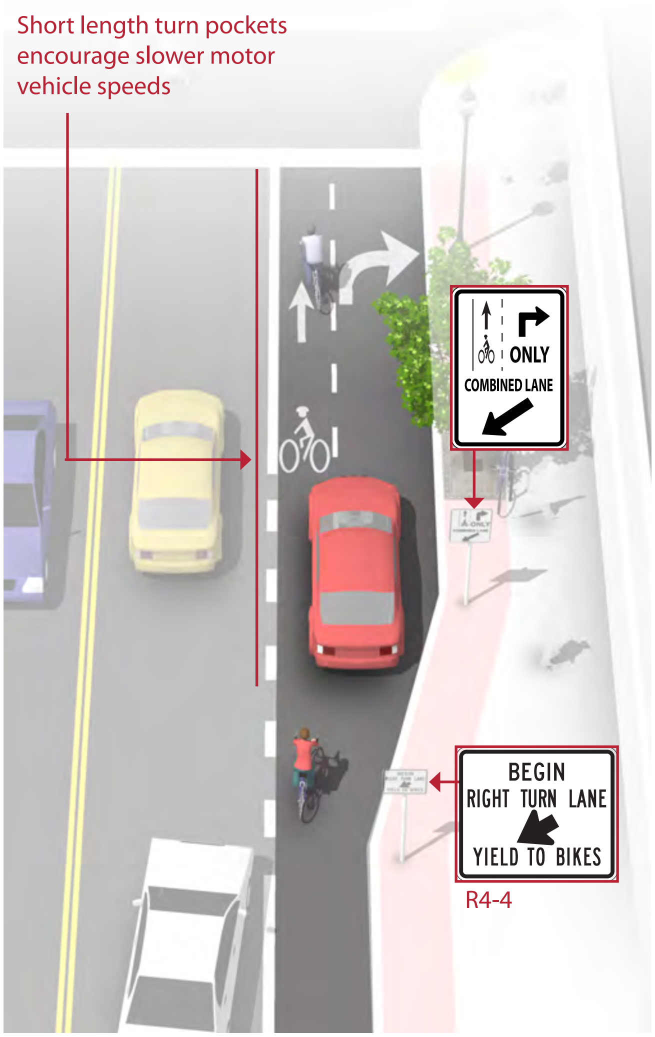
Guidance

Maximum shared turn lane with is 13 feet.

Bike Lane pocket should have a minimum width of 4 feet with 5 feet preferred.

A dotted 4 inch line and bicycle lane marking should be used to clarify bicyclist positioning within the combined lane without excluding cars from the suggested bicycle area.

A sign may be needed to make it legal for through bicyclists to use a right turn lane.



Discussion

Case studies cited by the Pedestrian and Bicycle Information Center indicate that this treatment works best on streets with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less). May not be appropriate for high-speed arterials or intersections with long right turn lanes. May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

Additional References and Guidelines

NACTO. (2011). Urban Bikeway Design Guide.
This treatment is currently slated for inclusion in the next edition of the AASHTO Guide for the Development of Bicycle Facilities

Materials and Maintenance

Locate markings out of tire tread to minimize wear. Because the effectiveness of markings depends on their visibility, maintaining markings should be a high priority.

Separated Bikeways at Intersections

Intersection Crossing Markings

Description

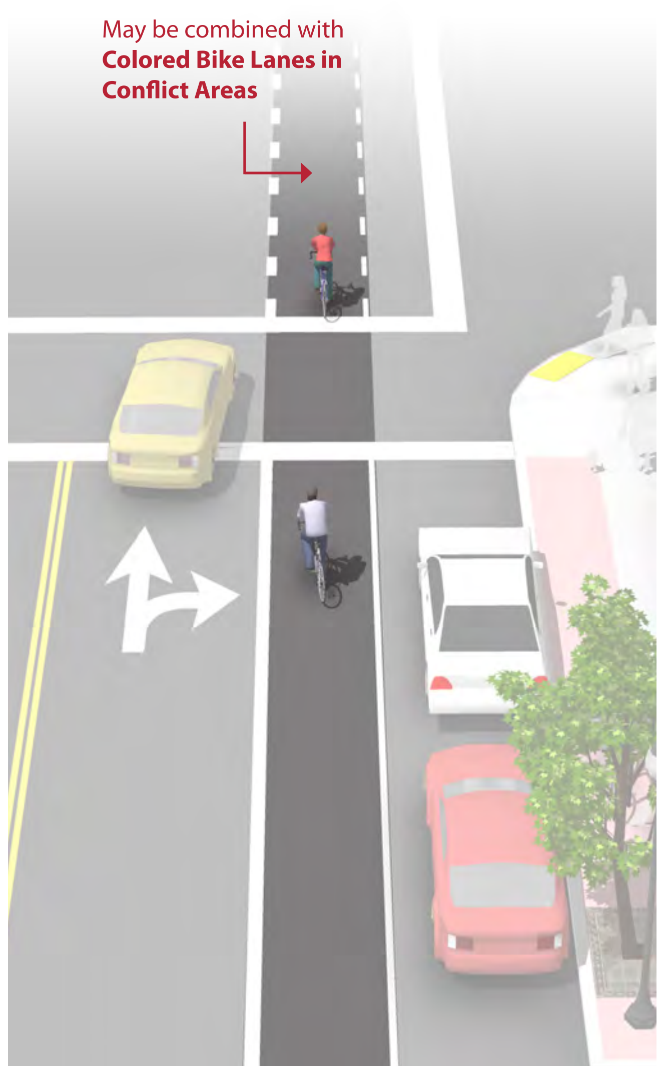
Bicycle pavement markings through intersections indicate the intended path of bicyclists through an intersection or across a driveway or ramp. They guide bicyclists on a safe and direct path through the intersection, and provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane.

Guidance

Crossing striping shall be at least six inches wide when adjacent to motor vehicle travel lanes.

Dashed lines should be two-foot lines spaced two to six feet apart.

Chevrons, shared lane markings, or **colored bike lanes in conflict areas** may be used to increase visibility within conflict areas or across entire intersections.



Discussion

Additional markings such as chevrons, shared lane markings, or **colored bike lanes in conflict areas** are strategies currently in use in the United States and Canada. Cities considering implementing markings through intersections should consider standardizing future designs to avoid confusion.

Additional References and Guidelines

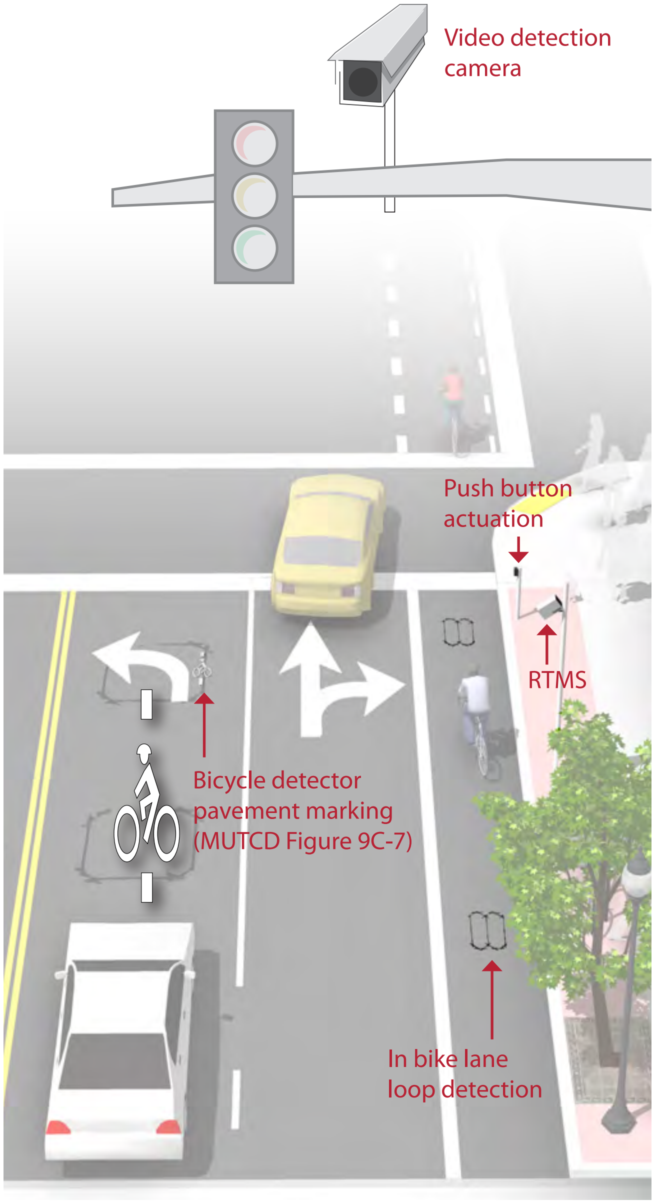
FHWA. (2009). Manual of Uniform Traffic Control Devices. (3A.06)
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority.

Separated Bikeways at Intersections

Bicycle Detection and Actuation



Description

Push Button Actuation

User-activated button mounted on a pole facing the street

Loop Detectors

Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. This allows the bicyclist to stay within the lane of travel and avoid maneuvering to the side of the road to trigger a push button.

Current and future loops that are sensitive enough to detect bicycles should have pavement markings to instruct bicyclists how to trip them, as well as signage

Video Detection Cameras

Video detection cameras can also be used to determine when a vehicle is waiting for a signal. These systems use digital image processing to detect a change in the image at the location. Video detection can be calibrated for bikes, bike lanes, and bike pockets. Video camera system costs range from $20,000 to $25,000 per intersection.

Remote Traffic Microwave Sensor Detection (RTMS)

RTMS is a system, which uses frequency modulated continuous wave radio signals to detect objects in the roadway. This method is marked with a time code which gives information on how far away the object is. The RTMS system is unaffected by temperature and lighting, which can affect standard video detection.

Discussion

Proper bicycle detection meets two primary criteria: 1) accurately detects bicyclists; and 2) provides clear guidance to bicyclists on how to actuate detection (e.g., what button to push, where to stand).

Bicycle loops and other detection mechanisms can provide bicyclists extra green time before the light turns yellow, so that bicyclists of all abilities can reach the far side of the intersection.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Because the effectiveness of markings depends on their visibility, maintaining markings should be a high priority.

Separated Bikeways at Intersections

Bicycle Signal Heads

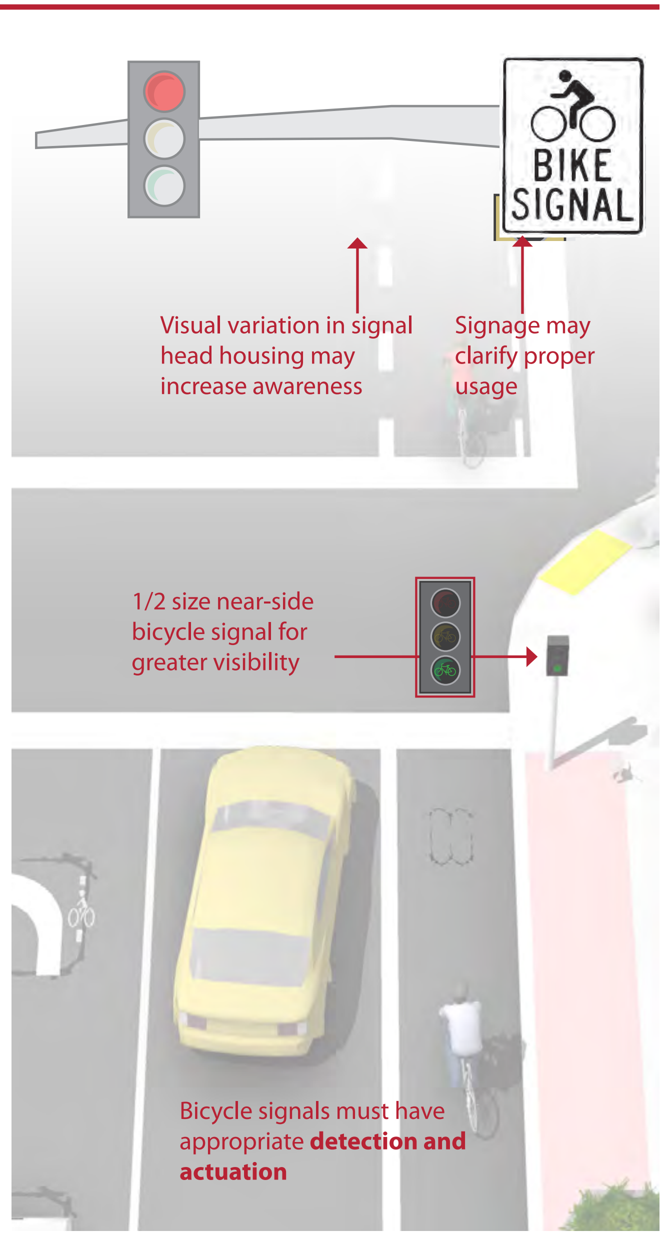
Description

A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing conventional or hybrid signal. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities. Bicycle signal heads may be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. In the United States, bicycle signal heads typically use standard three-lens signal heads in green, yellow, and red lenses. Bicycle signals are typically used to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle-only movements, or leading bicycle intervals).

Guidance

Specific situations where bicycle signals have had a demonstrated positive effect include:

- High volume of bicyclists at peak hours
- High numbers of bicycle/motor vehicle crashes, especially those caused by crossing paths
- At T-intersections with major bicycle movement along the top of the T
- At the confluence of an off-street bike path and a roadway intersection, and
- Where separated bike paths run parallel to arterial streets
- Bicycle signals can be actuated with bicycle sensitive loop detectors, video detection, or push buttons.



Discussion

Local municipal code should be checked or modified to clarify that at intersections with bicycle signals, bicyclists should only obey the bicycle signal heads. For improved visibility, smaller (4 inch lens) near-sided bicycle signals should be considered to supplement far-side signals.

Additional References and Guidelines

NACTO. (2011). Urban Bikeway Design Guide.
The National Committee on Uniform Traffic Control Devices has formed a Task Force that is considering adding guidance to the MUTCD on the use of bicycle signals.

Materials and Maintenance

Bicycle signal heads require the same maintenance as standard traffic signal heads, such as replacing bulbs and responding to power outages.

Path/Roadway Crossings

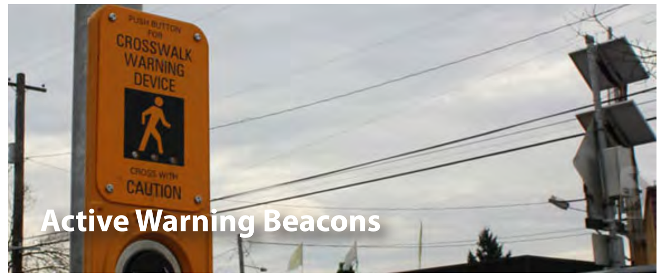
At-grade crossings can create a potential conflicts between path users and motorists, however, well-designed crossings can mitigate many operational issues and provide a higher degree of safety and comfort for path users. This is evidenced by the thousands of successful facilities around the United States with at-grade crossings. In most cases, at-grade path crossings can be properly designed to a reasonable degree of safety and can meet existing traffic and safety standards. Path facilities that cater to bicyclists can require additional considerations due to the higher travel speed of bicyclists versus pedestrians.

