Peoria Bicycle Master Plan

Acknowledgments

The City of Peoria appreciates the efforts of the hundreds of community members who participated in the development of the Peoria Bicycle Master Plan. Their creativity, passion, and commitment to a brighter future for bicycling were integral to the success of this planning effort.

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CoPilot

1: Introduction

Plan Purpose

The City of Peoria Bicycle Master Plan (the Plan) will guide future investments in bicycle infrastructure and programming to provide safe, comfortable, and convenient bicycle travel for residents, businesses, and visitors.

An increasing number of leaders throughout the Midwest and across the country are seeing that policies and investments that support active transportation are crucial to the future health, safety, and success of communities. While bicycling is just one piece of the puzzle to creating vibrant cities, measures that support bicycling have been successful in addressing a variety of issues including obesity, traffic safety, roadway congestion, job attraction, infrastructure costs, and environmental concerns. This Plan will create a road map for the future of bicycling in Peoria, a vital element in the overall future prosperity of the City.

The Plan is committed to improving residents lives through transportation initiatives.

Plan Goals

The Plan includes infrastructure and non-infrastructure recommendations to accomplish the following goals, created in coordination with stakeholders and the public:

- **Increase safety and comfort:** The Plan addresses safety and comfort issues in conflict areas, pinch points, and areas currently lacking bicycle accommodation.
- **Transform Peoria into a regional destination for bicycling:** Peoria's burgeoning focus on creating bicycle amenities can catapult the city to become a regional and national example of bicycle planning and design best practice. The increased attention to bicycling can result in increased numbers of visitors who wish to experience bicycling in Peoria.
- **Decrease the number of vehicular lane miles:** The City of Peoria's Public Works Department has a Department-wide goal of decreasing the number of vehicular lane miles. As such, the Plan studies opportunities to put travel lanes to higher and better uses by making improvements to the bicycle and pedestrian realm.
- **Increase connectivity:** Community leaders and residents brought forth a desire for improved connections such as linking the Rock Island Trail to the City's street network. Bicycle accommodation is desired to and from major destinations and residences.
- **Develop successful recommendations and implementation strategies:** Recommendations should be actionable and should provide both short-term improvements and long-term vision. The Plan can act as a powerful foundation for future grant funding opportunities.
- **Foster public support:** Normalizing bicycle use for transportation means developing a network that appeals to residents and visitors of all ages and abilities. The Plan's recommendations aim to positively influence community perceptions of bicyclists. The Plan can spur the community to apply for Bicycle Friendly Community (BFC) designation.

Plan Components

The Plan is comprised of the following chapters and appendix that document the planning process and resources for implementation.

1. Introduction

The introduction provides a brief overview of the purpose and background of the Plan, the benefits of a bicycle friendly community, and the planning framework that guide the recommendations in the Plan.

2. Existing Conditions

The existing conditions chapter describes the physical, social, and policy contexts surrounding the development of this Plan. Included in this chapter are thorough analyses of bicycling facilities, roadway characteristics, crash data, previous plans, policies, and current programs that support and encourage active transportation. Understanding, acknowledging and addressing these existing conditions creates a foundation for the Plan's recommendations.

3. Public Involvement

The public involvement chapter summarizes the outreach and participation efforts to engage Peoria residents, planning partners, and key stakeholders. From public workshops to online surveys and mapping tools, the planning process utilized a diversity of platforms to build consensus and solicit ideas to shape the bicycling environment. The community's input is a driving force behind the Plan's recommendations.

4. Recommendations

This chapter describes the capital projects and supporting programs recommended to transform Peoria into a great bicycling community. Best practices in bicycle infrastructure design provide solutions within the context of the surrounding environment.

5. Implementation

This chapter provides a comprehensive strategy to implement the Plan, including early action steps, project prioritization criteria, high priority projects, cost estimates, funding sources, and maintenance activities. These implementation strategies are critical to the immediate and long-term success of the Plan.

Appendix. Design Guidelines

This section provides an inventory of bicycle infrastructure design treatments and provides guidelines for their development. They represent the tools for creating a safe, accessible community for bicycling.

The "Five E's" Approach

The project team has committed to considering a multi-facted approach to accomplish the Plan's goals. The "Five E's" will be continuously discussed throughout this document. They are:

- Engineering
- Education
- Encouragement
- Enforcement
- Evaluation

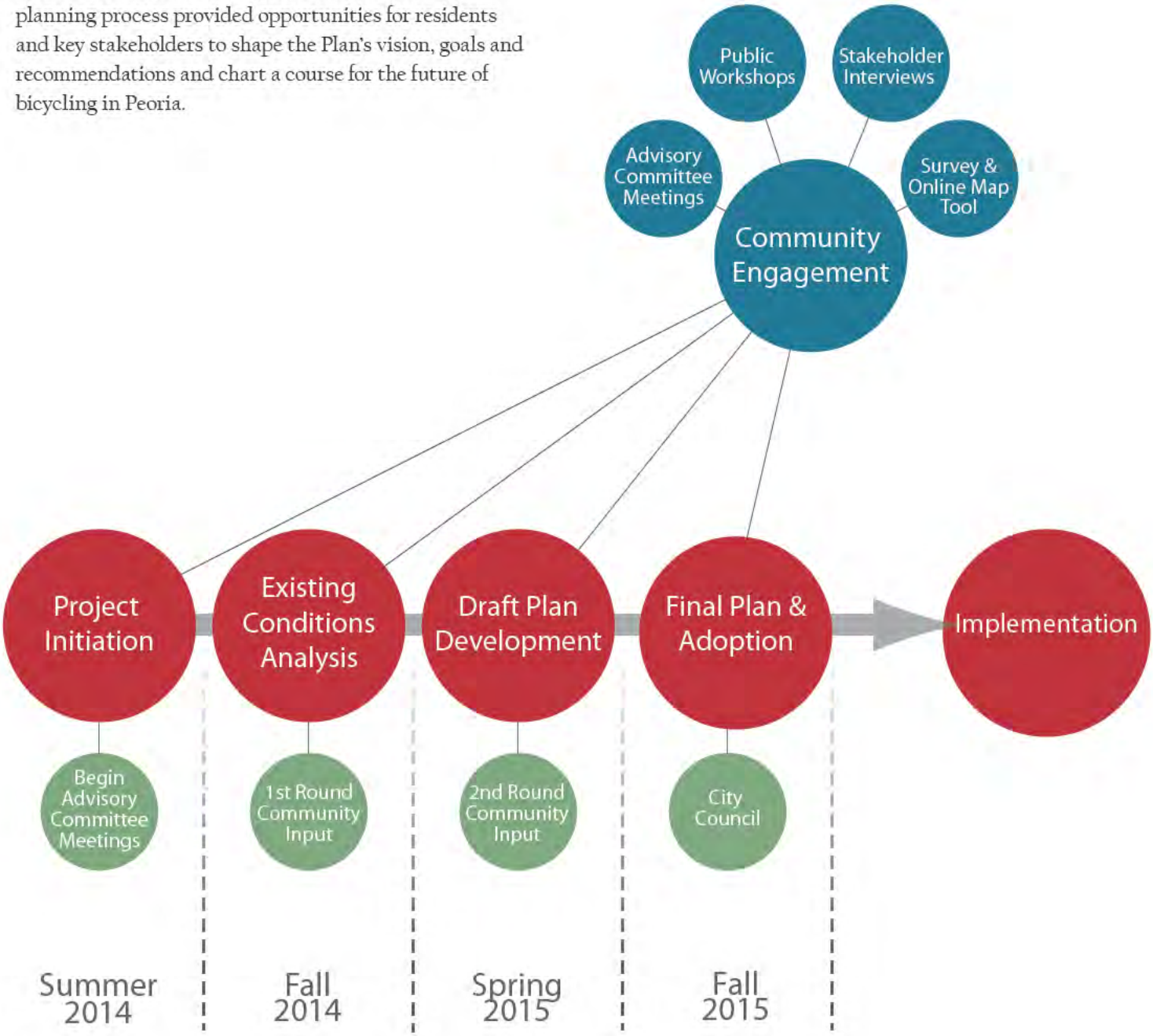
Improving bicycle connectivity and safety is a significant component of the Plan, but creating a Bike Friendly Community takes more than just new trails, bike lanes and sidewalks. In order to create significant and lasting change, the Plan utilizes the Five E's framework to establish bicycling and walking as comfortable, safe and convenient transportation choices for people of all ages and abilities. This holistic approach to community transformation addresses the physical, social, and policy environments that influence transportation decisions and behaviors, creating meaningful opportunities to build a culture that values and supports bicycling.

An additional E - equity - is often grouped with the Five E's to address access and opportunity for disadvantaged and low income populations within the community. There is, however, an important distinction between equity and the Five E's: equity is a guiding principle and desired outcome, whereas the Five E's are tools used to achieve the goals of the Plan. The following graphic shows how equity is incorporated into the planning framework as an overarching principle that is integrated into all plan recommendations.

The 5 E's Framework, including the overarching principle of equity.

The Planning Process

The planning process began in Summer 2014 and concluded in Summer 2015. The diagram below outlines the planning process from project initiation to plan completion and adoption. Community engagement events and activities throughout the course of the planning process provided opportunities for residents and key stakeholders to shape the Plan's vision, goals and recommendations and chart a course for the future of bicycling in Peoria.



Who Rides (Or Doesn't) and Why?

Current conditions in Peoria mean that low numbers of residents regularly use a bicycle to travel throughout the City. Nonetheless, some areas of the City have high rates of zero or one car ownership. Moreover, the heavily-used Rock Island Greenway shows community support for bicycling along comfortable, well-maintained facilities.

Bicyclists today are often of the "strong and fearless" variety, meaning they are not afraid to rub elbows with cars. With proper bikeway development, the Plan envisions a transportation network in all people regardless of age, economic status, or demographics can enjoy bicycling to everyday destinations. The Plan also encourages using bicycles for recreation, as many residents already do.

Despite low levels of overall bicycle ridership, the City of Peoria is not without strong support from municipal leadership, employers, community organizations, and bicycle advocacy groups. The Plan's diverse Advisory Committee, robust public comments, and strong support from local advocacy organizations all reinforce this point.

Making the Case for Bicycling Investment

The City of Peoria is a vibrant place. Its charming downtown and former industrial character are a testament to the area's history. Located on the Illinois River, the City has a strong history of vaudeville theater. The term, "Will it play in Peoria?" speaks to the City's reputation as a testing ground for some of yesteryear's most sought after theatrical productions.

Peoria is often thought of as a quintessential American city. The City even won "All-America City" designation four times: 1953, 1966, 1989 and 2013. Once, Peoria's demographics mirrored national trends so precisely, that advertising executives saw Peoria as their ideal target audience. Drawing on this legacy, the Plan's team is interested in making the case that *yes* creating comfortable and safe bicycle lanes and trails will indeed "play" in Peoria as well as across the country.

The following benefits summary highlights just a few examples of how active transportation can improve peoples' lives.

Peoria's existing bicycle connections, particularly off-street trails, are already well-loved amenities.

Health Benefits

Increased rates of active transportation have shown a direct positive impact on community health. Boulder, CO- a renowned bicycle friendly mid-sized city- sees 72.5% of its population meeting recommended minimum weekly levels of aerobic physical activity while only 15.1% of adults are obese. Similarly, in Eugene, OR, 65% of the population meets recommended minimum weekly levels of physical activity and 28.4% of adults are obese. Other cities see a similar inverse correlation between active transportation-friendliness and obesity rates.

Safety Benefits

High travel speeds are known to contribute to high rates of bicycle crashes and fatalities. Driver response times are reduced with higher speeds and crash severity increases. Although a pedestrian has a 95% chance of surviving a crash at 20 MPH, one has only a 20% chance of surviving a crash at 40 MPH.[1]

Nationally, there were over 33,500 traffic fatalities reported in 2012. [2] The Alliance for Bicycling and Walking reports that 14.9% of traffic fatalities are pedestrians or bicyclists, while 11.4% of all trips are made either walking or bicycling. [3]

Increasing the number of bicyclists and pedestrians along a corridor creates a safer environment for these users. Motorists expect the presence of these users and drive more cautiously as a result.[4]

"Complete Streets" improvements, or improvements that make space for all roadway users, such as improved bicycle lanes, crossings and paths, foster safer speeds and behavior among all who use a roadway.[5] These amenities improve the visibility and predictability of people traveling by foot and by bicycle.

Economic Benefits

Traffic congestion in 2011 caused Americans in urban cities to travel an additional 5.5 billion hours and spend an additional $121 billion in gas. This means, on average, each car commuter spends roughly 40 hours and over $800 per year waiting in traffic.[6]

Reducing the number of vehicular lane-miles through road-diets and other methods decreases wear and tear from motor vehicles. Replacing these with active transportation facilities increases transportation capacity with less investment.

Reducing the dependence on personal motor vehicles decreases personal and family expenditures on automobiles, potentially saving thousands of dollars per family annually. These are savings that would likely be invested back into the local economy.

Homeowners also benefit from trails, sidewalks and bike lanes. On average, houses in areas with above-average levels of bike and walk amenities are worth up to $34,000 more than similar properties in less walkable and bikeable areas.[7] A study of residential properties in Indianapolis noted that home values increase by 11% just for being a half mile closer to the Monon Trail.[8]

Investments in bicycling and walking infrastructure are cost-efficient catalysts for private development. Bicycle and pedestrian projects create 11-14 jobs per $1 million spent, compared to just seven jobs for highway projects. Once complete, sidewalks, bikeways and trails attract new businesses and increase retail activity. The Cultural Trail in Indianapolis has been a major catalyst for private development. For every one dollar spent on capital improvements, ten dollars in private investment have been injected into the local economy, and more than 11,000 jobs are projected to be added to the local workforce as a result of the project.[9] In Fort Worth, Texas, retail businesses experienced a 163% increase in sales between 2009 and 2011, following the installation of bicycle lanes and improved bicycle parking.[10]

Bicycle and pedestrian projects are paying significant dividends not just for residents and businesses, but for cities too. No longer perceived as add-ons, afterthoughts, or feel-good projects, trails and on-street bikeways are cost-effective components of a multi-modal transportation system. Increases in property values, local spending, and tourism activity generate additional tax revenue for local governments, providing strong returns on their investments. In 2009, bicycle and pedestrian activity in Vermont generated $1.6 million in tax and fee revenues for the state.[11] Bicyclists on Minnesota trails spend $481 million annually, resulting in $40.6 million in state and local taxes.[12]

Environment

Motor vehicle emissions account for 31% of carbon dioxide, 81% of carbon monoxide, and 49% of nitrogen oxides released in the United States.[13] Acknowledging the harmful effects of these automobile emissions on local and global ecosystems, cities around the world are turning to bicycling as a sustainable, environmentally-friendly transportation alternative. Studies have shown that reducing automobile trips and replacing them with bicycling, walking and transit can produce significant benefits. One study noted that a 5% increase in neighborhood walkability is associated with a 6.5% decrease in vehicle miles driven, 5.6% fewer grams of nitrous oxide emitted, and 5.5% fewer grams of volatile organic compounds (VOCs) emitted.[14]

Sources:

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2) http://www-fars.nhtsa.dot.gov/Main/index.aspx

3) http://www.bikewalkalliance.org/storage/documents/reports/2014BenchmarkingReport.pdf

4) http://injuryprevention.bmj.com/content/9/3/205.full

5) http://www.smartgrowthamerica.org/documents/cs/factsheets/cs-safety.pdf

6) Texas A&M Transportation Institute, 2012 in: http://www.bikewalkalliance.org/storage/documents/reports/2014BenchmarkingReport.pdf

7) Cortright, Joe, Impresa, Inc. Walking the Walk: How Walkability Raises the Home Values in U.S. Cities. CEOs for Cities, 2009.

8) Lindsey, G., Man, J., Payton, S., Dickson, K. Property values, recreation values and urban greenways. Journal of Park and Recreation Administration 22, 69-90, 2004.

9) Inside Indianapolis Business. http://www.insideindianapolisbuisiness.com/newsitem.asp?ID=42250#middle

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11) Vermont Agency of Transportation. Economic Impact of Bicycling and Walking in Vermont. 2012.

12) Venegas, E. C. Economic Impact of Recreational Trail use in Different Regions of Minnesota. University of Minnesota Tourism Center. 2009.

13) The Green Commuter, A Publication of the Clean Air Council.

14) Frank, L., et al. Many pathways from land use to health: Associations between neighborhood walkability and active transportation, body mass index, and air quality, Journal of the American Planning Association, 72, 75-8. 2006.


PNC
ROAD
CLOSED
AHEAD

2: Existing Conditions

Before constructing recommendations for the Peoria Bicycle Master Plan, the team worked to understand existing conditions for bicycling throughout the City.

As described in the previous chapter, the Plan uses a comprehensive approach to study existing conditions and make recommendations for future progress, including: Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity. Each of these elements are crucial to developing safe streets where all of Peoria's residents feel welcomed and comfortable.

Public input was crucial in constructing a document that truly highlights Peoria's present and plans for our future. For an expanded discussion on public involvement practices and findings, refer to Chapter 3.

The existing conditions chapter reviews previous plans, transportation characteristics, peer cities, policies, demographics, crash data, and bicycle demand.

Review of Existing Plans

Fifteen documents were reviewed to understand the City's recent history of transportation planning. All documents reviewed for the purposes of this plan are presented below.

Table 1. Plans Reviewed

Plan	Agency	Year
Local and Regional Plans		
Congestion Management Process (CMP)	TCRPC	2011
Grow Peoria: Comprehensive Plan	City of Peoria	2011
Heart of Peoria Plan	City of Peoria	Charrette Date: June 20-28, 2002
Heart of Illinois Regional Sustainability Plan	TCRPC	2014
Human Services Transportation Plan (HSTP)	TCRPC	2010
Peoria/Pekin Urbanized Area Transportation Study 2010-2035 Long Range Transportation Plan (LRTP)	TCRPC	2010
School Neighborhood Impact Zone	City of Peoria	2010
Other Relevant Planning Efforts		
City of Peoria Community Investment Plan FY2014 - FY2018	City of Peoria	2013
City of Peoria, Illinois Guide to Development	City of Peoria	Not dated
Eastern Bypass	TCRPC; IDOT; Eastern Bypass Coalition Board of Directors	2013
Greater Peoria Preferred Bicycle Routes & Trails	TCRPC	2011
City of Peoria Growth Cells	City of Peoria	Ongoing
Envision HOI: Heart of Illinois Long Range Transportation Plan (LRTP)	TCRPC	2014
Strategic Plan Peoria County	Peoria County	2010
Wisconsin Avenue Business Corridor Plan	City of Peoria	2014

Key Findings

Multiple agencies throughout the Greater Peoria Area are committed to improving bicycle accommodations. Multi-modal planning efforts are supported with the local MPO's decision to prioritize Surface Transportation Program (STP) projects that include facilities for non-motorized users. The City's Complete Streets ordinance will bolster past efforts and will provide a policy mandate for creating space for roadway users of all modes, ages, and abilities.

Local efforts to enhance public transit add to the region's multi-modal travel network. Although more than 80% of commuters travel to and from work as the sole passenger in private motor vehicles, the tide is beginning to turn. Community Investment Plan (CIP) funds reserve bikeway project funding for FY 2014-2018.

The Peoria-Pekin Urbanized Area leads the Tri-County region in terms of existing trail mileage (32 miles). Planning documents' level of detail varies in terms of describing opportunities for future trails. Likewise, existing documents discuss a desire to include bicycle and pedestrian projects, but exact details are sometimes absent.

Other trends found throughout the plan review process include:

- The City of Peoria plans for increased population growth and increased residential and commercial revenue. Transportation options are described as valuable assets in providing for future growth.

- The City's comprehensive planning documents embrace walkable neighborhoods and seek to restore a more pedestrian-friendly scale, especially within the downtown area. The documents take a strong stance regarding making space for non-motorized users.

- Certain planning efforts, such as the Human Services Transportation Plan (HSTP), School Neighborhood Impact Zone revitalization, and the Heart of Illinois Regional Sustainability Plan note strategies to provide additional resources to traditionally underrepresented persons and geographic areas.

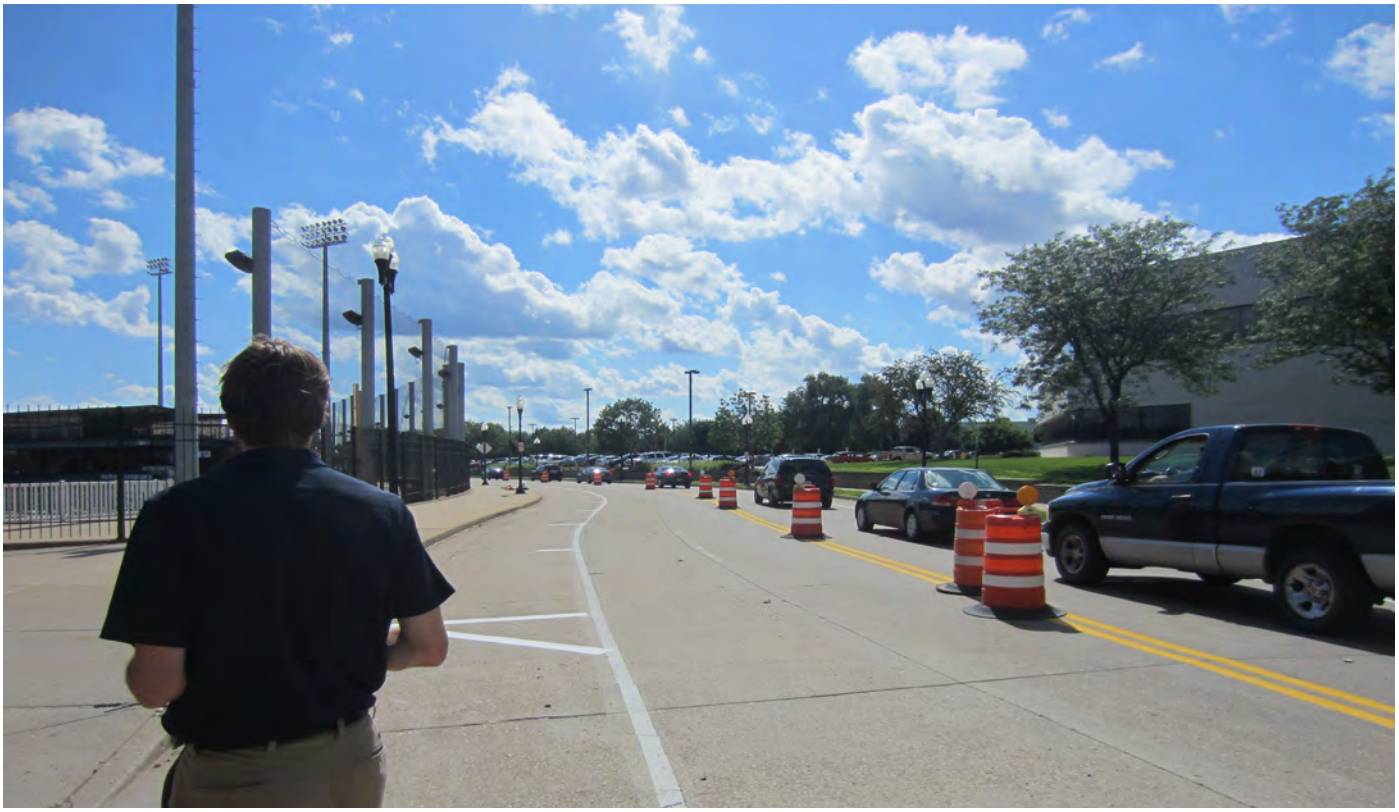
Past planning projects have resulted in travel lane reallocation that one can see in Peoria today.

Citywide Roadway Analysis

The following section presents a detailed existing conditions analysis based on studying Peoria's current roadway network. The metrics described throughout this section will help planners understand opportunities and constraints for formulating a safe and comprehensive bicycle network throughout the City of Peoria.

The findings presented herein are the result of data analysis using geographic information systems (GIS) technology, stakeholder input, and discussions with City staff. Areas of analysis contained within the section are:

- Roadway characteristics
- Demand for bicycling
- Road diet analysis
- Existing and planned bicycle facilities
- Bicycle comfort and safety
- Demographics, equity, and public goods



Staff from the City of Peoria and Illinois Department of Transportation (IDOT) were instrumental in providing data for the Plan.

Figure 1. Study Area

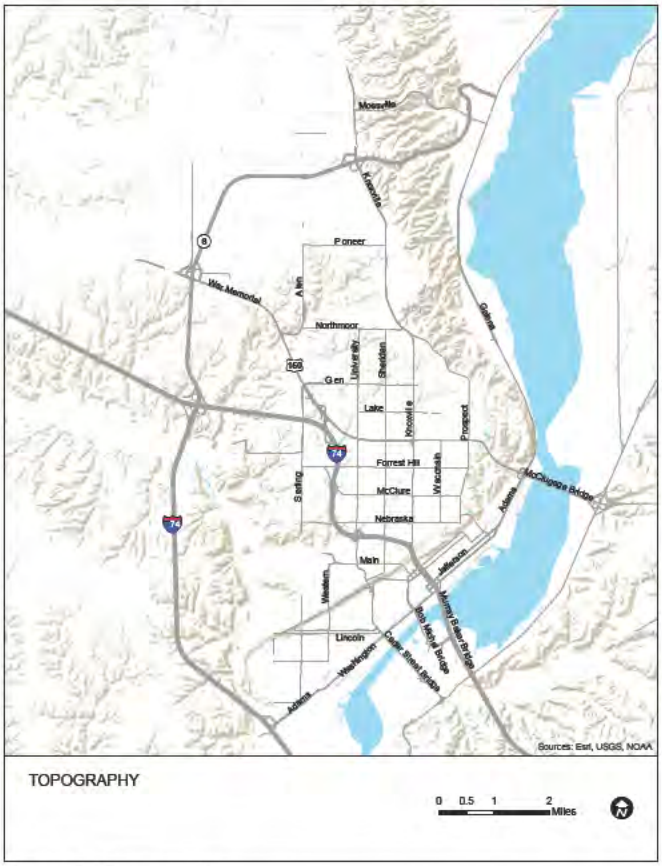


Figure 2. Topography

City Overview

The City of Peoria Bicycle Master Plan study area follows municipal boundaries (Figure l). Although the Plan seeks to establish comfortable bicycle connections from the City of Peoria to the City of East Peoria and to Peoria Heights, the main study area lies within City of Peoria's political jurisdiction. Other efforts such as the *Heart of Illinois Long Range Transportation Plan* address transportation connections within the greater Peoria region.

Numerous hilly cities throughout North America have shown that topography does not have to be a hindrance against attracting high bicycle ridership. Cities such as Seattle, San Francisco, and Pittsburgh have built comfortable and well-loved bicycle facilities, despite their cities' topography challenges. This plan acknowledges that current conditions make it challenging for people in some parts of Peoria to comfortably ride bicycles given the bluffs and hills. Bike lanes that grant better separation from car traffic will help facilitate smoother travel, as will bicycle boulevard systems that meander along hills instead of across them. Areas of interest, in terms of understanding topography, include the eastern bluffs (i.e.- near Route 29/Galena Road), and the ridge of higher elevation running between W Moss Avenue and W Martin Luther King Junior Drive/ NE Glen Oak Avenue and NE Glendale Avenue (Figure 2).

Roadway Characteristics

Understanding basic characteristics of Peoria's existing roadway system helps the project team make educated decisions regarding bikeway planning. Figures 3-9 describe each of the items in the following section.

