



City of Phoenix
STREET TRANSPORTATION DEPARTMENT

**COMPREHENSIVE
BICYCLE
MASTER PLAN**

**Making
Connections**

PROJECT No. ST87600080

MARCH 2014

DRAFT



Vision & Goals

What will bicycling in Phoenix be like in 20 years? What actions and policy changes will be needed to achieve this vision? These and other questions led to development of the plan's vision statement and eight supporting goals presented in this chapter.

Community Input

The bicycling vision for Phoenix was developed through a comprehensive process undertaken from July 2013 - March 2014. Extensive public and City staff input guided development of the plan approach and content, which led to the overall theme of *Making Connections*. Highlights of the community outreach process included:

- Community Workshops** ▶ 4 public meetings to reach City's diverse demographics
196 site-specific comments on routes & intersections received
- Interactive Wikimap Software** ▶ web-based comment tool live for 2 months
594 users logged in 1,000 site-specific comments
- Outreach at Transit Stations** ▶ 8 hours of outreach at 3 different transit stations
91 in-person responses on bicycling habits
- Technical Advisory Committee** ▶ technical guidance from a 32-member TAC representing 18 departments and agencies
- Ad Hoc Task Force** ▶ plan vision and oversight from a 12-member citizens advisory group

VISION STATEMENT:

In 20 years, Phoenix will be a Platinum-level Bicycle Friendly Community.

It will be safe and easy to bike anywhere in the city. A well-connected infrastructure network will link people and places, making bicycling a preferred option for daily transportation, recreation, and healthy lifestyles.



The Vision

This plan establishes direction to transform the City of Phoenix into a bicycle-friendly community over the next 20 years. The goal is to systematically improve levels of bicycle-friendliness, as defined by the League of American Bicyclists' Bicycle Friendly Communities program. Phoenix received a Honorable Mention in 2011; the next goal is a Bronze Award, progressing up to the Platinum Level as additional recommendations of this plan are implemented over time.

Connectivity Goals

To achieve this vision, the City is adopting a series of eight goals that address different aspects of what it will take to make Phoenix more bicycle friendly. These are presented in this chapter, along with benchmarks that can be used to measure progress toward attaining each goal. In addition, subsequent chapters of this plan contain specific recommendations, implementation details, and action plans for how public agencies and private citizens can work to achieve the following goals:



The 5 E's for Bicycle Friendly Communities

ENGINEERING

▶ Creating safe and convenient places to ride and park

EDUCATION

▶ Giving people of all ages and abilities the skills and confidence to ride

ENCOURAGEMENT

▶ Creating a strong bike culture that welcomes and celebrates bicycling

ENFORCEMENT

▶ Ensuring safe roads for all users

EVALUATION & PLANNING

▶ Planning for bicycling as a safe and viable transportation option

Policies & Perceptions

A strong bike culture will be the norm, not the exception, as reflected in government organization, community, and individual actions. Public policy will be connected with the desire to have more people riding bikes more often. Bicycling will be easy, safe, convenient, fun, and an accepted mode of transportation and recreation.

Opportunities & Investments

Investments made for bicycling will be smart, focused, and equitable. The city will leverage existing assets and create partnerships with local, county, and state agencies to build out the bicycle infrastructure network.

People & Places

The city's bicycle network will connect neighborhoods with each other and into Downtown Phoenix. Bicycling will be a safe, fun, and convenient transportation option to access schools, parks, shopping, work, and community centers in all parts of the city.

Safety

Bicycling will be a safe transportation and recreation option. Streets will be designed and retrofitted to safely accommodate all modes. People on bikes will understand bicycling rules of the road through proper facility design and safety education. Bicycling will be safer by promoting accountability and responsible attitudes of all road users.

Arterials & Collectors

People on bikes will be able to share transportation facilities with motor vehicles and easily cross roadways. Missing gaps in the bicycle network will be completed.

On-Street & Off-Street

Multi-use paths and trails will intersect and seamlessly connect with the street network. This mix of facility types will provide a variety of comfortable travel options for all ages, abilities, and trip purposes.

City & Region

The City will be connected to bikeways in adjoining communities to provide longer-distance recreation and commuting opportunities. Bike connectivity through loops and links will be promoted.

Bikes & Transit

Commuting by public transportation will be a seamless and efficient choice for cyclists. Completing the first and last 2.5 miles of a transit trip will be easy to accomplish on a bike as modes will be fully integrated.

Community Input

I Community Meetings

The City of Phoenix and Lee Engineering conducted four public meetings related to the Phoenix Comprehensive Bicycle Master Plan. The community outreach strategy was to reach the City's diverse demographics, including transit-dependent groups, to engage bicyclists of all ages and abilities, as well as local Bicycle Advocacy groups.

The purpose of the public meetings was to:

- Provide introductory information about the City's current efforts to prepare its Bicycle Plan;
- Obtain input on bicycle-related transportation issues and priorities; and
- Obtain input on biking areas that may benefit from street or other infrastructure improvements.

1.1 Meeting Notification and Attendance

A water bill notice and meeting notification flyer were prepared as well as a media press release. Additionally, the meetings were posted on the City website and tweeted through the City of Phoenix Street Transportation Department. Additional outreach methods included posting meeting information at bikearizona.com and direct outreach to bicycle clubs, advocacy groups, and businesses.

Notifications were facilitated as follows:

Media Press Release was sent to...

- Technical Advisory Committee (34 members)
- MAG Pedestrian/Bicycle Committee (23 members)

Media Press Release was sent to the following Village Planning Committees:

- Alhambra
- Central City
- Deer Valley
- Desert View
- Encanto
- Maryvale
- North Gateway
- North Mountain
- Paradise Valley
- Rio Vista
- South Mountain
- Ahwatukee Foothills
- Camelback East
- Estrella
- Laveen

Flyer notices were e-mailed or otherwise electronically distributed to:

- Technical Advisory Committee (34 members)
- Valley Metro
 - 10/9/13 – Commute Solutions Update e-newsletter distributed to approximately 2,100 employer representatives who participate in the Maricopa County Trip Reduction Program.
 - 10/19/13 – West Plaza Neighborhood Association GAIN event, La Pradera Park at 39th Ave and Glendale (20 copies)
 - 10/24/13 – Grand Canyon University Fall Festival, 3300 W. Camelback Rd (20 copies)
- MAG Pedestrian/Bicycle Committee (23 members)



Figure 1 City of Phoenix Street Transportation Department Tweet

- Bicycle Clubs and Advocacy Groups
 - Bicycle Shops and Businesses within the Cities of Phoenix, Glendale, Peoria, Cave Creek, Scottsdale, Tempe, Chandler, and Town of Guadalupe

Flyer notices were distributed to the following community centers for posting:

- Goelet A. Beuf Community Center
- Devonshire Senior Center
- Desert West Community Center
- Eastlake Park

1.2 Information Provided

The community meetings included a Prezi presentation about the background and purpose of the study, overarching goals, and next steps in the study, namely, to compile community input on the City’s bicycle network, identifying gaps in the existing/current conditions, and developing alternatives for the future. A copy of the presentation is available for viewing [online](#)¹. As of November 13, 2013, the presentation was viewed more than 100 times.

Group discussion followed the presentation, giving participants a chance to provide general comments, ask questions, and discuss network qualities and concerns. Participants were asked to complete a survey and write down their comments on provided Comment cards. Information cards were also provide for participants to take home with contact information for the project team and URLs for the City, project Wikimap, and community meeting presentation.

Participants were then given time to look at maps of the city, highlight routes that need to be addressed, and identify existing barriers within the network. They also identified missing links. These maps provided input for the study network for data collection. Maps that depicted existing bicycle facility conditions and data for the 15 villages were available at each meeting. Participants at the four community meetings, listed below, identified 196 unique routes and intersections on these maps.

- October 22, 2013 – Districts 1 & 2 - Goelet A C Beuf Community Center
- October 24, 2013 – Districts 3 & 4 - Devonshire Senior Center
- October 29, 2013 – Districts 5 & 7 - Desert West Community Center
- October 30, 2013 – Districts 6 & 8 - Eastlake Park Community Center

2 WikiMaps

In addition to the community meetings, the City used crowd-sourcing to gather comments about where people currently bike and dangerous or difficult spots. Toole Design Group developed and managed the interactive, web-based map (i.e. Wikimap) that allowed the public to provide input on specific locations and routes, and for this information to be directly integrated into a GIS database.

The Google base map showed the City of Phoenix jurisdictional boundary and existing bikeways. To learn where people currently bike, and places they would bike if the street or bikeway were improved, Wikimap users were able to add points and lines to identify problem intersections and routes, routes they currently ride, and places they go. Users could mark as many areas as they like, comment on others’ routes and points, and upload photos to map points.

¹ <http://prezi.com/ughgawkbooaj/bikephx-community-meetings/>

The Wikimap was open for input at <http://wikimapping.net/wikimap/Phoenix-Bicycle-Master-Plan.html> for two months from September 9, 2013 to November 10, 2013. The ability to upload photos to map points was enabled on October 4, 2013.

In total, 594 users input approximately 1,000 features to the Wikimap. Additionally, project team members added more than 200 problem intersections and routes identified at the community meetings and via email to City of Phoenix Street Transportation staff.

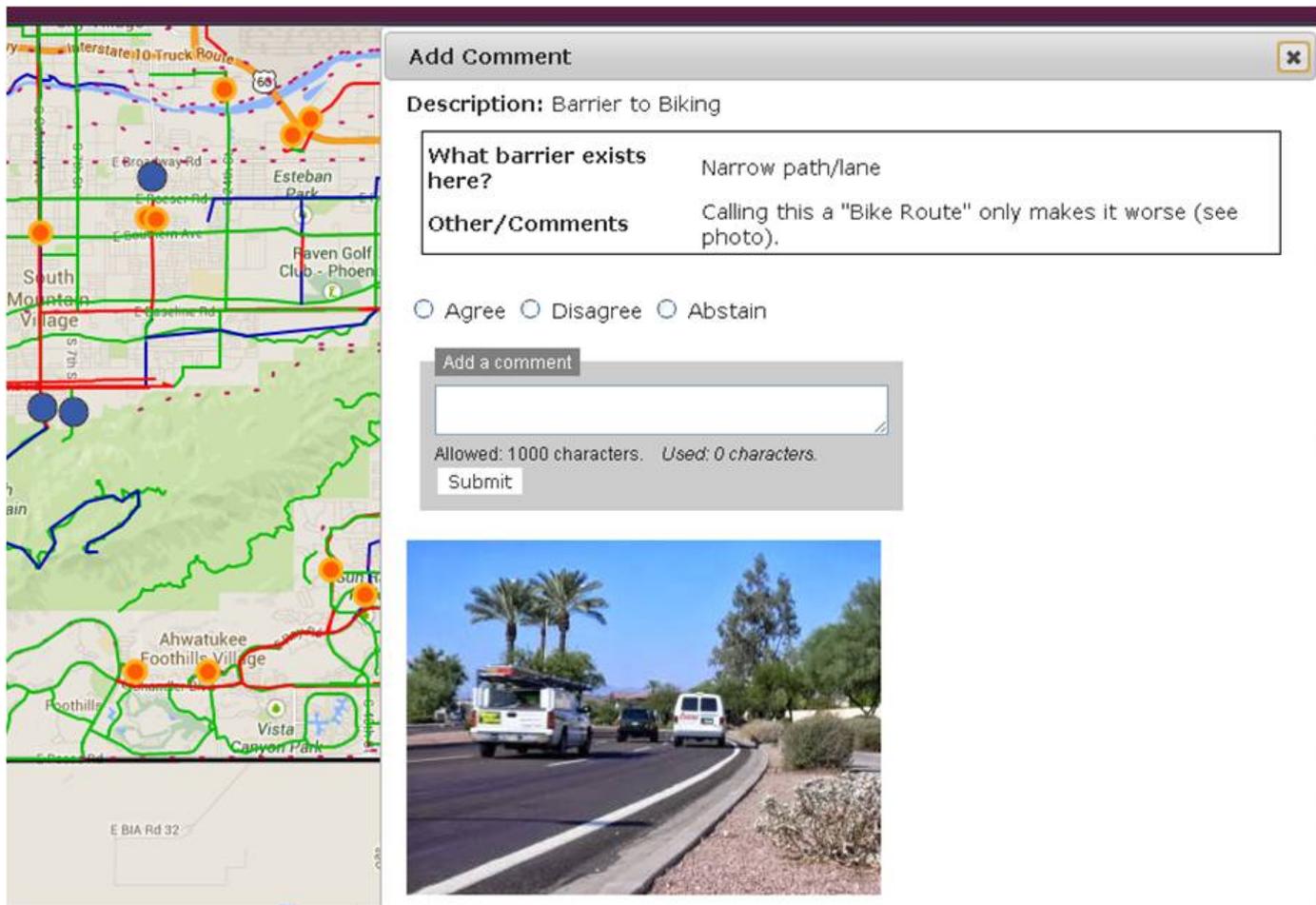


Figure 2 Wikimap comment with supporting photo

2.1.1 Overview of Comments

The main (most often cited) concerns for each category are provided below.

Route I'd Like to Ride

- Pave canal path
- Add bike lanes
- Make connections between off-road paths
- Make connections for bicyclists and pedestrians when there is a gap in street network
- Poor pavement conditions
- Add signalized crossing
- Provide physically separated bike lane
- Make connections to light rail



Figure 3 - Photo uploaded by Wikimap user with a request to add wayfinding signs

High Stress Routes

- Poor surface conditions
- Lack of paving along canals
- Heavy traffic
- Poor bike connectivity (gaps)
- Trail ends with no outlet

- Rude motorists
- No bike lane
- High speed traffic
- Canal crossings at arterials
- Lack of sidewalks
- Narrow sidewalks
- Paved path wet from sprinklers
- Narrow bike lanes
- Debris on roadway
- Conflicts with turning vehicles, particularly at dual rights
- Not enough space on road for motor vehicles to pass cyclists
- Lack of connection across freeways
- Intersection without traffic control
- Lack of striping on multiuse paths for exclusive bicycle use

What makes this route stressful?

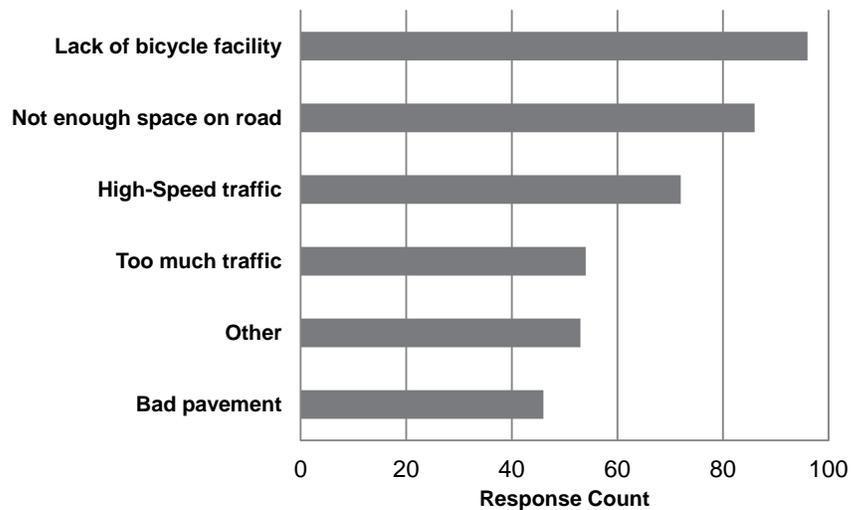


Figure 4 Wikimap user responses to "What makes this route stressful?"

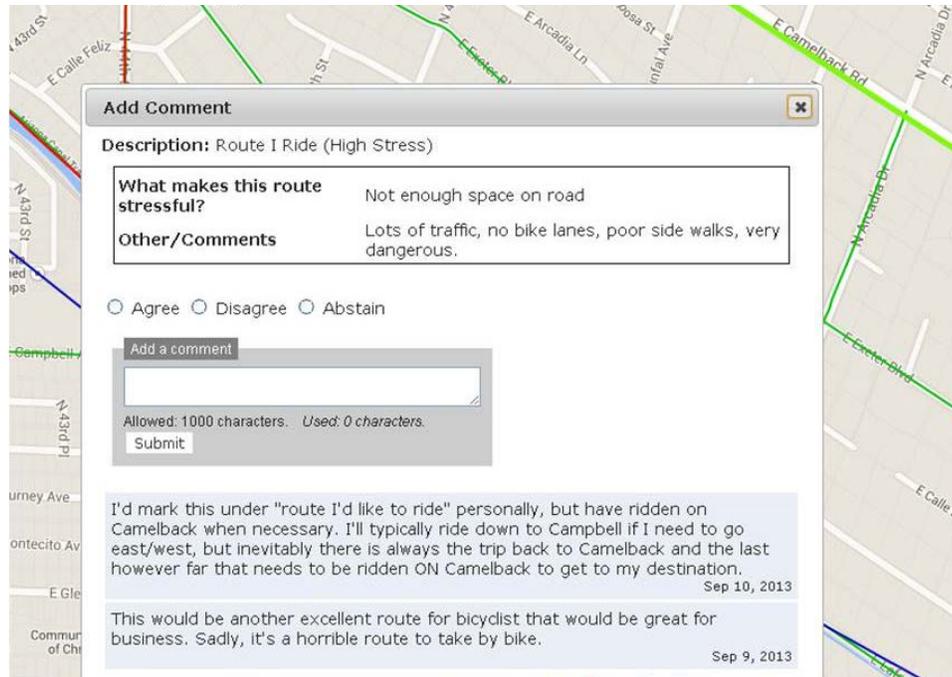


Figure 5 Wikimap comment on a High Stress route (Camelback Road) and supporting comments from two other users

Barriers

- Berm south of ASU West
- Freeways
- Canal crossings at arterials
- Intersection without traffic control
- Lack of bicycle detection
- Bike lanes do not continue through signalized intersections
- Crosswalk paint is thick and makes riding across very bumpy
- Poor lighting at night
- High speed, busy traffic
- Abandoned streets
- Gates on canal paths
- Trail ends
- Lack of signs to direct bicyclists (wayfinding)

What barrier exists here?

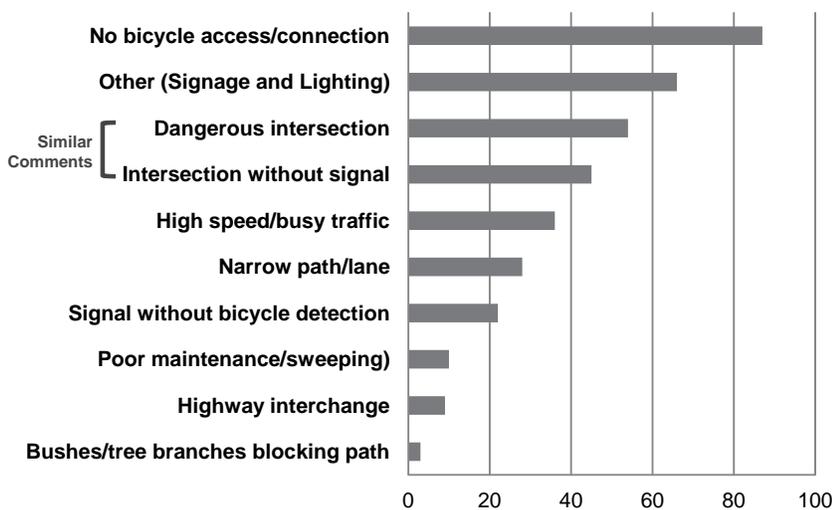
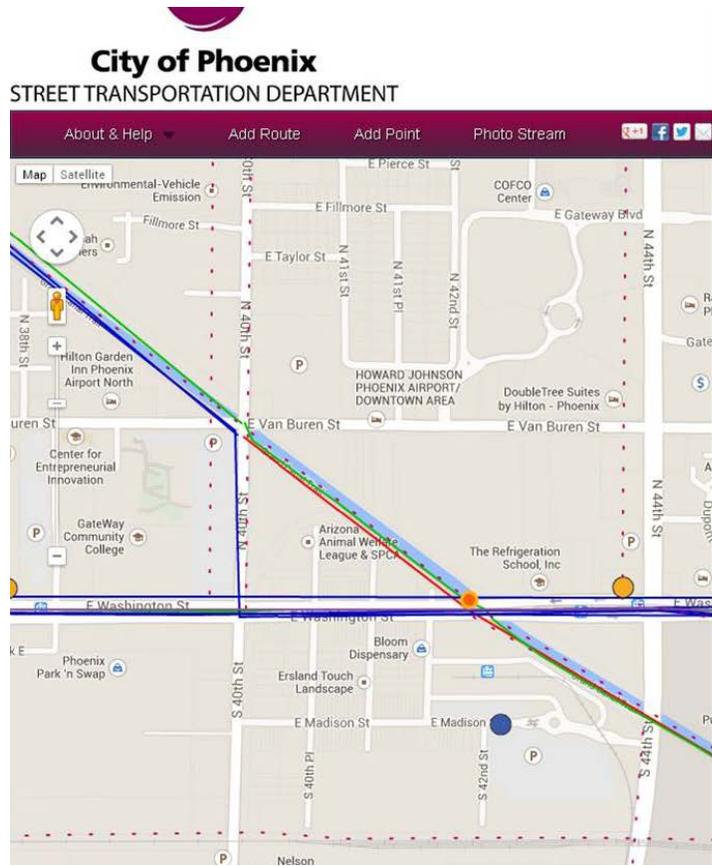


Figure 6 Wikimap user responses to "What barrier exists here?"



Description: Barrier to Biking

What barrier exists here? Dangerous intersection

Trying to cross the canal where it meets with Washington is one of the more dangerous intersections I've ridden on. The intersection immediately east of this crossing has a light but no crosswalk, only a left-turn lane for WB traffic. The canal crossing forces people on bikes to cross a bike lane, two lanes of WB motor vehicle traffic, bi-directional LRT track, and two more lanes of EB motor vehicle traffic before entering the EB bike lane with no option for reprieve in the median or in a merge lane (I'm not suggesting those things, just making a note), and the direct route across the LRT tracks doesn't put you at a good angle to cross. I've been taking 40th Street to Washington instead of continuing on the canal.

Agree Disagree Abstain

Add a comment

Allowed: 1000 characters. Used: 0 characters.



Figure 7 Wikimap comment on point identified as a barrier to biking

Low Stress Routes

- Canal paths
- Bike lanes
- Respectful motorists
- Close to light rail
- Separation from traffic
- Bike lanes through intersections
- Paved
- Low traffic volumes
- Grade separated crossings (bridges)
- Buffered bike lane

What makes this route low stress?

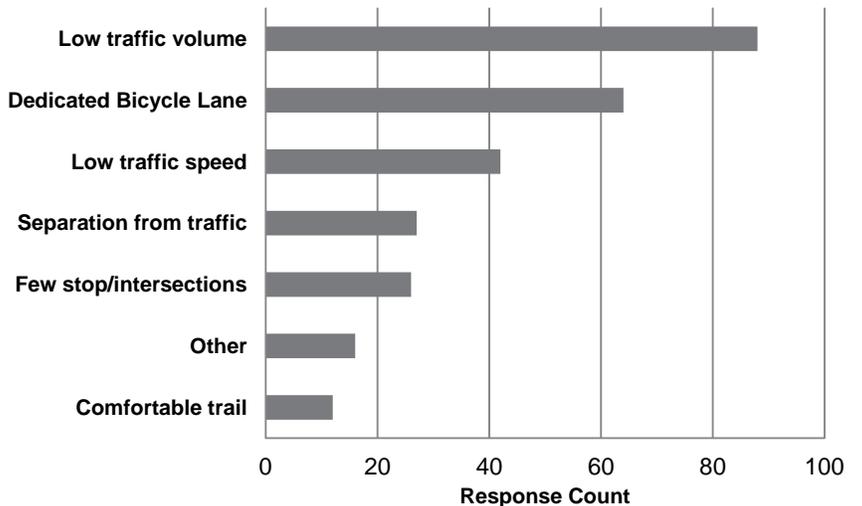


Figure 8 Wikimap user responses to "What makes this route low stress?"

Destinations

- Tempe Town Lake
- Grocery stores
- Dining
- Libraries
- Recreation centers
- Gyms
- Schools
- Light rail stations
- Sky Harbor Airport
- Entertainment
- Canals

What destination is located here?

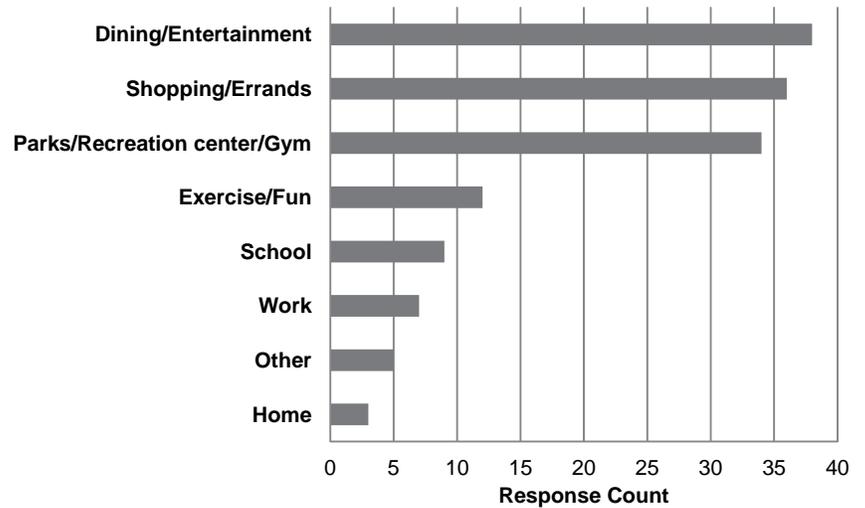


Figure 9 Wikimap user responses to "What destination is located here?"

3 Additional Outreach

The Street Transportation Department agrees that to develop an encompassing, comprehensive bicycle master plan, it is critical that decision- and policy-makers listen to and consider input from those individuals who have limited transportation choices, especially where bicycling is their only travel choice.

To receive input from cyclists and other city residents who do not have access to a computer and may not be routinely engaged with City of Phoenix issues and processes, city staff scheduled several hours of outreach at transit stations. The week of Nov. 4-8 four Street Transportation Department staff members conducted over eight hours of outreach to transit passengers across three locations, MetroCenter Transit Center at 9451 N. Metro Parkway West, Central Station, 300 N. Central Ave., and the Phoenix Sky Harbor Sky Train station at Washington and 44th streets.

As part of the outreach staff asked people at the facilities what the city could do to improve bike access in the areas where they live, if and how connections to transit service could be improved, and any additional comments or concerns they might have as bicycle riders.

In all, staff received 91 in-person responses from individuals on their bicycling habits and suggestions for improvements or comments about bicycling in Phoenix.

APPENDIX A – COMMUNITY OUTREACH RESULTS

4 Technical Advisory Committee

[Placeholder for TAC Introduction paragraph]

The TAC consists of the following representatives:

Wylie Bearup	<i>City of Phoenix - Street Transp.</i>
Ray Dovalina	<i>City of Phoenix - Street Transp.</i>
Tom Godbee	<i>City of Phoenix - Street Transp. - TS</i>
Scott Logan	<i>City of Phoenix - Street Transp. - TS</i>
Kerry Wilcoxon	<i>City of Phoenix - Street Transp. - TS</i>
Joseph Perez	<i>City of Phoenix - Street Transp. - TS</i>
Matthew Heil	<i>City of Phoenix - Street Transp. - PIO</i>
Shane Silsby	<i>City of Phoenix – Street Transp. - PDP</i>
Mark Melnychenko	<i>City of Phoenix - Street Transp. - PDP</i>
Jim Baker	<i>City of Phoenix - Street Transp. – TS - Signals</i>
Mani Kumar	<i>City of Phoenix - Planning</i>
Matt Giordano	<i>City of Phoenix - Police</i>
*Marcus Virgil	<i>City of Phoenix - Police</i>
Jeremy Stapleton	<i>City of Phoenix - Environmental Quality Committee & Bicycle Subcommittee</i>
Albert Santana	<i>City of Phoenix - City Manager's Office</i>
Phil McNeely	<i>City of Phoenix - Mayor's Office</i>
Colin Tetreault	<i>City of Phoenix - Mayor's Office</i>
Dean Zattair	<i>City of Phoenix - Aviation</i>
Eric Johnson	<i>City of Phoenix - CED</i>
*Jeremy Legg	<i>City of Phoenix - CED</i>
Inger Erickson	<i>City of Phoenix - Parks</i>
Jarod Rogers	<i>City of Phoenix - Parks</i>
Jon Brodsky	<i>City of Phoenix - Parks</i>
Katherine Coles	<i>City of Phoenix - Planning</i>
Lysistrata Hall	<i>City of Phoenix - NSD</i>
Amanda Luecker	<i>Valley Metro RPTA</i>
Ray Cabrera	<i>Downtown Phoenix Partnership</i>
Abigail Williams	<i>Arizona Department of Administration (ADOA)</i>
David Oihus	<i>Arizona Department of Administration (ADOA)</i>
Mike Sanders	<i>ADOT</i>
Maureen DeCindis	<i>Maricopa Association of Governments (MAG)</i>
Eric Iwersen	<i>City of Tempe</i>
James Hash	<i>City of Mesa</i>
Jude Nelson	<i>ASU</i>

**attended TAC meeting in place of TAC member*

5 Pedestrian and Biking Ad Hoc Task Force

The success of this plan is contingent upon the input, and guidance and of the city's residents and many bicycle advocates. Their expertise, experience, and creativity are invaluable in planning and developing improvements for our current and future bikeway system. As a means of incorporating these individuals into a cohesive group to help shape the future of our bikeway system, the Phoenix Office of the Mayor established a Pedestrian and Biking Ad Hoc Task Force that will be charged with the following tasks:

1. Review past reports, data, maps and bike-related information provided by City staff
2. Help prepare the overall Vision for the 20-Year Master Bike
3. Provide feedback and guidance to City staff and its Consultant on best methods for enhancing the Phoenix bikeway system including, but not limited to, improving infrastructure and facilities, policies and bike safety education
4. Assist the Consultant in the analysis of the bike-related community feedback
5. Attend project meetings to stay engaged on the development of the Plan
6. Provide feedback and oversight into the Bike Share program station locations and operation

7. Serve in an advisory capacity to City Council on proposed City initiatives and policies that enhance pedestrian and bicycling mobility, such as Complete Streets
8. Advise City staff and Council on methods and actions to improve pedestrian safety citywide

The Pedestrian and Biking Ad Hoc Task Force met every two weeks beginning on December 5, 2013 and will sunset after the completion of the Master Bike Plan, and the adoption of the Complete Streets Ordinance and adoption of a Pedestrian Safety Action Plan which is estimated to be completed by the Spring of 2014.

The Vision

A vision statement for bicycling in Phoenix was developed with input from a Technical Advisory Committee and refinement from an Ad Hoc Task Force established in conjunction with the master plan project. The Phoenix vision for the Bicycle Master Plan emphasizes connectivity and mode shift:

In 20 years, Phoenix will be a Platinum-level Bicycle Friendly Community. It will be safe and easy to bike anywhere in the city. A well-connected infrastructure network will link people and places, making bicycling a preferred option for daily transportation, recreation, and healthy lifestyles.

This plan establishes direction to transform the City of Phoenix into a bicycle-friendly community over the next 20 years. The goal is to systematically improve levels of bicyclefriendliness, as defined by the League of American Bicyclists' Bicycle Friendly Communities program. Phoenix received a Honorable Mention in 2011; the next goal is a Bronze Award, progressing up to the Platinum Level as additional recommendations of the Bicycle Master Plan are implemented over time.

Connectivity Goals and Measurable Benchmarks

To achieve this vision, the City is adopting a series of eight goals that address different aspects of what it will take to make Phoenix more bicycle friendly. These are presented below, along with benchmarks that can be used to measure progress toward attaining each goal.

Policies & Perceptions

A strong bike culture will be the norm, not the exception, as reflected in government organization, community, and individual actions. Public policy will be connected with the desire to have more people riding bikes more often. Bicycling will be easy, safe, convenient, fun, and an accepted mode of transportation and recreation.

Benchmark

- Revised City policies, procedures, codes, ordinances, guidelines, and standards to promote bicycle safety and facilities by [YEAR].

Opportunities & Investments

Investments made for bicycling will be smart, focused, and equitable. The city will leverage existing assets and create partnerships with local, county, and state agencies to build out the bicycle infrastructure network.

Benchmarks

- Progress completing top priority projects on ranked project list
- Amount of funding dedicated to the bicycle program including infrastructure, amenities, and education

[Placeholder for 20 year chart with values every 5 years]

People & Places

The city's bicycle network will connect neighborhoods with each other and into Downtown Phoenix. Bicycling will be a safe, fun, and convenient transportation option to access schools, parks, shopping, work, and community centers in all parts of the city.

Benchmark

- Number of major destinations accessible by bikeways

[Placeholder for 20 year chart with values every 5 years]

Safety

Bicycling will be a safe transportation and recreation option. Streets will be designed and retrofitted to safely accommodate all modes. People on bikes will understand bicycling rules of the road through proper facility design and safety education. Bicycling will be safer by promoting accountability and responsible attitudes of all road users.