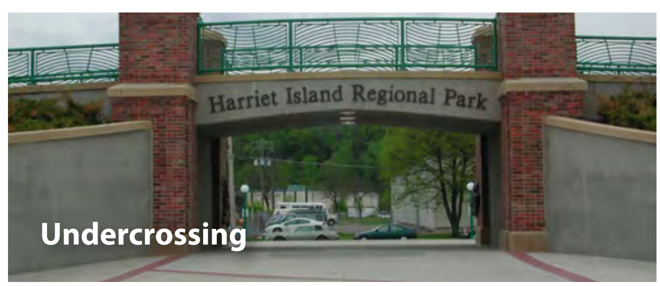
Consideration must be given for adequate warning distance based on vehicle speeds and line of sight, with visibility of any signing absolutely critical. Catching the attention of motorists jaded to roadway signs may require additional alerting devices such as a flashing beacon, roadway striping or changes in pavement texture. Signing for path users may include a standard "STOP" or "YIELD" sign and pavement markings, sometimes combined with other features such as bollards or a sharp bend in the pathway to slow bicyclists. Care must be taken not to place too many signs at crossings lest they begin to lose their impact.

A number of striping patterns have emerged over the years to delineate path crossings. A median stripe on the path approach will help to organize and warn path users. The actual crosswalk striping is a matter of local and State preference, and may be accompanied by pavement treatments to help warn and slow motorists. In areas where motorists do not typically yield to crosswalk users, additional measures may be required.

This Section Includes:

- Marked/Unsignalized Crossings
- Active Warning Beacons
- Route Users to Existing Signalized Intersection
- Signalized/Controlled Crossings
- Undercrossings
- Overcrossings





Path/Roadway Crossings

Marked/Unsignalized Crossings

Guidance

Maximum traffic volumes

- ≤9,000-12,000 Average Daily Traffic (ADT) volumes
- Up to 15,000 ADT on two-lane roads, preferably with a median
- Up to 12,000 ADT on four-lane roads with median

Maximum travel speed

- 35 MPH

Minimum line of sight

- 25 MPH zone: 155 feet
- 35 MPH zone: 250 feet
- 45 MPH zone: 360 feet

Description

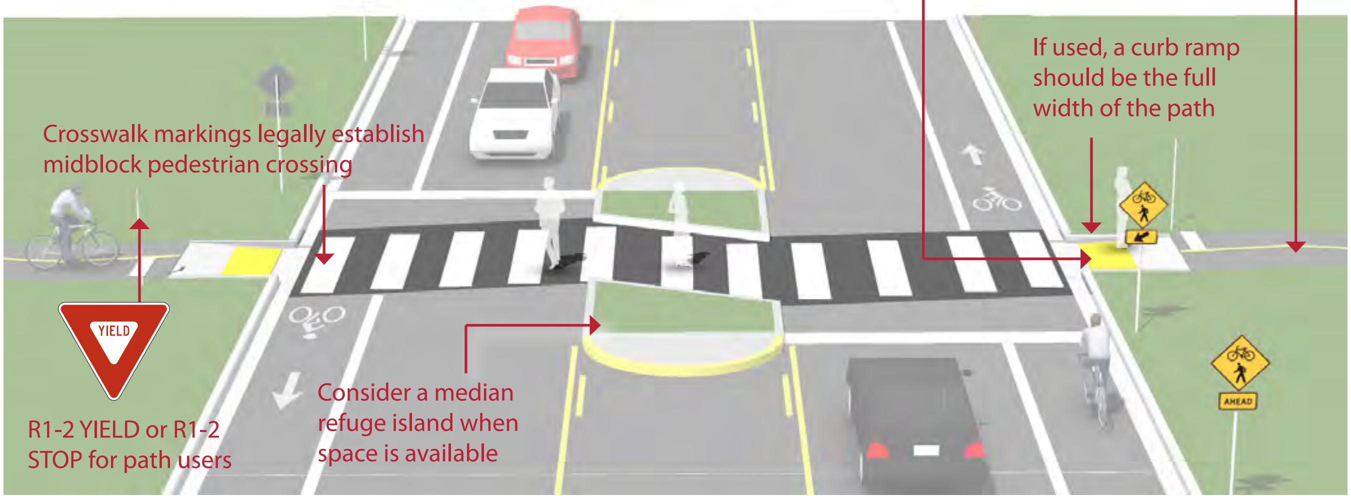
A marked/unsignalized crossing typically consists of a marked crossing area, signage, and other markings to slow or stop traffic. The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type and width, and other safety issues such as proximity to major attractions.

When space is available, using a median refuge islands can help improve safety by providing a crossing refuge, allowing pedestrians and cyclists to gauge safe crossing of one side of the street at a time.

W11-15,
W16-9P

Curves in paths help slow path users and help make them aware of oncoming vehicles

Detectable warning strips help visually impaired pedestrians identify the edge of the street



Discussion

Crossings of multi-lane arterials over 15,000 ADT may be unsignalized with features such as: excellent sight distance, sufficient crossing gaps (more than 60 per hour), median refuges, and/or active warning devices like rectangular rapid flash beacons or in-pavement flashers. See **Enhanced Marked Crossings** for a discussion of active warning beacons.

On roadways with low to moderate traffic volumes (<12,000 ADT) and a need to control traffic speeds, a raised crosswalk may be the most appropriate crossing design to improve pedestrian visibility and safety.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
FHWA. (2009). Manual of Uniform Traffic Control Devices.

Materials and Maintenance

Locate markings out of wheel tread when possible to minimize wear and maintenance costs.

Active Warning Beacons

Guidance

Guidance for **Marked/Unsignalized Crossings** applies.

- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.
- Warning beacons shall initiate operation based on pedestrian actuation and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.

Description

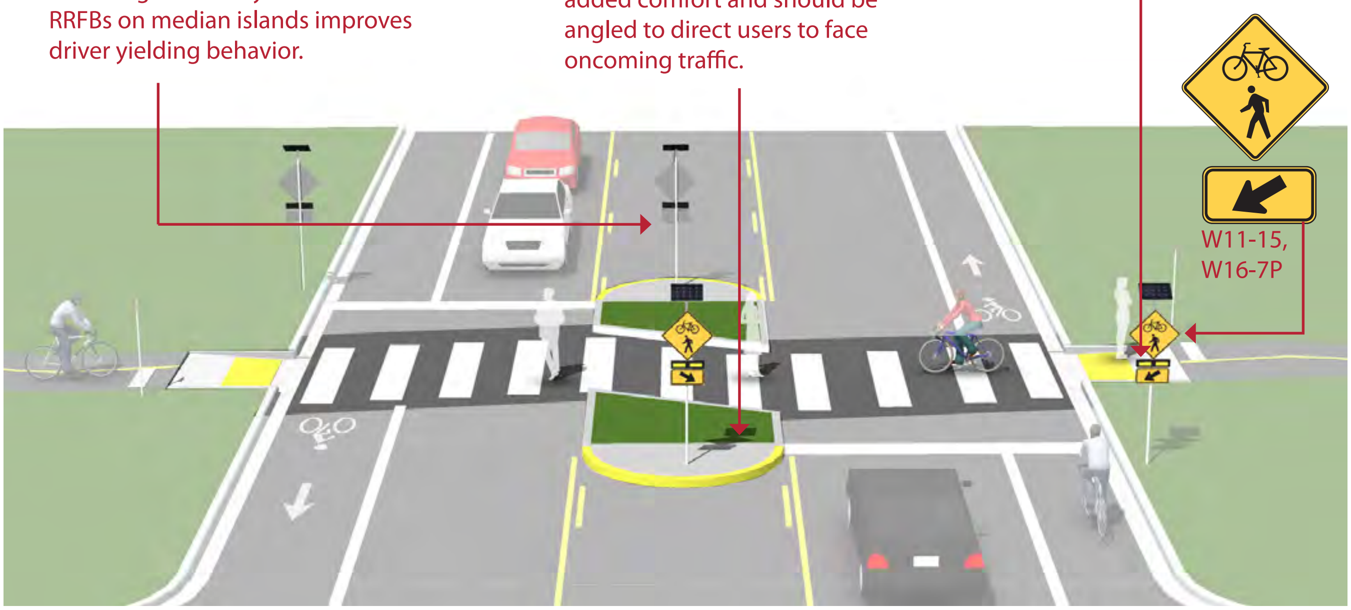
Enhanced marked crossings are unsignalized crossings with additional treatments designed to increase motor vehicle yielding compliance on multi lane or high volume roadways.

These enhancements include pathway user or sensor actuated warning beacons, rectangular rapid flash beacons (RRFB) shown below, or in-roadway warning lights.

Rectangular Rapid Flash Beacons (RRFB) dramatically increased compliance over conventional warning beacons

Providing secondary installations of RRFBs on median islands improves driver yielding behavior.

Median refuge islands provide added comfort and should be angled to direct users to face oncoming traffic.



Discussion

Rectangular rapid flash beacons show the most increased compliance of all the warning beacon enhancement options.

A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88 percent. Additional studies over long term installations show little to no decrease in yielding behavior over time.

Additional References and Guidelines

NACTO. (2011). Urban Bikeway Design Guide.
FHWA. (2009). Manual of Uniform Traffic Control Devices.
FHWA. (2008). MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)

Materials and Maintenance

Locate markings out of wheel tread when possible to minimize wear and maintenance costs. Signing and striping need to be maintained to help users understand any relatively unfamiliar traffic control.

Path/Roadway Crossings

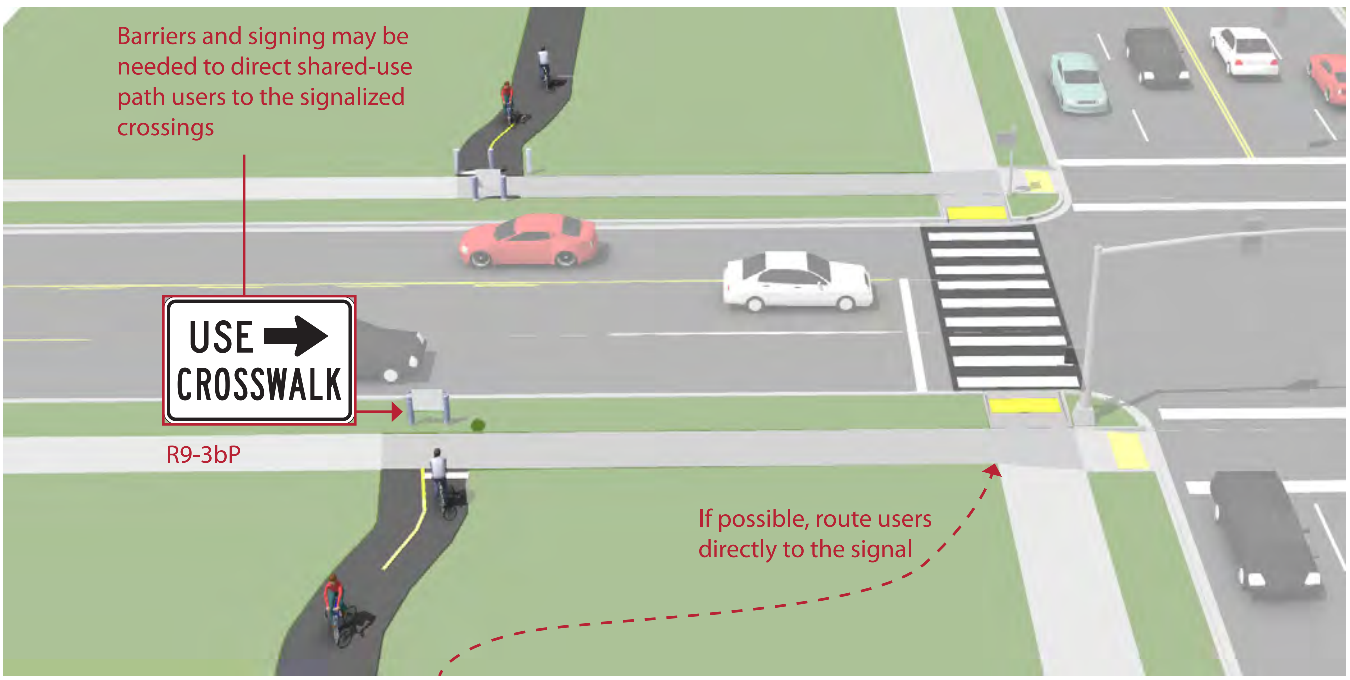
Route Users to Signalized Crossings

Guidance

Path crossings should not be provided within approximately 400 feet of an existing signalized intersection. If possible, route path directly to the signal.

Description

Crossings within approximately 400 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection as they can cause traffic operation problems so close to an existing signal. For this restriction to be effective, barriers and signing may be needed to direct path users to the signalized crossing. If no pedestrian crossing already exists at the signal, modifications would be made.



Discussion

The minimum distance a marked crossing can be from an existing signalized intersection varies across the nation from approximately 250 to 660 feet. Engineering judgement and the context of the location should be taken into account when choosing the appropriate allowable setback. Pedestrians are particularly sensitive to out of direction travel and jaywalking may become prevalent if the distance is too great.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.

Materials and Maintenance

Path/Roadway Crossings

Signalized/Controlled Crossings

Guidance

Traffic signal installations must meet MUTCD pedestrian, school, or modified warrants.

Hybrid signals may be installed without meeting traffic signal control warrants, if roadway speed and volumes are excessive for comfortable path user crossings.

Additional guidance for signalized crossings:

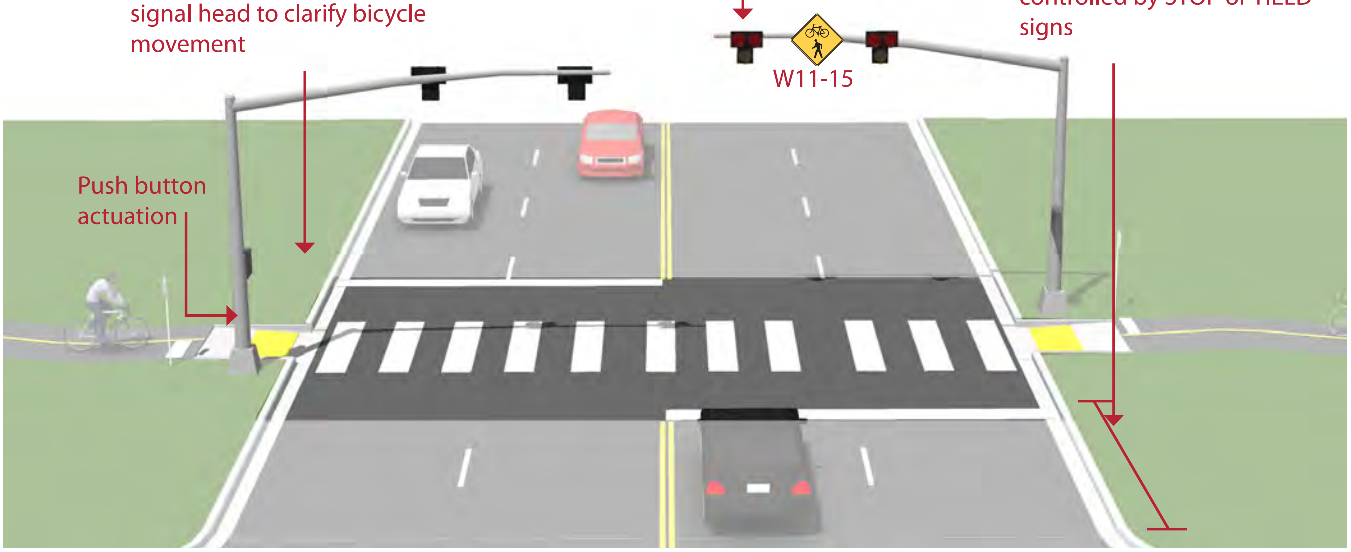
- Located more than 300 feet from an existing signalized intersection
- Roadway travel speeds of 40 MPH and above
- Roadway ADT exceeds 15,000 vehicles

Description

Signalized crossings provide the most protection for crossing path users through the use of a red-signal indication to stop conflicting motor vehicle traffic. The two types of path signalization are full traffic signal control and hybrid signals.

