PUBLIC DRAFT

Salt Lake City
PEDESTRIAN & BICYCLE
Master Plan

Prepared for Salt Lake City
by Alta Planning + Design
November 2014

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Vision

Walking and bicycling in Salt Lake City will be safe, convenient, comfortable, and viable transportation options that connect people to places, foster recreational and economic development opportunities, improve personal health and the environment, and elevate quality of life.

Goals

INTEGRATION

Integrate walking and bicycling into community planning to enhance livability, health, transportation, the environment, and economic development.

NETWORK

Develop a safe, comfortable, and attractive walking and bicycling network that connects people of all ages, abilities, and neighborhoods to the places they want to go.

MAINTENANCE

Maintain the walking and bicycling system year-round.

PROGRAMS

Promote the safety and attractiveness of walking and bicycling through education, encouragement, and enforcement programs.

TRANSIT CONNECTIONS

Integrate pedestrian and bicycle facilities with transit routes, stations, and stops.

Complete Streets

Streets are an integral part of everyday life and public space. The term "Complete Streets" refers to designing streets for people of all ages and abilities who walk, bicycle, use transit, and drive. Salt Lake City's Complete Streets ordinance seeks to balance the competing needs of different transportation modes within the unique contexts of each roadway. The walking and bicycling recommendations presented in this plan are consistent with and support Complete Street principles.

Why Invest in Walking & Bicycling

Access for All

Walking and bicycling are affordable transportation options available to everyone. This master plan emphasizes facilities that can be used by all City residents, not just those who are extremely fit and confident riding bicycles in traffic.

Personal Health

Lack of physical activity is associated with increased risk of many health problems. Many people do not have convenient access to places where they can by physically active. Walking and bicycling help people meet recommended physical activity levels, thereby reducing chronic disease and associated health care costs.

Economic Health

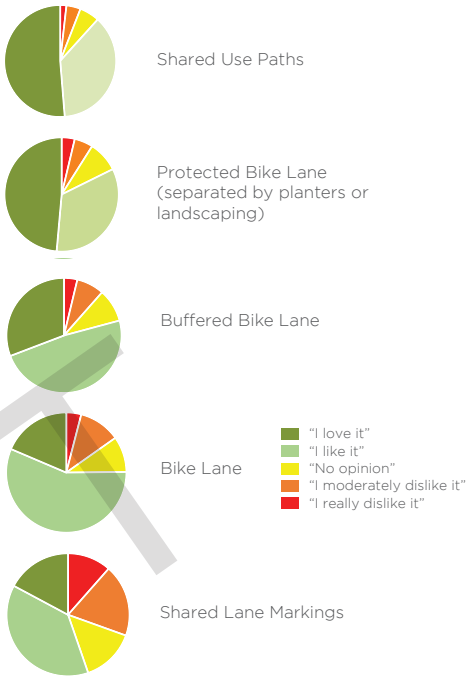
Business and employee relocation decisions are increasingly being made based on quality of life considerations such as access to quality walking and bicycling facilities. Active transportation infrastructure also generates tourism revenue, supports local business, and creates jobs.

Air Quality

Combustion engines and industry combine with geographic constraints to create air quality concerns in the Salt Lake Valley. Walking and bicycling can play an important part in a comprehensive strategy to improve air quality.

Outreach

- Ongoing direction from focus group, stakeholder committee, and steering committee.
- Direct input from 1,000-2,000 residents through the following venues:
  - 2 public open houses
  - Online survey with nearly 1,000 responses
  - Nearly 30 other community events such as farmers markets and community festivals



Results of the online survey show clear community preference for low-stress bikeways that have more separation from traffic

Walking

Salt Lake City already has a robust system of sidewalks and pathways. Each year more enhanced crosswalks, signs, and signals are installed to make road crossings safer and more comfortable for pedestrians. The City will continue to use its crossing prioritization process to install mid-block signals and crosswalks, as well as build other pedestrian-friendly amenities such bulb-outs, refuge islands, and pavement markings.



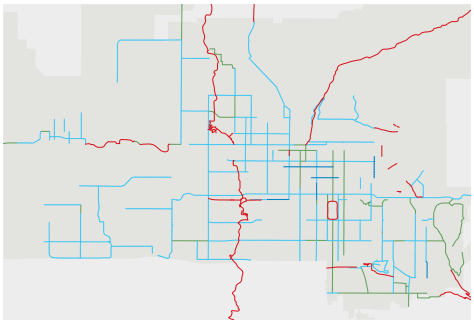


Typologies for a few specific situations applicable to the City were developed to show how the City could improve walking conditions in those situations

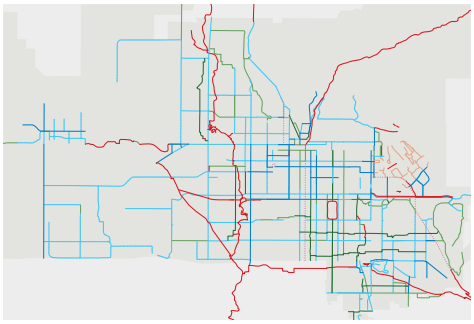
Bicycling

Citywide Bikeway Network

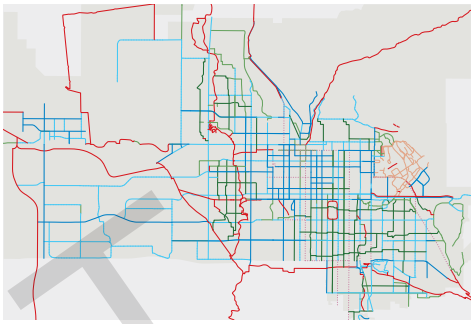
The maps and graphic below show how Salt Lake City's bikeway system will grow over time as the plan recommendations are implemented.



EXISTING BIKEWAYS

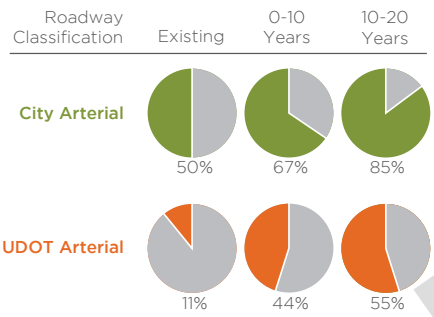


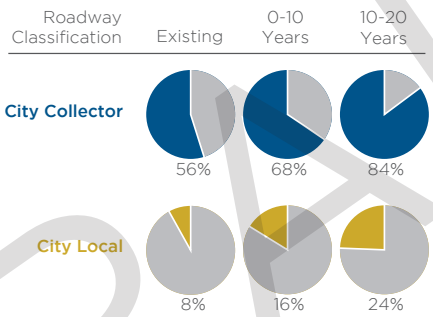
2025 BIKEWAYS



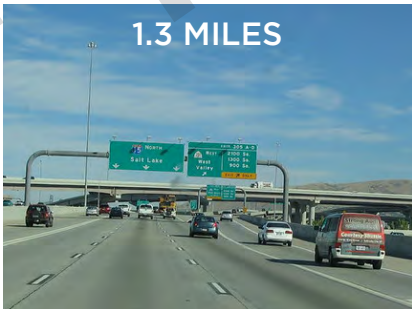
2035 BIKEWAYS

OR





Percentage of road miles with bikeways



The entire 220-mile recommended bikeway network could be built for the same amount of money as widening 1.3 miles of freeway

Low-Stress Bikeway Network

Low-stress facilities such as multi-use paths, protected and buffered bike lanes, and neighborhood bicycle boulevards appeal to people who want more separation from traffic. Surveys show that 50-60% of people say they would like to bike more but are deterred by conventional bikeways. Development of a low-stress bikeway network is a key component of this master plan.

Multi-use path connecting 900 S to the 9-Line near 900 W

Protected bike lane on 300 S

Multi-use path in Liberty Park

Programs

The programs recommended in this plan typically have an education, encouragement, or enforcement focus.

Multi-Modal Programs

The plan contains recommendations for multi-modal programs that benefit multiple user groups. Some are targeted at pedestrians and bicyclists only, while others include other groups such as transit riders and drivers. Programs include efforts such as driver education, median campaigns, law enforcement, Smart Trips, and Open Streets events.

Pedestrian-Specific Programs

Examples of recommended pedestrian programs include Safe Routes to School, crosswalk enforcement, and mid-block walkway programming. These programs are geared toward encouraging people to walk and making their experience more safe and comfortable.

Bicycling-Specific Programs

Bicycling programs include user counts, training, bicycle-friendly business efforts, route mapping, social rides, and recreational route designation among others. They are geared toward encouraging people to bicycle more, particularly user groups who are less likely to ride now.

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CHAPTER ONE

WALKING & BICYCLING BACKGROUND

Americans increasingly demand walkable, bikeable cities, and Salt Lake City residents are no different. Providing quality, walkable places and transportation options is key to the City's ability to attract and retain people, businesses, and the convention and tourism economies.

Salt Lake City's previous Pedestrian and Bicycle Master Plan was adopted in 2004. While this document served the City well, much has changed in the past decade in the realm of active transportation. Innovative facilities the City now constructs were not even invented a decade ago. While the sidewalk network is fairly complete, pedestrian facility innovations include crossing treatments especially appropriate for wide streets.

Historically, Salt Lake City's bicycle facilities have primarily served people comfortable riding in or near traffic, a group which comprises less than 10% of the population. This master plan leads Salt Lake City boldly into a new era where people of all ages and abilities can comfortably travel on foot or by bike. The plan outlines goals and objectives, proposes a 20-year build-out of bicycle facilities, and recommends changes to City processes and non-infrastructure programs.

Walking and bicycling investments benefit everyone. More people traveling on foot and by bicycle will boost our community's health, improve our air, invigorate local businesses, and incentivize employers to locate here. This chapter provides historical context for active transportation in the City, outlines important demographic trends, and discusses how this master plan interfaces with other City efforts.

Main subsections include:

- History of Active Transportation in the City
- National Trends
- Local Trends
- Relationship to City Plans

1.1 History of Active Transportation in Salt Lake City

From the pioneers who founded it to those who continue its legacy, Salt Lake City has a long and rich history when it comes to active transportation. Active transportation refers to walking, bicycling, and other people-powered transportation devices.

The City was founded 50 years prior to cars arriving on the scene, when walking was the dominant transportation option. Pedestrians shared the streets with horse-drawn carriages and streetcars. In later years sidewalks were created for people to safely walk around the City when cars began to dominate the interior street space.

The bicycle in particular has been a popular device for both transportation and recreation in our community ever since it was first introduced to the American public in the late 1800s.

By the 1890s, much like today, the increasing presence of bicycles in the City brought conflict that required action as well as a cultural shift in how residents went about their daily lives. A number of significant historical events and facts provide context for this current Pedestrian and Bicycle Master Plan.

More than 100 years after bicycles first appeared on the Salt Lake City scene, our community still seeks to promote safer interaction between pedestrians, motorists, and a growing number of cyclists on streets and sidewalks. The recent and pending installation of protected bike lanes on 300 South and 200 West are just the latest steps in this effort. This Pedestrian and Bicycle Master Plan builds upon the many challenges and successes of Salt Lake City's past to work toward a more balanced and sustainable transportation future.

Renowned cyclist Marshal "Major" Taylor at the Salt Palace race track, 1920 (Photo: Shipler Collection, Utah State Historical Society)

1890–1900

» Bicycle **ownership** in the City, previously only afforded by people of substantial means, **becomes more widespread.**

» Bicycles allow lower, middle, and working class families to **live further away from work** in more affordable areas of town.

» **Bike shops** in the City **double from four to eight**.

» Exclusive **clubs such as the Social Wheel Club begin to form** around cycling as a summer pastime.

» Lagoon Amusement Park begins sponsoring an **annual Memorial Day Race** from Salt Lake City to Farmington.

Early bike shop in Salt Lake City (Photo: Shipler Collection, Utah State Historial Society)

» Growing numbers of **bicyclists take to sidewalks** to avoid muddy streets during inclement weather.

» Pedestrian and bicycle collisions necessitate **ordinances regulating cycling**.

» **City Council passes legislation** to make it illegal to ride a bicycle on many downtown sidewalks between the months of May and October or face a fine up to $25 (more than $650 today).

» Citizen group proposes reserving one side of downtown streets and sidewalks exclusively for cyclists while **another group proposes that bicycles be licensed and taxed** $1 per year to help pay to pave bike paths and make it easier to for pedestrians to identify scofflaws. Both proposals are rejected.

» Bicyclists claim that they are **treated as second-class citizens**, blaming novice riders and careless young people for accidents and riding too fast.

» Bicyclists lead the **movement to pave Salt Lake City roads**.

» **Streetcar lobby convinces State legislature to limit road paving** to a maximum of three miles per year per municipality out of fear of ridership losses resulting from more bicycle use.

1900–1910

» **Half of Salt Lake City's 50,000 residents own bicycles** and nearly every family in the City owns at least one bicycle.

» Amount of sponsorship money made available by Salt Lake City businesses for professional racers makes the City **one of the most important destinations for track cycling in the country.**

» Salt Lake City boasts **three outdoor race tracks** located at the Salt Palace, Saltair, and Calder's Park (now Nibley Park).

» Salt Lake City is **recognized internationally as a notable destination** for both professional cyclists and newcomers seeking improved health through increased physical activity.

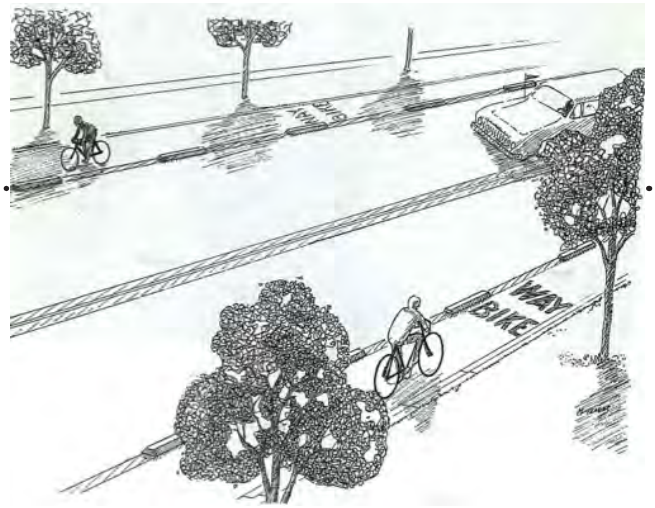
The Salt Lake YMCA Bike Club at 100 South/State Street, 1906 (Photo: Shipler Collection, Utah State Historical Society)

» Both Democratic and Republican mayoral **candidates vow to pave five-foot-wide bicycle paths** on several downtown streets including South Temple, Main Street, 200 South, 400 South, 800 South, and West Temple.

» **City Council revises ordinance** limiting bicycle speed limit to 4 mph on sidewalks (where still permitted), 8 mph in bike lanes, and 10 mph on City streets. Bicyclists must keep at least one hand on their handlebars and both feet on the pedals at all times. Violators face fines up to $100 (more than $2,500 today) and/or 100 days in jail.

1970s

» **Protected bike lanes** are proposed by regional and City planners for Foothill Drive, Redwood Road, Beck Street, and 1700 South.



Curb-separated protected bike lanes were proposed on streets in Salt Lake City in the 1970s

1990s

» In the early 1990s, the Mayor's Bicycle Advisory Committee (MBAC) creates a **bicycle plan for the City.**

2004

» The City's first professionally-created **Bicycle & Pedestrian Master Plan is adopted.**

1.2 National Trends

Pedestrian and bicycle planning in the U.S. is a rapidly evolving field. The following sections describe national trends relating to bicycling and walking. Understanding these trends and the underlying reasons behind them helps to inform decisions here in Salt Lake City.

1.2.1 Demographic Shifts

The United States has experienced demographic shifts in recent decades. These shifts directly and indirectly impact transportation patterns. For instance, between 2010 and 2020 "Baby Boomers" will make more than 200 million residential moves. They also will increase the size and reshape the demographic character of rural areas and small towns throughout the country. Studies also show that quality-of-life considerations have begun to replace employment-related factors in decisions about when to move and where to live.[1]

Recent studies have noted trends revealing that Millennials – those born between 1981 and 2001 – are a part of a generation of declining car ownership.[2] For example, people between the ages of 18 and 34 make up just 11% of today's auto market – down from 17% in 2007.[3] A number of factors contribute to the decline in car ownership among Millennials: economic recession, recent trends toward urban living, and the desire to stay connected to social media sites and other technologies that are not conducive to driving. The younger generation appears to place less value on vehicle ownership and suburban living due to a combination of high costs, improved travel options, and changing preferences for living and commuting.[4]

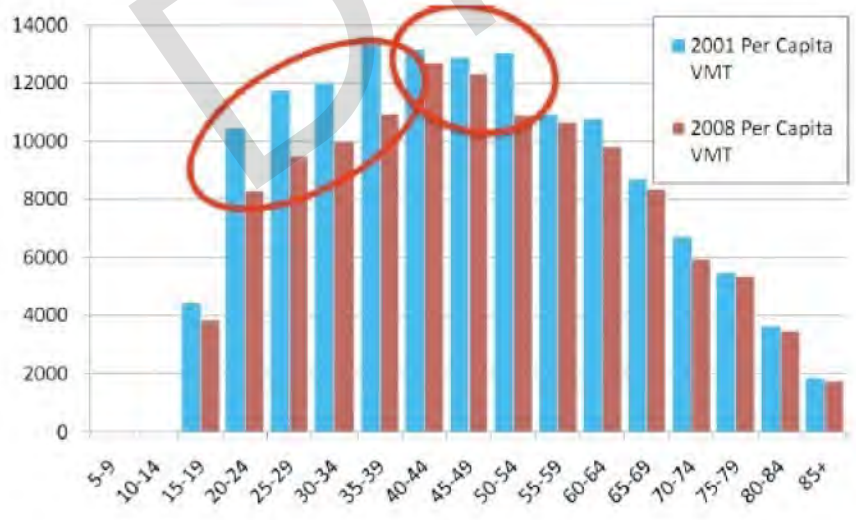
In 2011, Zipcar performed a travel preference survey that confirmed these trends, as illustrated in Figure 1-1.[5] Based on these trends and forecasted predictions, it is estimated that the size of the U.S. vehicle fleet and annual vehicle sales will continue to decline (Figure 1-2).[6]

1.2.2 Benefits of Walking & Bicycling

Bicycling and walking provide a wide range of benefits to individuals, their communities, and the surrounding environment.

1.2.2.1 Safety Benefits

Studies show that installing pedestrian and bicycle facilities directly improves safety by reducing



Annual motor vehicle travel is significantly lower for people born after 1978 than previous generations at the same age. This indicates intergenerational changes in consumer preferences and lifestyles. Although younger people are likely to increase their vehicle travel as they earn more and become parents, they are unlikely to drive as much as the Baby Boom generation.

Figure 1-1 Annual Vehicle Miles Traveled (VMT) by Age Group

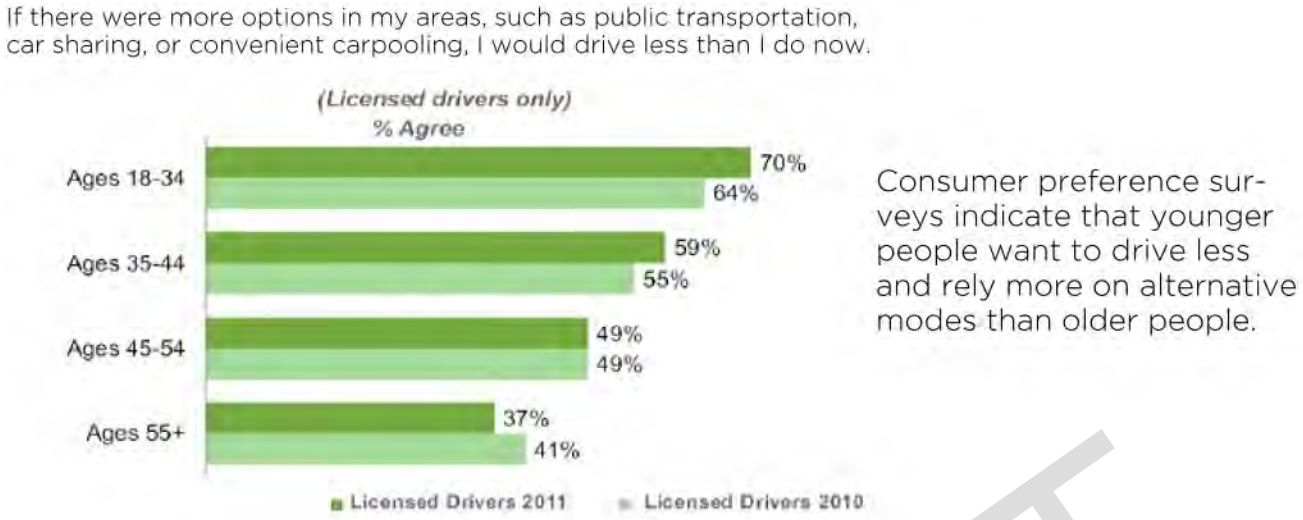


Figure 1-2 Average Annual Mileage by Age

the risk of pedestrian-automobile and bicycle-automobile crashes. For example, streets with bike lanes have been shown to be safer not just for bicyclists (compared with no bicycle facilities), but also for pedestrians and motorists.[7] Streets without bicycle facilities may pose a greater collision risk. When walking and bicycling rates double, per-mile pedestrian-motorist collision risk can decrease by as much as 34%.[8]

Improved walking and bicycling environments contribute to a safer transportation system in two important ways: by directly reducing collision risk and by increasing walking and bicycling rates. New York City saw a 73% decrease in the average risk of serious injury to bicyclists at the same time they experienced a 400% increase in ridership. Portland (OR) saw a similar dip in injury rates concurrent with an increased bicycling rate. Safe places to walk and bike are especially important for non-drivers who require safe, reliable, and convenient transportation options.

1.2.2.2 Health Benefits

Lack of physical activity is associated with increased risk of many health problems, particularly obesity, diabetes, and heart disease.[9] It is also the third-highest cause of preventable death in the U.S., behind only tobacco use and poor nutrition.[10] Today many cities and businesses are facing a crisis as they attempt to cope with the growing healthcare costs associated with preventable chronic diseases. A recent Institute of Medicine report states that the estimated annual cost of obesity-related illness is $190.2 billion (in 2005 dollars), or nearly 21% of annual medical spending in the United States.

The Centers for Disease Control and Prevention recommend at least 2.5 hours of moderate exercise each week, yet many people do not have convenient access to places where they can be physically active. Walking and bicycling are some of the most basic forms of physical activity. Improving facilities for these activities and linking

them to recreational and daily destinations would help better connect people with convenient exercise options.

Active transportation options such as walking and bicycling help people meet recommended physical activity levels, thereby reducing chronic disease and associated health care costs. About half of Utahns are overweight and do not exercise enough (see Figures 1-3 and 1-4).[11,12] According to the Salt Lake Valley Health Department, these statewide obesity and physical activity data match local data closely.[13]

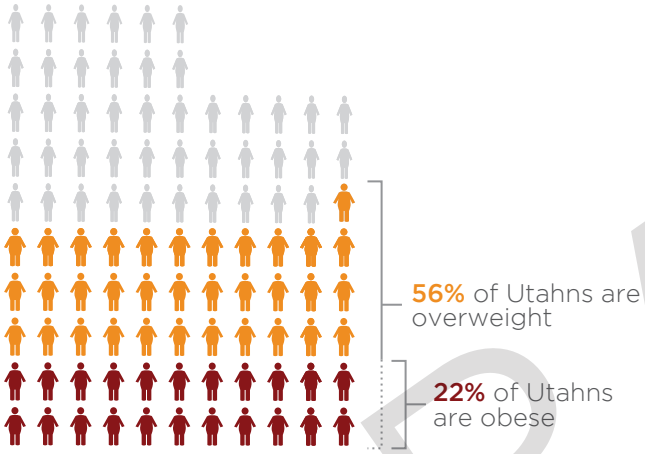


Figure 1-3 Overweight & Obese Population In Utah

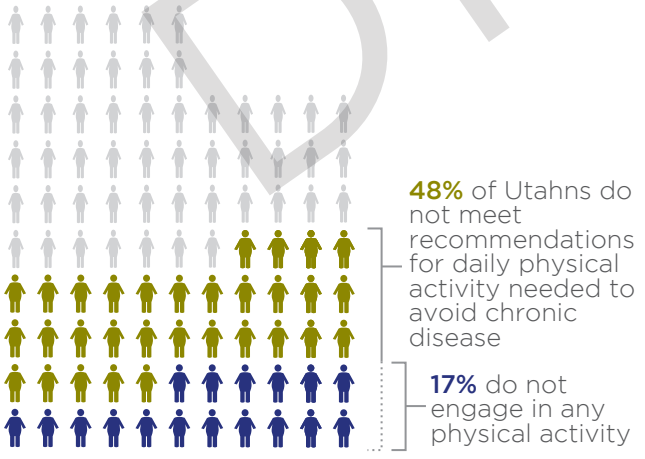


Figure 1-4 Utahns' Physical Activity Habits

Studies show that people walk more in safe, walkable, and aesthetically pleasing places. Improved facilities promote physical activity by making walking and bicycling more appealing, easier, and safer.[14] A Portland (OR) study on the benefits of bicycle projects found that by 2040 Portland's investment of $138-605 million in bicycling will have saved $388-594 million in health care costs and provided an additional $7-12 billion in the value of increased life span.[15]

Walking and biking also provide greater social interactions than some other forms of transportation. These interactions may be associated with mental health and social engagement benefits.

1.2.2.3 Economic Benefits

Walking and bicycling are affordable transportation options. Walking is virtually free and owning and operating a bicycle for one year costs approximately $121.[16] The average cost of owning and operating a vehicle for one year is $8,946.[17]

Cities that invest in active transportation are investing in people and their quality of life. Business decisions are increasingly being made based on quality of life amenities for employees and their families. Sidewalks, on-street bicycle facilities, multi-use paths, and transit service are important quality of life indicators. They demonstrate a commitment to healthy transportation options and lifestyles.

According to the National Association of Homebuilders, trails are consistently ranked as one of the most important community amenities by prospective homebuyers – above golf courses, parks, and security.[18] More than two-thirds of Americans say that having bike lanes or paths in their community is important to them, and two-thirds of homebuyers consider the walkability of an area in their purchase decision.[19] This preference for communities that accommodate

walking and bicycling is reflected in property values across the country.[20] Houses in walkable neighborhoods have property values $4,000 to $34,000 higher than houses in areas with average walkability.[21]

Active transportation infrastructure and programs generate tourism revenue, support local business, and create jobs.[22] In the North Carolina Outer Banks, an investment of $6.7 million in paths and wide paved shoulders has generated $68 million in annual tourism revenue from bicyclists.[23] After bike lanes were added to Valencia Street in San Francisco, two-thirds of merchants surveyed said that the lanes had a positive overall impact on their business.[24] New York City installed the first protected bike lanes in the U.S. on 8th and 9th Avenues in Manhattan in 1997 and by so doing brought more people to these streets. As a result, 9th Avenue had a 49% increase in retail sales at locally based businesses compared to a 3% increase across Manhattan as a whole.[25]

Employers are increasingly locating in vibrant urban centers with diverse transportation options in order to attract young workers and improve current employees' satisfaction. Active transportation investments heighten Salt Lake City's appeal to existing and potential employers.

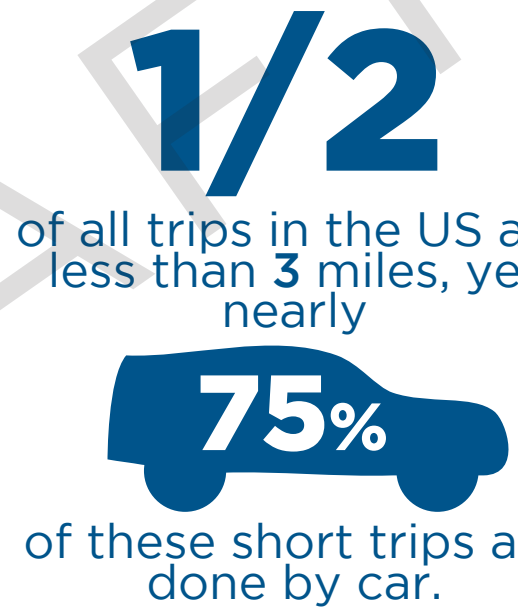
1.2.2.4 Transportation Efficiency

Short trips typically taken in cars[26] can more easily be made on foot or by bike if safe, comfortable, and convenient facilities are provided. By shifting 160 annual trips (about three per week) averaging 2.4 miles in length from driving to bicycling, an individual can reduce congestion costs to other road users by approximately $216 in urban areas and about $108 in rural settings.[27] Providing a variety of travel options also reduces dependency on foreign oil and promotes energy efficiency.

1.2.2.5 Climate Impacts

Over the past four decades, population has grown rapidly in the western U.S., an area sensitive to drought, air pollution, and heat waves.[28] Scientists project that warmer temperatures from climate change will increase the frequency of days with unhealthy levels of air pollution.[29]

As of 2003, 27% of U.S. greenhouse gas emissions were attributed to the transportation sector and personal vehicles accounted for 62% of all transportation emissions.[30] Replacing two miles of driving each day with walking or bicycling prevents 730 pounds of carbon dioxide from entering the atmosphere annually.[31] This reduction minimizes the transportation sector's air quality impacts, improves air quality, and decreases public health concerns such as asthma.