Benchmarks

- Number of enhanced intersection design and mid-block crossings of major streets
- Reduction in the number or rate of bicycle crashes and fatalities

[Placeholder for 20 year chart with values every 5 years]

Arterials & Collectors

People on bikes will be able to share transportation facilities with motor vehicles and easily cross roadways. Missing gaps in the bicycle network will be completed.

Benchmarks

- Miles of new or resurfaced roadway projects that incorporate bike lanes
- Percent of arterials and collectors with bike facilities (bike lanes or higher)

[Placeholder for 20 year chart with values every 5 years]

On- & Off-Street Routes

Multi-use paths and trails will intersect and seamlessly and safely connect with the street network. This mix of facility types will provide a variety of comfortable travel options for all ages, abilities, and trip purposes.

Benchmarks

- Miles of multi-use paths and shared-use trails
- Number of canal crossing enhancements across roadways (i.e., crosswalks, median refuge islands, rectangular rapid flash beacons (RRFB's), and bike HAWKs)

[Placeholder for 20 year chart with values every 5 years]

City & Region

The City of Phoenix will be connected to bikeways in adjoining communities to provide longer-distance recreation and commuting opportunities. Bike connectivity through loops and links will be promoted.

Benchmark

- Percentage of routes that cross the City limits and connect into bike facilities in adjacent jurisdictions

[Placeholder for 20 year chart with values every 5 years]

Bikes & Transit

Commuting by public transportation will be a seamless and efficient choice for cyclists. Completing the first and last 2.5 miles of a transit trip will be easy to accomplish on a bike as modes will be fully integrated.

Benchmarks

- Number of transit riders using bicycles or bike share for part of their trip
- Bike parking or bike support facilities at transit centers, park 'n rides, light rail stations

[Placeholder for 20 year chart with values every 5 years]

Past & Present

Phoenix first recognized the need to plan for bicycles almost 30 years ago. Accomplishments of the City to date include:

Major Milestones

- 1985** Bicycle Task Force appointed
- 1987** Council approves initial 700-mile Phoenix bike system
- 1988** Bond program provides \$2.9M for plan implementation over 5 years
- 1993** Built system reaches 360 miles
- 2002** Phoenix General Plan includes Bicycle Element
- 2009** City adopts bicycle standards as part of Street Planning & Design Guidelines
Environmental Quality Commission establishes a Bicycle Initiative Subcommittee to begin meeting monthly
- 2011** City of Phoenix receives an Honorable Mention award in the national Bicycle Friendly Communities program
- 2013** Reinvent PHX initiative looks at bicycling as sustainable transportation option within TOD districts



Building on the Past

The first step in developing this Comprehensive Bicycle Master Plan was to assess existing government policies and programs that support and impact bicycling as a mode of transportation. Eleven planning and policy documents were reviewed that directly relate to bicycling, six departmental interviews were conducted, and 14 regional and neighboring community bicycle plans were consulted.

Five basic types of bikeways are currently provided within the City of Phoenix:

- shared-use paths
- on-street bicycle lanes
- bicycle routes
- bicycle boulevards
- bikeable streets

These facilities fall into two functional categories: **recreational paths** within city parks, desert preserves, and along canals, which are generally implemented and maintained by the Parks and Recreation Department; and **commuter/transportation-related facilities** located within street corridors under the jurisdiction of the Street Transportation Department.

Snapshot of the Present

Levels of bicycle accommodation in Phoenix today may be summarized by examining the current status of the City's physical bicycle infrastructure and bicyclist ridership data.

Miles of Bikeways

Phoenix today has:

705 total bikeway miles comprised of

- ▶ **588 miles** of on-street facilities
- ▶ **117 miles** of off-street paths
- ▶ includes 22 bike bridges and 20 bike tunnels

The City of Phoenix currently provides 0.48 miles of bicycle facilities per 1,000 residents, ranking 20th of 29 MAG member communities.

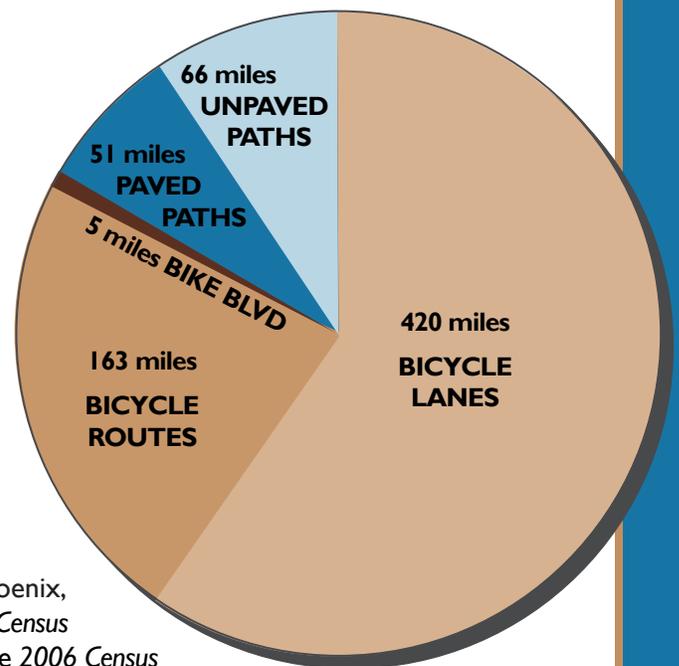
Number of Cyclists

Limited tools are currently available to determine levels of bicycling in Phoenix. Three sources that can help track numbers of cyclists reveal the following:

- ▶ There are over 4,900 estimated bicycle commuters in Phoenix, representing 0.76% of all commuters, according to the *U.S. Census 2011 American Community Survey*. This number is up from the 2006 Census rate of 0.62% percent bicycle commuting.
- ▶ Work commute rates reported by the *2013 Maricopa County Trip Reduction Program Survey* are slightly higher. Bicycling is used by 1.12% of commuters surveyed (1.47% of students; 1.04% of employers), with the <25 year old group most likely to bicycle, and men more likely to bike to work than women by a 3:1 ratio.
- ▶ **?? MAG bicycle count results....**

Planning for the Future

Over time, additional data will need to be collected and monitored and used to plan, design, and implement additional miles of facilities that will attract new riders and let them safely make connections to destinations citywide.



I Background of Bicycling in Phoenix

Level terrain and good weather conditions for a majority of the year provide an ideal environment for bikers. All bicyclists are not the same and vary widely, from young children riding to school, to recreational riders, up to experienced adult riders equipped with mirrors, lights, helmets, and special clothing to ride in traffic. Experienced bicyclists prefer to ride in the roadway with motor vehicles, and are normally equipped to do so. They ride at higher speeds and for longer distances, and by riding in the street, are governed by the laws for any other vehicle operator (where relevant). Experienced bicyclists are typically not suited to riding on sidewalks along the street. Sidewalks are intended primarily for pedestrian use.

Children or inexperienced bicyclists typically do not have the confidence or equipment to share arterial streets with higher speed motorized traffic. From a safety standpoint, it is advisable that these less experienced riders use sidewalks, local streets, collector streets, or separate bicycle paths instead of arterial streets. To encourage more experienced cyclists to use the street instead of sidewalks, traffic officials should design, install and maintain a system of contiguous bicycle facilities throughout the city.

There are five basic types of facilities (bikeways) for bikers, each with different designs and characteristics:

1. **Shared-use Paths:** Bikeways physically separated from motorized traffic and designed for shared use by bicycles, pedestrians, joggers, roller-blades, and other non-motorized modes of transportation. Paths may be along the highway right-of-way or within an entirely independent right-of-way (i.e. canal banks or through park land).
2. **On-street Bicycle Lanes:** Bikeways created by designating a portion of street (using pavement markings and signs) for preferential use by bicyclists. Per the 2009 MUTCD, BIKE LANE signs are no longer required for establishing on-street bike lanes.
3. **Bicycle Routes:** Bikeways designated by guide signing to indicate a trailblazed route, which is a shared facility either on-street (shared with cars) or on the sidewalk (shared with pedestrians).
4. **Bikeable Streets:** Streets which connect with higher level bikeway facilities and have proven to be acceptable for bicycle travel and are designated on a bikeable street map for biker convenience. Bikeable streets are intended only as a guide and are generally local and collector streets which connect bike lanes or signed bike paths/routes.
5. **Bicycle Boulevards:** Bicycle boulevards are shared roadways that create an attractive, convenient, and comfortable cycling environment that is welcoming to cyclists of all ages and skill levels. Bicycle boulevards are low-volume, low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments. These treatments allow through movements for cyclists while discouraging similar through trips by non-local motorized traffic. One such treatment may be shared-lane markings.

Per the 2009 MUTCD, shared-lane markings may be used to:

- a. Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking,
- b. Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane,



Figure 1 - Chris-Town - Gateway Bicycle Boulevard

- c. Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane,
- d. Alert road users of the location bicyclists are likely to occupy within the traveled way,
- e. Encourage safe passing of bicyclists by motorists,
- f. Encourage safe passing of bicyclists by motorists, and
- g. Reduce the incidence of wrong-way bicycling.

There are two functional types of bikeways in Phoenix: Recreational and Commuter/Transportation-related. The Parks and Recreation Department is primarily responsible for planning and implementing recreational bikeways, and periodically publishing brochures showing recreational bikeways. Bike facility maps are normally available through the Maricopa Association of Governments based on information provided by the Street Transportation Department. The Parks and Recreation Department is responsible for monitoring and maintaining recreational bikeways along canals, in city parks and off-road alignments. When the Parks and Recreation Department is unable to provide maintenance, they may refer signing deficiencies to the Traffic Services Division or surface problems to the Street Maintenance Division for repair. On-street routes (such as Third Avenue/Fifth Avenue one-way pair, Seventh Street, 23rd Avenue, etc.) are monitored, maintained and operated by the Street Transportation Department.

2 Current levels of ridership

Bicycle lane usage (bicyclists/hour) at strategically selected locations throughout the city collected by the City of Phoenix and the Maricopa Association of Governments as part of their concurrent bicycle count project. Appendix B includes bicycle count data collected by the City of Phoenix using pneumatic tubes, MAG Bicycle Count station location and technologies, and MAG Bicycle Count data for City of Phoenix sites. Additionally, a map of all bicycle count site locations is provided.

[PLACEHOLDER FOR ADDITIONAL DISCUSSION OF BICYCLE COUNTS]

APPENDIX B – BICYCLE COUNTS

3 Existing Facilities

In late summer and fall of 2013, City of Phoenix Street Transportation technicians drove city roadways to verify existing bikeways in the field compared to map records. The technicians utilized a bicycle facility observation report to make notes of whether:

- a. bike lanes or bike routes were shown on the map and present in the field
- b. bike lanes or bike routes were shown on the map but not present in the field
- c. bike lanes or bike routes were present in the field but not shown on the map
- d. bike lanes or bike routes were shown on the map but a different facility was present in the field

When a discrepancy was identified, a note for action was made. For situation b and c, the action was to remove or add the facility to the map records. For situation d, the action was to update the map records to the correct facility type. In addition, during this process, work orders were written for damaged, defected or missing bike facility signs and fake pavement markings. The following list is the inventory of bicycle facilities (705 total bikeway miles) in the City of Phoenix as of October 7, 2013:

- o 22 bike bridges
- o 20 bike tunnels
- o 420 miles of bike lanes
- o 163 miles of bike routes
- o 5 miles of bike blvd
- o 51 miles of paved paths on canals and mountain parks and preserves
- o 66 miles of unpaved paths

[PLACEHOLDER FOR EXISTING BIKE FACILITIES MAP]

MAKING CONNECTIONS

Policies & Perceptions

The first goal of the 2014 City of Phoenix Comprehensive Bicycle Master Plan is to expand the perception of bicycling beyond merely a recreational pursuit to that of efficient and enjoyable transportation mode. A cultural shift is envisioned that moves Phoenix away from auto-dependency and embraces bicycling as an everyday part of active, healthy lifestyles for Phoenix residents.

Why Institutionalize Bike-Friendly Practice?

Affecting widespread social change must begin with modifications to local government policies and practices. The Technical Advisory Committee and Ad Hoc Task Force guiding development of this plan stressed that the first step needed in “Making Connections” is departmental coordination and support to advance bicycling within City Hall. Interviews conducted as part of this project’s background review and research revealed six key city departments that are involved in bicycle planning and/or directly impacted by its implementation. These include:

- ▶ City of Phoenix Street Transportation Department
- ▶ City of Phoenix Parks and Recreation Department
- ▶ City of Phoenix Planning and Development Department (P&D)
- ▶ City of Phoenix Community and Economic Development (CED)
- ▶ City of Phoenix Neighborhood Services Department (NSD)
- ▶ City of Phoenix Police Department

GOAL:

A strong bike culture will be the norm, not the exception, as reflected in government organization, community, and individual actions.

Public policy will be connected with the desire to have more people riding bikes more often. Bicycling will be easy, safe, convenient, fun, and an accepted mode of transportation and recreation.



In addition, regional transportation planning must be coordinated with the following additional governmental agencies and public service providers:

- ▶ Arizona Department of Transportation (ADOT)
- ▶ Maricopa Association of Governments (MAG)
- ▶ Valley Metro Regional Public Transportation Authority (RPTA)
- ▶ Salt River Project Power and Water (SRP)

Departmental Roles and Responsibilities

In 2008, the Street Transportation Department identified \$19 million in unfunded bike program needs, which include bike structures, multi-use paths, safety projects, bike share program, major street improvement projects, bike lane retrofit projects, and bike program operations. Traditional transportation funding sources have fallen short of meeting these needs, so creative multi-agency partnerships and involvement of all sectors of the community will be needed to assist Street Transportation in meeting newly prioritized needs of the 2014 Comprehensive Bicycle Master Plan.

Recommendations include programing City of Phoenix priority needs into the city's Capital Improvement Program (CIP); sharing division of responsibilities for bicycle education/encouragement/enforcement/evaluation between city departments and regional agencies; seeking state and federal funding through MAG to assist with implementation of large and difficult projects; and forging partnerships between the City and the Salt River Project to develop bicycle commuter paths adjacent to SRP canals.



Community Education and Encouragement

In keeping with the 5-E approach to bicycle planning used by the League of American Bicyclists, this chapter of the Bicycle Master Plan highlights current programs, activities, and organizations that support bicycling in Phoenix.

In addition, an action plan of program recommendations is included to foster increased education and enforcement through consolidation of web-based information, training of transportation professionals and police officers, developing driver education campaigns, conducting bicyclist education programs, hosting special events, and evaluating successes.



Individual Actions for Cultural Change

Community Wikimap input reported that many routes are too stressful for most people due to lack of facilities, not enough space on roadways, and high traffic speeds. Public investment in bike-friendly infrastructure and more vibrant, people-oriented urban development will serve as catalysts in getting more people on bikes more often. However, focused efforts need to be made to reach out to those who currently do not consider themselves cyclists. *The Maricopa County FY2013 Trip Reduction Program Annual Report* indicates that men are more likely to bicycle than women by a 3:1 ratio, and people under age 25 are most likely to bike. Thus the goal is to make bicycling fun, safe, and effortless to increase usage by women, families, and others who have yet to enjoy daily health, social, and economic benefits of bicycling.

Government Policy

I Existing Plans and Policies

I.1 City of Phoenix Bike Planning Documents and Policies

This section provides a review of relevant City of Phoenix plans, policies, and documentation relating to bicycling.

Table 1 - City of Phoenix Plans and Policies Related to Bicycling

Title	Notes
City of Phoenix (2002). Phoenix General Plan – Bicycling Element.	The Bicycling element sets forth goals, policies, and recommended programs that will help enhance bicycle facilities within the City of Phoenix. The three goals are- <i>Bicycle access</i> : increase bicycle access to destinations in Phoenix and maximize bike route connections to other cities; <i>Ridership</i> : increase bicycle ridership by removing barriers, improving facilities and providing more information; <i>Safety</i> : improve bicycling safety through more education, better signage and installation of more safety features. Includes the Planned Bikeway System Approved 1987 consisting of approximately 588 miles of bike facilities.
City of Phoenix (2009). City of Phoenix Street Planning and Design Guidelines. Chapter 10 – Bikeways.	These standards are for planning and designing both on- and off-street types of bikeways within the City of Phoenix. It contains detailed information on the location of bikeways and the signs and markings for each type. Guidance for bikeways affected by construction and a list of maintenance responsibilities is provided. National, regional, and local design standards to be used in conjunction with this document are listed.
2012 City of Phoenix Supplement to 2012 MAG Uniform Standard Specifications	These Specifications are developed for public works construction within the City of Phoenix and include construction of improvements that will be owned and/or maintained by the City of Phoenix. These Specifications are not intended to supersede the City of Phoenix Construction Code, or any other applicable law, or ordinance. Multi-Use Trails shall allow bicycle use with tread and surface conditions that allow side-by-side travel and ease of passing by bicycles.
City of Phoenix (2011). Traffic Operations Handbook. Chapter 5 – Pedestrians and Bicyclists	The purpose of this chapter is to provide guidelines on the design and operation of bike facilities. The definition of bicycles and requirements on bicycle equipment and usage, by law, is provided. Four types of bikeways and two functional types are defined. The procedure for installing bicycle racks is detailed. Several portions of this handbook chapter are pending in draft form.
City of Phoenix (additions and revisions in 1997 and 2003). <i>City of Phoenix Zoning Code (Canal Design Guidelines)</i> .	These Canal Bank Design Guidelines applies to all development in the City of Phoenix on both public and private land adjacent to Highline, Grand, Arizona, and Western canals which is subject to development review. It states that canal banks be a primary component of pedestrian, bicycle, and equestrian pathways. There is mention of cyclists in regards to safety where canals cross arterials and adjacent to power easements.
Perez, J. (2012). Bicycle Minimum Green Times at Signalized Intersections.	This internal memorandum provides a methodology for calculating minimum green times based on street width, speed limits, yellow and red time to accommodate bicyclists stopped at a signal. Bicycle minimum green times can be as low as 4.9 seconds to cross a 40 foot road and as high as 9.7 seconds to cross a 132 foot road. It is recommended that a bicyclist be present to test any changes to signal timing, especially at wider intersections. Look-up tables are included.

Title	Notes
Perez, J. (2012). Bicycle Acceleration at Signalized Intersections.	This paper reviews the FHWA publication <i>Characteristics of Emerging Road Users and Their Safety</i> , which analyzes performance characteristics of human powered objects, including bicycles. The FHWA report provides a table of distance versus observed times for various user types. An important observation is that hand cyclists, entitled to use bike lanes, do not meet the lowest bicycle acceleration rate suggested for use in AASHTO guidelines. The City of Phoenix allows engineering judgment to determine whether to use the AASHTO equation (with the recommendation of using a bicycle acceleration rate of 1.5 ft/s ²) or the FHWA table for hand cyclists to calculate minimum green time.
Perez, J. (2013). Bicycle Detection at Traffic Signals.	This paper discusses how bicycle detection at intersections can be accomplished using several technologies as implemented in the City of Phoenix and neighboring cities. Information regarding the Bicycle Detector Pavement Marking and Bicycle Signal Actuation Sign (R10-22) is provided.
Perez, J. (2011). Bicycle Detection at Traffic Signals.	This paper discusses how bicycle detection at intersections can be accomplished using several technologies as implemented in the City of Phoenix and neighboring cities. Information regarding Bicycle Push Buttons, Bicycle Signal Heads, Bicycle Boulevard Intersection needs, Bicycle Detector Pavement Markings and Bicycle Signal Actuation Signs are provided. References are listed.
Bearup, W. (2013). Phoenix Bicycle Program Inventory and Status City Council Report (CCR).	This City Council Report to the Transportation and Infrastructure Subcommittee on May 14, 2013 explains the issue of implementing the Phoenix Bikeway System plan and “Complete Streets” initiative with budget challenges. A request of \$1.5 million in Arizona Highway User Revenue is supported with a summary of existing bike lane and route miles, a list of recently completed, ongoing, and committed bike projects, and the proposition of undertaking the 2014 Phoenix Bikeway Plan (aka Bike Master Plan). A draft 2011 Bicycle Plan by the Street Transportation Department is enclosed.
MyPlanPHX http://www.myplanphx.com/ (as of 8/2/2013)	MyPlanPHX provides an opportunity for all residents to help shape the future of the City through participation in two very important projects: an update to the city’s General Plan (Conserve Create ConnectPHX), and planning for the community. 3 of the top 5 most popular ideas on the “What’s your big idea for our future?” webpage topic thread relate to bicycle infrastructure.

1.2 City of Phoenix Department & Valley Metro RPTA Interview Summary

Several City of Phoenix departments and Valley Metro RPTA were also interviewed to determine their major issues and needs in relation to bicycling. The interviews are summarized in the following table.

Table 2 - Major Issues and Needs of other City of Phoenix Departments and Valley Metro RPTA

Department	Major Issues/Needs	Reference Documents
City of Phoenix Community & Economic Development (CED)	<p>Seeing a lot of bikes on light rail at most popular stations. Focus on enhanced bike connectivity from these stations to 3-10 top destinations, prioritize these projects for improvements, and then market the enhanced access once completed.</p> <p>Revisit and try to implement 2004 vision for Downtown Phoenix. Would like to see vision for "The Connected Oasis" create a distinctive sense of place by using both pedestrian connectivity and shade as defining elements in Downtown's design.</p> <p>New projects are including lockers and formal bike storage areas as an amenity. Currently not required, but developer-initiated. (i.e. multi-family Roosevelt Point parking structure)</p>	<p>Downtown major projects map</p> <p>Downtown Phoenix: A Strategic Vision and Blueprint for the Future</p> <p>Downtown Phoenix: Two-Year Progress Update</p>
City of Phoenix Parks & Recreation Department	<p>Incorporate Parks shapefiles into Wikimap tool. Will show existing and proposed canal trails, soft-surface trails, major trailheads, and paved trails.</p> <p>Biggest hurdles are trail crossings of arterial streets, especially in southern portions of the city. At-grade signals are needed in many locations where users must use a confusing 1/2-mile jog to get to a signalized crossing.</p> <p>Canals offer largest opportunity. Parks has recreational management for maintenance roads/trails with both Salt River Project (SRP) & Central Arizona Project (CAP). Most are open for trail use; some are signed; proposed trail extensions noted by dashed lines. Attention is needed where streets cross canals, making regional connections into adjacent jurisdictions, and funding of projects in lower income neighborhoods.</p> <p>Loop 202/South Mountain Freeway project was originally proposed to include a parallel trail. Freeway will run on Pecos Road alignment in Ahwatukee, which is currently very popular with cyclists. Inclusion of trail in project may be way to garner support with people who oppose freeway. <i>Follow-up information received from ADOT:</i> Earliest start for design and construction of project is next fall, with a five year build-out. A parallel bike path is not currently a part of the freeway design plan. If Phoenix wants to have a bike trail along the freeway, they would have to fund the design and cost of that facility.</p> <p>Rio Salado is a major habitat restoration project with US Army Corp of Engineers. Includes 5 miles where trails are located on both sides of the Rio Salado, with plans to build further east and west. This is located just south of Downtown Phoenix and should be pursued as the big "Wow" project that becomes a tourist destination to link with Tempe. Airport section will be most difficult part to implement.</p> <p>Phoenix has largest urban preserve system in country with >30,000 acres in preserves, and >250 miles of trails. Bike Plan needs to focus on how to provide on-street access to major trail heads, and identify which trails across preserves are good commuter routes for connectivity between streets.</p> <p>Coordinate with and connect into Maricopa County trails system.</p> <p>Tunnel needed under 6-lane Tatum Boulevard to access soccer fields.</p> <p>In general, users need wayfinding signage to identify how to get to major destinations, especially how to access major trailheads.</p>	<p>Comp Plan Open Space and Recreation Elements (2007 General Plan Amendment)</p> <p>County Trails Plan http://geo.azmag.gov/maps/bikemap/</p> <p>Reach 11 Master Plan</p>

Department	Major Issues/Needs	Reference Documents
City of Phoenix Neighborhood Services Department (NSD)	<p>Biggest challenge in several lower-income neighborhoods is overcoming crime and safety issues to be out and about on streets on foot or bike. Also often a lack of personal resources to buy bicycle equipment, and concerns if redevelopment/enhancements will force out low-income populations. However, people want to be able to access light rail stations.</p> <p>NSD is responsible for managing a variety of Federal grant programs (CDBG, HUD, etc.) Department thus getting more interested in Complete Streets and ped/transit improvements, also Green Infrastructure design (GI) and rain water harvesting techniques within street right-of-ways. Phoenix has a hybrid form-based code in Downtown, but suburban standards elsewhere. Note that shade trees won't grow in tree wells in Phoenix - thus need to plan for fewer, higher-quality trees in larger spaces than current suburban development code (20' o.c. with 5 shrubs per tree) to create a "sustainable urban forest." Several resources exist to help designers and planners design for healthy urban trees.</p> <p>Individual neighborhood planning efforts have also addressed bikes to some degree.</p>	<p>Green Street Manual</p> <p>Section plans for Taylor Street Mall</p> <p>Tree and Shade Master Plan</p> <p>South Phoenix Village Redevelopment Area Plan</p> <p>Garfield Redevelopment Plan</p>
City of Phoenix Planning and Development Department (P&D)	<p>Some past bike planning work was done as part of 1987 General Plan and through the Maricopa Association of Governments, but mostly just lines on maps. Various subplans may address bicycling at policy level; will check to see if any have gone as far as identifying/mapping proposed projects.</p> <p>Include State-designated Sun Circle Trail and identify missing gaps in this route within bike plan.</p> <p>Phoenix has many policy and implementation barriers to completing bicycle projects. Most notably, look at recommended street cross-sections vs. Subdivision Ordinance. "Shall" vs. "Should" language in ordinance often means projects are often not implemented. Primary examples are not requiring bike lanes be striped on collectors; lack of coordination between departments on maintenance issues; and lack of local street connectivity between subdivisions.</p>	<p>Subdivision Ordinance</p>
Valley Metro RPTA	<p>Metro recently conducted a study on bicycle integration with rail. Included was a 2011 Valley Metro On-board Survey which summarizes on bicycle transit rider demographics and trip patterns; 2012 Metro Bike-Transit Integration Survey that summarizes qualitative responses on bike/transit experiences; and an Existing Conditions Analysis focusing on the trains, station areas, bicycle parking, and bikeway connections to stations.</p> <p>Bicycle access to light rail stations is largest issue. Metro currently is undertaking a separate initiative working on three station access projects at 7th & Camelback, Campbell & Central Ave, and Dorsey & Apache in Tempe.</p> <p>Metro is working with Street Transportation Department on new Bike Share program. Is challenging to work within federal guidelines to find parking locations at stations. Additional Bike Share bikes on board trains may also be an issue, especially in initial phasing of project.</p> <p>The limit of two bikes per bus may also be an issue.</p> <p>The Valley Metro website offers information on employer trip reduction programs, bike safety, biking tips, bike resources, and Valley Bike Month. A variety of regional and local bike plan links are provided under the Bike Resources page.</p>	<p>2012 Bike-Transit Integration White Paper</p>
ReinventPHX	<p>ReinventPHX is a concurrent planning initiative that aims to create long-term sustainable plans for the five TOD Districts along the Metro light rail</p>	<p>draft Gateway TOD Report</p>

Department	Major Issues/Needs	Reference Documents
	<p>line. For each district, a charrette process is being held to establish a shared vision, identify transition areas targeted for change, and create public realm investment concepts. The Gateway District plan is completed in draft form, and the Eastlake plan is currently under development.</p> <p>Bicycling issues that have emerged during the first two charrette processes include personal safety, completion of a bicycle network within each district, connections to the larger citywide bicycling system, access to the light rail stations, and the need for innovative urban bikeway design treatments at intersections, within certain major arterial corridors, and to provide access to one-way bike lane pairs.</p> <p>In general, several streets are over-designed for auto traffic and offer opportunities for lane restriping and adding streetscape treatments to provide both shade and traffic calming.</p>	<p>draft Eastlake/Garfield elements</p>

1.3 Policies, Practices, and Procedures Assessment based on National Recommendations

Toole Design Group reviewed and assessed the following Phoenix policies, practices, and procedures for traffic control and bike facility design with respect to the standards and guidelines published by AASHTO, MUTCD, and NACTO:

- 2002 Phoenix Master Plan
- 2002 Phoenix General Plan – Bicycling Element
- 2011 Traffic Operations Handbook – Chapter 5: Pedestrians and Bicyclists
- City of Phoenix Zoning Code (Canal Design Guidelines)
- 2012 Bicycle Minimum Green Times at Signalized Intersections
- 2013 Bicycle Acceleration Rates at Signalized Intersections
- Bicycle Detection at Traffic Signals
- City of Phoenix Traffic Barricade Manual

The detailed assessment is provided in Appendix C.

APPENDIX C – Policy Assessment

2 Recommended Revisions to City policies and procedures

[Placeholder for recommendations list]

3 Roles and Responsibilities of Other Agencies and Private Sector

4 Recommended Partnerships

Public Perceptions

5 Education and Encouragement

5.1 Existing Programs, Activities and Organizations

The following list highlights current programs, activities and organizations that support bicycling in Phoenix.

- City of Phoenix Bicycle Program web page
- City of Phoenix Bicycle Safety web page
- Phoenix Police Department Bicycle Safety web page
- Phoenix Police Department bicycle rodeos
- Valley Metro bike on bus and bike on LRT programs
- Phoenix Safe Routes to School program--The Phoenix Street Transportation Department Safe Routes to School (SRTS) Coordinator coordinates SRTS at the city-wide level. Duties include organizing bicycle rodeos and walk and bike to school days. 30-40 schools within the city participate every year.
- Maricopa Association of Governments (MAG) Safe Routes to School Program
- Local bike races and charity rides (Phoenix Tour de Cure)

5.2 Recommendations

Communities that combine infrastructure development, and education and encouragement programs are the most successful at increasing levels of participation in bicycling. Education and encouragement programs are a good opportunity for partnerships between government agencies, community groups and the non-profit sector. The following section highlights recommendations for improving existing programs or developing new initiatives to support and promote safe bicycling throughout Phoenix.

City of Phoenix Website

- Consolidate bicycle information on the City of Phoenix website into one bicycling portal with an intuitive URL that is easy for people to remember and include this URL on printed materials.
- Add the Street Maintenance Division's problem reporting telephone number and Online Street Maintenance/ADA Problem Reporting Form link to the bicycle safety website.

Training for Transportation Professionals and Police Officers

- Provide training to City of Phoenix transportation engineers, as well as consultants who regularly work with the City of Phoenix regarding the City's complete streets policy (when finalized), City bicycle facility standards and guidelines, and bicycle facility planning and design best practices.
- Establish a program to train police officers on laws impacting bicyclists and bicycle safety. ([Link to San Francisco Police Department bicycle training video](#))

- Partner with Valley Metro to provide training to bus drivers on sharing the road with bicyclists. ([Link to MUNI bus driver training video.](#))

Driver Education

- Expand automobile driver education about bicycle laws, behavior, and rights.
- Launch a “coexist” campaign to educate motorists and bicyclists to promote safe and respectful behavior from all road users. ([Link to Fort Collins Coexist Campaign website.](#))
- Launch anti-distracted driving campaign to remind drivers of the dangers of distracted driving.

Bicyclist Education

- Continue City-wide coordination of Safe Routes to School (SRTS) activities, including bicycle rodeos and Bike to School Day safety assemblies and group rides.
- Establish a Phoenix Bicycle Ambassadors Program to provide outreach and education on bicycling. Potentially partner with Phoenix Metro Bicycle Club or other local or regional advocacy organization to institute and sustain the program. ([Link to Salt Lake County Bicycle Ambassadors Program](#))
- Establish a bicycle education program targeting seniors, e.g., by allowing seniors to try comfortable and stable three-wheeled bicycles and encouraging empowerment in transportation and health decisions. ([Link to Portland Senior Cyclist Program](#))
- Establish an active living partnership that includes agencies, businesses and institutions involved in promoting health and wellness to implement programs promoting bicycling for health. ([Link to Active Living Partnership of greater Stapleton web page](#))

Events

- Continue promotion of Bike to School Day and Bike to Work Day at the City-wide level.
- Establish a regular Ciclovía in downtown Phoenix, where streets are closed to motorized vehicles and opened up to non-motorized users. ([Link to Los Angeles CicLAvia website](#)) One such event was held in Council District 5 in conjunction with John F. Long Elementary School on March 8, 2014.

Evaluation

- Create an implementation performance dashboard to track progress on implementing various aspects of the bicycle plan and document the impact on rates of bicycling, bicycle crashes and demographics (e.g. increases in female or minority riders).
- Conduct observations around schools where bike helmets have been distributed to students and safety assemblies and rodeos were conducted to monitor the change in student behavior and helmet use.

MAKING CONNECTIONS

Opportunities & Investments

This 20-year Comprehensive Bicycle Master Plan is intended to strike a balance between being visionary and realistic. Chapters 7 and 8 detail citywide recommendations for a variety of on-street and off-road bicycle projects. These include:

- ▶ 37 corridors, with 110 segment projects identified to complete gaps and make connections within the corridors;
- ▶ 186 intersection projects to improve bicycle lane striping;
- ▶ 78 canal crossing enhancements; and
- ▶ 18 projects within the Gateway and Eastlake TOD Districts, per the ReinventPHX planning initiative.

These projects have been prioritized using a methodology that reflects community values, builds upon best practices in bikeway planning, and takes advantage of the latest national research on safety and other issues. The outcome is a three-tiered approach to implement need-based projects over short, medium, and long-term planning horizons.