A full traffic signal installation treats the path crossing as a conventional 4-way intersection, and provides standard red-yellow-green traffic signal heads for all legs of traffic.

Hybrid signal installation (shown below) faces only cross motor vehicle traffic, says dark when inactive, and uses a unique 'wig-wag' signal phase to indicate activation. Vehicles may proceed after stopping during ending flashing red phase, reducing motor vehicle delay when compared to a full signal installation.



Discussion

Shared-use path signals are normally activated by push buttons, but also may be triggered by embedded loop, infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.

Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.

Additional References and Guidelines

FHWA. (2009). Manual of Uniform Traffic Control Devices.
NACTO. (2011). Urban Bikeway Design Guide.

Materials and Maintenance

Hybrid signals are subject to the same maintenance needs and requirements as standard traffic signals. Signing and striping need to be maintained to help users understand any relatively unfamiliar traffic control.

Path/Roadway Crossings

Undercrossings

Guidance

Width: 14 feet minimum , greater widths preferred for lengths over 60 feet.

Height: 10 feet minimum

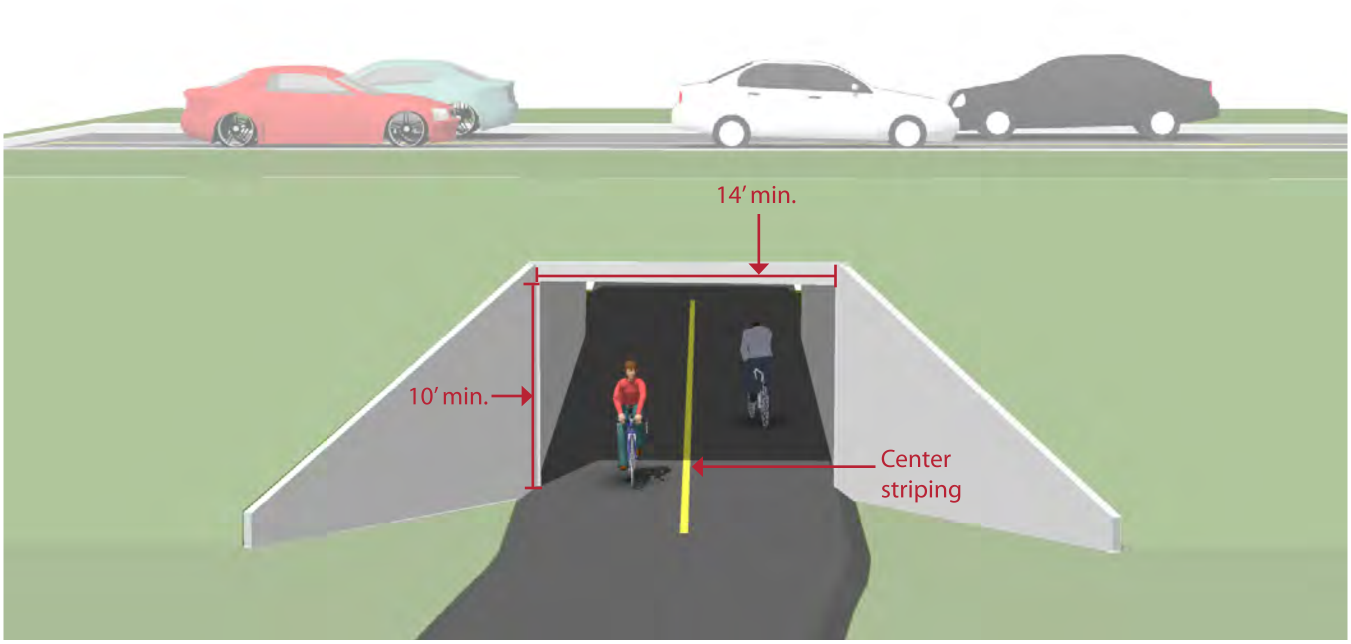
Signage & Striping: The undercrossing should have a centerline stripe even if the rest of the path does not have one.

Lighting: Lighting should be considered during design process for any undercrossing with high anticipated use or in culverts or tunnels.

Description

Bicycle/pedestrian undercrossings provide critical non-motorized system links by joining areas separated by any number of barriers such as railroads and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.

Grade-separated crossings are advisable where existing bicycle/pedestrian crossings do not exist, where ADT exceeds 25,000 vehicles, and where 85th percentile speeds exceed 45 miles per hour.



Discussion

Safety is a major concern with undercrossings. Shared-use path users may be temporarily out of sight from public view and may have poor visibility themselves. To mitigate safety concerns, an undercrossing can be designed to be spacious, well-lit, equipped with emergency cell phones at each end, and completely visible for its entire length prior to entering.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.

Materials and Maintenance

14 foot width allows for access by maintenance vehicles.

Potential problems include conflicts with utilities, drainage, flood control, and issues with vandalism.

Path/Roadway Crossings

Overcrossing

Guidance

Width: 8 feet minimum, 14 feet preferred. If overcrossing has any scenic vistas additional width should be provided to allow for stopping. A separate 5 foot pedestrian area may be provided for facilities with high bicycle and pedestrian use.

Height: 10 feet headroom on overcrossing; clearance below will vary depending on feature being crossed.

Roadway: 17 feet
Freeway: 18.5 feet
Heavy Rail Line: 23 feet

Signage & Striping: The overcrossing should have a centerline stripe even if the rest of the path does not have one.

Description

Bicycle/pedestrian overcrossings provide critical non-motorized system links by joining areas separated by any number of barriers such as deep canyons, waterways or major transportation corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.

Grade-separated crossings may be needed where existing bicycle/pedestrian crossings do not exist, where ADT exceeds 25,000 vehicles, and where 85th percentile speeds exceed 45 miles per hour.

Overcrossings require a minimum of 17 feet of vertical clearance to the roadway below versus a minimum elevation differential of around 12 feet for an undercrossing. This results in potentially greater elevation differences and much longer ramps for bicycles and pedestrians to negotiate.

Discussion

Overcrossings for bicycles and pedestrians typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to 5% (1:20) with landings at 400 foot intervals, or 8.33% (1:12) with landings every 30 feet.

Overcrossings pose potential concerns about visual impact and functional appeal, as well as space requirements necessary to meet ADA guidelines for slope.

Additional References and Guidelines

AASHTO. (1999). Guide for the Development of Bicycle Facilities.
AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.

Materials and Maintenance

Potential issues with vandalism.

Overcrossings can be more difficult to clear of snow than undercrossings.

Appendix B – Selected Projects

The project Steering and Working Committees selected five projects to explore from the recommended projects in Chapter 6. These projects are presented in greater detail with conceptual graphics, additional discussion and other information that is intended to provide additional guidance if and when these projects are developed. The intent of the project Steering and Working Committees was to select projects that could serve an important role in the bikeway system that have some degree of complexity.

The five projects selected for project sheets are:

1. North Campus Path #1
2. 1500 East Connector
3. Mario Capecchi Drive & Wasatch Drive
4. North-South Bike Path – West End of Business Loop to Merrill Building
5. HPER Mall Bisect – East End of Business Loop to Central Campus Drive

North Campus Path #1

Project Description

North Campus Drive is currently a significant barrier for bicyclists due to the steep grade, narrow travel lanes, high traffic speeds, poor sight distance, and poor shoulder areas. Some bicyclists use North Campus Drive in the downhill direction since it's possible to take a travel lane and keep up with vehicular traffic. There is currently no facility for bicyclists to traverse the northern side of campus. This is of particular importance for bicyclists who desire to reach the Health Sciences and Medical campuses from the Avenues, Federal Heights, and downtown.

Proposed Improvements

North and West Side of North Campus Drive:

Sections of a wide 8-foot sidewalk totaling approximately 0.3 miles exist along the north side of North Campus Drive between Penrose Drive and the Jewish Community Center access drive. The first phase of bicycle improvements proposes to extend this facility to the south with a new 12-foot-wide concrete shared-use path. Improvements to delineate intersections with cross streets are also included. For detailed recommendations for the minor road crossings, please see the shared-use pathway section of the Bikeway Design Guidelines in Appendix A.

Penrose Drive & Federal Heights Drive Crossings

It is possible that a signal will be installed at the Penrose/Wasatch intersection in the future in conjunction with the Ambulatory Care Complex and other campus development in the area. If constructed, the signal should have provisions for pedestrians and bicyclists to cross North Campus Drive. The University, UDOT, and Salt Lake City would need to decide whether to allow through vehicle movements as well.

Modifications could be made to the Federal Heights Drive intersection to allow bicyclists to turn left onto North Campus Drive. A vehicular "pork chop" island may be used to maintain vehicle restrictions while allowing bicycle access. A conceptual illustration of this scenario is provided on the following page.

South and East side of North Campus Drive:

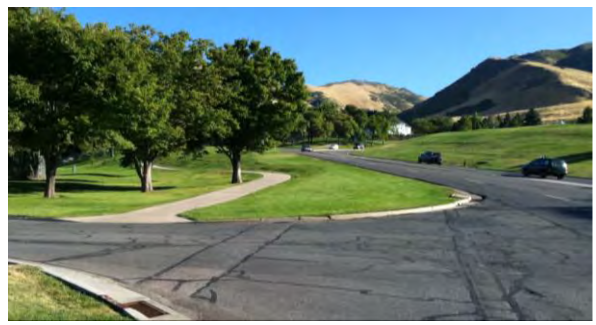
The northern shared use path will make a critical connection for bicyclists and pedestrians trying to reach the Health Sciences Campus and the hospitals. However, it requires users already on campus to cross North Campus Drive twice to reach those destinations. In the long term, it is recommended that the University of Utah also pursue development of a shared-use pathway on the south side of North Campus Drive. Topography will be more challenging on this side of the roadway. Wherever possible, sections of this path should be worked into future campus development projects.

Estimated Cost

North Side Path: $145,500; South Side Path: $250,200

Photos

Looking west along North Campus Drive where the road turns to the south; grade and utilities may pose challenges

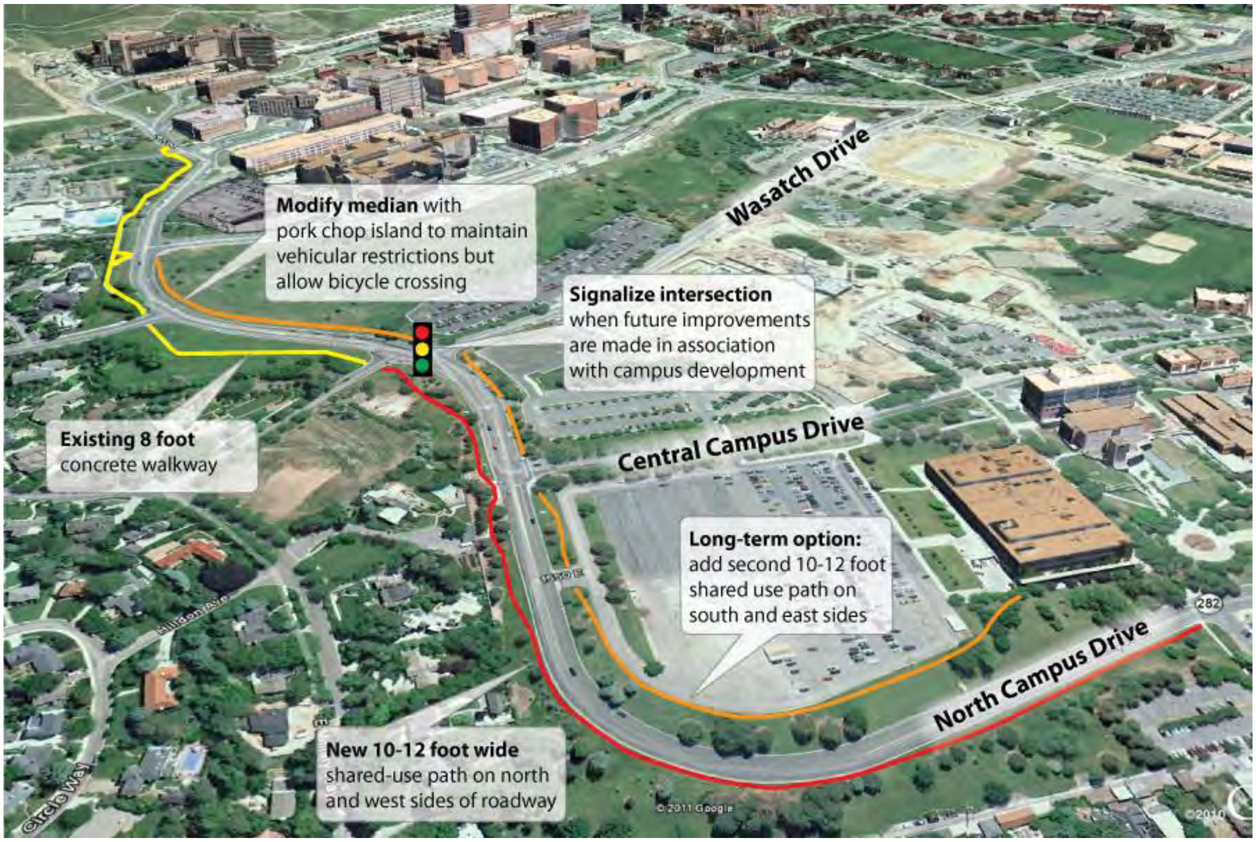


Existing sidewalk just north of Penrose Drive

Wasatch/Penrose Intersection

A bicyclist travels against traffic on North Campus Drive

Concept Graphics



Short- and long-term shared use paths along North Campus Drive (looking east towards Health Sciences campus)

Conceptual strategy to allow bicycle left turns from Federal Heights Drive to North Campus Drive

1500 East Connector

Project Description

One of the most frequently cited problems by students, faculty and staff is the discontinuity between the existing bicycle lanes on Guardsman Way and campus. This project represents a response to this problem via a short-term improvement. This project lies within University property with the exception of the short crossing of South Campus Drive.

Proposed Improvements

Improvements to existing shared-use path

An 8-foot concrete walkway on the west side of Parking Lot 09 (southwest of the Guardsman/South Campus roundabout) connects to the Foothill Drive/Guardsman Way intersection. Many cyclists already use this walkway. The route should be formalized though the use of wayfinding signage and pavement markings. Concrete wheel stops should be installed in the parking spaces along the western edge of the parking lot to keep vehicles from encroaching into the path and becoming a hazard to cyclists and pedestrians. For bicyclists traveling from campus towards Guardsman Way, instructional signage should be provided about using the pedestrian signal to access the bike lanes along Guardsman. If heavy bicycle use is attracted, the University may wish to consider widening this pathway to 12 feet.