The majority of short trips are currently made by car

1.2.3 State of the Planning Practice for Walking & Bicycling

Though still a small fraction of total travel, the number of people bicycling for transportation has grown dramatically in major cities during the last 10 years. Cities with high walking and bicycling rates realize that conditions need to be safe, pleasant, and convenient for people of all ages and physical abilities in order to have broad appeal.

The League of American Bicyclists awards Bicycle Friendly Community (BFC) status to communities that have made significant strides toward becoming comfortable places to bicycle. Bicycle commuting rates in large BFCs increased by 80% between 2000 and 2010 and 47% across the U.S. as a whole (Figure 1-5).[32]

Research indicates the need for improved walking and bicycling facilities. A 2014 report from Smart Growth America ranks U.S. cities by pedestrian safety and examines the types of roads where fatalities are most likely to occur.[33] In a 2002 National Highway Transportation Safety Administration survey, 84% of respondents said that bicycling is "a great form of exercise" for them. More than two-thirds said they would like to ride more than they do now. However, less than 50% were satisfied with the current bicycle infrastructure in their community.

Salt Lake City continues to be at the forefront of walking and bicycling innovation, pioneering the use of green shared lanes, making efficient use of pavement management systems to affordably expand the bikeway network, and becoming well known for pedestrian crossing enhancements such as countdown timers, orange crossing flags, and "LOOK" pavement messages.

In 2007, the League of American Bicyclists rated Salt Lake City as a bronze "Bicycle-Friendly Community (BFC)". In the years that followed, the City hired a bicycle/pedestrian coordinator (followed by additional staff), increased active transportation expenditures, increased outreach and enforcement efforts by the Police Department, initiated an annual bicycle summit, instituted annual bicycle counts, and formalized a Complete Streets policy. These efforts were rewarded in 2010 with a silver BFC designation. The City is now focused on achieving gold status.

As a result of dissatisfaction with traditional designs, many cities developed new bicycle facility types and intersection treatments that respond to uniquely urban challenges. In 2009, the Cities for Cycling initiative was launched within the National Association of City Transportation Officials (NACTO). NACTO

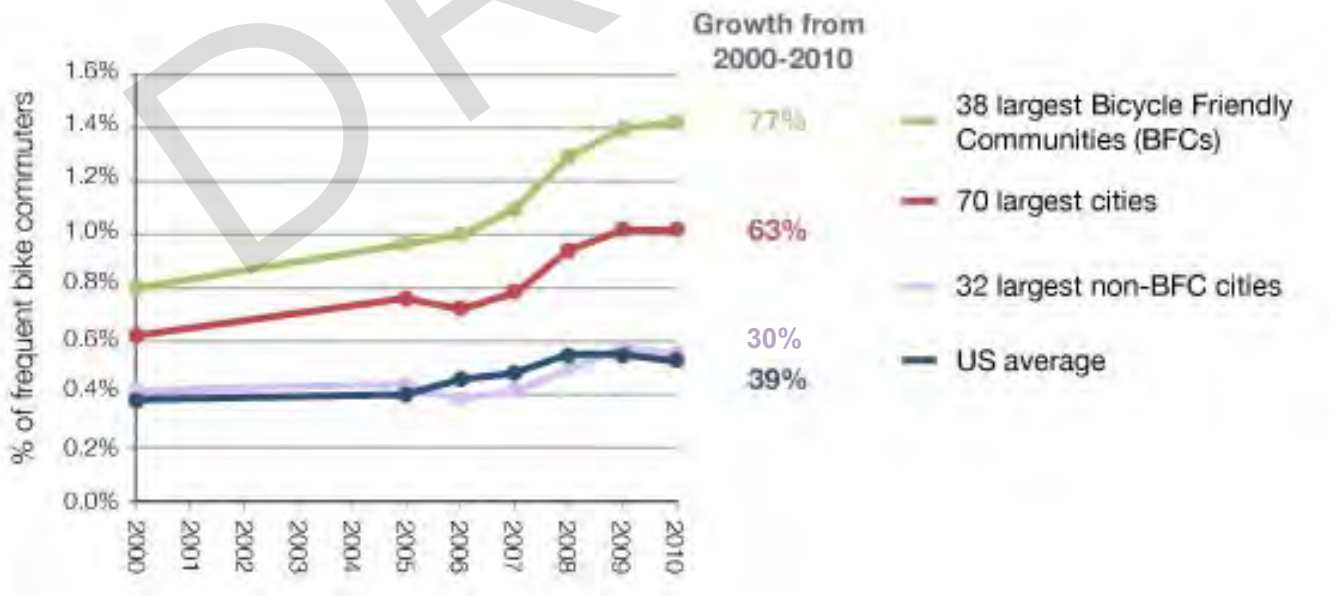


Figure 1-5 U.S. Bicycle Commuting Growth, 2000-2010 (Source: American Community Survey & League of American Bicyclists)

produced its own Urban Bikeway Design Guide in 2011 and has since published two updates. This new resource includes guidance for protected bike lanes, intersection treatments, signals, and neighborhood bicycle boulevards. Salt Lake City endorsed the NACTO Urban Bikeway Design Guide in 2010 and the NACTO Urban Street Design Guide in 2013.

1.2.3.1 Types of Bicyclists

Bicycle planning and engineering professionals historically classified bicycle users into three types – Advanced, Basic, or Child.[34] Another methodology was developed by planners in Portland (OR) and has since been corroborated by data from other U.S. cities. This classification, illustrated in Figure 1-6, provides the following four categories:[35]

- **Strong & Fearless**: People who will ride anywhere regardless of roadway conditions or weather. They ride faster than other user types and prefer direct routes even if they must share lane space with cars.
- **Enthused & Confident**: People who are comfortable riding all types of bikeways but usually choose lower-volume streets or multi-use paths when available. They may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists – commuters, recreationalists, racers, and utilitarian bicyclists.
- **Interested But Concerned**: People who typically only ride a bicycle on low traffic streets or multi-use paths under favorable weather conditions. They perceive significant barriers to bicycling more, specifically traffic and other safety concerns. This group may become "enthused and confident" with encouragement, education, and experience.
- **No Way, No How**: People who don't desire to bicycle. They may perceive severe safety issues with riding near traffic. Though some of them may eventually bicycle, a significant portion will not ride under any circumstances.

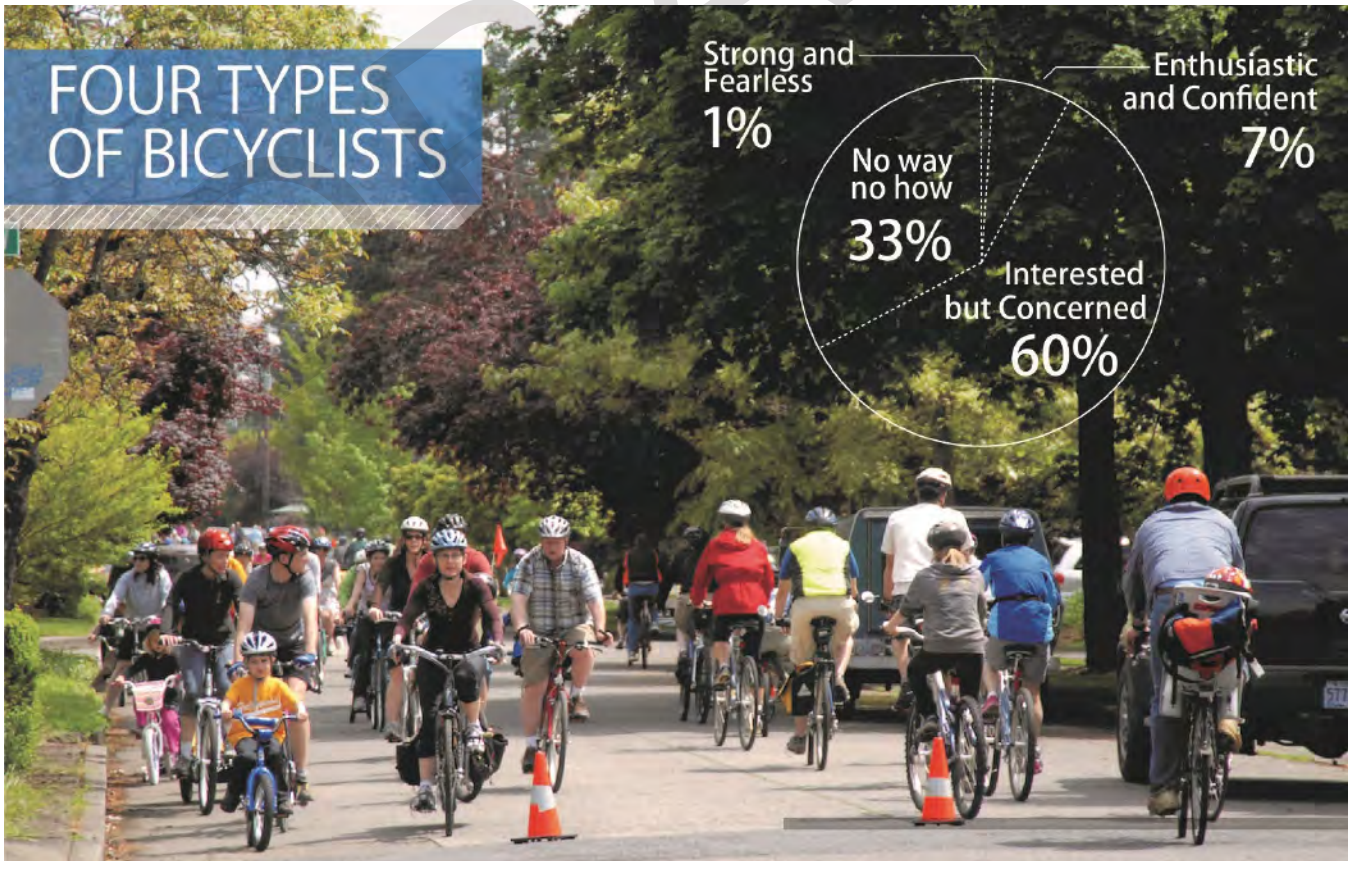


Figure 1-6 Types of Bicyclists

1.3 Local Trends

According to the 2012 American Community Survey (ACS), Salt Lake City has one of the highest bicycling and walking mode shares in Utah, surpassed only by the college cities of Logan and Provo. This is not surprising given the higher concentrations of college-age students in Logan and Provo that normally live very close to their daily destinations.

1.3.1 Utah Travel Survey

A coalition of regional transportation planning agencies jointly conducted a Utah-specific travel survey in 2012. Results shed light on walking and bicycling trends in Utah.

1.3.1.1 Walking Mode Share

On average, Salt Lake City residents take about three to four times more walking trips than bicycling trips (see Table 1-1).

Walking is more common in urban areas like Salt Lake City because destinations are closer together and more easily accessible by foot. Additionally, walking to lunch, meetings, or to other destinations may be more convenient than driving. This trend is apparent in the downtown Salt Lake City data represented in Table 1-2.

Table 1-1 Statewide Walking & Bicycling Mode Share

Region	All Trips		Commute Trips	
	Walk	Bike	Walk	Bike
Salt Lake City	**17.4%**	**4.8%**	**18.2%**	**4.3%**
Wasatch Front	7.8%	1.7%	3.1%	1.9%
Cache	7.7%	2.7%	3.8%	4.3%
Dixie	6.0%	1.3%	0.5%	2.4%
Utah Total	7.5%	1.8%	2.9%	2.0%

Source: Utah Travel Survey

Table 1-2 Downtown Walking & Bicycling Mode Share

Purpose	To Downtown SLC		In Downtown SLC	
	Walk	Bike	Walk	Bike
Commutes	30.5%	5.0%	53.6%	3.4%
All Trips	27.5%	5.8%	48.0%	5.5%

Source: Utah Travel Survey

1.3.1.2 Bicycling Mode Share

In Salt Lake City, 70.5% of households own at least one adult bicycle and 50% own two or more. In households with children, 31% own at least one child's bike. Salt Lake City far surpasses all other communities in the State when it comes to bicycle mode share, except for commute trips where it is tied with the Cache Valley area.

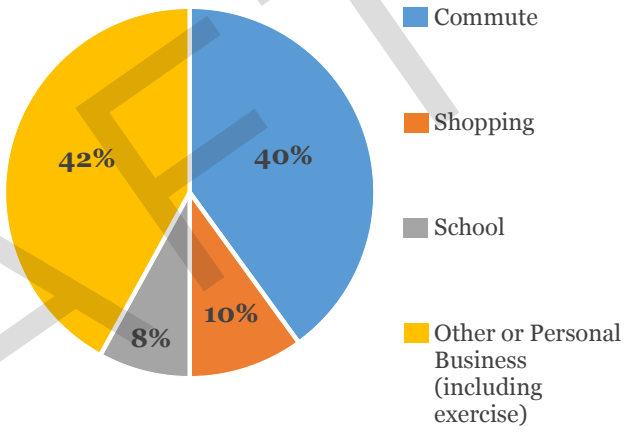


Figure 1-7 Bike Trip Purposes in Salt Lake City (Utah Travel Survey)

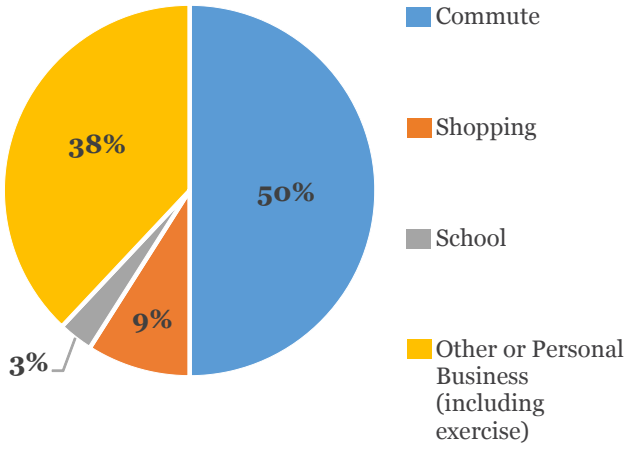


Figure 1-8 Walk Trip Purposes in Salt Lake City (Utah Travel Survey)

1.3.1.3 Trends

Salt Lake City residents enjoy walking and bicycling for many of the same reasons. Figures 1-7 and 1-8 show the relative breakdown of trip purposes for walking and bicycling, respectively. Other commonly cited benefits of walking and bicycling are enjoyment of the outdoors, saving money, and improving the environment.[36]

1.3.2 Bicycle Infrastructure Focus

Salt Lake City's on-street bikeway efforts going back to the 1970s have primarily focused on conventional painted bike lanes complemented by multi-use paths such as the Jordan River Parkway. More recently, the City's focus has shifted to "lower stress" bikeways both on-road and off-road that accommodate a wider range of people, abilities, and experience. Low stress facilities are discussed further in Chapter 6.

1.3.3 Air Quality

Urban air quality is a national concern, with many cities across the country falling short of Clean Air Act standards. In the Salt Lake Valley, industry, automobiles, trucks, fires, and various other small air pollution sources combine with geographic constraints to create air quality and health concerns for residents. Air quality concerns are most acute during winter months but may also occur at other times of year.

Air quality issues are often raised by businesses and individuals looking to relocate to or stay in Salt Lake City. The City hosts many conventions such as Outdoor Retailers and air quality issues have been raised by organizers when considering alternate venues.

Salt Lake City's investments in walking and bicycling help to mitigate transportation impacts to air quality. While active transportation cannot solve all air quality issues, it can be one of the vital components within a comprehensive strategy, particularly combined with transit.

1.3.4 Pedestrian Counts

Pedestrian counts were conducted at six downtown mid-block walkways in June 2012 as part of a study conducted by the City. Four counts were conducted at each site – three on weekdays from 8-9 am, noon- 1 p.m., and 5-6 p.m., and one on Saturday from noon-1 p.m.

1.3.4.1 Count Locations

Each of the six count sites shown in Figure 1-9 is a mid-block walkway. Prior to the counts, use of these walkways was unknown, as was the extent to which quality of the pedestrian environment impacts use.

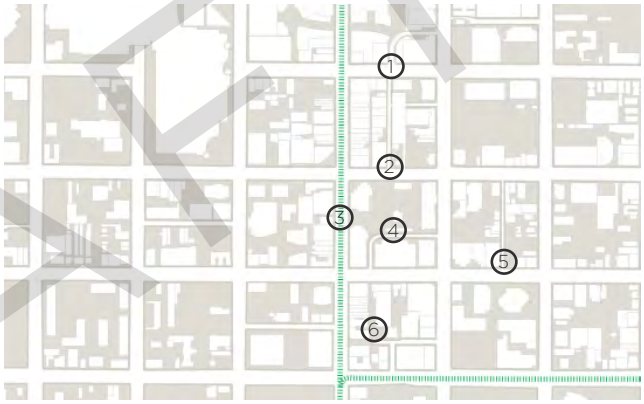


Figure 1-9 Pedestrian Count & Survey Locations
1. Regent Street/100 South
2. Regent Street/200 South
3. Alleyway at 222 South Main Street
4. Gallivan Avenue
5. Edison Street/300 South
6. East Exchange Place

On average, foot traffic ranged from 46 people per hour at the Edison Street/300 South location to 265 people per hour at the Regent Street/100 South location near City Creek. Figure 1-10 shows the full results of the weekday counts.

The Regent Street/100 South walkway offers more pedestrian-friendly elements than the other five locations, which coincides with its high use. Many of the lesser-used walkways like Gallivan Avenue, East Exchange Place, and Edison Street

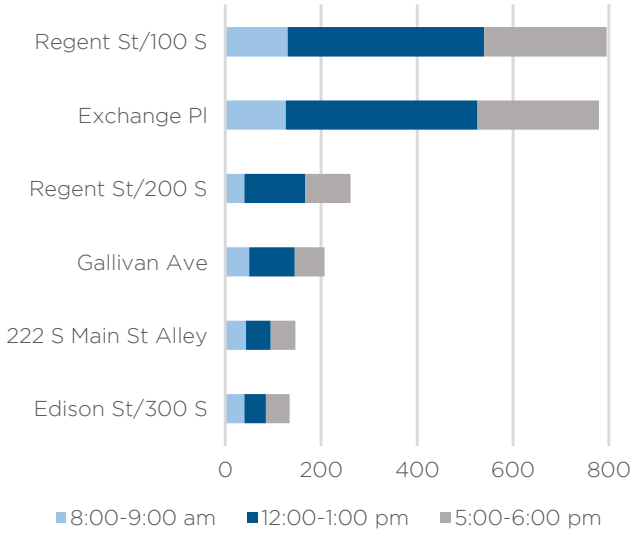


Figure 1-10 June 2012 Weekday Pedestrian Counts

Regent Street mid-block walkway at 100 South had the highest pedestrian counts

were designed as pedestrian-friendly spaces but lack programming, nearby multi-use buildings, and the attention to design detail that would make them more inviting or useful to pedestrians.

1.3.4.2 Surveys

During the counts, surveys were administered to determine opinions about the mid-block walkways. Respondents said that convenience and safety contribute to a good walking environment. Some people stated that trees and landscaping contribute positively. Others mentioned the number of people on the street and adequate maintenance.

1.3.5 Bicycle Counts

Beginning in September 2010, Salt Lake City has conducted annual bicycle user counts during the second full week of September. Counts are taken at each location on Tuesday, Wednesday, and Thursday evenings (5-7 pm) and Saturday and Sunday afternoons (12-2 pm).

In 2011, Salt Lake City reported a citywide 27% increase in bicycling from the previous year. Major local media outlets and national organizations reported the significant change. Bicycling Magazine listed the 27% increase in bicycling as one of the reasons that Salt Lake City jumped from 43rd (2010) to 26th (2012) in the magazine's "America's Most Bicycle-Friendly Cities" biennial ranking. Since 2011, there has not been another dramatic yearly increase, but the following year saw a modest increase. Weather during the 2013 counts was very rainy, which likely impacted numbers.

This is mirrored in the 2012 ACS Journey to Work data (2008-2012 5-Year Estimates) as compared to the same data source for 2010. In that two year period, bicycle commuting rates rose from 2.2% to 2.5%, while male bicycle commuters increased from 3.0% to 3.2% and females from 1.3% to 1.7%.

1.3.5.1 Count Locations

The original count in 2010 involved 12 locations. In subsequent years, the City has incorporated two or three new locations per year in order to collect before/after data for specific facility improvements. The first "after" data will be collected in 2014.

Count locations with consistenly high ridership are 800 E/800 S, 200 S/Main, Sunnyside/Arapeen, Sunnyside/Guardsman, and Parley's Crossing. This may be due in part because they are on popular commuting routes, provide access to the University of Utah, or are frequented heavily by recreational bicyclists.

1.3.5.2 Analysis of Bicyclist Totals

Figure 1-11 shows observed trends in overall riders counted, helmet use, sidewalk riding, and female ridership.

1.3.5.3 Sidewalk Riding

Sidewalk ridership is lower at locations near the University of Utah, at 800 E/800 S, and Beck St/Chicago Ave. Conversely, west side count locations have higher levels of sidewalk riding.

1.3.5.4 Helmet Use

Helmet use was observed during the 2010 and 2011 counts. It was highest in locations frequented predominately by recreational bicyclists and those commuting long distances. Count locations downtown and on the west side had lower levels. After collecting adequate baseline data, collecting helmet use data was discontinued after 2011.

1.3.5.5 Female Bicyclists

Since 2012, rider gender has been recorded during counts. This data enables City staff to see how changing infrastructure types (from conventional bike lanes to lower stress facilities), other improvements, and weather affect the share of female bicyclists.

The 600 E/1300 S count location had a higher share (30%) of female bicyclists than any other location. Like helmet use, count locations on the east side of the City generally had a higher share of female bicyclists, while the west side had lower percentages.

1.3.5.6 Context & Comparison

Salt Lake City is the only city in Utah that performs regular bicycle user counts. Portland (OR) has conducted annual counts since the early 1990s. They have experienced a two-decade-long upward trend, which includes a 211% increase since 2000. Portland and Tucson (AZ) have both experienced ups and downs at specific locations or in their overall annual totals for individual years while maintaining an upward long-term trend.

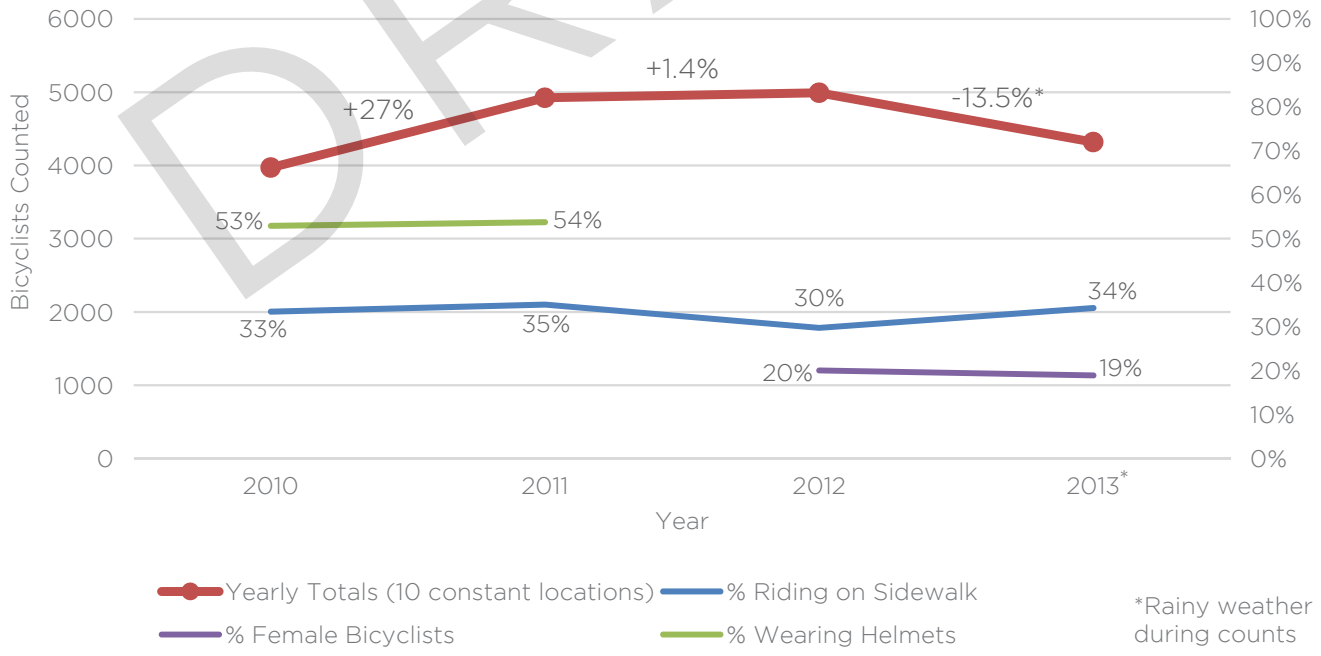


Figure 1-11 Bike Counts, Sidewalk Riding, Female Bicyclists, & Helmet Use by Year

1.4 Relationship to City Plans

Many other City planning documents influence and are influenced by this Pedestrian and Bicycle Master Plan. Some of the major related planning efforts include:

- Plan Salt Lake (still in draft form)
- Downtown Master Plan
- West Salt Lake Master Plan
- 9 Line Corridor Plan
- Jordan & Salt Lake Canal Trail Implementation Study

1.4.1 Plan Salt Lake

Plan Salt Lake is still in process and has not yet been adopted. The purpose of this plan is to set a citywide vision for the next 25 years and create an overarching master plan for the City. It considers where the City currently is, where people want to be, and establishes the framework for decision making that will accomplish the desired end result.

All community and system plans will be subsets of Plan Salt Lake and help to implement the goals contained within it. The City's Transportation Master Plan is one such system plan and the Pedestrian and Bicycle Master Plan fits within its umbrella.

Public input for Plan Salt Lake mirrors the strong interest in active transportation found during the public process conducted for the Pedestrian and Bicycle Master Plan (see Chapter 3). Comments received through Plan Salt Lake reflect a high level of interest in walking and bicycling, even outside of the "transportation" category. The following categories all had input related to active transportation:

- Air quality – while most comments were related to public transit and idling, about 25% of responses mentioned walking or bicycling as partial solutions.
- Diversity – about 15% of responses related to diversifying transportation choices with walking and bicycling strongly mentioned.
- Neighborhoods, Downtown, and Outdoors – each category included comments (about 10-20% of those received) in support of walking and bicycling.
- Transportation – between a third and half of comments referenced walking or bicycling, with expansion of the bikeway network being requested in about half of the comments. Nearly all comments were positive.

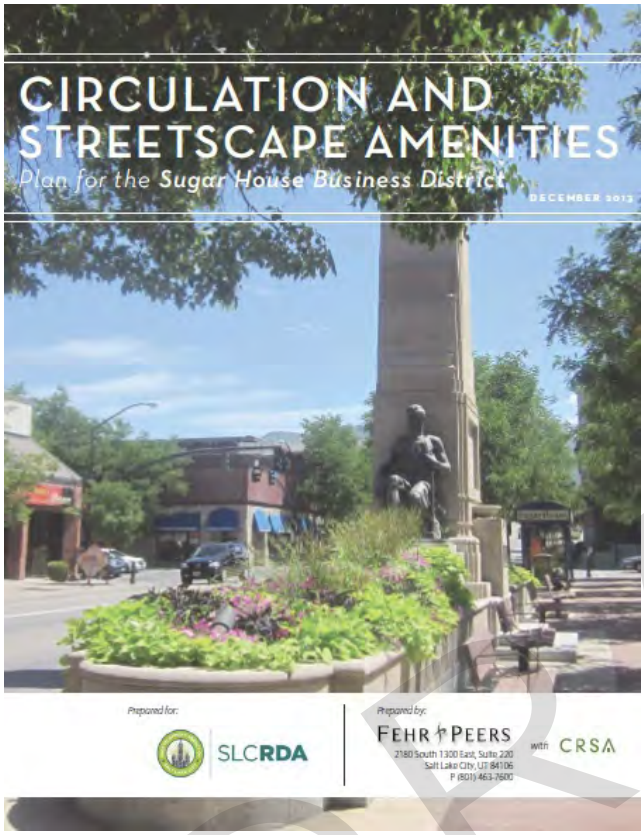
Public input for Plan Salt Lake closely mirrors results of local opinion polls. The most recent edition of the biennial Dan Jones phone survey found that approximately two-thirds of City residents would be very willing or somewhat willing to support tax increases for improving pedestrian and bicycling facilities.

1.4.2 Other City Plans

Recommendations from the City's area, modal, and corridor master plans were also reviewed at the beginning of the master plan effort to gain ideas and make sure that previous planning efforts were appropriately incorporated. The Downtown, West Salt Lake, 9 Line, and Jordan and Salt Lake Canal Trail plans mentioned above are just a few examples of such plans that provided input and background for the Pedestrian and Bicycle Master Plan.