Why Focus on Need-Based Investments?

Many communities – Phoenix included – began bikeway implementation in areas where pilot projects could be built at low to moderate costs, with community backing and support, as opportunities arose. The result is a collection of individual

GOAL:

Investments made for bicycling will be smart, focused, and equitable.

The City of Phoenix will leverage existing assets and create partnerships with local, county, and state agencies to build out the bicycle infrastructure network.



bikeway segments that do not provide the network connectivity desired by cyclists who wish to ride for transportation or longer-distance recreational pursuits. Second-generation bicycle plans therefore often look at how to overcome cross-town travel barriers and complete missing gaps in a community's bicycle network. The challenge is determining where to start when many diverse and worthy projects combine to form the long-range bicycling vision of a community.

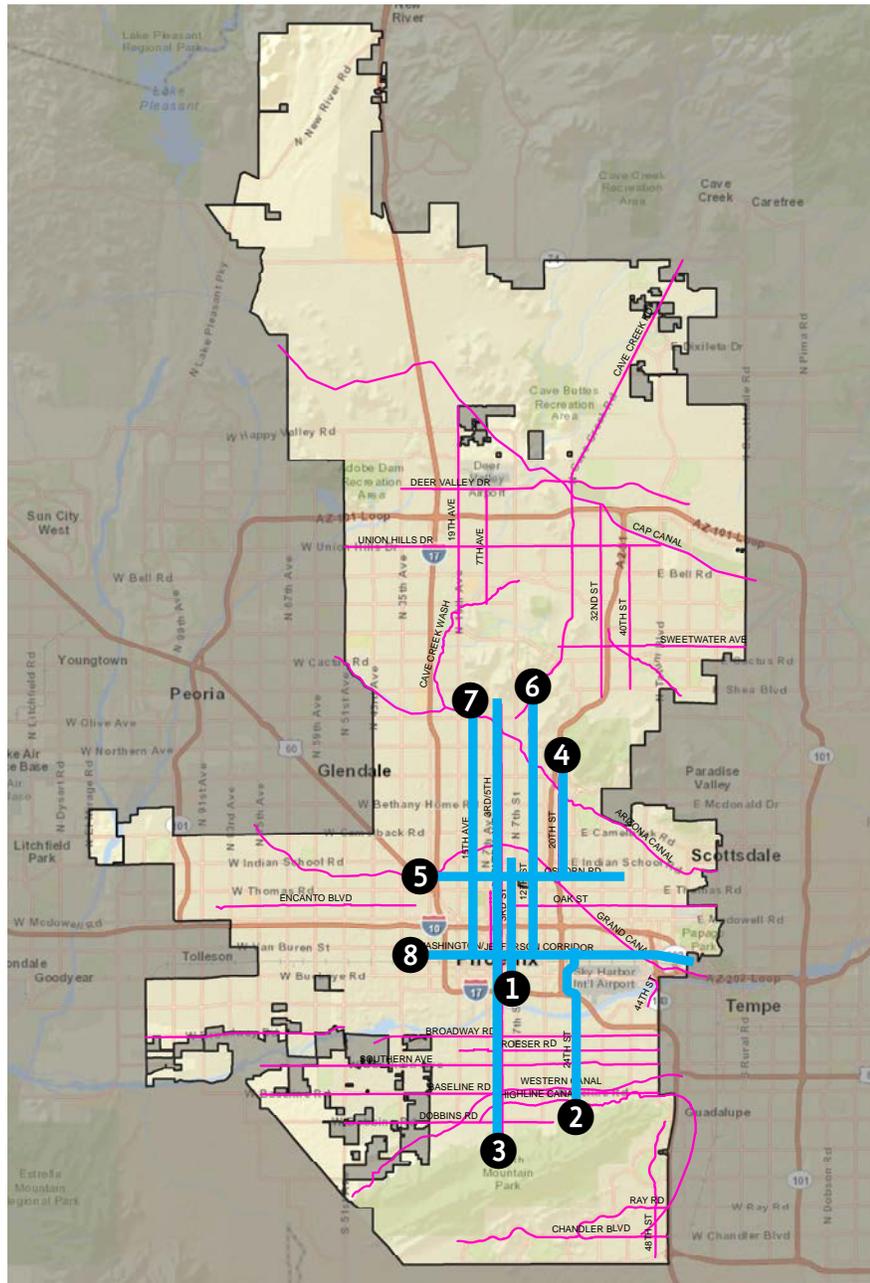
Bikeway Prioritization Process

The City of Phoenix Bicycle Master Plan served as a national pilot methodology for evaluating corridors and selecting bicycle improvement projects. This chapter details the methodology used. Factors such as demand, connectivity, stakeholder input, safety, existing conditions, constraints, and equity were weighted and used to develop a ranked list of prioritized projects. The initial phase of recommendations will be implemented as part of the five-year Capital Improvement Program (CIP); projects associated with Tier II and Tier III corridors will be addressed in Phases 2 and 3 of bike plan implementation.

Tier I Projects

Within the next five years, the City of Phoenix plans to add **67.5 miles** of bikeways. The highest priority corridors for implementation include the following, in order ranked:

- 1 **3rd Street**
from Indian School Road to Buckeye Road
- 2 **24th Street**
from Van Buren Street to Baseline Road
- 3 **Central Avenue**
from Mountain View Road to South Mountain Park
- 4 **20th Street**
from Grand Canal Trail to Glendale Avenue
- 5 **Osborn Road**
from I-17 to 40th Street
- 6 **12th Street**
from Mountain View Road to Washington Street
- 7 **15th Avenue**
from Dunlap Avenue to Jefferson Street
- 8 **Washington/ Jefferson Streets**
one-way pair from 27th Avenue to 56th Street



Unmet Needs

I Bicycle Projects

The City has seven basic types of expenditures for the bike program:

1. **Bike structure** – new bridges and tunnels to accommodate the flow of bicyclists over or under canals or roadways (\$1 million - \$6 million per structure)
2. **Bike trails/paths** – off-roadway bicycle or multi-use paths to fully separate the flow of pedestrians and bicyclists from motorized traffic (\$800,000 - \$3 million per mile), including ROW acquisition, asphalt, etc.
3. **Special projects** – smaller specialty projects to support education, safety and improved operation for bicyclists (\$2,000 - \$30,000 per project)
4. **Bike share** – Program for residents and visitors to rent bicycles at stations throughout the city (\$1.5 million in approved funding including regional Congestion Mitigation Air Quality funding in partnership with the City of Tempe)
5. **Major street improvement projects** – new bike infrastructure added in conjunction with new roadway or roadway widening projects (\$600,000 - \$1.1 million per mile, estimated at \$725,000 per mile on average)
6. **Bike lane retrofit projects** – new bike lanes added to existing streets without widening, e.g., new bike lanes added with overlay projects or through road diets (\$5,000 - \$75,000 per mile)
7. **Bike program operations** – operating budget to manage program, including staff, materials and related expenses (\$160,000 - \$210,000 per year)



Figure 1 - Special Projects: Bike racks on Pierce Street and Downtown Parking Meter Rings for Bicycle Parking



Figure 2 - Bike Lane Road Diet Project: Central Avenue, Camelback Road to Bethany Home Road (Before and After)

The following table summarizes some of the recently completed (RC), ongoing (O), and committed (C) bike program expenditures:

Table 1 - City of Phoenix Bicycle Program Expenditures

Project	Funding	Status	Cost
Bike Structures (\$12,189,726)			
Arizona Canal Bike Tunnel under 7 th Ave.	AHUR, stimulus	RC	\$2,877,165
South Mt. Comm. College Ped. and Bike Crossing	AHUR, fed aid	RC	\$790,518
Royal Palm (15 th Ave/Dunlap) AZ Canal Bike Bridge	AHUR, fed aid	RC	\$1,261,698
Nevitt Park at Western Canal Bike Bridge	AHUR, fed aid	C	\$1,168,600
7 th St. Science Center Bike and Ped. Bridge	'06 bond	C	\$6,091,745
Bike Trails and Paths (\$15,401,201)			
Indian School/16 th St. Multi-Use Trail	AHUR, fed aid	O	\$1,882,885
19 th Ave./Cave Creek Wash Bike Trail (Revised project scope)	'06 bond	C	\$794,306
Rio Salado/Salt River; 24 th ST. to I-10 Path	AHUR, fed aid	O	\$3,552,487
Arcadia Portal Multi-Use Trail	AHUR, fed aid	RC	\$651,137
Grand Canal Bike Crossings	AHUR	O	\$14,434
Grand Canal Major St. Safety Improvements	'06 bond	O	\$25,000
Sonoran Blvd. Paseo Bike Trail	PPI (Parks)	RC	\$3,800,000
Rio Salado/Salt River; 32 nd St. – 40 th St. Path	AHUR, fed aid	C	\$1,122,642
Rio Salado/Sal River; 40 th St. – SR 143 Path	AHUR, fed aid	C	\$2,058,310
107 th Avenue; ISR to Camelback Shared Use Path	AHUR, fed aid	C	\$1,500,000
Special Projects (\$86,572)			
Bike Racks and Corrals Citywide	AHUR	O	\$26,822
Bike Detection at Traffic Signals	AHUR	O	\$22,250
Bike Storage Corrals for Schools	CCF	O	\$7,500
Bike Parking Rings for Parking Meters	AHUR	O	\$5,000
Bike Safety Education	GOHS	O	\$9,000

Project	Funding	Status	Cost
Bike Helmets for Children	GOHS	O	\$6,000
Bike Share (\$1,914,500)			
Regional Bike Share Project with City of Tempe	CMAQ, Fed Aid	O	\$1,414,500
Bike Share Infrastructure Improvements	AHUR	O	\$500,000
Major Street Improvement Project Bike Lanes (\$18,279,900)			
Baseline; 51 st Ave. – 59 th Ave. Bike Lanes	AHUR	C	\$725,000
43 rd Avenue; Baseline – Southern	AHUR	C	\$725,000
Southern Avenue; 19 th Avenue/ - 31 st Avenue/	AHUR	RC	\$725,000
Pinnacle Peak Road; 35 th Ave. – 55 th Ave.	AHUR	O	\$1,450,000
Sonoran Boulevard; NW Pkwy. - Cave Creek Rd.	AHUR, IF, CCF	RC	\$2,175,000
Avenida Rio Salado	AHUR, fed aid	O	\$272,400
Centennial Way (Washington St. near State Capitol)	ADOT, fed aid	RC	\$5,000
7 th Avenue; Southern – Salt River	AHUR	C	\$1,087,500
43 rd Avenue; Lower Buckeye – Buckeye Rd.	AHUR	C	\$725,000
32 nd Street; Southern – Broadway	AHUR, '01 bond	C	\$725,000
35 th Avenue; Baseline – Southern Ave.	AHUR	C	\$725,000
75 th Avenue; Lower Buckeye – Buckeye	AHUR	C	\$725,000
Buckeye Road; 67 th Ave. – 59 th Ave.	AHUR, IF	C	\$725,000
Lower Buckeye; 51 st Ave. – 43 rd Ave.	AHUR, '06 bond	C	\$725,000
32 nd Street; Washington St. – McDowell Rd.	Fed aid, '06 bond	C	\$725,000
56 th Street; Deer Valley Rd. – Pinnacle Peak Rd.	AHUR, IF	C	\$725,000
35 th Avenue; Dobbins – Baseline	AHUR	C	\$725,000
27 th Avenue; Lower Buckeye – Buckeye	AHUR	C	\$725,000
27 th Avenue; L-101 – Deer Valley	AHUR	C	\$725,000
64 th Street; Utopia – Mayo	AHUR, IF	C	\$1,450,000
Buckeye Road; 7 th St. – 16 th St.	AHUR	C	\$725,000
Baseline Road; 59 th Ave. – 51 st Ave.	AHUR	C	\$725,000
Roosevelt; Central Ave. – 4 th St.	AHUR, fed aid	C	\$240,000
Bike Lane Retrofit Projects (\$2,781,136)			
Central Avenue; Camelback – Bethany Home Rd.	AHUR	RC	\$41,754
Chris-Town Gateway Bicycle Boulevard	AHUR	RC	\$58,613
11 th St Pedestrian and Bike Improvements	FTA	O	\$10,000
Indian School; 19 th Ave. – I-17	AHUR	C	\$100,000
Overlay Projects (2 miles, various projects)	AHUR	RC	\$10,000
32 nd Street SR 51 – Reach 11	AHUR, fed aid	C	\$445,568
Shea Boulevard; 32 nd St. – SR 51	AHUR, fed aid	C	\$364,941
Roosevelt Row Bike Lanes	AHUR, fed aid	C	\$750,260
Discretionary Project Funding for Bike Lanes	AHUR	C	\$1,000,000

Project	Funding	Status	Cost
Bike Program Operations/Administration (\$419,968)			
Staffing (1 Full-Time Equivalent position)	AHUR	O	\$110,000
Citywide Specialty Bike Marking and Signing	AHUR	O	\$59,968
Discretionary Small Project Funding (FY13-17)	AHUR	O	\$250,000
TOTAL EXPENDITURES/COMMITTED BIKE FUNDING			\$51,073,003

FTA – Federal Transit Authority

CCF – Capital Construction Funds

PPI – Parks and Preserve Initiative

IF – Impact Fees

GOHS – Governor’s Office of Highway Safety

AHUR – Arizona Highway User Revenue

CMAQ – Congestion Management & Air Quality

2 Evaluation Process

The City of Phoenix participated as a pilot agency for the National Cooperative Highway Research Program (NCHRP) 07-17: *Pedestrian and Bicycle Transportation along Existing Road* study. By participating, Phoenix had the opportunity to prioritize bicycle projects using a methodology that represents best practices from around the country while also taking advantage of the latest safety and other related research. As a participant, the City was provided with a detailed explanation of the methodology, an Excel-based spreadsheet tool, detailed instructions on how to use the tool, and periodic support from the Research Team.

A primary goal of the NCHRP 07-17 project is to develop a methodology that guides practitioners through the step-by-step process of setting up a framework for prioritizing bicycle and pedestrian projects along existing roads. The methodology is intended to be flexible for a range of agency needs and capabilities, so that more agencies are encouraged to prioritize pedestrian and bicycle projects. The prioritization methodology was developed based on findings from a national survey and literature review, and agency interviews. This prioritization methodology was only used for bicycle corridors and projects in this master plan study.

Transportation agencies often make decisions based on what the communities they serve value most (e.g. transportation choices, safety, congestion mitigation, etc). Rather than being a rigid, “one-size-fits-all” tool, the methodology is flexible and allows practitioners to choose the most appropriate approach to reflect community values and the resources that are available to the agency. The methodology includes guidance on factors, variables, data collection, data organization, and analysis, as well as different technological tools that can be used for prioritization.

Different types of agencies may use the methodology in different ways. Funding agencies (e.g. MPOs, RPOs, state DOTs) that distribute funding among many projects in many local jurisdictions may use the methodology to evaluate projects and select locations or projects that rank highest based on established factors and variables that reflect policy objectives. Local agencies with an identified list of bicycle or pedestrian improvements may use the methodology to establish which improvements are implemented in the near-, medium-, and long-term. Agencies may employ the methodology more iteratively as well. For example, the methodology could be used to identify and rank corridors, then used again to identify/rank intersections within identified corridors at which to focus resources and conduct field assessments in order to identify specific types of improvements. Once specific improvements are identified, the methodology can then be used to rank and prioritize each type of improvement.

The prioritization methodology can be used to rank pedestrian and bicycle facility improvements by a set of locations (e.g. roadway segments, intersections) or by facility type (e.g. trails, shared lanes, or bicycle lanes) to determine a rank order for funding and/or implementation. Before embarking on the prioritization of specific improvements, an agency must first identify where improvements should be made. While the methodology can assist an agency in identifying areas or locations for improvements, it does not provide any guidance for determining bicycle facility design solutions. Lee Engineering provided this additional guidance for the Bicycle

Master Plan to address bicycle facility design solutions in the form of “projects” to eliminate missing gaps and overcome barriers within the prioritized project corridors.

2.1 Terms Used to Describe the Prioritization Process

Several terms are used to describe how data are organized and analyzed in the prioritization process. It is critical for practitioners to understand how these terms are defined.

Prioritization Elements

Prioritization elements are the specific intersections, roadway segments, areas, or other features that are considered during the prioritization process. For example, a prioritization process may seek to identify the top 10 intersections for bicycle crossing improvements in a neighborhood with 100 intersections. This prioritization process would have 100 prioritization elements.

Factors

Factors capture and categorize a range of community values that are commonly considered in the prioritization process. Factors contain groups of variables with similar characteristics. For example, the factor called “demand” includes variables such as “population density”, “employment density”, “proximity to schools”, “proximity to shopping”, and other characteristics related to the potential to generate pedestrian and bicycle activity. Including certain factors and weighting those factors differently allows a community to express what they value or care most about.

Variables

Variables are characteristics of roadways, households, neighborhood areas, and other features that can be measured. Variables are the core elements of the prioritization process. For example, “roadway traffic speed” and “neighborhood population density” are variables. Variables can be measured using quantitative or qualitative data values.

Measures

Measures are the specific metrics used to quantify variables. In fact, there is often more than one way to measure a variable. For example, “roadway traffic speed” can be represented by the measure of “85th percentile speed” (which is gathered from a speed study) or by the measure of “posted speed limit” (which can be observed from signs in the field or from a roadway segment database).

Data Values

Data values are the quantitative or qualitative values used to express the measures in the prioritization process. For example, quantitative data may be “30 miles per hour” on a roadway segment, “100 people per square mile” within a quarter-mile buffer of an intersection, or “2 crashes” reported at an intersection.

Weights (Weighting)

Weights are numbers used to indicate the relative importance of different factors. These weights reflect community values. During the prioritization phase, the data values are multiplied by the specific weights (for a particular variable or factor category) and summed across all factor categories to produce a prioritization score. This step is referred to as weighting. For example, if a community decides that crashes is a more important factor than roadway characteristics, then safety data values will be multiplied by a greater weight than roadway characteristics values.

Prioritization Scores

Prioritization scores are the final scores for each discrete element considered in the prioritization process. They are the result of multiplying the data values or scaled values by specific weights and summing these values across all factor categories (as described above). These prioritization scores are ranked from highest to lowest to show the final prioritized list (roster of projects). For example, each roadway segment that is being prioritized will receive a final prioritization score. The roadway segment with the highest score will be the top priority for project implementation.

3 Summary of Prioritization Process

3.1 Step 1: Prioritization Purpose

A vision statement for bicycling in Phoenix was developed with input from a Technical Advisory Committee and refinement from the Pedestrian and Biking Ad Hoc Task Force established in conjunction with the project. The vision for the Phoenix Bicycle Master Plan emphasizes connectivity and mode shift:

In 20 years, Phoenix will be a Platinum-level Bicycle Friendly Community. It will be safe and easy to bike anywhere in the city. A well-connected infrastructure network will link people and places, making bicycling a preferred option for daily transportation, recreation, and healthy lifestyles.

This Vision (and Goals) was applied for the prioritization process in an iterative manner:

- Iteration 1: Develop demand heat map and use the map as a basis for identifying corridors.
- Iteration 2: Prioritize corridors based on demand and connectivity; separate corridors into three tiers.
- Iteration 3: Identify projects and then prioritize these improvements along the prioritized corridors, focusing on the highest tier corridors.

Figure 1: Iterative Approach to Using the Bicycle Corridor/Project Prioritization Methodology



3.2 Steps 2 and 3: Select Factors and Variables

The factors and variables selected for the three iterations of the Phoenix Bicycle Master Plan prioritization are listed below.

3.2.1 Iteration 1 – Demand Heat Map

A heat map was developed using GIS to show relative levels of bicycle demand across the City. The color red was used to indicate highest demand with yellow representing medium demand and green representing areas of lowest demand. The resulting Demand Heat Map from Iteration 1 is provided in Appendix A. The variables used to determine bicycle demand are listed in Table 1.

Table 1. Iteration 1 Factors and Variables

Factor	Variable	Source
Demand	Schools	City of Phoenix
	Bus Stops	City of Phoenix
	City Facilities	City of Phoenix
	Community Centers	City of Phoenix
	Light Rail Stops	Valley Metro
	Park and Rides	Valley Metro
	Parks	City of Phoenix
	Existing Bikeways	City of Phoenix
	Identified High and Low Stress Routes (from Wikimap)	Wikimap
	Identified Destinations (from Wikimap)	Wikimap
	% of Households in Poverty	U.S. Census Bureau
	% of Population under 18	U.S. Census Bureau
	% Households with No Vehicle	U.S. Census Bureau
	Population Density	City of Phoenix

3.2.2 Iteration 2 - Corridor Prioritization

The Technical Advisory Committee and Ad Hoc Task Force reviewed the Demand Heat Map and identified 37 corridors with the highest bicycle demand in the City. These corridors were digitized into GIS as polylines and prioritized based on the factors and variables listed in Table 2. The result of this iteration is a ranked list of the 37 corridors (see Appendix B). The ranked corridors were divided into three groups termed Tier I, Tier II, and Tier III.

Table 2. Iteration 2 Factors and Variables

Factor	Variable	Source
Connectivity	Number of times corridor intersects other corridors	N/A
	Number times corridor intersects bicycle facilities	N/A
	Presence of existing bicycle facilities	City of Phoenix
Demand	Tier I attractors (light rail stops, colleges/universities)	Valley Metro Google Maps
	Tier II attractors (schools, bus stops, city facilities, community centers, , park and rides, parks)	City of Phoenix Valley Metro
	Land Use (commercial and high-density housing)	City of Phoenix
	Population Density	City of Phoenix
	% Households in Poverty	U.S. Census Bureau
	% Households with No Vehicle	U.S. Census Bureau
	Maricopa County Trip Reduction Survey Data	MAG
Stakeholder Input	Wikimap Destinations (included public meeting input and transit center surveys)	Wikimap
	Wikimap Routes (included public meeting input)	Wikimap
	Ad Hoc Task Force input	Ad Hoc Task Force
	Technical Advisory Committee input	TAC

3.2.3 Iteration 3 - Project Prioritization

Tier I represents projects to implement in the short (5-year) term, and Tier II and III projects implemented in the medium to long-term unless additional resources or opportunities arise. Projects to eliminate gaps and overcome barriers were identified for each corridor by driving each corridor or using other data to establish the desired bikeway facilities and connections along the corridors and are listed in Appendix C. Iteration 3 ranked these projects within each Tier which are provided in Appendices D through F.

Table 3. Iteration 3 Factors and Variables

Factor	Variable	Source
Connectivity	Bicycling Barriers	Wikimap
	Existing Bikeways	City of Phoenix
Safety	Crash Data	MAG
Existing Conditions	Posted Speed Limit	City of Phoenix
	Street Classification	City of Phoenix
Constraints	Order of Magnitude Cost	Lee Engineering
	Available Rights of Way	City of Phoenix
Demand	Tier I Attractors (light rail stops, colleges/universities)	Valley Metro Google Maps
	Tier II Attractors (schools, bus stops, bikeshare stations, city facilities, community centers, park-and-rides, parks)	City of Phoenix Valley Metro
	Population Density	City of Phoenix
	Land Use (commercial and high-density housing)	Maricopa County
Equity	% Households in Poverty	U.S. Census Bureau
	% Households with No Vehicle	U.S. Census Bureau

3.3 Step 4: Data Assessment

The City of Phoenix and project team considered data availability as part of variable selection. For example, Phoenix considered using Employment Density as a Demand Variable but decided otherwise when it became apparent that the necessary data was difficult to obtain.

3.4 Step 5: Resource Assessment

The City of Phoenix has GIS capability; however, the City's GIS capability was not utilized as part of the Phoenix prioritization process. Instead, Toole Design Group conducted the prioritization.

3.5 Step 6: Prioritization Tool(s) Used

For iteration 1, the prioritization process relied exclusively on GIS. For iterations 2 and 3, the prioritization process used a combination of GIS and the programmed spreadsheet.

3.6 Step 7: Data Input

For iterations 2 and 3, the GIS data was cut and pasted into the programmed spreadsheet for purposes of scaling, weighting, and ranking. The City also felt that the programmed spreadsheet would help clarify the prioritization process for the Technical Advisory Committee, Ad Hoc Task Force, and members of the public.

3.7 Step 8: Variable Scaling

Phoenix used the proportionate scaling formula provided in the NCHRP 07-17 methodology to scale all variables from 0 to 10. Proportionate scaling involves assigning the highest value in the common scale to the maximum raw value for a particular variable and assigning 0 to the lowest raw value. Other raw values are scaled proportionately based on their relationship to the highest and lowest raw values.

The formula for proportionate scaling is

$$Y = \frac{(X - MIN)}{(MAX - MIN)} * S$$

where Y is the scaled value, X is the raw value, MIN is the minimum raw value, MAX is the maximum raw value, and S is the scale (i.e. 10).

3.8 Step 9: Weighting Factors

The City of Phoenix did not apply weights for iteration 1, which included only the Demand factor. For iteration 2, the Ad Hoc Task Force assigned a weight of "10" to the Connectivity Factor, "7" to the Demand Factor, and "3" to the Public Input factor. Weights for the factors used in iteration 3 (prioritization of individual projects with each tier) have not yet been determined.

3.9 Step 10: Ranked List of Prioritized Projects and Next Steps

The Phoenix Bike Master Plan will use the Tier 1 ranked list of improvements identified in iteration 3 to identify and prioritize projects for inclusion in the Capital Improvement Program (CIP). The prioritized roster of Tier I projects is provided in Appendix F. These projects will also be designated in the Phoenix Bicycle Master Plan as part of the initial phase of implementation. Projects associated with Tier II and Tier III corridors will be addressed in phases 2 and 3 of plan implementation. The prioritized roster of Tier II projects is provided in Appendix G. The prioritized roster of Tier III projects is provided in Appendix H.

Candidate improvement projects

4 Implementation sequencing plan – 5, 10, 20-year priorities

5 Potential funding sources

5.1 Arizona Highway User Revenue Funds (AHUR or HURF)

In 2008, the Department released an Infrastructure Needs report which identified \$43 million in needs for the Bikeway Program. Many of these projects are now already built, under construction or will be constructed with the Five-Year Capital Improvement Program (CIP). The report also documented \$19 million in unfunded bike program needs but the projected shortfall in AHUR (Arizona Highway User Revenue Funds) revenues jeopardizes the City's ability to complete these projects.

The State of Arizona taxes motor fuels and collects a variety of fees and charges relating to the registration and operation of motor vehicles on the public highways of the state. These collections include gasoline and use fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. These revenues are deposited in the Arizona Highway User Revenue Fund and are then distributed to the cities, towns and counties and to the State Highway Fund. These taxes represent a primary source of revenues available to the state for highway construction, improvements and other related expenses.¹

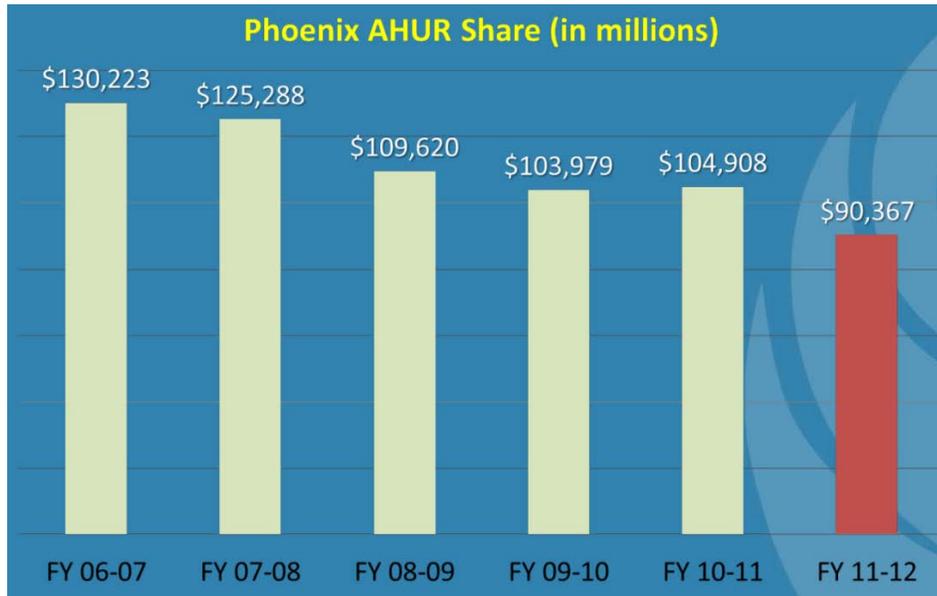


Figure 3 - City of Phoenix's Share of AHUR Revenue from FY 06-07 to FY 11-12

5.2 Developer Improvements

¹ http://www.azdot.gov/Inside_ADOT/FMS/Hurfund.asp

5.3 MAP-21

The first draft of the Alliance for Biking and Walking's *2014 Benchmarking Report on Bicycling and Walking in the United States* report is the source of the following text as contributed by Darren Flusche of the League of American Bicyclists.

On October 1, 2012, the recently passed federal transportation law, Moving Ahead for Progress in the 21st Century (MAP-21), went into effect. MAP-21 maintained broad eligibility for bicycling and walking projects across transportation funding programs and put more decision-making power in the hands of regional governments for active transportation projects, but it also consolidated bicycle- and walking-friendly programs while reducing total funding for them. It also made it easier for states to divert these funds to other purposes.

Program Consolidation: What Happened to Transportation Alternatives, Recreational Trails, and Safe Routes to School?

Prior to MAP-21, three of the most common sources of federal funds for bicycling and walking projects were the Transportation Enhancements Program (TE), Safe Routes to Schools (SRTS), and the Recreational Trails Program (Rec Trails or RTP). Under MAP-21 these have been consolidated into one program called the Transportation Alternatives Program (TAP). Unfortunately, the funding for the TAP program is 26 percent less in fiscal year 2014 than the combined FY2012 funding for the three programs it replaced. You can find specific funding levels for your state and region at www.AdvocacyAdvance.org/MAP21.

There have been some changes in eligible activities. For example, states and regions can still use TAP funds for pedestrian and bicycling improvements, but they cannot use TAP to pay for adult bicycle education classes. There is a new activity called Safe Routes for Non-Drivers, which is meant to improve access and accommodations for older adults, children, and individuals with disabilities and may lend itself to creative projects. Another new use of TAP funds is that the right-of-way of former Interstate routes can be converted into walkable, low-speed thoroughfare in urban environments.

Any activity that was eligible under the Safe Routes to School Program, including educational safety programs for K-8 students, is eligible under TAP. Some states are using a portion of TAP funds to maintain an independent SRTS project selection process, others are incorporating SRTS activities in their overall TAP process. Some states, like Washington, are using additional safety funds from the Highway Safety Improvement Program to cover SRTS activities to make up for reduction in funds.

Every year, each state decides if it wants to maintain the Rec Trails program as it had been, with the same agency administration and rules, or "opt-out". If the state maintains the program, the funds equal to the FY2009 amount are taken off the top of TAP. If the state opts out, the Rec Trails funds get absorbed into TAP. In 2013, only Florida and Kansas opted out of the Rec Trails.

Local Control

TAP funds are distributed within states in two ways. Half of the funds are controlled by the state DOT to be spent anywhere in the state. The other half is allocated to rural areas, small cities, and large cities based on the proportion of the population in those geographies.

In many places, local governments are more responsive to walking and bicycling needs than states are. In response, bicycling advocates fought to increase the amount of control regional planning agencies – Metropolitan Planning Organizations (MPOs) – have over federal transportation dollars. The result of these efforts is that MPOs with a population of over 200,000 are now sub-allocated funds to run their own TAP application process and select the projects they think are most important.

Flexibility: Transferability and Opt-outs of TAP Funds

One of the goals of MAP-21 was to increase "flexibility" for how states spend their federal dollars. One of the things this means is that states can transfer their anywhere-in-the-state funds to other transportation programs – for uses other than biking and walking projects. Additionally, if funds are unspent ("unobligated")

after the first full year, funds may be flexed to the Congestion Mitigation and Air Quality Improvement Program (CMAQ).

Broad Eligibility: Looking Where the Big Money Is

TAP is a very small part of MAP-21 and it is just a small source for walking and biking projects within the law. Bicycling and walking projects are broadly eligible in the vast majority of federal-aid funding programs. CMAQ funds projects that provide alternatives to car travel, including several bikeshare systems. The Highway Safety Improvement Program (HSIP) funds pedestrian and bicycle safety infrastructure. Section 402 State and Community Highway Safety Grants funds non-infrastructure programs, like adult bicycle education classes and pedestrian safety trainings. And the Surface Transportation Program (STP) funds bicycle and pedestrian transportation projects and now can be used for TAP-type projects and Rec Trails-type projects.

5.4 TIGER Discretionary Grant Program

The Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grant program, provides a unique opportunity for the DOT to invest in road, rail, transit and port projects that promise to achieve critical national objectives. Since 2009, Congress has dedicated more than \$4.1 billion for six rounds to fund projects that have a significant impact on the Nation, a region or a metropolitan area.

The TIGER program enables DOT to examine a broad array of projects on their merits, to help ensure that taxpayers are getting the highest value for every dollar invested. In each round of TIGER, DOT receives many applications to build and repair critical pieces of our freight and passenger transportation networks. Applicants must detail the benefits their project would deliver for five long-term outcomes: safety, economic competitiveness, state of good repair, livability and environmental sustainability.