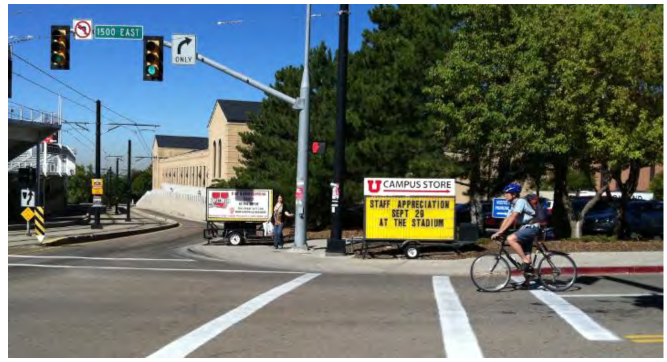
1500 East Shared Lane Markings

After a short shared-use path section, bicyclists should be directed on-street to use approximately 800 feet of 1500 East as a low-speed shared lane bicycle route. This route should have consistent wayfinding signage directing bicyclists to major destinations such as the Marriott Library and Olpin Union building. Shared lane markings should be placed in the center of the travel lane at the far side of intersections and at intervals of no more than 150 feet. Bicyclists should be directed to enter the plaza in front of the library rather than continue through the parking kiosks. From the library, bicyclists can connect to other routes serving destinations within central campus. Testing should be conducted to ensure that the South Campus Drive1500 East signal detects bicyclists.

Estimated Cost

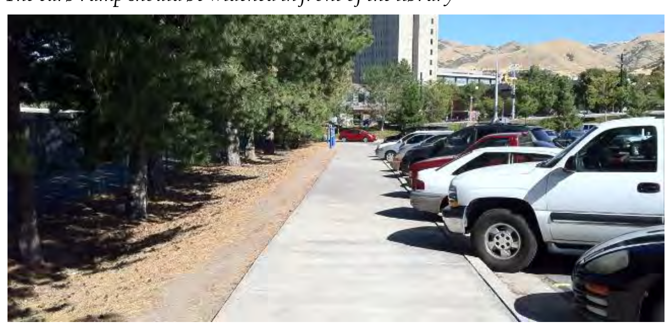
$10,000

Photos

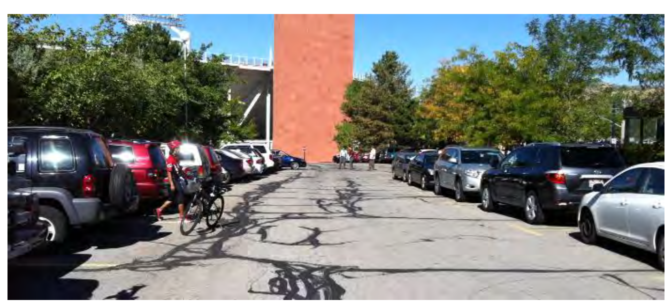


Bicyclists crossing South Campus Drive along 1500 E should be detectable by the signal. Bicycle stencils over the loop detector should be installed.

The curb ramp should be widened in front of the library

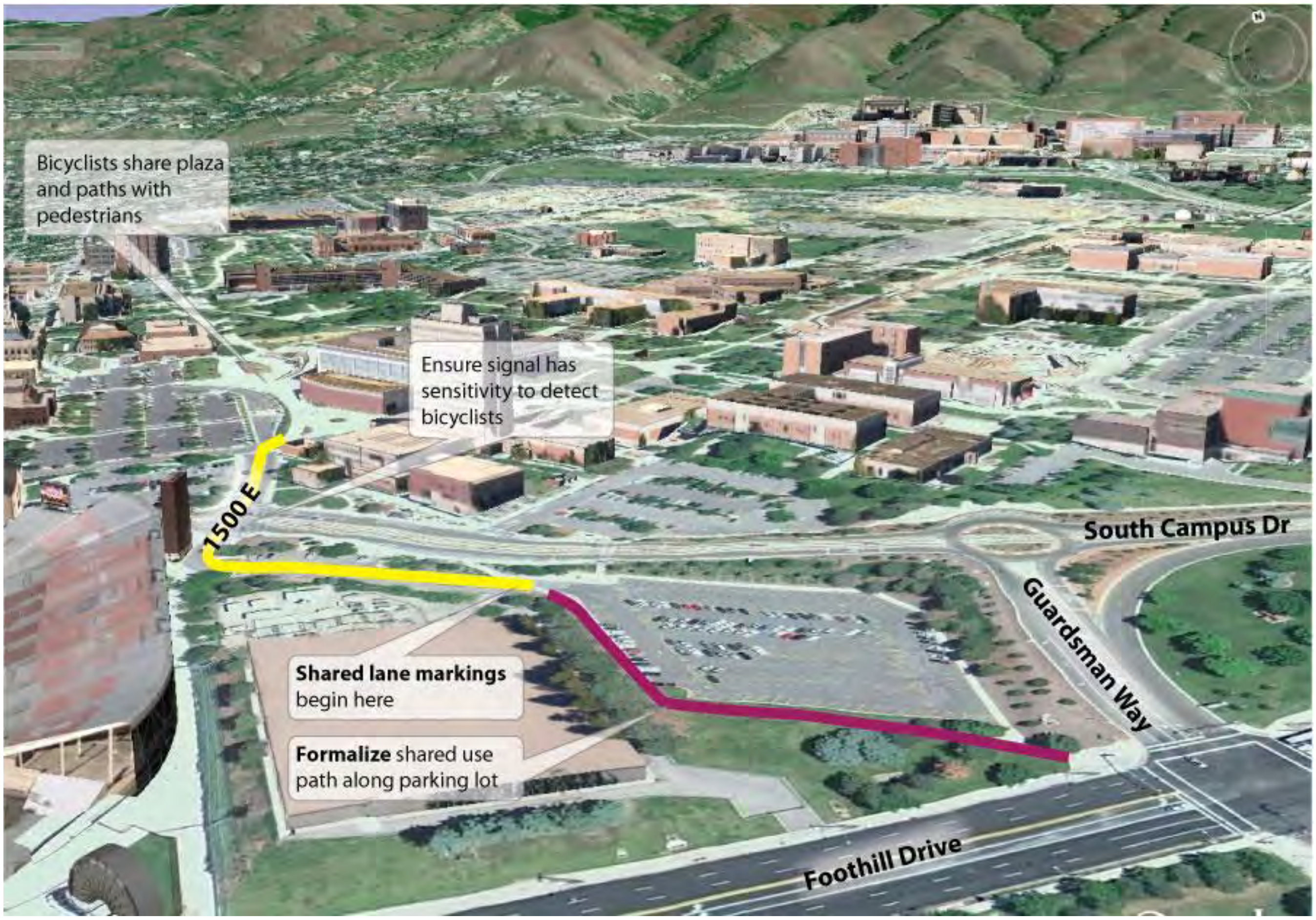


Wheel stops should be added to the parking lot



Share lane markings should go down the middle of 1500 East

Concept Graphics



Route details for bicycle connection from Guardsman Way to the Marriott Library

Mario Capecchi Drive & Wasatch Drive

Project Description

This project concept provides a new connection for bicycles and shuttle buses between the Fort Douglas and mid-campus areas. Getting across Mario Capecchi Drive – especially north of South Campus Drive – is difficult for both bicycles and buses.

This concept would tie a new 20-foot-wide roadway into the Wasatch Drive/Mario Capecchi Drive intersection. The design would allow shuttle vehicles to pass in the unlikely event that two would meet at this location, while keeping it narrow enough to potentially fit around the Legacy Bridge support structure. Currently, the Orange Shuttle Route serves the Wasatch Drive–Fort Douglas area. This connection would make the route more direct. Other shuttle routes could be reconfigured to take advantage of this connection as well.

Proposed Improvements

Median and signal modifications would be necessary to allow through movements from Wasatch Drive. A new road southeast of the intersection would need to be constructed beneath the Legacy Bridge to connect to Fort Douglas. Allowing left turns from Wasatch Drive onto Mario Capecchi could be considered, but this would have a larger impact on signal performance. A full engineering study including traffic and signal analysis should be performed before devoting funding to further planning or design.

The bike lanes should have dashed lane lines to allow shuttle vehicles to pass when necessary if there are no bicycles in the lane.

Challenges

- Full engineering study needed, including assessment of possible impacts to Legacy Bridge structure
- Traffic Impact Assessment needed
- Coordination and cooperation with UDOT and UTA required
- Significant earthwork and retaining walls are likely needed

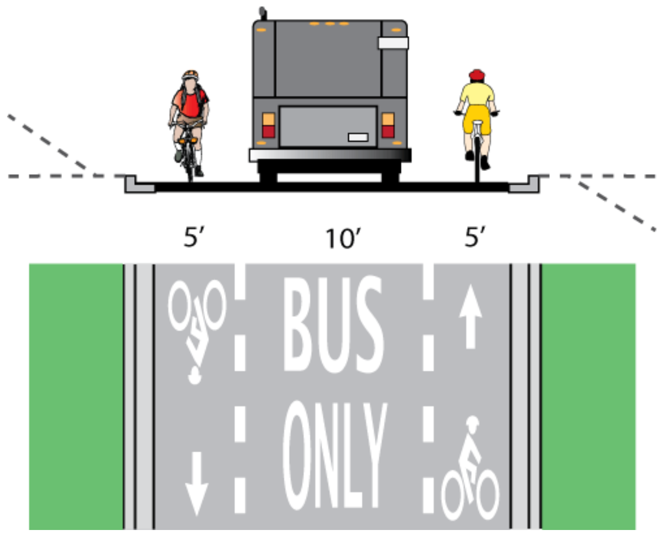
Estimated Cost

Unknown. Cost will depend on soil investigations, intersection modifications, and chosen alignment for shuttle/bike connector.

Photos

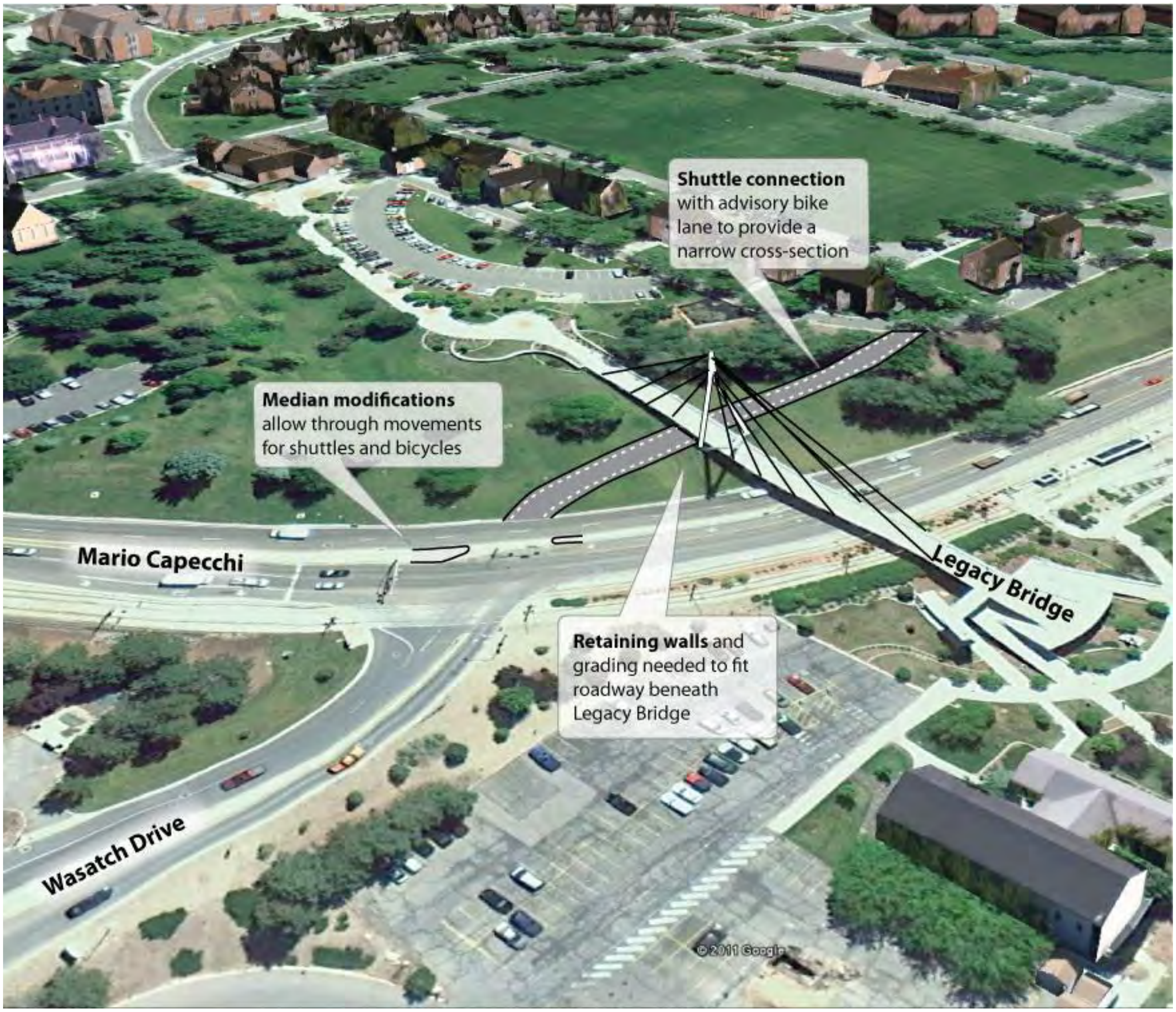
Looking east across Mario Capecchi Drive from Wasatch Drive

Looking down at the intersection from the Legacy Bridge



Concept of 20-foot-wide bike and shuttle connection

Concept Graphics



Concept of roadway connection for bicycles and campus shuttle vehicles

North-South Bike Path – West End of Business Loop to Merrill Building

Project Description

In 2008, the University experimented with designating part of this campus pathway for bicycles. The experiment consisted of yellow dashed center striping and bicycle symbols. This route is particularly strategic in that it is continuous across campus and is mostly flat. For these reasons, the route is well-used by bicyclists. Currently, there is low compliance with many bicyclists using the pedestrian side and pedestrians using the bicycle side. The University of Utah Bicycle Master Plan provides new design guidance for bike paths interfacing with pedestrian areas. This corridor is the perfect place to apply these concepts and test their effectiveness.

Proposed Improvements

The following additional visual cues and treatments should be implemented to provide continuity and improve clarity for bicyclists and pedestrians.