The Circulation and Streetscape Amenities Plan for the Sugar House Business District is

also illustrative of how information from these plans was used. That plan included specific recommendations for bikeways in the area. Those recommendations were reviewed and included in the Pedestrian and Bicycle Master Plan.



Recommendations from the Sugar House Circulation and Streetscape Amenities plan were incorporated into the Pedestrian and Bicycle Master Plan

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CHAPTER TWO

GOALS & OBJECTIVES

Vision statements, goals, and objectives are the guiding forces behind the development and implementation of infrastructure and programs. They direct resource allocations and priorities. A vision statement outlines what a city wants to be. It concentrates on the future and is a source of inspiration. Goals provide a guide to fulfilling the vision. Objectives are more specific statements that define how each goal will be achieved. They are measurable and allow tracking of progress toward achieving the goals and overall vision.

Main sections of this chapter are as follows:

- Updating the 2004 Plan
- Vision
- Goals & Objectives

2.1 Updating the 2004 Plan

A vision statement, goals, and objectives were part of the previous Bicycle and Pedestrian Master Plan adopted in 2004. These items were all updated during the course of this current master plan effort. The public had opportunities at both open houses to comment on how they would like to see the vision, goals, and objectives updated. The Steering and Stakeholder Committees were able to provide targeted input during their meetings. The documents were then reviewed and refined based on a series of meetings, including City Council meetings.

2.2 Vision

This master plan is guided by the following vision statement:

"Walking and bicycling in Salt Lake City will be safe, convenient, comfortable, and viable transportation options that connect people to places, foster recreational and economic development opportunities, improve personal health and the environment, and elevate quality of life."

Library patrons walking between the Downtown Main Branch anc the City-County Building

Goal #1

Integrate walking and bicycling into community planning to enhance livability, health, transportation, the environment, and economic development.

Objectives

- Update City policies and ordinances, including the Complete Streets Ordinance, to foster desired walking and biking outcomes.
- Educate City staff and leadership on benefits of active transportation to individuals, government, and business.
- Coordinate with Plan Salt Lake, community master plans, and other City divisions on their planning documents and processes.
- Use best design practices from appropriate publications.
- Participate in long-term regional active transportation planning efforts.
- Work with neighboring cities to extend walkways and bikeways beyond Salt Lake City boundaries, with special emphasis on connections to transit stations.
- Coordinate with UDOT regarding desired improvements on their roadways within the City.
- Work with the State of Utah Driver License Division to enhance active transportation curricula.
- Achieve Gold level BFC status.
- Partner with clean air advocates and health insurers to increase walking and bicycling rates.
- Work with the police department, used bicycle dealers, pawn shops, and other entities to address bike theft.
- Expand the bike sharing system throughout the City.
- Continue to support the annual Utah Bike Summit.
- Continue efforts to host conventions and conferences such as Outdoor Retailers, Interbike, and ProWalk/ ProBike, and recruit bike-related retailers and manufacturers to the City.

Walking, running, and bicycling are healthy activities enjoyed by many Salt Lake City residents

Goal #2

Develop a safe, comfortable, and attractive walking and bicycling network that connects people of all ages, abilities, and neighborhoods to the places they want to go.

Objectives

- Expand walking and bicycling networks to enhance connectivity across barriers such as freeways, rail lines, waterways, and disconnected street networks.
- Conform to pedestrian design standards that promote accessibility for disabled persons.
- Implement a low stress bikeway network (multi-use paths, protected bike lanes, buffered bike lanes, and neighborhood bicycle boulevards) citywide to provide access for people who are uncomfortable riding close to or in traffic.
- More fully connect the various multi-use path systems (e.g. Jordan River Parkway, 9 Line Trail) and enhance wayfinding between them and other important cross-streets and destinations.
- Educate the community about neighborhood bicycle boulevards and protected bike lanes as they are constructed to heighten awareness and understanding of these new bikeway types, as well as highlight benefits to pedestrians.
- Educate the school district about planned active transportation projects that will help students walk or bike to school.

Families enjoy walking and bicycling in Liberty Park

- Enhance traffic signal systems to detect bicycles through use of pavement markings and sensor technology.
- Use turn queue boxes, intersection crossing markings, curb extensions, and other innovations to increase bicyclist and pedestrian comfort and safety at intersections.
- Conduct bike counts throughout the year to determine long-term trends and seasonal ridership.
- Seek opportunities to enhance existing (and develop new) bicycle recreation facilities such as BMX and pump tracks.

Goal #3

Maintain the walking and bicycling system year-round.

Objectives

- Increase enforcement of the City's sidewalk shoveling and landscape encroachment ordinances to encourage landowners to responsibly maintain their sidewalks for the public's safety.
- Provide City resources to maintain winter access to pedestrian refuge islands and sidewalks where public properties abut overpasses and underpasses, including State roads.
- Create a prioritized snow plowing schedule for bikeways.
- Create a snow plow team for plowing the bike lane network with appropriate equipment at the same time as car lanes are plowed.

Salt Lake City snow plow during a winter storm

- As needed, increase sweeping frequency and effectiveness for on-street facilities and multi-use paths.
- Consider maintenance needs during design of protected bike lanes to ensure that they can be maintained properly after construction.
- Enhance current efforts to manage undesirable plant growth (e.g. Puncturevine) along multi-use paths.
- Formalize maintenance of unpaved bike parks and trails such as the I Street Jumps and Tanner Park trail system.

Goal #4

Promote the safety and attractiveness of walking and bicycling through education, encouragement, and enforcement programs.

Objectives

- Continue to support efforts by the police department to enforce against driving practices that endanger pedestrians.
- Educate drivers about safely operating around people on foot and on bike.
- Use various forms of media to disseminate information to the public and heighten awareness of walking and bicycling issues.
- Disseminate information to residents, employers, and other organizations about the health, environmental, and cost benefits of active transportation and educate them about how to more fully utilize the walking, bicycling, and transit systems.
- Encourage pedestrian and bicycle-friendly business practices through zoning, code changes, and encouragement incentives.
- Continue to support Open Streets events and explore other opportunities to selectively open roads to more walking and bicycling activities.
- Continue to produce online and printed bikeway maps and disseminate them to the public.
- Continue to coordinate with and support the Bicycle Collective's community education and encouragement efforts.
- Integrate active transportation education and encouragement activities into K-12 schools.
- Continue to enhance training of police officers so that they have the tools to properly enforce laws and regulations pertaining to walking and bicycling.
- Provide options for people to complete road safety courses in lieu of paying for pedestrian or bicycle related citations.

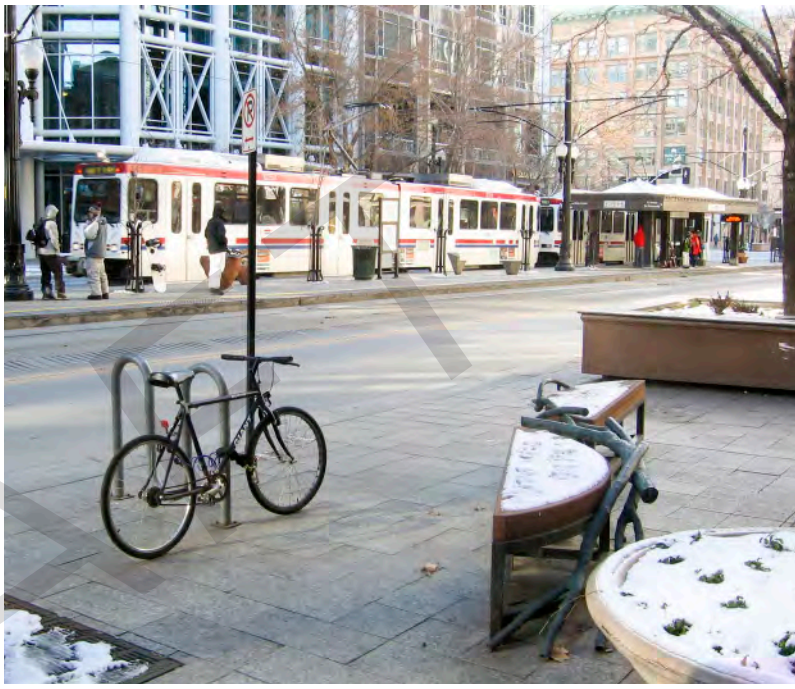
Information booth on the 2013 Road Respect Tour in Salt Lake City (Photo: Road Respect, UDOT)

Goal #5

Integrate pedestrian and bicycle facilities with transit routes, stations, and stops.

Objectives

- Plan and implement active transportation routes to serve major transit stops in order to foster access to destinations within ¼-mile or ½-mile of the stations.
- Work with UTA to conduct a station-by-station, or stop-by-stop, audit for pedestrian and bicycle access.
- Work with UTA to include benches and bike parking at bus stops using UTA guidelines as a baseline for what should be installed.
- Work with UTA to install bike racks on TRAX light rail trains.
- Work with UTA to install bike racks capable of holding three bikes on all buses in the City (most buses currently accommodate two bikes each).
- Work with UTA to provide secure and sheltered bike parking at high demand transit stops.
- Locate additional bike sharing stations near fixed-route transit stops and major destinations.
- Coordinate with UTA to submit applications for bikeways eligible for Federal Transit Administration grant money.



Bike rack & seating near the Gallivan Center TRAX station

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CHAPTER THREE

PUBLIC PROCESS

Community engagement was vital to creating this plan. Various avenues were available for City staff, key community stakeholders, and the general public to participate in the Pedestrian and Bicycle Master Plan development. The planning process included direct input from 1,000-2,000 residents in addition to the related comments received through Plan Salt Lake.

Conventional outreach such as open houses and more community-based outreach such as social media, online surveys, and attendance at events, concerts, and street fairs were cornerstones of the public engagement. This chapter describes the various input opportunities and summarizes the public feedback.

Main sections of this chapter are as follows:

- Master Plan Committees
- Public Open Houses
- Online Survey
- Other Outreach Events
- Key Themes

3.1 Master Plan Committees

Several distinct committees were convened to accomplish specific purposes in support of this master plan. Their various roles are outlined below.

3.1.1 Stakeholder Committee

The Stakeholder Committee performed similar functions as the Steering Committee, but was comprised mainly of representatives from non-City institutions with an interest in the outcome of the Pedestrian and Bicycle Master Plan. In general, documents and coordination items were taken to the Stakeholder Committee after they had already been vetted through the Steering Committee. Groups with representation on the Stakeholder Committee included:

- Active transportation advocates
- Downtown business community
- Government agencies with a regional or statewide transportation focus
- University of Utah staff

3.1.2 Downtown-to-University Focus Group

Providing a recommendation for a prioritized bikeway between the University of Utah and the downtown area was a specific focus of the master plan. A focus group was set up to provide guidance and feedback for concepts as they were developed. The focus group met twice and included representatives of:

- Affected community councils and neighborhood groups
- University of Utah staff
- Active transportation advocates
- Downtown businesses

"When interviewing teachers for employment at my school, candidates ask whether they can easily walk or bike to school. Improving walking and bicycling is very important to me because it allows me to attract and hire good teachers."

- Vicki Mori, Principal, Guadalupe School

3.1.3 Steering Committee

The Steering Committee consisted of approximately 25 people from various City divisions and committees. Engineering, Planning, Parks and Public Lands, Streets, and Sustainability were just some of the City divisions with representation on the committee. The Steering Committee met a total of eight times to provide direction on such topics as key working documents, route planning, public open house planning, and final document review.

3.2 Public Open Houses

Two public open houses were held, one near the beginning of the project and another after recommendations had been developed.

3.2.1 Open House #1

The first public open house for the plan was held in April 2013. The purpose was to introduce the project to the public, disseminate information about the master planning process, and receive feedback about key elements of the process.

The first public open house in April 2013

Approximately 100 people attended. Attendees learned that the master plan would:

- Provide a blueprint for enhancing the City's walking and bicycling networks
- Recommend ways to strengthen education, encouragement, and enforcement programs
- Identify and prioritize an enhanced bikeway between downtown and the University of Utah
- Identify low-stress, family-friendly bikeways
- Provide phasing recommendations

Interactive informational stations highlighting different elements of the master planning process were set up. Attendees circulated to different stations and conversed with City staff and members of the consultant team about each topic. The stations addressed the following project emphases:

- Master plan vision and goals
- Importance of accommodating people of all ages and physical abilities
- Popular origins and destinations for people walking and bicycling
- Different types of infrastructure for pedestrians and bicyclists
- Desired improvements for walking
- Desired improvements to the bikeway network
- Education, encouragement, and enforcement programs to support walking and bicycling

Feedback received at this open house was used to inform the detailed project documents developed later in the process.

3.2.2 Open House #2

A second open house held in October 2013 presented the infrastructure and program recommendations to the public, explained how they were developed, and asked for feedback. Specific stations addressed the following topics:

- Vision and goals
- Feedback received from Open House #1 and other City outreach events
- Pedestrian and bicycle facility descriptions
- Pedestrian design typologies
- Proposed pedestrian and bicycle spot improvements
- Proposed citywide bicycle network, including a network of downtown low-stress routes and a prioritized route from the University to downtown
- Proposed education, encouragement, and enforcement programs for walking and bicycling

There was general support for the goals and vision with very few specific critiques. Attendees strongly supported protected bike lanes and other low stress bikeways as a whole. However, there was targeted feedback about perceived problems with protected bike lane designs from a convenience and safety standpoint, particularly at intersections. It was clear that although the majority of people want more protected bike lanes, some experienced bicyclists would like to see their concerns addressed through changes to future designs.

An online version of the second open house was also available for those who could not attend the live event. Online input was added to the feedback received at the live open house.

3.3 Online Survey

An online survey soliciting preferences for different types of pedestrian and bicycle facilities as well as non-infrastructure programs was available to the public for nearly two months during Summer 2013. The survey received 969 responses. Figure 3-1 shows a demographic breakdown.

Responses to pedestrian questions showed a strong preference for sidewalks buffered from traffic by parking or landscaping. They also showed an overwhelming emphasis on the importance of winter sidewalk maintenance.

Three-quarters of people support mid-block high-intensity activated crosswalk (HAWK) signals (only 11% dislike) and 78% support LED-illuminated flashing signs at crosswalks (only 5% dislike), with similar results for overhead flashing crossing beacons. Nearly everyone supports inclusion of countdown timers on pedestrian signals (only 2% dislike). Together these results show strong support for mid-block crossing and intersection features that make it easier and safer for people to cross busy streets.

Figure 3-2 illustrates how respondents self-identified as different types of bicyclists. It is evident from this cross-section of the respondents that people with an interest in bicycling were much more likely to take the survey than those without such an interest.

Section 6.2 and Figure 6-1 in Chapter 6 describe survey respondents' preference for more protected, low-stress bicycling facilities.

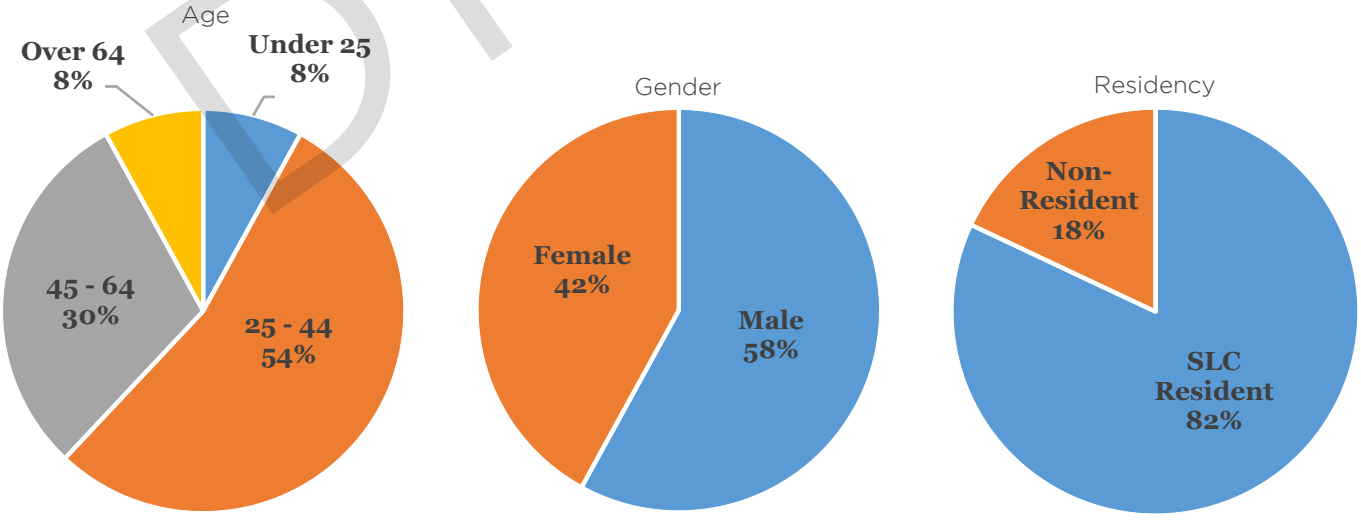

Figure 3-1 Demographics of Public Survey Respondents

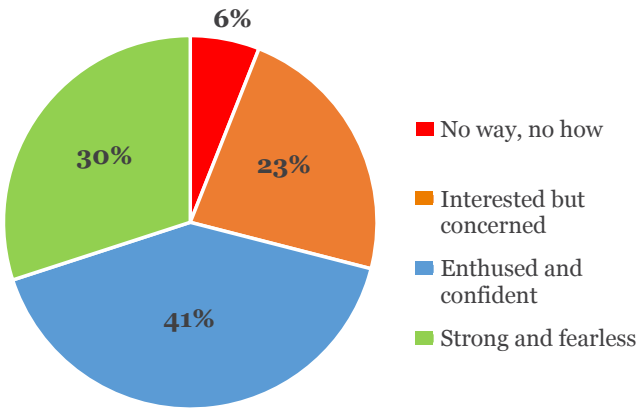

Figure 3-2 Types of Bicyclists (Pedestrian & Bicycle Master Plan Public Survey)

3.4 Other Outreach Events

City staff set up tables and booths at nearly 30 events in Summer 2013 to inform people about this plan and solicit more input. Events included:

- Downtown Master Plan open house
- Downtown Streetcar Master Plan open house
- Rose Park Community Festival
- West Salt Lake Street Festival
- 9th & 9th Street Festival
- People's Market, Downtown Farmer's Market, and Sugarhouse Farmer's Market
- Twilight Concert Series (4 separate days)
- UTA Bike Bonanza
- Road Respect Festival
- Utah Arts Festival (2 separate days)
- Tour de France Viewing Party
- Midtown Employee Clinic open house
- Solar Day
- Bike light giveaway
- Night Out Against Crime (3 separate days)
- Tour of Utah Stage 4 Circuit Race
- Bike To the U Day
- Greek Festival (2 separate days)
- Active Transportation & Health Summit
- Blessing of the Bikes

Approximately 50 people also submitted comments through the Open City Hall web forum.

3.5 Key Themes

A number of key themes emerged amidst the large amount of information collected through the public input process. The most common and pervasive themes are:

- Support for the goals and objectives shown in Chapter 2, with few specific critiques or feedback.
- Heavy support of the City's efforts to install high-visibility pedestrian treatments such as HAWKs and LED-illuminated signs to improve crossings of major streets.
- A desire for better winter maintenance, particularly enforcement of laws requiring landowners to clear snow from public sidewalks.
- Support for all types of bikeways, both conventional and low stress.
- Heavy support for the City's vision of creating a system of low stress bike facilities, including protected bike lanes.
- Concern from some very experienced bicyclists about specific design elements of protected bike lanes, and a desire for the City to implement these types of facilities in ways that minimize intersection conflicts.
- Support for a designated low stress bikeway between the University and downtown, and a preference for it to be located on 300 South.

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CHAPTER FOUR

COMPLETE STREETS

Streets are an integral part of everyday life and public space. The term "Complete Streets" refers to designing streets for people of all ages and abilities using various travel modes such as walking, bicycling, transit, and driving.

Salt Lake City adopted a Complete Streets ordinance in 2010. The ordinance seeks to balance the competing needs of different transportation modes within the unique contexts and needs of each roadway.

The City proactively implements Complete Streets principles during roadway projects. Examples include the many new bike lanes that have been striped in conjunction with pavement overlay projects.

Main sections of this chapter are as follows:

- Relationship to Pedestrian & Bicycle Master Plan
- Strengthening the Complete Streets Ordinance
- Policy Considerations for Non-Bicycle Wheeled Transportation
- Speed Limit Policies

4.1 Relationship to Pedestrian & Bicycle Master Plan

The recommendations for enhanced facilities and programs presented in Chapters 5, 6, and 7 are consistent with and support Complete Streets principles. Table 4-1 illustrates how implementing the 10-year and 20-year bikeway recommendations in Chapter 6 would make Salt Lake City's transportation backbone much more accessible by bicycle in the future. Likewise, the pedestrian recommendations will enable people to more comfortably walk along and across streets.

Table 4-1 Percentage of Roads with Bikeways

Roadway Class	Existing	10 Yr	20 Yr
City Arterial	50%	67%	85%
State Arterial	11%	44%	55%
City Collector	56%	68%	84%
City Local	8%	16%	24%

4.2 Strengthening the Complete Streets Ordinance

The National Complete Streets Coalition annually evaluates policies from across the country. The Coalition's assessment of Salt Lake City's current ordinance reveals strengths and improvement opportunities. Based on this assessment, the City should consider the following enhancements:

- Modify language to explicitly reference other transportation options, particularly transit.
- Modify language in the ordinance's "Purpose" section to include users of all ages.
- Extend the ordinance to cover privately-built roads and agency-funded projects not on agency-owned roads.
- Explicitly state the importance of the need to work with partnering agencies on roads passing through the City that are owned, operated, and maintained by other jurisdictions.
- Include specific references to additional best practice design guidance.
- Include language allowing for design flexibility to meet the needs of all transportation users.
- Include language pertaining to context-sensitive design.
- Include specific performance measures (e.g. changes in walking/bicycling mode shares, changes in pedestrian/bicyclist crash rates, number of ADA accommodations built) so that the City can evaluate the ordinance's effectiveness over time.
- Clearly state the City's implementation process, project selection criteria, and reporting requirements in the ordinance.

4.3 Policy Considerations for Non-Bicycle Wheeled Transportation

As the City moves forward in planning a connected bicycle network, policy questions may arise regarding accommodations for other wheeled transportation devices such as skateboars, inline skates, motorized wheelchairs, and scooters. Such questions should be referred to the City's Transportation Advisory Board, ADA committee, and Bicycle Advisory Committee for further consideration. Potential topics may include:

- Allowing devices other than bicycles in bikeways
- Providing storage for non-bicycle devices at destinations
- Allowing devices on City sidewalks or in certain sections of the City
- Allowing devices on transit vehicles

4.4 Speed Limit Policies

Research shows that pedestrian fatality risk increases dramatically as vehicle speeds increase. The risk at 30 mph is more than twice as high as 25 mph and more than five times higher than

the risk at 20 mph.[1] Lower speeds produce less noise, improve crosswalk yielding behayior, and contribute to a more people-friendly environment.

The de facto speed limit in Salt Lake City is 25 mph when not otherwise posted. However, most roads classified as collectors or arterials usually have speed limits higher than 25 mph. Speed limits are referenced in the 2008 Downtown in Motion Plan, which recommends lowering speed limits in the downtown area to a maximum of 25 mph (preferably 20 mph) with the goal of maintaining speeds "compatible with pedestrian and bicycle activity." Cities as diverse as New York City, Burlington (VT), Miami Springs (FL), and San Mateo (CA) have recently implemented downtown speed limits of 25 mph.

Lower speeds will also contribute to the safety and comfort of the emerging low stress bikeway network that the City seeks to expand. Speed reductions should generally be achieved through physical roadway changes rather than arbitrarily changing signs. Studies show that most people will drive at a speed that feels safe based on the physical conditions presented to them. Arbitrarily lowering speed limits leads to poor compliance, difficult enforcement, and resentment of regulatory speed limits.

Chapter 4 Sources

1. Rosen, Erik and Ulrich Sander. "Pedestrian fatality risk as a function of car impact speed". Accident Analysis and Prevention 41 (2009). Viewed online at: http://nacto.org/docs/usdg/pedestrian_fatality_risk_function_car_impact_speed_rosen.pdf

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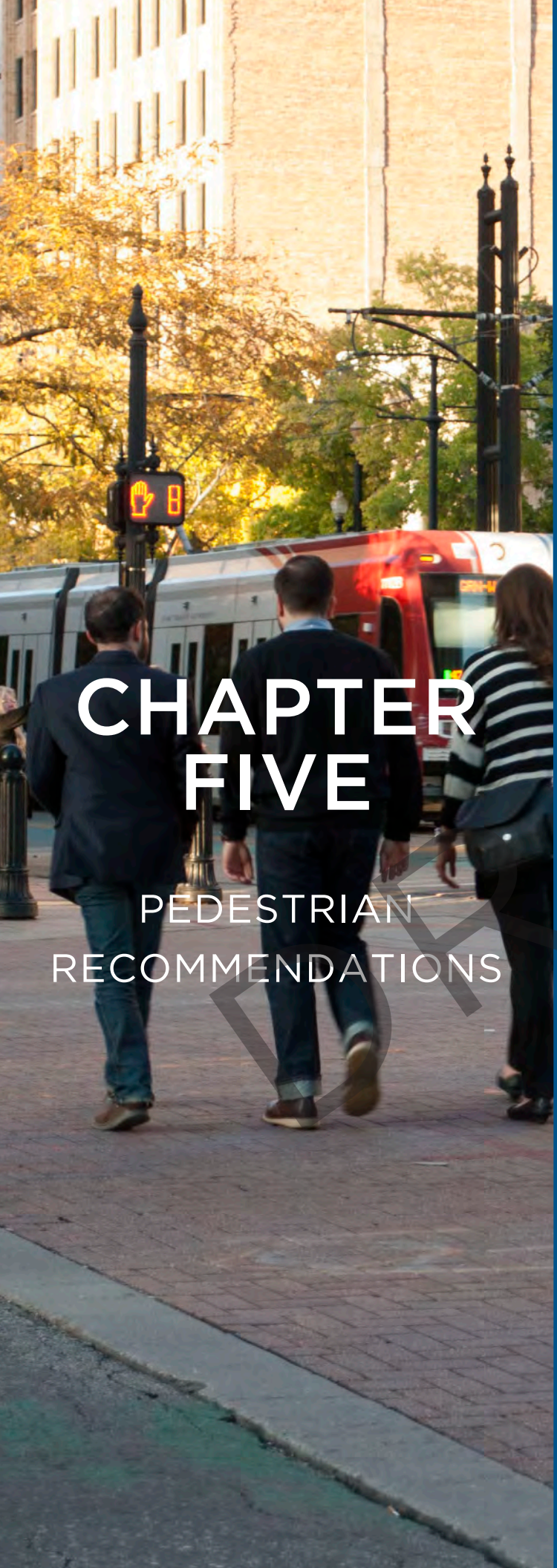


CHAPTER FIVE

PEDESTRIAN RECOMMENDATIONS

Complete Streets principles dictate that the transportation network should accommodate pedestrians with a variety of needs, abilities, and possible impairments. Sidewalks are the most fundamental element of the pedestrian network. They provide an area for pedestrian travel that is separated from vehicle traffic. Fundamental tenets of good sidewalk design include:

- Accessibility for all users
- Separation from traffic by landscaped park strips and/or parking
- Continuity
- Proper drainage
- Inclusion of social space for standing, sitting, and visiting in neighborhood and business districts

Intersections are also an important piece of the pedestrian realm. Although design decisions will vary according to context, typical attributes of pedestrian-friendly intersection design include:

- Transit stops where appropriate
- Areas for pedestrians to congregate
- Appropriate accessibility to (and maintenance of) all corner pedestrian features
- Corner design and construction that discourages turning vehicles from driving over the pedestrian area
- Minimization of pedestrian crossing distances
- Lighting that promotes visibility, legibility, and accessibility

Primary subsections of this chapter include:

- Walking Facility Descriptions
- Traffic Signal & Warning Beacon Considerations
- Pedestrian Counts
- Pedestrian Spot Improvements
- Pedestrian Typologies

5.1 Walking Facility Descriptions

Most trips begin and end as walking trips even when a car, bicycle, bus, or train is also involved. Generally, Salt Lake City has a very complete walking network and there are few places where walking facilities are not available. The City continually adds sidewalk improvements as a part of redevelopment, street reconstruction, new or upgraded traffic signals, and targeted spot improvements.

5.1.1 Linear Facilities

Pedestrians use several different types of facilities to travel in Salt Lake City, primarily multi-use paths and sidewalks.

5.1.1.1 Multi-Use Paths

These facilities are shared by many active transportation and recreation users including pedestrians, bicyclists, and in-line skaters. The Jordan River Parkway Trail, Legacy Parkway Trail, Liberty Park Path, 9-Line Trail, and Parley's Trail are all examples of multi-use paths in Salt Lake City.

Jordan River Parkway Trail near International Peace Gardens

5.1.1.2 Sidewalks

Sidewalks are the most common walking facility in Salt Lake City. Some are directly adjacent to travel lanes without any buffer or barrier, while others are buffered by landscaping, parking, seating, or other physical means.