\$600 million has been appropriated for the FY 2014 TIGER program. The FY 2013 TIGER program, the fifth round of federal TIGER grants, awarded \$474 million to 52 projects. Although highly competitive, past rounds of TIGER have funded several stand along bicycling and walking projects and a large number of successful projects that include bicycling and walking components.

5.5 Crowdfunding

Crowdfunding for project development is a well-established model for individuals to pool their resources in support of specialty initiatives, for example software development, art projects, and business startups. But as the model is rarely used for physical improvements to the built environment. Crowdfunding civic infrastructure assumes significant municipal cooperation and support, as the local government carries long term operation and maintenance expenses and is liable for safety in the public realm. Crowdfunding does allow citizens unprecedented access into infrastructure management through initial financing and decision-making. When civic projects compete for crowdfunding, success inherently relies on popularity and appeal; however, it is not a true democracy when people vote with disposable income. Conceivably, a municipality could be swept away by the crowdfunding wave, resulting in under-service for lower income areas without the means to pre-finance public improvements.

Overall, crowdfunding is a potential funding tool that gets people motivated and creates an inspired community of people that can attract big money. In other words, crowd psychology can be as important in executing such projects as the money itself. When thousands of people are involved, it also makes it very attractive for politicians to get involved. The “crowd” is generally thought to be individuals, but it’s also corporations and institutions that have an interest in getting their name on something.

MAKING CONNECTIONS

People & Places

Cyclists desire safe and convenient access to the same destinations as motorists. Community meeting and Wikimap input repeatedly stressed the need for safe corridors of travel and enhanced intersection designs to remove barriers and provide bicyclist access to destinations located throughout all parts of the city.

Desired Destinations:

- ▶ transit
- ▶ work places
- ▶ public schools
- ▶ health care providers
- ▶ canal paths
- ▶ neighboring communities
- ▶ destinations located on major arterial streets

The Need to Address Transportation Equity

Access to affordable and reliable transportation is a civil and human rights need that is essential to addressing poverty, unemployment, and other equal opportunity goals such as access to good schools and health care services.

Providing equal access to transportation means providing all individuals living in Phoenix with realistic options for conducting daily travel. Bicycle accommodation thus must not be viewed as a luxury or recreation-only amenity, but rather as an affordable, sustainable way to move around the city.

GOAL:

The city's bicycle network will connect neighborhoods with each other and into Downtown Phoenix.

Bicycling will be a safe, fun, and convenient transportation option to access schools, parks, shopping, work, and community centers in all parts of the city.



To truly connect people and places, this plan must make recommendations that benefit the urban poor, the elderly, children and teens, transit commuters, and others who cannot or choose not to drive. For these reasons, demand and connectivity were key factors used to determine the Tier I bikeway projects identified in Chapter 4, with the eight highest-priority projects traversing a rich diversity of neighborhoods and places. The priority corridors are all centrally located and provide connectivity between more developed bikeway networks found in outlying areas of the city. Tier II and Tier III projects will further expand this core bikeway network.



Rethinking transportation to include bicycling as a daily mode of travel also serves to support the visions of other recent planning initiatives, including the PlanPHX Connected Oasis and ReinventPHX. Developing a high-profile bicycling network to specifically to connect neighborhoods with local destinations, other neighborhoods, the central city, and public transportation is viewed as a tool to create a more vibrant downtown, celebrate diverse communities, and help to ensure that neighborhoods remain unique and livable.

End of Trip Accommodation

Young or old, recreational or utilitarian, urban or suburban – all cyclists have similar needs at end-of-trip destinations. Places to conveniently, securely, and safely park bicycles need to be provided if bicycling is to become a preferred option for daily transportation, recreation, and healthy lifestyles.



Just as city development codes require automobile parking at destinations, this plan recommends provisions for bicycle parking, with quantities determined according to building type.



The type of bicycle parking facility to be provided will vary according to the duration of storage needs. Recommended accommodations include a combination of inverted-U bicycle parking racks to fulfill short-term needs (i.e. – a brief shopping stop), covered racks where bicycles will be parked for longer periods of time (all-day use), lockers and bike-lids in lightly-supervised locations, and indoor bicycle parking within apartments and multi-family residential projects.



In addition, showers, changing rooms, and storage lockers for clothing and bicycling gear are amenities that employers can provide to encourage and support bike-to-work trips.

Recommended implementation actions and bicycle parking guidelines for each type of parking accommodation are included within this chapter.

I Public desires for access and connectivity

During the community meetings, City of Phoenix staff and other members of the project team were available to talk with attendees, listen to comments and concerns, and answer any questions. Through those discussions, comments and concerns included the following:

- Lack of parking at health care providers
- Lack of space for bicycles on transit
- Safety should be paramount
- Importance of bicycles having headlights, taillights or reflectors when ridden between dusk and dawn
- Operators of motorized vehicles cannot easily see bicycle riders, especially when the rider wears dark colored clothing
- Desire for CAP (Central Arizona Project) to be involved in Bicycle Master Plan and for adjacent property owners to clear fences built on 10 feet of right-of-way to allow use by bicyclists.
- Importance of coordination with neighboring cities
- Compliment of green bike lanes on Grand Avenue
- Desire for bicycle push buttons at signalized intersections
- Desire for continuously paved canal paths
- Desire to retrofit all arterial streets with bike lanes during resurfacing
- Compliment of bike lane retrofit on Indian School Road
- Desire for bike lanes on 7th Street and 7th Avenue
- Request for HAWK at 21st Avenue and Camelback Road
- Request review and revision of contradicting laws and ordinances related to bicyclists
- There needs to be a traffic ordinance that all new tar overlays on every major arterial road shall or must include bicycle lanes (painted, buffered, etc...) in their implementation/construction.
- It is important to ensure that there is continuity of bike routes between Phoenix and adjacent cities.
- There be some planning focused on bike routes within two to three miles of public schools – K through 12 – so that children (ages 5 – 19) can ride and walk to school safely.
- Part of bike and pedestrian safety has to do with keeping pathways clear of branches – a job for city landscapers/arborists (tree pruning).
- Require bicycles that are ridden between dusk and dawn, to have headlights, taillights, and reflectors. Enforce a City ordinance by confiscating bikes, without lights, that are ridden after dark, until such time as the owner provides lights and reflectors and installs them on the bike.
- Recommend the “strobe light” type of headlight and tail light since a flashing light is more easily seen than a constant beam.
- Educate drivers, police, and engineers
- Improve access to bike lanes, protected bike lanes, and canals
- Develop new funding mechanisms
- Require bike parking and showers at work places or partner with fitness centers
- De-silo City Hall to foster inter-departmental collaboration on planning and funding infrastructure
- Include transit department and fund and fill a position at Valley metro to focus on bike/ped interconnectivity
- Promote bike commuter tax incentives and workplace health and fitness campaigns
- Put road diet on Indian School Road from I-17 to Scottsdale Road
- Cyclists want to connect to destinations on major arterials safely
- Increase staff dedicated to bike/ped planning and add urban designers to streets department
- Develop and apply a “speed management plan”

- Develop an app to report information (crowd sourcing)
- Valley Metro should encourage bicyclists on buses and LRT.
- Install bike HAWK on 19th Avenue at Cave Creek Golf Course (South of Greenway Rd).
- Osborn's bike path needs to be extended to cross Central Avenue
- More and larger signs that state "Share the Road 3 Feet Minimum Distance is the Law"
- Discourage driving to encourage bicycling by having more bike paths that restrict traffic
- 3rd Street would be an excellent candidate for a bike path
- Canal paths are great but they need better crossings at the larger intersections
- LRT bike hooks cannot fit the 29 inch wheels and 29 CC wheels also are difficult to fit into the racks. The hook is reportedly designed to be too close to the tire. He would like to recommend these hooks to be changed.
- Drastically increase bike infrastructure
- Promote denser residential development
- For bridges over canals, use steel that will be sturdy and last for years
- Use a universal color scheme
- Connecting communities to schools and parks is most important.
- Safety for families is important.
- Completely separate bikes and cars.
- Provide kids with a park for biking (bmx).
- Safety is a big concern.
- Color would be helpful.
- Improve connections and safety at intersections
- Encourage: show local business benefit with cycling community. Key into local business, markets, and supporting community.
- Reach out to females, schools and (untapped resource) healthy communities.
- While bike lanes can be better than nothing, a bike lane on a street engineered for 60 MPH traffic is not a complete street.
- Implement city-wide greenways project aimed at slowing traffic on key through streets like 15th Ave, Campbell, etc...
- Complete the paved canal network and create safe crossings. The worst is 32nd St & Grand Canal, but that entire canal path needs signals.
- Enhance facilities with a cycle track on 44th Street between Salt River and LRT, bike/bus only lanes on Central/1st Ave through downtown.
- Work with streets department to significantly slow arterial traffic on most arterials
- For safety, do not allow right turn on red for vehicles.
- Move the stop line at each intersection with traffic signals back 1 ½ car lengths (establish bike boxes).
- Close down Central Avenue on Sundays to encourage families to ride.
- Buffered bike lanes.
- Make sure the language of the plan looks ahead and is extremely comprehensive.
- Bicycling and proper bicycling infrastructure is beneficial for the health of people – especially those who are low income and at risk for chronic disease. We must consider how this plan can reach not only avid bicyclists in good neighborhoods but also those in low income areas that cycle in order to survive everyday.
- More bicycle friendly paths and along major boulevards.
- Make it safe so there are minimal bicycle related injuries and accidents.

- Encourage more bicycling through incentives like register your bike (with police in case of theft) and receive Valley Metro pass discounts, etc...
- Add bike lanes on Osborn Road between 19th Avenue and 20th Street and also 3rd Street as an additional north/south corridor for cycling safely.
- The best way to get more people on their bikes is to make the streets friendlier to bikes and pedestrians, as in lanes and crossings.
- Build a BMX bike park in the City of Phoenix. Desert West Community Center is a desired location.

2 Addressing Equity

3 Bicycle Parking at Destinations

Bicycle parking is an important component of a multi-modal transportation system. More people are likely to bicycle if they are confident they will find convenient, secure, and weather-protected parking areas at their destination. Convenient, well-designed bicycle parking enables bicyclists to secure their bicycles and discourages locking bicycles to trees, fences, and other undesignated locations. Adding bicycle parking is also an opportunity to integrate public art into streetscapes, develop a brand for the Phoenix bicycling program, and engage the business community in bicycling.

3.1 General Guidelines

- Bicycle parking should be located to prevent encroachment into the pedestrian traveled way and prevent damage to vegetation and street furniture.
- Bicycle parking should be conveniently placed within close proximity of entrances to businesses, transit stops, multi-family dwellings, parks, schools, libraries and other community facilities.
- Unless located at a transit station or other high demand destination, generally one or two racks at multiple locations along a block face is preferred to grouping all bike racks at one location.
- Bicycle racks should be covered wherever possible to prevent damage from the sun and rain, and to prevent bicycle seats from deteriorating (from ultra violet rays) or getting too hot. This can often be achieved through strategic placement, such as placing racks under an existing storefront awning or eave.
- Bicycle parking should be designed to accommodate the full range of bicycle types, including cargo bikes, bikes with trailers, bikes with a trailer bike, bikes with built-in child or cargo holders, tandems, and adult and child tricycles.
- In areas with high bicycle parking demand, limited space behind the curb, and limited private bike parking, in-street corrals or other high capacity bike rack designs should be considered.

3.2 Recommended Facilities

Bicycle parking may be provided in a variety of forms depending on whether it is for short-term or long-term use (e.g., a brief shopping stop or an all-day event).

Short Term Parking

Bicycle racks are an inexpensive and effective way to provide short-term bicycle parking. The preferred bicycle rack design is the Inverted-U, due to its versatility, level of security and small footprint. Inverted U racks can be installed individually or as part of a series. Hitch style racks may also be appropriate in locations where there is insufficient space for inverted U-racks.

Covered or uncovered bicycle racks are appropriate for short term parking needs at retail stores, restaurants, recreation centers, parks, libraries and similar locations. Covered bicycle racks are recommended at transit stations, universities, colleges, and elementary, middle and high schools, because students, teachers and staff often stay for longer periods of time. At all locations it is important to plan for both employee and visitor bicycle parking.

Long-Term Parking

On-demand lockers, standard rental lockers or bike-lids are recommended at locations where long-term bicycle parking is needed in lightly supervised locations such as park-and-ride lots, commuter rail stations, office complexes, and industrial parks. Bike lids are covered racks that provide protection from the weather, but are easier to install and move if needed.

Secure indoor parking is needed in apartment buildings and other multi-family, residential housing types, including senior housing and retirement centers. Garden apartments and campus-style complexes that have limited public access can meet residents' needs by providing covered medium security bike parking in convenient locations for regular use, and indoor storage areas for long-term storage.

Showers, changing rooms, and secure storage facilities

People choose to travel by bike because it is fun and a good source of exercise. To make their trips more comfortable, bicyclists often choose to wear athletic clothing and work up a sweat, while their plain clothes are stowed in a backpack, basket or pannier. If their final destination does not have a place where they can clean up and change, they may opt to drive instead. One method employers use to encourage bicycle commuting is installing showers and locker rooms in their buildings. Some establishments have partnered with nearby gyms to allow their employees and customers access to the showering facilities, at a reduced or subsidized cost. Phoenix can show its support by installing showers and changing rooms in their civic buildings for employees to use.

Bicyclists often have additional gear that needs to be stored safely when they arrive at their destination. This can include helmets, lights, bells, baskets/panniers, etc. Usually these items are vulnerable to theft or damage even if the bike is secured to a rack. To ease the concerns of the bicyclist, it can be helpful to offer lockers or other secure locations for bicyclists to store their gear. One low-cost alternative is allowing customers to store their gear behind a store counter, or with a coat check. If bicyclists know that their gear is safe, it makes the choice to bike an easier one.

Recommendations

- The City of Phoenix should review and potentially expand the existing rack request program operated by the Street Transportation Department.
- The City of Phoenix should partner with business improvement districts such as the Downtown Phoenix Partnership to provide bicycle racks in commercial areas.
- The City of Phoenix should prioritize funding for bicycle rack installation along Tier I corridors during the initial phase of bicycle plan implementation, Tier II corridors during the second phase of bicycle plan implementation, and Tier III corridors during the third phase of bicycle plan implementation.
- The City of Phoenix should consider initiating an interagency program to evaluate, replace and add bike parking at all City-owned public facilities.

- The City of Phoenix should consider amending zoning and subdivision codes to require redevelopment and new development to provide appropriate types, quantities and locations of bicycle parking as part of development approval. See Sample Bicycle Parking Guidelines below.
- The City of Phoenix bicycle program web page should provide a map of bicycle parking locations in downtown Phoenix, a way for bicyclists to indicate where bicycle parking is needed, and information on how to request a bicycle rack.
- If the City of Phoenix Street Transportation Department converts single-space parking meters to pay-stations, old parking meter posts should be modified to function as bicycle racks where feasible and appropriate.
- The City of Phoenix should establish a process to evaluate locations and facility types for long-term bicycle parking, and develop branding.
- The bicycle parking standards provided in the Phoenix Traffic Operations Handbook should be updated to:
 - Accommodate cargo bikes, bikes with trailers, bikes with a trailer bike, bikes with built-in child or cargo holders, tandems, and adult and child tricycles.
 - Provide specifications for in-street bicycle corrals and long-term bicycle parking, such as bike lockers.
 - Specify that, with the exception of racks attached to parking meters, racks located perpendicular to the curb should be a minimum 3-feet from the back of the curb and racks located parallel to the curb should be a minimum of 2 feet from the back to the curb per AASHTO. Professional judgment should be exercised in areas where the sidewalk is narrow.
 - Specify that the minimum clearance between a crosswalk and a bike rack is 5 feet.
 - Specify that the minimum clearance between a bike rack and street furniture is 3 feet.
 - Specify that the minimum clearance between utility vaults, manholes, power poles, permanent planters, etc. shall be 3 feet.
 - Specify that the minimum clearance between bus shelters, fire hydrants, and signal control cabinets should be 5 feet.
 - Specify desirable spacing between racks.
 - Specify spacing between bicycle racks and walls per the 2012 AASHTO Bicycle Design Guide. For U-racks placed perpendicular to a wall, AASHTO recommends a minimum of 4 feet, assuming access is needed from both sides. For U racks placed parallel to a wall, AASHTO recommends a minimum of 3 feet between the wall and the rack.

3.3 Sample Bicycle Parking Guidelines

The following sample guidelines provide guidance and direction for new regulations in the City of Phoenix zoning and subdivision codes that govern new development, redevelopment or major renovations. These sample guidelines are intended to facilitate adequate and secure short and long-term bicycle parking for residents, workers in office and commercial buildings and students and staff in institutional buildings. They can also serve as a template for those building owners who would like to retrofit existing residential or commercial properties with new or added bike parking facilities.

The proposed guidelines presented below are provided as a model for the City of Phoenix. Sections include: Why Bike Parking, Definitions, Requirements, Equipment and Installation Design.

Why Bike Parking?

The provision of parking facilities directly encourages people to use their bicycles as a means of transportation. More people are likely to bicycle if they are confident that they will find convenient, secure, and weather-protected parking areas at their destination. The following Bicycle Parking Requirements are applicable for accommodating bicycles in all buildings and development types in Phoenix.

These requirements also set standards for bicycle parking at public facilities, bike-share stations and shower and changing facilities.

Definitions

Secure/Covered Facilities: Bicycle parking areas that protect the entire bicycle, its components and accessories against theft and against inclement weather, including wind-driven rain. Examples include but are not limited to: indoor bike room, indoor storage area, bike lockers, indoor or outdoor bike valet parking

with weather protective cover and siding, areas with security camera linked to live viewers, and/or key access-covered cages with weather-protective siding.

Outdoor/Covered Facilities: Bicycle parking areas that provide some protection against inclement weather and may have added theft security. Covers include but are not limited to a building projection, an awning or tented roof. Siding is not required. Racks associated with covers will allow the user to lock the bicycle frame and one wheel while the bicycle is supported in a stable position.

Outdoor/Open facilities: Bicycle parking areas that permit the locking of the bicycle frame and one wheel to a bicycle rack and which supports the bicycle in a stable position without damage to wheels, frame or components. Cover and/or security enhancements are not provided.

Bicycle parking space: The number of bicycles that can be accommodated by the bicycle racks or facility, as defined by the user's manual for the rack or facility referenced. For the remainder of this document, guidelines refer to spaces, or number of bicycles for which the facility is designed to accommodate.

Requirements

The following are minimum requirements according to building type. Exceeding these minimum requirements is encouraged but not required.

Three-Five Unit Residential Buildings:

- One Secure/Covered bicycle parking space per unit located in an easily accessed basement storage area or adjacent / attached garage or shed.
- Shower / changing facilities as included in each residential unit.

Multi-Unit Residential (6 or more units) Buildings:

- One Secure/Covered bicycle parking space per unit located in an easily accessed dedicated storage area.
- One Outdoor/Covered or Outdoor/Open parking space per five units with a minimum of 2 Outdoor/Covered or Outdoor/Open spaces per building.
- Shower / changing facilities as included in each residential unit.

Office, Commercial and Industrial Buildings:

- One Secure/Covered parking space per worker for 10% of the planned part- and full-time worker occupancy (or 0.3 parking spaces per 1,000 square feet of development), but no fewer than 4 Secure/Covered parking spaces per building.
- One Outdoor/Covered or Outdoor/Open parking space for patrons and visitors for 2.5% of estimated daily building users but no fewer than 4 Outdoor/Covered or Outdoor/Open spaces per building.
- Provide at least one shower / changing facility for any building with 100 or more planned part- and full-time workers (or over 40,000 square feet of development) and one additional shower / changing facility per every 200 planned workers (or 80,000 square feet of development), thereafter. Shower / changing facility requirements may be met by providing the equivalent of free access to on-site health club shower facilities where the health club can be accessed without going outside.

Retail Buildings:

- One Secure/Covered bike parking space per worker for 10% of the planned part- and full-time worker occupancy (or 0.3 spaces for 1,000 square feet of development) but no fewer than 2 Secure/Covered parking spaces per building.
- One Outdoor/Covered or Outdoor/Open parking space for patrons and visitors per 5,000 square feet, but no less than 2 Outdoor/Covered or Outdoor/Open spaces per building.
- Provide at least one shower / changing facility for any development with 100 or more planned part- and full-time workers (or over 40,000 square feet of development) and one additional shower /

changing facility per every 200 planned workers (or 80,000 square feet of development), thereafter. Shower / changing facility requirements may be met by providing the equivalent of free access to on-site health club shower facilities where the health club can be accessed without going outside of buildings.

Institutional Building and Campus Dormitory Buildings:

- One Secure/Covered parking space per student and staff for 15% of the planned part- and full-time campus wide occupancy (or 0.5 parking spaces per 1,000 square feet of development), but no fewer than 4 Secure/Covered parking spaces per building.
- One Outdoor/Covered or Outdoor/Open parking space for patrons and visitors for 5% of estimated daily building users but no fewer than 4 Outdoor/Covered or Outdoor/Open spaces per building.
- Provide at least one shower / changing facility for any campus building with 100 or more planned part- and full-time students and staff (or over 40,000 square feet of development) and one additional shower / changing facility per every 200 planned students and staff (or 80,000 square feet of development), thereafter. Shower / changing facility requirements may be met by providing the equivalent of free access to on-site health club or gym shower facilities where the health club or gym can be accessed without going outside.
- One Secure/Covered parking space per every two beds in a Dormitory building where such parking spaces may not be counted in the campus wide total.

Mixed- Use Buildings:

- Provide parking and shower facilities proportional to the mix of uses using the above requirements.
- Shared facilities may be provided for non-residential uses mixed within a single building or for non-residential uses within a single development that is under 50,000 square feet. Specific requirements for unique uses such as senior or assisted living facilities, movie theaters, sports arenas or conference venues will be determined on a case-by-case basis. Special provisions such as bicycle valet parking for single events such as concerts should be encouraged.

3.4 Bike Parking Equipment and Installation Design

1. Acceptable bike rack designs must have a two point support system for easy access and locking of frame and wheels. The designs must present no sharp edges to pedestrians or bicyclists.
2. Developers are encouraged, but not required to use either an inverted-U style rack or an artistic style rack to match City of Phoenix preferred designs.
3. All racks and other fixtures must be securely affixed to the ground or a building.
4. Areas used for bicycle parking should be secure, well-maintained, well-lighted and easily accessible to bicycle riders.
5. No bicycle parking areas should impede sidewalk or pedestrian traffic. Designs that do not provide two-point supports for bicycles may create unfit sidewalk conditions. Poor rack designs may allow bicycles to fall over easily and become damaged, or encroach into the pedestrian right-of-way. Older “school” or “dish” racks are not functional and do not provide full support. Single post designs with sharp edges can also be problematic to pedestrians, especially those with visual disabilities. Racks with one point of contact, like hitch racks need to be in-ground mounted. Examples of recommended racks include: inverted U, hitch rack, upside down U rack, and multiple bike racks.
6. Retail establishments shall have Outdoor/Covered or Outdoor/Open facilities within 50 feet of the primary entrance(s).
7. Racks must be 4-5 feet away from hydrants and other street furniture.
8. No bicycle parking shall be located farther from the entrance of a building than the closest automobile parking space (including accessible parking spaces).

9. Prominently placed signs should be within 50 feet of parking and immediately visible. Signs must direct users to all secure/covered or outdoor/covered facilities that are not immediately visible from the street.
10. All bicycle parking shall be separated by a physical barrier/parallel to curb or sufficient distance from car parking and vehicular traffic to protect parked bicycles from damage.
11. Accessible, Indoor and Secure Accessible bike parking encourages daily use with well-maintained and well-lit easy access for riders.
12. Converting on-street car parking to in-street bike corrals can accommodate up to eight bicycles, and encourage people to use their bikes for shopping and running errands-not just commuting.

MAKING CONNECTIONS

Safety

One of the goals of the Bicycling Element of the 2002 Phoenix General Plan was to improve bicycle safety through more education, better signage, and installation of more safety features. This plan continues that goal and expands it to focus on redesigning major streets and intersections to be “complete streets” that are safe and accommodating for all users.

Why Does Phoenix Need Complete Streets?

The City of Phoenix Street Transportation Department, in collaboration with a group of community stakeholders, developed a draft Complete Streets Policy in July 2013. The stated intent of this policy, if adopted by City Council, is that –

“Complete Streets will make Phoenix more walkable and bikeable, support investments in transit, foster social engagement and community pride, boost the local economy and property values, and improve the livability and long-term sustainability of our region. Phoenix will be a better place to be, realizing long-term savings from improved public health and safety, environmental stewardship, social mobility and transportation equity.”

Safety Statistics

A review of reported motor vehicle crashes involving cyclists in Phoenix over the past five years highlights the need to focus on the redesign of arterial streets and intersections to better accommodate cyclists.

GOAL:

Bicycling will be a safe transportation and recreation option. Streets will be designed and retrofitted to safely accommodate all modes.

People on bikes will understand bicycling rules of the road through proper facility design and safety education. Bicycling will be safer by promoting accountability and responsible attitudes of all road users.



The following chapter of the Bicycle Master Plan presents a detailed summary of bicyclist crash data from 2008 through 2012. In summary, future facility planning and education programs should strive to address the following:

Numbers

- ▶ 25% of bicyclist crashes in the State of Arizona occur in Phoenix.
- ▶ 495 crashes were reported annually, resulting in approximately 62 serious injuries and 8 fatalities per year.
- ▶ In the past two years, total bicyclist crashes have increased by more than 8% each year. However, the number of serious injury and fatal crashes has not followed the same trend.

Locations

- ▶ 96.3% of bicyclist crashes occur on arterial and local roads.
- ▶ 53.3% of all crashes are intersection related.
- ▶ Serious injury crashes frequently occur along major arterial streets that serve transit.

Demographics

- ▶ Children and teenagers age 10-19 were involved in the highest number of crashes.
- ▶ Crash incidents were highest in October, November and March, and on weekdays from 7-8am and 3-6pm – corresponding to bicycle commuter patterns.

How Can Complete Streets Help?

One of the commonly cited problems with bicycling on many streets in Phoenix today is the speed of automobile traffic. With few provisions for on-street parking, bicycle facilities, or other urban traffic calming features, many arterial roadway corridors have traffic moving at very high speeds, which can result in serious injury or death if a cyclist is involved in a crash with a motor vehicle.

“Complete Streets” projects address this problem by re-examining the allocation of roadway space, making transportation improvements to promote active transportation and public health, and adding to the value of businesses, offices, and schools along the roadway. The goal is to make streets safe and inviting for people, whether walking, shopping, biking, parking, or driving in an urban context.

It is important to note that there is no single design treatment that makes a given street a complete street. The draft 2013 City of Phoenix Complete Streets policy includes adding street and sidewalk lighting; pedestrian and bicycle safety improvements; accommodations for freight; access improvements including compliance with the Americans with Disabilities Act; public transit facilities accommodation including, but not limited to, pedestrian and bicycle access improvements to transit stops and stations; landscaping; drainage; and street amenities. Chapter 7 of this plan further addresses specific design options to make Phoenix streets more bicycle friendly.

Bicycle Safety Education

In addition to making engineering improvements to the city’s infrastructure, education programs are also being recommended. Model programs from Boston, Chicago, Davis, Minneapolis, Portland, and other cities may be adapted to address safety needs in Phoenix. Input from the October 2013 bike planning workshops further highlights community desires to focus on the following:

Community Concerns

- ▶ Safety is important for families. Also at all intersections.
- ▶ From dusk to dawn, cyclists should be required to use headlights, taillights, and reflectors.
- ▶ Cyclists should wear light color clothing to increase visibility to motorists.
- ▶ Use of signage stating a “Share the Road” message is desired.
- ▶ Maintenance crews and arborists need to keep paths and bike lanes free from debris and branches.
- ▶ Bicycle safety education efforts should also reach out to drivers, police, and engineers.

I Complete Streets Initiative

Over the past 40 years, Phoenix-area population, housing, and employment experienced some of the fastest growth in the nation by over 500 percent. The population in the United States as a whole grew by approximately 70 percent during the same time period.

Complete Streets are comprehensive, integrated transportation corridors that are safe, accessible, convenient and comfortable for all. This includes pedestrians, cyclists, public transit users, vehicles, freight, and persons of all ages and abilities.

Complete Streets provide numerous benefits including:

- Increases safety
- Encourages walking and bicycling
- Spurs economic development
- Fosters sustainable growth
- Strengthens environment
- Provides more transportation choices and accessibility
- Lowers transportation costs
- Strengthen federal funding applications

The City of Phoenix Complete Streets Policy proposes a Vision that

Phoenix streets are designed and maintained to be safe, accessible, convenient and comfortable for all ages and abilities at all times.

The intent of the Complete Streets Policy is to make Phoenix more walkable and bikeable, support investments in transit, foster social engagement and community pride, boost the local economy and property values, and improve the livability and long-term sustainability of our region. Phoenix will be a better place to be, realizing long-term savings from improved public health and safety, environmental stewardship, social mobility and transportation equity.

The Complete Streets Policy is the basis for establishing guiding principles and practices for all phases of transportation improvements and is integral to everyday transportation decision making. The policy will also affect developer guidance and requirements. The Complete Streets Policy will be used in both new and existing street projects including Safe Routes to Schools, neighborhood revitalization efforts, accessibility to transit stops, and along future light rail transit corridors. A Citizen Advisory Committee will establish performance measurements to determine the success of the new policy.

[Placeholder for additional information provided by Mark Melnychenko]



Figure 1 Keys to the Success of Complete Streets

2 State Law and City Code

Arizona Revised Statutes ARS 28-101 and City Code Section 36-97 define bicycles as devices propelled by human power, having two tandem wheels greater than 16 inches in diameter or having three wheels in contact with the ground with at least one greater than 16 inches. Anyone riding a bike with wheels greater than 16 inches is a bicyclist and can ride on the sidewalk or in the street regardless of age, experience, or ability. State law imposes requirements on bicycle equipment and usage, prohibiting carrying more than one rider (unless designed to do so), and carrying bulky articles that take both hands from the handle bars. ARS 28-817 requires an "adequate" front lamp to be seen at 500 feet, rear red reflector for nighttime use, and requires equipment to enable proper braking.

City Code Section 36-98 requires bicycles operating on streets, alleys or public highways to be licensed by the Police Department. However, the police have not issued licenses in decades. Additionally, ARS 28-812 requires bicyclists riding in the road (or on the shoulder) to obey "Rules of the Road" as any other vehicle operator (where appropriate). Traffic laws apply to all cyclists when riding in the roadway. Bicyclists are required to ride on the right side of the road, travel in the same direction as traffic, stop at STOP signs or red traffic signals and yield the right-of-way to pedestrians in crosswalks.

Bicyclists may ride on sidewalks, but clearly sidewalks are designed to give preferential use to pedestrians. For example, City Code Section 36-113 requires bicyclists on sidewalks to yield right-of-way to pedestrians. City Code Section 36-110 also requires bicyclists emerging from an alley, driveway or building to yield right-of-way to pedestrians on sidewalks, and yield right-of-way to all vehicles on the road. Furthermore Section 36-108 requires bicyclists to ride at a speed reasonable and prudent under existing conditions, which with pedestrians and street furniture, often requires a readiness to come to a complete stop. A combination of narrow sidewalks, conflicts with pedestrians and at driveways, and "wrong way" riding on sidewalks often results in sidewalks being a poor place to experienced bicyclists to ride.

3 Bicycle Safety

The information provided in this section is intended to supplement the Phoenix Traffic Collision Summary and Phoenix Bicycle Collision Summary reports. Both are compiled by the Street Transportation Department; the former on an annual basis and the latter as staff resources permits. The most recent year available for the Phoenix Bicycle Collision Summary is 2010.

To gain insight into crash occurrence involving bicyclists in the City of Phoenix, an analysis of crash data was performed for the years 2008 through 2012. The results of this analysis, as shown in Figures 2 through 9, provide an overview of bicycle transportation safety in the City of Phoenix. Fatalities (K) and serious injuries (A) are a prime focus of this analysis to reflect national performance measures.

The analysis was performed using the Regional Transportation Safety Information Management System (RTSIMS) software. RTSIMS Version 1.0 serves as a key analytical tool at the Maricopa Association of Governments (MAG) for performing transportation safety analysis that is required for safety planning functions at the regional level. The primary source of this crash data is the ALISS crash database maintained by the Arizona Department of Transportation (ADOT). Crashes involving bicyclists are defined as crashes involving a "pedalcyclist" traffic unit. Data for this analysis was filtered for crashes with Phoenix as the law enforcement agency having jurisdiction of the crash scene. Note that to get in the ALISS crash database at least one motor vehicle must be involved.

The Arizona Motor Vehicle Crash Facts, compiled annually by ADOT, is the source of State crash data presented in this section. Twenty-five percent of the State's bicyclist crashes occur in the City of Phoenix. Based on the 2010 US population census, 22.6% of the State's population reside in the City of Phoenix.