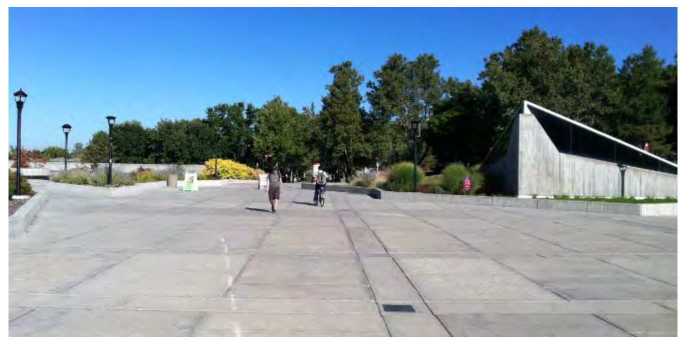
- Green colored pavement for first 20 feet after a pedestrian mixing area or crossing
- Bicycle and pedestrian guide signs at entrances to bike path
- Move bike path to east side of corridor between the Business Loop and library pedestrian plaza rather than down the middle. Delineate this section entirely in green.
- Provide bicycle wayfinding markings through mixing areas and across pedestrian plazas such as in front of the Marriott Library
- “SLOW” pavement stencils and “Yield” signage on the bike path at approaches to pedestrian areas

Estimated Cost

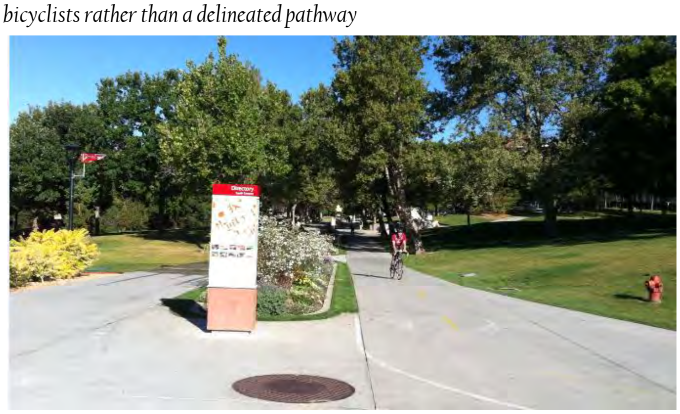
$95,000

Photos

Existing configuration between Architecture and the C Roland Christensen Center

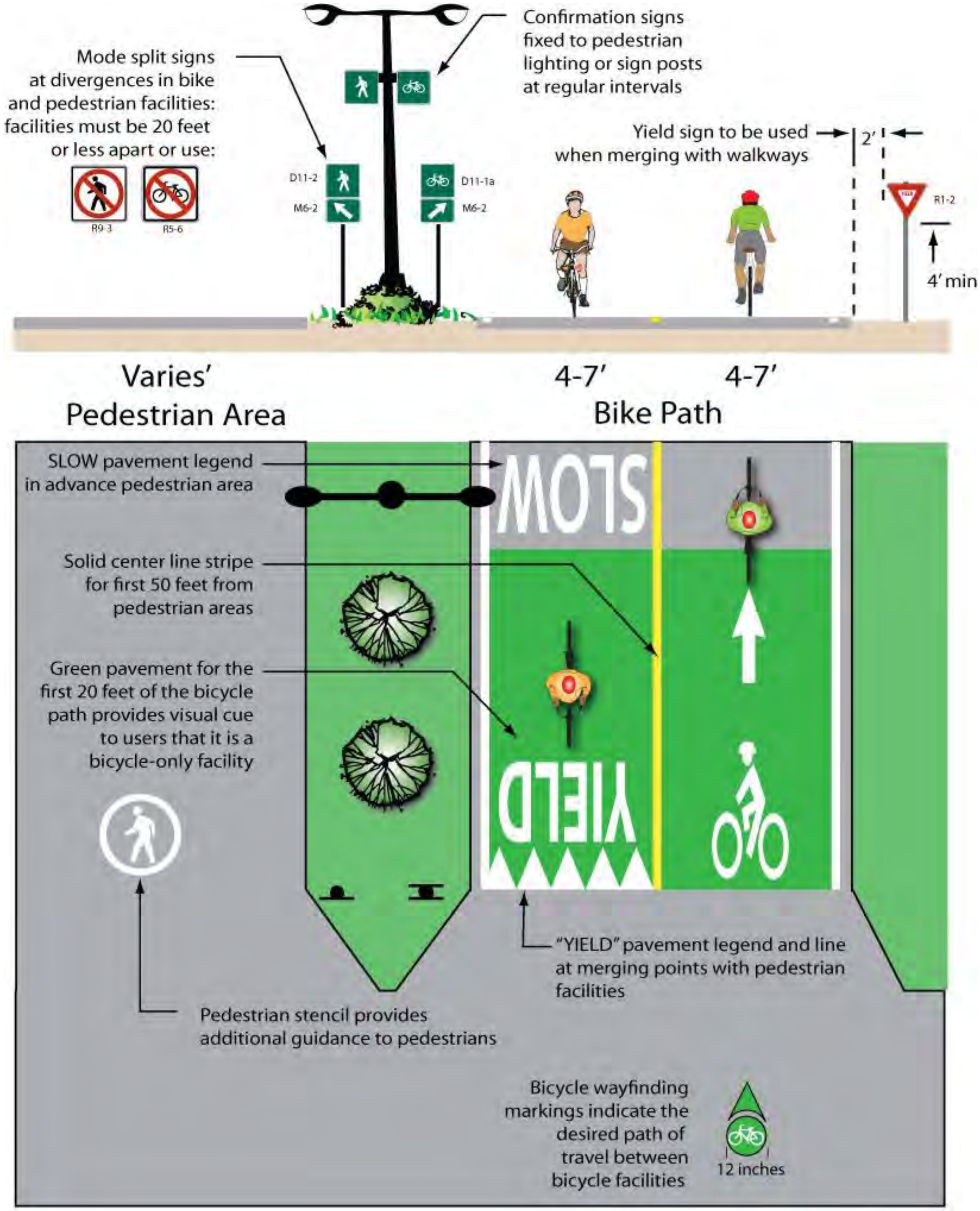


Plaza in front of library should have bicycle wayfinding markings directing bicyclists rather than a delineated pathway

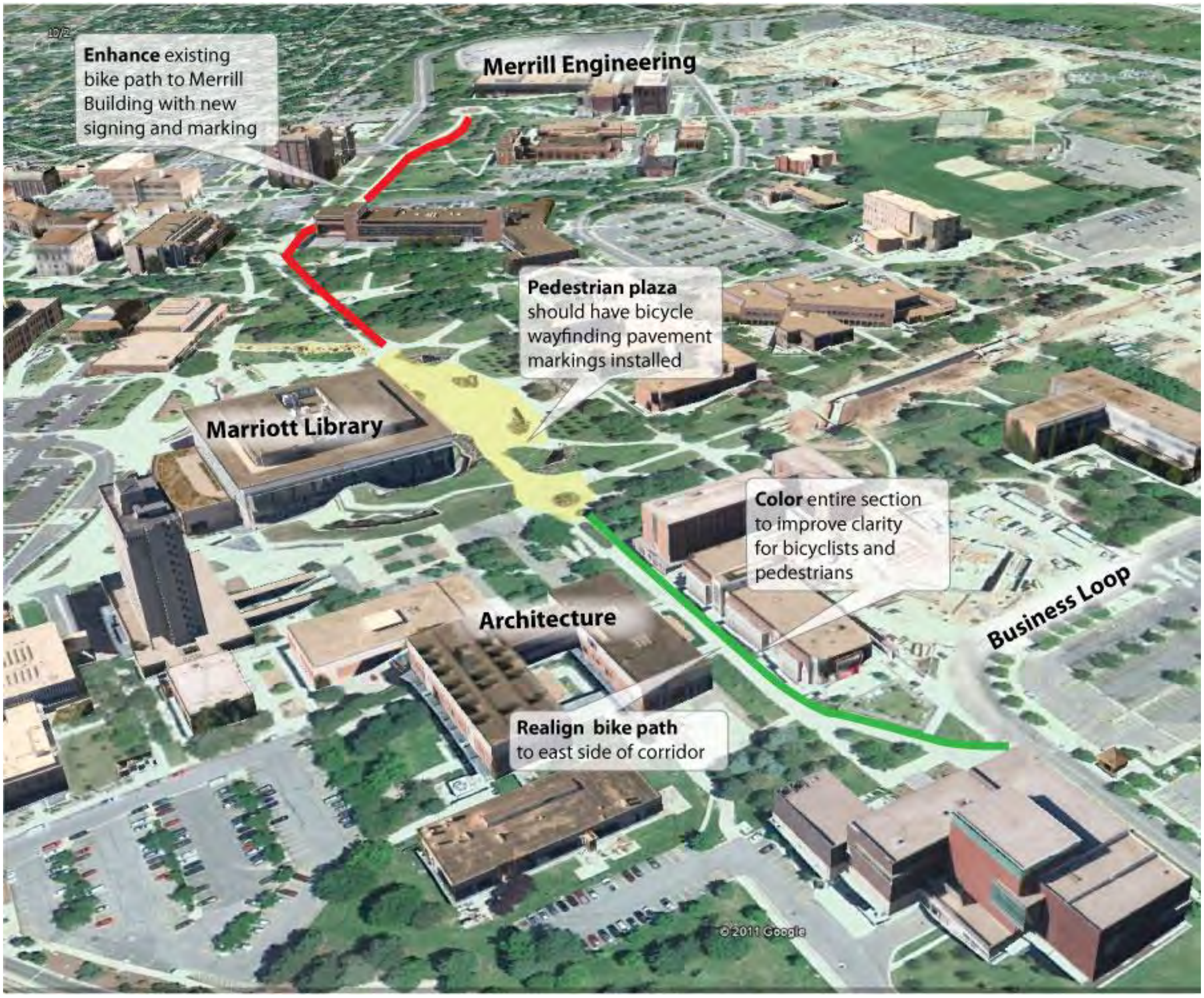


The existing split configuration of the bike and pedestrian portions of the corridor

Concept Graphics



Concept Graphics



HPER Mall Bisect – East End of Business Loop to Central Campus Drive

Project Description

This project was identified through the public involvement process and through discussions with the project Working and Steering Committees. Discussions withUniversity of Utah Facilities Management Departmentpersonnel and individual project managers indicate opportunities for improvements to be coordinated with existing and future development.

Proposed Improvements

The bike path should be established keeping with the same design detail afforded to the other bike paths proposed on campus with clear signage, green pavement for the first 20 feet beyond a pedestrian plaza or mixing area, and wayfinding markings and signs to help bicyclists navigate.

From business loop to HPER Mall

- Two options (upper or lower)
  - Upper option as either repurposing of exiting pathway, or widening to accommodate both bicyclists and pedestrians
  - Lower option as bicycle and pedestrian corridor on east side corridor. This option may provide a higher quality experience because more space is available
- Integration with pedestrian plazas (bicycle wayfinding signage and markings)

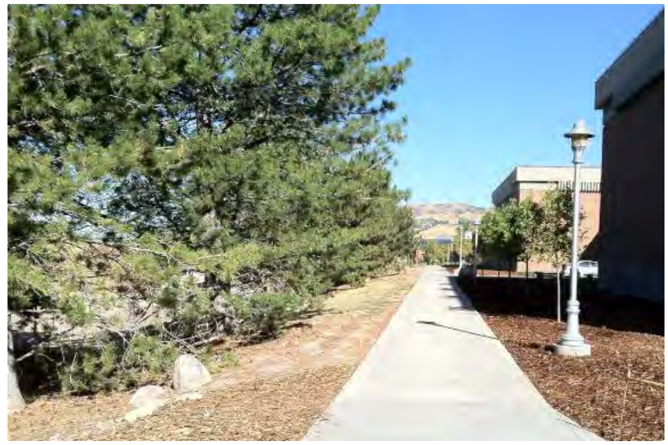
From HPER Mall to Central Campus Drive:

- Use of existing bike path ramp to Parking Lot 24 or new facility in association with future HPER Mall shuttle connection
- Route through Parking Lot 24
- Bicycle path from Parking Lot 24 around the back of the Humanities Building to Central Campus Drive

Estimated Cost

$193,000

Photos

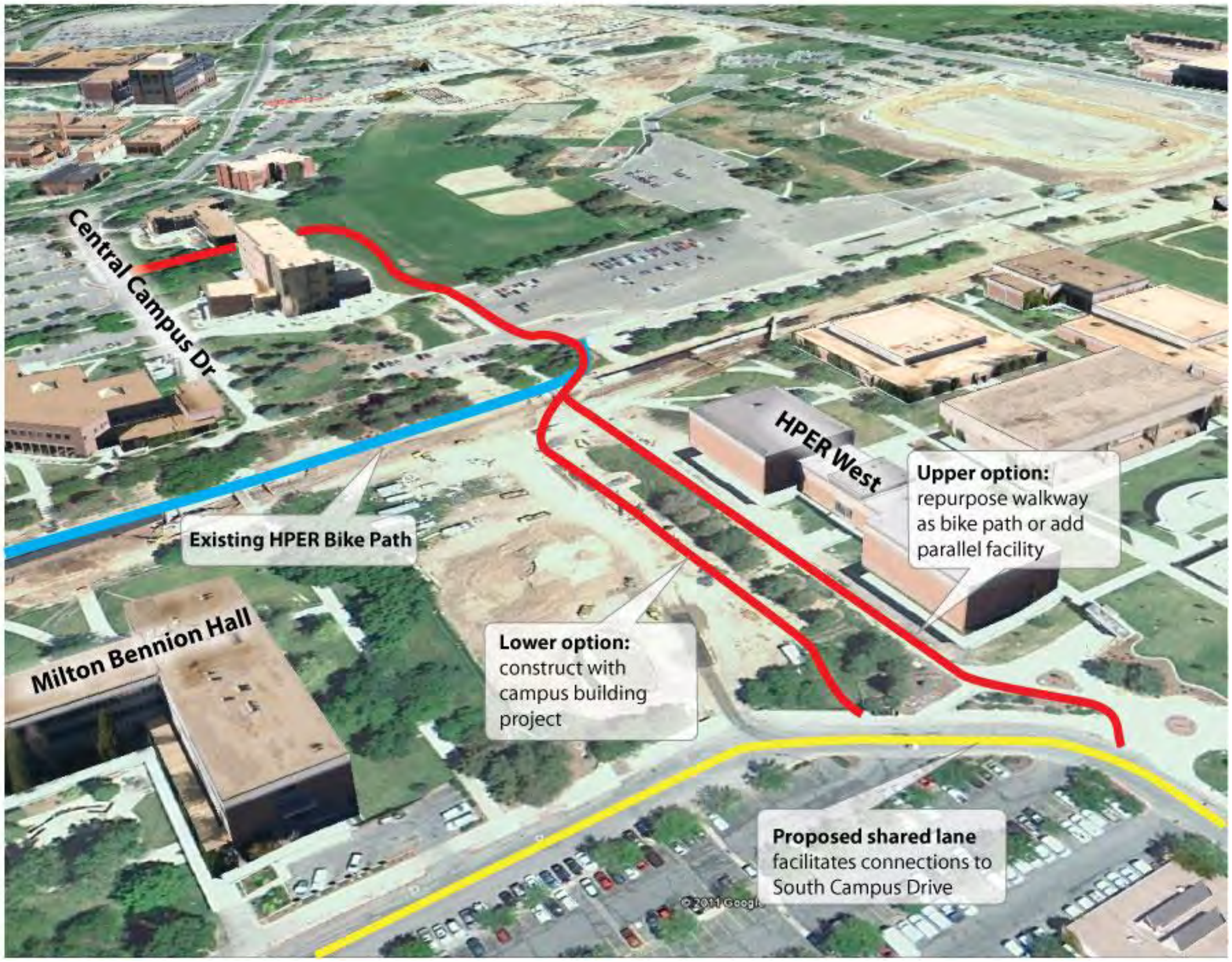


Looking north along the HPER West building – bike path could route through here or with new construction at the bottom of the slope

Looking north within HPER Mall with new HPER Mall bike path on left

New HPER Mall bike path connects to Parking Lot 24

Concept Graphics



Concept of options for the HPER Mall Bisect

Appendix C – StreetPlan Model

StreetPlan Analysis

An innovative component of the on-street bikeway analysis was the use of Alta Planning + Design's StreetPlan model. The StreetPlan model is a method of determining how an existing roadway cross-section can be modified to include bike lanes. Assuming acceptable minimum widths for each roadway element, the model analyzes a number of factors including strategies to retrofit bike lanes on each surveyed roadway segment. Factors used in this analysis include:

- Current roadway width
- Raised or painted median
- Number and width of travel lanes
- Presence and number of turn lanes and medians
- Location and utilization of on-street parking

In some cases, the retrofit is simple and only requires the addition of a bike lane in readily available roadway space. In other circumstances a retrofit may be more challenging and require the narrowing of a travel lane, the removal of on-street parking or a more detailed engineering study. This model is useful because it clearly illustrates locations where bike lanes can be completed easily and, conversely, where doing so would be challenging.