Traffic Volume

Measured as average annual daily traffic (AADT), existing traffic volumes help planners and engineers decide where to reallocate existing travel lanes for other purposes, such as bicycle lanes or expanded sidewalks. Traffic volumes also point to routes that may currently be more difficult to travel via bicycle. Residential routes typically have less than 3,000 vehicles per day. Between 20-30,000 vehicles typically travel on University Street and Knoxville Avenue. Between 20-60,000 vehicles use War Memorial Drive per day. Interstate routes can have more than 60,000 vehicles per day. (Figure 3).

Roadway Functional Class

The Federal Highways Administration (FHWA) sets guidelines for separating urban and rural roadways according to functional classifications. Figure 4 on the following page illustrates Peoria's existing functional classification system according to IDOT data. Classes identify the corresponding routes' role within a transportation network. With the resurgence of bicycle traffic within the US, planners and engineers are rethinking how to design roadways given existing functional classes.

For example, buffer- or barrier-separated bikeways (i.e.- cycle tracks) grant more comfortable bicycle travel along collectors, minor arterials, and principal arterials. Typically, these are wide roads with high posted speed limits. Local roads or streets are usually narrower and have lower posted speed limits. Bicycle boulevards or signed bicycle routes are appropriate for such roadway classes.

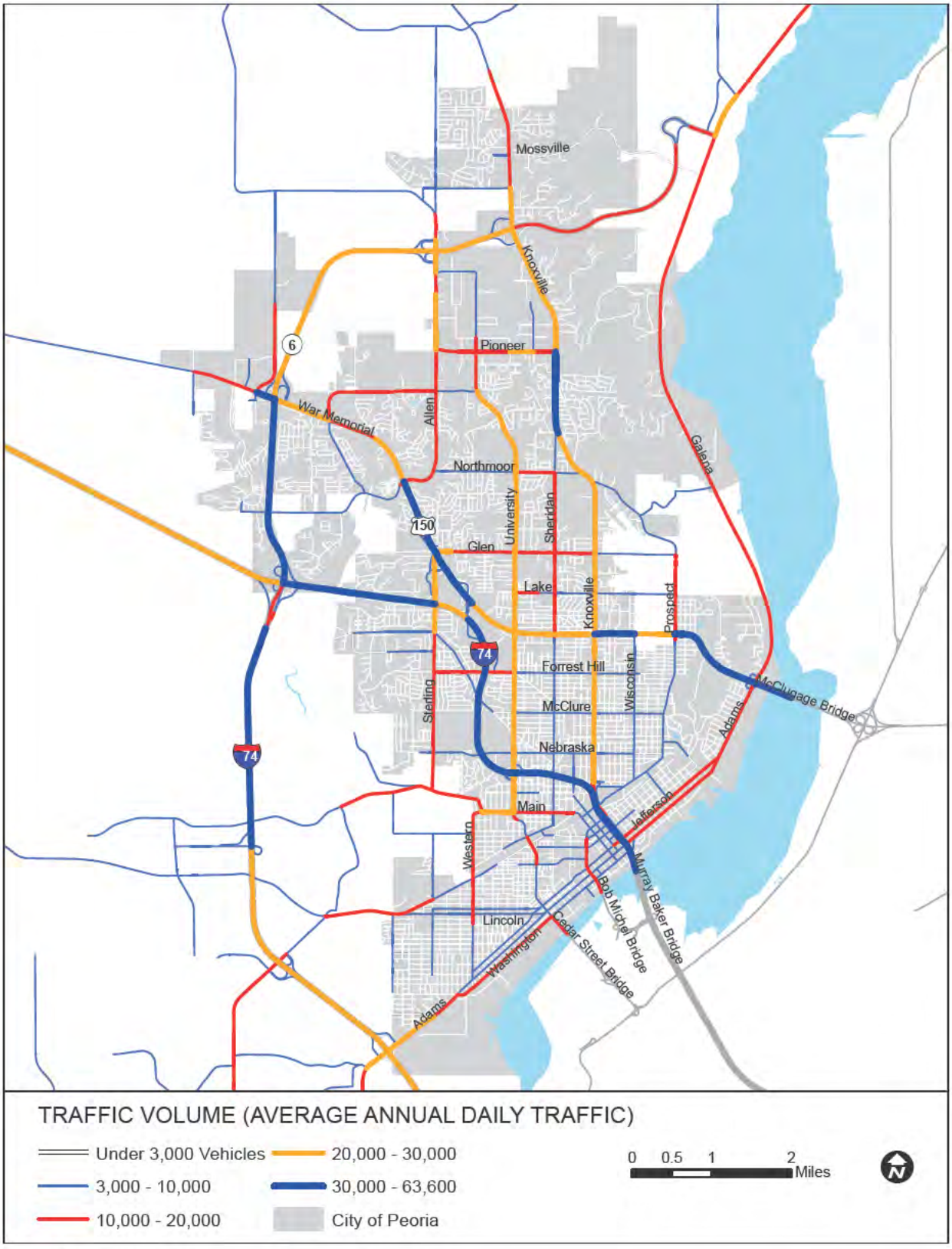


Figure 3. Traffic Volume

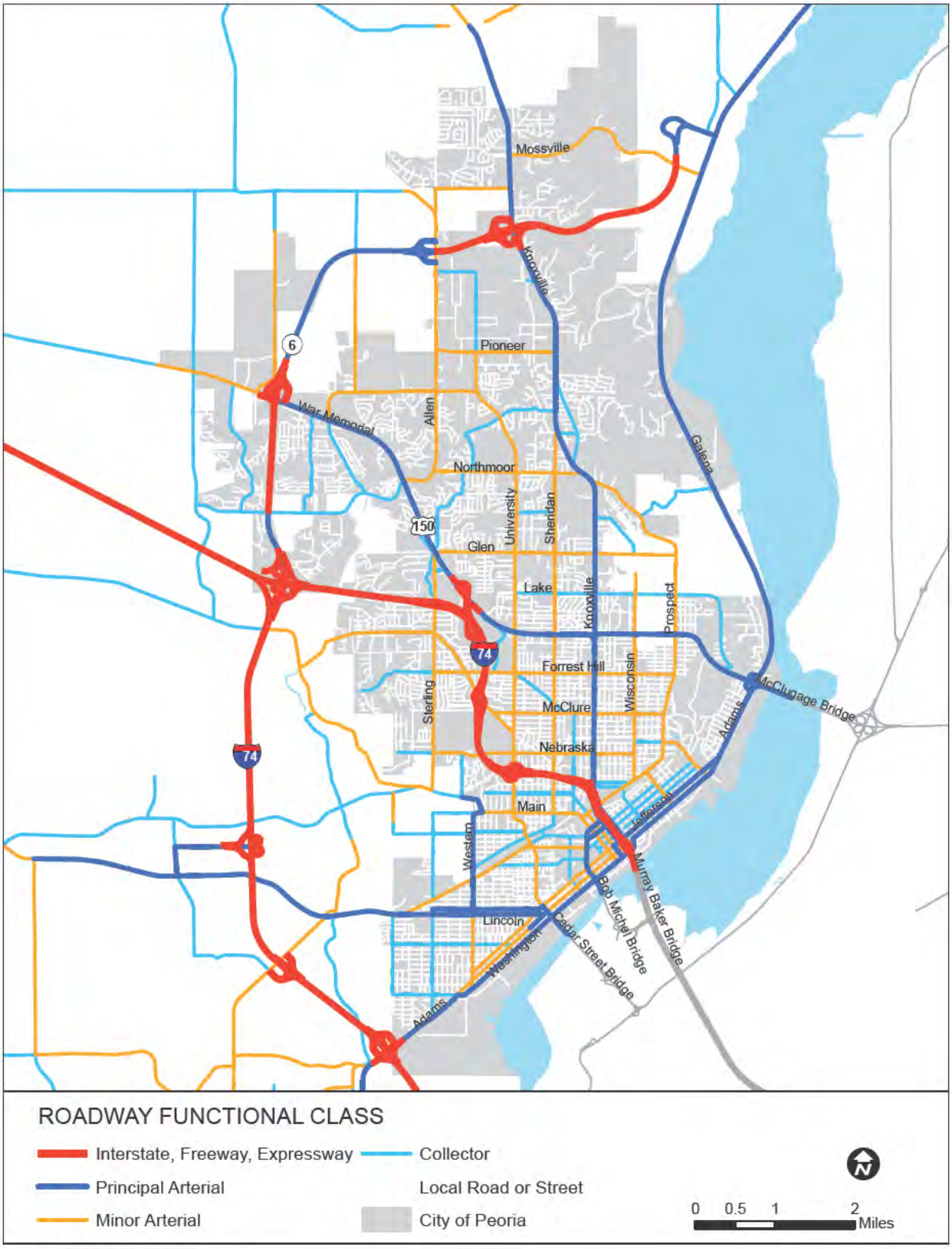


Figure 4. Roadway Functional Class

Number of Lanes and Surface Width

These metrics help identify how much of a street's right-of-way may be available for re-purposing to bicycle lanes (Figures 5 & 6). Although subject to further analysis, streets with four or more lanes may be candidates for road diets, the most typical of which involve conversions from four travel lanes (two in each direction) to three lanes (one travel lane in each direction and a center turn lane). Streets with a combination of 1) ample width, 2) high number of lanes, and 3) low daily traffic volumes are often "easy wins" for installing improved bicycle infrastructure.

Truck Routes

Peoria relies on several designated truck routes including Knoxville Ave, War Memorial Dr, Washington Street, Adams Street, Galena Road, and others (Figure 7). In some cases, key bikeway corridors are chosen on streets running adjacent to major arterials with high truck volumes. In others, bikeways are proposed to enable safe passage for both bicyclists and trucks (i.e.- cycle tracks).

Roadway Jurisdiction

Knowing who has jurisdiction over a roadway is paramount to understanding which decision makers to involve in bikeway planning, design and implementation processes. Most of Peoria's roads fall under City jurisdiction. Illinois Department of Transportation (IDOT) and Peoria County have jurisdiction over several roadways including Jefferson, Adams, Washington, War Memorial/McClugage Bridge, Knoxville, and others (Figure 8). Since projects involving IDOT roadways typically have longer timeframes for planning through construction, this Plan sought to engage these stakeholders throughout the planning process.

One-way Operation

Some of Peoria's downtown streets, including Adams and Jefferson, are currently one-way streets (Figure 9). The City of Peoria has decided to convert some of these streets to two-way operation. Two-way conversion offers benefits for smoother bicycle travel, since people bicycling can easily use the same route to travel in both directions. On the other hand, one-way streets sometimes offer the possibility to convert one vehicular travel lane to a bi-directional cycle track.

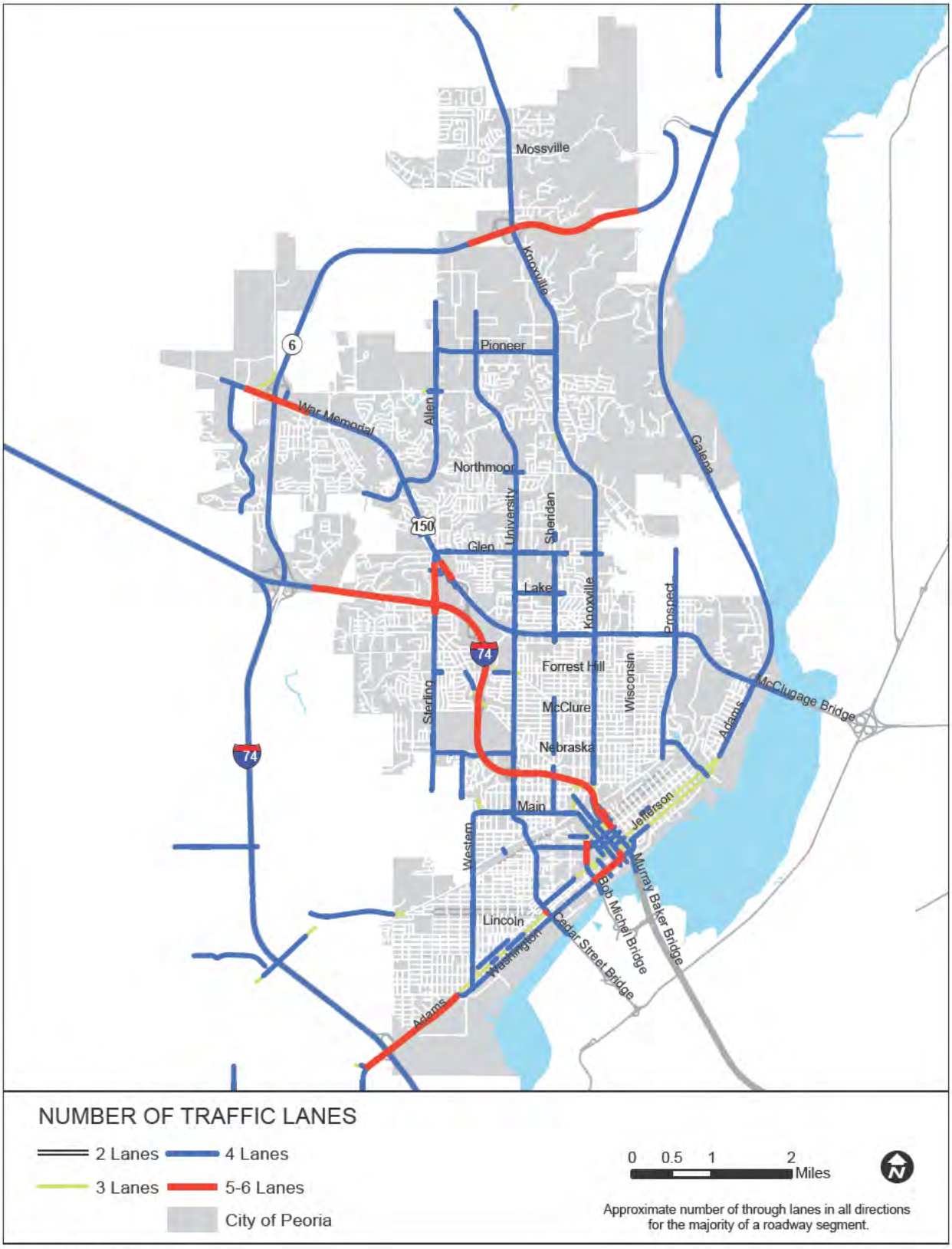


Figure 5. Number of Traffic Lanes

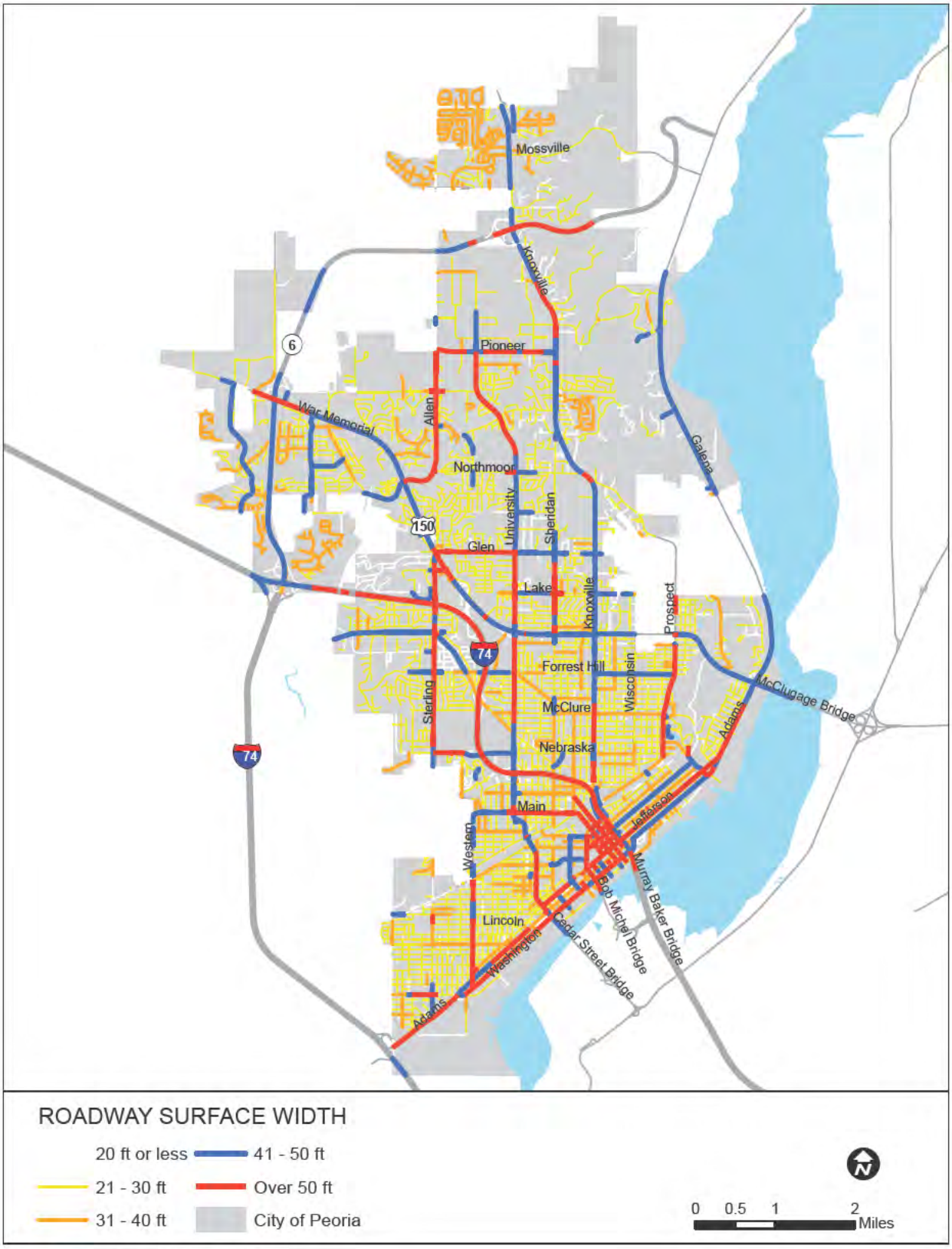


Figure 6. Roadway Surface Width

Figure 7. Designated Truck Routes

Figure 8. Roadway Jurisdiction

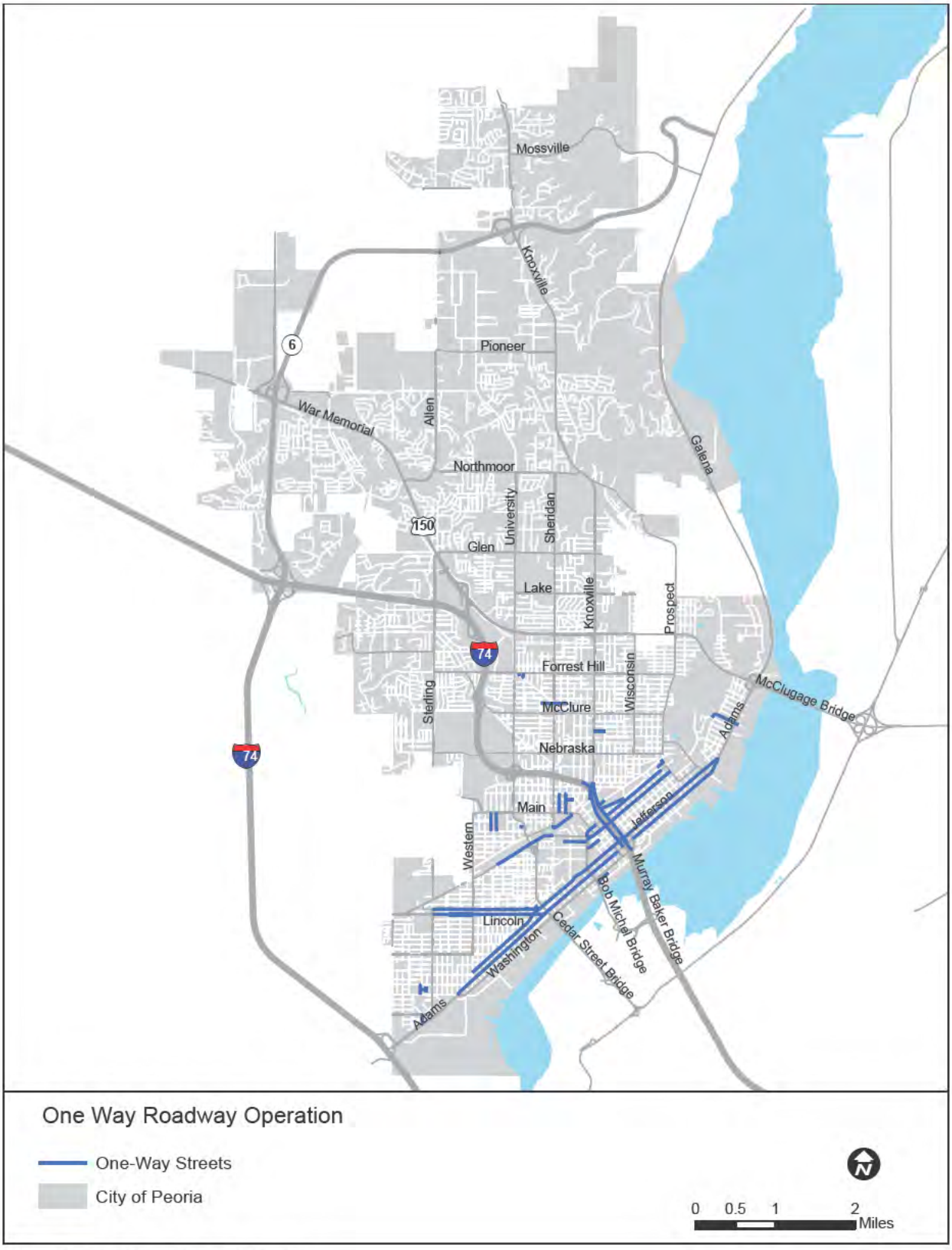


Figure 9. One Way Roadway Operation

Demand: Where People Live, Work, and Play

Identifying existing destinations throughout Peoria reveals areas that are likely to become high demand destinations for beginning or ending a bicycle trip.

An interactive online mapping tool allowed City of Peoria residents to label popular destinations where they currently bike or destinations they would like to reach by bike. The series of maps found on the following pages were created from this data as well as US Census data. The result illustrates places where residents work, live, shop, access green space or entertainment, and more (Figures 10 - 12).

High demand work areas include:

- The Caterpillar campus in Mossville
- Downtown Peoria
- The Pioneer Pkwy commercial corridor, Northpoint Shopping Plaza, and the Mt Hawley Auxiliary Airport (bordered by Route 6, Knoxville Ave, Pioneer Pkwy, and Allen Rd)
- and Metro Centre and Evergreen Square malls (bordered by Glen Avenue, Route 40, War Memorial Dr, and University St) .

Residential areas cover much of Peoria. Population density is high near the City's center as well as in neighborhoods stretching from the south through the north.