Bicyclist Crashes in Arizona

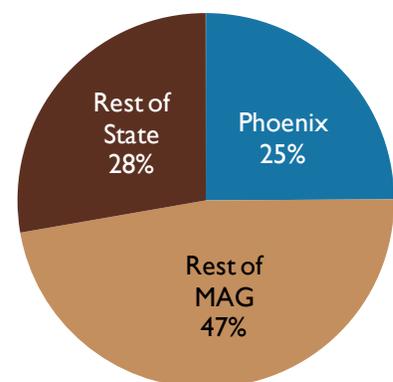


Figure 2 - 2008-2012 Bicyclist Crash Comparison of City of Phoenix to MAG Planning Area and the State

As shown in Figure 3, most reported bicyclist crashes result in an injury (89.4%). In the past two years, total bicyclist crashes have increased by more than 8% each year. The number of serious injury and fatal crashes has not followed the same trend.

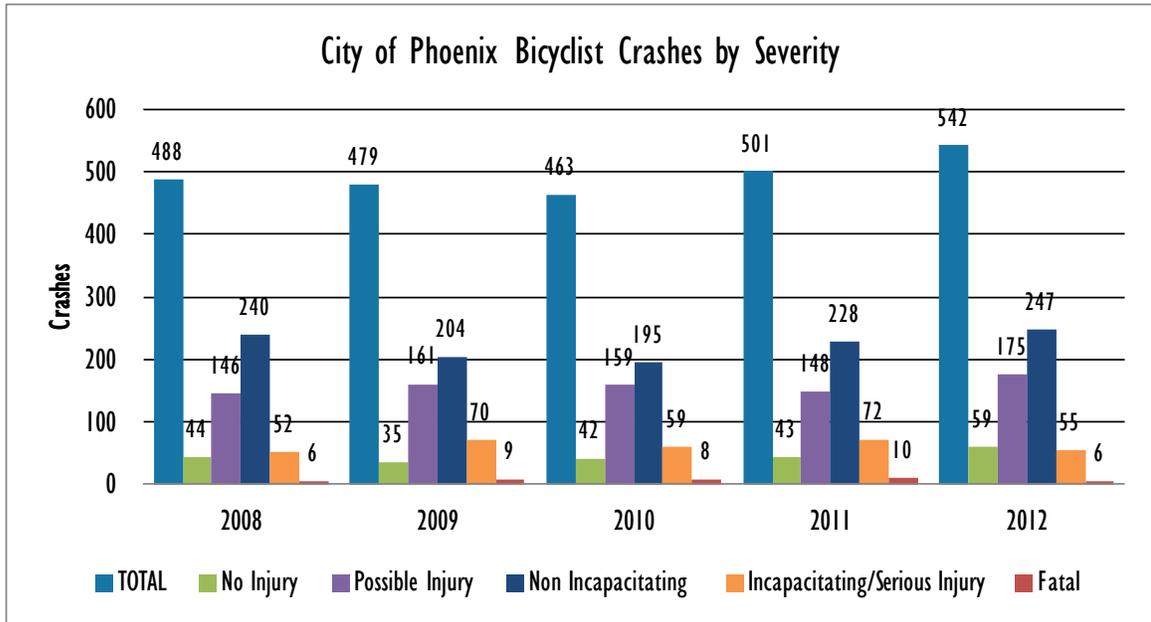


Figure 3 - Crashes Involving Bicyclists in the City of Phoenix by Severity

Crashes involving bicyclists are highest in the month of October, followed by November and March (Figure 4), which is largely consistent to those times when it is most comfortable to ride Phoenix with respect to temperature (Figure 4b).

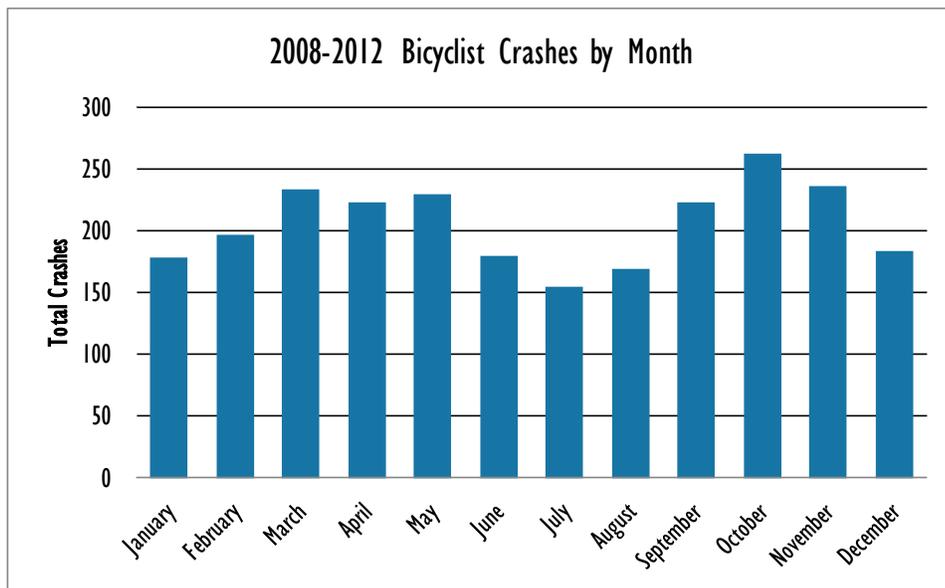


Figure 4 - 2008-2012 Crashes Involving Bicyclists in the City of Phoenix by Month



Figure 4b – Average Monthly Low and High Temperatures in Phoenix by Month

Bicyclist crashes occur most frequently on weekdays; particularly Thursdays and Tuesdays (Figure 5). Bicyclist volume data that is being collected and analyzed by MAG and Phoenix will provide further insight into ridership by day of week.

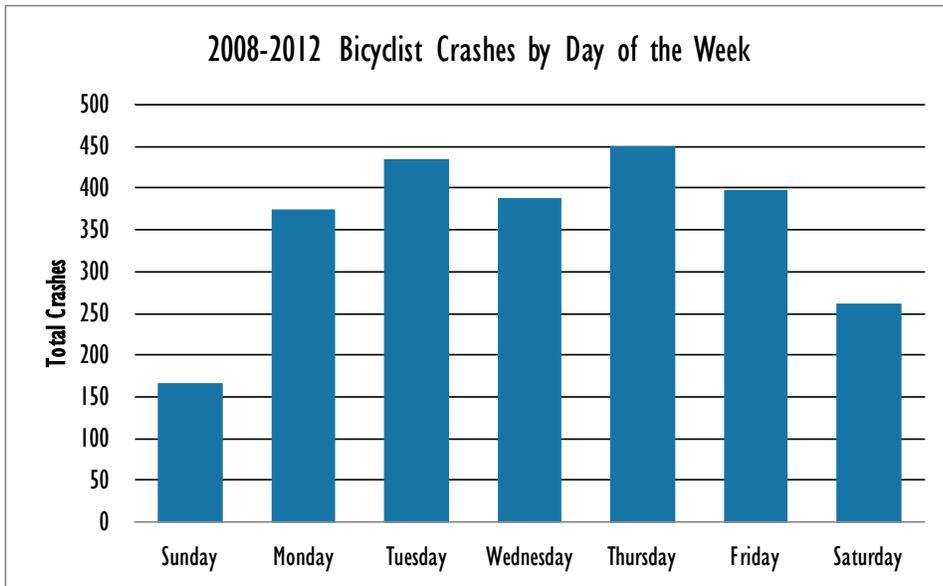


Figure 5 - 2008-2012 Crashes Involving Bicyclists in the City of Phoenix by Day of the Week

Bicyclist crashes are highest in the afternoon hours of 3 pm to 6 pm and the morning hour of 7 am to 8 am. This data suggests that bicyclist crashes are more likely to occur at times of high motor vehicle volumes. The total number of bicyclists may also be higher at these times. Bicyclist volume data that is being collected and analyzed by MAG and Phoenix will provide further insight into ridership by time of day.

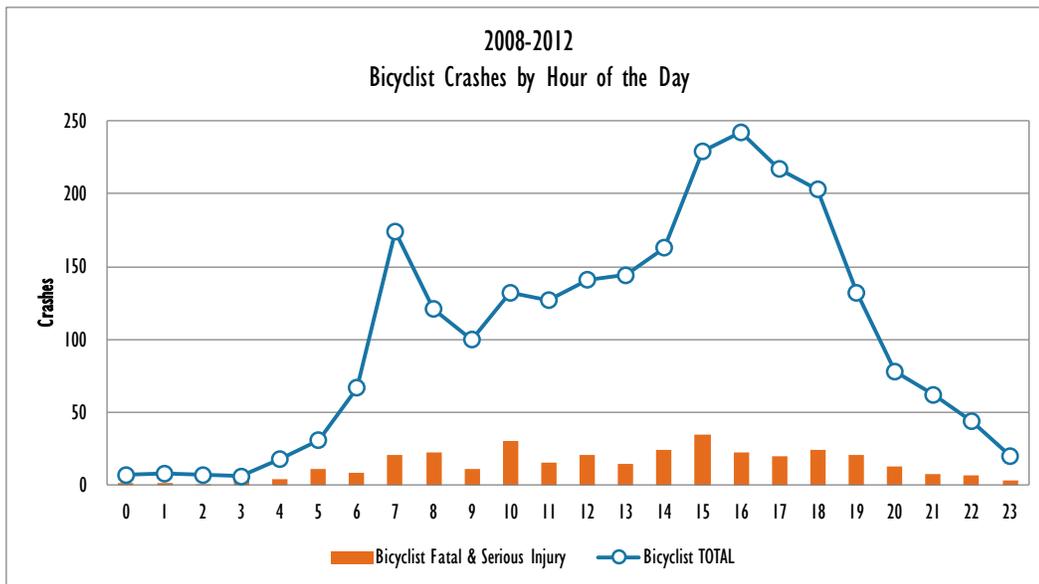


Figure 6 - 2008-2012 Crashes Involving Bicyclists in the City of Phoenix by Hour of the Day

Children and teenagers between the ages of 10 and 19 are involved in the highest number of bicyclist crashes (Figure 7). For those under the age of 16, this group may rely on bicycling as a primary mode of transportation because they are not old enough to obtain a driver’s license and those from 16 to 19 may not be able to afford the expense of owning and driving a motor vehicle. Bicyclists between the ages of 40 to 54 also experience a higher number of bicycle crashes. The bicyclists within this age range (40-54 years old) are most likely to sustain serious injuries or die in a crash.

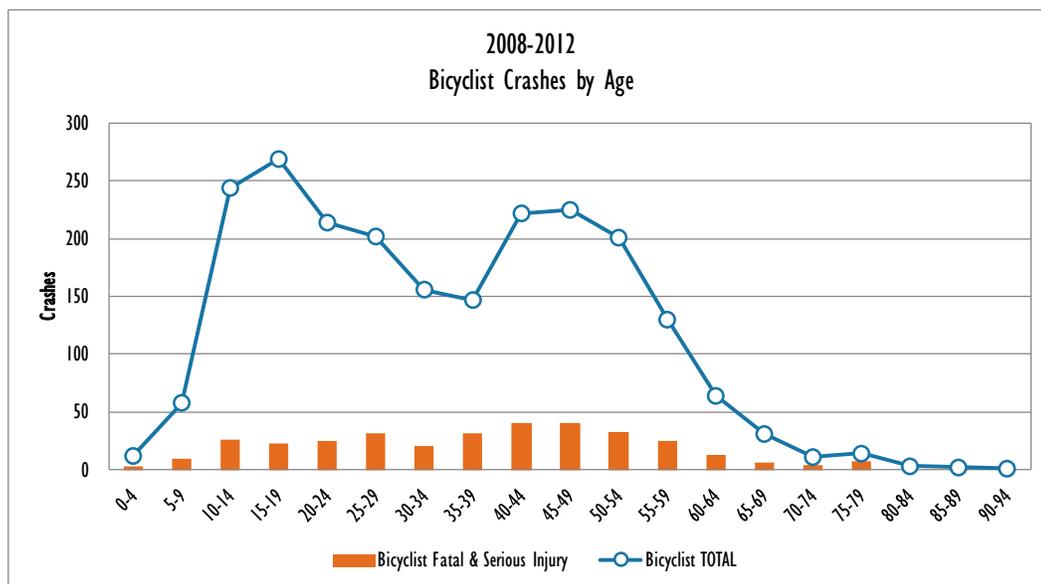


Figure 7 - 2008-2012 Crashes Involving Bicyclists in the City of Phoenix by Age

A crash tree of fatal and serious injury bicyclist crashes in Phoenix for 2008-2012 is presented in Figure 8. Crash trees are a tool to help identify and select the facility types and roadway and traffic characteristics of the locations where target crash types occur most frequently. Bicyclist-involved K (fatal) and A (serious injury) crashes in the City rarely occur at freeway interchanges with 96.3% occurring on arterial and local roads. Approximately half of these crashes occur at intersections. Of the intersection-related crashes, there is nearly an even split between bicyclist-involved fatal and serious injury (K and A) crashes at signalized versus unsignalized intersections. Angle crashes (38%) are most common at intersections. Angle crashes (24%) are also common elsewhere which is likely due to potential conflict between bicyclists and motor vehicles at driveways.

The current crash report form and police officer reporting may not provide enough detail to accurately describe bicyclist crashes. Upon review of fatal and serious injury (K and A) crashes involving bicyclists by manner of collision, approximately 50% are coded under “other” or “single vehicle.” This may indicate a greater need for police officer training on how to accurately fill out crash reports that involve bicyclists. It would also be desirable to include more types of bicycle-involved crashes in the ALISS crash database to better monitor the safety of the road network for bicyclists. This would require a change in the ADOT reporting procedures.

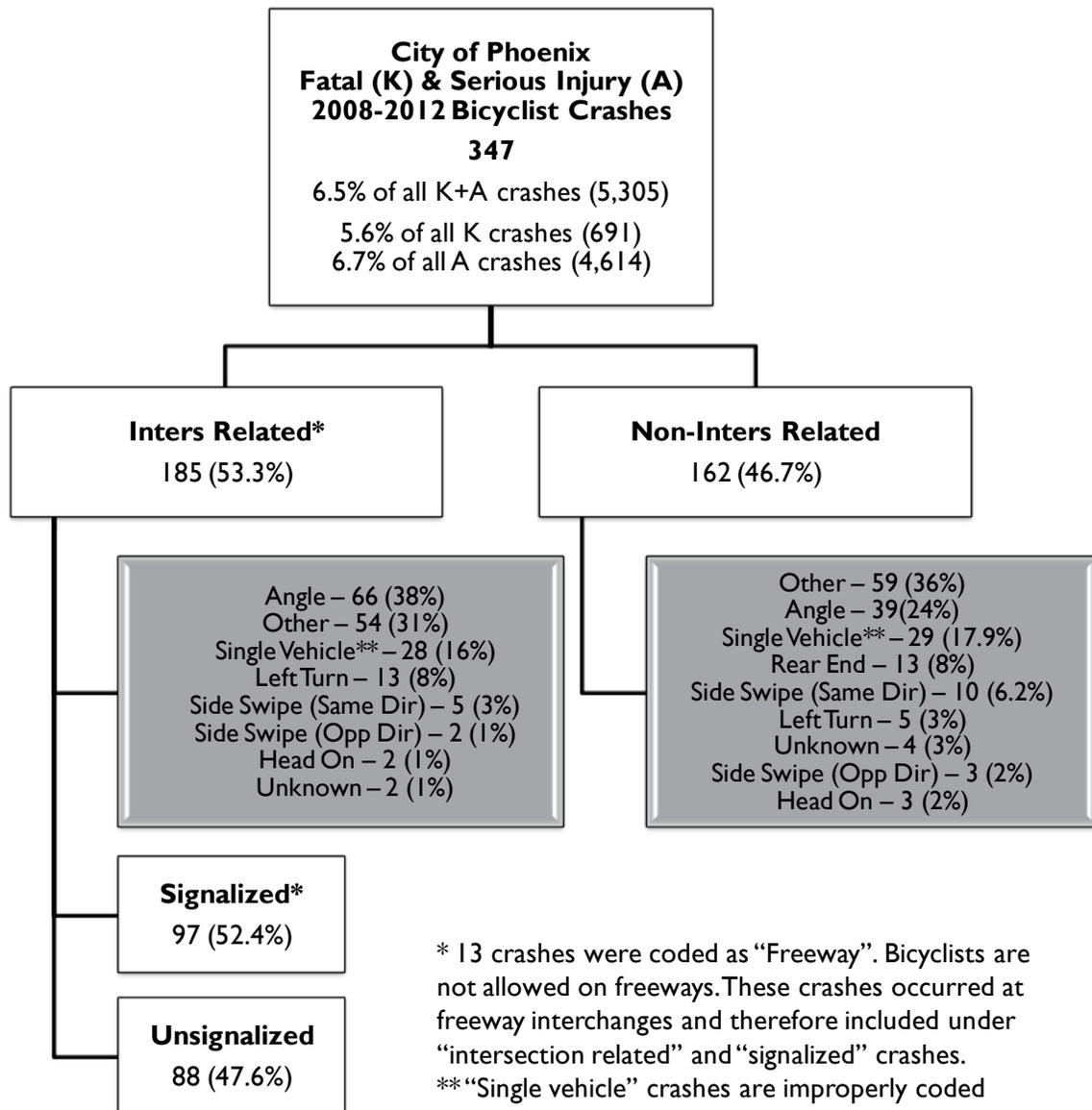


Figure 8 - Crash Tree of Fatal and Serious Injury Bicyclist Crashes in the City of Phoenix for 2008-2012

A spatial analysis of fatal and serious injury bicyclist crashes within the City of Phoenix was performed and provided in Figure 9 on the next page. The METRO Light Rail line and Valley Metro transit centers are shown on the map.¹ There appears to be a pattern of serious injury crashes along some of the arterial streets that transit serves such as Bell Road, Camelback Road, and Indian School Road. Indian School Road has the most fatal bicyclist-involved crashes.

¹ Source: Valley Metro RPTA (METRO). The contents of this report reflect the views of the Licensee who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of METRO and have not been approved or endorsed by METRO.

MAKING CONNECTIONS

Arterials & Collectors

This chapter covers several design details that are needed to successfully retrofit street corridors to help reach the targeted Platinum level Bicycle Friendly Community designation by 2035. These include addressing traffic speeds, roadway space, intersection design, and innovative bikeway facility treatments along arterial and collector streets.

The adoption of new Complete Streets policy and practices will help to create more sustainable streets that feel less like highway designs traversing an urban landscape. Streets in Phoenix will become public spaces for people as well as arteries for traffic and transportation, with reinvented public rights-of-way serving as catalysts for urban transformation.

The Backbone of a Connected Bicycle System

Phoenix has the benefit of being physically laid out on a gridded street network, which provides multiple routes of travel for all modes. However, the functional street classification system – and corresponding design standards and speeds of vehicular travel – create major roadway corridors that have become barriers to bicycling. Interstate highways require grade-separated crossings; multi-lane arterials must be crossed at signalized intersections; local and minor collector streets offer little connectivity outside of neighborhoods.

GOAL:

People on bikes will be able to share transportation facilities with motor vehicles and easily cross roadways.

Missing gaps in the bicycle network will be completed.



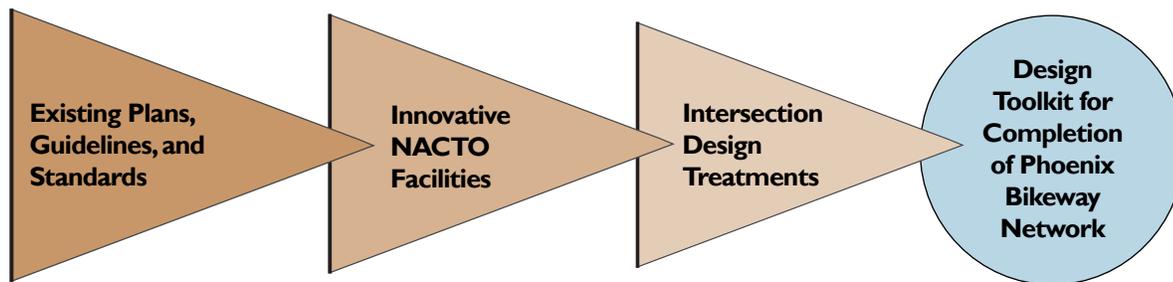
To overcome these barriers, the backbone of the Phoenix bicycle system will be comprised of retrofitted minor arterial and collector streets that meet cross-town commuting needs and utilize signalized intersections, while minimizing the need to ride on the most heavily-trafficked major arterial routes.

A “road diet” is a tool recommended for many corridors to reconfigure vehicular lanes and restripe existing streets to accommodate bicycle lanes without major reconstruction. Other corridors may employ a variety of innovative techniques to complete critical missing gaps in the bikeway network.

This chapter identifies corridors and projects for Tier I, Tier II, and Tier III bikeway implementation within street rights-of-way. Additional multi-use pathways will supplement the street network and provide a greater diversity of riding environments, as outlined in Chapter 8.

Designs to Encourage Increased Levels of Bicycling

Many engineering advancements have been made in recent years to make bicycling a more prominent daily activity for short-distance trips within cities. Most notably, the National Association of City Transportation Officials (NACTO) has developed two new guidance documents that are being enthusiastically embraced by metropolitan areas across the country. The *NACTO Urban Street Design Guide* and *Urban Bikeway Design Guide* will be used by the City of Phoenix to supplement current local, state, and national transportation standards. The need for a more complete bicycle toolkit that provides additional design attention toward roadway intersections and innovative facilities is summarized below. Specifications, photos, and recommended applications for each facility type are detailed in this chapter.



- Bicycle Lanes
- Bike Routes
- Bikeable Streets
- Multi-Use Paths
- Bike Bridges
- Bike Tunnels

- One-Way Protected Cycle Tracks
- Raised Cycle Tracks
- Two-Way Cycle Tracks
- Buffered Bike Lanes
- Contra-Flow Bicycle Lanes
- Left-Side Bicycle Lanes
- Colored Bike Facilities
- Shared Lane Markings
- Bicycle Boulevards

- Bike Boxes
- Intersection Crossing Markings
- Two-Stage Turn Queue Boxes
- Median Refuge Islands
- Through Bike Lanes
- Combined Bike Lane/Turn Lanes
- Cycle Track Intersection Approaches
- Bicycle Signal Heads
- Active Warning Beacons
- BikeHAWK Signals

Arterial and Collector Street System

1.1 Identify Bicycle System Obstacles and Gaps

Lee Engineering reviewed existing bicycle facilities using city-provided bike data to identify bicycle system obstacles and gaps including:

- Barriers to bicycling as identified by the public
- Missing links from Phoenix to/from bicycle facilities in neighboring cities and towns
- Arterial street segments with potential to retrofit bicycle lanes within the existing cross-section

The map below shows locations identified as barriers to bicycling. The map also depicts where bicycle facilities are not continuous with adjacent agencies, lack of bicycle facilities on the arterial street network, and locations with potential for retrofit.

[Placeholder for Map with Barriers, gaps at city limits, other key gaps in on-street bike network]

The engineering tools that can be utilized to incorporate bicycle facilities include: designing new roadways with bicycle facilities, restriping existing street right-of-way to accommodate bicycle lanes, and implementing road reconfigurations (road diets).

1.2 New and Existing Streets to Accommodate Bicycle Facilities / Restriping

Street Planning and Design Guidelines (2009) as adopted by the City of Phoenix recognize eleven street cross-sections for new arterial and collector streets. These cross-sections are required to be used for new roadway design. Some of the cross-sections include bicycle lanes as presented below (Cross-sections A,B,C,D,F).



Figure 1. Cross-section "A" – Major Arterial / 140 ROW / 104 FOC / with Bike Lane



Figure 2. Cross-section "B" – Major Arterial and Arterial / 130 ROW / 94 FOC / with Bike Lane



Figure 3. Cross-section "C" – Major Arterial and Arterial / 110 ROW / 74 FOC / with Bike Lane



Figure 4. Cross-section "F" – Minor (Residential) Collector / 60 feet ROW / 40 feet FOC / with Bike Lanes

The above cross-sections design include bicycle lanes; however, streets that were designed before 2009 when the latest City of Phoenix Street Planning and Design Guidelines was approved, may not necessary have bicycle lanes. In such cases, restriping existing street right-of-ways to accommodate bicycle lanes may be considered. Roadway restriping, as referred to in this document, does not require a change to the existing number of motor vehicle lanes (as opposed to road diet). Instead it as is a term used to describe the situation where lane width can be narrowed to accommodate new or buffered bicycle lanes in the roadway between the existing curbs. The City of Phoenix cross-section "D" is presented below as an example of road retrofit to accommodate bicycle lanes (Figure 5 and Figure 6).



Figure 5. Cross-section "D" – Arterial, / 100 feet ROW / 64 feet FOC / no Bike Lanes



Figure 6. Cross-section "D" – Arterial, and Major Collector / 100 feet ROW / 64 feet FOC / with Bike Lanes

Another example of roadway restriping is adding buffer space to provide additional separation between bicyclists and vehicular traffic. This option is presented in Figure 7 and Figure 8.



Figure 7. Cross-section with bike lanes / no buffer space / 81feet FOC



Figure 8. Cross-section with bike lanes and buffer space / 81 feet FOC

Additional separation between bicyclists and vehicular traffic can be achieved by adding cycle tracks. This retrofitting requires significant right-of-way to accommodate both pedestrians and bicyclists outside of the paved roadway, but it provides even more separation between bicyclists and vehicular traffic than a buffer space (Figure 9 and Figure 10).

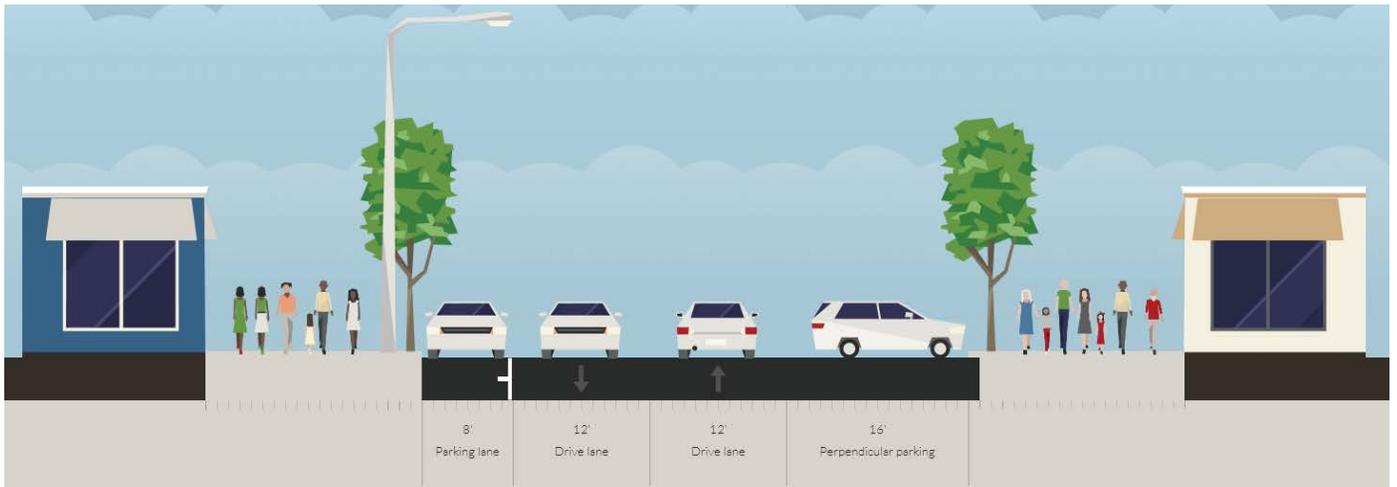


Figure 9. Cross-section without cycle track¹



Figure 10. Cross-section with cycle track²

¹ All dimensions are approximate

² All dimensions are approximate

1.3 Roadway Reconfiguration

Road diets, also known as roadway reconfigurations, are based on reallocation of road space through reduction of the number of vehicular traffic lanes. Typical roadway reconfiguration on a 40 feet wide collector street involves converting an undivided four lane roadway into three lanes made up of two through lanes and a center two-way left turn lane. The remaining space can be utilized as bike lanes, pedestrian crossing islands or parking spaces. The advantages of road reconfiguration include, but are not limited to crash reduction, improved overall safety and accessibility for non-motorized users, reduced traffic speed, and improved access management.

Not every road can be reconfigured. According to Federal Highway Administration³ four lane roadways with Average Daily Traffic (ADT) of 20,000 or less may be good candidates for road reconfiguration. Libby (2013) indicated that road reconfiguration treatment generally seems compatible with maintaining motor vehicle capacity from around 5,000 up to 24,000 vehicles per day, or up to around 1,500 to 1,750 vehicles during the peak hour⁴. Knapp and Giese (2001)⁵ recommended considering conversion of a four-lane undivided roadway into three-lane when bi-directional peak-hour volumes are less than 1,500 vehicles per hour.⁶ However, Leix (2012)⁷ indicated that using a peak-hour traffic volume of 1,000 vehicles as a maximum threshold for implementing road diets. Huang et al. (2002)⁸ found that for ADTs above approximately 20,000 on road diet section, there is an increased likelihood of traffic congestion that may increase to the point of diverting traffic to nearby parallel roads.

Several feasibility factors should be considered before implementing a road diet: roadway function and environment, overall traffic volume and level of service, turning volumes and patterns, frequent-stop and slow-moving vehicles, weaving, speeds, and queues, crash type and pattern, pedestrian and bicycle activity, right-of way availability, cost, and acquisition impacts, presence of parallel routes as well as other contextual considerations. None of these factors have specific threshold assigned to consider road diet; rather, multiple factors need to be taken into account when evaluating road diet option.

Knapp and Giese (2001) provided in-depth discussion related to variety of factors that need to be considered for the purpose of road diet. More information related to the feasibility determination factors and characteristics from Knapp and Giese (2001) are provided in Appendix C of their report.

Knapp and Giese (2001) also reported a number of sites with road diet that had volumes in the range of 20,000 ADT. A summary of the results is presented in Table 2

³ FHWA Proven Safety Countermeasures “Road Diet” (Roadway Reconfiguration),

⁴ Libby, T. *Road Diet Conversions: A Synthesis of Safety Research*. DTFH61-11-H-00024, May 2013.

⁵ Knapp, K.K. and Giese, K. (2001). *Guidelines for the Conversion of Urban Four-Lane Undivided Roadways to Three-Lane Two-Way Left-Turn Lane Facilities. Final Report*. Sponsored by Iowa Department of Transportation’s Office of Traffic and Safety. Ames, IA: Center for Transportation Research and Education, Iowa State University.

⁶ Caution be exercised when the roadway has a bi-directional peak-hour volume between 1,500 and 1,750 vehicles per hour.

⁷ Leix, T. *Research Spotlight Balancing safety and capacity for road diet lane conversions*. MDOT Research Administration Bureau of Field Services Michigan Department of Transportation, January 2012.

⁸ Huang, H.F., Stewart, J.R. and Zegeer, C.V. (2002), *Evaluation of Lane Reduction “Road Diet” Measures on Crashes and Injuries*. Transportation Research Record 1784, Paper No.02-2955.

Table 2 Road Diet examples for high volume locations

Location	Approx. ADT	Safety	Operations
Montana: Helena – U.S. 12	18,000	Improved*	No Notable Decrease*
Minnesota: Duluth – 21 st Avenue East	17,000	Improved*	No Notable Decrease*
Ramsey County—Rice Street	18,700 Before 16,400 After	28 percent total crash reduction (3 years of data)	NA
California: Oakland—High Street	22,000–24,000	17 percent in total crash reduction (1 year of data)	No notable change in vehicle speed
San Leandro—East 14th Street	16,000–19,300 Before 14,000–19,300 After	52 percent in total crash reduction (2 years of data)	Maximum of 3 to 4 mph spot speed reduction
Washington: Seattle –Nine Locations	9,400–19,400 Before 9,800–20,300 After	34 percent average total crash reduction (1 year of data)	NA

*Summarized results based on anecdotal information.

Another study was conducted in Orlando, Florida (Edgewater Drive)⁹. The City of Orlando converted four-lane road with on-street parking into three-lane road with bike lanes and on-street parking. The results indicate the following:

- drop in speed between approximately 1% to 7%,
- drop in safety: crash rate dropped by 34%, injury rate dropped by 68%,
- increase in on-street parking utilization by approximately 12%,
- overall increase in bicyclist use by approximately 30%

The FHWA Highway Safety Information System (HSIS) Summary Report discussed the Evaluation of Lane Reduction “Road Diet” Measures and Their Effects on Crashes and Injuries.¹⁰ This report includes road-diet before and after study using 10 groups, with 11 road diets and 24 comparison sites. The analysis included examination of crash frequency, crash rate, crash severity and crash type on selected locations. The results of this study are depicted in Figure 11.

ANALYSIS CATEGORY	COMPARISON			
	Road Diets Before vs. After	Comparison Sites Before vs. After	Before Period Road Diets vs. Comparison Sites	After Period Road Diets vs. Comparison Sites
Crash frequency	Reduction in after period	No change	No difference	Road diets lower
Crash rates	No change	No change	Road diets lower	Road diets lower
Crash severity	No change	No change	No difference	No difference
Crash type	No change	No change	Difference: 1. Road diets had a higher percentage of angle crashes. 2. Road diets had a lower percentage of rear-end crashes.	Difference: 1. Road diets had of angle crashes. 2. Road diets had a lower percentage of rear-end crashes.