Sidewalk on South Temple separated from traffic by landscaping

Sidewalk on 25th St in Ogden separated from traffic by trees, planters, and parking

5.1.2 Crosswalks

Crosswalks exist everywhere that sidewalks and streets intersect, whether marked or not. Marked crosswalks provide a delineated space for pedestrians and other sidewalks users to cross. Differences in striping patterns (e.g. double ladder or piano key crosswalks) and paving surfaces (e.g. raised and/or brick crosswalks) offer varying levels of delineation between pedestrians and automobiles, bicyclists, and other roadway users.

Salt Lake City uses double ladder crosswalks in school zones and at midblock crosswalks in the downtown Central Business District

This raised crosswalk on 2nd Ave calms speeds and elevates the crossing for better visibility

5.1.2.1 Crosswalk Flags

Salt Lake City has been providing crosswalk flags at downtown crosswalks for many years. Flags are simple, low cost, popular, and are effective at improving pedestrian safety. The Adopt-a-Crosswalk program allows individuals, schools, neighborhood councils, and businesses to install crosswalk flags by sponsoring a crosswalk. The City installs the flag equipment and the sponsors maintain their flags by providing labor and minimal financial assistance.

Mid-block double ladder crosswalk with crossing flags at 300 S/Regent St

5.1.2.2 Mid-Block Crossing Prioritization Process

The City uses a process to prioritize appropriate mid-block crossing treatments. Prioritization factors include traffic volume, nearby pedestrian traffic generators, traffic speed, crash history, roadway crossing distance, and gaps in traffic. Refinements and updates to this process were completed as part of this master planning effort.

5.1.3 Other Treatments

Salt Lake City uses additional treatments to improve the pedestrian experience, calm traffic, and create streets more amenable to walking.

5.1.3.1 Bulbouts

Bulbouts reduce the width of roadway crossings at intersections and mid-block crossings. They also create a visual traffic calming cue to drivers to slow for pedestrians, improve pedestrian visibility, and protect transit passengers as they board or alight from buses or streetcars. Sufficient space for bicyclists is a necessary design consideration.

Intersection bulbouts on 400 West

5.1.3.2 Traffic Circles & Roundabouts

Traffic circles and roundabouts allow for constant vehicular traffic flow through intersections and do provide some benefits to pedestrians and bicyclists, such as reduced traffic speeds. However, they also have drawbacks. Yielding compliance at crosswalks may be reduced if the facility is not designed properly. Also, designs often require bicyclists to merge into traffic through the roundabout, which is uncomfortable for many riders.

5.1.3.3 Median Refuge Islands

Refuge islands enable pedestrians to cross one direction of a street at a time. They are typically used in conjunction with crosswalks where traffic volumes or speeds are high or roads are wide. Sometimes other traffic control measures such as signals or flashing beacons are also used.

5.1.3.4 Bus Shelters

Bus shelters protect pedestrians from rain, snow, and the sun. These amenities may encourage more people to ride transit.

5.1.3.5 "LOOK" Pavement Markings

Salt Lake City installs pavement markings in the downtown area to encourage pedestrians to look both ways before entering a crosswalk.

Median refuge island near Bennion Elementary on 800 East

Bus shelter at Ogden Intermodal Center (Photo: UTA)

"LOOK" pavement marking in Salt Lake City

5.1.3.6 Landscaping & Street Furniture

Although trees can be costly, planters and hanging plants are simple and relatively inexpensive investments that produce some of the same effects. Building maintenance, including washed windows and neat paint, can also be an inexpensive means of improving walkability and attractiveness.

Improvements that encourage stationary activities (e.g. benches, tables, chairs, food trucks, and programmed events) increase street life. People attract people. Select streets could make the jump to higher numbers of pedestrians with minor improvements.

5.1.3.7 Lighting

Most street lighting is primarily designed for the safety and comfort of motorists except at intersections, where crosswalks are typically illuminated. The illumination of sidewalks and other walkways is often a separate consideration.

Pedestrian lighting typically includes shorter lights (14-18' maximum pole heights) directly above walkways and accent lighting that illuminates features on or near buildings. Pedestrian lighting increases drivers' visibility of pedestrians, promotes perceived personal security, illuminates potential hazards, and creates vibrant and inviting streetscapes.

5.2 Traffic Signal & Warning Beacon Considerations

Traffic signal standards are well established in the U.S. Salt Lake City has been in the forefront of implementing many pedestrian and bicycle related best practices including countdown timers, audible signals, HAWK signals, and other innovations.

Section 4 of the Manual on Uniform Traffic Control Devices (MUTCD) defines minimum requirements for signal timing, displays, pushbuttons, and other pedestrian signal considerations. The City carefully adheres to national standards and exceeds them in many cases. Typical concerns that pedestrians experience at signalized crossings include:

- Delays caused by long signal cycles
- Lack of understanding of WALK/flashing DON'T WALK indications
- Uncertainty about whether the button must be pressed to activate a pedestrian signal, particularly in downtown areas where signals operate differently during different times of day
- Lack of confirmation that someone has already pressed a pushbutton
- Conflicts with turning vehicles at intersections

5.2.1 Pedestrian Countdown Timers

The City installs pedestrian countdown timers at all City owned traffic signals. Many UDOT owned signals also have pedestrian countdown timers but UDOT still uses the old non-countdown style pedestrian signals in some locations. Pedestrian countdown timers improve safety by providing information to assist pedestrians with crossing decisions. Pushbuttons with confirmation lights are also sometimes used so that people can see whether the signal has been activated.

Pedestrian countdown timer at 200 E/200 S intersection

"There should be better ways to cross major and busy streets, and not just for bicyclists, but also for pedestrians."

- Comment from 2013 public survey

5.2.2 Actuated & Recalled Signal Phasing

Phasing determines which traffic movements are allowed to operate simultaneously and which occur separate from one another. Timing refers to the amount of time given to particular movements during a phase.

For many years, Salt Lake City has not had pedestrian buttons in the downtown area, meaning that the pedestrian phase is recalled on every signal cycle 24 hours a day. This allows a pedestrian phase at all times without having to push a button. One negative aspect of the "no-button" approach is that signals operate in a pre-timed fashion 24 hours a day regardless of actual traffic flows and pedestrians, which leads to unnecessary stops and driver delay in the downtown area, especially late at night, early morning, and weekend periods when there is little pedestrian or vehicle traffic.

The City recently began installing pushbuttons in the downtown area when traffic signals are upgraded. However, during the day (typically 6 AM to 10 PM) most signals operate in coordination to achieve efficient flow, meaning that one or both of the principal directions are recalled automatically regardless of traffic detection and the pedestrian phase is also displayed. This is the most efficient way to operate signals when car volumes are steady and predictable (as they are on most weekdays). It is also better for pedestrians during these hours.

The downside of this method is that when traffic volumes are light and few pedestrians are present, pedestrians must push the button to activate the signal. Pedestrians who use the signals during the day and are accustomed to receiving a WALK signal automatically may not realize that they need to push a button during the off-peak hours.

5.2.3 Exclusive Pedestrian Phases & Scrambles

Exclusive pedestrian phases allow pedestrians to cross the street in both directions simultaneously. Salt Lake City operates a few traffic signals this way in locations where pedestrian volumes are high, such as the Main/South Temple, 100 S/West Temple, and 400 S/University St intersections.

"Scrambles" permit pedestrians to cross all four legs of an intersection or to cross diagonally while all motor vehicle traffic is stopped. This benefits car traffic by reducing turning conflicts and allowing cars to clear intersections more efficiently during their signal phase.

Scrambles are not widely used in the U.S., but when used they are typically found at downtown intersections with high volumes of pedestrians relative to motor vehicles. While they provide the convenience of a diagonal crossing, they have

Scramble in Carlsbad (CA) that serves 8,000 pedestrians per day

a number of disadvantages including longer pedestrian crossings times, complications to coordination with other nearby signals, and delay to pedestrians that only need to cross one leg of the intersection. Salt Lake City has not implemented any scrambles to date.

5.2.4 Leading Pedestrian Intervals

Leading Pedestrian Intervals (LPI) are common in cities across the U.S. They give pedestrians a WALK indication before (typically 3-7 seconds) vehicles are given a green light. The advantage of LPI is that it puts pedestrians in the crosswalk in advance of cars and makes them more visible to turning motorists. The LPI can be omitted if no pedestrians press the pushbutton.

5.2.5 Accessibility for Disabled Persons

Accessible pedestrian features at traffic signals consist of audible and/or tactile communication to assist visually impaired persons with locating pushbuttons, identifying the appropriate button for the desired crossing, locating the curb ramp, and conveying the pedestrian signal status.

Currently, the City installs accessible signals where there is an identified need. Accessible signals may be a requirement at all new and reconstructed pedestrian signals when the Public Rights-of-Way Accessibility Guidelines (PROWAG) are adopted. Salt Lake City has installed accessible pedestrian features at many locations with known needs, such as the audible "chirp" signals in the downtown and Sugarhouse areas.

5.2.6 Mid-Block Crossings

In addition to standard pedestrian traffic signals, the following three types of mid-block pedestrian traffic control devices may be used to improve safety:

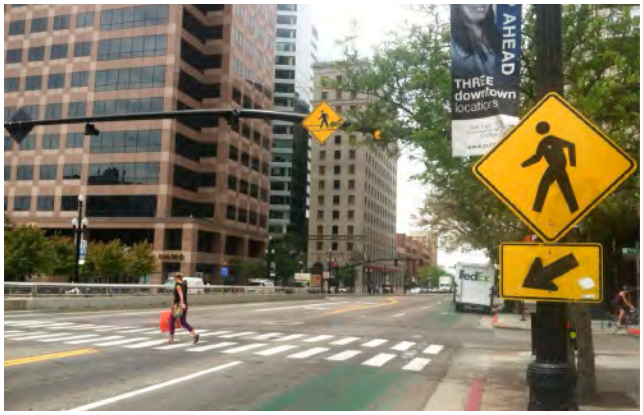
- Warning Sign with Flashing Beacons
- Pedestrian Hybrid Beacon (also known as a High Intensity Activated Crosswalk or "HAWK")
- Toucan signal

5.2.6.1 Flashing Beacons

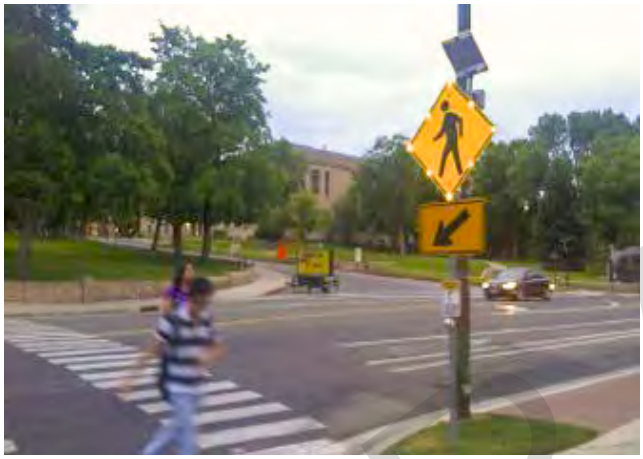
Various types of flashers may accompany warning signs. Examples include rectangular rapid flashing beacons (RRFB), yellow ball flashers, and LED flashers outlining the signs. Although these methods differ, they share a common goal of garnering motorists' attention with flashing beacons. Flashing beacons are typically used at marked mid-block crosswalks where extra motorist warning is desired. They are relatively inexpensive compared to higher-level mid-block signalization options like HAWKs, Toucans, and regular pedestrian signals.

Yellow ball flashers are often used in overhead mast arms, whereas RRFB and LED flashers are typically used in combination with street signs. The MUTCD contains the most up to date national standards for these devices. RRFB is currently the accepted standard for flashing beacons on signs, but LED flashers are being considered as well.

RRFB pedestrian crossing at 1100 East South Temple



Flashing yellow ball crossing at Regent St/200 South



LED flashing sign at Presidents Circle/200 S

5.2.6.2 HAWKs

HAWK signals consist of two red lenses above a single yellow lens. The beacon head is dark until a pedestrian activates it by pushbutton. After brief yellow flashing and steady yellow intervals, the signal displays a steady red indication to drivers and a WALK indication to pedestrians, allowing them to cross the road while traffic is stopped.

After the WALK phase ends, the pedestrian indication changes to a flashing upraised hand and countdown timer. During the countdown phase, the hybrid beacon displays alternating flashing red lights to drivers, indicating a STOP condition just as if a STOP sign were present. After stopping for crossing pedestrians, drivers can then proceed when pedestrians are outside of their lane and the adjoining lane(s). After the countdown phase ends the overhead traffic signal goes completely dark and the pedestrian signal displays a solid upraised hand.

HAWK signal on 100 S between West Temple and Main St

HAWKs are much more expensive than flashing beacons, typically costing almost as much as a standard traffic signal. However, they are more effective than flashing beacons because they require vehicles to stop, helping pedestrians cross busy high-speed streets safely and comfortably while minimizing traffic flow interruptions better than a standard traffic signal.

5.2.6.3 Toucans

Toucan signals allow pedestrians and bicyclists to make mid-block crossings simultaneously (i.e. “two can cross”). These signals are commonly used where multi-use paths or neighborhood bicycle boulevards cross a road. Separate pedestrian and bicycle signal heads allow the signal to time the crossing differently depending on which button is pushed, thereby minimizing delay. These heads are displayed to pedestrians and bicyclists as they approach the signal.

Toucan signal in Tucson (AZ)

Toucans are typically activated by pushbuttons but passive detection can also be used. Conventional three-section traffic signal heads are displayed to drivers. The signal rests in green until activated by a pedestrian or bicyclist. It displays a yellow signal followed by a steady red during the pedestrian/bicycle phase. Costs are similar to HAWK signals.

5.2.7 Pedestrian-Related Signal & Warning Beacon Recommendations

- In the downtown area continue using recalled pedestrian phases during the day with actuated pedestrian phases during light traffic hours because it represents the best balance between being pedestrian-friendly and creating unnecessary vehicle delays and air pollution.
- Continue installing countdown timers and latching pushbuttons with confirmation lights as new signal equipment is installed and old equipment is replaced.
- Evaluate protected bike lane impacts to pedestrian phasing and timing at specific intersections on a case-by-case basis as the City builds more of those types of facilities.
- Continue to consider exclusive pedestrian phases and scrambles in conjunction with special events, at signals with significant year-round pedestrian loads, or where they may yield signal operation benefits.
- Consider using LPIs in the downtown and other areas where pedestrian volumes are relatively high. Also consider using "No Turn on Red" blank-out signs in conjunction with LPIs.
- Consider implementing a proactive policy to identify locations where additional accessible signal features may be desirable, standardize equipment according to best practices and PROWAG guidelines, and describe conditions under which they will be installed.
- Continue installing mid-block pedestrian warning beacons and signals using the treatments most appropriate for specific sites, per the City's current process that considers traffic speeds, volumes, number of lanes, and expected pedestrian use as major determining factors.

5.3 Pedestrian Counts

Salt Lake City recently purchased infrared counters that can be used to count pedestrians on a regular basis. Resources to assist the City with future pedestrian counts may be found at the National Bicycle and Pedestrian Documentation Project website.

5.4 Pedestrian Spot Improvements

Some recommended locations for the signals and treatments discussed previously are identified in this plan as spot improvements. Spot improvements are small non-linear projects, such as intersection upgrades, crosswalks, and mid-block crossing installations, that cannot be easily represented by lines on a map. Figure 5-1 shows recommended pedestrian spot improvements associated with this plan. This map is not an exhaustive representation of pedestrian spot improvements that will be planned or implemented in Salt Lake City. As mentioned in Section 5.1.2.2, the City will use a pedestrian crossing and signalization toolbox to improve pedestrian crossings throughout the City.

Some bicycling spot and linear recommendations also benefit pedestrians. For example, the neighborhood bicycle boulevard network recommendations described in Chapter 6 help bicyclists and pedestrians cross busy roadways and reduce traffic volumes on the boulevards themselves, which also makes walking safer and more enjoyable. In some cities bicycle boulevards are called neighborhood greenways because they are not just for bicyclists. Protected bike lanes also offer benefits for pedestrians as illustrated by Figure 5-5.

5.5 Pedestrian Typologies

The pedestrian typologies shown in Figures 5-2 to 5-7 are not specific corridor or site designs. Rather, they provide conceptual design information for six typical situations that the City may encounter when trying to improve pedestrian conditions.

Figure 5-1 Pedestrian Spot Improvement Recommendations Map

Recommended Pedestrian Spot Improvements

- Enhanced Road Crossings and Signals
- Intersections and Signage
- New Pavement and Curb Cuts
- Structure Improvements
- Misc Bicycle Blvd Improvements

Recommended Facilities

- Multi-Use Paths
- Transvalley Corridor*

Existing Facilities

- Multi-Use Paths

Existing Transit and Other Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line

*The exact alignment for the Transvalley Corridor (800 S/900 S) is pending. Per the 1992 Salt Lake City Open Space Plan, the Transvalley Corridor is an opportunity to link "the City east of I-15 to the City west of I-15 and provide a pedestrian and bicycle route from the foothills, through the urban area, into the wetlands." The map shows a western terminus based on the City's 1992 Open Space Plan. Due to changes in this area of the city, a different western connection may now be appropriate, possibly extending to the Salt Lake Marina or Antelope Island.

0 0.5 1 2 Miles

Map Produced: 11/21/2014

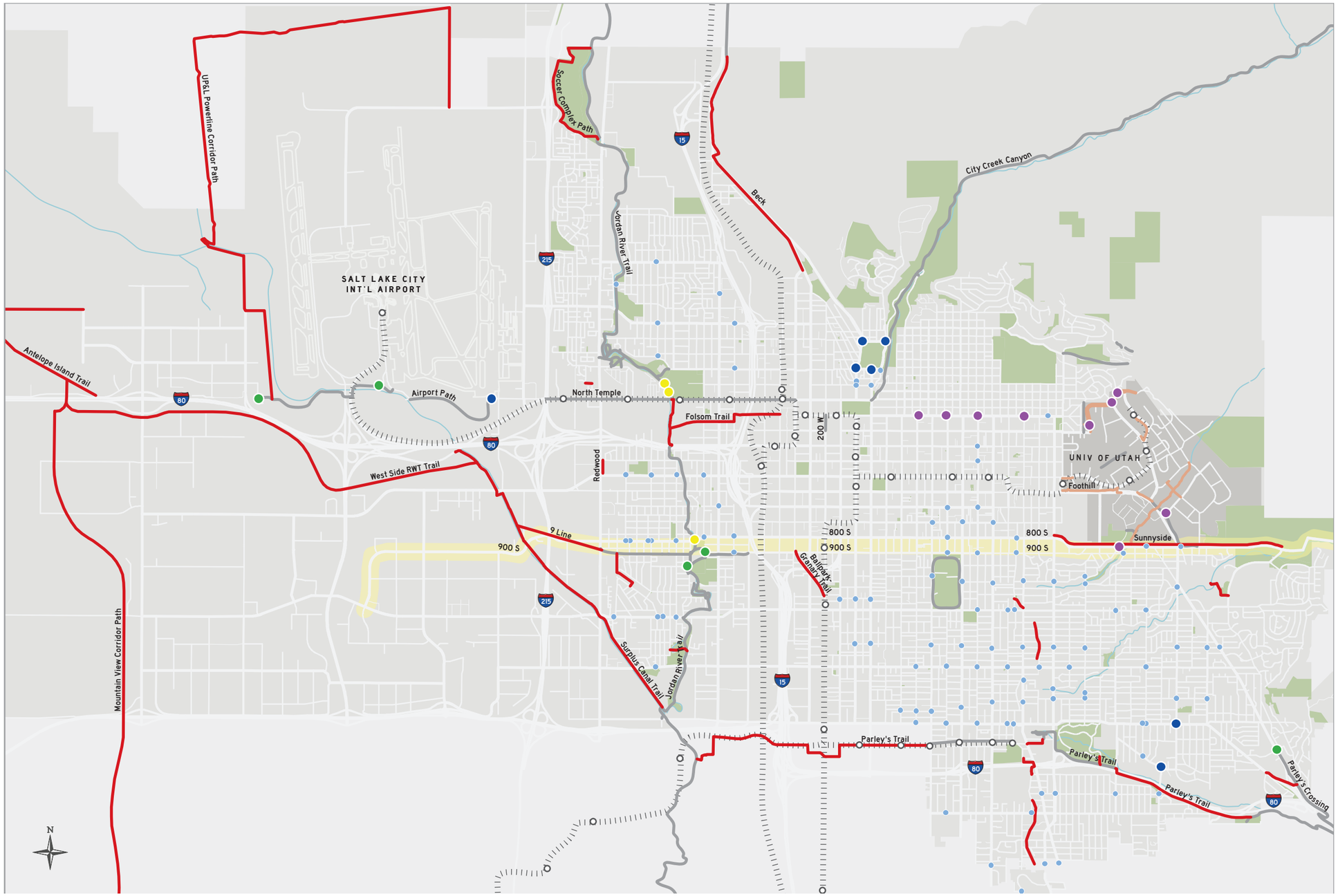
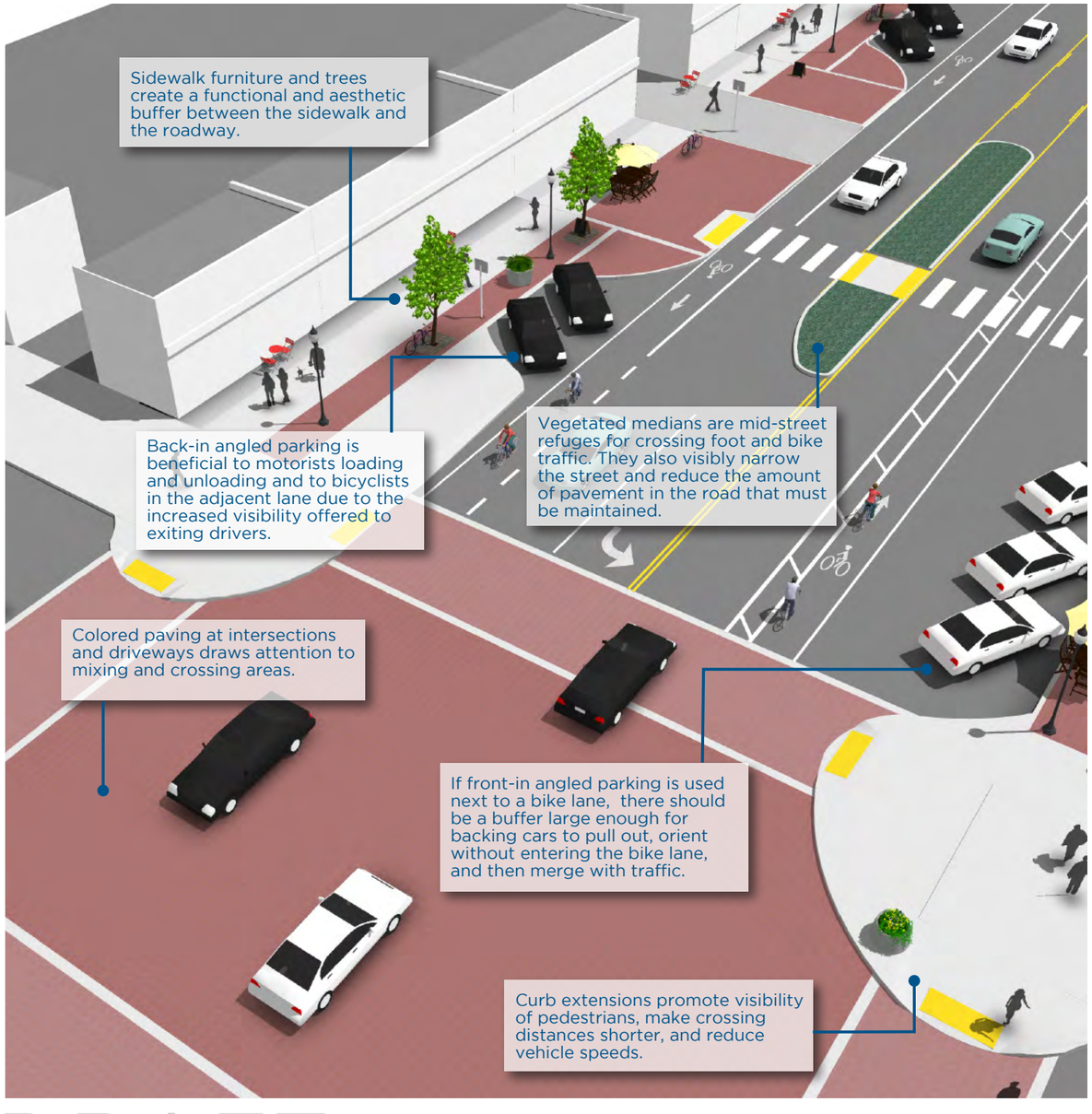


Figure 5-2 Neighborhood Business Node

Description

Neighborhood business nodes are usually intersections where a concentration and mix of uses exist, particularly retail and entertainment (e.g. movie theatres, retail stores, coffee shops, restaurants, outdoor dining and seating, etc.). Neighborhood business nodes usually incorporate streetscape elements like trees and planter boxes, on-street parking, curb extensions, reduced speed limits, and medians that provide a pleasant environment for walking, dining, shopping and bicycling.



Guidance

- Back-in angled parking is recommended when adjacent to a bike lane.
- Curb extensions, sidewalk furniture, median refuge islands, benches, and marked crossings create more space and an enjoyable setting for pedestrians and also reduce vehicle speeds.
- Curb extensions should use under-utilized or unused space on the street, like space needed for parking setbacks. They should not block bike lanes.

Back-in angled parking next to bike lane and streetscape:

Front-in angled parking next to bike lane (requires more room) and streetscape:

Parking buffer | Parking, landscaping, and curb extensions 14'-16' | Furnishing zone 2'-6' | Sidewalk through zone | Frontage zone | Building

Discussion

Sidewalks are often the life of neighborhood business nodes. They should be more than areas to travel; they should provide places for people to interact. There should be places for standing, visiting, and sitting. Sidewalks and streetscape design should contribute to the character of neighborhoods and business districts, strengthen their identity, and be an area where adults and children can safely participate in public life.

Additional References & Guidelines

Salt Lake City Planning Division. (2013). "Outdoor Dining Design Guidelines".

Salt Lake City. (2013). Downtown Master Plan Guideline. "Mid-block Walkways".

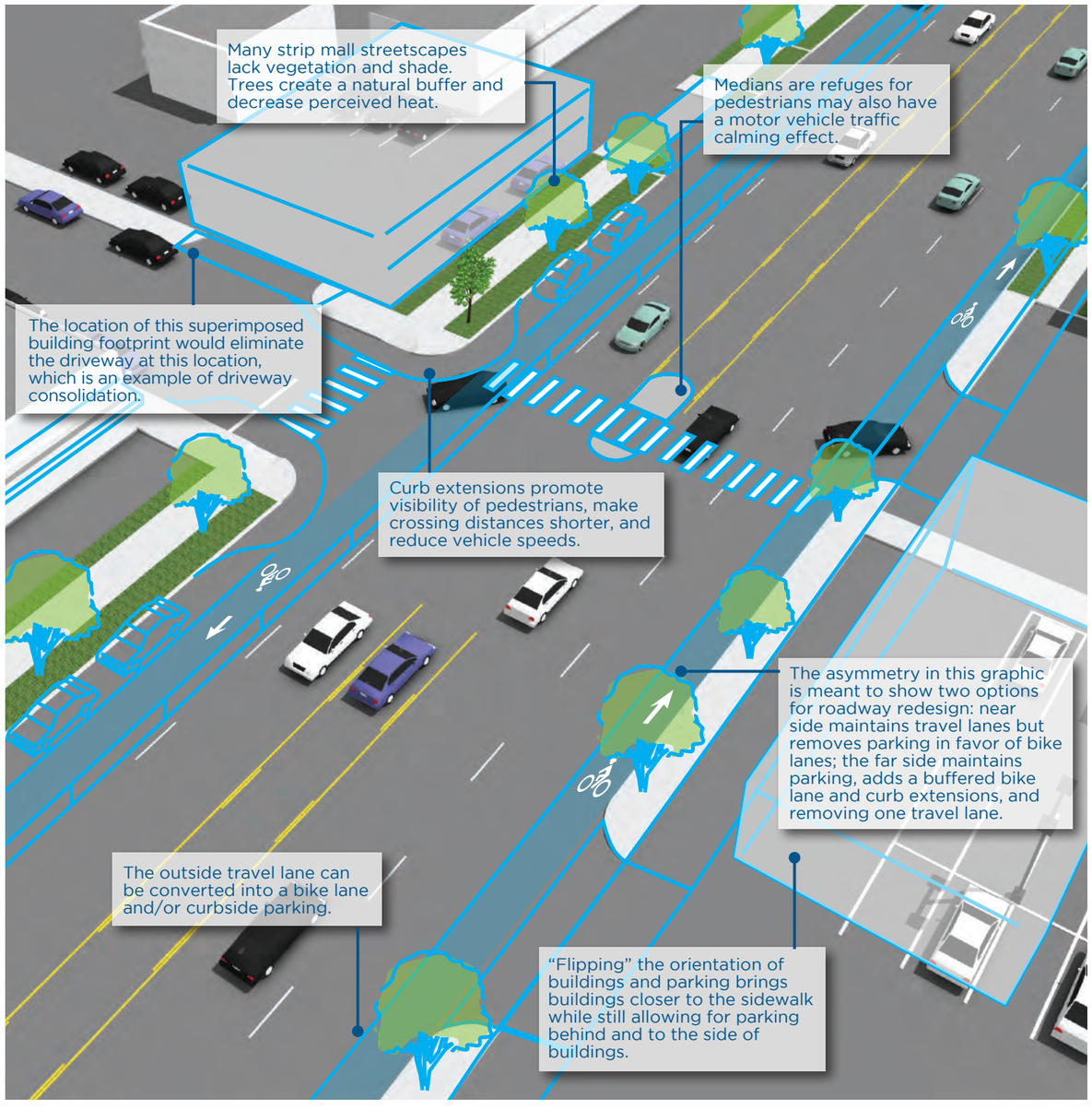
Materials and Maintenance

Due to Salt Lake City's winter climate, some sidewalk and on-street amenities (like chairs and tables) may need to be seasonal in nature and removed for safekeeping.