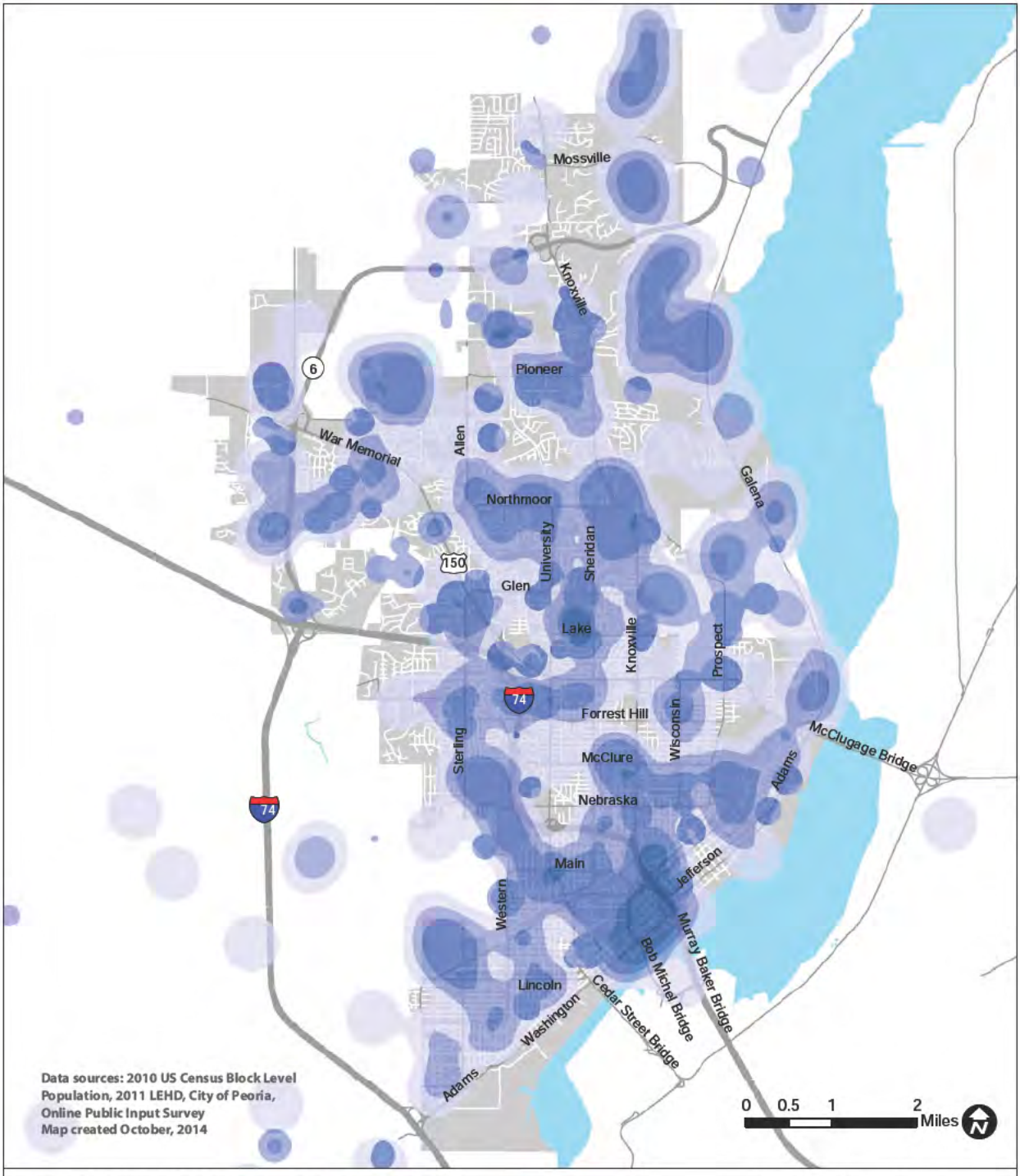


Figure 10. Demand Analysis: Destinations

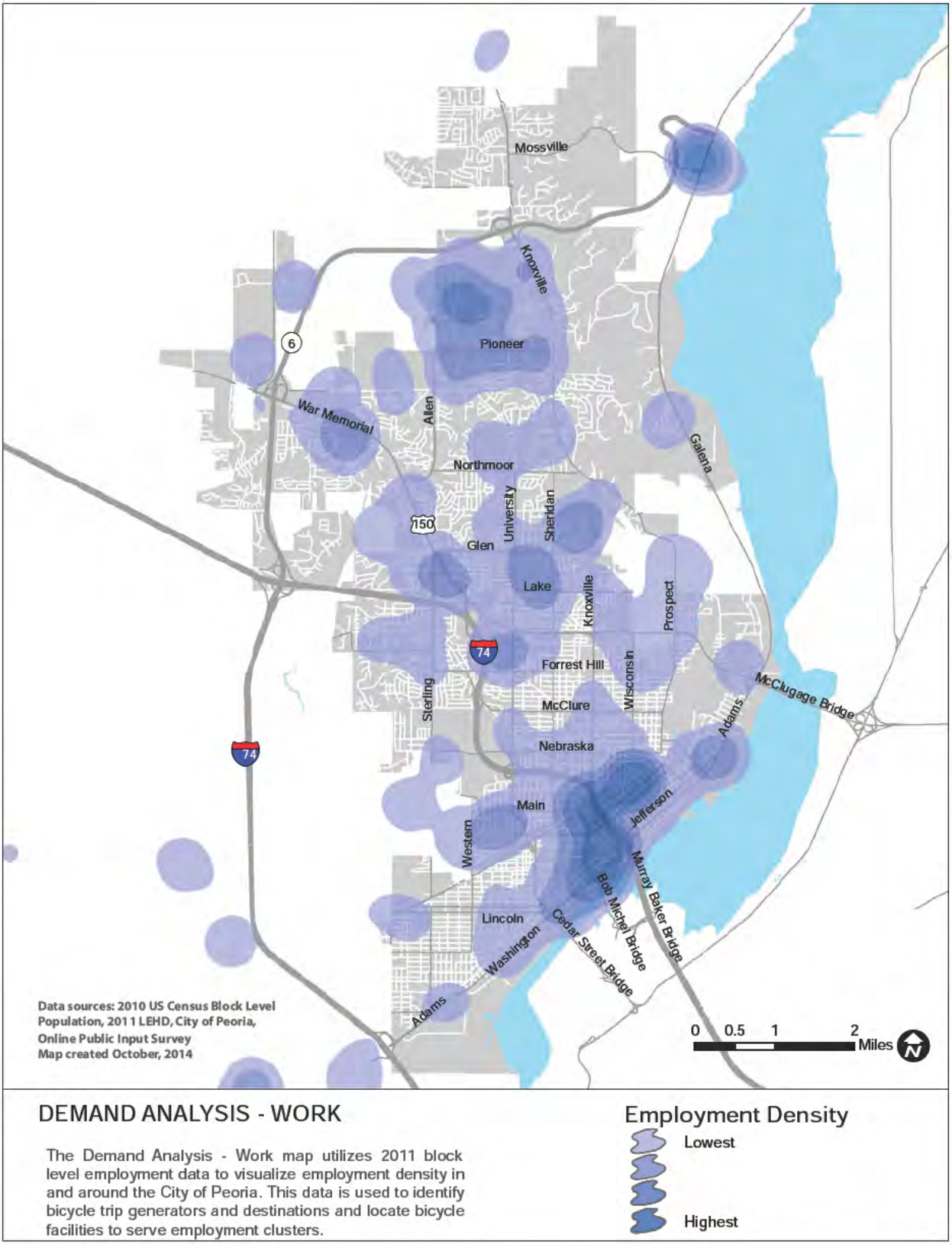


Figure 11. Demand Analysis: Work

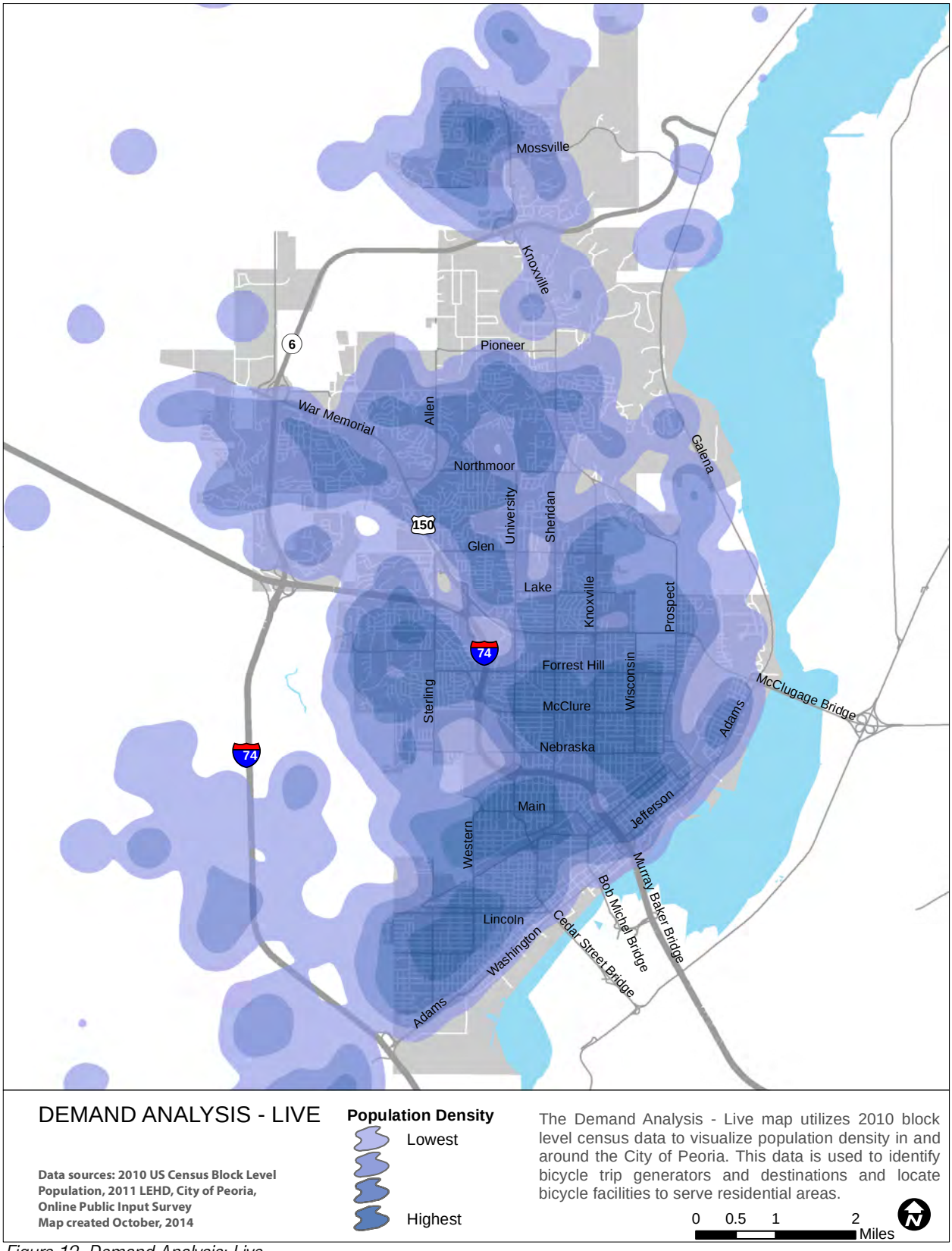


Figure 12. Demand Analysis: Live

Road Diet Potential

The road diet analysis investigates Peoria's road network's potential for converting motor vehicle lanes to other uses (Figure 13). Travel lane conversions repurpose existing travel lanes for on-street parking, bike lanes, sidewalk expansions, or other roadway features. Many roads undergo "four-to-three" conversions, for instance, to convert four lane roads into two travel lanes plus one center turning lane. These conversions make space for bicycle lanes and pedestrian accommodations.

Road diets can improve safety and operations for motor vehicles by reducing speeds and the instances of rear-end collisions. Communities similar to Peoria have completed road diets and have accrued benefits such as lower vehicular crash rates along such facilities, the addition of more protected non-motorized transportation facilities, and an improved environment for abutting property owners.

By applying available traffic data to roads with four or more lanes, the team investigated whether a road is a viable candidate for a road diet.

The map uses yellow coloring along corridors with road diet potential. Notice that much of the downtown street system is suited for lane reallocation as well as Galena Road, and numerous streets distributed throughout the City. Streets identified for potential road diets include:

- Sterling Avenue
- Western Avenue
- Prospect Road
- Pioneer Parkway
- Jefferson Street
- Washington Street
- Main Street

Although the analysis identifies potential road diet candidates, the City should analyze other factors such as traffic dispersion, number of curb-cuts, number of potential turning movements, bus stops, and intersection operations before selecting road diets to implement. The analysis, therefore, is intended for general planning purposes only and is reliant on subsequent review.

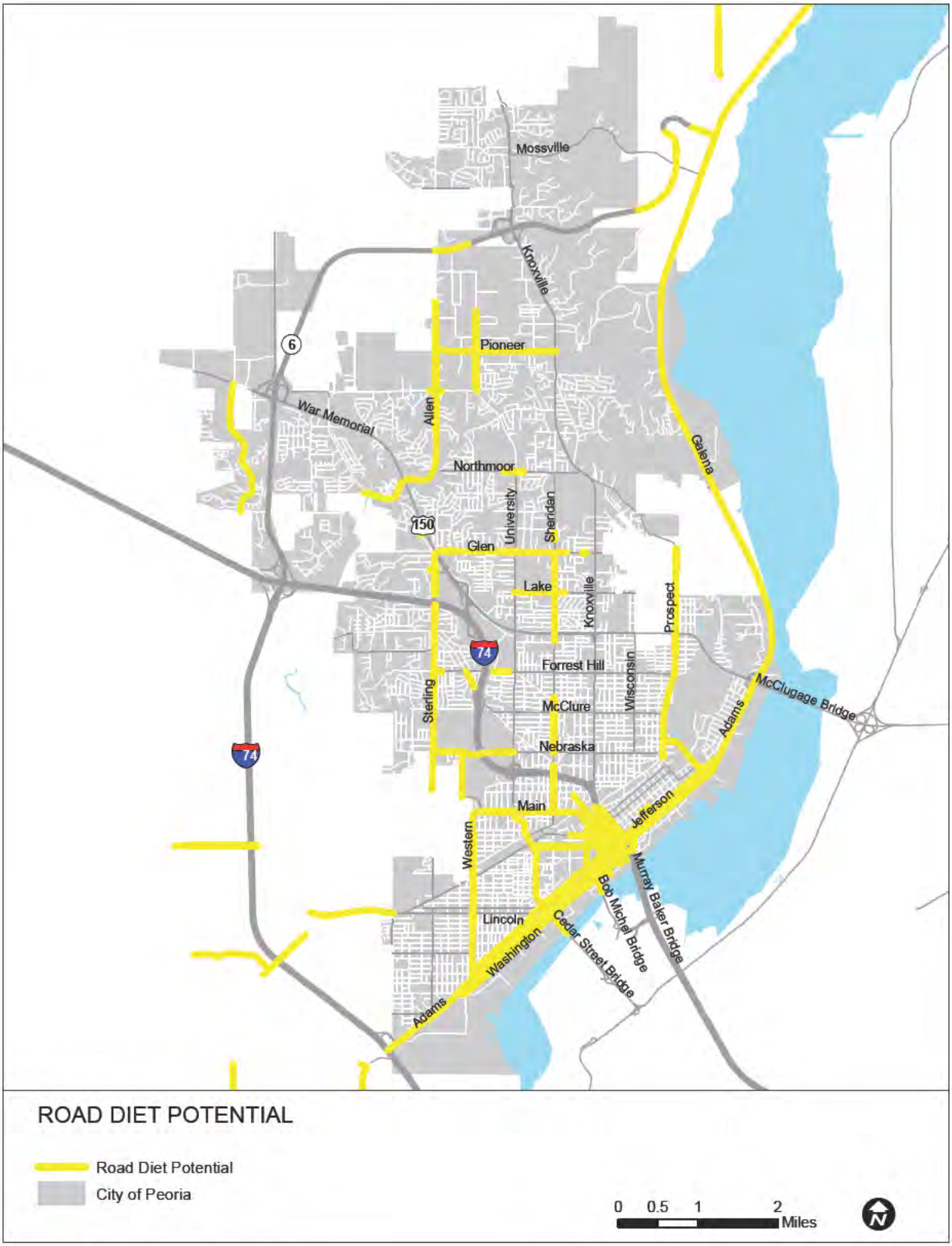


Figure 13. Road Diet Potential

Existing and Planned Bicycle Facilities

Figure 14 illustrates bike lanes and multiuse paths currently found in Peoria. The Rock Island Trail stretches through the northern neighborhoods to the northeast end of Peoria's downtown. A separate section of multiuse path borders the river. Existing bike lanes are found on Howett Street, Lincoln Avenue, Monroe Street, Reservoir Boulevard, Forest Hill Avenue, Mt Hawley Road, and others.

Data on proposed on-street bicycle lanes and off-street multiuse trails is pulled from existing municipal and regional planning documents. This Plan identifies past and ongoing planning initiatives to develop recommendations in concert with existing proposals.

Comfort and Safety

Crash data and the estimated level of comfort experienced when biking along a given roadway help guide Plan recommendations by highlighting existing gaps in safety and comfort. Plan recommendations seek to remedy existing safety concerns.

Crashes

IDOT data for bicycle and pedestrian crashes occurring between 2008-2012 shows a concentration of crashes within the downtown area, perhaps illustrating higher levels of biking and walking downtown than elsewhere in the City (Figures 15-16).

Fatal pedestrian crashes are distributed throughout the City, but the majority within the given dataset (four of five) occurred downtown (south of McClure and northwest of the river). Again, this may correlate with higher levels of pedestrian activity in these areas.

Data analysis revealed one location with four to five bicycle crashes between 2008-2012. This represented the highest frequency of crashes:

Over Four Bicycle Crashes
IL-116 near Western Avenue

Locations with two to three bicycle crashes each between 2008-2012:

Two to Three Bicycle Crashes
N Sheridan Road near W Main Street
Northwest Expressway
W Starr Street, west of S Griswold Street
W Starr Street, east of S Griswold Street (before Western Avenue)
IL-116, just west of S Griswold St
Western Avenue, just south of Martin Luther King Jr Drive
W Main Street & N Sheridan Road
Glen Oak, just northwest of Main Street
Monroe Street, just northeast of Bryan Street
IL-29 near Van Buren
Forest Hill Avenue, just west of University Street

Four to five pedestrian crashes occurred at each of the following locations between 2008-2012. This represented the highest frequency of crashes:

Over Four Pedestrian Crashes
Western Avenue near Garden Street
University Street near Main Street
Main Street near Monroe Street
Main Street near Adams Street
Knoxville Avenue near Arcadia Avenue

Investigating high crash corridors identifies locations where current safety and comfort could be improved for people biking and walking. Planners cannot assess risk without accurate estimates of the number of people biking and walking. Improving data collection to estimate bicycle riding and walking throughout Peoria will improve what is known as *exposure data*, the relative risk of bicycling or walking in a given area. Additionally, under-reporting of bicycle and pedestrian crashes remains a nationwide issue.

Level of Traffic Stress (LTS)

A Level of Traffic Stress analysis classifies roadways according to adult bicycle riders' approximated stress levels as they travel along a given corridor (Figure 17).

The results of these models can be used to identify pedestrian and bicycle network gaps as potential areas for improvement. The analysis can also help aid in system-wide planning by addressing the areas that are currently most stressful.

Roads with multiple lanes and high speed limits, without comfortable bicycle facilities, have higher stress estimates than roadways with fewer lanes and lower posted speed limits. Level of traffic stress closely follows a road's functional classification:

- Local roads or streets (i.e.- residential areas) are comfortable to most adult cyclists. These streets lack connectivity to major low-stress routes that could offer riders crosstown connections.
- Forrest Hill, McClure, Nebraska, Lincoln, Hewett, and Jefferson are acceptable to "enthused and confident" riders
- Principal arterial streets are most acceptable to "strong and fearless" riders. These riders are those who will ride on any street, regardless of roadway conditions.

This analysis illustrates that Peoria's main streets are currently too stressful for many potential bicyclists. While bicyclists might feel comfortable riding within their neighborhood, crossing major streets and accessing destinations are too uncomfortable.

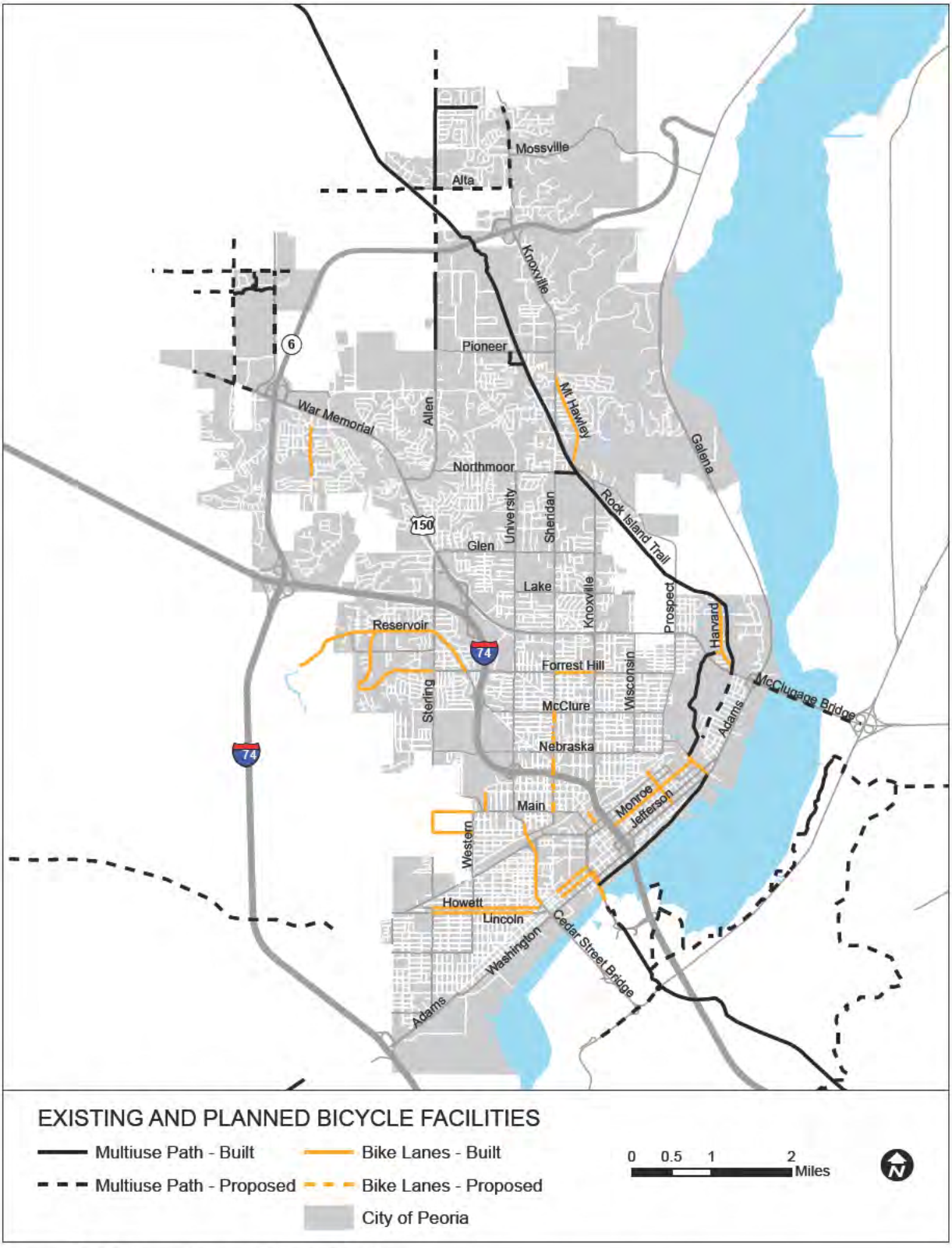


Figure 14. Existing and Planned Bicycle Facilities

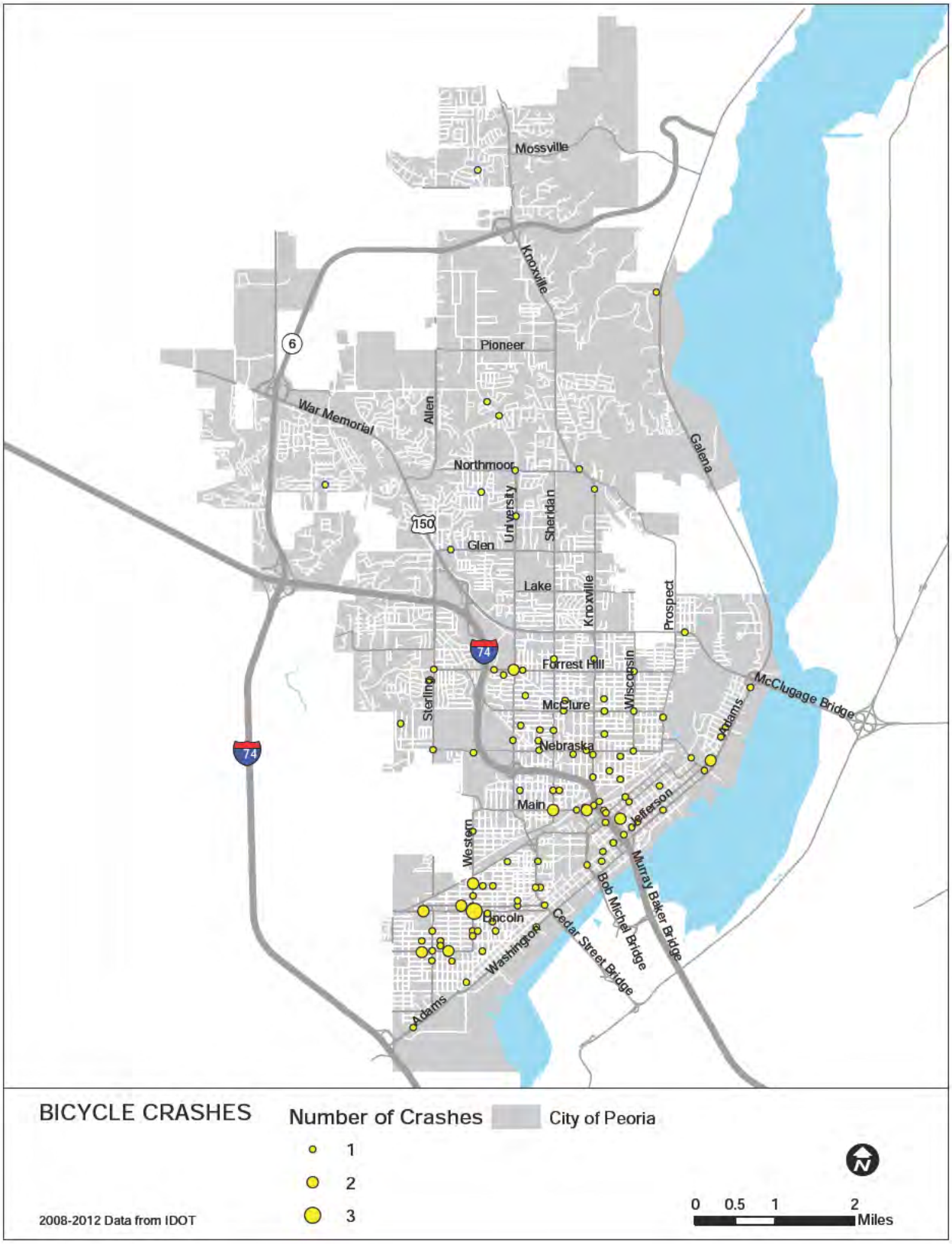


Figure 15. Bicycle Crashes

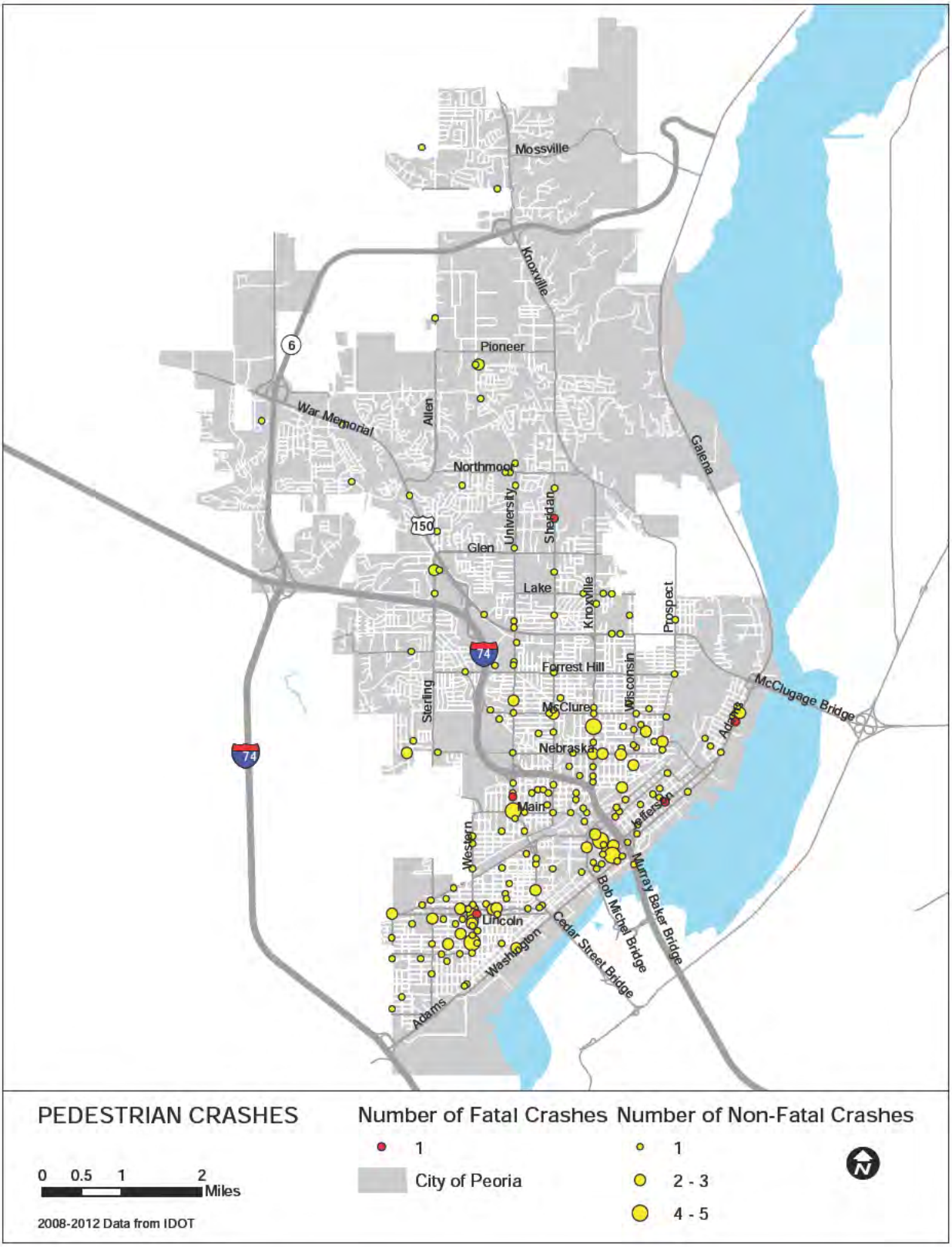


Figure 16. Pedestrian Crashes

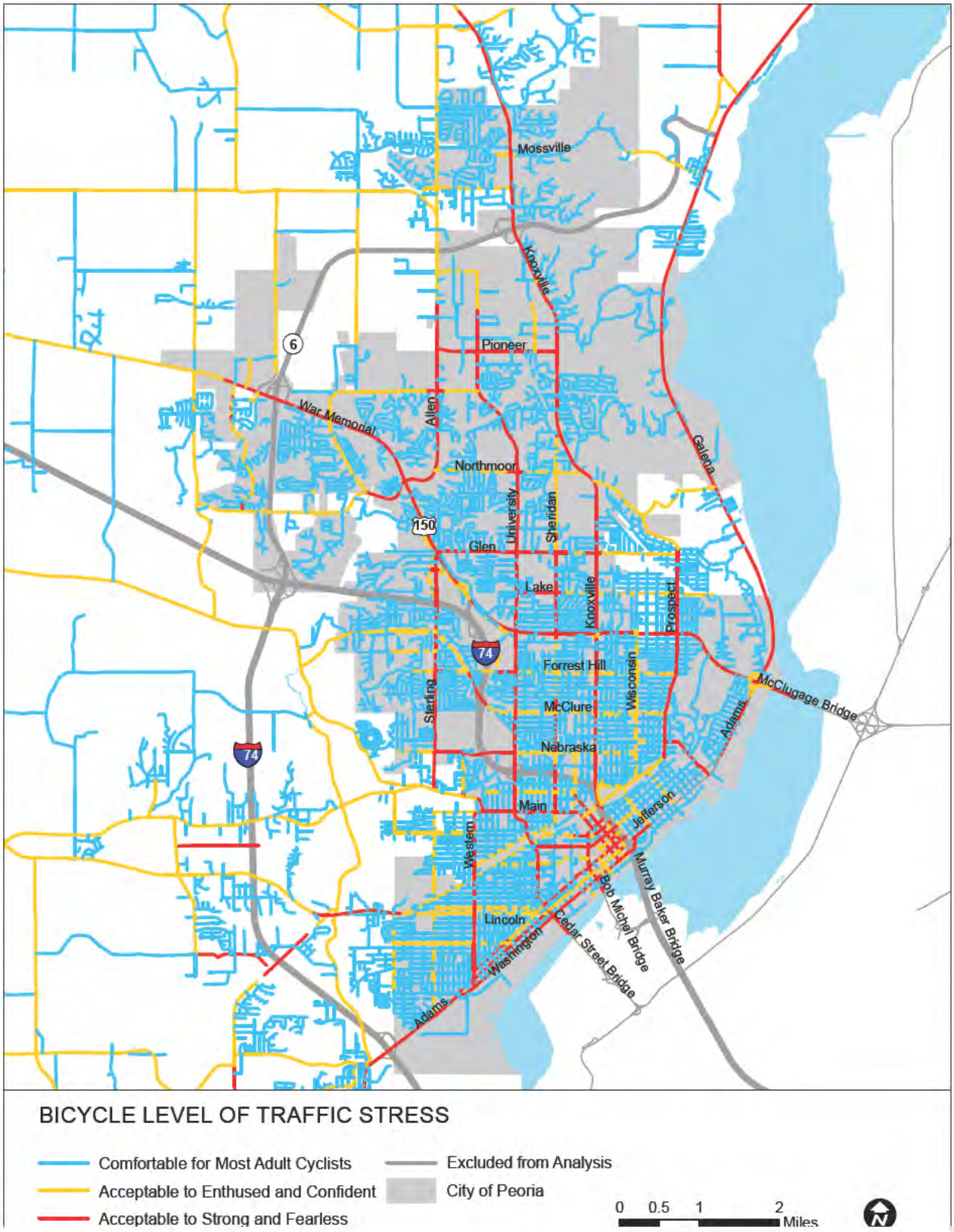


Figure 17. Bicycle Level of Traffic Stress

Demographics, Equity, and Public Goods

Conducting an analysis of the geographic concentration of households with zero or one car (Figure 18), the concentration of low income households (Figure 19), and the geographic distribution of schools and open spaces (Figure 20), further identifies criteria for planning the bikeway network. The Plan aims to create a viable transportation network throughout Peoria that is safe and convenient for all residents.