Acceptable lane widths vary by functional classification. For example, 10-foot travel lanes may be acceptable for a local street, but higher speed arterials may require 11 feet for the minimum lane width. For the purposes of the model, acceptable minimum roadway dimensions were set at the values shown in Table C.1. These values were obtained from the respective agencies:

Table C.1: StreetPlan Lane Minimum Lane Width Inputs

Lane Type	University of Utah	Salt Lake City	UDOT
Travel Lane	11 feet	10 feet	11 feet
Turn Lane	11 feet	12 feet	11 feet
Parking Lane	N/A	7.5 feet	8.5 feet

StreetPlan Outcomes

Many segments of the roadway network resulted in multiple potential strategies for accommodating bike lanes. The model layers these potential strategies based on the following hierarchy:

1. Bike lanes will fit with existing roadway configuration
2. Reconfigure travel lanes and/or parking lanes
3. Consider 4-to-3 lane road diet
4. Remove redundant on-street parking and stripe bike lanes
5. Remove a lane of on-street parking to accommodate bike lanes
6. Bike lanes cannot be accommodated easily – engineering solution needed

Based on this order, the StreetPlan model uses the first strategy for a given segment of roadway and is given priority over succeeding strategies. Not all of the options were possible strategies for all segments, but on many segments multiple strategies could be used to implement bike lanes.

Bike Lanes Fit With Existing Roadway Configuration

In this option, enough surplus road space exists to simply add the bike lane stripes and stencils without an impact on the number of lanes or configuration of the roadway. This is by far the most desirable and easily implemented option available. Such segments represent the "low hanging fruit" of the recommended on-street bikeway network.

Reconfigure Travel Lanes and/or Parking Lanes

In this option, bike lanes can be added by simply adjusting wide travel lanes or parking lanes within the established minimums presented above. No reduction to the number of travel or parking lanes is needed.

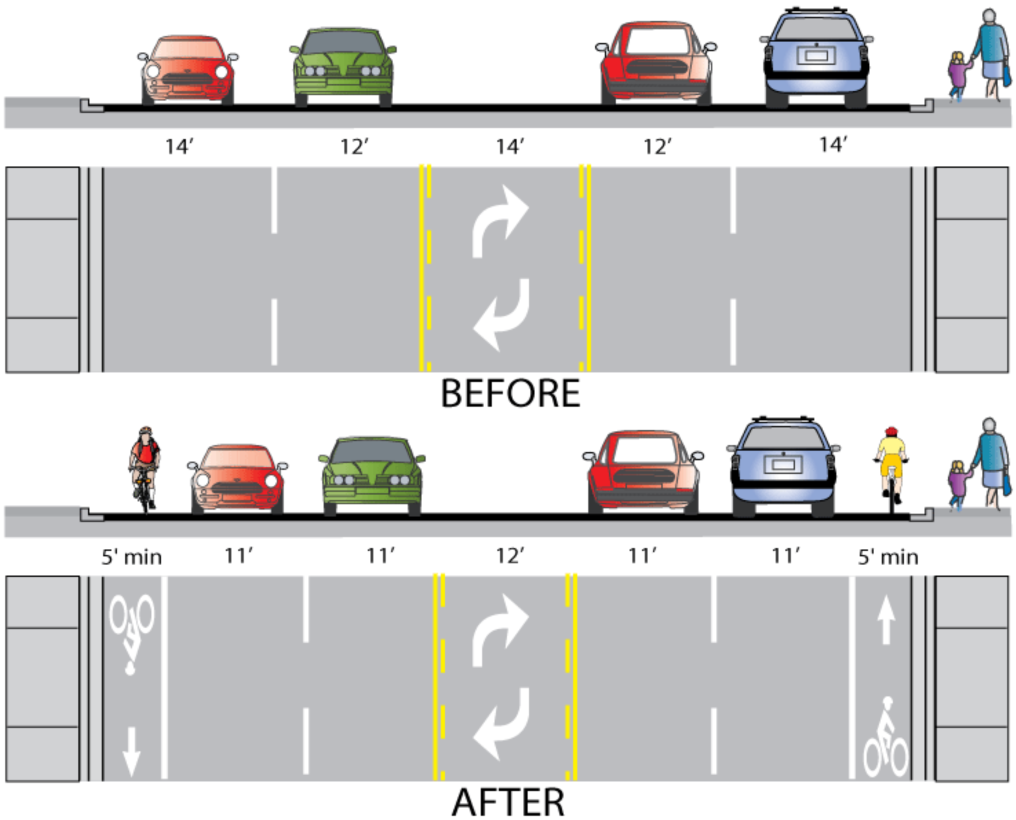


Figure C.1 – Bicycle Lanes Added Through Lane Narrowing

Consider 4-to-3 Road Diet

In this option, a four-lane road section is "put on a diet" and reconfigured to include a single travel lane in each direction and a two way left turn lane. Three-lane road sections have operational and safety benefits for motorists by facilitating left turns and reducing rear-end crashes. Road diets are strong candidates for roadways with traffic volumes below 20,000 vehicles per day. In some instances, road diets have been successful on roads with 23,000 vehicles per day.

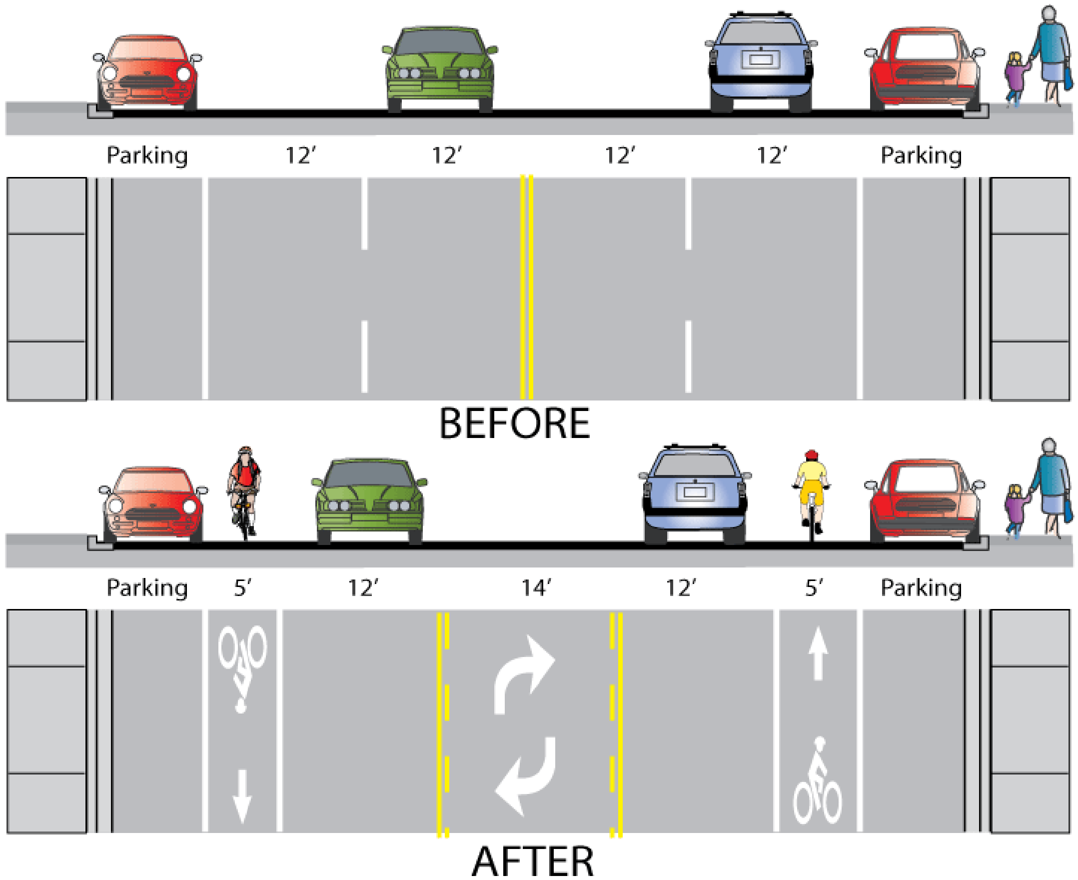


Figure C.2: Road Diet

Remove Redundant or Unneeded On-Street Parking

In this option, unnecessary on-street parking on one or both sides of the street is removed to create space for bike lanes. Acceptable situations for this scenario include collector or arterial roadways that pass by back fences of homes rather than the front sides, or areas that have large surface parking lots adjacent to existing on-street parking.

Remove On-Street Parking

In this option, on-street parking may be removed on one side of the road. This is a less desirable option and may only be considered as a last resort in short sections to maintain bike lane continuity. A full parking study should be conducted to determine if excess parking capacity exists before making changes to the roadway configuration.

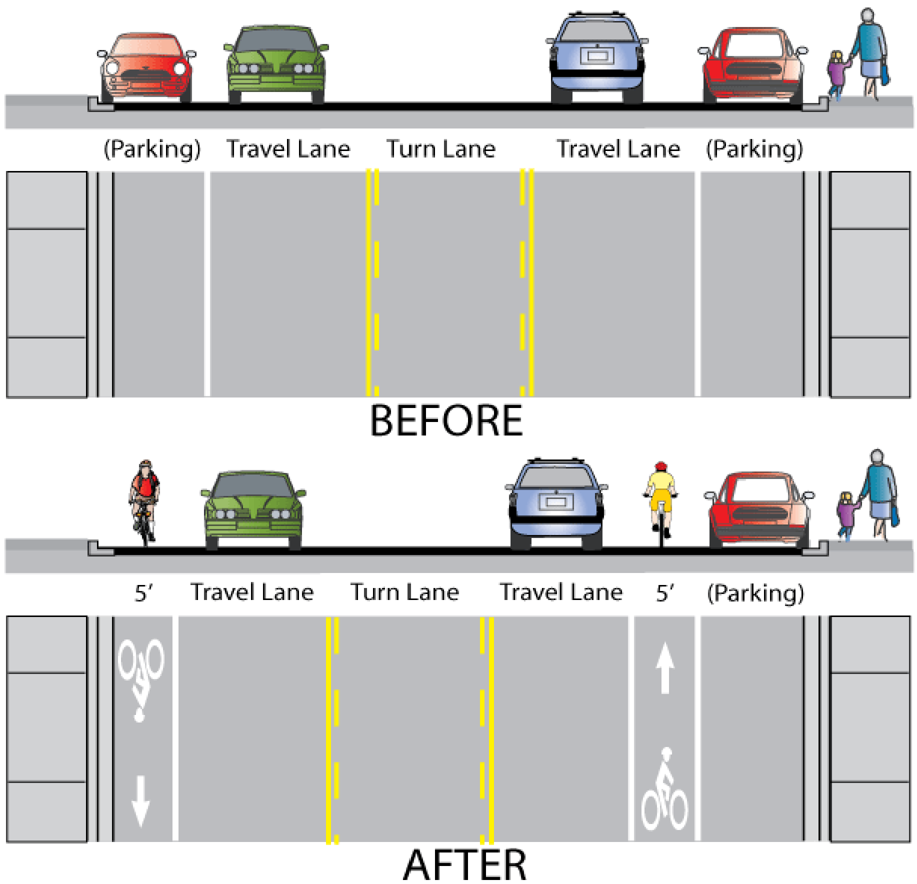
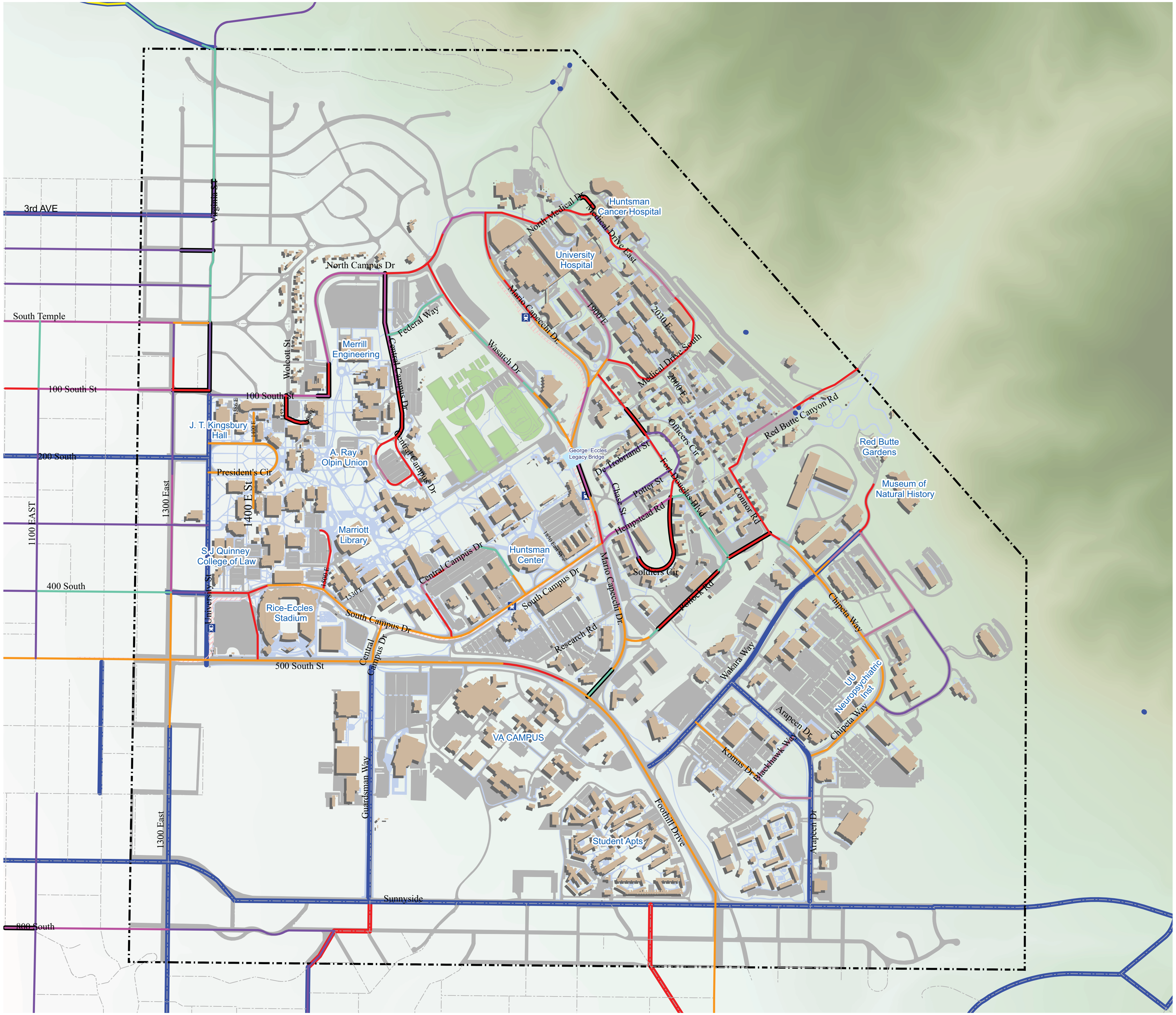


Figure C.3 – Bicycle Lanes Added Through Parking Removal

Figure C.4 displays the output of the StreetPlan Model. This analysis represents only what is physically possible within the existing roadway dimensions and does not reflect the final recommendations provided in Chapter 6.