Figure 11 Depicting HSIS study: results¹¹

⁹ https://smartech.gatech.edu/bitstream/handle/1853/20063/GnG-Complete%20Streets_McKinney.pdf?sequence=1 (last visited 12/5/2013)

¹⁰ <http://www.fhwa.dot.gov/publications/research/safety/humanfac/04082/04082.pdf> (last visited 12/5/2012)

¹¹ <http://www.fhwa.dot.gov/publications/research/safety/humanfac/04082/04082.pdf> (last visited 12/5/2012)

The need for bicycle lanes in urban/suburban setting was evaluated by the Oregon Department of Transportation (ODOT) study¹². As a result of this study, a chart was created to help practitioners determine the need for bicycle lanes (Figure 12).

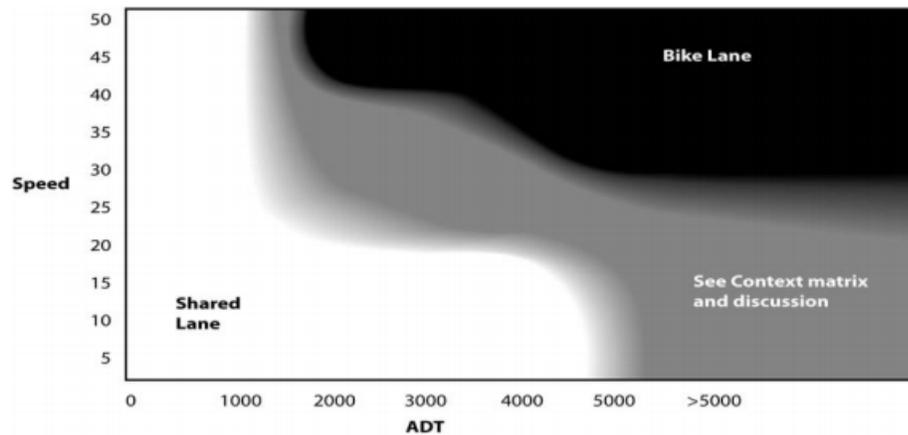


Figure 12 Oregon Department of Transportation chart

The decision to reconfigure an existing roadway requires careful consideration. In addition to factors pointed by Knapp and Giese (2001) other location-specific factors should be considered (local conditions, drivers behavior, roadway geometry, environmental characteristics, costs, safety any others). Typical roadway reconfiguration involves four-lane undivided roadway conversion into a three-lane roadway (Figure 13).

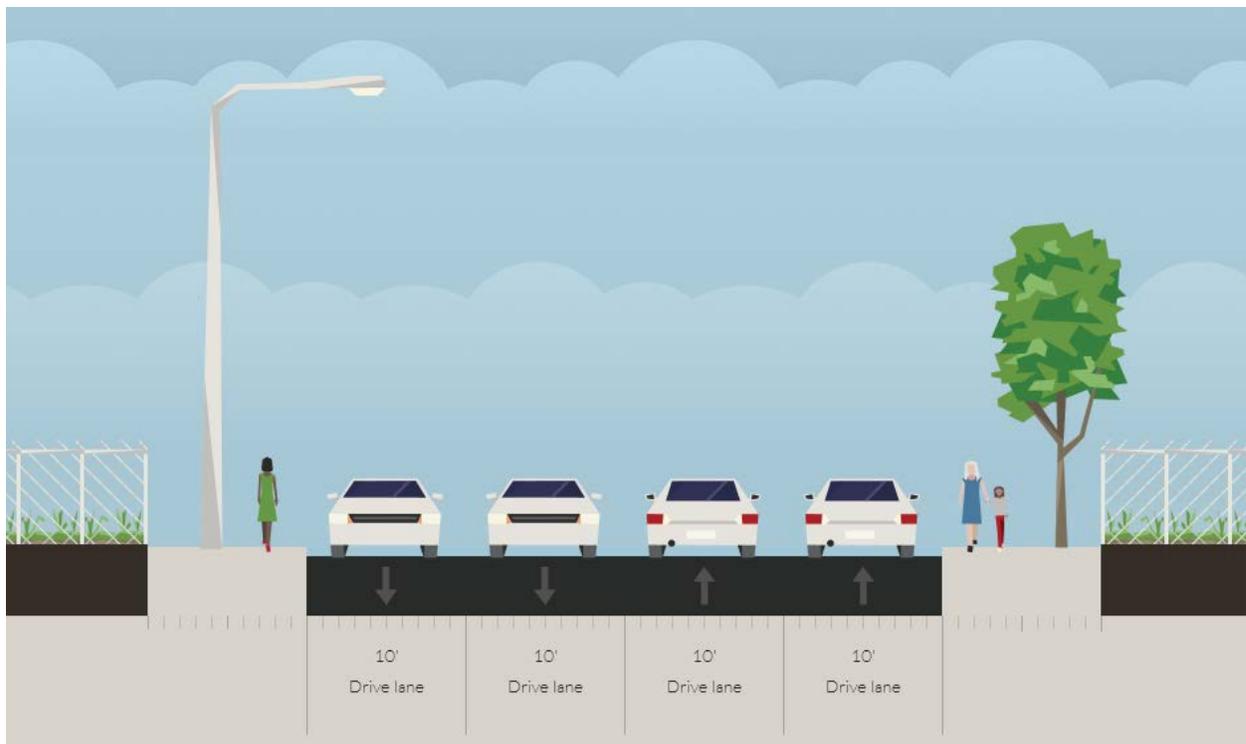


Figure 13 Typical four-lane roadway before road diet

¹² http://www.oregon.gov/ODOT/HWY/BIKEPED/docs/bike_lane_matrix.pdf

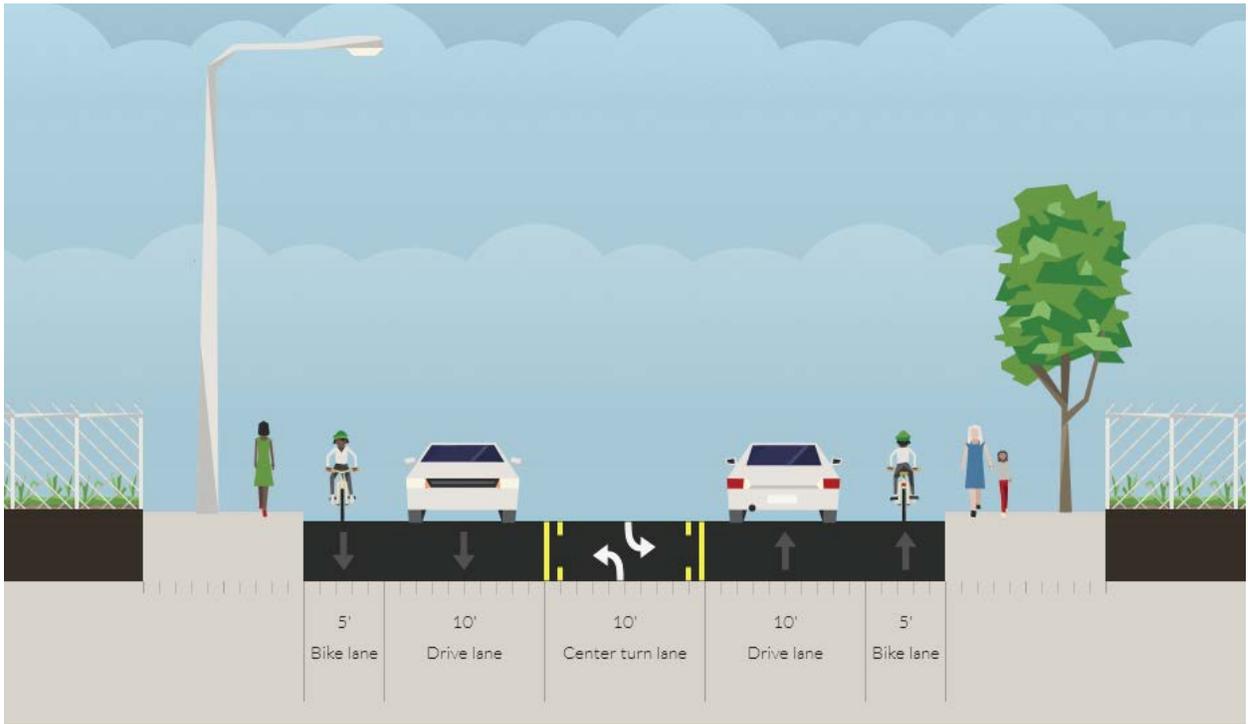


Figure 14 Typical four-lane roadway after road diet

Another roadway reconfiguration may involve a five-lane undivided roadway conversion into a four-lane roadway as presented in Figure 15 and Figure 16.

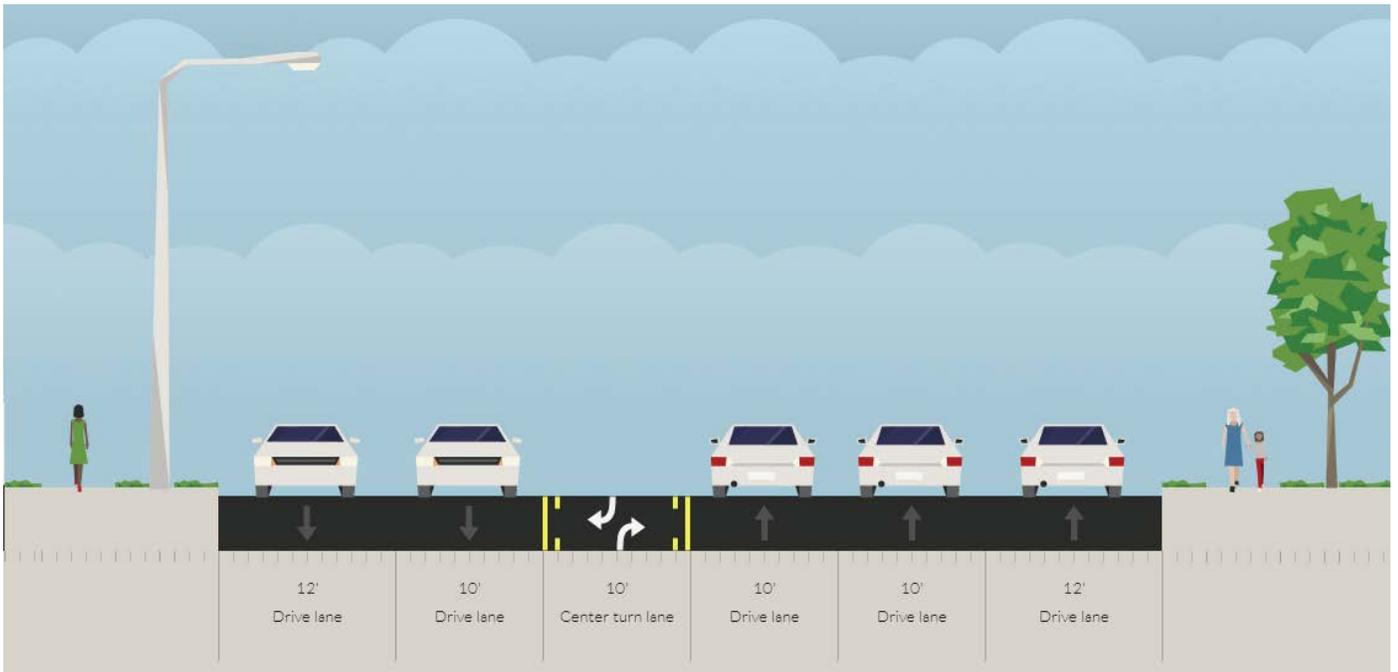


Figure 15 Five-lane roadway before road diet / 64 feet FOC

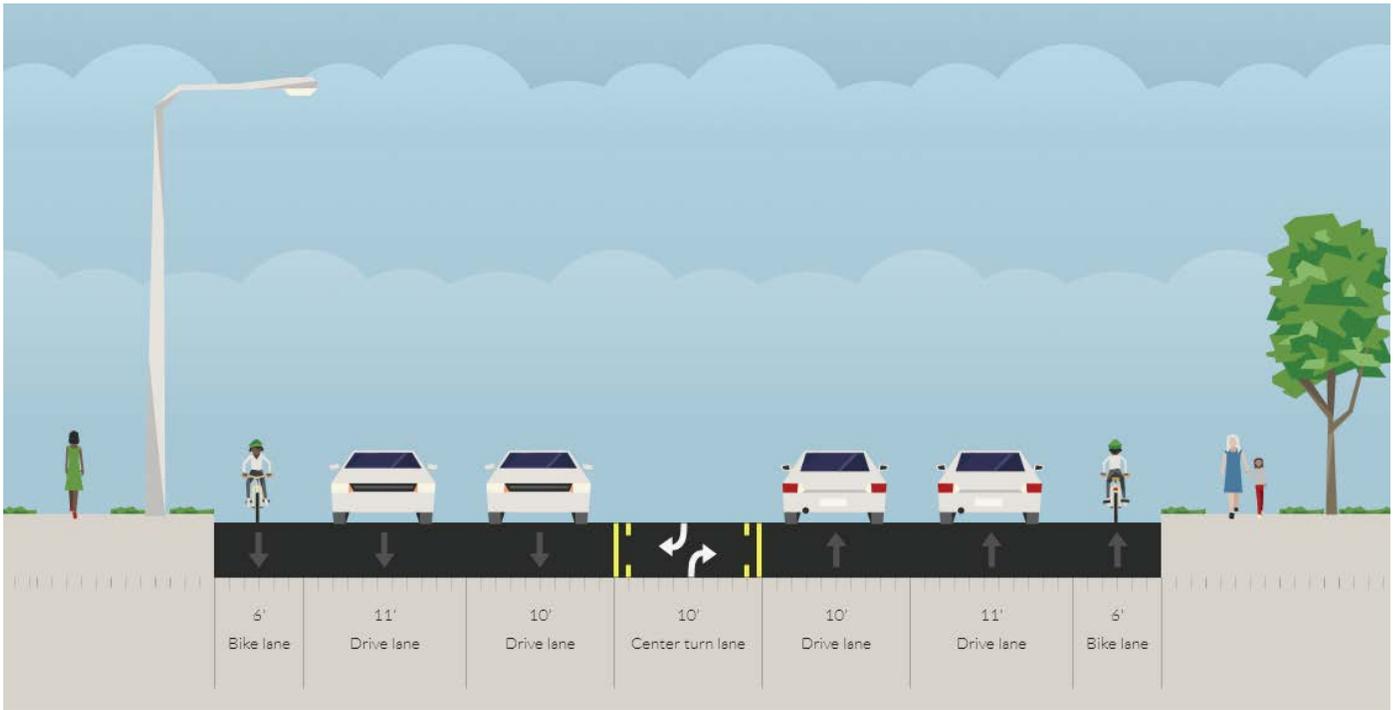


Figure 16 Typical four-lane roadway after road diet / 64 feet FOC

Over the last 15 years, road diets have been implemented in the City of Phoenix. Examples of road diet projects include:

- 12th Street between Osborn Road and Campbell Avenue
- 12th Street between Camelback Road and Mountain View Road
- 15th Avenue between Van Buren Street and Bethany Home Road
- 1st Street between Camelback Road and Bethany Home Road
- 23RD Avenue between Dunlap Avenue and Peoria Avenue
- 40th Street between McDowell Road and Camelback Road
- Grand Avenue between 7th Avenue and 15th Avenue

In particular, the City of Phoenix implemented a road diet on 40th Street between McDowell Road and Camelback Road as a part of a traffic calming project. Prior to the road diet implementation, 40th Street was four-lane roadway without bike lanes, and had approximately 18,000 vehicles per day. After the road diet was implemented 40th street was converted into a two-lane roadway with a center turn lane and bike lanes. However, all 40th Street approaches were designed to have one left, one through and one right turn lane at the collector street intersections. The signalized intersections along 40th Street remained unchanged. A one-year before and after study concluded that the collision rate between the arterial street intersections decreased by 43 percent. Collision rates at the signalized intersections remained approximately constant during this same time period.¹³

2 Design Options

This section of the report documents an extensive review of the state of the art and practice in variety of design options. These design options represent the most innovated technologies and practices implemented worldwide by cities leading in bicycle friendly design. The design options were selected to accommodate preferences of a variety of bicyclists (e.g. preferring to use on and/or off-street bicycle facilities).

In a memorandum dated August 20, 2013, the Federal Highway Administration expressed support for taking a flexible approach to bicycle and pedestrian facility design, particularly in urban areas. The AASHTO bicycle design guide is the primary national resources for planning, designing, and operation bicycle facilities. The

¹³ Lee Engineering 40th Street Traffic Study, 2003

NACTO Urban Bikeway Design Guide builds upon the flexibilities provided in the AASHTO guide, which can help communities plan and design safe and convenient facilities for bicyclists.

The City's existing plans, standards, and guidelines do not specifically address intersection treatments, so the Comprehensive Phoenix Bicycle Master Plan will include recommendations to address this gap. Additionally, the existing plans, standards, and guidelines do not reference innovative facilities, such as cycle tracks. Below is a list of innovative facilities from the NACTO guide that are recommended to be incorporated into the Comprehensive Phoenix Bicycle Master Plan. These as well as other design options are presented with greater detail in the next section of this report.

- Cycle Tracks (All topics)
 - One-Way Protected Cycle Tracks
 - Raised Cycle Tracks
 - Two-Way Cycle Tracks
- Buffered Bike Lanes
- Contra-Flow Bike Lanes
- Left-Side Bike Lanes
- Intersection Treatments (All topics)
 - Bike Boxes
 - Intersection Crossing Markings
 - Two-Stage Turn Queue Boxes
 - Median Refuge Island
 - Through Bike Lanes
 - Combined Bike Lane/Turn Lane
 - Cycle Track Intersection Approach
- Signals
 - Active Warning Beacon for Bike Route at Unsignalized Intersection
 - Bicycle Signal Head
 - Hybrid Beacon for Bike Route Crossing of Major Street (BikeHAWK)
- Signs and Markings
 - Colored Bike Facilities (lanes)
 - Colored Pavement Material Guide
 - Shared Lane Markings
 - Bike Route Wayfinding Sign and Marking System
- Bicycle Boulevards

The design options presented below were chosen as infrastructure tools that can be used to improve bicycling in Phoenix and are consistent with guidance provided by the National Association of City Transportation Officials (NACTO), Manual on Uniform Traffic Control Devices (MUTCD), and the American Association of State Highway and Transportation Officials (AASHTO).

Table 5 represents the general description of the proposed design options. Table 6 represents the design options for bicycle lanes. Table 7 represents detail descriptions of design options.

Table 5 Design Options

<p>BICYCLE BOULEVARD</p> <p>Street with bicycles preference over cars designed in a way to effectively divert motorized traffic</p> <p>AppendixC-BikeFacilities P6.JPG</p>		<p>BICYCLE BOXES</p> <p>A designated area at a signalized intersection that allows bicyclists to position themselves in front of traffic</p> <p>ChicagoStreetsforCycling2020 p83.JPG</p>	
<p>MULTI-USE PATH</p> <p>Area designed for the shared use of bicycles, pedestrians, or other designated users.</p> <p>Fort Collins bike_plan-2008 p31.JPG</p>		<p>CYCLE TRACK</p> <p>Exclusive bicycle facility separated from motor vehicle lanes and sidewalks by fixed objects.</p> <p>Denver_Moves p20.JPG</p>	
<p>BICYCLE FRIENDLY TRAFFIC CALMING</p> <p>Traffic calming measures designed to accommodate bicyclists.</p> <p>http://www.portlandoregon.gov/transportation/article/322218</p>		<p>Pedestrian Hybrid Beacon</p> <p>High-intensity Activated crosswalk (HAWK) assist pedestrians and cyclists to safely cross busy streets.</p>	
<p>TRAFFIC SIGNAL OPERATIONS FOR BICYCLES</p> <p>Provides a separate actuated signal lights in shape of bicycle to direct bike traffic through an intersection.</p> <p>ChicagoStreetsforCycling2020 p74.JPG</p>		<p>BICYCLE PARKING</p> <p>Provides convenience and security for bicyclists at destinations.</p> <p>AUSTIN2009_bicyclenetworkplan p424.JPG</p>	
<p>BICYCLE MARKINGS THROUGH INTERSECTION</p> <p>Provides awareness for both bicyclists and motorists of conflict areas.</p>		<p>BICYCLE OVER/UNDER PASS</p> <p>A special under or over pass provided for bicycle exclusive or share use.</p> <p>scottsdale Bicycle Element-2008 p43.JPG</p>	
<p>ROAD DIET / RETROFIT</p> <p>A roadway transformation project where the existing travel lanes are narrowed to accommodate a bicycle facility.</p> <p>03-BikeNetwork p41.JPG</p>		<p>BICYCLE LANE</p> <p>Area within the roadway specifically designated for the use of bicycles. Design elements may include: lane stripe, pavement markings, and signage</p> <p>Mesa BikeMasterPlan 2012 p70.JPG</p>	

Table 6 Design Options – Road Sections

Road Sections	
<p>Barrier Protected Bicycle Lane</p> <p>A bicycle lane that is separated from traffic with a row of parked cars, a curb, or other physical separation.</p> <p>http://chicagocompletestreets.org/your-streets/bikeways/barrier-protected-bike-lanes/</p>	<p>Raised Bicycle Lanes</p> <p>Bicycle lane that create a physical separation and an individual space for the rider. The change in surface elevation and color help both the motorist and the cyclist.</p> <p>http://bfw.org.s132128.gridserver.com/2012/05/25/milwaukee-adding-76-miles-to-bikeway-network/</p>
<p>Colored Bicycle Lanes</p> <p>Provide a visual perception of narrower roadway and separation from traffic. Green color is frequently used to indicate a potential conflict area.</p> <p>San Francisco Bicycle Strategy Draft p40.JPG</p>	<p>Buffered Bicycle Lane</p> <p>Bicycle lane with an additional painted buffer to provide more separation from motor vehicles.</p> <p>Dallas_Bike_Plan_Addendum p4.JPG</p>
<p>Contraflow Bicycle Lane</p> <p>Bicycle lanes installed on a one-way street that allow bicyclists to travel in both directions while vehicular traffic remains one-way only.</p> <p>http://www.streetsblog.org/2006/06/27/this-is-what-bike-safety-looks-like/</p>	<p>Climbing Bicycle Lane</p> <p>Bicycle lane in the uphill direction and shared lane markings in the downhill direction. Used on hills where there is insufficient space for a bike lane in both directions.</p> <p>http://sf.streetsblog.org/2010/10/14/a-pleasant-ride-to-the-beach-in-the-new-kirkham-street-bike-lanes/</p>
<p>Bus-Bicycle Lane</p> <p>Shared on-road facility designated only for bus and bicycle use. Frequently painted in red.</p> <p>FDOT_BDK85_977-32 p19.JPG</p>	<p>Priority Shared Lane</p> <p>Shared lane with additional visual cues to denote bicycle priority and encourages motor vehicles to pass bicycles by switching lanes.</p> <p>http://www.coe.neu.edu/transportation/facilities/priority.html</p>

Table 7 Detail description of proposed design options

BICYCLE BOULEVARD



Purpose:

Bicycle Boulevards are local street routes that are optimized for bicycle and pedestrian travel. Design elements may include: diverters, reconfiguration of stop signs to favor the bike boulevard, traffic calming and shared lane markings, and crossing improvements at high traffic crossings

Application:

Any residential street

Advantages:

- Improve connectivity
- Improve bicycle comfort
- Improve bicycle safety
- Provide comfortable and attractive places to all age users to bike, run, skate, and walk
- Low vehicular volume

Disadvantages:

Maintenance costs

Source:

Mesa BikeMasterPlan 2012 p66.JPG

<http://bostonbiker.org/2008/04/01/mass-ave-turned-into-bicycle-boulevard/>

BICYCLE BOX



Source:

Denver_Moves p32.JPG

<http://www.treehugger.com/bikes/green-box-biking-and-safety-its-all-in-our-heads.html>

Purpose:

Bicycle box provides a dedicated space for bicyclists to wait ahead of traffic during the red light at signalized intersections. A typical bicycle box is designated by two pavement markings called stop bars, approximately 12 to 16 feet apart with painted bicycle symbol. Frequently bicycle boxes are painted with bright colors (green, blue).

Application:

Signalized intersection with:
High number of queuing
High automobile and bicycle volume
History of frequently turning conflicts
High turning volumes

Advantages:

Improve visibility of bicyclists stopped at signalized intersection
Reduce bicycle/motor vehicle crashes
Gives bicyclist priority when signal has a short green phase
Allows left turn bicyclist to position themselves ahead of traffic
Shorter crossing distance for bicyclists
Lessens nuisance from exhaust

Disadvantages:

No right turn on red for motorists
Vehicle encroachment into bike boxes
Maintenance costs of color surface

FORWARD STOP BAR



Source:

http://blog.bicyclecoalition.org/2010_06_01_archive.html
http://la-bike.org/glendale/?page_id=6

Purpose:

Forward Stop Bar provides a dedicated space for bicyclists at unsignalized intersection to wait ahead of traffic. A typical Forward Stop Bar is designed by painting an additional stop bar ahead of the vehicular stop bar. Typically used with crossing treatment (e.g. curb extension) to encourage bicyclists to take full advantage of crossing design.

Application:

Low-volume, stop controlled intersection (preferably with curb extension)

Advantages:

Improve visibility of bicyclists stopped at intersection
Reduce bicycle/motor vehicle crashes
Bicyclists have better visibility of cross-traffic
Shorter crossing distance for bicyclists

Disadvantages:

Conflict with pedestrians

MULTI-USE PATH



Source:

Denver_Moves p17.JPG

Fort Collins bike_plan-2008 p31.JPG

Purpose:

A special area separated from motorized vehicular traffic dedicated to be share by bicyclists, pedestrians and other designated users. Multi-use paths are intended to provide adequate and convenient routes for bicycling, walking, and other non-motorized uses. Typical multi-use-path is at least 8 feet wide.

Application:

Corridors with not well served by the on-street bikeway network

Advantages:

Separates bicyclist from vehicular traffic

Disadvantages:

Possible conflict with pedestrians and other designated users

CYCLE TRACK



Purpose:

Exclusive bicycle facilities adjacent/ separated from the roadway by a physical barrier. Typical cycle track width is 7 feet with 2 feet buffer on vehicle side.

Application:

Arterial roadways with higher motor vehicle speeds and volumes

Roadway with fewer cross-streets and longer blocks

Advantages:

Physical separation from automobile traffic in busiest parts of town

Disadvantages:

Additional right-of-way required

Possible removal of travel lane or on-street parking

ADA Access to sidewalk from on street parking

Construction cost

Source: For example picture location, great example 2,

Denver_Moves p20.JPG

TRAFFIC SIGNAL OPERATIONS FOR BICYCLES



Source:

Tucson RegionalBicyclePlan p1.JPG

<http://www.wired.com/gadgetlab/2008/11/gadget-lets-bic/>

Purpose:

Bicycle dedicated traffic signal heads use a bicycle symbol lens at signalized intersections to indicate when bicycles may travel through the intersection.

Application:

Signalized intersection with high bicycle volume

Advantages:

Minimize conflicts between bicyclists and other modes of transportation.

Reduced bicycle delay during periods of high vehicle traffic

Provide bicyclist priority over other users (leading bicycle interval)

Help to simplify bicycle movements through complex intersections

Disadvantages:

Maintenance costs

Increase stops and delay for automobile traffic

Increase delay for bicyclist during periods when the major street traffic is low

DEDICATED TRAFFIC SIGNAL FOR BICYCLES



Source: City of Tucson BikeHAWK
Photo Credit: Michael Cynecki

Purpose:

Provide an opportunity for bicyclist to cross major street. Design includes actuated traffic signal for bicycles, pedestrian hybrid signals, and midblock signals for trails and pedestrian crossing.

Application:

Within bicycle route crossing high volume collector or arterial street

Advantages:

Minimize conflicts between bicyclists and other modes of transportation.

Provide crossing protection

Reduce bicycle delay during high vehicle traffic

Disadvantages:

Installation and maintenance costs

Increase stops and delay for automobile traffic

Increase delay for bicyclist during periods when the major street traffic is low

LOOPS FOR BICYCLE LANES



Source:

<http://bikesd.org/2013/12/foto-friday-bike-lane-detection-loops/>

Purpose:

Provide detection for bicyclists at signalized intersection. Design may include in addition to adding loops for bicycle lanes, marking a spot (sweet spot) on the roadway where a given loop will detect a bicycle.

Application:

Signalized intersection where signal change is unlikely without detection

Advantages:

Provide dedicated bicycle detection

Disadvantages:

Maintenance costs

SHORT TERM BICYCLE PARKING



[designer racks – SkyTrain]
[parking meter rings]

Purpose:

Most of the time short-term parking consists of a bicycle rack unit and does not provide security for bike accessories or weather protection and it is located within 50 feet from the main entrance door of the building.

Application:

Within 50 feet from the building main doors (short-term).

Close to places of employment, transit centers, educational facilities, airports, and train stations (long-term).

Advantages:

Promote bicyclist traffic to variety of destinations
Provide secure located to store bicycles

Disadvantages:

???

Source: For example picture location, Mesa
BikeMasterPlan 2012
03-BikeNetwork p87.JPG

LONG TERM BICYCLE PARKING

[bike lockers – central station & SkyTrain]
[business – Bike Cellar in Tempe]
[bike lids – not in AZ]
[urban building/parking garage storage?]

Purpose:

Long-term parking is intended to be indoor with additional amenities that may include showers, lockers, maintenance stations, on site mechanics, and bicycle rentals.

Application:

Close to places of employment, transit centers, educational facilities, airports, and train stations (long-term).

Advantages:

Promote bicyclist traffic to variety of destinations
Provide secure located to store bicycles

Disadvantages:

???

Source: For example picture location, Mesa
BikeMasterPlan 2012
03-BikeNetwork p87.JPG

BICYCLE FRIENDLY TRAFFIC CALMING



[5th St in Tempe – speed tables]

Source: For example picture location, definition boston2

Purpose:

Reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for bicyclists. Examples of traffic calming treatments include curb extensions, speed tables, chicanes, storm water plantings, cut-throughs, and diverters.

Application:

Local streets

Advantages:

Calm traffic
Speed & volume reduction
Reduce cut-through traffic

Disadvantages:

Maintenance (issues such as street sweeping)
Parking lost

BICYCLE OVER / UNDER PASS



Purpose:

Provide safe and efficient bicycle movement for bicyclists traveling over or under a major railway or roadway.

Application:

Major roadway or railway where no crossing is provided.

Advantages:

No interaction with vehicular traffic

Disadvantages:

Cost



Source:

Davis Bike - Plan - 2009 p22.JPG

<http://jimsbikeblog.wordpress.com/2013/04/23/fort-worths-bike-share-launch-chronicled-in-photographs-2/bike-delivery-coordinator-mark-troxler-leads-a-group-through-the-main-street-underpass-into-downtown-fort-worth-3/>

ROAD DIET



(Pic 3.7 = 3 Lanes + Bike Lanes, after Road Diet)²³



Source: For example picture location
AUSTIN2009_bicyclemasterplan p488.JPG

Purpose:

Reduce the amount of space for motor vehicles, either through eliminating lanes or shrinking the width of lanes, and reallocating that space for other uses including bicycle lanes.

Application:

- Low volume streets

Advantages:

- Provide additional space for bicycle traffic
- Reducing the multiple-threat crash
- Reducing rear-end and side-swipe crashes
- Decreasing crash severity

Disadvantages:

Reduce number of lanes for vehicular traffic

BICYCLE LANE



Source:

<http://www.richmond.ca/services/tp/cycling/local.htm>

Purpose:

Marked space along the roadway for exclusive use of cyclists. Recommended width varies between 6.5ft to 8.2 ft.

Application:

- On roadways with \Rightarrow 3,000 motor vehicle trips per day
- Any street with excessive curb to curb space where bike lanes could help reduce vehicle lane widths

Advantages:

- Allow for bicycle access on major through street
- Distinguish lane usage between motorists and cyclists
- Increase cyclist's comfort through visual separation

Disadvantages:

- Space required

BICYCLE MARKINGS THROUGH INTERSECTION



Source:

<http://calmstreetsboston.blogspot.com/2012/04/shares-lanes-bike-lanes-mfa-back-bay.html>

Purpose:

Increases visibility of bicycles at intersections

Application:

Advantages:

- Provides greater visibility for bicyclists at intersections.
- Informs all roadway users of where bicyclists should cross.
- Separates modes to reduce conflicts.

Disadvantages:

- Maintenance

BARRIER PROTECTED BICYCLE LANE



Purpose:

Provide dedicated and protected space for bicyclists through separation from traffic by using e.g. barriers.

Application:

- Minimum roadway width of 52 feet for one travel lane and one parking lane in each direction
- Should not be installed on 52 foot roadways with bus routes
- Should not be installed on a roadway with heavy truck movement
- The preferred minimum roadway width for barrier protected bike lanes is 58 feet.

Advantages:

- Provide dedicated space for bicyclist
- Increase bicyclists comfort
- Reduce crashes
- Prevent parking vehicular parking within bike lane

Disadvantages:

- Space required
- Maintenance

Source:

<http://bikeportland.org/2012/11/19/the-public-art-of-riding-in-new-york-city-80373>

RAISED BICYCLE LANES



Source:

<http://sf.streetsblog.org/2013/04/09/raised-bike-lanes-a-solution-to-help-taxis-and-cyclists-share-the-streets/>

Purpose:

Provide physical separation and space for the bicyclists. The surface change and color help both motorists and the cyclist distinguish bicycle lane.