Zero and One Car Households

Between 80% - 100% of households living along the riverfront south of downtown do not have access to cars. These households use other means of transportation to travel within Peoria and beyond. Increasing the options available for these people by bicycling, walking, and transit is of high importance. Neighborhood connections can facilitate local travel (i.e.- visiting friends, errands), while bikeways along higher volume arterials can facilitate trips across the city (i.e.- work commutes).

While low car ownership is often correlated with a corresponding concentration of residents living below the poverty level, low car ownership is also associated with the millennial generation, whose members often choose other forms of transportation over private automobile ownership. Therefore, improving bicycle connections in Peoria serves multiple demographics.

Concentration of Low Income Households

While households living in northern Peoria neighborhoods have very low levels of poverty by census track (0-5% of households below the poverty level), areas of southern Peoria have much higher poverty rates. In these areas, as many as 75% of a census track population lives below the poverty level.

Schools and Open Space

Like roadways, schools and parks are public goods. Figure 20 illustrates the distribution of parkland and schools throughout the city. Schools and parks are important destinations for planning the bikeway network.

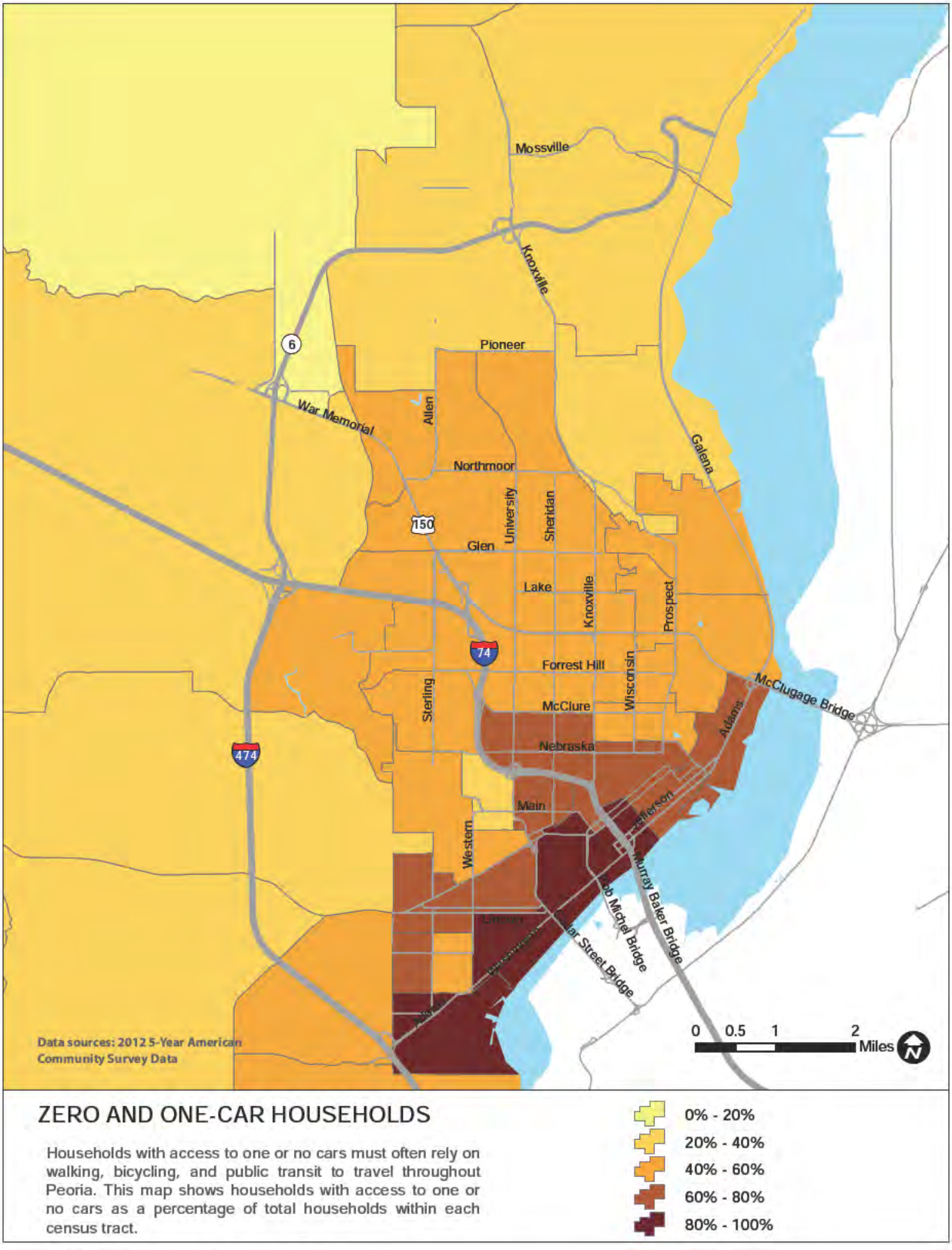


Figure 18. Zero and One-Car Households

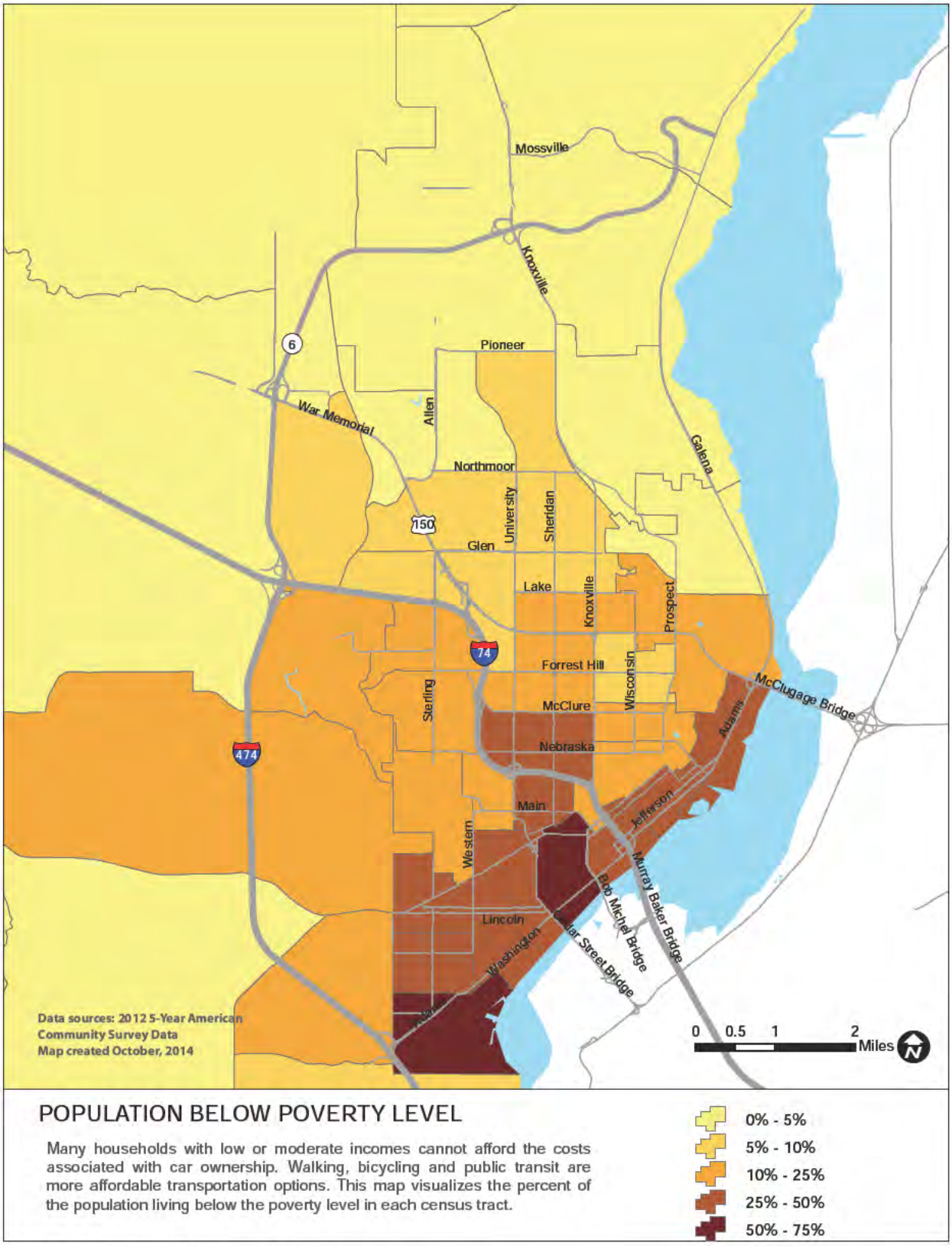


Figure 19. Population Below Poverty Level

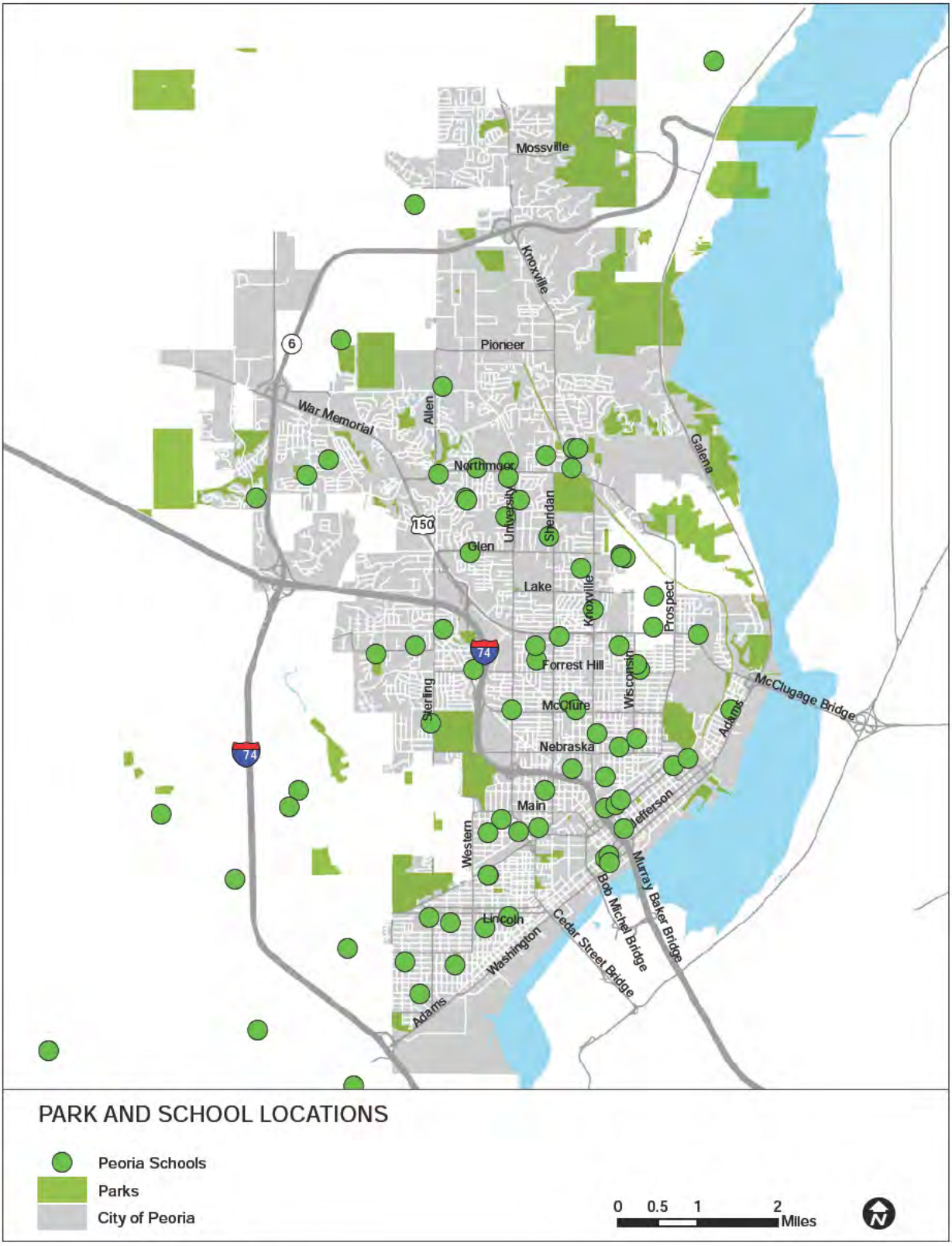


Figure 20. Park and School Locations

Peer City Review

Undertaking a benchmarking and best-practice review helps the City understand its progress in terms of bicycling policies, practices and programs, and build upon these accomplishments by adapting lessons-learned and ideas from other bicycle-friendly peer cities.

This section investigates current practices observed in the following cities with similar characteristics to Peoria:

- Batavia, IL
- Chattanooga, TN
- Dayton, OH
- Fort Wayne, IN
- Grand Rapids, MI
- Normal, IL
- Springfield, MO

These cities are similar in terms of size, governance, geography or other characteristics to Peoria. The cities have varying levels of bicycle-friendliness, yet all are working towards specific and quantitative goals to increase current levels of bicycling.

The following table compares peer cities to Peoria according to a number of different characteristics that affect and demonstrate walk and bicycle-friendliness. The characteristics are pulled from data from the League of American Bicyclists.

Table 2. Peoria's Peer Cities and Bicycle Friendly Community Ratings

Peer City Name	Bicycle Friendly Community Designation (BFC)	Designation Year	Approximate Population	Population Density (in people per square mile)	Total Area (in square miles)	Percent of Arterial Streets with Dedicated Bicycle Facilities	Modal Split of Commuters
Batavia, IL	Bronze	2012	26,000	2,700	9.71	1-25%	Bicycling: 0.42% Walking: 0.96% Transit: 2.95%
Chattanooga, TN	Silver	2014	171,000	1,200	141.0	45%	Bicycling: 0.85%
Dayton, OH	Bronze	2014	142,000	2,500	55.8	2%	Bicycling: 0.85%
Fort Wayne, IN	Bronze	2012	254,000	2,300	110.80	1-25%	Bicycling: 0.41% Walking: 0.99% Transit: 0.94%
Grand Rapids, MI	Bronze	2009	188,000	4,200	45.27	1-25%	Bicycling: 0.41% Walking: 2.27% Transit: 4.33%
Normal, IL	Bronze	2015	53,000	3,000	18.4	1-9%	Bicycling: 1%
Springfield, MO	Bronze	2010	163,000	2,000	82.56	1-25%	Bicycling: 0.79% Walking: 3.96% Transit: 0.90%

Municipal Code Review

An important non-infrastructure analysis for a bicycle plan is a review of the Municipal Code. Understanding the rules and regulations guiding bicycle travel, policies, and enforcement can elicit recommendations that address these issues. The Municipal Code Review studies Code 1957, Article X.- Bicycles and Article IV.- Operation of Vehicles within the City of Peoria's Municipal Code of Ordinances. In certain instances, the City's Code cites State Laws that also apply to bicycles.

This section occasionally references State Law from the Illinois Vehicle Code. These references specify where State Law exists in the absence of local-level regulations.

Table 3. Municipal Code Review

Topic	Existing Policy	Recommendation
OVERVIEW		
Definition of "bicycle"	As defined by Illinois Vehicle Code (625 ILCS 5/1-106): "Every device propelled by human power upon which any person may ride, having two tandem wheels except scooters and similar devices"	Bicycles should be defined as a type of vehicle requiring its own specialized facilities and regulations for safe operation on any highway or street. Use of a bicycle on streets should not be restricted by age.
Bicyclist rights and responsibilities	Sec. 28-496: "Every person riding a bicycle upon a street shall be granted all of the rights and shall be subject to all of the duties applicable to the driver of a vehicle by this chapter, except as to special regulations in this article, and except as to those provisions of this chapter which by their nature can have no application."	This is a good guideline.
DUTIES OF PEOPLE DRIVING MOTOR VEHICLES		
Motorist duties towards bicycles and pedestrians	People driving motor vehicles must "exercise due care to avoid colliding with any pedestrian, or any person operating a bicycle or other device propelled by human power".	Other policies should create more explicit considerations for motorists' safe interactions with non-motorized users.
Mandatory passing guidelines for motor vehicles overtaking bicyclists	Illinois Vehicle Code (625 ILCS 5/11-703) states that: "The operator of a motor vehicle overtaking a bicycle or individual proceeding in the same direction on a highway shall leave a safe distance, but not less than 3 feet, when passing the bicycle or individual and shall maintain that distance until safely past the overtaken bicycle or individual."	This is a good guideline.
Stop required when entering roadway or crosswalk, or when crossing an intersection	Vehicles must stop at stop signs before a marked line, or before a crosswalk in the absence of a stop bar. Regarding yielding: "After slowing or stopping, the driver shall yield the right-of-way to any vehicle in the intersection or approaching on another roadway so closely as to constitute an immediate hazard during the time such driver is moving across or within the intersection" (Code 1957, § 19-71). 'Yield Right-of-Way' signs illustrate intersections which require a motor vehicle driver to reduce their speed to 20 MPH and yield to other vehicles.	Enforcing motorists' responsibility to yield to bicyclists in all situations, including entering a roadway or traveling through an intersection helps protect non-motorized users from collisions. Policy language should also enforce motorists' responsibility to yield to bicyclists when the motorist is turning (discussed later in this table).
Parking in bike lane prohibited	None found.	Prohibiting motor vehicle parking in a bicycle lane would remove potential obstacles from cyclists' paths and reinforce the idea that bicyclists are entitled to the roadway.
Opening vehicle doors	From Illinois Vehicle Code (625 ILCS 5/ Sec. 11-1407.): No person shall open the door of a vehicle on the side available to moving traffic unless and until it is reasonably safe to do so, and can be done without interfering with the movement of other traffic, nor shall any person leave a door open on the side of a vehicle available to moving traffic for a period of time longer than necessary to load or unload passengers.	Opening car doors in the paths of bicycles forces bicyclists to unexpectedly dodge the sudden obstacle and merge into the path of faster moving traffic. Dooring crashes can severely injure or kill cyclists as they are thrown from their bicycles and into traffic. In 2008, the City of Chicago reviewed municipal fine structures and language related to bicycle ordinances. Petty offenses result in $150 fines. Offenses resulting in a bicycle-car crash result in $500 fines.

Table 3. Municipal Code Review (cont.)

Topic	Existing Policy	Recommendation
Motorists' duty to yield when turning	The Code does not mention bicycles when describing the proper placement of motor vehicles making right turns. When turning left, "the driver of a vehicle....shall yield the right-of-way to any vehicle approaching from the opposite direction which is so close as to constitute an immediate hazard" (Code 1957, § 19-71). Bicycles are included in this description, since they are lawfully considered vehicles.	Policy language should enforce motorists' duty to yield to bicyclists when turning left as they would any other situation involving oncoming vehicles. Policy should also prohibit turning right in front of a bicycle. Driver manuals and other materials should indicate proper methods of yielding to bicyclists in these and other scenarios.
DUTIES OF PEOPLE RIDING BICYCLES		
Riding to the right of the roadway	Bicycles must operate, "as close to the righthand side of the roadway as conditions of traffic permit" (Code 1957, § 19-33).	Exceptions should include language giving bicyclists permission to avoid debris, avoid hazardous road conditions, prepare for turning movements, make turning movements, overtake and pass another bicycle or vehicle, and utilize the middle of a narrow lane. In the case of current residential streets or future bicycle boulevard systems, it may not be logical or safe for bicyclists to ride along the right edge of the roadway. When traveling on one-way streets, bicyclists may use the far left travel lane, particularly when planning on turning left, so as not to cross multiple lanes of vehicular traffic. Moreover, current bicyclists must frequently "take the lane" to be most visible in traffic and to avoid being "squeezed out" by passing motorists who pass without leaving a safe and comfortable passing distance.
Regulations about number of bicyclists riding abreast	People riding bicycles shall not ride more than two abreast unless on paths set aside for use by bicycles. Although legal, other provisions for riding two abreast on roadways apply.	Riding two abreast allows riders to travel in a more compact line. This offers safety benefits as passing motorists do not have to spend as much time in the opposite travel lane. The policy language should not discourage riding single file, as there are circumstances when this is safer, such as on roadways with wider vehicular travel lanes where there is more space for passing cars.
Bicycle speed regulation	Ordinances do not outline speed limits for bicycles except as follows, "No person riding a bicycle shall ride faster than is reasonable and proper, having regard to the safety of the rider and others".	This is a good guideline.
Mandatory use of bicycle facilities	None found.	Ideal language would explicitly state that bikes can legally choose to use either a provided sidepath or the roadway, thus protecting cyclists from mandatory use of facilities that do not meet their needs. Facilities with excessive debris or damage may necessitate riders using the roadway instead of adjacent sidepaths.
Mandatory obedience to traffic control devices	Since bicycles are subject to the laws governing vehicles, they must remain obedient to traffic control devices.	This is a good guideline.
Sidewalk riding	Sidewalk riding is prohibited in the business district. The area is marked by signs. When erected by the City Traffic Engineer, these signs prohibit riding on sidewalks. Generally, people riding on sidewalks must yield the right-of-way to pedestrians. In these situations, people riding bicycles have the same rights and duties applicable to pedestrians on sidewalks or crossing a roadway.	Although no policy change is suggested, education about the dangers of sidewalk riding, rather than enforcement is usually more effective. High rates of sidewalk riding generally suggest infrastructure conditions that are unwelcoming or deemed hazardous to riders

Table 3. Municipal Code Review (cont.)

OTHER BICYCLE REGULATIONS		
Lamps and other equipment on bicycles	Guidelines for safety equipment: • Front white headlamp visible from at least 500 feet (when riding at night) • Rear red reflector visible from 100-600 feet. Riders may also add a red light visible from at least 500 feet (when riding at night). • Bicycles must have a brake. • Bicycles must have side reflectors. • Bicycles cannot be sold without peddle reflectors, a side reflector, and a front reflector.	These are good guidelines.
Bicycle registration	Bicycles—other than those with tires of 20 inches or less—must be registered and must hold license tags provided by the Superintendent of Police. The accompanying application costs $0.50.	Mandatory bicycle registration has shown cumbersome and time consuming to enforce in other communities. Communities outside Peoria have experienced police harassment, rider deterrence, lack of enforcement, and high administrative costs needed to cover such programs. The team recommends removing mandatory bicycle registration ordinances.
Mandatory helmet usage	None found.	This is good. Mandatory helmet laws often have the opposite effect of increasing safety. The policies discourage bicycle use. Helmets provide limited protection compared to other tactics, such as building protected facilities to separate vulnerable users from motorized traffic. Poorly fitted helmets offer even less protection. Education is recommended instead of enforcement. Helmet laws require many resources for their enforcement, which agencies could use elsewhere. Although helmet laws for minors could remind parents about their role in encouraging their children's safe bicycling, the legislation can create additional points of conflict between law enforcement and minority communities.
Bicycle parking requirements	Recommended bicycle parking guidelines and suggestions are included within the Heart of Peoria Land Development Code., adopted by the City Council on June 12, 2007.	Consider adopting bicycle parking requirements or the possibility to install bicycle parking as substitutes for motor vehicle parking requirements.

Conclusions

The Code of Ordinance review illustrates that Peoria currently has a number of regulations concerning bicycle travel and operation. Adding additional regulations to clarify motor vehicle drivers' responsibility towards bicycle and pedestrian safety would help enforce traffic safety. Ordinances such as safe passing requirements or obligations to yield to non-motorized users are two such examples.

Existing Opportunities and Constraints

Peoria contains a number of opportunities and constraints to develop a more connected, safe, and comfortable network of on-street and off-street bicycle facilities. The following photo inventory showcases some of these ideas.

Photo Inventory

CONSTRAINT

Downtown streets lack bicycle amenities. Sidewalk riding is often an indication of car-focused streets.

OPPORTUNITY

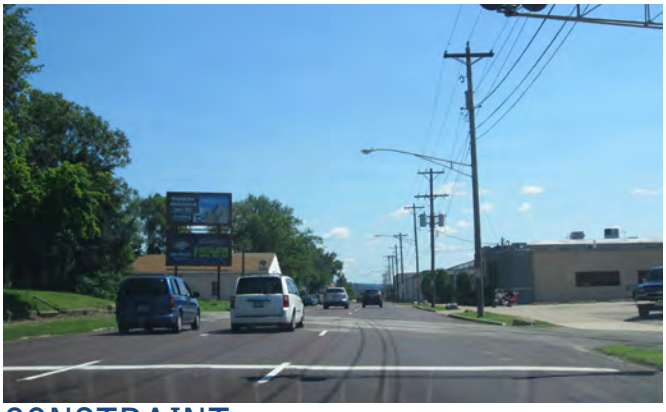
Neighborhood streets do not offer robust connectivity, but are comfortable streets without much car traffic.

CONSTRAINT

Arterial streets lack bicycle facilities. They have high posted speed limits and heavy traffic. They are usually barriers to bicycling except for the most daring bicyclists or those who have no other transportation option.