Figure 5-3 Strip Mall Retrofit

Description

Strip malls are often characterized by large surface parking lots that divide store frontages from the roadway and sidewalks. Additional buildings that front the sidewalk and streetscape will create a more walking-friendly environment and decrease the reliance on automobiles for access to work, shopping, entertainment, and socializing. Improving the streetscape with vegetation and travel lane reductions (where possible) will also contribute to a more attractive enviroment.



Guidance

- Buildings should be located near the sidewalk to increase pedestrian and bicyclist access as well as to better define the street from the motorist perspective.
- Widen sidewalks where possible.
- Excess roadway width can be converted into street parking, bike lanes, and/or traffic buffers.
- Strip malls are often characterized by frequent driveway access. Where possible, driveway access should be consolidated and remaining driveways should be calmed through the use of narrower entrances, curb extensions, and other designs that reduce vehicle speeds and make walking more comfortable.

Before:

After:

Bicycle Lane | Parking | Sidewalk, landscaping, curb extensions, and/or sidewalk furniture

Discussion

Road reconstruction and private business investments are essential elements of strip mall retrofits. In order to successfully remake strip malls into more pedestrian- and bicycle-friendly streetscapes, zoning changes may be required.

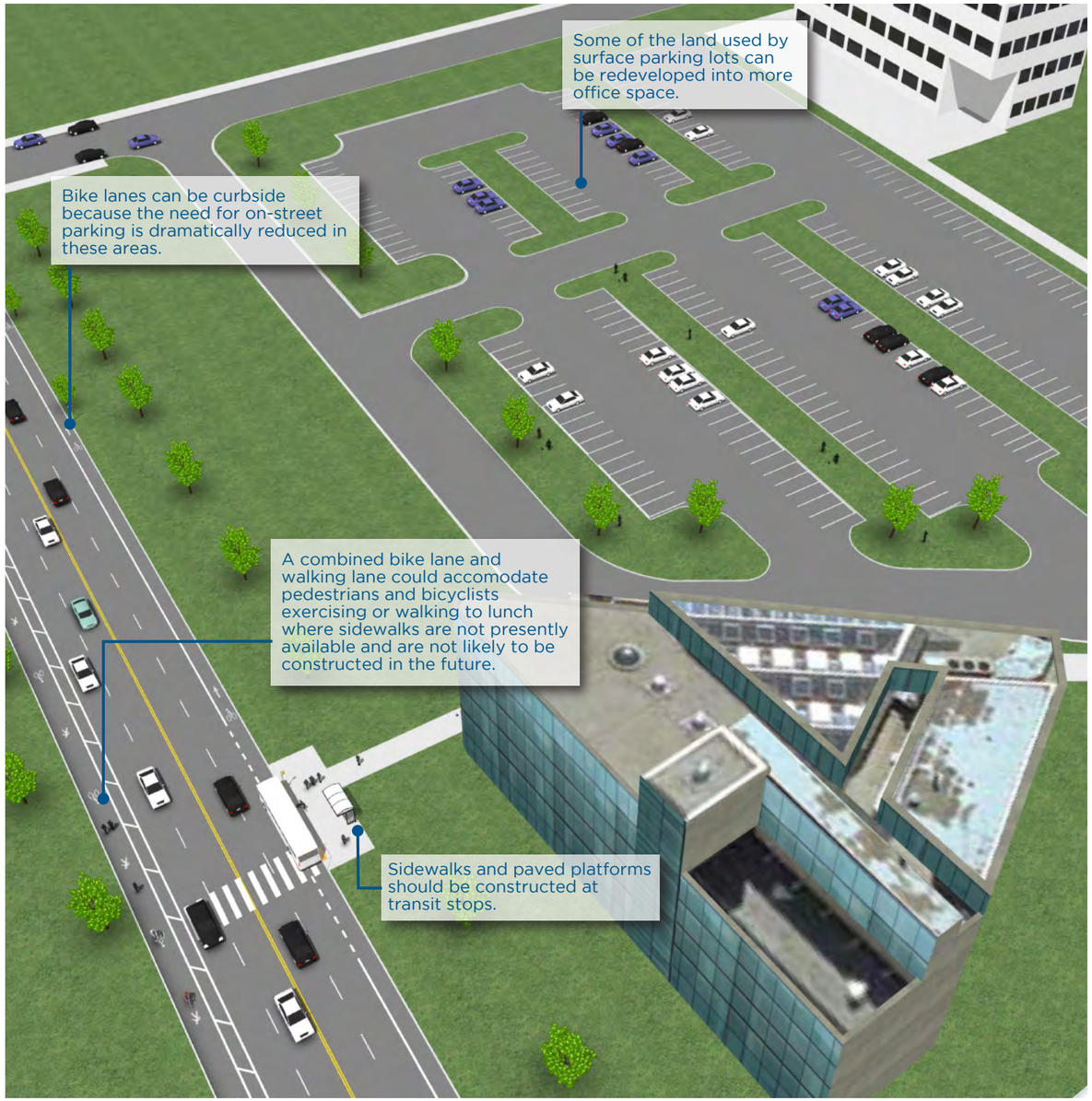
Materials and Maintenance

In Salt Lake City's winter climate, adding square footage to or creating new building footprints will reduce the need for parking lot snow removal and snow storage.

Figure 5-4 Suburban Business Park Without Sidewalks

Description

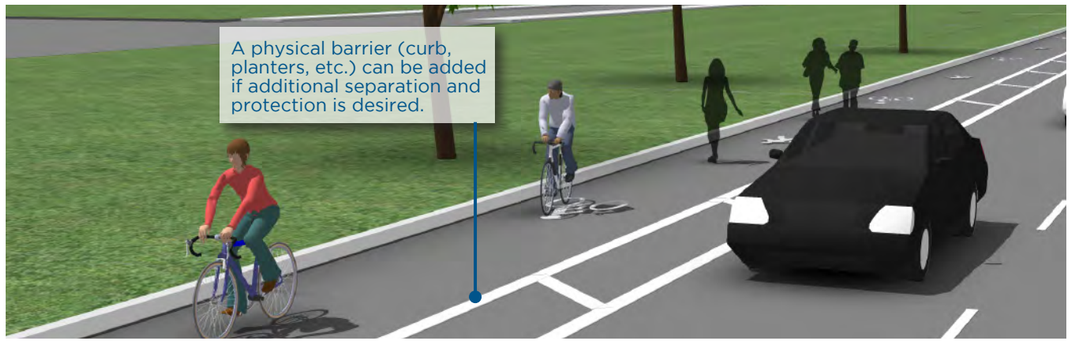
Historically, these job centers have been located on the fringes of a city or town and combine suburban development elements with the daytime employment peak hours and demands. They are primarily designed for motorists in single occupancy vehicles arriving in the morning and departing in the evening and frequently lack sidewalks. A retrofit of this type of land use would accommodate and encourage more walking, exercise, and more options for transportation to and from the site, as well as mid-day users.



Guidance

- Sidewalks may replace some green space in order to accomodate walking, access to and from transit, and exercising.
- Due to the frequent presence of large surface parking lots, on-street parking is, for the most part, unnecessary. Providing it may not be an efficient use of roadway space.
- Encouraging transit-oriented development and corporate transit pass programs decreases parking demand and peak-hour congestion.

Bicyclist & pedestrian lane interface:



Transit stop accomodation:

Discussion

Businesses within suburban business parks are often self-contained, which reduces the need for employees to go out for lunch or other needs. However, some people like to use their lunch hour for exercise or to walk to a lunch destination and providing places for them to walk and bike helps to satisfy this demand. Specific attention should be given to making transit stops more accessible and attractive to employees.

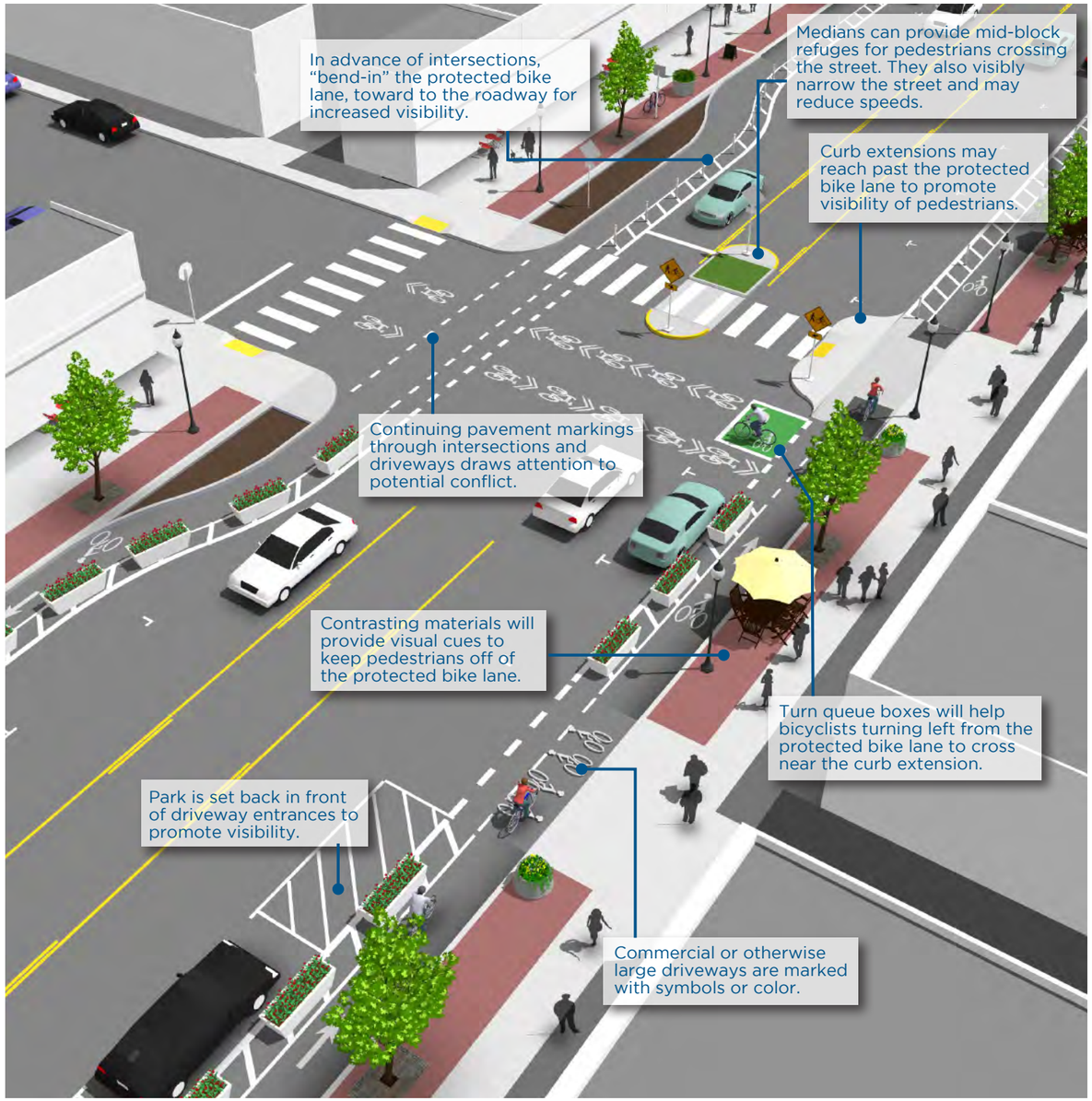
When the opportunity to retrofit suburban business parks arises, consideration should be given to consolidating parking between the various businesses. Unused green space should also be consolidated into more productive, usable vegetated spaces. Building accesses should be added or reoriented to face the street rather than only face parking lots located at the rear of the buildings. Sidewalks would preferably be added along all streets as part of retrofits but this graphic emphasizes improvements that could be made in lieu of continuous sidewalks.

Figure 5-5 Protected Bike Lane Streetscape

Description

One-way protected bike lanes are physically separated from motor traffic and distinct from the sidewalk. Protected bike lanes are either raised or at street level and use a variety of elements for physical protection from passing traffic.

Bike lane protection is provided through physical barriers and can include bollards, planter strips, raised curbs, on-street parking, or medians. Protected bike lanes using these protection elements are typically "street level" and share the same elevation as adjacent travel lanes.



Guidance

- 7 foot recommended minimum protected bike lane width to allow passing.
- 3 foot buffer between parked cars and protected bike lane recommended to allow for standard plows to clear snow, to make passenger loading easier, and to prevent bicyclist collisions with car doors.
- When placed adjacent to a travel lane, one-way raised protected bike lanes may be configured with a mountable curb to allow entry and exit from the bicycle lane for passing other bicyclists or to access vehicular turn lanes.

Paint and bollard street-level protected bike lane retrofit:

Planter box-separated street-level protected bike lane retrofit:

Note: actual numbers of lanes and dimensions of those lanes will vary from street to street.

Discussion

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions. Driveways and minor street crossings are unique challenges to protected bike lane design. Parking should be prohibited within 30 feet of each intersection and major driveway to improve visibility. Color, yield markings, and "Yield to Bikes" signage should be used to identify the conflict area and make it clear that the protected bike lane has priority over entering and exiting traffic.

Additional References and Guidelines

NACTO. (2012). Urban Bikeway Design Guide.

Salt Lake City. (2013). Downtown Master Plan Guideline. "Mid-block Walkways".

Materials and Maintenance

In cities with winter climates, barrier-protected bike lanes may require special equipment for snow removal.

Figure 5-6 Improving Neighborhood Connections to Major Destinations

Install new crossings and add curb extensions on both ends of the crosswalks (to shorten crossing distance and time), median refuge island, LED flashing signs, and a left turn lane east of the crosswalk for turning motorists.

Example pedestrian crossing on 1700 South in Salt Lake City

Construct a hard- or greenscaped raised median to replace the existing paint-striped center turn lane. Leave gaps for left turning motorists to enter major destinations and adequate entrances for left turning motorists.

Raised center median with left turn bays for turning traffic on 700 East near Liberty Park in Salt Lake City

Proposed at-grade or grade-separated crossing

GENERAL NOTE

Replacing some on-street parking spaces with curb extensions will help calm traffic speed. The curb extensions should not impede bicycle traffic.

Planters and curb extensions in the parking lane on Sunset Blvd in Santa Clara, UT

Install new signalized crossing treatments (e.g. HAWK, Toucan) to provide opportunities for pedestrians and bicyclists to cross major roadways. Consider curb extensions to shorten pedestrian crossing time and distance and install wayfinding signage.

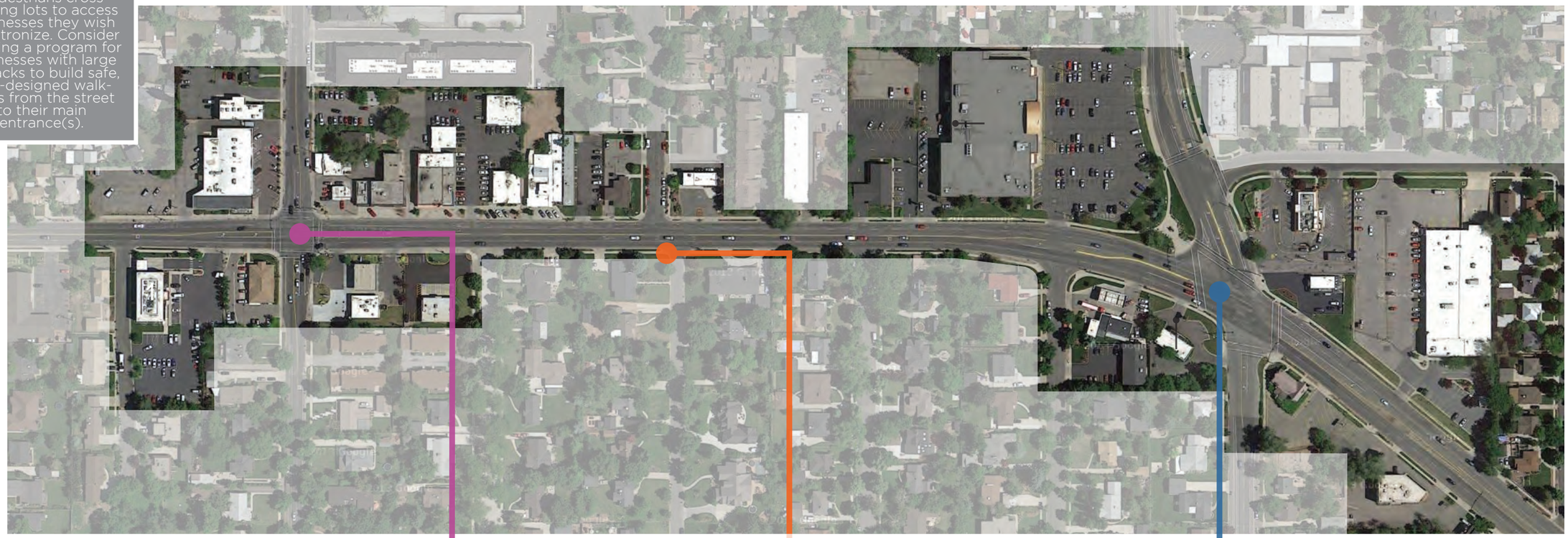
HAWK crossing
(Photo: Mike Cynecki)

Wayfinding signage in Portland, OR
(Photo: PBOT)

Figure 5-7 Neighborhood Commercial District

GENERAL NOTE

Pedestrians cross parking lots to access businesses they wish to patronize. Consider creating a program for businesses with large setbacks to build safe, well-designed walk-ways from the street to their main entrance(s).



← Bike lane and one travel lane in each direction, and a landscaped center median and turn bay area

Buffered bike lane and one travel lane in each direction, and a landscaped center median and turn bay area

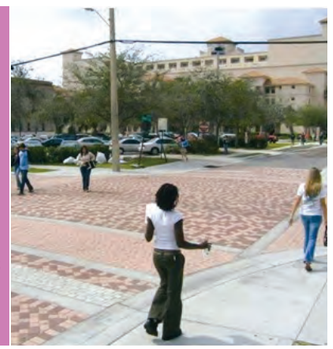
South side parking lane, buffered bike lane, two travel lanes in each direction, and a landscaped center median and turn bay →

GENERAL NOTE

Replace the existing paint-striped center turn lane with a hard- or green-scaped raised median along the entire corridor. Leave gaps for key left turning movements at key intersec-tions and parking lot driveways.

Buffered bike lanes and a raised center median

Recon-struct the intersec-tion with brick or colored concrete in order to mark the entrance & exit of the district, alert drivers to pedestrians in the crosswalk, and calm traffic.



Textured and colored intersection (Photo: FHWA)

RRFB or LED-controlled crossing with colored con-crete or brick at the offset intersection. Further traffic analysis should determine what class of crossing control should be installed.

Brick RRFB-controlled crossing in a school zone (Photo: Safe Routes to School Coalition)

A roundabout will offer speed control. It can create shorter and more priori-tized pedes-trian crossings and may increase walking comfort.

Pedestrian crossing in a roundabout

CHAPTER SIX

BICYCLING RECOMMENDATIONS

Bicyclists are much more affected by facility design, construction, and maintenance practices than motor vehicle drivers because of their exposure level. They lack the protection from weather and roadway hazards provided by an automobile's structure and safety features. By understanding their unique characteristics and needs, Salt Lake City can provide Complete Streets for bicyclists.

People who bicycle vary in their physical abilities, experience levels, and the types of bicycles that they ride. In the context of bicyclists, a Complete Street is one that is designed to comfortably accommodate the different types of people expected to ride there. Many streets such as low speed, low volume local streets may not need any special facilities to accommodate bicyclists, while others with larger volumes and higher speeds may require significant bikeway infrastructure investments.

The bicycling recommendations provided in this chapter represent a master planning level of thought and detail. Recommendations may change as individual projects are implemented.

Primary subsections of this chapter include:

- Bikeway Type Descriptions
- Evolution Toward Low-Stress Bicycling
- Bikeway Recommendations
- Interim Bypass Routes
- Bikeway Maintenance
- Traffic Signal Considerations
- Bicycle Counts & Surveys

6.1 Bikeway Type Descriptions

Bicycle facilities can generally be grouped into two categories – conventional and low stress facilities. Salt Lake City currently has nearly every type of facility described in this chapter in its network.

The bikeway classes described in this chapter are organized first by group (conventional and low stress) and then within each group by degree of separation from motor vehicle traffic, from most separation to least separation.

6.1.1 Conventional Bike Facilities

Conventional facilities like bike lanes and shared lane markings have been standard practice in the U.S. for many years. They provide dedicated or shared space for confident bicyclists who have experience riding next to traffic.

6.1.1.1 Conventional Bike Lanes

This type of bikeway uses signage and striping to delineate roadway space for exclusive use of bicyclists. Conventional bike lanes are typically located to the right of the outside car lane. Parking may be allowed to the right of the bike lane.

6.1.1.2 Shared Lane Markings

Shared lane markings (i.e. "sharrows") indicate a travel lane shared by bicyclists and motor vehicles. According to NACTO, shared lane markings "reinforce the legitimacy of bicycle traffic on the street and recommend proper bicyclist positioning."

6.1.1.3 Signed Shared Roadways

This type of facility is typically used on streets with lower motor vehicle traffic volumes or speeds where bike lanes are not feasible or necessary. It's defining characteristic is the green "Bike Route" sign used to mark the route.

Conventional bike lane on 200 S

Shared lane marking on 1700 S

Bicyclist on signed shared roadway

"I wish there were more protected and buffered bike lanes in Salt Lake City."

- Comment from 2013 public survey

6.1.2 Low Stress Bike Facilities

Low stress bikeways appeal to a broader cross section of the public than conventional facilities. Their low stress nature is a result of greater separation from traffic or use of low volume, low speed streets depending on the specific facility type.

6.1.2.1 Multi-Use Paths

Multi-use paths are separated from cars by open space or barriers and are for the exclusive use of bicyclists, pedestrians, and other non-motorized users. They are frequently located along waterways, utility corridors, and other rights-of-way where interactions with cars are limited.

6.1.2.2 Protected Bike Lanes

Protected bike lanes are separated from traffic by a physical barrier of some kind and are also distinct from the sidewalk. Barriers may be in the form of planters, raised curbs, parking, bollards, or other streetscape elements. Protected bike lanes can be configured for either one-way or two-way travel.

6.1.2.3 Buffered Bike Lanes

These are similar to conventional bike lanes with the difference being a painted buffer between the bike lane and adjacent car lane. Alternatively, the buffer may also be placed between the bike lane and parked cars. Where space permits, buffers are sometimes placed on both sides of the bike lane. Buffered bike lanes differ from protected bike lanes because the buffer space is paint rather than a physical barrier.

Jordan River Parkway Trail near International Peace Gardens

Bicyclist on 300 E protected bike lane

People riding in a buffered bike lane on 300 E

6.1.2.4 Neighborhood Bicycle Boulevards

Neighborhood bicycle boulevards are shared, on-street facilities with low traffic volumes and speeds. Intersection improvements to allow bicyclists to cross large busy streets are critical to their utility. Wayfinding signage and shared lane markings are also important components. Traffic diversion and calming measures are often used when traffic volumes or speeds are higher than desirable.

Neighborhood bicycle boulevard with traffic diverters in Portland (OR)

6.2 Evolution Toward Low Stress Bicycling

Salt Lake City's established system of multi-use paths and on-street bike lanes enables a modest percentage of the population to feel comfortable traveling by bicycle. People who feel comfortable riding in mixed traffic or in bike lanes adjacent to mixed traffic are generally able to access most places in the City currently. However, a much larger segment of the public would like to ride bicycles more but are discouraged from doing so by the currently available bikeways.

Surveys both nationally and locally show that 50-60% of people say they would ride more (or start riding) if they had access to bikeways that provide more separation from traffic, lower traffic speeds, and lower traffic volumes. For this reason, identifying opportunities for more low stress bikeways was an emphasis of this master plan. Input received from the nearly 30 community event tables also indicated a strong demand for more facilities like the 300 South and 300 East protected bike lanes.

In the online survey (see Section 3.3), people were asked to rank bicycle facilities by their preference. Results reveal that even those who are currently urban bicyclists generally favor bikeways with more separation, as illustrated by Figure 6-1. Support for non-separated facilities also remains high.

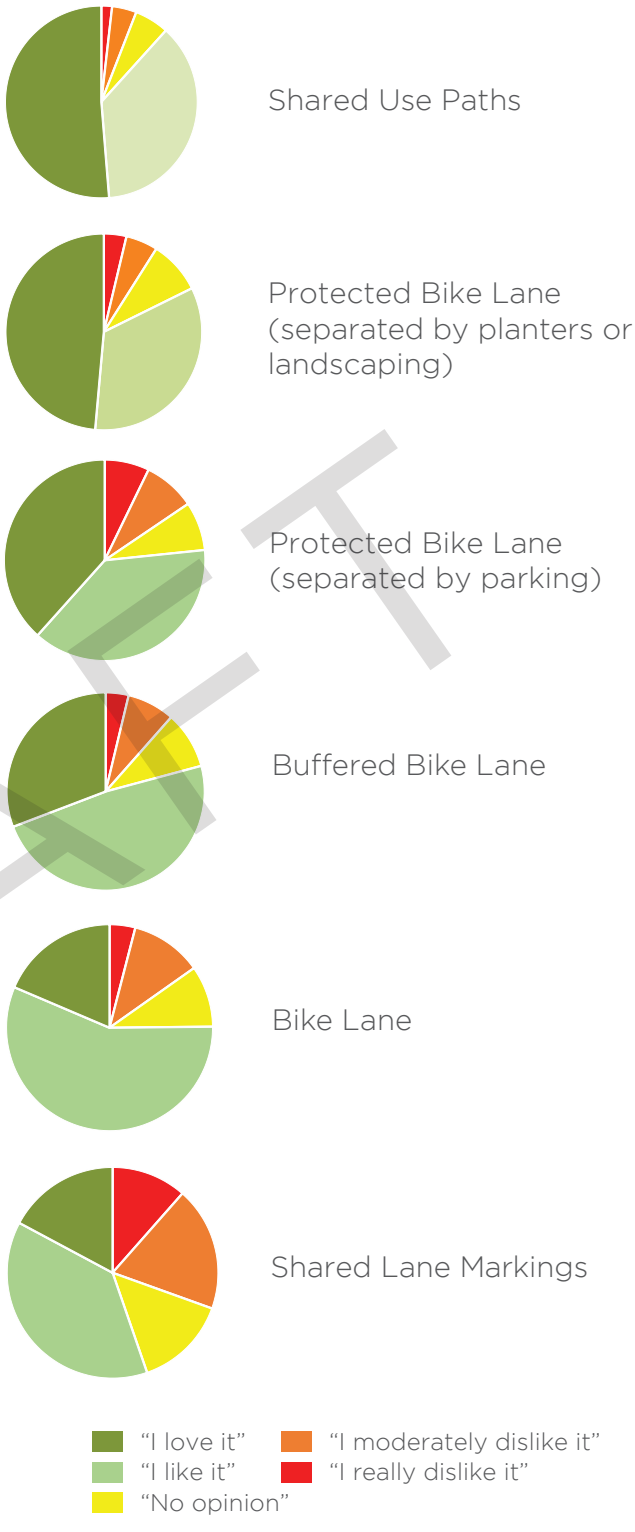


Figure 6-1 2013 Public Survey Bicycle Facilities Preferences

Particular emphasis was placed in this master plan upon providing recommendations for a low stress bikeway network in the downtown area. Downtown Salt Lake City is a destination for jobs, residential housing, entertainment, and shopping. Many people desire to ride to these destinations but historically the downtown bikeways on City streets have not been comfortable enough to appeal to a wide cross section of the public.

Bringing more people downtown without cars benefits businesses, frees up valuable street parking, reduces car traffic, and improves air quality. It also supports business employment of highly educated professionals who are often more interested in bicycling to work. Large employers, especially those in high-tech industries, are finding that this lifestyle choice is key to attracting and retaining the best employees.