Application:

Advantages:

- Provide physical separation
- Provide visual separation and bicycle comfort

Disadvantages:

- Additional space is required
- Maintenance

COLORED BICYCLE LANES



Source: For example picture location
ChicagoStreersforCycling2020 p29.JPG

Purpose:

Provide visual perception of a narrow roadway for motorists and give the bicyclist a psychological perception of separation from traffic.

Application:

- Use for existing bicycle lanes
-

Advantages:

- Provide visual separation
- Provide warning of possible conflict from crossing paths

Disadvantages:

- Maintenance
- Cost

BUFFERED BICYCLE LANE



Purpose:

Provides buffer space on one or both sides of bicycle lane to provide greater separation between bicyclists and passing motorists as well as on-street parking.

Application:

The buffer is typically installed on the parking side where parking turnover is high and traffic speeds low, and on the travel lane side where parking turnover is low and traffic speeds high.

Advantages:

- Provide additional space to separate bicyclists from vehicular traffic

Disadvantages:

- Additional space is required

Source: For example picture location
ChicagoStreetsforCycling2020 p49.JPG

CLIMBING BICYCLE LANE



Purpose:

A bicycle lane only on the uphill direction of a roadway.

Application:

Advantages:

- Provide benefits for cyclists going uphill at slower speed

Disadvantages:

Source:

<http://sf.streetsblog.org/2010/10/14/a-pleasant-ride-to-the-beach-in-the-new-kirkham-street-bike-lanes/>

CONTRAFLOW BICYCLE LANE



Purpose:

Provides a bicycle lane for bicyclist to travel in both directions while vehicular traffic remains one-way only. Contraflow bicycle lanes require special provisions at intersections to ensure bicyclists can cross legally and safely.

Application:

- One-way traffic streets
- Narrow streets where on-street parking and bicycle accessibility are given priority over traffic accessibility
- Minimum contraflow bicycle lane width of 5 feet

Advantages:

- Provide direct access for bicycles traveling in both directions
- Influence motorist choice of routes without limiting bicycle traffic
- Cyclists do not have to make detours as a results of one-way traffic

Disadvantages:

- Limited parking on side with contraflow lane
- Illegal parking within the contraflow lane

Source:

<http://www.streetsblog.org/2011/04/28/dot-to-extend-east-side-bike-lanes-to-57th-but-mostly-with-shared-lanes/>
http://www.bicyclinginfo.org/bikesafe/case_studies/casestudy.cfm?CS_NUM=209

BUS-BICYCLE LANE



Source: For example picture location
Denver_Moves p29.JPG

Purpose:

Provide on-road travel lanes designated exclusively for bus and bicycle use.

Application:

Advantages:

- Provides dedicated lane for buses and bicyclists

Disadvantages:

May be uncomfortable for some bicyclists due to sharing lane with large vehicles and mixing with motor vehicle traffic at intersections.

SHARED ROADWAY MARKINGS



Source: For example picture location Great example 2
Denver_Moves p27.JPG
<http://www.minneapolismn.gov/bicycles/bicycling101/shared-lane>

Purpose:

Provide a shared lane environment for bicycles and automobiles. Design includes shared roadway pavement markings, or “sharrows”.

Application:

- Streets with moderate traffic volumes where bike lanes are precluded by constrained right-of-way.
- Short gaps between bike lanes.
- Streets without space for bike lanes in both directions.
- Low-traffic shared roadways to indicate presence of bikeway.
- To designate through-movement of bicycles through shared turn lane

Advantages:

- Increase visibility of bicyclists
- Guide proper roadway positioning of bicyclists on streets

Disadvantages:

Maintenance costs

MAKING CONNECTIONS

On-Street & Off-Street Routes

While bicycle accommodation on arterial and collector streets is needed to form the backbone of the city's bicycle network, such riding environments are not always comfortable or suitable for all bicyclists. Families with children, people less confident operating in traffic, and non-cyclists will not likely attempt to ride in corridors that they feel have too much traffic, are too noisy, or are too high stress for their personal comfort level.

For this reason, this plan looks to merge multi-use pathway planning, traditionally under the umbrella of Parks and Recreation, with on-street bikeway initiatives of the Street Transportation Department. Seamless transitions between both types of facilities will expand the functionality of the overall bicycle network and better meet the needs of a wider variety of cyclists.

Different Facilities for Different Users

There is a nationally recognized "design bicyclist" concept in which the planning and design of facilities considers the needs of three distinct classifications of users:

- ▶ Type A: Advanced Bicyclists
- ▶ Type B: Basic Bicyclists
- ▶ Type C: Child Bicyclists

GOAL:

Multi-use paths and trails will intersect and seamlessly connect with the street network.

This mix of facility types will provide a variety of comfortable travel options for all ages, abilities, and trip purposes.





Type A: Advanced Bicyclists

- Experienced riders who can operate under most traffic conditions.
- Include road cyclists comfortable riding in traffic, who will ride with or without bicycle facilities present, often bike long distances, and prefer direct routes for utilitarian trips and/or long-distance loops for recreational outings.



Type B: Basic Bicyclists

- Casual adult and teenage riders who are less confident operating in traffic.
- Are often intimidated by motor vehicles, tend to make short trips close to home, and prefer designated bicycle facilities.
- Some will develop greater skills and progress to the advanced level, but there will always be many millions of basic bicyclists.



Type C: Child Bicyclists

- Pre-teen riders whose bicycle use is initially monitored by parents.
- Do not like to ride in traffic and/or are not allowed to ride on most streets.
- Desire access to key destinations surrounding residential areas.
- Will seek out multi-use pathways as safe, recreational places to ride.

Most bikeway and trail planning initiatives combine Type B/C riders into a single user group that prefers access to off-road paths, a network of lightly traveled neighborhood streets, and bike lanes on streets with moderate to low traffic volumes and speeds.

Parks, Canals, and Desert Preserves

The Phoenix Parks and Recreation Department and other agencies currently manage 51 miles of paved trails and 66 miles of unpaved trails.

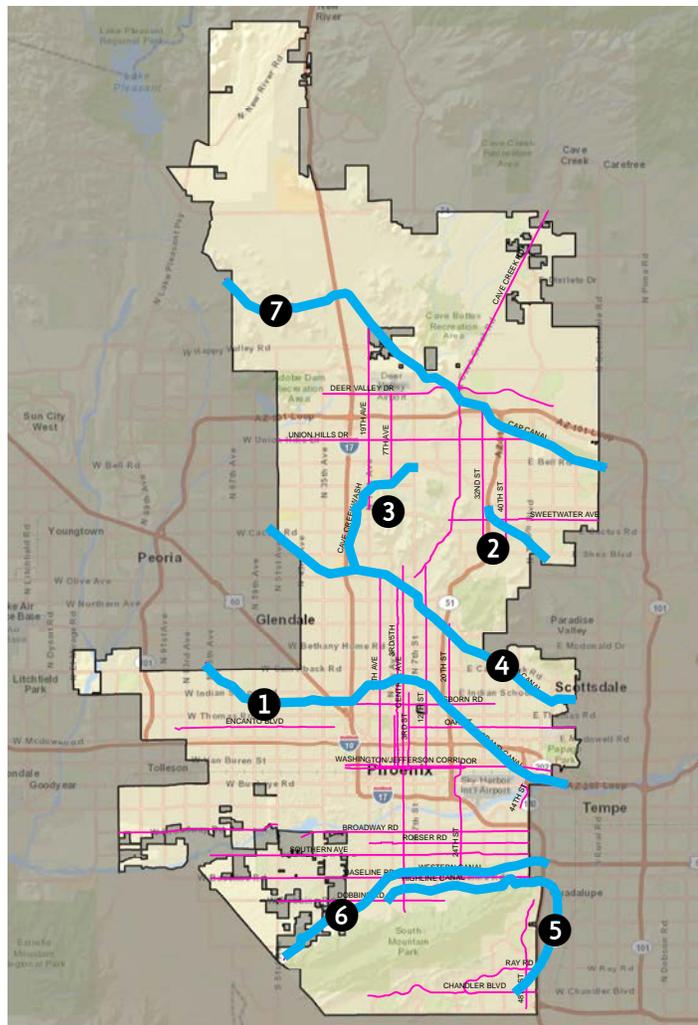
The Bicycle Master Plan proposes that seven corridors be further developed as cross-town bicycle commuter paths to provide **93 miles** of off-road multi-use pathways to supplement the on-street bicycling network. These include the following:

Tier II Projects

- 1 **Grand Canal** – 18.69 miles
- 2 **Indian Bend Wash** – 3.78 miles

Tier III Projects

- 3 **Cave Creek Wash** – 6.64 miles
- 4 **Arizona Canal** – 16.72 miles
- 5 **Highline Canal** – 13.41 miles
- 6 **Western Canal** – 13.27 miles
- 7 **CAP Canal** – 20.40 miles



I Tier I – III project list & map for off-road projects

The Phoenix Parks and Recreation Department and other agencies currently manage 51 miles of paved trails and 66 miles of unpaved trails.

Seven of the 37 priority corridors are off-road multi-use pathways to supplement the on-street bicycling network. These include:

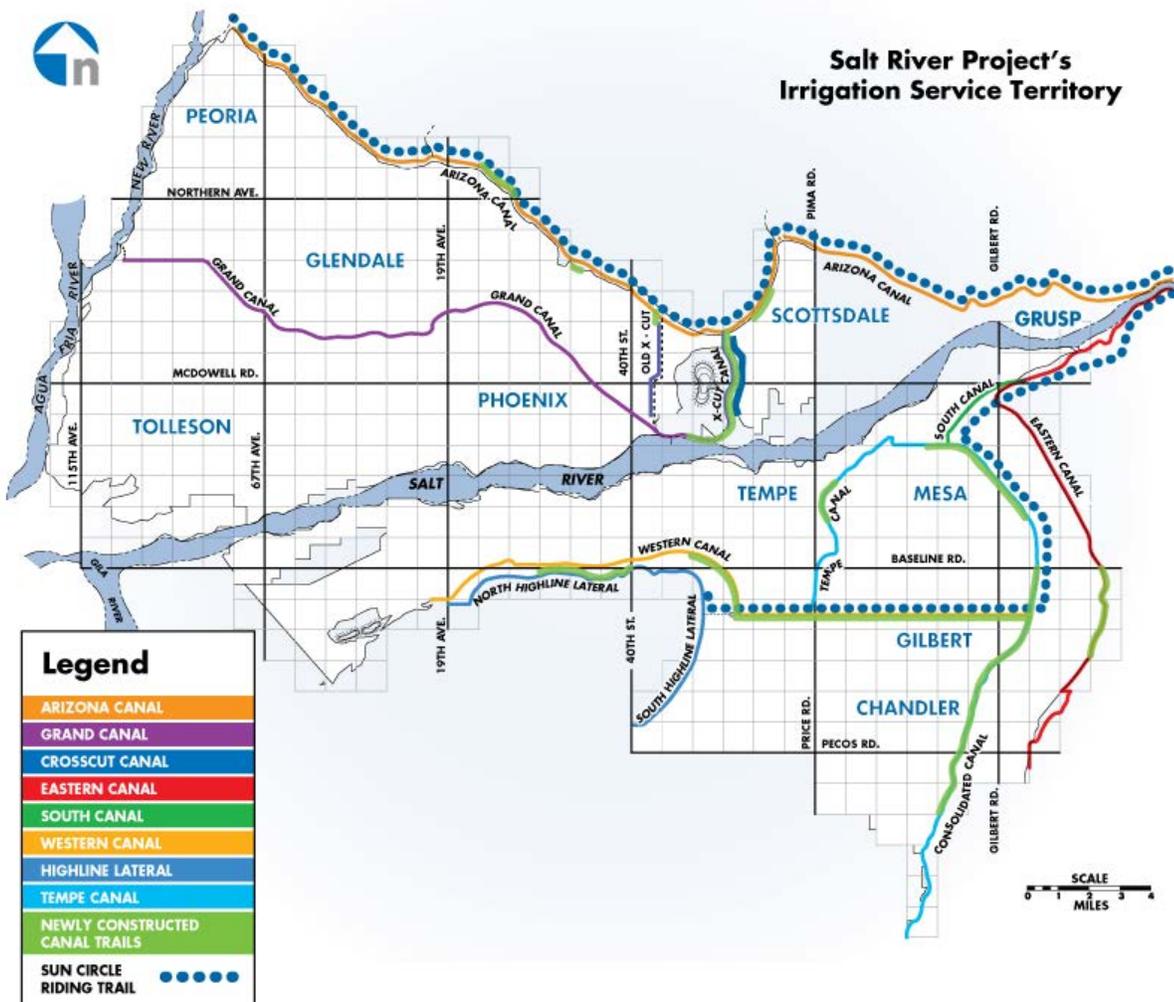
- Grand Canal (18.69 miles)
- Indian Bend Wash (3.78 miles)
- Cave Creek Wash (6.64 miles)
- Arizona Canal (16.72 miles)
- Highline Canal (13.41 miles)
- Western Canal (13.27 miles)
- CAP Canal (20.40 miles)

Projects along these corridors focus on treatments to improve the wash or canal trail crossings of the City of Phoenix street network. For the off-street corridors listed above, each intersection is provided with proposed improvements and planning level cost estimates in Appendix X.

[Placeholder for map of off-street corridor intersection projects]

2 The Grand Canal

As one of Arizona's largest utilities, the Salt River Project (SRP) operates a system of canals throughout the metropolitan area for the purposes of transmission and distribution of water. The banks of SRP-operated canals have become popular recreation areas. Some corridors offer developed trails for biking and walking; others currently provide access primarily for SRP maintenance vehicles.



Source: www.srpnet.com

As illustrated above, the Grand Canal is a major SRP corridor that links the communities of Peoria, Glendale, Phoenix, and Tempe. Within the City of Phoenix, it connects neighborhoods in the urban villages of Maryvale, Alhambra, Encanto, Camelback East, and Central City. Enhancing the Grand Canal is the top ranked off-road bikeway project coming out of this study, with 18.69 miles of trail development recommended as part of Tier II improvement projects.

In addition, the concurrent ReinventPHX initiative has been studying urban reinvestment and infill opportunities along the banks of the Grand Canal within the Uptown and Gateway TOD Districts. Working closely with both the Street Transportation Department and the Salt River Project, ReinventPHX planners are developing detailed plans for trail development and crossing improvements of major streets at ten intersections located between E. 7th Avenue and N. 44th Street. Recommendations include developing 12-foot wide paved multi-use trails; enhancing intersections through use of a combination of highly visible crosswalk markings, colored pavements, median refuge islands, bicycle hybrid beacon (BikeHAWK) signals; and transforming the intersection of the Grand Canal with Van Buren and N. 40th Streets into an urban roundabout with public art and urban amenities to celebrate the canal and create a community gateway.

The Grand Canal represents a major under-utilized asset for the Gateway and Uptown communities. In addition to providing a recreational venue for the community, it also contributes to the transportation network as a major bike trajectory connecting neighborhoods along its route and linking with two Metro Light Rail stations at Sky Harbor International Airport and Campbell/Central Avenue. Along the route, the canal edges will be activated with buildings fronting onto the canal, improved access through several new pedestrian bridge crossings, and the creation of new public civic spaces at select nodes. Conceptual ReinventPHX renderings of the enhanced urban canalscape are depicted below.



3 Map identifying key gaps in off-street bike network

MAKING CONNECTIONS

City & Region

Over the years, the Maricopa Association of Governments (MAG) has taken a lead in bikeway coordination by developing a Regional Bicycle Plan, Regional Off-Street System Plan, and Regional Bikeways Map. MAG is currently conducting a Bicycle Count Project, developing an Off-Street Network Wayfinding Guide, and as the designated Metropolitan Planning Organization (MPO) for the region, MAG plans and finances the regional transportation system. In addition, twelve neighboring cities have completed community bikeway plans and/or have transportation plans with bicycle elements. All of these efforts were reviewed and consulted to provide a picture of how the City of Phoenix fits into the expanding regional bikeway network and can become a central hub of bicycling culture in Maricopa County.

The Vision for a Connected Region

The 2007 MAG Regional Bikeway Master Plan outlines a series of goals to support the following vision statement –

“Provide an interconnected Regional system of bikeways that contribute to a vibrant, healthy, and livable community.”

Citizen and Technical Advisory Committee input into the 2013 Phoenix bicycle planning process further emphasized the desire to make regional connections with adjacent communities. Public input received was a combination of developing regional multi-use paths (primarily along canals) and providing uniform bicycle design treatments on area streets as they cross into adjacent jurisdictions.

GOAL:

The City of Phoenix will be connected to bikeways in adjoining communities to provide longer-distance recreation and commuting opportunities.

Bike connectivity through loops and links will be promoted.



Recreational Cycling and Regional Commuting

Recreational cycling was the number one trip type reported in the community survey conducted as part of this planning effort (30.9% of all survey respondents). Individual athletes in training, organized weekly bicycle club rides, and special bicycle fundraising events are recreational pursuits that use various longer-distance loop rides originating in and around Phoenix.

Cyclists may also ride longer than average distances for work commutes. The national average bicycle trip length is generally thought to be 2.5 miles; but the average bicycle commuter travels 5 to 6 miles. An analysis of the *Maricopa County Annual Trip Reduction Program (TRP) Survey* revealed a high latent demand exists for bike-to-work trips both with the City of Phoenix and into adjacent communities. The TRP survey queried employees who do not currently bike to work but are interested in bicycling to work. Highest demand between communities exists for people wanting to make commuter bike trips from Glendale and Peoria into the Deer Valley area, and from Phoenix into the City of Tempe along Warner Road.

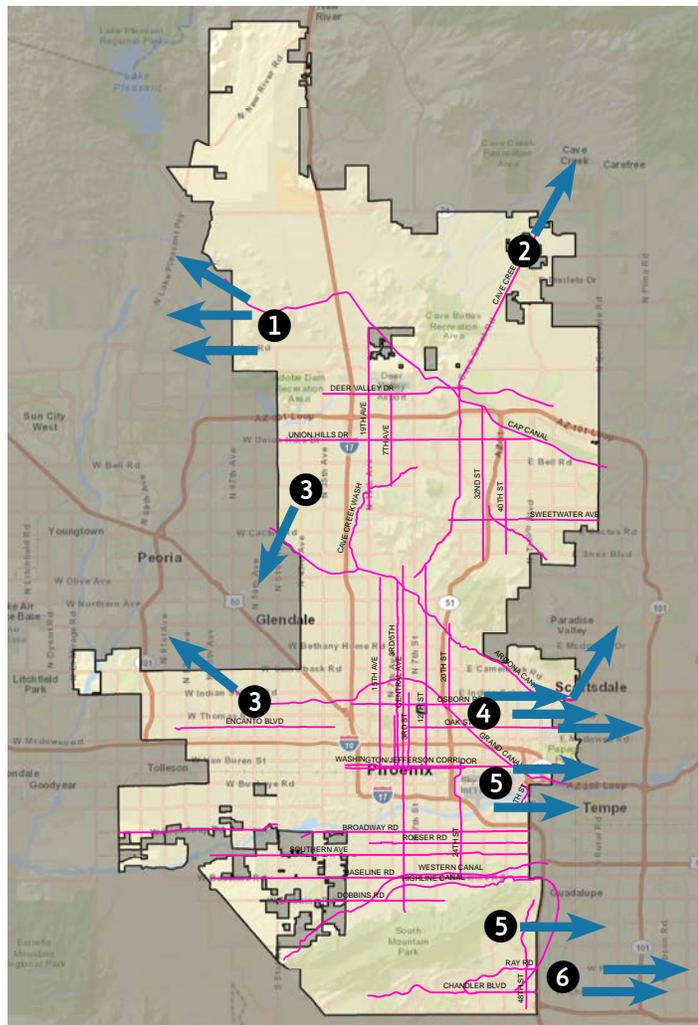
Connectivity with Adjacent Communities

Using Google Maps, this project identified a number of discontinuities between bikeway facility design treatments and/or a lack of bicycle accommodation within a given roadway corridor as the street crosses jurisdictional lines. Complete descriptions of existing bicycle facilities along the city limits in agencies within and outside of Phoenix are provided in this chapter. Meetings with community bike coordinators, email correspondence, Wikimap input, and an agency survey instrument were used to further identify primary bikeway enhancements desired for regional connectivity.

Desired Projects

Key adjacent community bicycle connections include the following, in no particular order:

- 1 City of Peoria** – Extend Happy Valley Rd bicycle lanes. Widen Jomax Rd and Pyramid Peak Pkwy/67th Ave for bicycle connections.
- 2 Town of Cave Creek** – Complete missing bike facility on Cave Creek Rd.
- 3 City of Glendale** – Connect campuses of ASU West and Glendale Community College. Enhance access to Grand Canal Trail at Camelback Rd and to the New River Trail.
- 4 City of Scottsdale** – Add on-street bike lanes along Indian School Rd, McDowell Rd, and Thomas Rd. Extend Arizona Canal Path.
- 5 City of Tempe** – Add bike lanes on Washington St, University Dr, and Warner Rd. Develop multi-use paths along the Western Canal, Lake/Rio Salado West, and the Grand Canal.
- 6 City of Chandler** – Possible connections across I-10 on Ray Rd and Chandler Blvd.



I Summary of regional projects and connections

The project team met with or contacted bike coordinators in the communities around Phoenix to identify the need to provide connectivity across the city borders. Agencies contacted included:

- City of Glendale
- City of Peoria
- Town of Cave Creek
- City of Scottsdale
- City of Tempe
- City of Chandler
- Town of Paradise Valley
- City of Avondale
- ADOT
- Maricopa County Department of Transportation

Some of information was obtained in face to face meetings, and some was a result of email information or Wikimap information. In addition a survey was provided to each agency to provide information on major bicycle destinations within their cities, the use of bicycle wayfinding signs, maintenance practices for bicycle facilities, how are bicycles treated during work zones (detours and/or temporary closures of bike lanes), monitoring the on and off-road bicycle systems within their agencies, and identifying if agencies have a mechanism to work with developers to provide bicycle facilities in their community. The survey instrument used to gather this information provided in Appendix C.

APPENDIX C – ADJACENT COMMUNITY SURVEY

I.1.1 Connectivity with Adjacent Communities

I.2 City of Glendale

One of the primary desires for connectivity between Phoenix and Glendale includes a connection from the ASU West campus (located south of Thunderbird Road from 51st Avenue to 43rd Avenue) to the main campus of Glendale Community College (located north of Olive Avenue to Mountain View Avenue, between 59th Avenue and 63rd Avenue.) The Glendale bicycle coordinator envisioned an on-street path from the ASU West campus along 47th Avenue in Phoenix south to Mountain View Road and west to the Glendale Community College main campus. In addition there is existing connectivity along the Skunk Creek Wash from the Glendale/Phoenix border at 51st Avenue (north of Union Hills Drive) that extends to Rio Vista Park in the City of Peoria west of 83rd Avenue and north of Thunderbird Road where it connects with the New River Bike Trail as shown on Figure 17. This same Figure shows that east/west connectivity also exists along the Arizona Canal Diversion Channel multi-purpose trail (Thunderbird Paseo trail) from Phoenix through Glendale and into Peoria that links with the Skunk Creek Trail that also provides access into the Rio Vista Park and the New River Trail that runs north/south through Peoria and Glendale.

Improved connectivity is also desired along the Grand Canal trail as it crosses Camelback Road at 75th Avenue at the Phoenix/Glendale border. This would provide improved bicycle access to the University of Phoenix stadium where the 2015 Super Bowl game will be held. In addition a number of additional major sporting and other types of events are held both the University of Phoenix football stadium and Jobing.com Hockey Arena complex immediately to the north of the football stadium.

This same Grand Canal off-road path would eventually provide access to the Camelback Ranch sports complex (spring training facility) located west of 107th Avenue and south of Bethany Home Road as well as provide connectivity to the New River off-road trail. The cities of Peoria and Glendale have plans to extend the New River off-road trail south from Olive Avenue to Bethany Home Road. Glendale plans to extend the Grand Canal trail west from SR-101 along approximately the Bethany Home Road alignment to connect with the New River Trail at about 107th Avenue. There are bike facilities that provide access to Midwestern University medical campus located between 57th Avenue and 59th Avenue and south of the Outer Loop Freeway (SR-101). There is also potential for on-street bike lanes along Greenway Rod between Phoenix

and Glendale that would provide access to the International School of Global Management located on the southeast corner of 59th Avenue and Greenway Road.

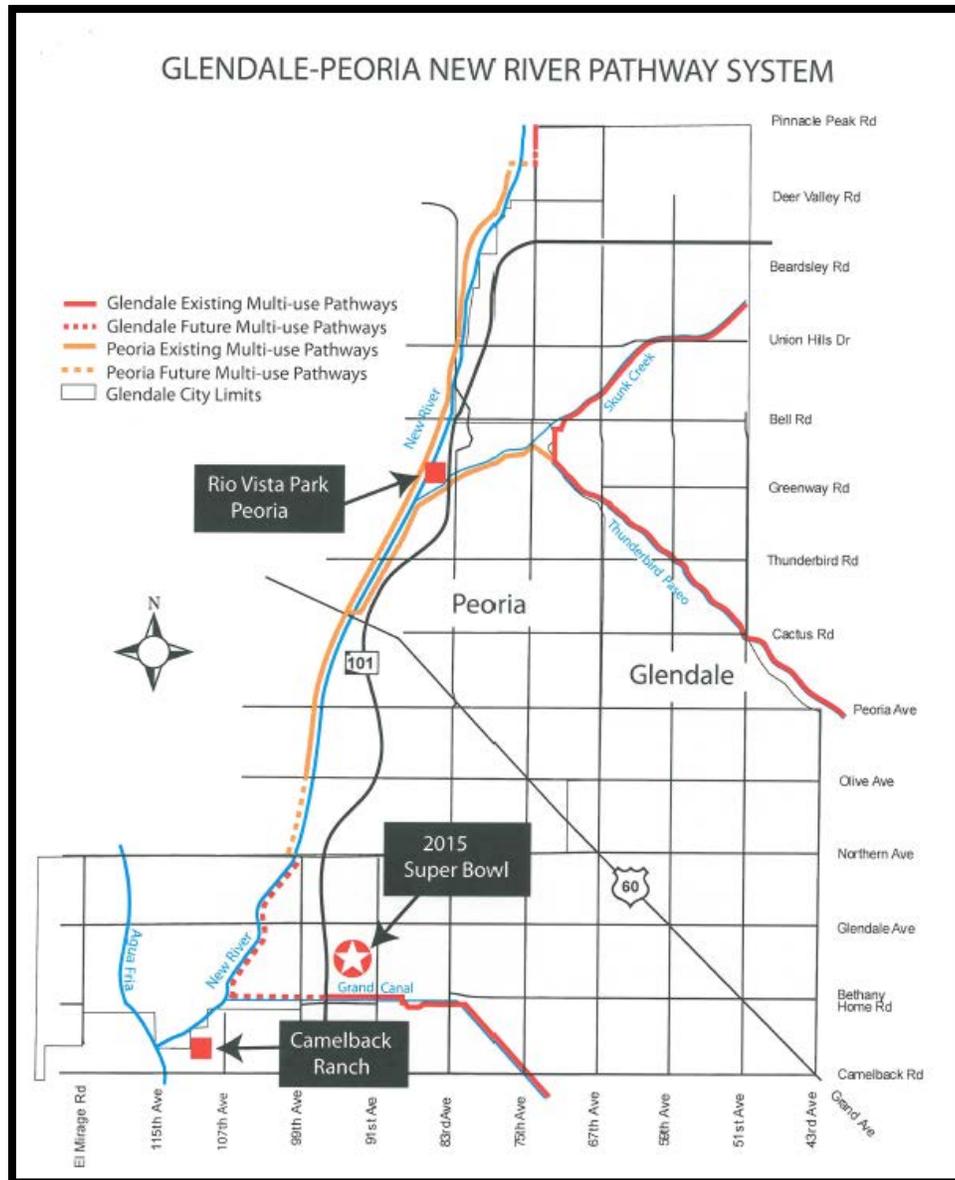


Figure 17 Bike System Connectivity with the cities of Glendale and Peoria

1.3 City of Peoria

Issues with Peoria include the need to extend the Happy Valley Road on-street bike lanes west of 67th Avenue into Peoria that connects with the Phoenix on-street bike lanes to the east. In the past, Peoria would not allow 10-foot wide motor vehicle lanes. However that policy has changed, and as arterial streets are being overlaid, striping plans are being reviewed to provide narrower 10-foot wide lanes to allow for the addition of on-street bike lanes whenever possible. Another issue between Phoenix and Peoria is the lack of a connection along Jomax Road west of 67th Avenue (which will be resolved when future development along Jomax Road occurs), and the inability to provide access into the Sonoran Mountain Ranch development in Peoria along Pyramid Peak Road north of Brookhart Way. Approximately one-half mile of development (or major street widening) is needed to provide bicycle connectivity from the Sonoran Mountain Ranch community to Phoenix and the rest of the bicycle network. Currently the only connecting street is a narrow two-lane road. Peoria officials speculate that most of the east/west bicycling along Happy Valley Road in Peoria appears to be recreational cyclists rather than commuters or those cycling for other trip purposes. It was thought that much of the cycling in this area appears to be distance riders or those accessing city parks/trails. Peoria formerly had a Bicycle Level of Service (LOS) measure to evaluate various streets for

future bicycle improvement but dropped the concept because it was far too complex to work with for developers and other city staff. Instead, the city is attempting to implement new bike facilities on all arterial streets as a part of future resurfacing activities. Peoria is also completing an in-house update of their 2007 Bike Master Plan because conditions had changed so much in the city since that plan was adopted.

1.4 Town of Cave Creek

Missing links were reported to exist along Cave Creek Road from Carefree Highway to Pima Road that would provide improved access from Phoenix to the downtown areas of both the Town of Cave Creek and Carefree. It is reported that construction of the missing bike facility is scheduled to begin in May 2015.

1.5 City of Scottsdale

The city bicycle coordinator stated that the Scottsdale Indian School Road on-street bike lanes that ends at 60th Street which is the border with Phoenix. In addition an off-road paved path along the south side of the Arizona Canal (north of Indian school Road) also ends at the City Limits which is the 60th Street alignment and has not extended west into Phoenix. Scottsdale also has plans to provide on-street bike lanes along McDowell Road and Thomas Road east of the Phoenix city Limits. There are no bike lanes on Thomas Road in this area, but there are on-street bike lanes along McDowell Road through Papago Park from 52nd Street to Galvin Parkway within Phoenix. These on-street bike lanes provide access to the Galvin Parkway bike trail and on-street bike lanes and the path along the west side of the Crosscut canal. Major bicycle trails currently in Scottsdale include the Crosscut Canal Path, Arizona Canal Path, Indian Bend Wash Path, Pima Path, Oak Street, Indian School Road, Miller road, Lincoln Drive, McDonald Drive, Scottsdale Road, Pima Road, Sweetwater, Cholla and Roosevelt Street. The bike coordinator also noted that downtown Scottsdale is a major bicycle destination for bicyclists. Unfortunately, there is no paved path along the Arizona Canal and no bike lanes on Indian School Road from Phoenix that will allow this connection to occur. Similarly, Scottsdale residents would want to more easily access downtown Phoenix. It was stated that Oak Street, Earll Drive and Osborn Road would be good bicycle corridors to allow this access, but there are barriers in some of the neighborhoods west of the Crosscut Canal that prevent a continuous route into downtown Phoenix.

1.6 City of Tempe

The primary bicycle routes connecting into Tempe includes Washington Street on-street bike lanes, University Drive bike lanes, the Western Canal Multi-user Path near I-10, Town Lake/Rio Salado Multi-use Path near the Grand Canal in Phoenix, and the bike lanes on Warner Road. Planned routes that will provide connectivity from Tempe to Phoenix include a Rio Salado West Multi-use Path. The purpose of this project is to construct a 10-foot wide multi-use path adjacent to the Rio Salado (Salt River) between Priest Drive and the City of Tempe boundary with Phoenix just east of ST-143. Tempe also plans to build a bike/pedestrian bridge over I-10 at Alameda, but this bridge is unfunded at this time. The major bicycle corridors in Tempe include College Avenue, Cross-cut Canal, Tempe town Lane/Rio Salado trails. Major destinations include downtown Tempe, Town Lake, ASU main campus, Kiwanis Park and a number of other schools and parks. Tempe officials indicated that Phoenix bicyclists would want to more easily access Tempe Town Lake (the Grand Canal is not a multi-use, lit path), Western Canal path (I-10 freeway is currently a barrier) and access Tempe via Alameda Drive, but I-10 is currently a barrier. Tempe residents would want to access Sky Harbor Airport (they can only do so via the Washington bike lanes to the Sky train at 44th Street), downtown Phoenix and the restaurants along the Grand Canal path. Tempe plans to launch Bikeshare in the spring of 2014. A copy of the Tempe Bikeway Map was provided for the portion of the city adjacent to Phoenix.

1.7 City of Chandler

Chandler does not have a person assigned to serve as a bicycle coordinator, but information was provided by the Transit Services Coordinator. Chandler shares a 2.5 mile border with Phoenix from approximately the Knox Road alignment to the Pecos Road alignment. There are two major arterials in Chandler that extend into Phoenix; Ray Road and Chandler Blvd. Both of these have on-street bike lanes in the city of Chandler. The Ray Road bike lanes extend to the ADOT right of way, but do not cross I-10 and there are no bike lanes on the Phoenix (west) side of the freeway. Bike lanes on Chandler Blvd terminate at 54th Street, ¼ miles east of I-10. The bike lanes do not extend all the way to the ADOT ROW and there are no on-street bike lanes in Phoenix west of I-10.