OPPORTUNITY

The City has already invested in traffic calming endeavors, including bicycle lanes.



CONSTRAINT

Streets may have an abundance of car lanes but no bicycle facilities.

OPPORTUNITY

The University St./MacArthur Highway buffered bi-directional bicycle lane offers comfortable bicycle travel as well as on-street car parking.

CONSTRAINT

The City does not have clear guidelines about work zone policies and bicycle access. This sign was placed in a bike lane, directly in front of a blind corner.

OPPORTUNITY

The Rock Island Trail is a well-used trail that runs through Peoria.

CONSTRAINT

Areas with high potential demand, such as near commercial areas, are frequently inaccessible by bicycle.

OPPORTUNITY

Streets in Peoria featured green pavement coloring well ahead of other communities. The IDOT pilot project still exists on Howett St. and Lincoln Ave.

OPPORTUNITY

The Main/University intersection has become an iconic landmark, featuring innovative stormwater treatment features.

OPPORTUNITY

Peoria has constructed a number of roundabouts, which have pedestrian and bicyclist safety benefits.

OPPORTUNITY

One-way to two-way conversion projects are underway. The projects are opportunities to include bicycle and pedestrian considerations within construction.

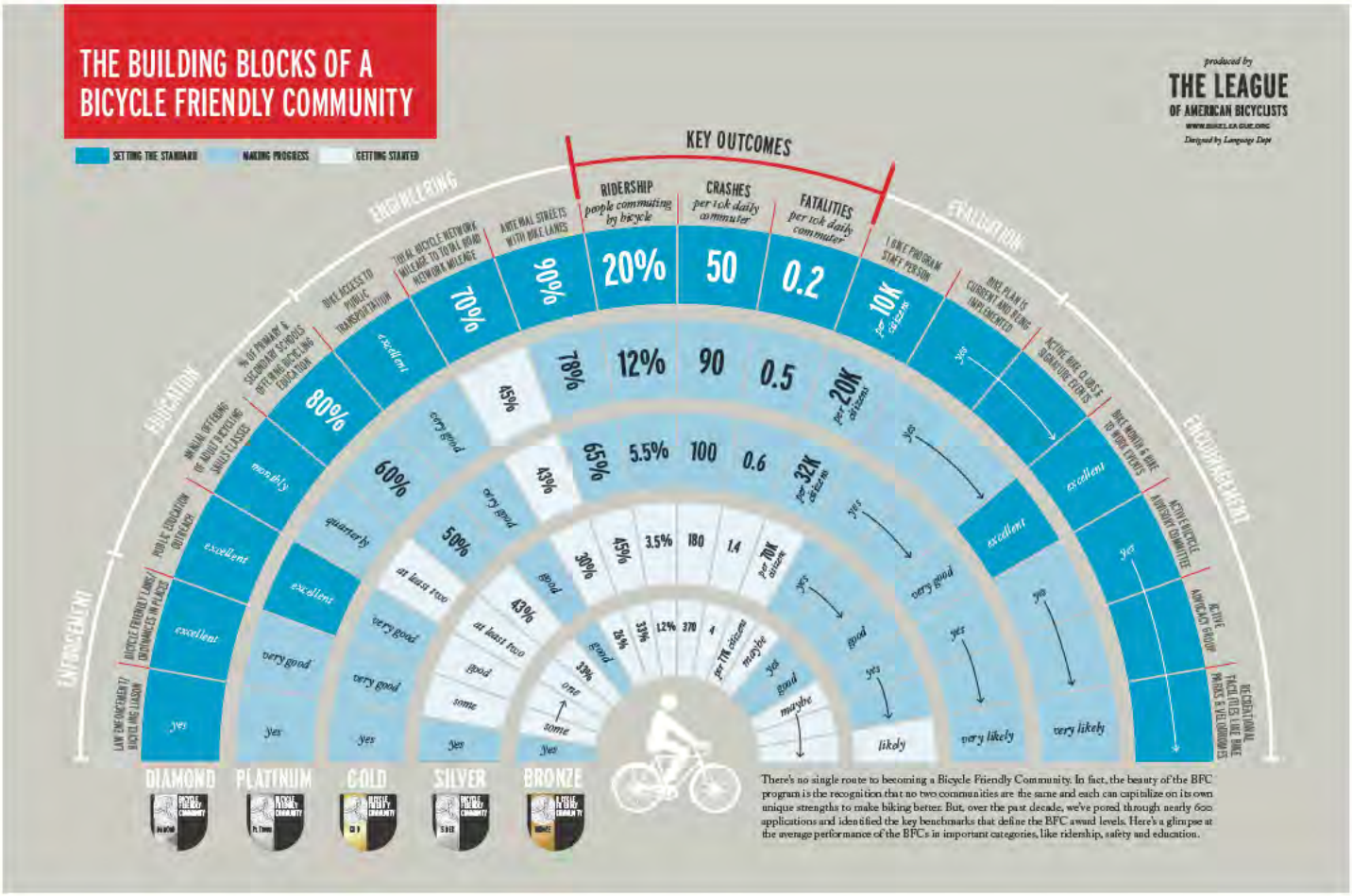
Bicycle Friendly Community Audit

The League of American Bicyclists promotes bicycling through its Bicycle Friendly Community program. If Peoria were to apply, the City could be recognized as a destination for bicycling.

Part of applying for recognition as a Bike Friendly Community involves a detailed audit of a municipality's engineering, education, encouragement, enforcement, and evaluation efforts as they relate to bicycling. This comprehensive inquiry is designed to yield a holistic picture of a community's work to promote bicycling and walking. This section offers a preliminary sample of data points found within bicycle-friendly community audits.

Engineering

- **Positive Aspects:**
  - Experimentation with a variety of design types (i.e.- buffered bike lane on University, green lanes on Howett/Lincoln)
  - New projects such as the Forest Drive road diet
- **Opportunities for Recommended Changes:**
  - Lack of connectivity between bicycle lanes
  - Need for bicycle parking
  - Public input requested greater consistency in bicycle amenity design



The Bicycle Friendly Community program recognizes cities for bicycling initiatives.

Education

- **Positive Aspects:**
  - Bicycle Safety Town is a premier educational facility, with a national reputation for excellence.
- **Opportunities for Recommended Changes:**
  - Additional education about bicyclists for motorists, commercial drivers, law enforcement officers, and others.

Encouragement

- **Positive Aspects:**
  - Bike Peoria is an involved advocacy group that champions the construction of new infrastructure as well as non-infrastructure opportunities. They were key partners during the Plan's development.
- **Opportunities for Recommended Changes:**
  - Implementing a bicycle, transit, walking, and carsharing encouragement program with major employers such as Caterpillar would support employees' transportation options.
  - Implementing such a program within Peoria's residential neighborhoods would encourage transportation options within these areas, particularly within low income and/or traditionally marginalized areas.

Enforcement

- **Positive Aspects:**
  - The City of Peoria Police and Fire Departments attended meetings and gave input throughout the Plan's development.
- **Opportunities for Recommended Changes:**
  - An enforcement "sting" to crack-down on dangerous driving behaviors that endanger bicycles and pedestrians would raise public awareness about the importance of these users' safety.

Evaluation

- **Positive Aspects:**
  - The City keeps record of projects and is aware of project successes and lessons learned.
- **Opportunities for Recommended Changes:**
  - Conducting a counts pilot project using automated equipment or volunteer/staff counters would help evaluate current bicycle ridership levels as well as assist with other planning initiatives.

3: Public Involvement

Public outreach processes help provide forums for citizens to participate in deciding future changes within their community. The team received comments from hundreds of Peoria residents, showing community buy-in for the City's multimodal planning endeavors. In-person and online activities let area residents provide input as well as remain up to date with the planning process. The team used these and other tools to help develop recommendations for creating enhanced connectivity throughout the City.

Outreach activities included: an online survey, an interactive mapping tool, public input and outreach meetings, steering committee meetings, advisory group meetings, and key stakeholder interviews. The survey and mapping tool serve a dual purpose by providing a snapshot of contemporary conditions. If the City successfully implements the Plan's recommendations, citizens' attitudes about their City's level of bicycle-friendliness will differ drastically with those opinions captured here.

This chapter covers the following topics:

- Online Input Survey Results and Findings
- Public Meetings Summary and Input
- Key Stakeholder Interviews
- Advisory Group Input

Online Input Survey Results and Findings

Online surveys let residents quickly provide feedback. **Four hundred and fourteen (414) individuals completed the online survey.** The majority of responses came directly from interested residents who submitted their thoughts through the survey link. Others completed the survey at the public meetings and at the Black Expo held on September 13, 2014. The 24-question survey asked respondents about their perceptions of current conditions, bicycle-related goals for Peoria, and their current use of the bikeway network.

Questions Regarding the Importance of Bicycling and Walking

Peoria residents and other survey respondents feel strongly about the importance of bicycling for the City and for the region. They also recognize current challenges related to comfortably bicycling. Of those surveyed, 62% said current bicycling conditions are "poor"; less than two percent (1.7%) rated them "excellent".

The surveyed population sees a definite need for improved bicycling conditions. Eight in ten respondents say improving bicycling conditions is "very important". Overall, 97.6% of all respondents say improving bicycling conditions is "very important" or "somewhat important".

Community members identify exercise (88%), recreation (84%) and transportation (83%) as the most important benefits to a bicycle system in Peoria. Quality of life benefits and connectivity between neighborhoods are the fourth and fifth most mentioned responses, respectively. The value respondents place on the existing Rock Island Trail and other recreation opportunities may have helped inspire their understanding of bikeway benefits. The majority of respondents use bicycles for exercise (82%) or recreation (72.9%). Transportation received half as many responses (42%) from the respondents, who were allowed to select all applicable responses. These responses indicate as much about the current bikeway system as they do about the respondents themselves. They show that the existing system is oriented towards off-street, primarily recreational travel instead of utility cycling or bicycling to major destinations for routine trips. Less than 1% of respondents said that there are no benefits of a bikeway system.

Current System Challenges

Understanding current deficiencies in the bicycle network results in a deeper understanding of the current transportation system's challenges.

Survey responses echoed findings from public meetings and steering committee meetings: Peoria suffers from disconnected bicycle facilities. Almost 90% of respondents cited lack of connections as one of the five most important factors that would need to be addressed to improve bicycling in the area. This viewpoint far outshone the other choices. Vulnerability to traffic (62%),

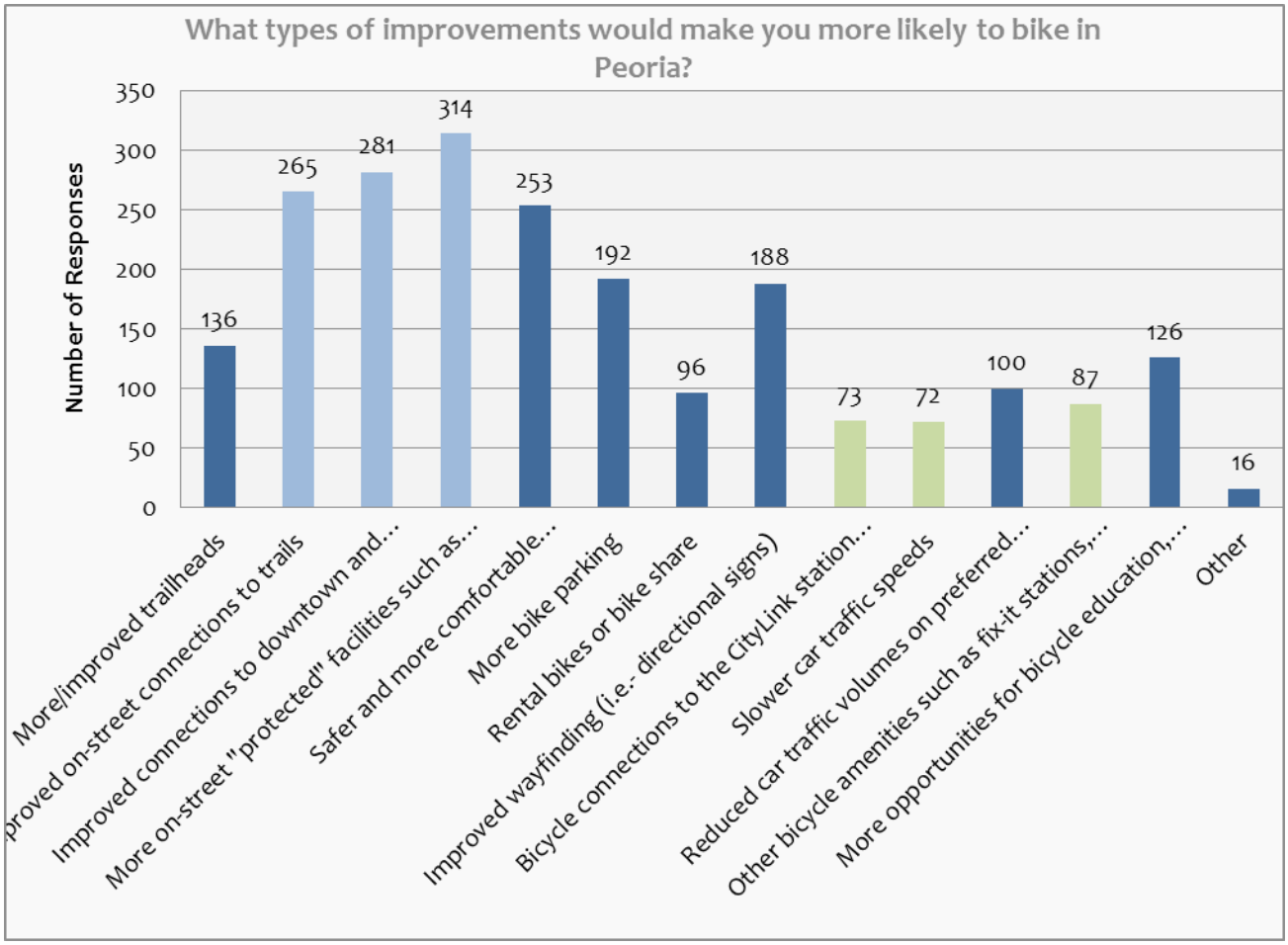


Figure 21.

motor vehicle traffic (58%), and unsafe street crossings (52%) illustrate the current system's reliance on motor vehicle transportation and absence of on-street bike lanes that provide some manner of separation from fast-moving car traffic. Interestingly, although meeting participants sometimes mentioned the area's topography as a discouraging factor (6%), the City's hills received the second to last number of responses, second only to "existing bicycle facilities are crowded" (0.8%).

Bicycle System Preferences

Respondents in Peoria identified strong support for buffered and protected bicycle lanes. When asked "What types of improvements would make you more likely to bike in Peoria?" the most-cited response was: "More on-street "protected" facilities such as buffered bike lanes and cycle track."

Echoing the trend of demanding increased connectivity, respondents chose "Improved connections to downtown and other destinations (such as retail, entertainment, restaurants, work, school, etc.)" and "Improved on-street connections to trails" as the second and third most-mentioned items, respectively.

Residents were particularly adamant about connections to public transportation, colleges/universities, and places of entertainment. These destinations represent the top three responses when asked to rank destinations they would like to reach via bicycle.

Proposed Road Improvements

Roads identified by respondents for bicycle and pedestrian improvements included Radnor Road, Wilhelm Road, War Memorial Drive, Highway 150 (McClugage Bridge), and N. University. Many respondents frequently discussed the Rock Island Trail, particularly:

- The Bridge over Knoxville Ave.
- Extending the Greenway over War Memorial Drive and connecting the segment to the riverfront trail.
- Connections with Pioneer Parkway and/or expanding sidewalks on Pioneer Parkway.
- Connections to the airport from the trail.
- Better bicycle travel to Dunlap. Cyclists frequently drive cars to Dunlap instead of riding their bicycles north.

Respondents' proposed routes and destinations suggest latent demand for bicycle facilities. Although 44.4% described themselves as "Enthused and Confident", the second-most represented cycling typology came from the "Interested but Concerned" group. The latter group self-describe themselves as comfortable riding on trails and greenways yet nervous riding on-street.

Peoria would substantially increase bicycling activity by connecting existing on-street facilities with new infrastructure that is safe, comfortable, and intuitive.

Public Meetings Summary

The team held three public outreach and input events during the Plan process. The first occurred on August 27th at Northwoods Community Church. The second occurred on August 28th at Bradley University. The two locations were strategically chosen to appeal to residents in varying areas of the city. The third meeting occurred after preliminary network recommendations were made. This meeting occurred on March 12th at the Gateway Building, in Downtown Peoria.

Each meeting began with a brief presentation by the consultant team. At the first two meetings, participants were invited to break into smaller groups to provide opinions about existing conditions and desired changes to existing infrastructure and programmatic opportunities. One team member was stationed at each table. The team member was tasked with guiding the participants through a list of questions about their experiences in Peoria. They were also instructed to invite participants to mark up blank maps of Greater Peoria's existing infrastructure.

Nearly 30 people attended each of the first two meetings. The list below provides thoughts about improvements that were common to both meetings:

- Existing bike lanes lack connectivity to one another and to key destinations.
- Major arterials lack bike lanes, although they hold opportunity to add more protected facilities. Neighborhood streets do not offer connections to destinations or to other neighborhoods.
- More bike lane maintenance is needed to clear glass, other debris, and snow.
- Existing signage does not intuitively guide bicycle users through the City's streets.
- Bike lane designs are not consistent. Travel lanes without bicycle lanes frequently have speed limits that deter bicycle travel.

Additionally, participants frequently mentioned the need for accommodation on the McClugage Bridge. IDOT intends to construct a multi-use path here in the near future.

At the third meeting, over 30 attendees spoke about specific proposed recommendations after the study team's presentation. Participants responded positively to the citywide recommendations. Attendees noted that downtown, Bradley University, and the Rock Island Trail areas are very important due to their ability to build on existing cycling opportunities. Sheridan Road was preferred as a north-south bicycle corridor, while spot intersection improvements around the Rock Island Trail were identified as key possibilities. Attendees desired continuity and consistency in bicycle accommodations so that future cyclists feel confident in knowing that the future bicycle network has connectivity across the City. Finally, attendees agreed on the need for future educational initiatives to explain to drivers and cyclists how to share the road.

Stakeholder Interviews

The team conducted phone interviews with key stakeholders throughout the planning process. The interviews were designed to give these stakeholders a chance to voice their opinions related to the Plan's development. Interview participants comprised individuals from a variety of fields to spark connections with individuals from outside of transportation planning.

A mother and daughter comment on proposed improvements at a public meeting.

Residents investigating possibilities for bicycle improvements throughout Peoria.

Stakeholders defined a successful plan as one that can quickly lead to "on the ground" changes for all, including low-income residents and children. They were earnest about the Plan acting as a paradigm shift within City departments who have traditionally tended to focus on automobile-oriented land use and transportation planning patterns. One mentioned the fact that Peoria has built its reputation on its ability to move citizens to any desired destination within 20 minutes by car. Although some current efforts are facing backlash, the interview participants commended the City for starting to reverse these trends.

Participants discussed opportunities for bicycling including:

- Connections using Springdale Cemetery
- Better connections to and from Union Hill (currently highly utilized, despite the incline)
- Future designs should think "big". The City needs statement projects; otherwise added standard lanes could be lost in the shuffle.
- East Bluff could have high opportunity for increased bicycling because it has an existing street grid.

Non-infrastructure-focused recommendations include:

- Safe Routes to School programming
- Better/increased use of Peoria's Safety Town
- Motorist education regarding safe motor vehicle operation near bicyclists
- Bicyclist education—particularly about wrong-way riding and similar behaviors

Online Interactive Map Summary

The project team developed an online input map to provide Peoria residents with a creative and engaging way to share their ideas for improving bicycling conditions throughout the City. Visitors to the online map identified roads that they are using or would like to use but in need of improvements, gaps in the bicycle network, dangerous roads and intersections for bicycling, and common destinations for bicyclists.

The input map also allowed users to comment on other users' suggestions, creating a conversation and sharing of ideas that you often see at public meetings.

More than 250 people viewed the map, resulting in 306 suggestions. Adams Street, Jefferson Avenue, and Main Street are locations that people would like to use by bike in order to reach downtown destinations. On the east side of downtown, respondents desired a better connection to the Rock Island Trail.

Sheridan Road, with schools and shopping centers along its route, is a connection that bicyclists would enjoy taking to the north and south sides of the city. Since it is not currently bike-friendly, many bicyclists are forced to ride on the sidewalk to avoid dangerous intersections, primarily around War Memorial Drive. Perpendicular to Sheridan Road is Forest Hill Ave, an east-west connection in Central Peoria, identified as a strong bicycle route to Westlake Shopping Center and Northwoods. It is already heavily used by bicyclists but found too dangerous by respondents.

Participants noted that Knoxville Ave provides a direct connection to the Rock Island Trail and Junction City shopping center. Although not currently used, visitors expressed desire to travel that route given proper bike improvements. In the same token, visitors of the online map expressed their concern with the intersection of Sterling, Glen Ave and War Memorial Dr as it is a very difficult intersection to cross and the streets uncomfortable to ride on. Many consider Glen Ave a potential east-west connection to Peoria Heights Schools and the shopping mall districts near War Memorial and Sterling. Riders are avoiding it though given the condition of the road, high vehicular speed and overgrown landscape.

Along and near the Rock Island Trail just east of Allen Rd, there are several key destinations such as schools, concert venues, bars and shopping that visitors would like to access. They are interested in better connecting the trail to local streets. Another key destination for shopping, dining and recreation in the area is at the intersection of War Memorial Dr and Koerner Rd. Many bicyclists see the benefit of using both roads to travel around the city but only if improvements are made.

In addition to this summary of key points, the online mapping tool is incorporated into the study team's GIS analysis. The digital routes and destinations suggested by participants are integrated into GIS to create a robust picture of existing conditions and future improvements.

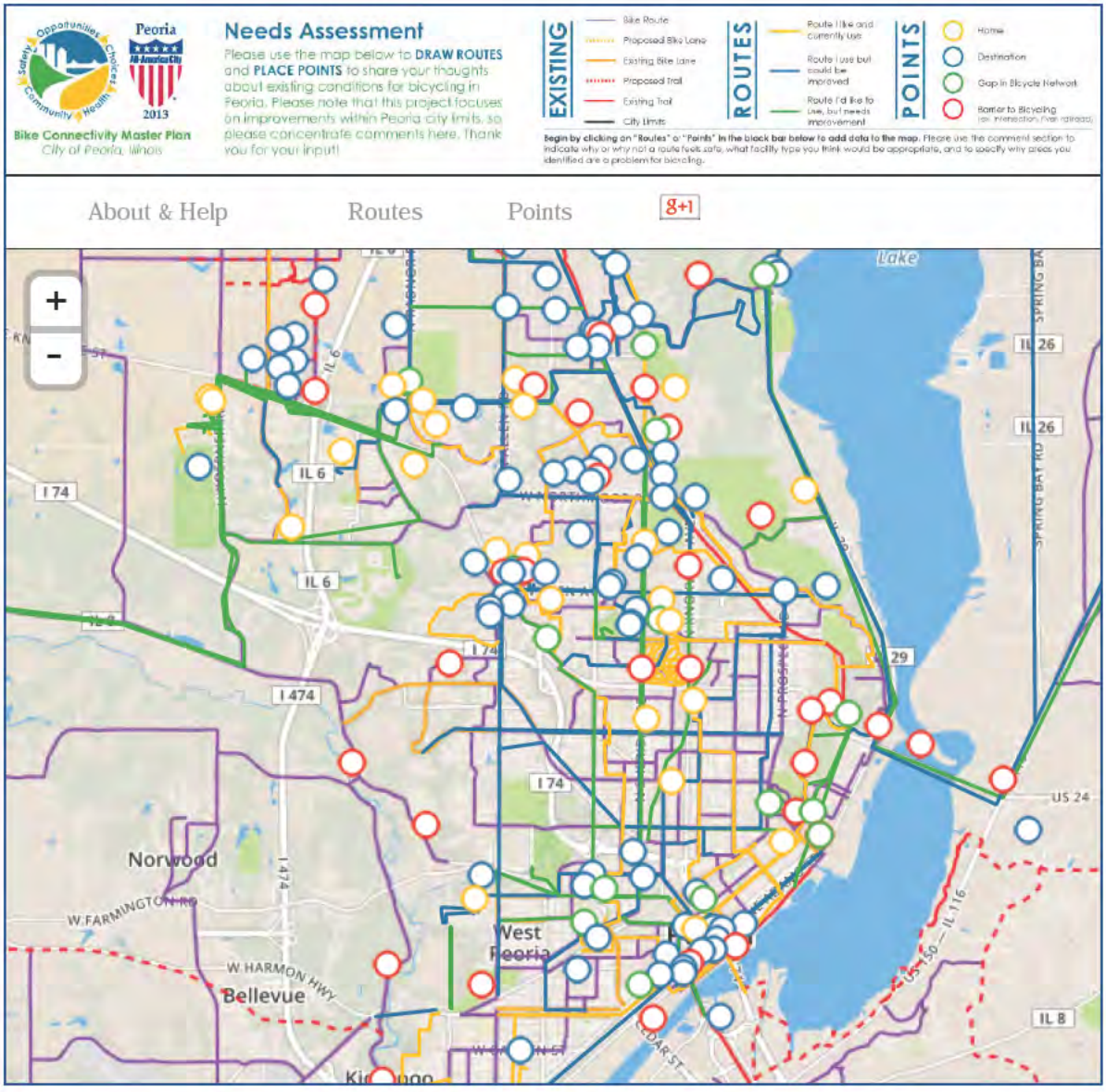


Figure 22. Hundreds of Peoria residents participated in the online interactive mapping exercise.

4: Recommendations

The recommendations presented in this chapter are informed by:

- The existing conditions analysis
- Public input
- Stakeholder and Advisory Committee Input
- Fieldwork observations
- Quantitative analysis using geographic information systems computer software (GIS)
- Best practices from other cities

Existing roadway characteristics such as traffic volume, crashes, roadway width, posted speed limit, jurisdiction, and truck routes helped determine proposed networks. Network development also takes the following factors into account:

- Directness of routes
- Barriers
- System connectivity for residents and visitors of all ages and abilities
- Potential routes' connection to multiple destinations, (i.e.- parks and schools) land uses and neighborhoods

The recommendations presented in this chapter develop a system of comfortable bicycle facilities. These facilities are intended to be comfortable even for residents who do not currently use bicycles for transportation. Associated improvements will further assist residents by lowering bicyclists' actual and perceived risk within these areas.

Building upon existing amenities will invite more people to bike throughout Peoria for utilitarian needs and for recreation. If streets are made with bicycling in mind, they will quickly integrate with the rest of Peoria's transportation system.

This section includes recommmendations to help make Peoria's transportation network inviting to people of all ages.

Types of Bicycle Infrastructure

The following section describes frequently used tools for developing bikeway networks.

Table 4. Types of Bicycle Infrastructure

Facility Type	Intended User	Recommended Roadway Typology	Key Details
Shared Use Path	Bicycles (road, mountain, or other varieties, depending on the surface) Pedestrians	Off-street Major arterials and collectors (sidepath)	Also called a greenway, trail, or sidepath. Usually located adjacent to one side of the road, sidepaths are bidirectional and intended for bicyclists and pedestrians.
Protected Bike Lane	Bicycles	Major arterials and collectors	Also called separated bike lane or cycletrack. Provides protection from motor vehicles vy placing physical obstacles (i.e.- vertical posts, planters, parked cars) between people biking and people driving.
Buffered Bike Lane	Bicycles	Major arterials and collectors	Provides more distance from cars than do standard bike lanes. Buffer design may take a variety of shapes and placements, depending on the project.
Bike Lane without Buffer ("Standard" Bike Lane)	Bicycles	Wider residential streets, minor arterials and collectors	Provides some distance between people driving and people biking. "Standard" bike lanes offer space for bicyclists. However, when used alongside busier roadways, they may be less welcoming to timid riders than separated bike lanes
Bike Boulevard	Bicycles	Residential areas	A variety of traffic calming measures and on-street pavement markings help facilitate low-stress travel through residential areas.
Shared Lane Markings	Bicycles	Street connections that can not accomodate other bicycle facility	Also called sharrows.