Legend

- Bike lanes will fit w/current striping
- Reconfigure travel lanes and/or parking lanes
- Consider '4 to 3 Road Diet'
- Remove redundant on-street parking and stripe bike lanes
- Add additional pavement width and stripe bike lanes
- Remove On-Street Parking
- Bike lanes will not fit easily, engineering solution necessary
- Suggest Reducing Minimus Travel Lane Widths
- Existing Salt Lake City Bike Lanes
- Existing Salt Lake City Signed Shared Route

N

0 500 1,000 2,000

Date: June 21, 2011

Figure C.4

Street Plan Map

UNIVERSITY OF UTAH BICYCLE MASTER PLAN

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Recommended Short-Term Bicycle Paths

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Connor/Fort Douglas Connector	a. Signing and Striping	160	LF	$ 25.08	$ 4,013
	b. Hardscape Improvements	160	LF	$ 103.74	$ 16,598
					$ 20,612
Heritage Center Path	a. Signing and Striping	475	LF	$ 25.08	$ 11,915
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
					$ 11,915
Heritage/Officers Connector	a. Signing and Striping	175	LF	$ 25.08	$ 4,390
	b. Hardscape Improvements (Requires 75%)	131	LF	$ 103.74	$ 13,616
					$ 18,006
Legacy Bridge Path	a. Signing and Striping	950	LF	$ 25.08	$ 23,830
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
					$ 23,830
Student Life Connector	a. Signing and Striping	660	LF	$ 25.08	$ 16,555
	b. Hardscape Improvements	660	LF	$ 103.74	$ 68,468
					$ 85,024
HPER Mall Path	a. Signing and Striping	2,700	LF	$ 25.08	$ 67,727
	b. Hardscape Improvements (Requires 50%)	1,350	LF	$ 103.74	$ 140,049
					$ 207,776
HPER Mall Bisect	a. Signing and Striping	1,500	LF	$ 25.08	$ 37,626
	b. Hardscape Improvements	1,500	LF	$ 103.74	$ 155,610
					$ 193,236
North-South Path	a. Signing and Striping	3,300	LF	$ 25.08	$ 82,777
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
	c. 600 ft Colored Bike Path (10 ft wide)	6,000	SF	$ 2.00	$ 12,000
					$ 94,777
1500 East/Olpin Union Connector	a. Signing and Striping	715	LF	$ 25.08	$ 17,935
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
					$ 17,935
Stadium Connector	a. Signing and Striping	1,050	LF	$ 25.08	$ 26,338
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
					$ 26,338

Recommended Medium-Term Bicycle Paths

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Student Housing Path	a. Signing and Striping	1,270	LF	$ 25.08	$ 31,857
	b. Hardscape Improvements (Requires 70%)	889	LF	$ 103.74	$ 92,225
					$ 124,081
2000 East Extension	a. Signing and Striping	1,270	LF	$ 25.08	$ 31,857
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
					$ 31,857
Interdisciplinary Mall	a. Signing and Striping	2,670	LF	$ 25.08	$ 66,974
	b. Hardscape Improvements (Assume 75% is part of project cost of USTAR and Amb. Care)	668	LF	$ 103.74	$ 69,246
					$ 136,221
Lower Campus East-West Path	a. Signing and Striping	2,270	LF	$ 25.08	$ 56,941
	b. Hardscape Improvements (Requires 30%)	681	LF	$ 103.74	$ 70,647
					$ 127,587
Middle Campus East-West Connector	a. Signing and Striping	820	LF	$ 25.08	$ 20,569
	b. No Hardscape Improvements Required	0	LF	$ 103.74	$ -
					$ 20,569
Stadium/President's Circle Connector	a. Signing and Striping	1,185	LF	$ 25.08	$ 29,724
	b. Hardscape Improvements (Assume 50% is part of bigger project cost)	593	LF	$ 103.74	$ 61,466
					$ 91,190

Recommended Long-Term Bicycle Paths

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Parking Lot North of Fieldhouse	a. Signing and Striping	500	LF	$ 25.08	$ 12,542
	b. Hardscape Improvements (Requires 70%)	350	LF	$ 103.74	$ 36,309
					$ 48,851

Cost Breakdown for a Bicycle Path

Signing/Striping Linear Items	Quantity	Unit	Unit Price	Item Cost
1. Linear Striping				
a. Left side white strip (4" solid) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.20	$ 0.20
b. Right side white strip (4" solid) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.20	$ 0.20
c. Middle yellow stripe (4" dashed) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.10	$ 0.10
Total $/ft				**$ 0.50**
2. Striping per Crossing				
a. Colored Pavement (20' long, 10' wide) x2 (One for each side of the crossing)	400	SF	$ 2.00	$ 800.00
b. Message Striping "**SLOW**" (4 Letters per each direction) Thermo Plastic	8	EA	$ 175.00	$ 1,400.00
c. Message Striping - **Bicycle** (one for each direction) Thermo Plastic	2	EA	$ 175.00	$ 350.00
d. Message Striping - **Direction Arrow** (one for each direction) Thermo Plastic	2	EA	$ 200.00	$ 400.00
e. Message Striping - **Pedestrian Stencil** (one for each side of the crossing) Painted	2	EA	$ 25.00	$ 50.00
Lump Sum Total per Crossing				**$ 3,000.00**
Average Cost per Linear Foot (Assuming Crossing Is Every 300')				**$ 10.00**
3. Mode Split Signs per Crossing (e.g. D11-2, D11-1a, M6-2, Custom) Placed in median between bicycle path and pedestrian path				
a. Generic Mode Split Sign (Assume two on the pedestrian side, two on the bicycle side, and on each side o	8	EA	$ 50.00	$ 400.00
b. Sign Posts (one for ped. Side, one for the bike side, and then duplicate for other side of crossing)	4	EA	$ 150.00	$ 600.00
c. Sign Post Bases (one for each post)	4	EA	$ 150.00	$ 600.00
Lump Sum Total per Crossing				**$ 1,600.00**
Average Cost per Linear Foot (Assuming Crossing Is Every 300')				**$ 5.33**
4. Confirmation Signs per Crossing (e.g. D11-1a, and D11-2) Assumed to be part of Mode Split Signing				
a. Assumed to be included in the Mode Split Signing	-		-	$ -
Lump Sum Total per Crossing				**$ -**
Average Cost per Linear Foot (Assuming Crossing Is Every 300')				**$ -**
5. Warning Signs per Crossing (e.g. R1-2, R15-8, W7-5)				
a. Yield to Pedestrian Sign (one for each direction)	2	EA	$ 85.00	$ 170.00
b. "Look" Sign (attached to "YIELD" sign post)	2	EA	$ 50.00	$ 100.00
c. Sign Posts (one per each direction)	2	EA	$ 150.00	$ 300.00
d. Sign Post Base (one per each post)	2	EA	$ 150.00	$ 300.00
Lump Sum Total per Crossing				**$ 870.00**
Average Cost per Linear Foot (Assuming Crossing Is Every 300')				**$ 2.90**
Sub-Total Signing/Striping Cost Per LF				$ 18.73
Mobilization (3%) Per LF				$ 0.56
Contingency (30%) Per LF				$ 5.79
Total Signing/Striping Cost Per LF				**$ 25.08**

Hardscape Items	Quantity	Unit	Unit Price	Item Cost
6. Grubbing Cost Per Linear Feet				
a. Assuming $0.20 per square feet, and a 20' wide corridor	1	LF	$ 4.00	$ 4.00
Total				**$ 4.00**
7. Concrete Pavement Cost per Linear Feet				
a. Bike Pathway - Concrete Pavement (10' Wide, 6" thick pavement, 8" thickened edge, 6" base material - per	1	LF	$ 40.00	$ 40.00
b. Ped Pathway - Concrete Pavement (6' Wide, 6" thick pavement, 8" thickened edge, 6" base material - per L	1	LF	$ 24.00	$ 24.00
Total				**$ 64.00**
9. Landscaped Median (Between Pedestrian and Bicycle Pathways)				
a. Grass Turf Median - Assumed $1.00 per square foot for a 4' wide strip	1	LF	$ 4.00	$ 4.00
b. Irrigation Installation - Assumed $1.00 per square foot for a 4' wide strip	1	LF	$ 4.00	$ 4.00
Total				**$ 8.00**
Sub-Total Signing/Striping Cost Per LF				$ 76.00
Mobilization (5%) Per LF				$ 3.80
Contingency (30%) Per LF				$ 23.94
Total Signing/Striping Cost Per LF				**$ 103.74**

Summary of Average Cost Per Linear Foot	
Signing and Striping Items - Cost per Linear Foot (Linear Items + Crossing Items)	**$ 25.08**
Hardscape Items (Cost per Linear Foot)	**$ 103.74**

Recommended Short-Term Shared-Use Paths

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Research Park Connector	a. Signing and Striping	980	LF	$ 6.83	$ 6,692
	b. Hardscape Improvements	980	LF	$ 57.33	$ 56,183
					$ 62,876
Foothill Dr. Path #1	a. Signing and Striping	700	LF	$ 6.83	$ 4,780
	b. Hardscape Improvements	700	LF	$ 57.33	$ 40,131
					$ 44,911
North Campus Path #1	a. Signing and Striping	4,100	LF	$ 6.83	$ 27,998
	b. Hardscape Improvements (Requires 50%)	2,050	LF	$ 57.33	$ 117,527
					$ 145,525
1500 East Connector	a. Signing and Striping	565	LF	$ 6.83	$ 3,858
	b. No Hardscape Improvements Required	0	LF	$ 57.33	$ -
					$ 3,858
Foothill Dr. Path #2	a. Signing and Striping	1,075	LF	$ 6.83	$ 7,341
	b. Hardscape Improvements	0	LF	$ 57.33	$ -
					$ 7,341

Recommended Medium-Term Shared-Use Paths

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Red-Butte Creek Trail - Segment 1	a. Signing and Striping	1,600	LF	$ 6.83	$ 10,926
	b. Hardscape Improvements	1,600	LF	$ 57.33	$ 91,728
					$ 102,654
Red-Butte Creek Trail - Segment 2	a. Signing and Striping	425	LF	$ 6.83	$ 2,902
	b. Hardscape Improvements	425	LF	$ 57.33	$ 24,365
					$ 27,268
Red-Butte Creek Trail - Segment 3	a. Signing and Striping	1,250	LF	$ 6.83	$ 8,536
	b. Hardscape Improvements	1,250	LF	$ 57.33	$ 71,663
					$ 80,199
Red-Butte Creek Trail - Segment 4	a. Signing and Striping	1,700	LF	$ 6.83	$ 11,609
	b. Hardscape Improvements	1,700	LF	$ 57.33	$ 97,461
					$ 109,070
Mario Capecchi Path	a. Signing and Striping	2,120	LF	$ 6.83	$ 14,477
	b. Hardscape Improvements	2,120	LF	$ 57.33	$ 121,540
					$ 136,017
Foothill Dr Path #3 (VA Connector)	a. Signing and Striping	180	LF	$ 6.83	$ 1,229
	b. No Hardscape Improvements Required	0	LF	$ 57.33	$ -
					$ 1,229
Foothill Dr Path #4 (Option 1: Re-Construct)	a. Signing and Striping	1,640	LF	$ 6.83	$ 11,199
	b. No Hardscape Improvements Required	1,640	LF	$ 57.33	$ 94,021
					$ 105,221
Foothill Dr Path #4 (Option 2: Re-Stripe Only)	a. Signing and Striping	1,640	LF	$ 6.83	$ 11,199
	b. No Hardscape Improvements Required	0	LF	$ 57.33	$ -
					$ 11,199

Recommended Long-Term Shared-Use Paths

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Foothill Dr. Path #5	a. Signing and Striping	120	LF	$ 6.83	$ 819
	b. Hardscape Improvements	120	LF	$ 57.33	$ 6,880
					$ 7,699
North Campus Path #2	a. Signing and Striping	3,900	LF	$ 6.83	$ 26,633
	b. Hardscape Improvements	3,900	LF	$ 57.33	$ 223,587
					$ 250,220

Cost Breakdown for a Shared-Use Path

Signing/Striping Items	Quantity	Unit	Unit Price	Item Cost
1. Linear Striping				
a. Middle yellow stripe (4" dashed) throughout the entire length ($/ft for Therm	1	LF	$ 0.10	$ 0.10
Total $/ft				$ 0.10
2. Message Striping				
a. Message Striping - **Bicycle** (one for each direction) Thermo Plastic	2	EA	$ 175.00	$ 350.00
b. Message Striping - **Direction Arrow** (one for each direction) Thermo Plastic	2	EA	$ 200.00	$ 400.00
Lump Sum Total per Placement				**$ 750.00**
Average Cost per Linear Foot (Assuming Placement Is Every 150')				$ 5.00
Sub-Total Signing/Striping Cost Per LF				$ 5.10
Mobilization (3%) Per LF				$ 0.15
Contingency (30%) Per LF				$ 1.58
Total Signing/Striping Cost Per LF				**$ 6.83**

Hardscape Items	Quantity	Unit	Unit Price	Item Cost
3. Grubbing Cost Per Linear Feet				
a. Assuming $0.20 per square feet, and a 10' wide corridor	1	LF	$ 2.00	$ 2.00
Total				**$ 2.00**
4. Concrete Pavement Cost per Linear Feet				
a. Bike Pathway - Concrete Pavement (10' Wide, 6" thick pavement, 8" thickenec	1	LF	$ 40.00	$ 40.00
Total				**$ 40.00**
Sub-Total Signing/Striping Cost Per LF				$ 42.00
Mobilization (5%) Per LF				$ 2.10
Contingency (30%) Per LF				$ 13.23
Total Signing/Striping Cost Per LF				**$ 57.33**

Summary of Average Cost Per Linear Foot	
Signing and Striping Items - Cost per Linear Foot	**$ 6.83**
Hardscape Items (Cost per Linear Foot)	**$ 57.33**

Proposed Short-Term Bicycle Lanes

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Mario Capecchi Dr.	a. Signing and Striping	1,950	LF	$ 7.14	$ 13,926
	b. Hardscape Improvements (Assume 70% is part of bigger project cost)	585	LF	$ 53.24	$ 31,142
					$ 45,068
Hempstead Rd.	a. Signing and Striping	1,080	LF	$ 7.14	$ 7,713
	b. No Hardscape Improvements Required	0	LF	$ 53.24	$ -
					$ 7,713
Fort Douglas Blvd.	a. Signing and Striping	880	LF	$ 7.14	$ 6,284
	b. No Hardscape Improvements Required	0	LF	$ 53.24	$ -
					$ 6,284
Wasatch Dr.	a. Signing and Striping	2,140	LF	$ 7.14	$ 15,282
	b. No Hardscape Improvements Required	0	LF	$ 53.24	$ -
					$ 15,282
Central Campus Dr.	a. Signing and Striping	1,250	LF	$ 7.14	$ 8,927
	b. No Hardscape Improvements Required	0	LF	$ 53.24	$ -
					$ 8,927