6.3 Bikeway Recommendations

The bikeway recommendations – both low stress and conventional – presented in this section are based on public input, coordination with the Stakeholder and Steering Committees, and connectivity needs. Non-City entities such as UDOT and the University of Utah were included in the Stakeholder Committee. Additional coordination will be needed to implement facilities in corridors owned by outside agencies. Recommendations may change as individual projects are implemented.

6.3.1 General Network Maps

Figure 6-2 shows how implementation of the bikeway recommendations over the next 20 years would increase the percentage of roads that include bikeways. Approximately 85% of City arterial and collector mileage would have bikeways if all recommendations are brought to fruition.

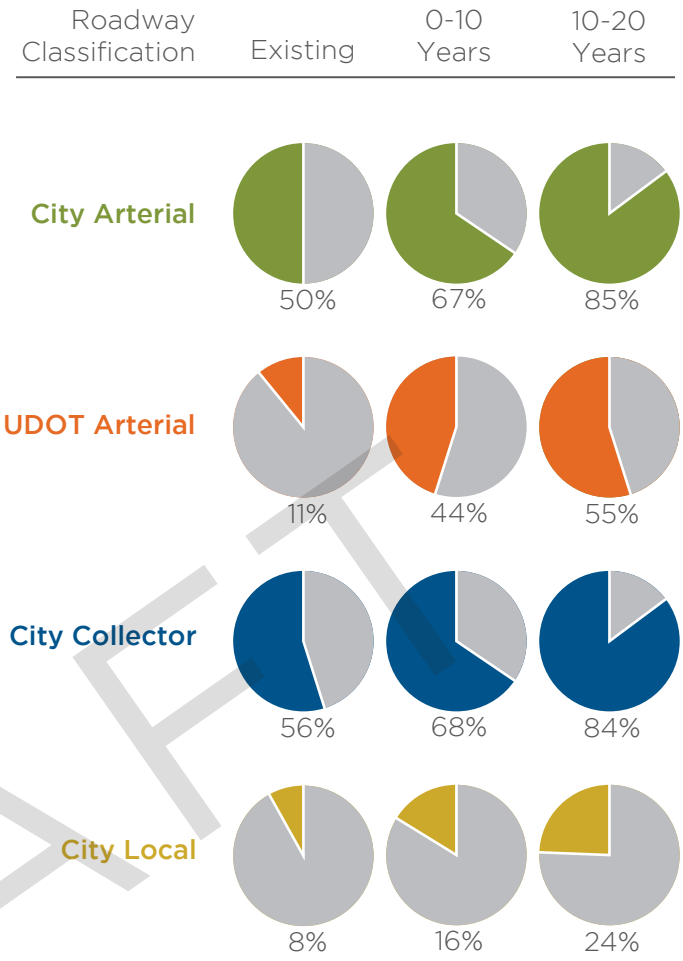


Figure 6-2 Percentage of Road Miles With Bikeways

Figures 6-3 presents the City's existing bicycling network. Figure 6-4 shows the short term recommendations (0-10 years), Figure 6-5 shows the long term recommendations (10-20 years), and Figure 6-6 shows all bicycle facility recommendations (0-20 years). Phasing recommendations are based on building a logical network as well as tapping the City's pavement maintenance process as a good opportunity to change street designs.

6.3.2 Low Stress Network Maps

Figures 6-7a and 6-7b show the low stress recommendations for the entire City and downtown, respectively.

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Figure 6-3 Bicycling Network Existing Conditions Map

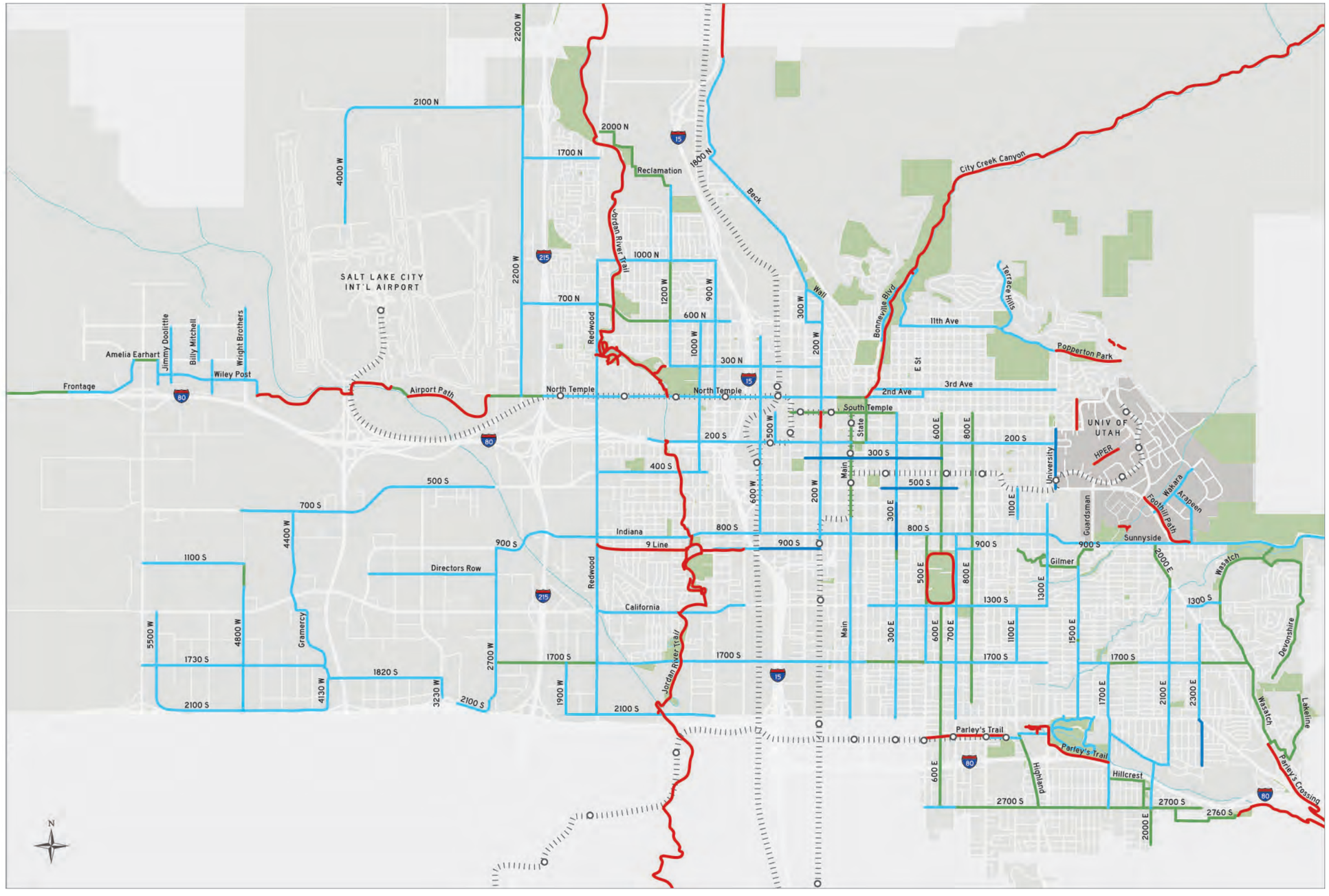

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Figure 6-4 Bicycling Network Existing Conditions + Short Term (0-10 Years) Recommendations Map

Recommended Bikeways

- Multi-Use Paths
- Buffered or Protected Bike Lanes
- Bike Lanes
- Neighborhood Bicycle Blvds
- Shared Roadways*
- Bikeways Proposed in Univ. of Utah Bicycle Master Plan
- Requires Further Study
- Transvalley Corridor**

Existing Bikeways

- All Existing Bikeways

Existing Transit Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line

*Includes marked & signed shared roadways

**The exact alignment for the Transvalley Corridor (800 S/900 S) is pending. Per the 1992 Salt Lake City Open Space Plan, the Transvalley Corridor is an opportunity to link "the City east of I-15 to the City west of I-15 and provide a pedestrian and bicycle route from the foothills, through the urban area, into the wetlands." The map shows a western terminus based on the City's 1992 Open Space Plan. Due to changes in this area of the city, a different western connection may now be appropriate, possibly extending to the Salt Lake Marina or Antelope Island.

Note: The protected bike lanes on 200 E (South Temple to 900 S) and 300 E (100 S to 600 S) are both shown on the map, but only one of the two options will be constructed.

0 0.5 1 2 Miles

Map Produced: 11/21/2014

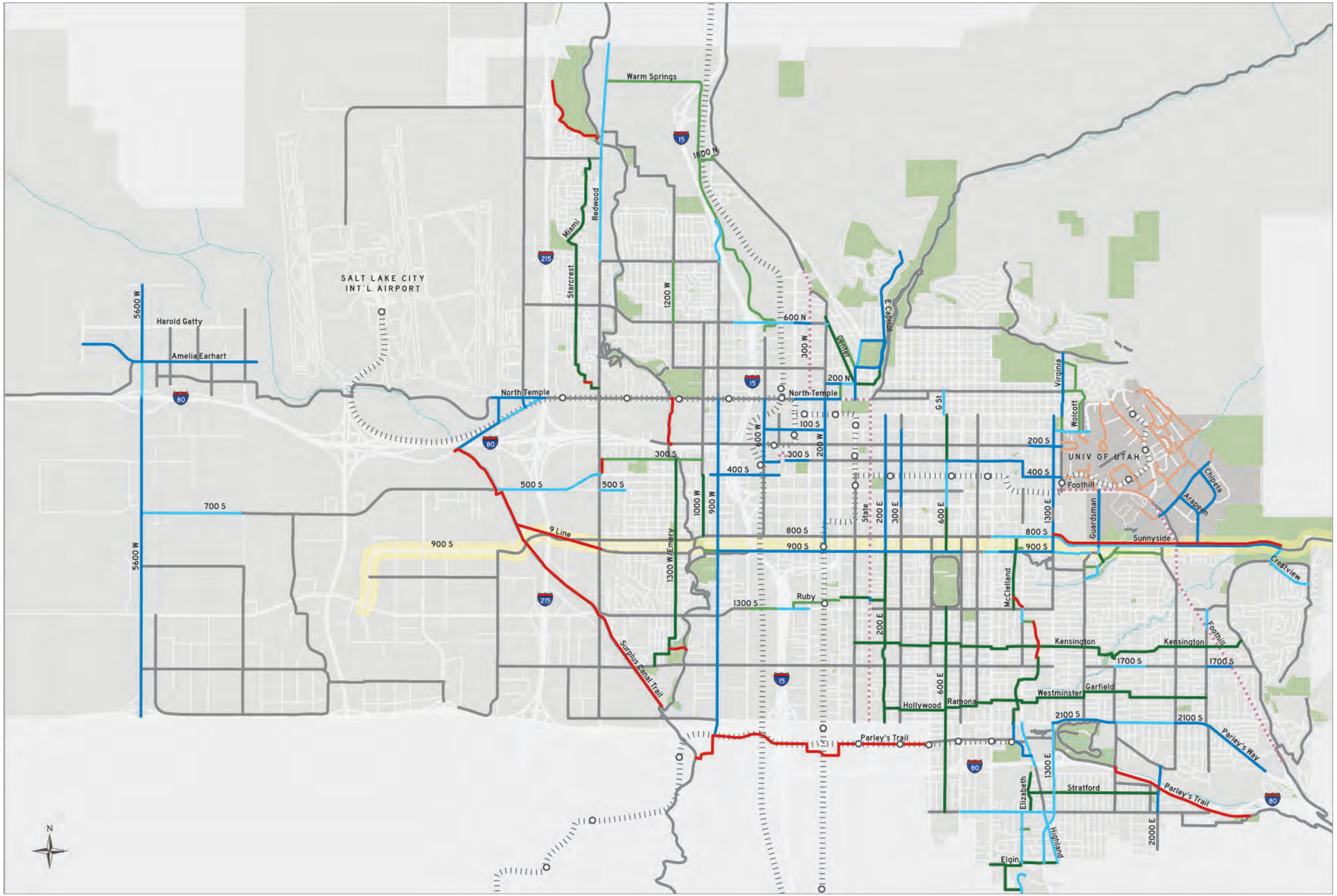

Figure 6-5 Bicycling Network Existing Conditions + Long Term (10-20 Years) Recommendations Map

Recommended Bikeways

- Multi-Use Paths
- Buffered or Protected Bike Lanes
- Bike Lanes
- Neighborhood Bicycle Blvds
- Shared Roadways*
- Bikeways Proposed in Univ. of Utah Bicycle Master Plan
- Requires Further Study
- Transvalley Corridor**

Existing Bikeways

- All Existing Bikeways

Existing Transit Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line

*Includes marked & signed shared roadways

**The exact alignment for the Transvalley Corridor (800 S/900 S) is pending. Per the 1992 Salt Lake City Open Space Plan, the Transvalley Corridor is an opportunity to link "the City east of I-15 to the City west of I-15 and provide a pedestrian and bicycle route from the foothills, through the urban area, into the wetlands." The map shows a western terminus based on the City's 1992 Open Space Plan. Due to changes in this area of the city, a different western connection may now be appropriate, possibly extending to the Salt Lake Marina or Antelope Island.

Note: The protected bike lanes on 200 E (South Temple to 900 S) and 300 E (100 S to 600 S) are both shown on the map, but only one of the two options will be constructed.

0 0.5 1 2 Miles

Map Produced: 11/21/2014

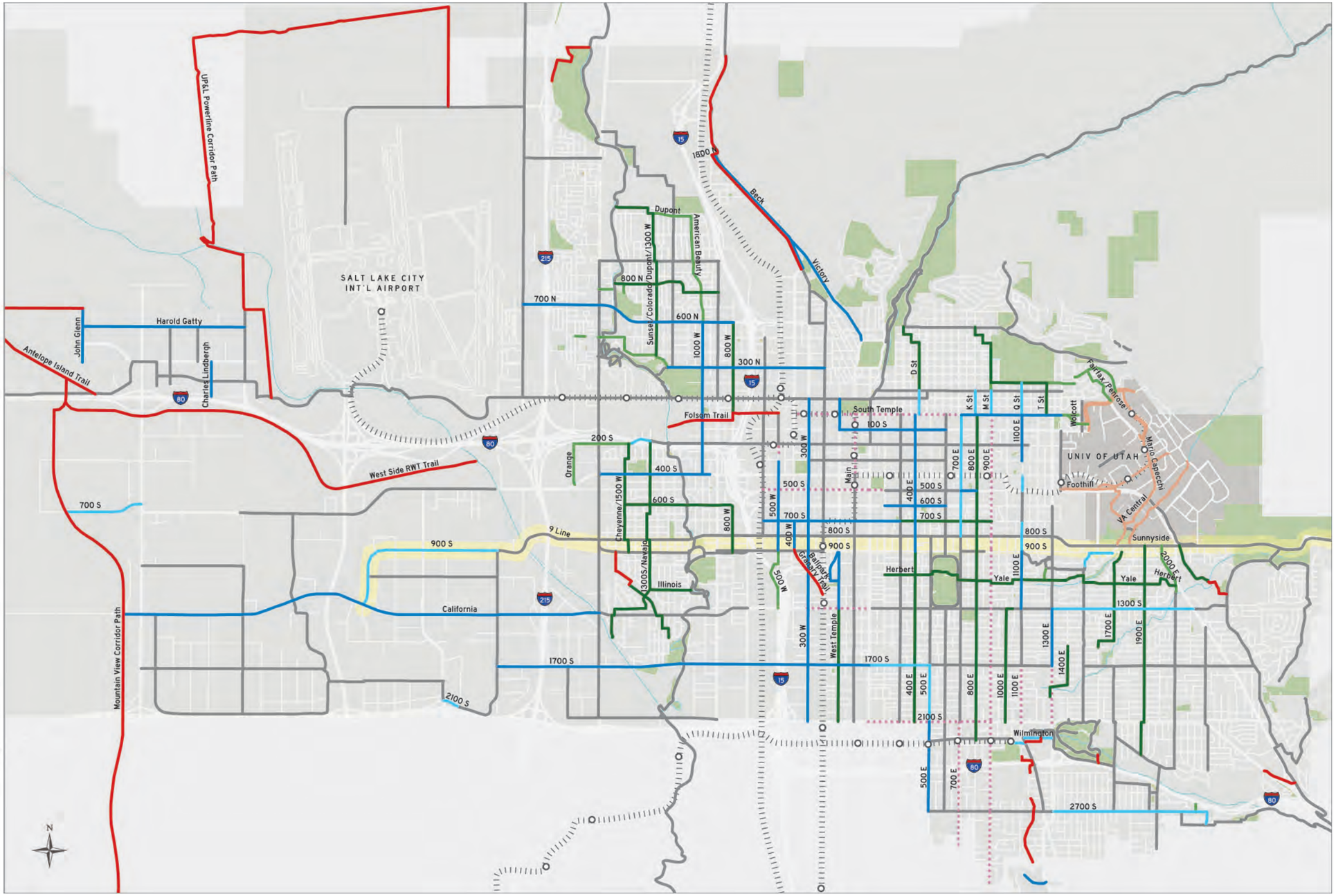

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Figure 6-6 Bicycling Network Existing Conditions + 20 Year Vision Map (2035)

Recommended Bikeways

- Multi-Use Paths
- Buffered or Protected Bike Lanes
- Bike Lanes
- Neighborhood Bicycle Blvds
- Shared Roadways*
- Bikeways Proposed in Univ. of Utah Bicycle Master Plan
- Requires Further Study
- Transvalley Corridor**

Existing Bikeways

- All Existing Bikeways

Existing Transit Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line

*Includes marked & signed shared roadways

**The exact alignment for the Transvalley Corridor (800 S/900 S) is pending. Per the 1992 Salt Lake City Open Space Plan, the Transvalley Corridor is an opportunity to link "the City east of I-15 to the City west of I-15 and provide a pedestrian and bicycle route from the foothills, through the urban area, into the wetlands." The map shows a western terminus based on the City's 1992 Open Space Plan. Due to changes in this area of the city, a different western connection may now be appropriate, possibly extending to the Salt Lake Marina or Antelope Island.

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0 0.5 1 2 Miles

Map Produced: 11/21/2014

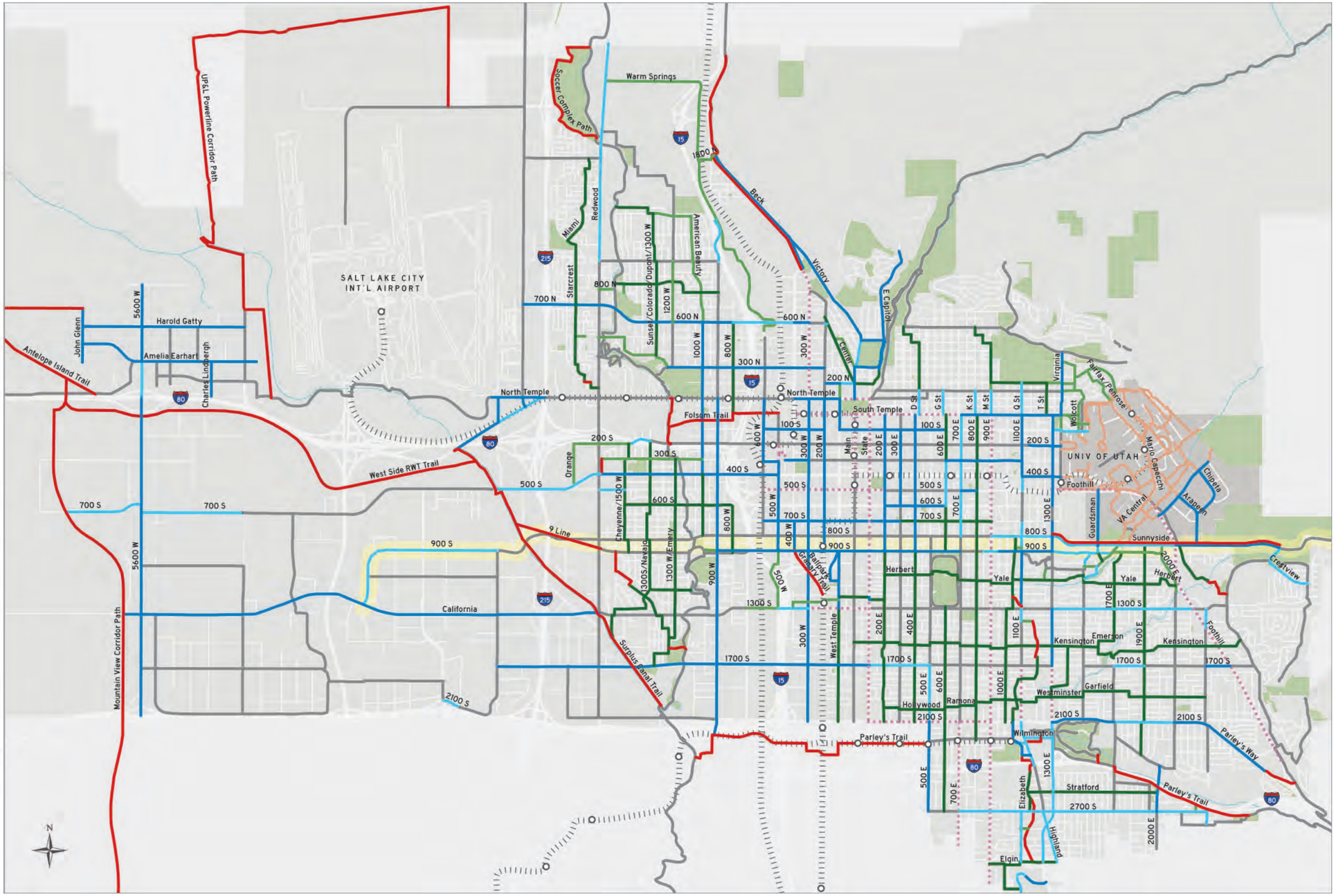


Figure 6-7a Low Stress Bicycling Network Recommendations Map (Citywide)

Recommended
Low Stress Bikeways

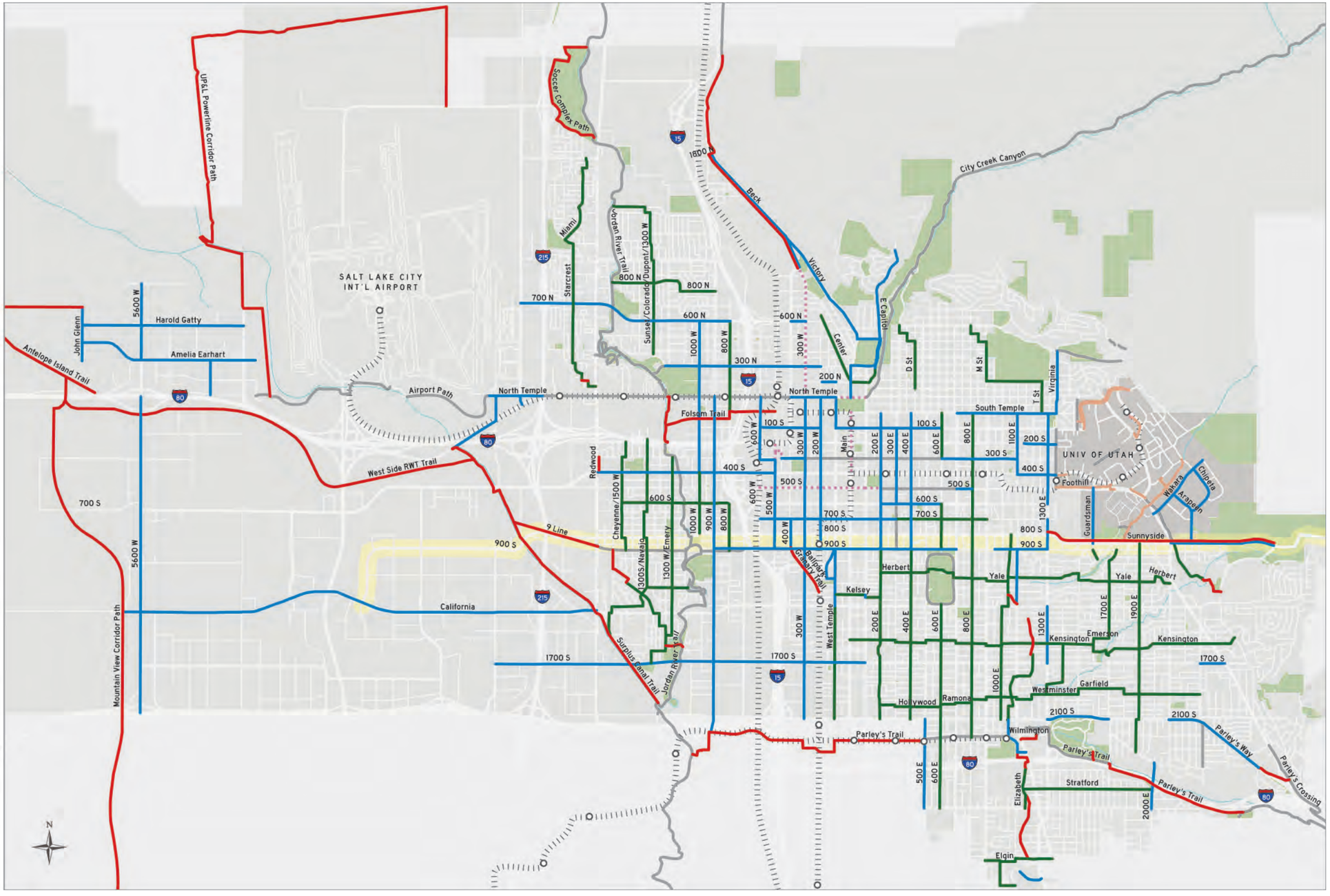
- Multi-Use Paths
- Buffered or Protected Bike Lanes
- Neighborhood Bicycle Blvds
- Bikeways Proposed in the Univ. of Utah Bicycle Master Plan
- Requires Further Study
- Transvalley Corridor*

Existing Low Stress Bikeways

- All Low Stress Bikeways

Existing Transit and Other Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line



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Note: The protected bike lanes on 200 E (South Temple to 900 S) and 300 E (100 S to 600 S) are both shown on the map, but only one of the two options will be constructed.

0 0.5 1 2 Miles

Map Produced: 11/21/2014

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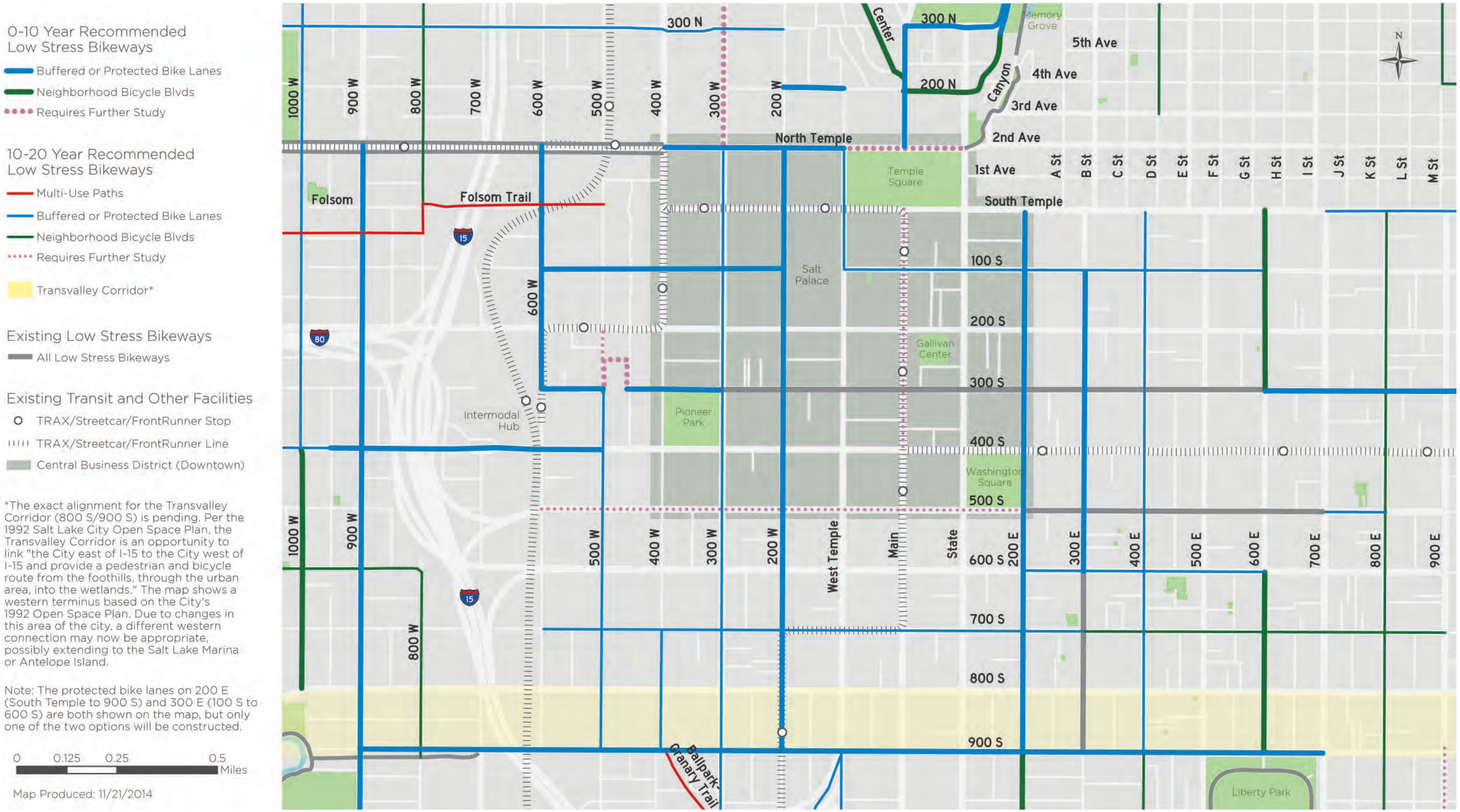
Figure 6-7b Low Stress Bicycling Network Recommendations Map (Downtown)



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"Being able to more easily take my bike on TRAX trains would be awesome."