A variety of infrastructure tools help create vibrant biking cities. Corridors that are stressful to bike along--with high traffic volumes, high posted speeds, multiple travel lanes--require greater separation between people biking and people driving. Calmer streets--such as those in Peoria's residential areas-- have less car traffic and lower speeds. These may already be comfortable spaces to bike. Facility types that encourage roadway "sharing", such as bicycle boulevards are generally appropriate options.

Off-street infrastructure options:

Shared Use Path

Trail

Sidepath

On-street infrastructure options:

More separation from car traffic

Protected Bike Lane

Buffered Bike Lane

Bike Lane

Bike Boulevard

Less separation from car traffic

The team used a two-fold decision-making process when deciding on network recommendations. The process involved analyzing street connectivity and opportunities to provide improved connections to destinations and residences. Next, the team analyzed each corridor to develop facility type recommendations. This involved assessing the existing street environment as well as desired design outcomes, such as lower instances of vehicular speeding and collisions between motorists and vulnerable users.

Bikeway Considerations

The Plan's overall goal is to increase the bicycle-friendliness of the entire system. The team created recommendations by assessing the following elements:

Safety

Corridors and intersections with high numbers of crash locations, compared to other streets throughout the system.

Latent and Existing Demand

Proximity to high-demand destinations, as revealed in the live, work, and play analysis. Some of these high demand areas are currently difficult to reach by foot or by bike.

Public Input

Residents who participated in the public input process particularly valued safety, connectivity, and access to downtown and other great destinations. Many enjoy the Rock Island Greenway and desire similar safe bicycling conditions throughout the city.

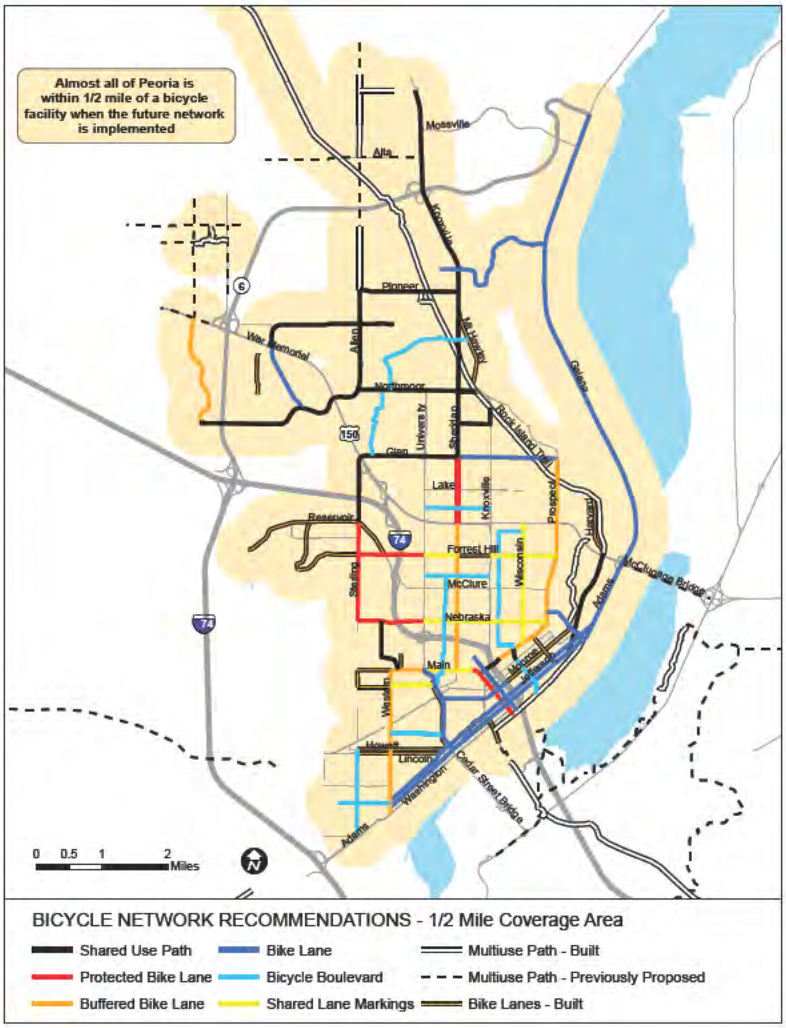


Figure 23.

Figure 24. Public input revealed a strong desire for Sheridan Road to become a comfortable bikeway. Improvements to Sheridan are a priority.

Map of Recommendations

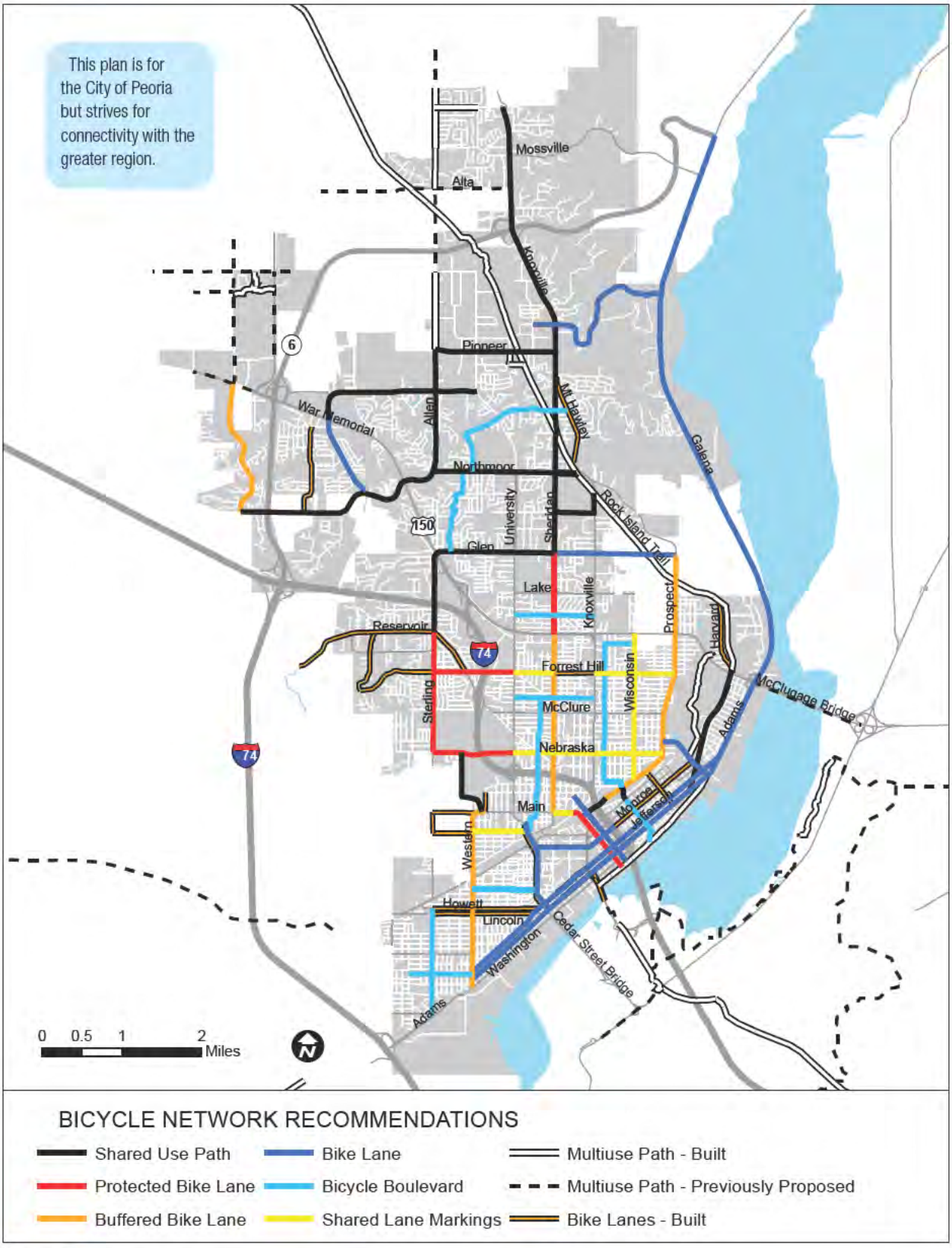


Figure 25.

Table of Recommendations

Table 5. Recommendations

Name	From	To	Improvement	Miles
Abington St	Prospect Rd	Adams St	Bike Lane	0.7
Adams St / IL-29 / US-24	Western Ave	War Memorial Drive	Bike Lane	5.2
Big Hollow	War Memorial Dr	Charter Oak	Bike Lane	1.0
Bradley	Western	University St	Shared Lane Markings	0.7
Bradley / Frink / Windom	University	Main	Bicycle Boulevard	0.3
Broadway	Main St	Hanssler	Bicycle Boulevard	1.5
Charter Oak	Orange Prairie	Big Hollow	Shared Use Path	1.7
Charter Oak / Allen Rd	Big Hollow	Pioneer Pky	Shared Use Path	2.6
Crestwood	University St	Knoxville	Bicycle Boulevard	1.0
Detweiller Dr	Knoxville Ave	Galena Rd	Bike Lane	2.1
Forrest Hill	Knoxville Ave	Prospect Rd	Shared Lane Markings	1.0
Forrest Hill	University St	Sheridan Rd	Shared Lane Markings	0.5
Forrest Hill	Sterling Ave	University St	Protected Bike Lane	1.0
Galena Rd	Il Rt 6	War Memorial Dr	Bike Lane	7.3
Glen Ave	Sheridan Rd	Prospect Rd	Bike Lane	1.5
Glen Oak	Berkeley	Nebraska Ave	Buffered Bike Lane	0.9
Glen Oak	Hamilton	Berkeley	Shared Use Path	0.3
Glen Oak	Main St	Hamilton	Bike Lane	0.1
Griswold St	Montana St	Howett St	Bicycle Boulevard	1.3
Hanssler	University St	Knoxville	Bicycle Boulevard	1.0
Hayes	Folkers`	Western	Bicycle Boulevard	0.8
Imperial / Teton	Northmoor Rd	Knoxville	Bicycle Boulevard	1.9
Irving / Wayne	Water	Glendale Ave	Bicycle Boulevard	0.7
Jefferson	Western Ave	Adams St	Bike Lane	4.1
Knoxville Ave	Giles	Hickory Grove	Shared Use Path	4.2

Table 5. Recommendations (cont.)

Name	From	To	Improvement	Miles
Knoxville Ave	Sheridan Rd	Prospect Rd	Shared Use Path	0.7
Macarthur Hwy	Main St	Adams St	Bike Lane	1.4
Main St	Water	North	Protected Bike Lane	0.9
Main St	University St	North	Shared Lane Markings	0.8
Martin / McBean	Western	MacArthur Hwy	Bicycle Boulevard	0.8
Nebraska Ave	University St	Prospect Rd	Shared Lane Markings	1.9
Nebraska Ave	Sterling Ave	University St	Protected Bike Lane	1.0
New York / Pennsylvania	Wayne	Peoria	Bicycle Boulevard	0.3
Northmoor Rd / CR-D 38	Allen Rd	Knoxville Ave	Shared Use Path and Marked Route thru neighborhood	1.8
Orange Prairie	Charter Oak	War Memorial Dr / US-150	Buffered Bike Lane	1.8
Peoria / Embert	Pennsylvania	Wisconsin	Bicycle Boulevard	2.1
Pioneer Pky	Allen Rd	Knoxville Ave	Shared Use Path	1.5
Prospect Rd	Glen Ave	Nebraska Ave	Buffered Bike Lane	2.5
RB Garrett / Monroe	Mac Arthur HWY	Spalding Ave	Bike Lane	1.1
Rock Island Trail Connector	Adams St	War Memorial Dr	Shared Use Path	1.6
Ronald / Renwood	Glen Ave	Northmoor Rd	Bicycle Boulevard	1.2
Sheridan Rd	Main St	War Memorial Rd / US-150	Buffered Bike Lane	2.2
Sheridan Rd	Glen Ave	Knoxville Ave	Shared Use Path	1.5
Sheridan Rd	War Memorial Rd / US-150	Glen Ave	Protected Bike Lane	1.0
Sterling Ave	Nebraska Ave	Reservoir	Protected Bike Lane	1.5
Sterling Ave / Glen Ave	Reservoir	Sheridan Rd	Shared Use Path	2.5
Wayne	Glendale Ave	New York	Shared Use Path	0.2
Western Ave	Hayes	Bradley	Buffered Bike Lane	2.0
Willow Knolls	War Memorial Dr	University St	Shared Use Path	2.2
Wisconsin Ave	Glen Oak	War Memorial Dr / US-150	Shared Lane Markings	1.8

Bicycle Facility Recommendations

From shared lane markings to cycle tracks, bicycle facilities vary greatly in character, context, and intended user. The bicycle facility types pictured here are recommended in the Plan and are described in detail in the Facility Design Guide section of this document. The Plan recommends approximately 80 miles of bicycle facilities.

Bicycle Wayfinding

Landmarks, destinations, neighborhood business districts, natural features, and other visual cues help residents and visitors navigate through Peoria. However, many of the recommended bicycle routes utilize less familiar, lower-volume roadways that people may not typically use while traveling by bus or car. The placement of wayfinding signs throughout the City will indicate to bicyclists their direction of travel, location of destinations, and the distance (and travel time by bike) to those destinations, in turn increasing comfort, convenience, and utility of the bicycle network. Wayfinding signs also provide a branding element to raise the visibility of the City's growing active transportation network.

Peoria will benefit from an on-street wayfinding signage system for use along bicycle facilities. Signage can serve both wayfinding and safety purposes, including:

- Helping to familiarize users with the bikeway system;
- Helping users identify the best routes to destinations;
- Helping to address commonly-held perceptions about travel time and distance;
- Helping overcome a "barrier to entry" for people who do not bicycle often and who fear becoming lost; and
- Alerting motorists that they are driving along a bicycle route and should use caution.

Wayfinding signs like these can include popular destinations and associated distances and travel times, making it easier for people to travel by bicycle.

Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Peoria should create a community-wide Bicycle Wayfinding Signage Plan that identifies:

- Sign locations along existing and planned bicycle routes;
- Sign type – what information should be included and what is the sign design;
- Destinations to be highlighted on each sign – key destinations for bicyclists; and
- Approximate distance and riding time to each destination.

The wayfinding system can utilize MUTCD guidance with branded elements that identify regional and local network facilities and distinguish signature trails and network elements.

End-of-Trip Facilities

End-of-trip facilities are an integral component of a successful, functional bicycle network. Without safe, secure and convenient bicycle parking, many residents and visitors will choose other means of transportation, viewing the lack of bicycle parking as a significant deterrent. Peoria has installed bicycle racks in City parks, commercial districts, and other locations throughout the community. The City should continue to increase bicycle parking supply with secure, attractive, and highly visible bicycle parking facilities, including short-term bicycle parking solutions like racks and corrals, and long-term solutions like secure parking areas.

Bicycle Share

Bicycle share systems are emerging across the United States as innovative programs to increase active transportation for short trips. Bicycle share systems consist of a fleet of bicycles located throughout a service area that can be checked out and returned to any other station within the service area. These systems can be implemented citywide or at a smaller scale, such as in the downtown or other areas with higher employment and residential densities. The City should undertake efforts to study the feasibility of a bicycle share system to increase bicycle transportation, diversify transportation choices, and build Peoria's brand as an active community.


STOP
ONLY

5: Implementation

Network Prioritization

The City of Peoria is a public agency, responsible for the efficient, effective, and values-driven expenditure of taxpayer dollars. Non-motorized infrastructure projects and programs must compete with other capital improvements and municipal services, as well as with one another, for limited internal and external resources. In order to maximize investment and provide the greatest benefit, the City of Peoria should pursue a prioritized approach to non-motorized transportation infrastructure investment and plan implementation. Each bicycle facility project has been assigned a score according to its ability to address certain prioritization criteria.

These criteria, found in Table 6, are based on the Plan's goals, input from the community, and feedback from stakeholders. The resulting scores were then used to group the recommended segments into three priority levels: high-priority projects, medium-priority projects, and low-priority projects. These priority levels are not intended to rigidly divide the projects into exclusive groups for the purpose of project phasing. Instead, these priority levels provide insight into which projects will have the most significant impact on the community.

Table 6. Network Prioritization Criteria

Criteria	Description	Ranking
Safety	The project will help improve areas with past bicycle and pedestrian crashes.	Good = 2 ; Fair = 1; Poor = 0 Ranking x 2 for greater weighting
Connectivity to existing facilities	The project will help build the overall network. This was a top priority identified in public input.	Good = 2 ; Fair = 1; Poor = 0 Ranking x 2 for greater weighting
Proximity to schools	The project will have value to school travel, connecting directly or indirectly to a school.	Good = 2 ; Fair = 1; Poor = 0
Proximity to parks	The project will connect directly or indirectly to a park.	Good = 2 ; Fair = 1; Poor = 0
Connectivity to proposed facilities	The project will ultimately impact and connect to the overall network.	Good = 2 ; Fair = 1; Poor = 0
Connections to Activity Centers	The project will make it easier to access important destinations such as job hubs, shopping centers, and civic buildings.	Good = 2 ; Fair = 1; Poor = 0
Ease of Implementation	The project's potential cost, right-of-way impacts, and roadway impacts.	Good = 2 ; Fair = 1; Poor = 0

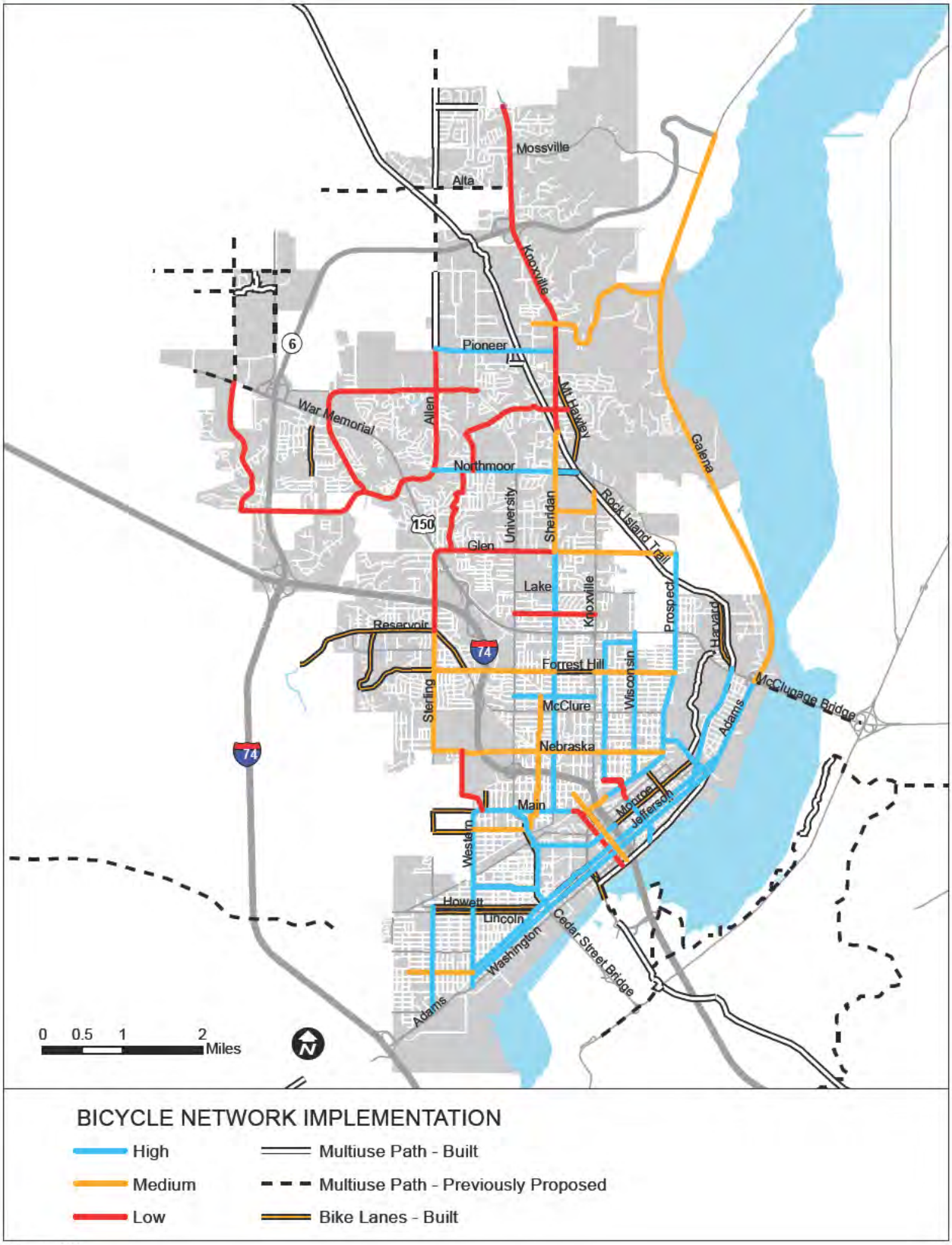

Mossville
Alta
Knoxville
Pioneer
War Memorial
Allen
Mt Hawley
Galena
Northmoor
University
Sheridan
Rock Island Trail
150
Glen
Lake
Knoxville
Prospect
Harvard
Reservoir
74
Forrest Hill
Wisconsin
McClugage Bridge
Sterling
McClure
Adams
Nebraska
Main
Monroe
Jefferson
Western
Howett
Lincoln
Washington
Cedar Street Bridge
Adams
0 0.5 1 2 Miles
N
BICYCLE NETWORK IMPLEMENTATION
High
Medium
Low
Multiuse Path - Built
Multiuse Path - Previously Proposed
Bike Lanes - Built

Figure 26.

General Costs and Implementation Prioritization Tables

Table 7.

Facility Type	Cost Per Mile	Miles	Total Cost Range	Description
Shared Use Path	$200,000 - $1,800,000	21	$4,000,000 - $38,000,000	The cost for paved multi-use trails can vary significantly based on path width, surface type, buffer, bridge structures, soil conditions, earthwork, grading, base, retaining walls, utilities, signs, and supporting amenities like benches, lighting, and landscaping. The most influential factors affecting the cost of sidepath construction are the presence of existing sidewalks, width and number of curb cut, intersection crossings. When programmed and constructed as part of a larger capital improvement, like a new roadway or roadway reconstruction, the costs will be lower than if the sidepath were to be constructed independently.
Protected Bike Lane	$150,000 - $325,000	6	$900,000 - $2,000,000	Protected bike lane costs include pavement markings and striping, flex post bollards, signs, minimal traffic calming treatments, and colored pavement. Price ranges reflect the price differences in material type and quality.
Buffered Bike Lane	$50,000 - $100,000	9	$450,000 - $900,000	Buffered bicycle lane cost estimates include pavement markings, striping and signage. Price ranges reflect the differences in material type and quality, particularly for pavement markings and striping.
Bike Lane	$30,000 - $70,000	25	$750,000 - $1,750,000	Standard bicycle lane cost estimates include pavement markings, striping and signage. Price ranges reflect the differences in material type and quality, particularly for pavement markings and striping.
Bike Boulevard	$60,000 - $150,000	13	$800,000 - $2,000,000	Cost estimates for bicycle boulevard projects include signage, pavement markings (shared lane markings), and intersection treatments to improve bicycle and pedestrian safety and connectivity. Specific traffic calming features will vary, but may include mini traffic circles, median refuge island, traffic diverter, or curb extensions.
Shared Lane Markings	$12,000 - $24,000	6	$70,000 - $150,000	Cost estimates for shared lane marking projects include signage and pavement markings.
Total		80	$7M - $45M	Note: Shared use paths and sidepaths are significantly more expensive than other treatments. $3M - $7M is the cost total for the other treatments separately.

Table 8. Implementation Prioritization

Name	From	To	Type	Miles (Rounded)	Schools	Parks	Bike/Ped Crash	Connect to Proposed	Connect to Activity Centers	Connect to Existing	Implementation	Construction Estimate (Low)	Construction Estimate (High)	Maintenance Estimate (Low)
High Priority														
Abington St	Prospect Rd	Adams St	Bike Lane	0.8	Good	Good	Fair	Good	Poor	Good	Fair	$24,000	$56,000	$1,600
Adams St / IL-29 / US-24	Western Ave	War Memorial Drive	Bike Lane	5.3	Fair	Fair	Good	Good	Good	Good	Fair	$159,000	$371,000	$10,600
Glen Oak	Berkeley	Nebraska Ave	Buffered Bike Lane	1.0	Good	Poor	Good	Good	Good	Good	Fair	$50,000	$100,000	$3,000
Griswold St	Montana St	Howett St	Bicycle Boulevard	1.4	Good	Fair	Good	Fair	Poor	Good	Good	$84,000	$210,000	$1,750
Hanssler	University St	Knoxville	Bicycle Boulevard	1.1	Good	Poor	Good	Good	Good	Poor	Good	$66,000	$165,000	$1,375
Irving / Wayne	Water	Glendale Ave	Bicycle Boulevard	0.7	Fair	Fair	Fair	Good	Good	Good	Fair	$42,000	$105,000	$875
Jefferson	Western Ave	Adams St	Bike Lane	4.2	Good	Fair	Good	Good	Good	Good	Fair	$126,000	$294,000	$8,400
Macarthur Hwy	Main St	Adams St	Bike Lane	1.5	Poor	Good	Good	Good	Fair	Good	Fair	$45,000	$105,000	$3,000
Main St	University St	North	Shared Lane Markings	0.8	Poor	Poor	Poor	Good	Good	Poor	Good	$9,600	$19,200	$800
Martin / McBean	Western	MacArthur Hwy	Bicycle Boulevard	0.9	Fair	Good	Good	Fair	Poor	Good	Fair	$54,000	$135,000	$1,125
Northmoor Rd / CR-D 38	Allen Rd	Knoxville Ave	Shared Use Path	1.9	Good	Good	Good	Good	Poor	Good	Poor	$380,000	$3,420,000	$19,000
Peoria / Embert	Pennsylvania	Wisconsin	Bicycle Boulevard	2.2	Good	Poor	Good	Good	Fair	Fair	Good	$132,000	$330,000	$2,750
Pioneer Pky	Allen Rd	Knoxville Ave	Shared Use Path	1.6	Fair	Fair	Good	Good	Fair	Good	Poor	$320,000	$2,880,000	$16,000
Prospect Rd	Glen Ave	Nebraska Ave	Buffered Bike Lane	2.6	Good	Good	Good	Good	Fair	Good	Fair	$130,000	$260,000	$7,800

Table 8. Implementation Prioritization (cont.)