1.8 Arizona Department of Transportation (ADOT)

Contact with ADOT was made to explore the future existence of a bike facility in conjunction with the Southwest Loop freeway (SR-101) west of I-10 around the west side of South Mountain. The freeway will be built along the existing Pecos Road alignment that is currently used quite heavily by bicyclists and also accommodates a major bicycle sporting event. It was reported that ADOT has no plans to build a bike facility in conjunction with the Southwest Loop freeway unless it is requested by Phoenix and Phoenix is willing to pay for the added cost of a bike facility. As of the Fall of 2013, no such request has been made by Phoenix for this bicycle facility. Other issues exist along Interstate freeways due to the lack of bicycle crossings of many of the ADOT interchanges throughout Phoenix. Some of the interchanges were built long ago (circa 1960's), such as Happy Valley Road at I-17. Other freeway interchanges have been rebuilt more recently, such as Deer Valley and Pinnacle Peak Road at I-17, but no provisions were made to accommodate bicycle traffic across the freeway, creating a barrier to bicycling. There are some bicycle and pedestrian bridges over the area freeways, such as the Maryland bridge over I-17, and bicycle/pedestrian bridges over SR-51 at Grovers Avenue, Nisbet Road, Paradise Lane, Oak Street, Campbell Avenue and at the Mercury Mine School (approximately 29th Street alignment); and underpasses along the Arizona Canal at I-17 and under SR-51 at Thunderbird Road, Maryland Avenue, Arizona Canal, and the Grand Canal to name a few.

2 Annual Trip Reduction Survey Data

The Maricopa County Air Quality Department conducts an annual survey as part of its Trip Reduction Program (TRP) in an effort to track and analyze the commuting habits of employees and students in Maricopa County. The program and its outreach efforts are in support of the voluntary "Clean Air Campaign" to assist employers and schools in reducing single occupancy vehicle (SOV) commuting rates. The goal is to reach a 60 percent rate of SOV travel. Progress is tracked through an annual commute survey of employer/school sites. The results of the survey are used to develop an annual plan that commits the employer/school to implementing and documenting various strategies to reduce SOV trips or miles.

The TRP program was begun in 1991, with approximately 500 employers and 800 employment sites affected. During fiscal year 2013, the TRP processed 2,965 employment sites representing 1,174 companies, with surveys administered to over 693,000 employees and students. This is estimated to reflect approximately 33% of employees who work within the Maricopa County area and 17% of the overall population.

Based on annual survey results, TRP participants used alternate modes of transportation for 33.7% of their commuting miles in 2013. Detailed statistical summaries of reports from each program site are summarized annually and include information on mode share, but with limited data available for bicycling.

Highlights from the FY2013 TRP Annual Report include:

- Carpooling continues to be the primary alternative mode used
- Bicycling is used by 1.12% of surveyed commuters – 1.47% of students and 1.04% of employees
- Men are more likely to bike to work than women, by a 3:1 ratio
- The less than 25 year old group is most likely to bike than any other age group
- Overall, 28.3 % of the TRP participants drive less than 5 miles to work/school

2.1 Benchmarking

The TRP annual survey was of interest to this bicycle master planning effort to determine if data could be used as a measurable benchmark to track increased bike commuter use over time. However, specific data that is collected for each employer/school site is protected and unavailable for other studies.

The Air Quality Department has been collecting overall data on the bicycling mode since 1991. During this time, bike share has remained approximately 1% of all reported commuting. However, as new bicycle facilities are built, increases in bike work trips are likely. Future Trip Reduction Program annual survey results may be used as one way to monitor this trend, acknowledging that this data is limited to the percentage of surveyed trips made to major employment and school sites.

2.2 Latent Demand

The Maricopa County Air Quality Department furnishes aggregate bicycling data by zip code to the Maricopa Association of Governments. FY2012 data was provided to Charlier Associates regarding commuters who ride bikes one or more days per week, and for people who are willing to make a change to their daily commute and switch to the bicycle option. This last data set has been mapped to examine areas of latent demand for use in project prioritization. The maps, listed below and discussed in the following paragraphs are provided in Appendix F:

- 1a - Commute Trip Origins
- 1b - Major Employment Destinations
- 2a - Latent Demand Commuting – Within A Zip Code
- 2b - Latent Demand Commuting – Between Zip Codes
- 2c - Latent Demand Commuting – To/From Adjacent Communities

Two maps have been generated using MAG FY2012 data to compare potential bicycling origins and destinations within the City of Phoenix. Map 1A shows zip codes with high demand (>200 residents interested in bike commuting). Map 1B shows location of major employment site destinations by zip code. Per the TRP survey responses, desired access is very high (>1000 expressions of interest) for people wishing to reach school/employment destinations located in zip codes 85027, 85021, 80534, and 85040. These geographically represent the village planning areas within the Deer Valley, North Mountain, Central City, and South Mountain villages.

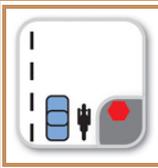
The FY2012 data set was also analyzed to determine where new bicycle work/school trips are most desired. Of 1,482 TRP survey respondents expressing an interest in commuter bicycling, responses have been mapped to show where more than 50 people, and more than 100 people, desire to make a bicycle trip. Map 2A depicts short-distance trips internal to a zip code. Map 2B depicts longer trips desired to be made between zip codes. Most of these trips are likely less than 5 miles in length and within easy riding distance if bicycle facilities are provided. In addition, Map 2C depicts the locations of commute trips between Phoenix zip codes and surrounding communities that are desired to be accomplished on bike.

In summary, the latent demand map series demonstrates that a long-distance north/south bicycle commuter corridor(s) is highly desired on the eastern side of Phoenix from, generally, the South Mountain Park open space lands, around the Sky Harbor International Airport, continuing north to the Camelback East Village area. A second major area of need is within the Deer Valley Village area. Regional connections that may be prioritized according to highest latent demand include bikeways connecting the City of Phoenix with the adjacent communities of Glendale and Tempe.

3 MAG Bikeways Map

The Maricopa Association of Governments (MAG) hosts a regional bikeways map that shows existing, locally-designated bicycle facilities at <http://geo.azmag.gov/maps/bikemap/>. This map was produced under the direction of the MAG Regional Bicycle Task Force with funding provided by the Federal Highway Administration.

The following recommendations for bicycling on streets is provided:

	<p>Obey Traffic Signals and Signs As a vehicle, bicycles must obey all the Rules of the Road. Cyclists have the same privileges and duties as other traffic.</p>
	<p>Ride on the Right Ride on the right with the flow of traffic. Never ride against traffic on the road, in a bike lane, or on a sidewalk.</p>

	<p>Use Appropriate Lane Avoid being in a right turn-only lane if you plan to proceed straight through. Move into the through lane early.</p>
	<p>Turning Left -Two Options 1. As a vehicle -signal your intentions in advance. Move to the left turn lane and complete the turn when safe. 2. As a pedestrian -ride to the far crosswalk and walk across.</p>
	<p>Beware of Car Doors Be wary of parked cars. Motorists can unexpectedly open doors. Be sure your bike is a car door length away from parked cars.</p>
	<p>Use Hand Signals Signal all turns and stops ahead of time. Check over your shoulder, then make your turn/stop when safe to do so.</p>
	<p>Use Lights at Night Always use a strong white headlight, rear light and red reflector at night or when visibility is poor.</p>
	<p>Make Eye Contact Confirm that you are seen. Establish eye contact with motorists to ensure that they know you are on the road. Share the road in a polite and courteous manner.</p>
	<p>Scan the Road Behind Look over your shoulder to check behind you regularly and use a mirror to monitor traffic. Although bicycles have equal right to the road, be prepared to maneuver for safety.</p>
	<p>One Person Per Bike Riding double is only permitted when carrying a child in an approved carrier or when riding on a tandem bicycle.</p>
	<p>Helmet your Head Cyclists should always wear a helmet.</p>
	<p>Be Courteous Share the road and the responsibilities. Motorists and cyclists get along much better when showing courtesy and consideration towards each other.</p>

The following recommendations for bicycling on multi-use paths is provided:

	Keep to the Right All path users must keep to the right except when passing or turning left. Move off the path to the right when stopping.
	Merge Correctly Look both ways. Yield to through traffic at intersections.
	Signal to Others Cyclists, when approaching others, sound your bell or horn early, then pass safely on the left. Pedestrians, acknowledge with a wave when someone is overtaking.
	Respect Nature Do not disturb or feed wildlife. Keep to well established paths to protect habitats. Do not collect plant or animal material.
	Right-of-Way Cyclists and in-line skaters must yield to pedestrians. Pedestrians always have the right-of-way.
	Where to Skate Follow the same rules as cyclists. Ensure your stride does not cross the center of the path.
	Control Your Pet Scottsdale ordinances require pets to be leashed while on the path and owners to clean up after their pets.
	Be Visible Outfit your bicycle with a headlight, rear light, and reflectors as you would for riding on the road.
	Earphone Dangers Keep the volume sufficiently low to be able to hear other path users approaching.
	Flooded Paths Many of our paths are in flood channels. Do not enter when water is present.

4 Recreational Cycling Enthusiasts

Cycling enthusiasts have frequent rides in excess of 50 miles per day and they desire large loops that utilize connectors that feed into larger main corridor routes. An analogy would be how surface streets feed into the freeway system. These loops can be built on/connected with larger loops to support rides from 35 to more than 60 miles. These loop routes would also provide access to cultural features such as the Musical Instrument Museum, Reach 11, or the canal system and other family oriented routes.

Priority corridors that support these larger loops are:

- Deer Valley from 35th Avenue to 56th Street
- Central Avenue to South Mountain Park and the route around South Mountain
- Cave Creek Road (surface is rough and needs repairs)

Additional corridors that would support these larger loops are:

- Greenway Road from 51st avenue to the Greenway/Hayden Loop. This would tie Phoenix into Scottsdale's system.
- Mayo Blvd from the Musical Instrument Museum (Tatum Boulevard) to Scottsdale Road. This would also tie north Scottsdale to the Phoenix system.

Bikes & Transit

Valley Metro provides eco-friendly public transit options to residents of greater Phoenix and Maricopa County including the planning and operations of a regional bus system and the development and operations of light rail. In Fiscal Year 2013, total ridership for the system was **73.4 million passengers**, which set a new record for bus and light rail boardings. The first 20 miles of light rail opened December 2008. Seven light rail extensions are planned or are under construction that will create a 60-mile system by 2034.

Valley Metro recognizes that public transit operates as a key part of the region's multimodal transportation system, working in tandem with walking, bicycling, and driving modes to provide commuters with multiple, equally easy transportation choices.

Why Address the “Last Mile” of Transit Trips?

The first and last miles are terms used to describe a common problem in urban areas where most of the geographic area of a city lies beyond an easy walking distance to a transit station. Therefore, people wishing to ride light rail must combine modes and use local bus service, bikes and/or cars to reach their final destinations.

Since the national average bicycle trip length is 2.5 miles, this study expands the targeted “last mile” transit catchment area and looks for ways to more safely accommodate bicycle trips within 2.5 miles of light rail stations and transfer centers, as well provide new facilities that may encourage people to ride who may not otherwise consider biking.

GOAL:

Commuting by public transportation will be a seamless and efficient choice for cyclists.

Completing the first and last 2.5 miles of a transit trip will be easy to accomplish on a bike as modes will be fully integrated.



Bike-Transit Integration

Valley Metro offers several programs to promote bicycling, and the agency is working with the City of Phoenix to enhance last-mile access for cyclists, as described in detail in this chapter. Highlights of these multimodal initiatives include:

Bikes on Buses All Valley Metro buses are equipped with a two-bike rack located on the front of vehicles. Racks are available on a first-come, first-serve basis. Valley Metro bike ridership for FY2011-12 showed that 13 bus routes had more than 20,000 bike boardings, and bike boardings on 14 routes represented more than 3% of total passengers.

Bikes on Trains Bike-transit integration is an important contributor to ridership along light rail. On-board storage hangers for 4 bikes are located in the center section of each vehicle. Standing with a bicycle is also allowed as long train aisles and doorways are not blocked. Allowing bikes on trains is so popular that it is starting to create capacity and vehicle circulation constraints during peak hours and special events. Of Metro riders surveyed in 2011, over 9% combined their transit trips with bicycling, with 72% of cyclists biking both to and from light rail.

Bicycle Parking Most transit centers and light rail stations have open air bike stands (bike racks) and/or enclosed bicycle lockers. Bike racks are provided at Valley Metro rail park-and-rides, rail station platforms, and several bus stops. Bicycle lockers are provided at Central Station in Downtown Phoenix, and at the Phoenix Skytrain Station at 44th and Washington. Existing capacity at station areas along the Central Phoenix/East Valley light rail alignment currently provides parking for 536 bicycles.

Bicycle Promotion Valley Metro actively encourages bicycling to transit through a variety of programs including Valley Bike Month, Bike to Work and School Day, Bike to the Ballpark, a Portable Bike Rack Loan Program for special events, Bicycle Commuting 101 classes, and distribution of educational materials on bike safety and sharing the road.

Bike Share A new bike share program will be launched in 2014. Named “Grid Bikes” after Phoenix’s well-known street grid system, the program will be implemented and operated by CycleHop. Valley Metro and the City of Phoenix are working with CycleHop to finalize locations for bicycle hubs, where bikes may be rented by the hour. Each Grid Bike will be equipped with a solar-powered, GPS-enabled locking mechanism and be remotely monitored. Plans are to have 500 bikes in the downtown Phoenix area by early 2014.

Reinvent PHX Reinvent PHX is a current planning collaborative that is actively engaging the community to create a vision and develop implementation strategies for establishing a new transit-oriented model for sustainable urban development along the city’s light rail corridors. Included are strategies to attract urban reinvestment, create active public spaces, reallocate street space, enhance bicycle circulation within neighborhoods, improve bicycle access to Metro rail stations, and develop a continuous bicycle commuter path along The Grand Canal.

I Transit Amenities and Ridership

Of the 15 transit centers in Maricopa County, there are nine in the City of Phoenix. A transit center is a facility where transit vehicles converge, enabling passengers to transfer among routes and services. Some transit centers also have Park-and-Ride locations. Transit centers are generally located off the street and provide passengers with a shaded or enclosed waiting area, seats, drinking fountains and transit information. Transit centers in the City of Phoenix with bike racks¹ include Central Station, Desert Sky, Ed Pastor, Metro Center, Paradise Valley Mall, and Sunnyslope. The number of bicycle parking spaces available at transit centers and park-and-rides is not currently available. Valley Metro provides the following information about bicycle parking in Downtown Phoenix at Central Station:

“In an effort to make commuting easier for people who bike/ride and with limited onboard bike space, customers with bikes are encouraged to park their bike at Central Station, when feasible. This will eliminate potential delays for cyclists who have to wait for bus or rail with available capacity for bikes onboard.”

Bike racks and lockers are available at Central Station for patrons who bike to and from Central Station.

Racks

- *Bike Racks are available on a first come first serve basis.*
- *Lock the front wheel or the frame to the rack.*
- *Do not lock your bike to railings, furniture, trees, poles, etc. It could impede access for others, i.e. wheelchair users, parents with strollers, etc.*

Lockers – 20 Available

Lockers provide a greater level of protection for bikes that are parked at Central Station. Bike lockers are free of charge and patrons merely have to ask the onsite security to remove the lock from any empty locker in order to gain access. Once the lock has been removed by security, the customer is responsible for providing their own lock to secure the locker with their bike.

- *Bike Lockers are available on a first come first serve basis.*
- *Bike lockers are available for use between 5 am and 10 pm seven days a week.*
- *Lockers shall be used for bike storage only.*
- *Lockers shall be secured using personal locks.*
- *Locks found on bike lockers after-hours, shall be cut and any bikes found therein are subject to confiscation.*
- *Lockers are subject to inspection at any time and for any reason by City of Phoenix, Public Transit Department staff.”*



Figure 1 - Central Station Bike Lockers; Source: ValleyMetro.org

The Phoenix Sky Train station at 44th Street and Washington Street provides bike racks and bike lockers. The high usage at this location prompted the Aviation Department to order more bike lockers and install more

¹ As listed under amenities at http://www.valleymetro.org/getting_on_board/transit_centers; accessed on October 1, 2013

bike racks since opening on April 8, 2013. Airport employees can use these amenities², and they are also able to bring their bikes on the Sky Train into the airport.

Light Rail vehicles have bicycle symbols on train windows to indicate the doors nearest the bicycle rack. Racks are first-come, first-served. If the bicycle rack on the train is full or individuals are unable to load their bicycle into the rack, they may stand with the bicycle as long as they do not block the aisle or doorway. If the train is crowded, bicyclists may choose to wait for a less-crowded train before boarding with their bike, however, some bicyclists may not have the ability to board if the train is overly crowded.

Bicycles may not be secured to the Light Rail station structure, railings or fences. Warning notices will be placed on bicycles secured to unauthorized locations. After 24 hours, the lock will be cut and the bicycle will be removed and taken to Lost and Found at Central Station, located at Van Buren and Central Avenue in downtown Phoenix. Bicycle racks are provided at Valley Metro Rail Park-and-Rides along the light rail and the Center Parkway/Washington station in Phoenix.

Valley Metro has a “Rack ‘n Roll” program to educate the public on how to take bicycles on the bus. As part of Valley Metro Notes³ (a series of short animated music videos that demonstrate all the ins and out of riding transit), there is an educational video called “Take Your Bike for a Ride” on the Valley Metro website. All Valley Metro buses are equipped with bike racks. Racks are available on a first-come, first-serve basis. If the bike rack is full, bicyclists will need to wait for the next bus. Children under the age of 12 must be accompanied by an adult. Folding bikes are allowed on all buses at all times. Adjacent sidewalk/bus stop bike racks are located at the following locations:

- 7th Avenue/Camelback Road
- Campbell Avenue/Central Avenue
- Indian School Road/Central Avenue
- Osborn Road/Central Avenue
- Thomas Road/Central Avenue
- Encanto Blvd/Central Avenue
- McDowell Road/Central Avenue
- Washington Street/Central Avenue
- 12th Street/Jefferson Street and 12th Street/Washington Street
- 24th Street/Jefferson Street and 24th Street/Washington Street
- 44th Street / Washington

1.1 Valley Metro Bike Ridership (FY2011-2012)

Routes were reviewed with more than 20,000 bike boardings or where bike boardings represented more than 3% of total passenger boardings. Table 1 summarizes the ridership data for these 24 routes. The general cross section of the roadway and the existence of bike lanes for these routes are provided. Except for the Union Hills Drive, 40th Street, Southern Avenue, and south Central Avenue routes, bike lane facilities do not exist for long distances on these routes.

² September 13, 2013 interview with Anne E. Kurtenbach, PHX Sky Train Program Manager, Phoenix Aviation Department

³ <http://www.valleymetro.org/notes/>

Table 1 - FY2011-2012 Valley Metro Bike Ridership and Roadway Features Summary

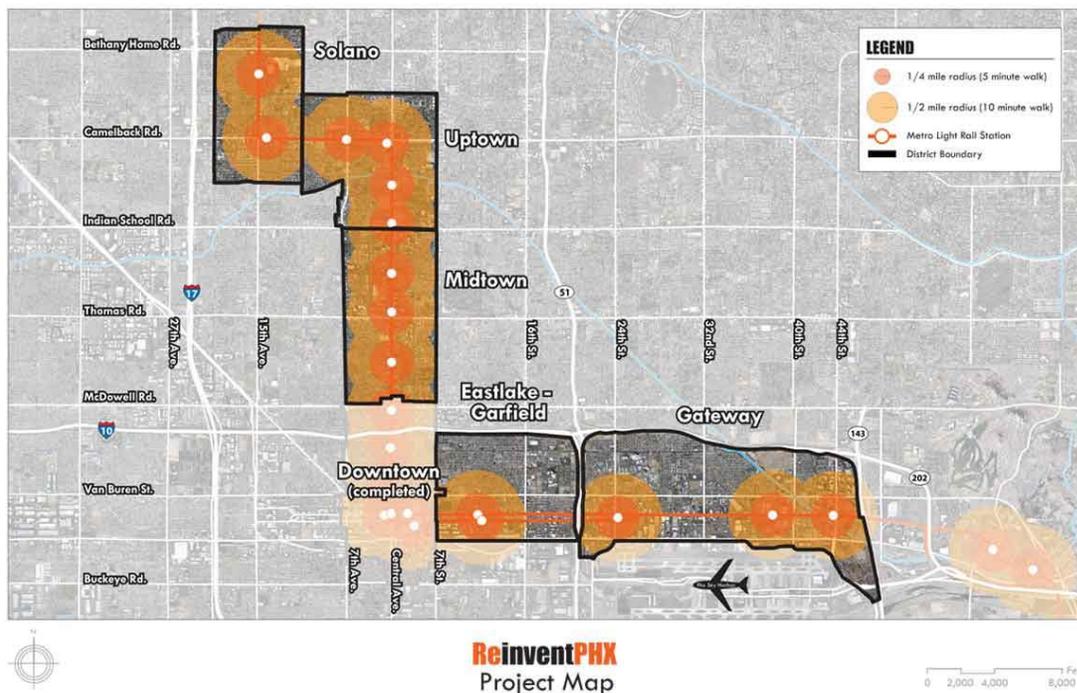
Route Name	Passengers (All Days)	Bikes (All Days)	% (All Days)	ADT	Cross Section (First listed is SB or WB)	Bike Lane?
19th Ave	2,562,634	69,244	2.70%	21,583	Generally 2 SB x 1 TWLTL x 3 NB	Few Bike Lanes, existing only on southernmost portion of route
Indian School	2,512,145	54,346	2.16%	39,843	Generally 3 WB x1 TWLTL x2 EB or 2 EB x1 TWLTL x3 WB, 4 WBx1x3 EB between 27th Ave and Central	No Bike Lanes (except 23 rd Ave to 19 th Ave)
35th Ave	1,948,950	52,202	2.68%	26,163	Generally 2x1x3 North of I-10, 2x1x2 South of I-10	Few Bike Lanes, existing north of Bell Rd
Thomas Road	2,756,478	47,675	1.73%	31,665	3x1x2 West of Central, 2x1x3 East of Central	No Bike Lanes
McDowell	2,102,721	45,890	2.18%	28,491	3x1x2 West of 7th St, 2x1x3 East of 7th St	Few Bike Lanes
Glendale - 24th Street	1,694,495	40,116	2.37%	32,064	3x1x2 W of Central, 2x1x3 E of Central	No Bike Lanes
16th Street	1,429,856	38,565	2.70%	33,427	Generally 2x1x2	Few Bike Lanes
Central	1,482,845	38,165	2.57%	22,486	Generally 2xLRx2	Few bike lanes north of downtown, south of I-17 bike lanes are present except from Southern to Baseline
Van Buren	1,518,478	37,723	2.48%	20,826	Generally 2x1x2	No Bike Lanes
7th Street	1,371,182	36,823	2.69%	33,997	2 SB x 1 Rev x 3 NB	Existing on south 1/3 of route
44th Street	698,117	23,986	3.44%	34,644	Generally 2x1x3 or 3x1x2	Few Bike Lanes
Bell	632,610	21,295	3.37%	34,040	Generally 3x1x3	No Bike Lanes
Union Hills	485,886	20,096	4.14%	22,496	Generally 2x1x2	Bike lanes along almost entire route in Phoenix
Southern	614,650	18,647	3.03%	27,947	Generally 2x1x2	Bike lanes along almost entire route in Phoenix
Broadway	482,292	15,038	3.12%	24,347	Generally 2x1x3	No Bike Lanes
Thunderbird	347,738	12,216	3.51%	29,853	Generally 3xMedianx3	Few Bike Lanes
Buckeye	341,161	11,290	3.31%	32,368	Generally 2x1x2	No Bike Lanes
Greenway	311,853	11,142	3.57%	28,690	Generally 3xMedianx3	Some bike lanes
40th Street	188,715	6,632	3.51%	11,847	Generally 2x1x2	Bike lanes along entire route
University	126,716	5,183	4.09%	16,887	Generally 2x1x2	No Bike Lanes
Priest Drive	116,688	4,752	4.07%	12,147	Generally 3x1x3	No Bike Lanes
Cactus - 39th Ave	54,362	1,841	3.39%	30,754	Generally 2x1x2	No Bike Lanes
RAPID	19,098	732	3.83%	181,370	Freeway	No Bike Lanes
RAPID	2,539	208	8.19%	-	Freeway	No Bike Lanes

2 Reinvent PHX TOD Initiative

Reinvent PHX is a collaborative partnership between the city of Phoenix, the U.S. Department of Housing and Urban Development, Arizona State University, St. Luke's Health Initiatives and numerous other organizations committed to developing walkable, opportunity-rich communities connected to light rail. Reinvent PHX will create action plans for districts along the light rail system. The plans will establish a community-based vision for the future and identify investment strategies to improve the quality of life for all residents. This process will establish a new, transit-oriented model for urban planning and development along the city's light rail system.

Objectives

- **Quality Development** - Create an attractive investment environment for high quality and equitable Transit-Oriented Development (TOD).
- **Smart Growth Model** - Establish a model process for guiding smart, cost-effective investment along light rail corridors.
- **Civic Engagement** - Empower the community, including low-income and limited English-speaking residents, to be actively involved in the decision-making and implementation processes.
- **Return on Investment** - Capitalize on the community's investment in light rail by guiding development to benefit residents, lower the cost of living and enhance unique and historic characteristics.



Bicycling Focus

As a component of neighborhood mobility studies, bicycle network plans are being developed for each of the five TOD districts included in the ReinventPHX project scope. Due to timing of concurrent planning efforts, the Eastlake and Garfield plans preceded development of the 2014 Comprehensive Bicycle Master Plan, and have been incorporated into the recommendations of this report. For the TOD districts of Solano, Uptown and Midtown, priority bicycling corridors identified in Bicycle Master Plan will be studied in greater detail to determine how to best implement innovative bicycle treatments in conjunction with reinforcing community identity and revitalizing housing, business, and public street rights-of-way.

The overall vision is to create mobility hubs surrounding Metro light rail stations that enjoy bustling pedestrian and bike traffic. People can live close to where they work, and are able to satisfy most of their daily needs

without a car. Overall, the affected urban neighborhoods will become balanced, diverse, thriving, connected, green, and healthy places to live, work, and recreate.

3 **Bike Share program**

The Republic | azcentral.com Thu Jan 9, 2014 12:11 PM

A limited number of neon-green bikes will hit downtown this month, a sign Phoenix's new bike-sharing program is on its way.

Vendor CycleHop wants to test the Gr:D (pronounced Grid) bikes before the company goes full scale this spring.

The company will place 10 bicycles at three temporary bike racks in downtown Phoenix: near Fifth and Van Buren streets, Second Avenue and Adams Street near Phoenix City Hall, and on Central Avenue near Taylor Mall by Arizona State University's downtown campus.

The general public can't use the bikes yet. The company plans to roll out the first 200 for the public in April. Eventually, they want as many as 1,000 bikes at 100 locations, including high-traffic areas in downtown and central Phoenix, according to the company's website.

About 20 beta testers — mostly CycleHop employees and city staff — will use the system like typical customers. They'll use a mobile device to book the bike online or rent from the bike itself and return the bicycles to one of the hub locations, according to John Romero, director of CycleHop's Phoenix operations.

"As we gear up to a system launch this spring, it's important for us to get feedback from riders by beta-testing our communications and tracking systems," Romero said in a news release. "The street test lets us see how customers are interacting with the bike and what works best for different parts of our operation, like the restocking of bike hubs."

After they launch, people can rent bikes for \$5 an hour, \$30 a month or \$79 a year, with a discount for students.

The bikes have a lock built in so the user can secure them on bike racks, "which prevents people from randomly jumping on the bikes," said Matthew Heil, a spokesman for the Phoenix Street Transportation Department.

Users also have to input an access code before they can remove a bike from a station. If they don't, Heil said, the bike generates an alert to CycleHop staff that it's on the move without an official checkout.

The bikes also have GPS so the company can track their locations. And to cut down on theft, some parts, like the handlebars, are built into the frame and can't be removed. The bike also has a drive shaft instead of a bike chain, which would-be thieves can't easily transfer to another bike.

Phoenix officials said they have not used city funds for the program. Heil said the city also did not provide incentives for the bike-share firm to start operations in Phoenix, but the contract allows for revenue sharing of profits once they reach a certain level.

"Phoenix can be a world-class bicycling city, with the support of its cycling community and great initiatives like bike share," Mayor Greg Stanton said in a statement. "Key to that success will be the rider experience, and this street demonstration helps us learn how to hit the ground rolling and launch Grid bikes in the best way."

The program also plans to expand into Tempe and Mesa.

4 Valley Metro 2012 Bike Transit Integration White Paper

BIKE-TRANSIT INTEGRATION SURVEY RECOMMENDATIONS

- Increase secure bike parking facilities at stations and park-and-rides (bike lockers / bike-lids) that can alleviate a good portion of the vehicle capacity constraints by offering riders more opportunities to leave their bicycles at stations.
- Create readily accessible bike-use policies, rules of conduct, & rider-guide.
- Implement station posters as a medium to inform riders of bike policies and best practices. Posters can illustrate the size of bike that will fit in the hangers. Posters can also share information graphics that demonstrate the safest ways to lock up bikes and utilize maps that highlight where bike lockers / racks are located along the alignment.
- Incorporate larger signage that is placed on vehicles and station platforms can show where the bikers need to enter the train with their bikes. In addition, bike signage needs to be placed on the outside of vehicle wraps.
- Increase presence of security personnel at stations / park-and-rides and on-board and lighting in stations areas to make riders feel more comfortable leaving bikes. The public should also be aware that cameras exist at stations and on-board trains. Cameras placed near bike racks at park-and-rides can discourage probable theft.
- Many riders recommended solutions to issues related to vehicle capacity constraints. Seats in the bike compartment area can be removed and replaced with more hangers or standing room. Another option frequently mentioned is an additional modified car, containing hangers or standing room only in replacement of regular seating area in order to accommodate bicyclists and mobility device users during peak hours.

CONCLUSION

Widening the catchment area by increasing bike-transit integration will not only improve accessibility and ridership, but also decrease auto-dependence, fossil-fuel consumption, harmful emissions contributing to global warming, and negative impacts on public health. (Rojas-Rueda, et al., 2011) By increasing bike integration with the overall transit system, METRO can provide an exemplary level of service that promotes environmental stewardship and physical activity. Bike-transit integration propagates a healthy living standard for Phoenix residents. Developers and residents will be more likely to embrace mixed-use and transit-oriented developments located along the METRO light rail corridor that allow residents freedom from expensive automobiles. These are hopeful improvements for a region inundated with sprawl.

Bicycle parking improvements of all types - indoor bike facilities, bike corrals, BikeLids, and bike lockers - benefit all riders. Riders who use mobility devices, such as wheelchairs and crutches, on-board the light rail often come into conflict with bicyclists. According to the 2012 METRO Mobility Device User Survey, 8% of respondents have difficulty interfacing with bicycles on the train. When this occurs, bicycles create an impediment to these individuals securing ADA seating, especially during peak hour and special event times when vehicles are crowded. Efforts toward alleviating capacity constraints for bicycles in the system benefits not only cyclists, but also improves conditions for mobility device users.

The installation of park-and-rides at METRO stations was a successful capital investment in encouraging METRO light rail ridership. It required commitment and coordination by the regional transit agency Valley Metro, METRO light rail, and member cities to solve end-of-line catchment issues. The existing level of bicycle/pedestrian-transit integration needs improvement and requires a feasible capital investment. METRO recognizes that accommodating the needs of riders, both that use bicycles and those who do not, is paramount to encouraging additional ridership. The current infrastructure that exists in station areas offers insufficient levels comfort, security, safety, and connectivity. The results of this research highlight short term and long term strategies for improving these conditions in order for METRO to accommodate the current bicyclist demand and encourage future bike trips by new users traveling to light rail, and those willing to switch from motorized modes of access and egress (Table 10) (Figures 36-39)). With these actions METRO

will effectively grow into a more complete and accessible system by allocating active transportation as an integral part of Valley Metro’s total transit network.

Table 10: Overview of Recommendations

<u>Goal</u>	<u>Solution</u>
Short-Term Alleviate the overcrowding of bikes on light rail vehicles	<ul style="list-style-type: none"> • Add secure bike parking facilities (i.e. BikeLids and bike lockers) to stations with the highest levels of bike access. • Vehicle modification to increase on-board bicycle capacity • Create bike-use policies, rules of conduct, & rider-guide. • Station info posters sharing bike policies, best practices, & bike amenities. • Larger bicycle decals on vehicles and station platform signage instructing bikers where to board. • Vehicle signage placed on the outside of vehicle wraps. • Bike compartment viewing portal (visible through vehicle wrap)
Long-Term Encourage additional bike ridership	<ul style="list-style-type: none"> • Provide secure bike parking at all stations. • Offer bike-sharing near popular bicyclist destinations along the light rail corridor • Improve station connectivity to bikeways • Improve bike infrastructure in and around stations • Increase security presence (personnel, cameras, lighting) at stations/park-and-rides. • Educate riders traveling to Park-and-rides about the health, environmental, and cost benefits of biking to stations and destinations.