- Comment from 2013 public survey

6.3.3 Transit Station Access

Many transit trips begin and end as walking or bicycling trips. Figure 6-8 shows the existing and recommended bikeways overlaid on the transit network within Salt Lake City limits. This figure illustrates how people in various parts of the City can access major transit stations by bicycle. Identification of needed spot improvements at transit stations will be handled as part of a separate Transit Master Plan.

6.3.4 Spot Improvements

The bicycle spot improvements presented in Figure 6-9 complement the linear bikeway recommendations. Spot improvements may consist of short gap closures, intersection upgrades, bridges, underpasses, curb cuts, or other improvements that are best represented by a dot on a map instead of a line. Maintenance items like pothole repair and minor striping changes are not included in this list because the City handles them routinely through a separate process.

Many of the spot improvements shown in Figure 6-9 also benefit pedestrians. Only spot improvements independent of linear bikeways are included in the spot improvements map. For example, intersection upgrades necessary for implementation of a particular neighborhood bicycle boulevard are assumed to be included in that linear project.

6.4 Interim Bypass Routes

Some bikeway implementations require difficult tradeoffs such as removal of traffic lanes or changes to on-street parking. In some cases the City may decide that the tradeoffs are not currently feasible in some segments. Interim bypass routes can be created to help bicyclists travel around the problematic areas until a more desirable, permanent solution is found. Figure 6-10 uses a challenging section of 1300 South to illustrate how this can be done.

6.5 Bikeway Maintenance

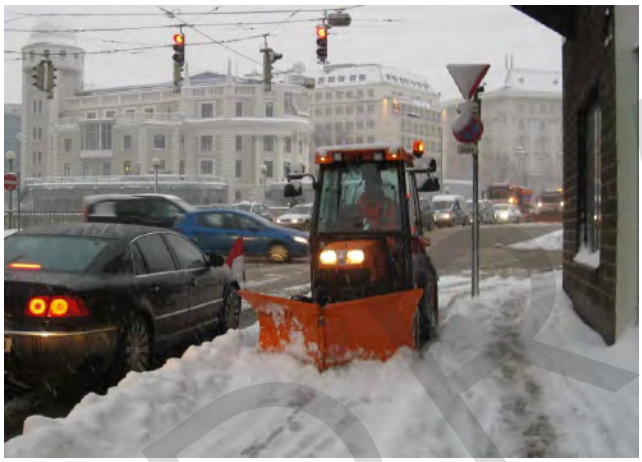
The Salt Lake City Streets Division currently sweeps roads with bike lanes on them twice per month, whereas roads without bike lanes are swept once a month. Streets are also sometimes swept by special request. Bike lanes, buffered bike lanes, and shared lane markings are plowed of snow at the same time as the streets where they are located.

Sweepers in Copenhagen are designed specifically for bicycle facilities and can sweep or clear snow (Photo: Copenhagenize)

Protected bike lanes may require greater maintenance efforts than conventional bikeways because of their separated nature. Protected bike lanes may require specialized equipment or processes, whereas conventional bikeways can usually be maintained as part of normal roadway maintenance activities. A technical memorandum discussing protected bike lane maintenance was developed as part of this project and is attached as an appendix.

6.5.1 Maintenance Recommendations

- Develop a bikeway maintenance plan to address priority sweeping, priority plowing, equipment needs, weed management, and other bikeway maintenance elements.



Small vehicle clearing a buffered bike lane in Vienna, Austria (Photo: I Bike Oulu)

Figure 6-8 Bicycling Access to Fixed Route Transit Stations Map

Recommended Bikeways

- Multi-Use Paths
- Buffered or Protected Bike Lanes
- Bike Lanes
- Neighborhood Bicycle Blvds
- Shared Roadways*
- Bikeways Proposed in Univ. of Utah Bicycle Master Plan
- Requires Further Study

Existing Bikeways

- All Existing Bikeways

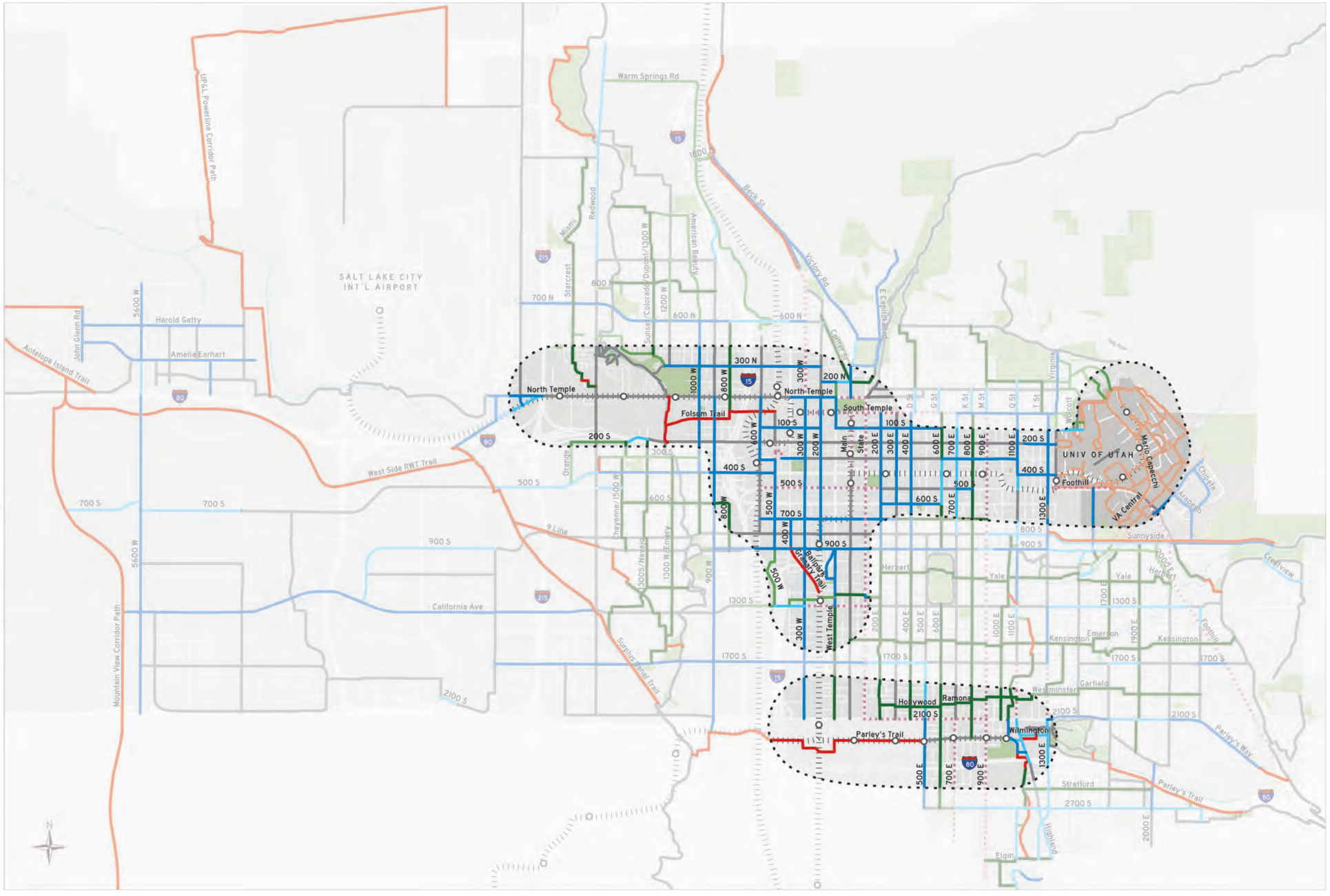
Existing Transit Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line
- 1/2 Mile Buffer Around Fixed Route Transit Stations

The bolder colored and grayed lines inside the dashed-bordered area are proposed and existing bikeways, respectively, that are within about one 1/2 mile (typical walking trip distance) from a fixed route transit station (TRAX or FrontRunner).

*Includes marked & signed shared roadways

Note: The protected bike lanes on 200 E (South Temple to 900 S) and 300 E (100 S to 600 S) are both shown on the map, but only one of the two options will be constructed.



0 0.5 1 2 Miles

Map Produced: 11/21/2014

Figure 6-9 Bicycling Spot Improvement Recommendations Map

Rec'd Bike Spot Improvements

- Enhanced Road Crossings and Signals
- Accelerated repaving
- Intersections and Signage
- New Pavement and Curb Cuts
- Structure Improvements

Recommended Bikeways

- Multi-Use Paths
- Buffered or Protected Bike Lanes
- Bike Lanes
- Neighborhood Bicycle Blvds
- Shared Roadways*
- Bikeways Proposed in Univ. of Utah Bicycle Master Plan
- Requires Further Study
- Transvalley Corridor**

Existing Bikeways

- All Existing Bikeways

Existing Transit Facilities

- TRAX/Streetcar/FrontRunner Stop
- TRAX/Streetcar/FrontRunner Line

*Includes marked & signed shared roadways

**The exact alignment for the Transvalley Corridor (800 S/900 S) is pending. Per the 1992 Salt Lake City Open Space Plan, the Transvalley Corridor is an opportunity to link "the City east of I-15 to the City west of I-15 and provide a pedestrian and bicycle route from the foothills, through the urban area, into the wetlands." The map shows a western terminus based on the City's 1992 Open Space Plan. Due to changes in this area of the city, a different western connection may now be appropriate, possibly extending to the Salt Lake Marina or Antelope Island.

Note: The protected bike lanes on 200 E (South Temple to 900 S) and 300 E (100 S to 600 S) are both shown on the map, but only one of the two options will be constructed.

0 0.5 1 2 Miles

Map Produced: 11/21/2014

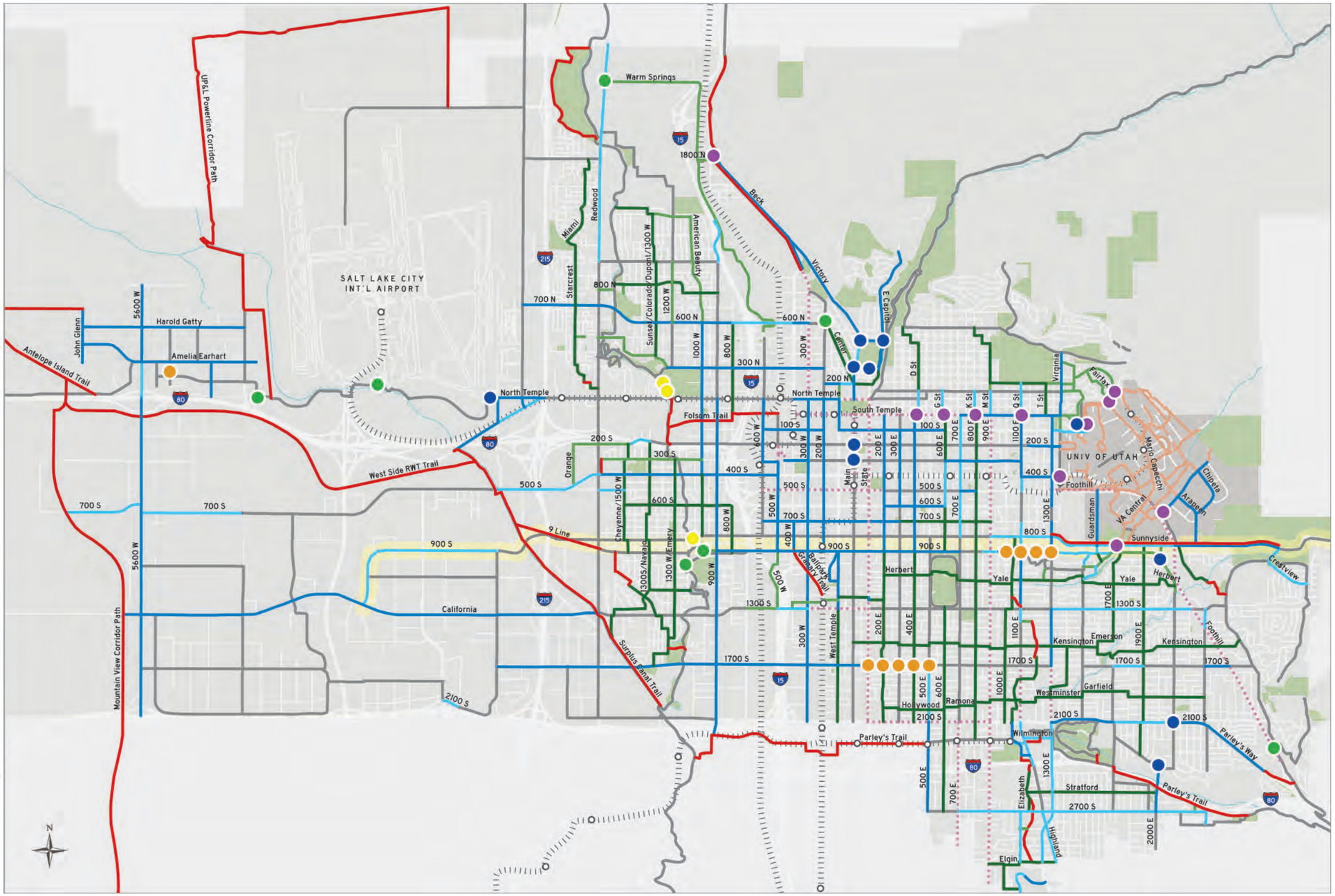


Figure 6-10 1300 South Interim Bypass Route

General Application of Bypass Routes

This specific example of a interim bypass route for bicyclists is on 1300 South between 500 West and 200 East in Salt Lake City. The recommendations for a interim bypass route on this corridor are typical of other situations where the City may have the need for a temporary bypass.

Challenges & Solutions

Bypass routes south of 1300 South are not feasible because the UTA TRAX light rail train corridor (~200 West) does not have any east-west crossings between 1300 and 1700 South. Approval of a bike/ped at-grade crossing by UTA is very unlikely and a grade-separated crossing would be very expensive.

The 1300 South bypass route is intended to be a interim solution to providing bicycle access through the area. The City's ultimate vision is accommodating bicyclists on 1300 South itself as parcel redevelopment opportunities arise and building setbacks can be increased. An overlay zone should be created along 1300 South to facilitate the long-term goal of acquiring additional right-of-way that would allow more comfortable facilities for pedestrians and bicyclists. However, such a process can take years if not decades to implements. As a result, this interim solution is expected to endure for some time.

Cost

The 1300 South Interim Bypass Route has an estimated cost of $550,000.

- Shared Lane Markings
- Bike Boulevards
- Bike Lanes
- Protected Bike Lanes

Solid lines represent existing bikeways. Dashed lines denote proposed facilities – thick represents the 1300 South Interim Bypass Route and thin represents other bikeways proposed in the 2014 Pedestrian & Bicycle & Plan.

6.6 Traffic Signal Considerations

Traffic control for bicyclists is a rapidly evolving field. Many recent advances are attributable to a growing demand for protected bike lanes. Protected bike lanes are more likely to need dedicated bicycle signals than conventional bikeways because bicyclists must be re-integrated with car traffic through intersections after having been separated between them.

Typical concerns that bicyclists experience at signals include:

- Inability to trigger detection sensors or know if a sensor has been triggered
- Inadequate time for bicyclists to cross wide streets
- Conflicts between right turning cars and bicyclists trying to go straight
- Difficulty turning at (or crossing) intersections with unusual geometry or multiple traffic lanes
- Lack of signal coordination to facilitate steady bicycle speeds

6.6.1 Detection

Bicycle detection is used to inform signal controllers that a bicyclist is waiting to use an intersection. Detection occurs primarily through automated means (passive detection) such as in-pavement inductive loops, video, and microwave radar. In recent years bicycle detection has become more important as traffic signals are increasingly operated in an actuated or semi-actuated mode rather than in a pre-timed mode.

An actuated signal is one where operations are adjusted automatically based on what the signal is detecting. A pre-timed signal's operations are fixed and unresponsive to demand. Semi-actuated signals operate under actuated and pre-timed conditions at different times of day. Bicyclists may be "stranded" at a red light if the signal cannot detect them and no cars arrive to trigger the sensor. This scenario often leads to bicyclists running red lights.

Historically, the most common form of detection has been inductive (electrical) loops. The introduction of metal within the magnetic field triggers the traffic signal controller. Loops can be designed specifically for bicycles but the design and sensitivity must be appropriate.

In many cases, existing inductive loops installed primarily for motor vehicles may be capable of sensing a bicycle. However, bicyclists may not be aware of loop locations or want to use them if they are located in the middle of a traffic lane where bicyclists may not feel comfortable. Detection pavement markings are useful for showing bicyclists where they should place their bicycle to achieve the best likelihood of detection.

Many bicycle frames are now made with carbon fiber or other materials that are less likely to be detected by inductive loops. Other forms of detection such as video and radar are able to detect any type of bicycle regardless of material.

Salt Lake City and UDOT use radar as their standard detection technology. New or retrofitted signals in the City will now be better equipped to sense bicycles. Radar is capable of detecting

Standard loop detection pavement marking (Photo: NACTO)

both bicycles and vehicles and has software-configurable detection zones. This provides cost savings by combining vehicle and bicycle detection needs without compromising bicyclist safety or convenience.

6.6.2 Confirmation Lights

Bicycle detector confirmation lights have been used in Portland (OR) at three locations. The lights illuminate when the bicycle detector is actuated and are relatively inexpensive to purchase and install. At this time, the use of confirmation lights is experimental and there are no formal studies that indicate clear benefits to bicyclists or a reduction in red light running.

White bicycle detector confirmation light (Photo: Jonathan Maus/BikePortland.org)

6.6.3 Bicycle Signal Heads & Phases

Bicycle signals and phasing have been used for many years in Europe but are relatively new to the U.S. More U.S. cities are installing them, particularly in conjunction with protected bike lanes where bicycles are separated from car traffic at intersections.

Bicycle signal heads are typically used at signalized intersections to give indications to bicyclists when special traffic signal phases are in effect for them. Typical displays in the U.S. consist of three-section red-yellow-green heads with bicycle symbols on the lenses.

Bicycle signal head (Photo: NACTO)

Supplementary signing may be required when special bicycle traffic signal phases are implemented. Of most concern is the possibility of vehicles turning right across the path of bicyclists who are proceeding straight ahead. The NACTO Urban Bikeway Design Guide recommends all-arrow displays for vehicle right turns, supplemented by an active blank-out "No-Turn-On-Red "sign.

Typical applications for bicycle traffic signal phases include the following:

- Where a multi-use path or bike boulevard crosses a street, especially where the needed bicycle clearance time differs substantially from the needed pedestrian clearance time.

"No Right Turn on Red" blankout sign

- To split signal phases at intersections involving protected bike lanes where a predominant bike movement conflicts with a main motor vehicle movement during the same green phase.
- At intersections where a bicycle facility transitions from a protected bike lane to a conventional bike lane if car turning movements are significant.
- At intersections with contra-flow bicycle movements that otherwise would have no signal indication and where a normal traffic signal head may encourage wrong-way driving by motorists.
- To give bicyclists an advanced green (like a leading pedestrian interval) or to indicate an "all-bike" phase where bicyclist turning movements are high.
- At complex intersections that may otherwise be difficult for bicyclists to navigate.

While bicycle signal phases may improve bicyclist safety, they may also increase delays to bicyclists if they are no longer permitted to move concurrently with motor vehicle traffic. Safety needs and extra delay should be weighed on a case-by-case basis. Several cities have adopted specific warrants for bicycle phases and bicycle signal heads.

Sign instructing turning motorists to yield to through bicycle traffic (Photo: NACTO)

6.6.4 Signal Timing

Traffic signal timing considerations for bicycles include the following:

- Ensuring adequate initial green time plus clearance time for a bicyclist to cross an intersection safely.
- Considering a "head start" phase to allow bicyclists to start their crossing of an intersection a few seconds before vehicles are released in order to reduce conflicts with right-turning vehicles.
- Considering "green wave" timing of signals allowing bicyclists to move smoothly down a street without stopping at multiple red lights.

6.6.4.1 Minimum Green Time

Traffic controllers are typically programmed to provide a minimum green time when a vehicle is detected on an actuated approach and to extend the green time by two or three seconds for each additional vehicle. The minimum green time may be set as short as five seconds for lightly traveled side streets, with the objective of minimizing unnecessary delay to a heavily traveled arterial

street. This situation may create a problem for bicyclists if they are attempting to cross a wide street on a green light at the same time as a single vehicle. An initial time of five seconds plus the yellow and all red time may be adequate for the single vehicle but inadequate for the bicyclist. There are three potential solutions:

- Ensure that vehicle minimum times at each intersection are also adequate for a bicyclist to safely cross the intersection even if bicycles are not detected separately.
- Detect bicycles separately from vehicles and utilize a separate "bike minimum green", which is a built-in feature of the controllers used in Salt Lake City (although not currently used).
- In exceptional cases of very wide streets intersecting low-traffic minor streets, provide a bicycle push button near the curb on the minor street approach so that bicyclists can call the pedestrian phase or a special bicycle phase.

Extension of green time for bicyclists arriving after the start of green is possible with certain types of detection. The detection must be capable of sensing the bicycle in motion. In the absence of a dedicated bicycle lane, detection must be capable of sensing the bicycle in any of the vehicle travel lanes.

6.6.4.2 Leading Bicycle Interval

Leading intervals for pedestrians were described previously in Chapter 5. A similar tactic can be used for bicyclists to give them a head start into the intersection in advance of cars. Leading Bicycle Intervals (LBI) improve visibility of bicyclists to right-turning vehicles. This mostly applies to protected bike lane situations where there is some form of separation between the bikeway and the space occupied by motor vehicles. LBI can be implemented very quickly and easily by programming of the controller and has minimal impact on motor vehicle delay. Turning movements that conflict with LBIs should be prohibited.

6.6.4.3 Bicycle Green Waves

Establishing green waves for bicycles is a traffic signal timing technique called "progression" that allows bicycles to proceed on a street with a minimum of stops at red lights. It normally requires designing the signal timing for the speed of bicycles instead of cars. However, in some congested urban environments, a speed of about 15 MPH has been found to be effective for both cars and bicycles. Green waves for bicycles have been implemented in European cities, particularly in Netherlands and Denmark, and on some streets in Portland and San Francisco.

Progression is much easier to achieve on one-way streets. On two-way streets establishing progression in both directions is mathematically dependent on the cycle length of the traffic signals and the spacing. In Salt Lake City, it is necessary to use relatively long cycle lengths because wide streets require long pedestrian crossing times. In addition, the presence of light rail also tends to impact cycle lengths.

Establishing a progression speed designed specifically for bicyclists also imposes the same speed for vehicles. Motorists may perceive this as adding to congestion and stops. Prioritizing one street for a bicycle green wave may interfere with signal progression on intersecting routes, particularly in Salt Lake City's downtown grid where signals every block are the norm. Implementing a bicycle green wave could prove especially challenging where State routes must be crossed and Salt Lake City does not have authority to make signal timing changes.

6.6.5 Two-Stage Left Turn Queue Boxes

Two-stage left turn queue boxes are designed to facilitate left turn maneuvers at locations where bicyclists have difficulty crossing multiple lanes of through traffic to reach a left turn lane. To make a two-stage left turn a bicyclist first proceeds straight through the intersection on the green light and stops in a bicycle box on the far side of the intersection. The bicyclist then turns 90 degrees to the left, waits for a green light in the cross street direction, and proceeds through. This combination of movements allows bicyclists to effectively make left turns without being required to merge across traffic. Care must be taken to place queue boxes in locations that do not unduly interfere with right turning motor vehicles.

Two-stage left turn queue box at 200 S/Main St

Typical two-stage queue box applications include:

- Signalized intersections with high traffic volumes and/or multiple lanes of through traffic.
- Along protected bike lanes.
- At streetcar or light rail tracks where perpendicular crossings are encouraged.
- Signalized intersections where left turns for motorists are prohibited but bicyclists may be permitted to safely and legally make a two-stage left turn.

6.6.6 Bike-Related Signal Recommendations

- Continue installing radar detection to sense bicycles at signals and use bike-specific pavement markings as needed on a case-by-case basis.
- Consider the use of confirmation lights if a suitable test site becomes apparent.
- Consider adopting specific warrants for bicycle phases and bicycle signal heads.
- Review signal timing algorithms to identify whether adjustments need to be made to provide bicyclists with safe minimum green time lengths.
- Consider using LPI and green wave timing in conjunction with protected bike lanes.
- Continue to install left turn queue boxes where appropriate.

6.7 Bicycle Counts & Surveys

Bicycle counts demonstrate where bicycling is most popular and where certain trends (e.g. sidewalk riding, helmet use, and percentage of female riders) are more or less prevalent. This information informs how cities plan infrastructure and implement programs. Salt Lake City has been conducting bicycle counts since 2011. The City has also used travel survey data from numerous sources to supplement the counts.

6.7.1 Data Anomalies

Situations periodically arise where it is not feasible to conduct counts at specific stations due to construction or other factors. One method for handling years when one or more count stations are inoperable is to calculate the percent change for the valid stations and apply that percentage to the previous year total for the inoperable stations. Such extrapolations should be noted for transparency. In the following year's count this value should be replaced with an average of the two years on either side of the extrapolated year.

6.7.2 Rolling Averages

Rolling averages are a statistical method used to smooth out yearly spikes, highlight long-term trends, and make it easier to absorb isolated data anomalies. For example, a three-year rolling average for 2014 would include data from 2012, 2013, and 2014. At the time this master plan was created, Salt Lake City only had three years of bicycle count data collected. A minimum of five years is needed before it makes sense for the City to use rolling averages for trend analysis.

6.7.3 Automated Count Technologies

Salt Lake City's annual bicycle counts currently are done manually with the help of citizen volunteers following protocols established by the National Bicycle and Pedestrian Documentation Project. These manual counts are relatively inexpensive but are subject to significant variability due to small sample sizes, which makes year-to-year comparisons less statistically robust.

Manual counts may be supplemented with continuous automatic count data. Increasingly affordable technologies include active infrared, inductive loops, and pneumatic tubes that exclude motor vehicles in mixed traffic environments. Automatic counts can greatly expand the amount of data available to the City for trend analysis.

6.7.4 Travel Surveys

Salt Lake City already uses data from various travel survey sources such as the National Household Travel Survey, American Community Survey, and Utah Travel Survey. One advantage of these surveys is their statistical significance owing to randomized and broad-reaching sample sizes.

6.7.5 Bicycle Count & Survey Recommendations

- Handle data anomalies according to the process detailed in Section 6.7.1.
- Report three-year rolling averages for bike counts instead of individual yearly totals once five years of data has been collected.
- Continue performing manual counts but supplement them with continuous automatic count data.
- Install permanent counters in important locations or rotate a limited number of automatic counters in a mobile count program.
- Continue utilizing travel surveys to provide more data points for bicycling trends.

Chapter 6 Sources

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2. Badger, Emily. "Dedicated Bike Lanes Can Cut Cycling Injuries in Half." The Atlantic Cities. Web. 5 Aug. 2013. <http://m.theatlanticcities.com/commute/2012/10/dedicated-bike-lanes-can-cut-cycling-injuries-half/3654/>.

CHAPTER SEVEN

PROGRAM RECOMMENDATIONS

Education, encouragement, enforcement, and promotional programs enhance the walking and bicycling experience and can be cost effective complements to infrastructure investments. These types of programs help people learn how to use Salt Lake City's roads safely, whether traveling on foot, by bicycle, or in a car.

This chapter outlines recommended program investments for Salt Lake City over the next five years. The recommendations were developed and refined through multiple rounds of review including two public open houses, an online survey, the Steering and Stakeholder Committees, and tabling at community events during Summer 2013.

The following programs and accompanying strategies will help Salt Lake City be a safer, more educated, and more equitable walking and bicycling community where people of all ages and abilities feel comfortable walking or riding a bicycle for any trip.

The first pages of this chapter summarize each program while more detail about funding, partnerships, the City's role, time commitment, reach and impact, community interest, expected outcomes, priority, and implementation phasing for each program is provided in Sections 7.4 and 7.5.

The chapter is broken down into the following five subsections:

- Multi-Modal Programs
- Pedestrian-Specific Programs
- Bicycling-Specific Programs
- Program Implementation Schedule
- Program Summary Tables

7.1 Multi-Modal Programs

Multi-modal programs benefit multiple user groups. Some are targeted towards pedestrians and bicyclists only while others may also encompass transit riders, drivers, or other groups. The programs typically have an education, encouragement, or enforcement focus.