Name	From	To	Type	Miles (Rounded)	Schools	Parks	Bike/Ped Crash	Connect to Proposed	Connect to Activity Centers	Connect to Existing	Implementation	Construction Estimate (Low)	Construction Estimate (High)	Maintenance Estimate (Low)
RB Garrett / Monroe	Mac Arthur Hwy	Spalding Ave	Bike Lane	1.2	Poor	Fair	Good	Fair	Good	Good	Fair	$36,000	$84,000	$2,400
Rock Island Trail Connector	Adams St	War Memorial Dr	Shared Use Path	1.7	Good	Good	Fair	Good	Good	Good	Fair	$340,000	$3,060,000	$17,000
Sheridan Rd	Main St	War Memorial Rd / US-150	Buffered Bike Lane	2.3	Good	Poor	Good	Good	Good	Good	Good	$115,000.00	$230,000.00	$6,900.00
Sheridan Rd	War Memorial Rd / US-150	Glen Ave	Protected Bike Lane	1.1	Good	Poor	Good	Good	Good	Poor	Fair	$165,000.00	$357,500.00	$4,400.00
Western Ave	Hayes	University	Buffered Bike Lane	2.6	Good	Fair	Good	Good	Good	Good	Fair	$130,000.00	$260,000.00	$7,800.00
Wisconsin Ave	Glen Oak	War Memorial Dr / US-150	Shared Lane Markings	1.9	Good	Poor	Fair	Good	Good	Fair	Good	$22,800.00	$45,600.00	$1,900.00
Medium Priority														
Bradley	Western	University St	Shared Lane Markings	0.7	Good	Poor	Fair	Fair	Good	Poor	Good	$8,400.00	$16,800.00	$700.00
Bradley / Frink / Windom	University	Main	Bicycle Boulevard	0.4	Fair	Poor	Fair	Fair	Good	Fair	Fair	$24,000.00	$60,000.00	$500.00
Broadway	Main St	Hanssler	Bicycle Boulevard	1.5	Fair	Poor	Good	Good	Fair	Poor	Fair	$90,000.00	$225,000.00	$1,875.00
Detweiller Dr	Hale Ave	Galena Rd	Bike Lane	2.3	Poor	Good	Fair	Fair	Fair	Good	Fair	$69,000.00	$161,000.00	$4,600.00
Forrest Hill	University St	Sheridan Rd	Shared Lane Markings	0.6	Fair	Poor	Poor	Good	Fair	Good	Good	$7,200.00	$14,400.00	$600.00
Forrest Hill	Knoxville Ave	Prospect Rd	Shared Lane Markings	1.1	Good	Poor	Poor	Good	Fair	Good	Good	$13,200.00	$26,400.00	$1,100.00
Forrest Hill Ave	Sterling Ave	University St	Protected Bike Lane	1.1	Fair	Fair	Good	Poor	Good	Good	Poor	$165,000.00	$357,500.00	$4,400.00
Galena Rd	Il Rt 6	War Memorial Dr	Bike Lane	7.4	Poor	Good	Fair	Good	Fair	Fair	Fair	$222,000.00	$518,000.00	$14,800.00

Table 8. Implementation Prioritization (cont.)

Name	From	To	Type	Miles (Rounded)	Schools	Parks	Bike/Ped Crash	Connect to Proposed	Connect to Activity Centers	Connect to Existing	Implementation	Construction Estimate (Low)	Construction Estimate (High)	Maintenance Estimate (Low)
Glen Ave	Sheridan Rd	Prospect Rd	Bike Lane	1.6	Good	Fair	Fair	Fair	Fair	Good	Fair	$48,000.00	$112,000.00	$3,200.00
Glen Oak	Hamilton	Berkeley	Shared Use Path	0.3	Fair	Poor	Good	Good	Good	Poor	Poor	$60,000.00	$540,000.00	$3,000.00
Hamilton Blvd	North Street	Water Street	Bike Lane	1.0	Poor	Poor	Good	Fair	Good	Good	Fair	$30,000.00	$70,000.00	$2,000.00
Hayes	Folkers`	Western	Bicycle Boulevard	0.8	Good	Fair	Fair	Fair	Fair	Poor	Good	$48,000.00	$120,000.00	$1,000.00
Knoxville Ave	Sheridan Rd	Prospect Rd	Shared Use Path	0.8	Poor	Good	Poor	Fair	Fair	Good	Fair	$160,000.00	$1,440,000.00	$8,000.00
Nebraska Ave	Sterling Ave	University St	Protected Bike Lane	1.1	Poor	Good	Good	Fair	Fair	Poor	Fair	$165,000.00	$357,500.00	$4,400.00
Nebraska Ave	University St	Prospect Rd	Shared Lane Markings	1.9	Good	Poor	Fair	Good	Fair	Poor	Good	$22,800.00	$45,600.00	$1,900.00
Sheridan Rd	Glen Ave	Knoxville Ave	Shared Use Path	1.6	Good	Good	Good	Fair	Fair	Good	Poor	$320,000.00	$2,880,000.00	$16,000.00
Sterling Ave	Nebraska Ave	Reservoir	Protected Bike Lane	1.6	Fair	Good	Fair	Fair	Poor	Fair	Fair	$240,000.00	$520,000.00	$6,400.00
Low Priority														
Big Hollow	War Memorial Dr	Charter Oak	Bike Lane	1.1	Good	Fair	Fair	Fair	Poor	Poor	Fair	$33,000.00	$77,000.00	$2,200.00
Charter Oak	Orange Prairie	Big Hollow	Shared Use Path	1.7	Fair	Fair	Poor	Poor	Poor	Poor	Poor	$340,000.00	$3,060,000.00	$17,000.00
Charter Oak / Allen Rd	Big Hollow	Pioneer Pky	Shared Use Path	2.6	Fair	Fair	Poor	Poor	Poor	Poor	Poor	$520,000.00	$4,680,000.00	$26,000.00
Crestwood	University St	Knoxville	Bicycle Boulevard	1.1	Poor	Fair	Fair	Good	Fair	Poor	Good	$66,000.00	$165,000.00	$1,375.00
Farmington Rd / Park Rd	Main	Nebraska	Shared Use Path	0.9	Poor	Good	Poor	Fair	Poor	Good	Poor	$180,000.00	$1,620,000.00	$9,000.00
Glen Oak	Main St	Hamilton	Bike Lane	0.1	Poor	Poor	Fair	Good	Fair	Poor	Fair	$3,000.00	$7,000.00	$200.00

Table 8. Implementation Prioritization (cont.)

Name	From	To	Type	Miles (Rounded)	Schools	Parks	Bike/Ped Crash	Connect to Proposed	Connect to Activity Centers	Connect to Existing	Implementation	Construction Estimate (Low)	Construction Estimate (High)	Maintenance Estimate (Low)
Imperial / Teton	Northmoor Rd	Knoxville	Bicycle Boulevard	1.9	Fair	Fair	Poor	Fair	Poor	Good	Fair	$114,000.00	$285,000.00	$2,375.00
Knoxville Ave	Giles	Hickory Grove	Shared Use Path	4.3	Poor	Fair	Fair	Poor	Poor	Good	Poor	$860,000.00	$7,740,000.00	$43,000.00
Main St	Water	North	Protected Bike Lane	1.0	Good	Poor	Good	Good	Good	Good	Poor	$150,000.00	$325,000.00	$4,000.00
New York / Pennsylvania	Wayne	Peoria	Bicycle Boulevard	0.3	Good	Poor	Fair	Fair	Poor	Poor	Good	$18,000.00	$45,000.00	$375.00
Orange Prairie	Charter Oak	War Memorial Dr / US-150	Buffered Bike Lane	1.8	Fair	Good	Poor	Poor	Poor	Fair	Fair	$90,000.00	$180,000.00	$5,400.00
Ronald / Renwood	Glen Ave	Northmoor Rd	Bicycle Boulevard	1.2	Good	Poor	Poor	Fair	Poor	Poor	Good	$72,000.00	$180,000.00	$1,500.00
Sterling Ave / Glen Ave	Reservoir	Sheridan Rd	Shared Use Path	2.5	Fair	Poor	Good	Poor	Poor	Fair	Poor	$500,000.00	$4,500,000.00	$25,000.00
Wayne	Glendale Ave	New York	Shared Use Path	0.2	Good	Poor	Fair	Good	Fair	Poor	Poor	$40,000.00	$360,000.00	$2,000.00
Willow Knolls	War Memorial Dr	University St	Shared Use Path	2.2	Fair	Fair	Good	Poor	Poor	Poor	Poor	$440,000.00	$3,960,000.00	$22,000.00

Potential Funding Sources and Opportunities

Federal Funding Sources

A variety of funding sources are available through the federal government. Peoria has already benefited from national-level grants and programs. TIGER grants, for instance, have helped fund the City's roundabout initiatives. The following funding initiatives are administered through IDOT. Municipalities receive federal funding through competitive grant processes (such as TIGER grants); they do not receive direct funding for transportation infrastructure.

Fixing America's Surface Transportation (FAST) Act

The newest federal legislation, Fixing America's Surface Transportation (FAST) Act was signed into law on December 4, 2015. The FAST Act replaces the Moving Ahead for Progress in the 21st Century (MAP-21) federal law. The FAST Act is the first long-term comprehensive surface transportation legislation since the Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005.

The FAST Act increases existing federal funding by 11% over a five-year time span. Funding totals $305 billion. Of the $305 billion, $284 billion is specifically for surface transportation, for which bicycle and pedestrian infrastructure projects are eligible.

Overall, the FAST Act represents minor changes compared to MAP-21. The FAST Act sets funding sources for bicycle and pedestrian projects at a similar level as in the past.

Programs or policies not explicitly mentioned in the FAST Act remain in place under the new law.

City staff should remain attentive to new program details, materials, or guidelines as they become available from IDOT and other funding sources.

Surface Transportation Block Grant Program Set-Aside (STBGP) and Bicycle and Pedestrian Funding

The FAST Act includes organizational changes to the country's existing Transportation Alternatives Program (TAP), which provides funding for bicycle and pedestrian infrastructure. Under the FAST Act, the TAP is folded into the Surface Transportation Program (STP), which is renamed Surface Transportation Block Grant Program Set-Aside (STBGP). Previously, TAP acted as a stand-alone program. Funding formerly housed under TAP, however, remains a specific set-aside within STBGP. As with TAP under MAP-21, STBGP covers a variety of project types, including, but not limited to bicycle- and walking-focused projects. States are now able to administer a specific amount ($820 million – $850 million total) rather than a percentage of state funds, as was MAP-21 regulation. The percentage of available STBGP funds will gradually increase over the five year period. Total available funding started at $10.1 billion as of the Act's signing. Funding will increase to $12.1 billion in 2020.

Highway Safety Improvement Program (HSIP) and Bicycle and Pedestrian Funding

Highway Safety Improvement Program (HSIP) funds may not be used for non-infrastructure construction projects under the FAST Act. HSIP funds totaled 3.6% of all FY 2015 non-motorized funding.

National Highway Traffic Safety Administration (NHTSA) Section 405 National Priority Safety Programs

The FAST Act includes a new subgrant housed under Section 405 of the National Priority Safety Programs. The subgrant aims to improve bicycle and pedestrian safety through law enforcement officer training, bicycle and pedestrian enforcement campaigns, and bicycling and walking traffic law awareness projects. States must have bicycle and pedestrian fatalities greater than 15% of total traffic fatalities. Twenty states are eligible for this funding source.

Illinois Transportation Enhancement Program (ITEP)

IDOT annually awards Illinois Transportation Enhancement Program (ITEP) funds to local bicycle and pedestrian projects as part of the federal Surface Transportation Block Grant Program Set-Aside (STBGP). The funding should support community-based projects that expand travel choices and enhance the local transportation experience. Local jurisdictions can apply for funds for on-road or off-road bicycle infrastructure, including rail-to-trail conversions. Projects must also related to surface transportation. The local agency must provide 20% matching funds. The ITEP Guidelines Manual lists the twelve eligible funding categories. IDOT

may release a new ITEP Guidelines Manual since current materials were produced under MAP-21. Planners and designers should remain attentive to new state guidance.

Illinois Green Streets Initiative

The Illinois Green Streets Initiative is an ITEP sub-category. Eligible projects use landscaping or streetscaping with native trees and prairie grasses to reduce greenhouse gas emissions and address climate change. Like the ITEP program, sponsors must contribute 20% of the project cost. Funding is provided for 80% of the project costs.

Illinois Safe Routes to School Program (SRTS)

Safe Routes to School (SRTS) is a federally funded program, with grant money administered by individual state departments of transportation. SRTS funding remains relatively unchanged under the FAST Act as it was from MAP-21. IDOT's program is divided into two categories: infrastructure and non-infrastructure. Infrastructure projects plan and/or build items to support bicycling and walking. Examples include new bicycle lanes or sidewalks, the purchase of pedestrian-actuated signals, the purchase/rental of speed feedback signs, and other initiatives. Infrastructure projects can apply for up to $200,000 worth of funding. IDOT application materials include a list of street design treatments to help communities understand sample design options. Non-infrastructure programs plan and implement education, encouragement, or enforcement programs to promote bicycling and walking to school.

The City of Peoria is undergoing a variety of new construction projects.

As of 2013, the program requires a 20% local match. Previous iterations required applicants to create a school travel plan prior to applying. This requirement no longer applies. Applicants may represent schools or school districts, governmental agencies, or park districts. Unlike previous cycles, non-profit organizations or advocacy groups may not apply on behalf of other entities.

Regional Surface Transportation Program (RSTP)

The RSTP is a block grant program that provides funding for a variety of transportation improvements including bicycle-focused projects. Annually, approximately $320 million is available through this program.

Land & Water Conservation Fund (LWCF)

The goal of the Land & Water Conservation Fund is the creation and maintenance of high quality recreation resources through the acquisition and development of public outdoor recreation areas and facilities. Funds originate from federal off-shore oil revenues. The program operates on a reimbursing basis. The local sponsor matches 50% of the project cost prior to applying for the grant. After the project is approved, the sponsoring park and recreation board receives a reimbursement of 50% of the actual project costs. Applicants must submit a bill to the grant coordinator to request the federal share of the cost throughout the grant term.

TIGER Discretionary Grants Program

The TIGER program funds large-scale multi-modal projects through a competitive grant process. Municipalities and counties can use Motor Fuel Tax funds to fulfill match obligations. The December 16, 2014 Consolidated and Further Continuing Appropriations Act authorizes $500 million for TIGER Discretionary Grants. The US Department of Transportation offers a 2015 Webinar Series as well as a catalog of past webinars to help applicants navigate the program.

State-level Funding Sources

Although the State of Illinois does not currently have a dedicated bicycle funding source, other state resources exist to help pay for nonmotorized facilities and programs.

In addition to federal and local funding mechanisms, the State of Illinois funds projects through:

Injury Prevention Program (IP)

The Division of Traffic Safety (DTS) within IDOT operates the Injury Prevention Program (IP) using National Highway Traffic Safety Administration (NHTSA) Highway Safety Program grants (Section 402). The program aims to, "reduce fatalities and injuries sustained in traffic crashes through educational programs". IP programs have been used to produce the brochure, "Safe Bicycling in Illinois," among other educational materials. Other educational offerings eligible for funding include public information campaigns, media awareness campaigns, and school/community meeting materials.

Local Alcohol Program (LAP)

The Local Alcohol Program (LAP) is also funded through a Highway Safety Program grant. In certain instances, LAP funding may be applied to bicycle-specific projects. LAP money is designated for education and enforcement campaigns designed to improve a community's impaired driving problem.

Sustained Traffic Enforcement Program (STEP)

The Sustained Traffic Enforcement Program (STEP) is the third State program that uses Highway Safety Program funding. Hire back enforcement initiatives are designed to target seatbelt usage compliance and DUI reduction. Communities can use funds for participation in national enforcement campaigns such as "Click It or Ticket" and "Drive Sober or Get Pulled Over". Communities who receive grants are required to conduct enforcement details during Thanksgiving, Christmas/New Years, St. Patrick's Day, Memorial Day, Independence Day, and Labor Day. Communities can choose programming for four additional enforcement periods.

The installation of new, attractive streetscaping improvements can be augmented by identifying a variety of potential funding sources.

Illinois Bicycle Path Program

The Illinois Department of Natural Resources (IDNR) administers the Bicycle Path Program. The funding source originates from State motor vehicle title fees and provides up to 50% of a project's total approved cost. The program funds land acquisition and trail development. IDNR grants have cumulatively developed approximately 982 miles of Illinois bicycle trails since 1990.

As of the Plan's publication, the latest round of program funding for Peoria County totaled $77,000. Former Governor Quinn announced the funding in February 2014. The matching grant to Peoria and Fulton Counties will help fund the acquisition of a 24.7 mile abandoned railroad corridor. The bicycle path will run from Farmington Township in Fulton County to just west of Bellevue in Peoria County. Although the trail will not enter City of Peoria city limits, the project will be an important regional trail connection.

Recreational Trails Program (RTP)

The Recreational Trails Program (RTP) was combined with other funding sources under TAP in MAP-21. As mentioned previously, TAP is now the Surface Transportation Block Grant Program Set-Aside (STBGP). RTP funding will stay at 2009 levels. These funds are set aside in the STBGP.

Open Space Lands Acquisition and Development (OSLAD), Land and Water Conservation Fund (LWF/LAWCON), and Park & Recreational Facility Construction (PARC)

Communities can use either OSLAD or LWCF funds for bicycle and shared-use trail development. The funds help acquire and develop land for public parks and open space. The PARC program is a similar funding pool, which provides funds for buildings and facilities associated with parkland and recreational areas. The annual program accepts applications between May 1 and July 1 of every calendar year.

Illinois Department of Commerce and Economic Opportunity (Illinois DCEO) Tourism Attraction Development Grant Program (TAP)

Counties, municipalities, non-profit, and for-profit organizations can apply for grants that develop and improve tourist attractions in Illinois. The total amount distributed for grants and loans shall not exceed $1 million and is capped at half of the actual expenditures for developing or improving a tourism attraction.

Illinois Main Street Program

The Illinois Main Street Program focuses on preserving historic central business districts, some of which may include streetscaping or bicycle/pedestrian facility development and installation. Street lighting, for instance, within a designated historic district, could be eligible for 80% funding. Applicants must define a proposed Main Street district and must organize a new non-profit organization in charge of steering its development.

Other State-level Funding Sources

The State of Illinois also funds bicycle projects through the following sources and tools:

- Development impact fees:
- State general fund
- License plate sales
- Local planning assistance grants
- Severance fees
- State fuel tax
- Vehicle registration fees
- Vehicle transfer fees

Local Funding Sources

Beginning in December 2006, the Peoria-Pekin Urbanized Area Transportation Study (PPUATS) adopted a new policy and quantitative criteria to evaluate project funding requests. PPUATS is a national leader in prioritizing bicycle and pedestrian projects for Surface Transportation Program-Urban (STPU) funding by using this evaluation process. Road projects are more likely to receive funding if they contain bicycle-and/or pedestrian-supportive elements.

The Tri-County Regional Planning Commission (TCRPC) is the City of Peoria's local metropolitan planning organization (MPO). As such, TCRPC is responsible for creating a long-range transportation plan (LRTP) every five years. The newest plan, "Envision HOI: Heart of Illinois Long Range Transportation Plan" (2014) identifies federal, state, and local funding sources to establish funding sources for the plan's priority projects according to a variety of project timeframes.

Crowdfunding

Cities are beginning to experiment with crowdfunded bicycle lanes. Denver, Portland, Kansas City, and Memphis, for example have successfully used community momentum to crowdfund bicycle lanes. Crowdfunding raises public awareness about bikeway projects and gathers enthusiasm for their implementation. For the most part, city staff should expect to use citizen-raised money in addition to other funding sources such as public funds or foundation gifts. Cities' crowdfunding campaigns may also benefit from leadership by an experienced fundraiser to help lead the campaign.

Ongoing System Maintenance

The quality and condition of bicycle facilities are essential to the success of the active transportation network. The City of Peoria should develop a maintenance schedule and program to delegate maintenance roles and responsibilities, develop resource and funding projections, and preserve the quality of the network. Maintenance can be separated into two categories: routine maintenance and remedial maintenance.

Routine Maintenance

Routine maintenance refers to the regularly-scheduled and day-to-day activities to keep the bikeways in a functional and orderly condition. These activities, which can be incorporated in normal routine maintenance by operations staff, include trash and debris removal, landscaping, weed and dust control, trail and street sweeping, snow removal, shoulder mowing, and tree and shrub trimming. Spot maintenance such as sealing cracks, replacement of small sections of sidewalk, filling potholes, and replacing damaged or worn signs also fall under this category.

Remedial Maintenance

Remedial maintenance refers to the correcting of significant facility defects and the repairing, replacing, and restoring of major facility components. Remedial maintenance activities include periodic repairs like seal coating asphalt pavement; restriping of bike lanes; replacement of wayfinding and other signs; repainting, replacement of trail amenities and furnishings (benches, bike racks, lighting, etc.); and more substantial projects like hillside stabilization, bridge replacement, trail or street surface repaving; and trail repairs due to washout and flooding. Pavement markings and striping maintenance will depend on anticipated and actual product lifecycle, which can range from one to ten years, depending on material type. Minor remedial maintenance for trails and greenways can be completed on a five to ten-year cycle, while larger projects should be budgeted on an as-needed or anticipated basis.

Maintenance Cost Estimates

Maintenance costs vary depending on the quality and durability of materials, expected lifecycle, use and wear, climate, weather, and other external factors. Planning level maintenance cost estimates are provided below to assist in the development of maintenance budgets and resource allocation.

Schaumburg, IL Adopt-a Bike-Path Program

Over 200 people participate in Schaumburg, IL's Adopt-a-Bike Path program. Volunteer groups can apply to "adopt" a particular path segment within the community, between 0.25 mile and two miles long. Adoption periods last for a minimum of two years. Volunteers collect litter along their adopted path at least twice per year. The Village provides specific safety guidelines for participating volunteer groups. City staff should note that Adopt-a-Bike Path programs are not intended to replace City-led trail maintenance activities.

Table 9. Annual Maintenance Cost Estimates

Facility Type	Annualized Maintenance Cost Per Mile
Shared Use Path	$10,000
Sidepath	$2,500
Protected Bike Lanes	$4,000
Buffered Bike Lanes	$3,000
Standard Bike Lanes	$2,000
Bike Boulevard	$1,250
Shared Lane Markings	$1,000

6. Design Guidelines

The following standards and guidelines are referred to in this section.

- The Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.
- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities.
- The National Association of City Transportation Officials' (NACTO) 2012 Urban Bikeway Design Guide is the newest publication of nationally recognized bicycle-specific design standards, and offers guidance on the current state of the practice designs. Most NACTO treatments are compatible within AASHTO/ MUTCD guidance.
- Meeting the requirements of the Americans with Disabilities Act (ADA) is an important part of any bicycle facility project. The United States Access Board's proposed Public Rights-of-Way Accessibility Guidelines (PROWAG) and the 2010 ADA Standards for Accessible Design (2010 Standards) contain standards and guidance for the construction of accessible facilities.

Should the national standards be revised in the future and result in discrepancies with this chapter, the national standards should prevail.

SHARED USE PATH AND OFF-STREET FACILITIES

SHARED USE PAVED TRAILS AND OFF-STREET FACILITIES

A shared use paved trail (also known as a greenway) allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Trail facilities can also include amenities such as lighting, signage, and fencing (where appropriate).

Key features of shared use paved trails include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the trail.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the trail where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.


Trails in River and Utility Corridors


Trails in Abandoned Rail Corridors


Trails in Existing Active Rail Corridors


Natural Surface Trail


Boardwalks

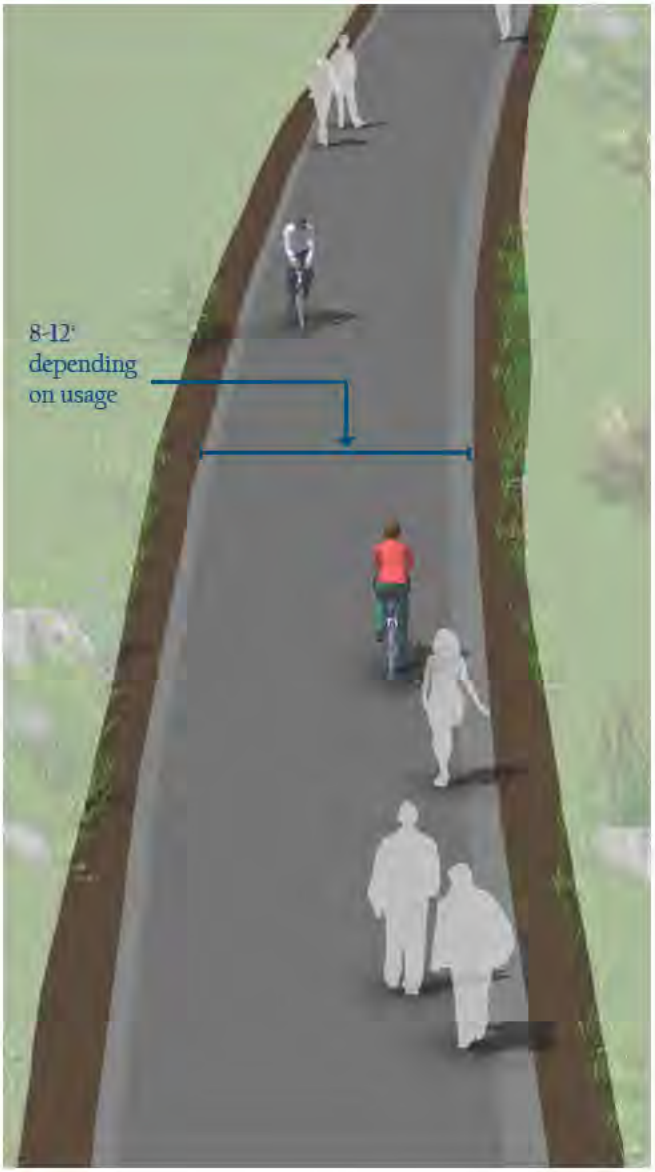

General Design Practices


Trails Along Roadways

GENERAL DESIGN PRACTICES

Description

Shared use paved trails can provide a desirable facility, particularly for recreation, and for users of all skill levels preferring separation from traffic. Bicycle trails should generally provide directional travel opportunities not provided by existing roadways.



Guidance

Width

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

Lateral Clearance

- A 2 foot or greater shoulder on both sides of the trail should be provided. An additional foot of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

- Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Discussion

Terminate the trail where it is easily accessible to and from the street system, preferably at a controlled intersection or at the beginning of a dead-end street.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
Flink, C. *Greenways: A Guide To Planning Design And Development.* 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle trails. The use of concrete for trails has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of trail users.

SHARED USE PAVED TRAILS IN ABANDONED RAIL CORRIDORS

Description

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street trails. Rail corridors offer several advantages, including relatively direct routes between major destinations and generally flat terrain.

In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

The railroad may form an agreement with any person, public or private, who would like to use the banked rail line as a trail or linear park until it is again needed for rail use. Municipalities should acquire abandoned rail rights-of-way whenever possible to preserve the opportunity for trail development.

Guidance

Shared use paved trails in abandoned rail corridors should meet or exceed general design practices. If additional width allows, wider trails and landscaping are desirable.

In full conversions of abandoned rail corridors, the sub-base, superstructure, drainage, bridges, and crossings are already established. Design becomes a matter of working with the existing infrastructure to meet the needs of a rail-trail.

If converting a rail bed adjacent to an active rail line, see Shared Use Paved Trails in Existing Active Rail Corridors.

Discussion

It is often impractical and costly to add material to existing railroad bed fill slopes. This results in trails that meet minimum trail widths, but often lack preferred shoulder and lateral clearance widths.

Rail-to-trails can involve many challenges including: the acquisition of the right of way, cleanup and removal of toxic substances, and rehabilitation of tunnels, trestles and culverts. A structural engineer should evaluate existing railroad bridges for structural integrity to ensure they are capable of carrying the appropriate design loads.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
Flink, C. *Greenways: A Guide To Planning Design And Development.* 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle trails. The use of concrete for trails has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of trail users.