Proposed Medium-Term Bicycle Lanes

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Arapeen Dr.	a. Signing and Striping	2,935	LF	$ 7.14	$ 20,960
	b. Hardscape Improvements	2,935	LF	$ 53.24	$ 156,245
					$ 177,205
Chipeta Way	a. Signing and Striping	2,740	LF	$ 7.14	$ 19,567
	b. Hardscape Improvements	2,740	LF	$ 53.24	$ 145,864
					$ 165,431
Wakara Way	a. Signing and Striping	2,975	LF	$ 7.14	$ 21,245
	b. Hardscape Improvements	2,975	LF	$ 53.24	$ 158,374
					$ 179,620
South Campus Dr. (Option 1: Re-Construct)	a. Signing and Striping	2,940	LF	$ 7.14	$ 20,996
	b. Hardscape Improvements	2,975	LF	$ 53.24	$ 158,374
					$ 179,370
South Campus Dr. (Option 2: Re-Stripe Only)	a. Signing and Striping	2,940	LF	$ 7.14	$ 20,996
	b. Hardscape Improvements	0	LF	$ 53.24	$ -
					$ 20,996
Guardsman Way (Option 1: Re-Construct)	a. Signing and Striping	450	LF	$ 7.14	$ 3,214
	b. Hardscape Improvements	450	LF	$ 53.24	$ 23,956
					$ 27,169
Guardsman Way (Option 2: Re-Stripe Only)	a. Signing and Striping	450	LF	$ 7.14	$ 3,214
	b. Hardscape Improvements	0	LF	$ 53.24	$ -
					$ 3,214

Proposed Long-Term Bicycle Lanes

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Mario Capeccihi Dr (Option 1: Re-Construct)	a. Signing and Striping	4,350	LF	$ 7.14	$ 31,065
	b. Hardscape Improvements	2,935	LF	$ 53.24	$ 156,245
					$ 187,310
Mario Capeccihi Dr (Option 2: Re-Stripe Only)	a. Signing and Striping	4,350	LF	$ 7.14	$ 31,065
	b. Hardscape Improvements	0	LF	$ 53.24	$ -
					$ 31,065
100 South	a. Signing and Striping	1,400	LF	$ 7.14	$ 9,998
	b. Hardscape Improvements	0	LF	$ 53.24	$ -
					$ 9,998
North Campus Drive	a. Signing and Striping	4,370	LF	$ 7.14	$ 31,208
	b. Hardscape Improvements	4,370	LF	$ 53.24	$ 232,637
					$ 263,845

Cost Breakdown for a Bicycle Lane

Signing/Striping Linear Items	Quantity	Unit	Unit Price	Item Cost
1. Linear Striping				
a. Traffic side white strip (6" solid) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.30	$ 0.30
b. Right side white strip (4" solid) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.20	$ 0.20
Total $/ft				**$ 0.50**
2. Message Striping				
a. Message Striping - **Bicycle** (one for each direction) Thermo Plastic	2	EA	$ 175.00	$ 350.00
b. Message Striping - **Direction Arrow** (one for each direction) Thermo Plastic	2	EA	$ 200.00	$ 400.00
Lump Sum Total per Placement				**$ 750.00**
Average Cost per Linear Foot (Assuming Placement Is Every 300')				**$ 2.50**
3. Confirmation Signs				
a. "BIKE LANE" Sign. Assume one on each side of the street (R3-17)	2	EA	$ 50.00	$ 100.00
b. Sign Posts (one for each side)	2	EA	$ 150.00	$ 300.00
c. Sign Post Bases (one for each post)	2	EA	$ 150.00	$ 300.00
Lump Sum Total per Placement				**$ 700.00**
Average Cost per Linear Foot (Assuming Placement Is Every 300')				**$ 2.33**
Sub-Total Signing/Striping Cost Per LF				$ 5.33
Mobilization (3%) Per LF				$ 0.16
Contingency (30%) Per LF				$ 1.65
Total Signing/Striping Cost Per LF				**$ 7.14**

Hardscape Items for Lanes that Require Expansion of Roadway (Expansion is As:	Quantity	Unit	Unit Price	Item Cost
4. Grubbing Cost Per Linear Feet				
a. Assuming $0.20 per square feet, and a 10' wide.	1	LF	$ 2.00	$ 2.00
Total				**$ 2.00**
5. Demo Inside Curb (No Gutter is on the inside curb)				
a. Remove and Dispose of Curb and Gutter	1	LF	$ 5.00	$ 5.00
Total				**$ 5.00**
6. Asphalt Pavement				
a. Assume 5' Wide, 3" Thick, over 4" High Quality Road Base	1	LF	$ 20.00	$ 20.00
Total				**$ 20.00**
7. Re-Pour Curb				
a. Assume curb with new road base	1	LF	$ 12.00	$ 12.00
Total				**$ 12.00**
Sub-Total Signing/Striping Cost Per LF				$ 39.00
Mobilization (5%) Per LF				$ 1.95
Contingency (30%) Per LF				$ 12.29
Total Signing/Striping Cost Per LF				**$ 53.24**

Summary of Average Cost Per Linear Foot	
Signing and Striping Items - Cost per Linear Foot	**$ 7.14**
Hardscape Items (Cost per Linear Foot)	**$ 53.24**

Recommended Short-Term Shared Lanes

Segment	Improvement Item	Quantity	Unit	Unit Price		Item Cost	
Wakara Way	a. Signing and Striping	1,400	LF	$	4.91	$	6,874
Chipeta Way/Connor Rd.	a. Signing and Striping	1,580	LF	$	4.91	$	7,757
Pollock Rd..	a. Signing and Striping	1,570	LF	$	4.91	$	7,708
Army Rd.	a. Signing and Striping	1,415	LF	$	4.91	$	6,947
Officers Circle	a. Signing and Striping	1,300	LF	$	4.91	$	6,383
Stover St. #1	a. Signing and Striping	220	LF	$	4.91	$	1,080
Stover St. #2	a. Signing and Striping	145	LF	$	4.91	$	712
2000 East #1	a. Signing and Striping	415	LF	$	4.91	$	2,038
2000 East #2	a. Signing and Striping	530	LF	$	4.91	$	2,602
Red Butte Canyon Rd.	a. Signing and Striping	1,220	LF	$	4.91	$	5,990
Fort Douglas Blvd.	a. Signing and Striping	1,715	LF	$	4.91	$	8,420
Northeast Parking Lot	a. Signing and Striping	3,920	LF	$	4.91	$	19,246
2030 East	a. Signing and Striping	2,175	LF	$	4.91	$	10,679
VA Western Route	a. Signing and Striping	2,100	LF	$	4.91	$	10,310
VA Central	a. Signing and Striping	2,960	LF	$	4.91	$	14,533
VA Eastern Route	a. Signing and Striping	1,200	LF	$	4.91	$	5,892
South Campus Drive	a. Signing and Striping	2,940	LF	$	4.91	$	14,434
Guardsman Way	a. Signing and Striping	450	LF	$	4.91	$	2,209
Institute Loop	a. Signing and Striping	2,060	LF	$	4.91	$	10,114
Business Loop	a. Signing and Striping	2,270	LF	$	4.91	$	11,145

1500 East	a. Signing and Striping	1,280	LF	$	4.91	$	6,284
Central Campus Dr.	a. Signing and Striping	2,100	LF	$	4.91	$	10,310
Wolcott Extension	a. Signing and Striping	915	LF	$	4.91	$	4,492
President's Circle	a. Signing and Striping	1,725	LF	$	4.91	$	8,469
Exploration Way	a. Signing and Striping	800	LF	$	4.91	$	3,928
Federal Way	a. Signing and Striping	1,000	LF	$	4.91	$	4,910
Fieldhouse/ Library Connector	a. Signing and Striping	525	LF	$	4.91	$	2,578
South Temple	a. Signing and Striping	960	LF	$	4.91	$	4,713
Research Rd	a. Signing and Striping	775	LF	$	4.91	$	3,805

Cost Breakdown for a Shared Lane

Signing/Striping Linear Items	Quantity	Unit	Unit Price	Item Cost
1. Message Striping				
a. Message Striping - **Bicycle Shared Lane Marking** (one for each directio	2	EA	$ 275.00	$ 550.00
Lump Sum Total per Placement				**$ 550.00**
Average Cost per Linear Foot (Assuming Placement Is Every 150')				**$ 3.67**
Sub-Total Signing/Striping Cost Per LF				$ 3.67
Mobilization (3%) Per LF				$ 0.11
Contingency (30%) Per LF				$ 1.13
Total Signing/Striping Cost Per LF				**$ 4.91**

Summary of Average Cost Per Linear Foot	
Signing and Striping Items - Cost per Linear Foot	**$ 4.91**
Hardscape Items (Cost per Linear Foot)	**None**

Proposed Short-Term Bicycle Lane/Shared Lane Combinations

Segment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Medical Dr.	a. Signing and Striping	2,090	LF	$ 7.25	$ 15,159
Medical School Access	a. Signing and Striping	740	LF	$ 7.25	$ 5,367
Wasatch Dr.	a. Signing and Striping	415	LF	$ 7.25	$ 3,010

Cost Breakdown for a Bike Lane/Shared Lane Combination

Signing/Striping Linear Items	Quantity	Unit	Unit Price	Item Cost
1. Linear Striping				
a. Bicycle Lane, traffic side white strip (6" solid) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.30	$ 0.30
b. Bicycle Lane, right side white strip (4" solid) throughout the entire length ($/ft for Thermo Plastic striping)	1	LF	$ 0.20	$ 0.20
Total $/ft				**$ 0.50**
2. Bicycle Lane Message Striping				
a. Message Striping - **Bicycle** (one for each placement) Thermo Plastic	1	EA	$ 175.00	$ 175.00
b. Message Striping - **Direction Arrow** (one for each placement) Thermo Plastic	1	EA	$ 200.00	$ 200.00
Lump Sum Total per Placement				**$ 375.00**
Average Cost per Linear Foot (Assuming Placement Is Every 300')				**$ 1.25**
3. Shared Lane Message Striping				
a. Message Striping - **Bicycle** (one for each placement) Thermo Plastic	1	EA	$ 175.00	$ 175.00
b. Message Striping - **Direction Arrow** (one for each placement) Thermo Plastic	1	EA	$ 200.00	$ 200.00
Lump Sum Total per Placement				**$ 375.00**
Average Cost per Linear Foot (Assuming Placement Is Every 150')				**$ 2.50**
4. Confirmation Signs (Bicycle Lane Side)				
a. "BIKE LANE" Sign. Assume one at each placement (R3-17)	1	EA	$ 50.00	$ 50.00
b. Sign Posts (one for each sign)	1	EA	$ 150.00	$ 150.00
c. Sign Post Bases (one for each post)	1	EA	$ 150.00	$ 150.00
Lump Sum Total per Placement				**$ 350.00**
Average Cost per Linear Foot (Assuming Placement Is Every 300')				**$ 1.17**
Sub-Total Signing/Striping Cost Per LF				$ 5.42
Mobilization (3%) Per LF				$ 0.16
Contingency (30%) Per LF				$ 1.67
Total Signing/Striping Cost Per LF				**$ 7.25**

Summary of Average Cost Per Linear Foot	
Signing and Striping Items - Cost per Linear Foot (Linear Items + Crossing Items)	**$ 7.25**
Hardscape Items (Cost per Linear Foot)	**None**

Proposed Short-Term Spot Treatments

Treatment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Foothill Share-Use Path Crossing modifications	a. Lump Sum Estimate	1	LS	$10,000	**$ 10,000**
Intersection modification (Foothill/Wakara Way)	a. Lump Sum Estimate	1	LS	$50,000	**$ 50,000**
Intersection Modifications (Foothill Dr. Mario Capecchi Dr.)	a. Lump Sum Estimate	1	LS	$50,000	**$ 50,000**
Intersection Modifications (North Campus Dr./Penrose/Wasatch)	a. Lump Sum Estimate	1	LS	unknown	unknown
Intersection Modifications (North Campus Dr.\Federal Heights Dr.))	a. Lump Sum Estimate	1	LS	$150,000	**$ 150,000**
Stop Bar Relocation (South campus Dr./LDS Institute Loop Rd)	a. Green Stop Box	600	SF	$2	**$ 1,200**
Stop Bar Relocation (South campus Dr./LDS Institute Loop Rd - South Bound Approach)	a. Green Stop Box	600	SF	$2	**$ 1,200**

Proposed Medium-Term Spot Treatments

Treatment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Red-Butte Path Crossing	a. Lump Sum Estimate	1	LS	unknown	unknown
Legacy Bridge Ramp	a. Lump Sum Estimate	1	LS	unknown	unknown
North Campus Crossing Modifications	a. Lump Sum Estimate	1	LS	unknown	unknown

Proposed Long-Term Spot Treatments

Treatment	Improvement Item	Quantity	Unit	Unit Price	Item Cost
Wakara Way Grade Separation	a. Lump Sum Estimate	1	LS	unknown	unknown
Red Butte Path Crossing	a. Lump Sum Estimate	1	LS	unknown	unknown
Mario Capecchi Crossing	a. Lump Sum Estimate	1	LS	unknown	unknown

Some items are unknown to to strong differences in design, construction, materials that could be implemented.

Table E.1: Summary of Public Comments

Red indicates negative comment

Green indicates positive comment

Total	Comment Cards	Email	Topic
62	<-- total in category		Accessibility
7	6	1	Stairs
15	7	8	Integration with City Bike Lanes
16	11	5	Paths on Campus (Clearly Identified)
11	11		Paths on Campus
13	6	7	Connections Across Campus
1	1		HPER Mall Railings
8	3	5	Wayfinding Signs
1	1		Wayfinding Signs
2		2	Lack of bike lanes on major campus roads
3	<-- total in category		Culture
3	3		Courtesy
1	1		Biking Community
1		1	Biking Community
32	<-- total in category		Safety
13	9	4	Conflicts with Pedestrians
12	8	4	Safe Routes to Campus
1	1		Lighting
1	1		Lighting
2	2		No vehicles on pathways
1	1		Flashing Crosswalk Signs
3	2	1	Too much traffic
1		1	Separate High speed/low speed riders
1		1	Hard corners on path
1		1	Vehicles/Obstructions on Bike paths
18	<-- total in category		Convenience
1	1		Shower Facilities
1	1		Weather
6	4	2	Room on transit
1	1		Elevation
4	1	3	Lack of Racks
12	12		Lots of Racks
2	2		Shower Facilities
2	2		Repair Facilities
5	2	3	Covered Bike parking
1	1		Bikes allowed on Transit
2	2		Close to Residences
12	<-- total in category		Security
12	10	2	Secured Bike Parking
0	5		Secured Bike Parking

Table E.2: Summary of Public Comments by Theme

# of Respondents		Themes Within Category
62		Accessibility
	15	Issues with Stairs
	16	Issues with Lack of Bike Paths
	11	Thought Bike-able Paths were plentiful
	15	Integration with City Bike Lanes
	13	Issues with Good Connections Across Campus
		From Lower Campus to Upper Campus
		From Central to Hospital, Research Park
	8	Issues with Lack of Wayfinding Signs
		To identify where bike paths are/go, trouble areas
32		Safety
	13	Conflicts with Pedestrians
	12	Safe Routes to Campus
		Issues with Traffic, Intersection Design, Presence of Routes
		Foothill Dr, 1300 East, 400 South
18		Convenience
	6	Need More Room on Transit
		Buses, TRAX, and even Shuttle Busses
	12	Happy with Amount of Bike Racks Present
	4	Issues with Lack of Racks
		South OSH, Stadium, JFB, North Union
	5	Issues with Lack of Covered Racks
12		Security
	12	Want more Secured Parking
		Allowed to bring bikes into offices, or lockers
	5	Satisfied with Lockers here

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