Pedestrians cross 200 S/State St as a bus passes

Beginning Driver Education

Improving driver awareness of pedestrians and bicyclists and increasing knowledge of pedestrian and bicycle rights, responsibilities, and common behaviors helps to make a safer and more comfortable road environment for all users. These courses can also increase public acceptance of enforcement actions. Salt Lake City can help support the safety of all road users by supporting efforts to require pedestrian and bicycle-related training within local, private, and statewide driver education courses.

Target Audience: Beginning drivers

Sample Programs: Illinois' Driver Education Video and Curriculum; Wisconsin's Share & Be Aware Driver Education Program

Media Campaign

Salt Lake City should partner with other groups to develop regional campaigns that address unsafe and illegal behaviors of motorists, pedestrians, and bicyclists while encouraging mutual respect among all road users and encouraging active transportation.

Target Audience: All road users; may be more specific for targeted campaigns

Sample Programs: Bikes Belong Safety Campaign Best Practices; Road Respect (Utah); How We Roll (Columbus, OH); Coexist Campaign (San Francisco, CA); Heads Up Boulder: Mind the Crosswalk (Boulder, CO)

Road Respect is a statewide program that promotes cooperation and respect between all road users (Photo: UDOT)

Open Streets Event

On Saturday May 4, 2013, Salt Lake City hosted an Open Streets event to engage people in walking, bicycling, and physical activity. The event temporarily opened a route of City streets exclusively to walking, biking, and other forms of human-powered transportation, as well as supporting activities such as exercise classes, dance classes, music, food, games, and other attractions. The event took place along the iconic downtown corridor of 300 South/Broadway between the Main Library and the Intermodal Hub. The Transportation Division led route selection, permitting, traffic control, and public funding, while Bike Utah led promotion, programming, and private sponsorship. A volunteer Event Chairperson assisted with all aspects of planning, and the Salt Lake City Volunteer Coordinator led volunteer recruitment and management.

A child and his dog at the May 2013 Open Streets

Target Audience: General public

Sample Programs: Open Streets Project/Open Streets Guide; Cyclovia Tucson (Tucson, AZ)

Police Training

Strengthening the walking and bicycling information in police education courses and training will help officers improve public safety and enforce existing laws more effectively. Police training will enhance many other educational and enforcement programs. The Transportation Division has already met with the police department and held one training event.

Target Audience: All SLCPD officers, including bike and foot patrols

Sample Programs: Traffic Enforcement for Bicyclist Safety Training Video (Chicago, IL)

Multi-Modal Enforcement

Successful and balanced enforcement comes from a strong, communicative relationship between transportation staff and local law enforcement. The Salt Lake City Transportation Division can build on their successful partnership with the Police Department for the bike light giveaway program and continue an enforcement focus on behaviors known to be the most dangerous, such as motorists not yielding to pedestrians and/or bicyclists when required to do so by law and bicyclists not using lights at night.

Target Audience: Any road users who commit motor vehicle code infractions known to endanger other road users

Sample Programs: Targeted Multi-Modal Enforcement (Tucson, AZ); Tucson police are available to speak with other law enforcement departments to offer insight and advice

SmartTrips

This is a neighborhood-based program that encourages public and active transportation through free bike/walk/transit kits, coupons to local businesses, educational newsletters, and collaborative community events. The program seeks to educate interested people on how to find a safe route to work, to the store, to ride, walk, or take transit with their children to school, and to reach other destinations without using a car. The Salt Lake City program is modeled after one that was started in Portland (OR). Other communities that have implemented SmartTrips programs have all successfully reduced the number of vehicle trips. Between 2012 and 2014, SmartTrips in Salt Lake City engaged the East Liberty Park, Rose Park, Wasatch Hollow, Sugar House, and Fairpark neighborhoods.

Target Audience: Residents of targeted neighborhoods

Sample Programs: SmartTrips Program (St. Paul, MN); SmartTrips Program (Portland, OR)

The SmartTrips team rides the S-Line Streetcar

Traffic Citation Diversion

Other than one-time drivers education courses, there are few formal opportunities for motorists and/or bicyclists to learn the legal rights and responsibilities specific to bicycling and walking. The Salt Lake City Transportation Division can work with the Police Department and other appropriate City divisions to develop traffic citation diversion classes so that road users (pedestrians, bicyclists, and/or motorists) who commit offenses known to endanger pedestrians and bicyclists can, at the discretion of the officer, be invited to take a safety and diversion class in lieu of paying fines.

Target Audience: Road users (pedestrians, bicyclists, and/or motorists) who commit offenses known to endanger pedestrians and bicyclists

Sample Programs: Share the Road Safety Class (Portland, OR); Bicycle Diversion Course (Pima County/City of Tucson, AZ)

Bus Driver Training

Bus driver training programs ensure that drivers know about laws related to walking and bicycling, and understand safe vehicle operation around pedestrians and bicyclists. The Salt Lake City Transportation Division should continue to encourage UTA and the Salt Lake City School District to train their bus drivers about how to safety drive near pedestrians and bicyclists.

Target Audience: UTA and School District bus drivers

Sample Programs: Bus Operator Education (Portland, OR); Frequent Driver Education (San Francisco, CA)

UTA bus driver (Photo: UTA)

7.2 Pedestrian-Specific Programs

These programs primarily benefit pedestrians and are focused on this group in particular. Summaries of the recommended pedestrian-specific programs are shown below.

Pedestrians cross 1300 S at 600 E Liberty Park

Pedestrian Wayfinding

Well-designed pedestrian wayfinding is one of the most fundamental elements of a welcoming, pleasant walking environment. Wayfinding schemes should include destinations, sign types, travel time and/or distance where possible, and a plan for implementation. A cohesive and conspicuous pedestrian wayfinding network will help pedestrians identify the best routes to destinations. Efforts should begin in the downtown area and Sugarhouse where some pedestrian wayfinding is already present, with possible expansion to other areas in following years.

Target Audience: Residents and visitors

Sample Programs: Legible London (London, England)

Walking School Bus

The rate of children walking to school is at an all-time low and parents have become wary of allowing children to walk alone, primarily due to traffic concerns. Walking School Buses help alleviate the fear – and the time constraints for parents – associated with children walking to school. They may be stand-alone efforts or part of a broader Safe Routes to School program. Parents can take turns leading the "bus", which follows the same route every time and picks up children from their homes or designated "bus stops" at designated times. A Walking School Bus can be as informal as a few parents alternating to walk their children to and from school, but often it is a well-organized effort led by the PTA or a local agency or organization. Some schools such as Uintah Elementary have already organized walking school buses.

Walking school bus in Columbia (MO)

Target Audience: Students and their parents

Sample Programs: Walking School Bus Program (Columbia, MO)

Park(ing) Day

Park(ing) Day is an annual event that happens around the world where neighborhood residents, artists, business owners, cities, counties, and others collaborate to temporarily transform parking spaces into small parklets as temporary public places for the day. Several businesses in Salt Lake City already participate in this event.

Target Audience: Neighborhood residents, business owners, shoppers

Sample Programs: Official Park(ing) Day

2013 Park(ing) Day at the 21st & 21st Business District (Photo: Architectural Nexus)

Targeted Crosswalk Enforcement

Motorists who routinely fail to yield the right-of-way to pedestrians, as required by law, are unlikely to change their behavior if they perceive that there are no consequences to their actions. Hundreds of communities around the U.S. implement targeted crosswalk enforcement. In Las Vegas, for example, crossing decoys often wear seasonal costumes (such as a turkey at Thanksgiving, or a leprechaun in March) to earn greater media attention. While targeted crosswalk enforcement often results in citations, the greater impact comes through media publicity of the event to reinforce the importance of obeying pedestrian crossing laws.

Target Audience: Drivers and bicyclists

Sample Programs: Back-to-School Crosswalk Stings (Shoreline, WA; Roseburg, OR; Plymouth, MN; and other locations)

Mid-Block Programming

An effort to reclaim and utilize mid-block walkways as public space requires a concerted effort among many stakeholders, including local government, businesses and business groups, advocacy organizations, and volunteers. These efforts increase vibrancy in hidden public spaces.

Target Audience: General public, property developers, land owners

Sample Programs: Privately Owned Public Space (New York, NY); Alley Network Project (Seattle, WA); Alley Network Project Guide

7.3 Bicycling-Specific Programs

These programs support efforts to educate and encourage people who bicycle, as well as gather information to quantify bikeway use.

Annual Bicycle User Counts

Ongoing bicycle user counts provide important information used to approximate use and demand for facilities and programs. The National Bicycle and Pedestrian Documentation Project (NBPDP), a nationwide effort to provide a consistent model of data collection and ongoing data, states that "without accurate and consistent demand and usage figures, it is difficult to measure the positive benefits of investments in [bicycling], especially when compared to other transportation options such as the private automobile." Since September 2010, Salt Lake City has utilized the NBPDP data collection model in each of its annual bicycle user counts. Implementation of automated data collection methods would augment the volunteer-based data and allow for much more trend analysis.

Bicycle count volunteers and bicyclists participate in a supplementary survey

Target Audience: Volunteers and City staff (analysts)

Sample Programs: National Bicycle and Pedestrian Documentation Project

Classroom Bike Training

Bicycle safety and skills education in elementary and middle/junior high schools can be an effective way to teach youth about bicycling safety and how to ride in a predictable, safe manner. These programs educate younger students about bicycling and other non-motorized transportation options that may go a long way in affecting their decision to choose bicycling for transportation and recreation later in life.

Target Audience: Elementary and middle/junior high school students

Sample Programs: The Florida Traffic and Bicycle Safety Education Program

Bicycle Friendly Businesses

Bicycle Friendly Business programs raise the profile of and show support for bicycling in a community, while also promoting local businesses and building a sense of community. As of Spring 2013, Salt Lake City has six businesses registered with the League of American Bicyclists' "Bike-Friendly Business" designation. In May 2013, the City hosted a bicycle-friendly business workshop that included participation from a group of business owners, Neighborhood Business District representatives, transportation planners, and students. The workshop presented about how Bicycle-Friendly Business Districts can support both bicycling and local business.

A Bicycle Benefits program in the City encourages businesses to offer discounts to customers who arrive by bicycle. As of 2014, there were about 60 Salt Lake City businesses participating in that program.

Target Audience: Current and potential bicyclists and the business community

Sample Programs: Bicycle Friendly Business Program (Long Beach, CA)

Bike Map

The Salt Lake City Bikeways Map has been published and distributed periodically since the 1980s. In spring 2013, an updated map was published and free copies are available throughout the City or via online download. Public feedback during the Salt Lake City Bicycle/Pedestrian Master Plan Update planning process showed strong support for a smartphone-based SLC bike map app. Rather than creating a stand-alone app, Salt Lake City should consider submitting GIS data to online map providers in order to improve the accuracy of bike layers and promote the online map app as a free source for turn-by-turn bicycle directions. Salt Lake City should continue to produce the hardcopy and digital copy of the citywide bikeways map approximately every other year.

Target Audience: Current and potential bicyclists

Sample Programs: Chicago (IL) CTA

The cover of the 2013-14 Salt Lake City Bikeways Map

Monthly Social Rides

Ongoing group bike rides can target many groups of people and cover countless topics or themes. In most cases, however, the purpose is the same: to provide a safe, comfortable, and social setting for bicycling. New riders experience riding safely in a group while learning bicycling skills and rules of the road, and all riders have the opportunity to meet neighbors, share in a feeling of camaraderie, and build community.

Target Audience: Current and potential bicyclists

Sample Programs: San Jose Bike Party (San Jose, CA); Kidical Mass (Eugene, OR, and many other locations)

Family attending the Super Hero-themed SLC Bike Party ride, June 2013 (Photo: SLC Bike Party Facebook)

Recreational Bike Routes

This program seeks to develop and promote Salt Lake City's recreational bicycle facilities for residents and tourists alike, highlighting great views, enjoyable rides, and the City's unique and intimate connection to the mountains, canyons, and the Great Salt Lake. It expands on the "Cycle the City" route created by the City and Visit Salt Lake in 2012-2013. Named routes would be created and geared toward recreational cyclists. Some routes would be either loop or out-and-back rides designed to be completed within one day, although regional opportunities may be identified to include multi-day trips. The routes would be developed with printed publications, online resources (including mobile devices), and eventually route signs. Route signs, with the route name and identifying logo, may include simple signs to mark the route, destination wayfinding signs, and/or signs themed around hill climbs or canyon route grades. Recreational bike routes may include both road and mountain biking opportunities.

Target Audience: Residents and tourists

Sample Programs: Explore Maine by Bike; New York State Bike Routes; Denmark National Cycle Routes

School Bike Trains

School bike trains offer a safe, fun way to ride as a group to school and can be part of a broader Safe Routes to School program. Although the national Safe Routes to School program suggests that they are usually best suited for older elementary school children, they may be applicable for a wider age range. As children age and enter secondary education, the need for oversight and companionship on rides to and from school may decrease.

Target Audience: Elementary school children

Sample Programs: SRTS Guide; Atlanta Walk and Roll to School Day (Atlanta, GA)

Women's Bicycling Programs

Women are often less comfortable with bicycling (particularly in traffic) than men, and user counts in the City confirm this trend. Because many potential bicyclists are women, encouraging, educating, and enabling women to ride a bicycle more often will attract a greater percentage of that group. By partnering with local organizations and bike shops to offer women-only clinics, workshops, and rides designed to be welcoming and supportive for participants at any stage of comfort, the City can promote and encourage women to ride.

Target Audience: Women who are current or potential bicyclists

Sample Programs: Women on Bikes Program (Portland, OR)

Mother and child ride on 800 East

Winter Bicycling Programs

Winter weather is a pervasive barrier to bicycling for transportation. For many people, daily transportation choices are habitual and feeling as though you cannot bike in winter makes bicycling a less viable option throughout the entire year. During cold, snowy winters, people may also be less active, so encouraging winter biking is good for a community's public health and physical activity levels. Salt Lake City can encourage bicycling year-round by linking the community to winter cycling resources and hosting classes and events like Winter Bike to Work Day, Winter Bike Fest (indoor event with clothing and equipment demonstrations), and improving maintenance of facilities during the winter.

Target Audience: Current and potential bicyclists

Sample Programs: Bike Winter (Chicago, IL)

Lack of encouragement, education, and/or gear deters some from riding when it is cold and wet

7.4 Program Implementation Schedule

Table 7-1 shows a general schedule for implementing the recommended programs. Priorities may appropriately change in coming years but this summary provides an outlook for where the City currently intends to invest its time and resources in future programs. Some programs such as enhancements to driver education may require significant lead time even though they are deemed to be high priorities.

7.5 Program Summary Tables

Tables 7-2 and 7-3 summarize key information for each of the recommended programs. They contain brief information about cost (both in money and time), expected outcomes, and priority. The Community Interest column is reflective of the level of support received through the public process. A value of "N/A" in that column means that the program idea surfaced as part of the public feedback and was thus not part of the open house and survey materials presented to the public. The column for Priority weighs factors such as cost, potential impact, feasibility, and public preferences.

Table 7-1 Program Implementation Schedule

	2015	2016	2017	2018	2019
Multi-Modal Programs					
Open Streets Event	High	High	High	High	High
Police Training	High	High	High	High	High
Media Campaign		High	High	High	High
Beginning Driver Education			High	High	High
SmartTrips	Medium	Medium	Medium	Medium	Medium
Multi-Modal Enforcement			Medium	Medium	Medium
Traffic Citation Diversion			Medium	Medium	Medium
Bus Driver Training				Low	Low
Pedestrian-Specific Programs					
Walking School Bus	High	High	High	High	High
Pedestrian Wayfinding		High	High	High	High
Park(ing) Day	Medium	Medium	Medium	Medium	Medium
Targeted Crosswalk Enforcement		Medium	Medium	Medium	Medium
Midblock Walkway Programming			Low	Low	Low
Bicycling-Specific Programs					
Annual Bicycle User Counts	High	High	High	High	High
Classroom Bike Training	High	High	High	High	High
Bike Map	High		High		High
Bicycle Friendly Businesses		High	High	High	High
Monthly Social Rides	Medium	Medium	Medium	Medium	Medium
Recreational Bike Routes		Medium	Medium	Medium	Medium
School Bike Trains			Medium	Medium	Medium
Women's Bicycling Programs			Medium	Medium	Medium
Winter Bicycling Programs				Low	Low

Priority	
High	
Medium	
Low	

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Table 7-2 Multi-Modal Programs Summary

Program	City Role**	Likely Partners	Cost Estimate (Annual)	Staff and Volunteer Time Commitment	Number of People Reached	Community Interest	Expected Outcomes: Increased Bicycling	Increased Walking	Improved Bicycling Safety Behavior	Improved Walking Safety Behavior	Improved Driving Safety Behavior	Economic/Cultural Benefits	Enhanced Sense of Community	Priority
Multi-Modal Programs														
Beginning Driver Education	Lead (SLCPD)/Partner	SLC Trans; Advocates; Other Agencies	○	○	◖	◖			✓+	✓+	✓+			●
Media Campaign*	Lead (SLC Trans)/Partner	Advocates; SLCPD; Business Groups; Media	◖/●	◖/●	●	◖	✓+	✓+	✓+	✓+	✓+			●
Open Streets Event*	Lead (SLC Events)/Partner	Police Dept.; Health Dept.; Advocates; Volunteers; Media	●	●	●	●	✓+	✓+				✓+	✓+	●
Police Training	Lead (SLCPD)	SLC Trans; Advocates; UDOT	◖	◖	◖	N/A			✓+	✓+	✓+			●
Multi-Modal Enforcement	Lead (SLCPD)/Partner	SLC Trans; Bicycle Advisory Committee; Media	◖	●	◖	◖			✓+	✓+	✓+			◖
SmartTrips*	Lead (SLC Sustainability)	SLC Trans; UTA	●	●	●	◖	✓+	✓+	✓	✓	✓	✓	✓	◖
Traffic Citation Diversion	Lead (SLCPD)/Partner	SLC Trans; Medical Community; Legal Community; Advocates	●	●	○	●	✓+	✓+	✓+	✓+	✓		✓	◖
Bus Driver Training*	Partner (Likely led by UTA)	SLC School Dist; SLCPD; U of U; Advocates; UTA	○/◖	◖	◖	N/A			✓	✓	✓+			○

○ = Low ◖ = Medium ● = High N/A = Feedback Not Available ✓+ = Primary Outcome ✓ = Secondary Outcome

*Existing program

**Lead = City instigates and carries out.
**Lead/Partner = City instigates but partners help out with doing a lot of the work.
**Partner = someone else instigates and the City helps in a lesser supporting role.

Cost Estimate Key	
Low	$0-$1000
Medium	$1,000-$5,000
High	$5,000+

Table 7-3 Pedestrian & Bicycle Programs Summary

Program	City Role**	Likely Partners	Cost Estimate (Annual)	Staff and Volunteer Time Commitment	Number of People Reached	Community Interest	Expected Outcomes: Increased Bicycling	Increased Walking	Improved Bicycling Safety Behavior	Improved Walking Safety Behavior	Improved Driving Safety Behavior	Economic/ Cultural Benefits	Enhanced Sense of Community	Priority
Pedestrian-Specific Programs														
Pedestrian Wayfinding*	Lead (SLC Trans)	Designers; Media	●	◖	●	●		✓+		✓		✓	✓	●
Walking School Bus	Lead (SLC School Dist)	SLC Trans; PTA Groups	◖	○ / ◖	○ / ◖	●		✓+		✓	✓		✓+	●
Park(ing) Day*	Partner	SLC Trans; Advocates; Small Business Districts	○	○ / ◖	○	N/A	✓	✓+		✓	✓	✓+	✓+	◖
Targeted Crosswalk Enforcement*	Lead (SLCPD)	SLC Trans; Advocates; Media	◖	○ / ◖	○	◖	✓	✓	✓	✓	✓+			◖
Midblock Walkway Programming*	Lead (Walkable Salt Lake)	SLC RDA; Volunteers; Media	◖ /●	○ / ◖	◖	N/A		✓+		✓		✓+	✓+	○
Bicycle-Specific Programs														
Annual Bicycle User Counts*	Lead (SLC Trans)	SLC Bicycle Collective; U of U	○	●	◖	◖	✓+					✓	✓	●
Bicycle Friendly Businesses	Lead (SLC Econ Dev)/Partner	SLC Trans; Business groups; Advocates; Media	○ / ◖	○ / ◖	◖	N/A	✓+					✓+	✓	●
Bike Map*	Lead (SLC Trans)	Bike Shops; Online Mapping Services	●	●	●	●	✓+		✓+			✓		●
Classroom Bike Training	Lead (SLC School Dist)	SLC Trans; Police Department	◖	○ / ◖	●	N/A	✓+		✓+					●
Monthly Social Rides*	Partner	Advocates; Volunteers; Bike Shops; Media	○	○	◖	N/A	✓+		✓				✓+	◖
Recreational Bike Routes	Lead (SLC Trans)/Partner	State Agencies (UDOT, Outdoor Recreation); Adventure Cycling Association; Visit Salt Lake	●	●	◖	N/A	✓+					✓	✓+	◖
School Bike Trains	Lead (SLC School Dist)	SLC Trans; PTA Groups	○	○ / ◖	●	N/A	✓+		✓+			✓	✓	◖
Women's Bicycling Programs	Partner	Advocates; Health Dept.; Bike Shops; Spoke Stoke	◖	○ / ◖	○ / ◖	◖	✓+		✓		✓		✓+	◖
Winter Bicycling Programs	Lead (SLC Trans)/Partner	Advocates; Health Dept.; SmartTrips; Bicycle Ambassadors	○	○	○	◖	✓+	✓	✓			✓	✓+	○

○ = Low ◖ = Medium ● = High N/A = Feedback Not Available ✓+ = Primary Outcome ✓ = Secondary Outcome

*Existing program

**Lead = City instigates and carries out.
**Lead/Partner = City instigates but partners help out with doing a lot of the work.
**Partner = someone else instigates and the City helps in a lesser supporting role.

Cost Estimate Key	
Low	$0-$1000
Medium	$1,000-$5,000
High	$5,000+

CHAPTER EIGHT

COST ESTIMATES & IMPLEMENTATION

Cost estimates are crucial elements of the City's ability to plan for future investments in infrastructure and supporting programs. The estimate ranges provided in this chapter should be understood as high-level planning estimates that are subject to change due to variable construction costs, changes in design standards, and other factors that can introduce price volatility. Nevertheless, the estimates give the City reasonable targets for the funding amounts that must be secured through City budget appropriations, partnering with other agencies, or grants in order to bring this plan to fruition.

Main sections of this chapter are as follows:

- Spot Improvements
- Linear Bikeways
- Implementation

8.1 Spot Improvements

This section outlines cost ranges for the pedestrian and bicycle spot improvements outlined in Chapters 5 and 6, respectively. Some of the improvements serve both pedestrians and bicyclists, so the ranges are grouped by improvement type rather than user group.

Unlike the bikeway recommendations, the spot improvements were not divided into phases. Costs are assumed to occur over a 20-year period.

8.1.1 Capital Costs

Capital costs represent the amount of money needed to construct new improvements. Table 8-1 shows per-project spot improvement capital cost ranges. The Accelerated Repaving projects shown in Chapter 6 are not included in this table because their costs are assumed to already be included in the City's budget as part of normal paving maintenance. These projects entail the City advancing repaving on some streets to earlier years while delaying repaving on others, so there is no net cost difference.

Table 8-1 Spot Improvement Capital Cost Ranges

Improvement Type	Est. Cost Range
Enhanced Crossings	$50,000-$250,000
Intersections, Signals, & Signage	$1,000-$200,000
New Pavement & Curb Cuts	$1,000-$200,000
Structure Improvements	$250,000-$1 million

Table 8-2 Spot Improvement Annual Maintenance Cost Ranges

Improvement Type	Est. Cost Range
Enhanced Crossings	$2,000-$12,000
Intersections, Signals, & Signage	$50-$13,000
New Pavement & Curb Cuts	$50-$13,000
Structure Improvements	$10,000-$40,000

The values in Table 8-1 prorate pedestrian and bicycle costs in the case of projects that typically involve other work elements unrelated to walking and bicycling. For example, if bike lanes are added as part of a routine repaving project only the additional cost of bike lane striping and pavement markings are included.

8.1.2 Maintenance Costs

Maintenance costs represent the effort associated with caring for capital improvements and keeping them in good working condition. Typical examples of maintenance activities include sweeping, snow removal, landscaping (mostly for multi-use paths), and replacement of paint striping and pavement markings.

Awareness of maintenance costs and a commitment to proper upkeep are important factors to consider before investing in capital improvements. Table 8-2 shows estimated annual maintenance costs for the spot improvements.

8.2 Linear Bikeways

Linear bikeways encompass all bicycle facilities that have a beginning and ending point, whereas spot improvements represent upgrades to crossings or other locations that can better be represented on a map as a single point.

8.2.1 Capital Costs

Table 8-3 shows approximate per-mile cost ranges and assumed average values for the types of bikeways proposed in this plan. It also shows mileage ranges to reflect approximate total lengths of each bikeway type as shown in Figure 6-6.

Ranges are shown because facilities can be constructed at various levels of quality. Costs also depend heavily on local context and construction materials.

Table 8-3 Per-Mile Capital Cost Estimate Ranges

Bikeway Type	Mileage Range	Cost/mi		
		Low	High	Assumed Average
Multi-Use Path	40-50	$575,000	$2,600,000	$800,000
Protected Bike Lane	20-25	$40,000	$3,000,000	$600,000
Buffered Bike Lane	35-45	$17,500	$135,000	$25,000
Neighborhood Bicycle Blvd	45-55	$200,000	$1,300,000	$350,000
Conventional Bike Lane	25-35	$12,000	$72,000	$20,000
Shared Lane Markings	15-25	$1,200	$17,000	$3,000
Signed Shared Roadway	1-5	$4,000	$5,200	$4,500

New multi-use paths may require right-of-way acquisition while other bikeway types generally do not. The cost ranges in Table 8-3 do not include right-of-way because land costs fluctuate greatly depending on location and right-of-way needs are difficult to predict at this advanced stage.

Maintenance costs should always be considered in project scoping. Projects that are constructed to lesser quality may trigger greater long-term maintenance.

The cost ranges shown in Table 8-3 represent 220 miles of bikeways at approximately $330,000 per mile. Off-street multi-use pathways would account for roughly more than half of the total cost even though they represent only about 20% of the mileage. When multi-use pathways are taken out of the equation, the remaining on-street bikeways could be constructed for approximately $193,000 per mile. As a comparison, the recently completed I-15 freeway reconstruction project in Utah County cost approximately $55 million per mile. The entire spectrum of 20-year bikeway recommendations could be built for 30% more than the cost of rebuilding a single mile of urban freeway. All of the on-street bikeway recommendations in this plan could be built for 60% of the cost of rebuilding a single mile of urban freeway.

Costs vary widely according to construction quality; inexpensive protected bike lane on 300 E (left) and more expensive protected bike lane on Grant Ave in Ogden (right; Photo: Ogden Bikes Facebook).

8.2.2 Maintenance Costs

Table 8-4 shows the annual estimated per-mile maintenance cost ranges. Future facility replacement (i.e. life cycle cost) is not included in the ranges. As Salt Lake City's bikeway system matures, expenditures are likely to transition gradually from an initial emphasis on capital improvements to a situation where the City constructs fewer new facilities and uses a larger share of funding to repair or replace aging facilities.

8.3 Implementation

There are multiple ways funding can be secured for the implementation of bicycle and pedestrian related infrastructure projects in Salt Lake City. Internally administered City funding sources may include the Capital Improvement Project (CIP), Redevelopment Agency (RDA), and Community Development Block Grant (CDBG) programs.

Local, state, and federal funding is also available through programs administered by Salt Lake County, State of Utah Department of Natural Resources (DNR), Wasatch Front Regional Council (WFRC), and UDOT. Some common funding programs administered by these agencies include the Regional Bikeway Commuter Grant Program, Recreational Trails Program, Transportation Alternatives Program, Congestion Mitigation Air Quality Program, and the Safe Sidewalk Program.

City staff will need to remain vigilant in keeping up with the latest bicycle and pedestrian related program developments because local, state, and federal funding programs often change from year to year. Common methods for doing so include maintaining close relationships with local, state, and federal agencies, membership in related professional organizations, and attendance at local or national bicycle and pedestrian design and planning conferences or webinars.

Table 8-4 Per-Mile Annual Maintenance Cost Estimate Ranges

Bikeway Type	Mileage Range	Cost/mi		
		Low	High	Assumed Average
Multi-Use Path	40-50	$3,000	$8,500	$5,000
Protected Bike Lane	20-25	$1,200	$2,500	$2,000
Buffered Bike Lane	35-45	$5,000	$12,000	$7,000
Neighborhood Bicycle Blvd	45-55	$2,000	$8,000	$3,000
Conventional Bike Lane	25-35	$2,000	$5,000	$3,000
Shared Lane Markings	15-25	$1,000	$2,500	$1,500
Signed Shared Roadway	1-5	--	$500	$250