SHARED USE PAVED TRAILS IN EXISTING ACTIVE RAIL CORRIDORS

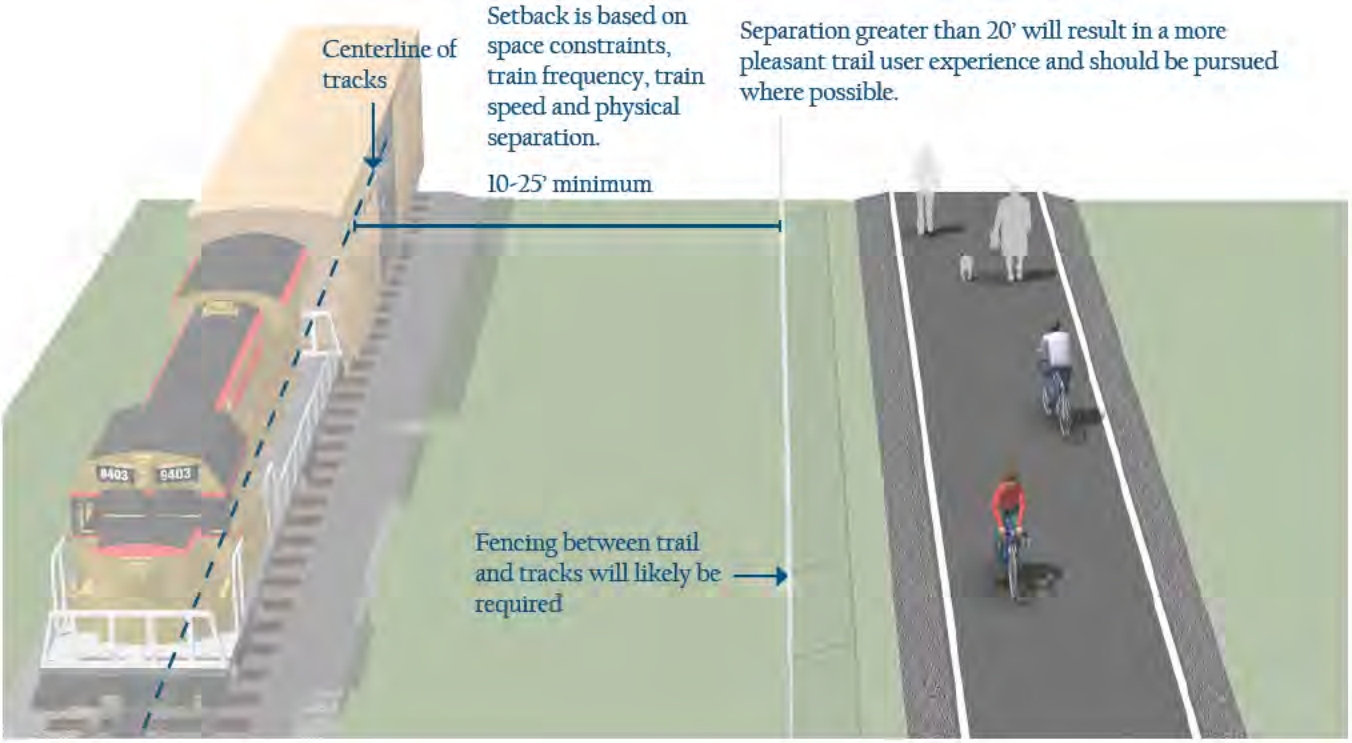
Description

Rails-with-Trails projects typically consist of trails adjacent to active railroads. It should be noted that some constraints could impact the feasibility of rail-with-trail projects. In some cases, space needs to be preserved for future planned freight, transit or commuter rail service. In other cases, limited right-of-way width, inadequate setbacks, concerns about safety/trespassing, and numerous mid-block crossings may affect a project's feasibility.

Guidance

Shared use paved trails in utility corridors should meet or exceed general design standards. If additional width allows, wider trails, and landscaping are desirable.

If required, fencing should be a minimum of 5 feet in height with higher fencing than usual next to sensitive areas such as switching yards. Setbacks from the active rail line will vary depending on the speed and frequency of trains, and available right-of-way.



Discussion

Railroads may require fencing with rail-with-trail projects. Concerns with trespassing and security can vary with the volume and speed of train traffic on the adjacent rail line and the setting of the shared use paved trail, i.e. whether the section of track is in an urban or rural setting.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
FHWA. *Rails-with-Trails: Lessons Learned*. 2002.

Materials and Maintenance

Asphalt is the most common surface for bicycle trails. The use of concrete for trails has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of trail users.

SHARED USE PAVED TRAILS IN RIVER AND UTILITY CORRIDORS

Description

Utility and waterway corridors often offer excellent shared use paved trail development and bikeway gap closure opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include canals, drainage ditches, rivers, and beaches. These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Guidance

Shared use paved trails in utility corridors should meet or exceed general design practices. If additional width allows, wider trails and landscaping are desirable.

Access Points
Any access point to the trail should be well-defined with appropriate signage designating the trail as a bicycle facility and prohibiting motor vehicles.

Trail Closure
Public access to the trail may be prohibited during the following events:

- Canal/flood control channel or other utility maintenance activities
- Inclement weather or the prediction of storm conditions

Discussion

Similar to railroads, public access to flood control channels or canals may be undesirable. Hazardous materials, deep water or swift current, steep, slippery slopes, and debris all may constitute risks for public access. If desired, consider appropriate fencing to keep trail users within the designated travel way. Creative design of fencing is encouraged to make the trail facility feel welcoming to the user.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
Flink, C. *Greenways: A Guide To Planning Design And Development.* 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle trails. The use of concrete for trails has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of trail users.

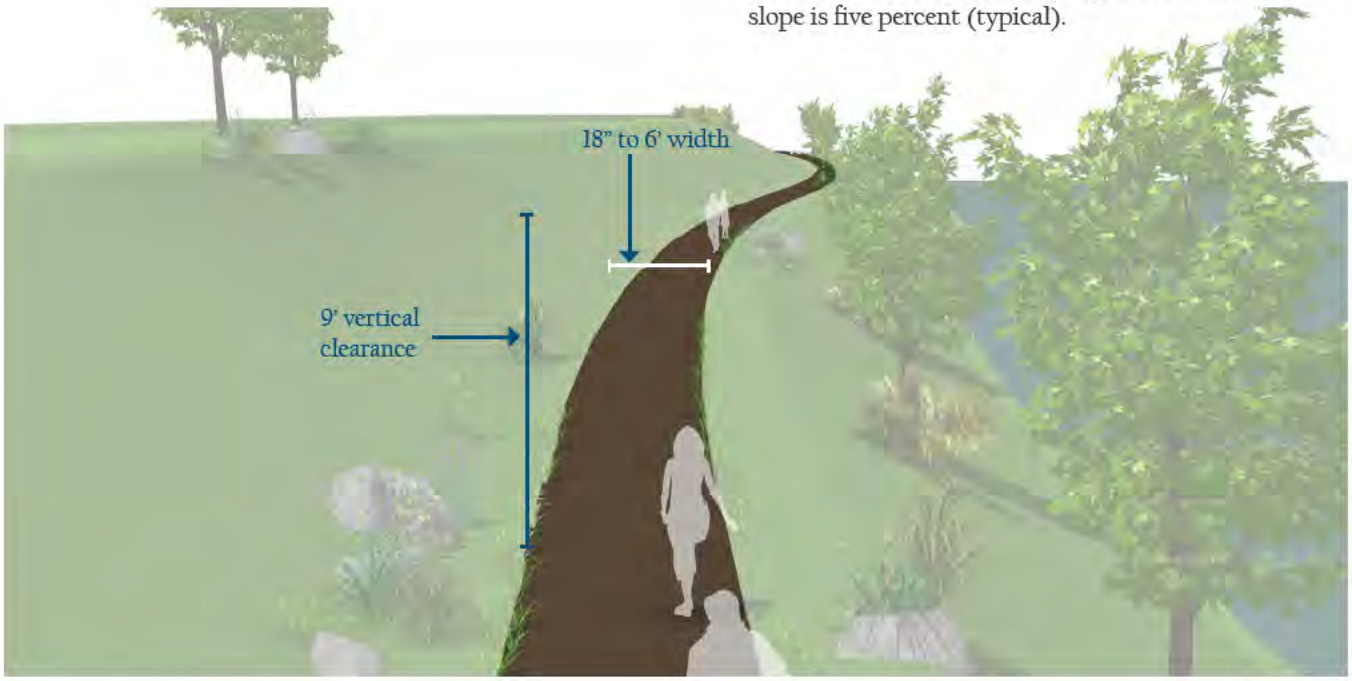
NATURAL SURFACE TRAIL

Description

Sometimes referred to as footpaths, hiking trails or single track trails, the soft surface shared use trail is used along corridors that are environmentally-sensitive but can support bare earth, wood chip, or boardwalk trails. Natural surface trails are a low-impact solution and found in areas with limited development or where a more primitive experience is desired.

Guidance

- Trails can vary in width from 18 inches to 6 feet or greater; vertical clearance should be maintained at nine-feet above grade.
- Mountain bike trails are typically 18-24 inches wide and have compacted bare earth or leaf litter surfacing.
- Base preparation varies from machine-worked surfaces to those worn only by usage.
- Trail surface can be made of dirt, rock, soil, forest litter, or other native materials. Some trails use crushed stone (a.k.a. "crush and run") that contains about 4% fines by weight, and compacts with use.
- Provide positive drainage for trail tread without extensive removal of existing vegetation; maximum slope is five percent (typical).



Discussion

Trail erosion control measures include edging along the low side of the trail, steps and terraces to contain surface material, and water bars to direct surface water off the trail; use bedrock surface where possible to reduce erosion.

Due to their narrow width and ability to contour with the natural topography, single-track mountain bike trails typically require the least amount of disturbance and support features of all types of trails.

Additional References and Guidelines

IMBA. *Managing Mountain Biking.* 2007.
IMBA. *Trail Solutions.* 2004.
Flink, C. *Greenways: A Guide To Planning Design And Development.* 1993.

Materials and Maintenance

Consider implications for accessibility when weighing options for surface treatments.

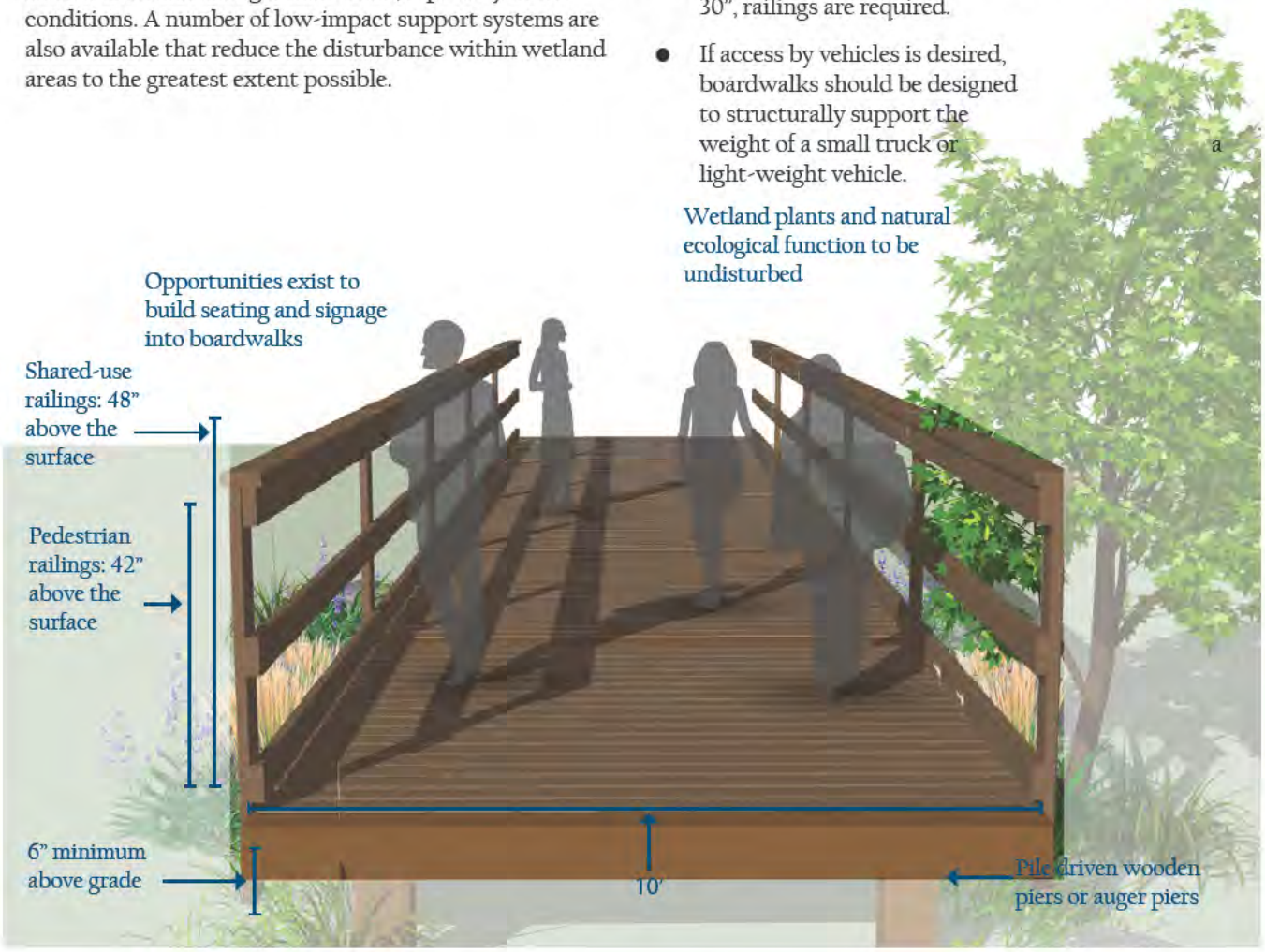
BOARDWALKS

Description

Boardwalks are typically required when crossing wetlands or other poorly drained areas. They are usually constructed of wooden planks or recycled material planks that form the top layer of the boardwalk. The recycled material has gained popularity in recent years since it lasts much longer than wood, especially in wet conditions. A number of low-impact support systems are also available that reduce the disturbance within wetland areas to the greatest extent possible.

Guidance

- Boardwalk width should be a minimum of 10 feet when no rail is used. A 12 foot width is preferred in areas with average anticipated use and whenever rails are used.
- When the height of a boardwalk exceeds 30", railings are required.
- If access by vehicles is desired, boardwalks should be designed to structurally support the weight of a small truck or light-weight vehicle.



Discussion

In general, building in wetlands is subject to regulations and should be avoided.

The foundation normally consists of wooden posts or auger piers (screw anchors). Screw anchors provide greater support and last much longer.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Wetland Trail Design and Construction.* 2007.

Materials and Maintenance

Decking should be either non-toxic treated wood or recycled plastic. Cable rails are attractive and more visually transparent but may require maintenance to tighten the cables if the trail has snow storage requirements.

SHARED USE PAVED TRAILS ALONG ROADWAYS

Description

Shared use paved trails along roadways, also called Sidepaths, are trails that run adjacent to a street.

Because of operational concerns it is generally preferable to place trails within independent rights-of-way away from roadways. However, there are situations where existing roads provide the only corridors available.

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

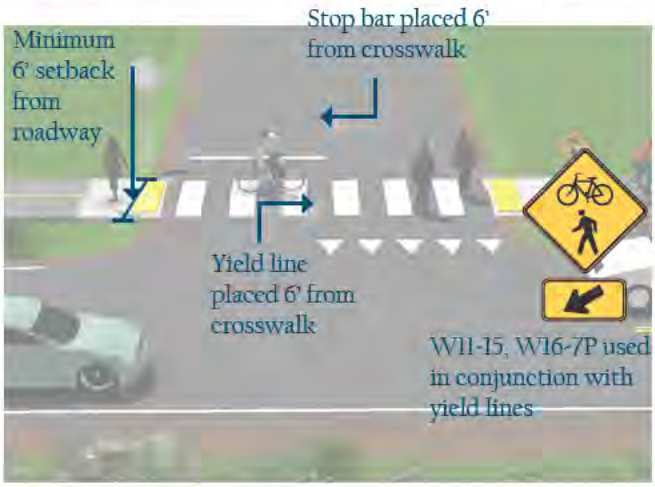
The AASHTO Guide for the Development of Bicycle Facilities cautions practitioners of the use of two-way sidepaths on urban or suburban streets with many driveways and street crossings.

In general, there are two approaches to crossings: adjacent crossings and setback crossings, illustrated below.

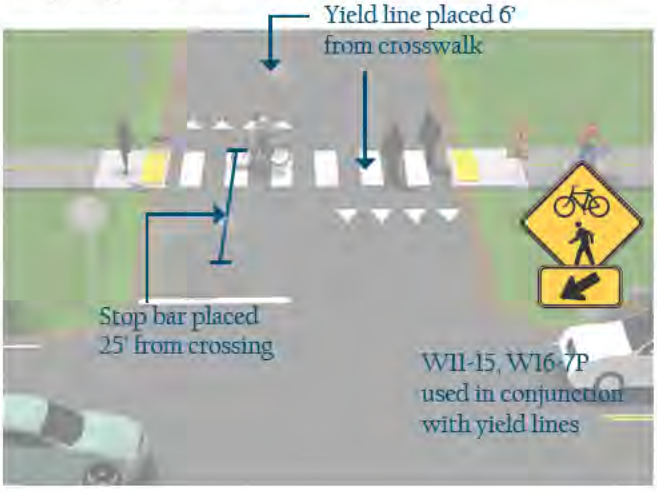
Guidance

- Guidance for sidepaths should follow that for general design practices of shared use paved trails.
- A high number of driveway crossings and intersections create potential conflicts with turning traffic. Consider alternatives to sidepaths on streets with a high frequency of intersections or heavily used driveways.
- Where a sidepath terminates special consideration should be given to transitions so as not to encourage unsafe wrong-way riding by bicyclists.
- Crossing design should emphasize visibility of users and clarity of expected yielding behavior. Crossings may be STOP or YIELD controlled depending on sight lines and bicycle motor vehicle volumes and speeds.

Adjacent Crossing - A separation of 6 feet emphasizes the conspicuity of riders at the approach to the crossing.



Setback Crossing - A set back of 25 feet separates the trail crossing from merging/turning movements that may be competing for a driver's attention.



Discussion

The provision of a shared use paved trail adjacent to a road is not a substitute for the provision of on-road accommodations such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.

To reduce potential conflicts in some situations, it may be better to place one-way sidepaths on both sides of the street.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
NACTO. *Urban Bikeway Design Guide.* See entry on Raised Cycle Tracks. 2012.

Materials and Maintenance

Asphalt is the most common surface for bicycle trails. The use of concrete for trails has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of trail users.

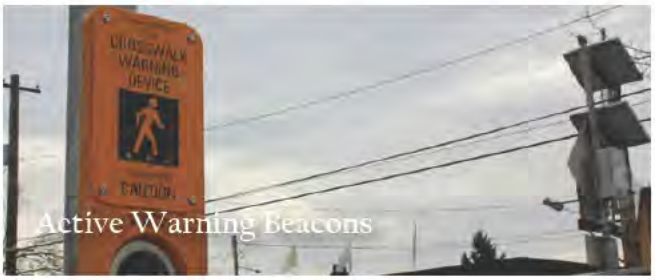
TRAIL/ROADWAY CROSSINGS

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

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

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


Marked/Unsignalized Crossings



Active Warning Beacons


Route Users to Existing Signals


Hybrid Beacons

Undercrossings


Overcrossings

MARKED/UNSIGNALIZED CROSSINGS

Description

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

When space is available, using a median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.

Guidance

Maximum traffic volumes

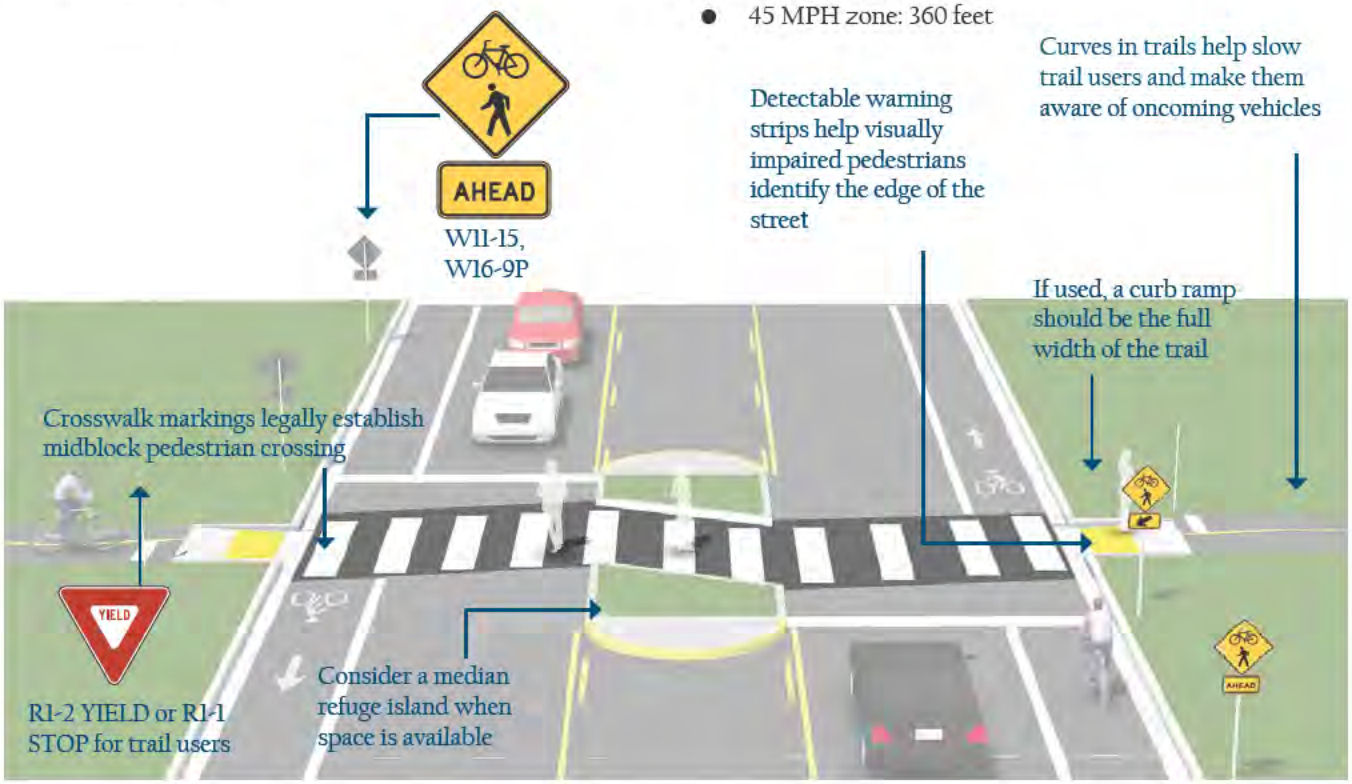
- ≤9,000-12,000 Average Daily Traffic (ADT) volume
- Up to 15,000 ADT on two-lane roads, preferably with a median
- Up to 12,000 ADT on four-lane roads with median

Maximum travel speed

- 35 MPH

Minimum line of sight

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



Discussion

Unsignalized crossings of multi-lane arterials over 15,000 ADT may be possible with features such as sufficient crossing gaps (more than 60 per hour), median refuges, and/or active warning devices like rectangular rapid flash beacons or in-pavement flashers, and excellent sight distance. For more information see the discussion of active warning beacons.

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

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

ACTIVE WARNING BEACONS

Description

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

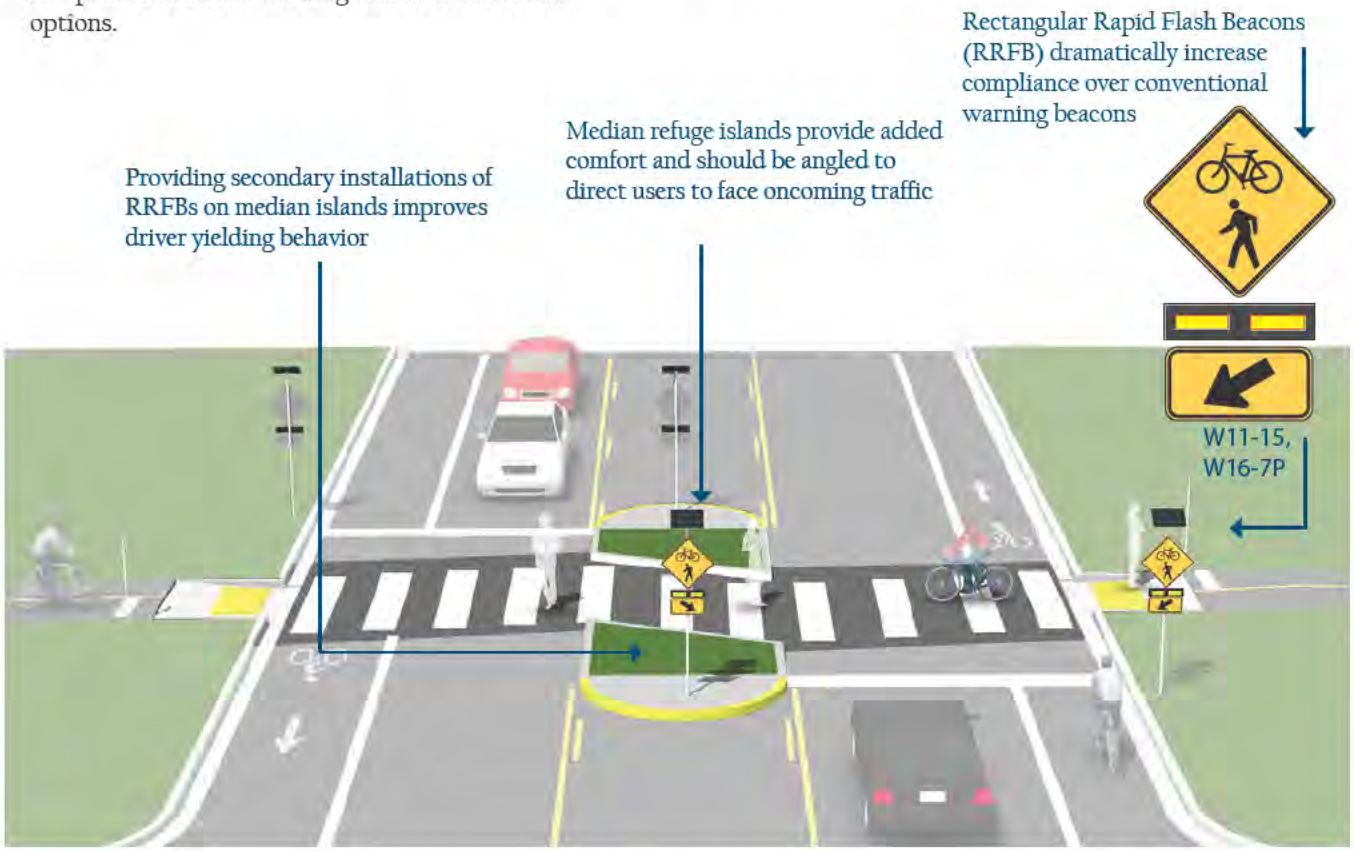
These enhancements include trail user or sensor actuated warning beacons, Rectangular Rapid Flash Beacons (RRFB) shown below, or in-roadway warning lights.

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

Guidance

Guidance for marked/unsignalized crossings applies.

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



Discussion

An FHWA report presented study results showing of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18% to 81%. A four-beacon arrangement raised compliance to 88%. Additional studies of long term installations show little to no decrease in yielding behavior over time. Additional studies in Oregon reported compliance rates as high as 99% when actuated.

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
FHWA. *MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11).* 2008.
FHWA. *Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks.* 2010.
Alhajri, F., Carlso, K., Foster, N., Geordе, D. *A Study on Driver's Compliance to Rectangular Rapid Flashing Beacons.* 2013.

Materials and Maintenance

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

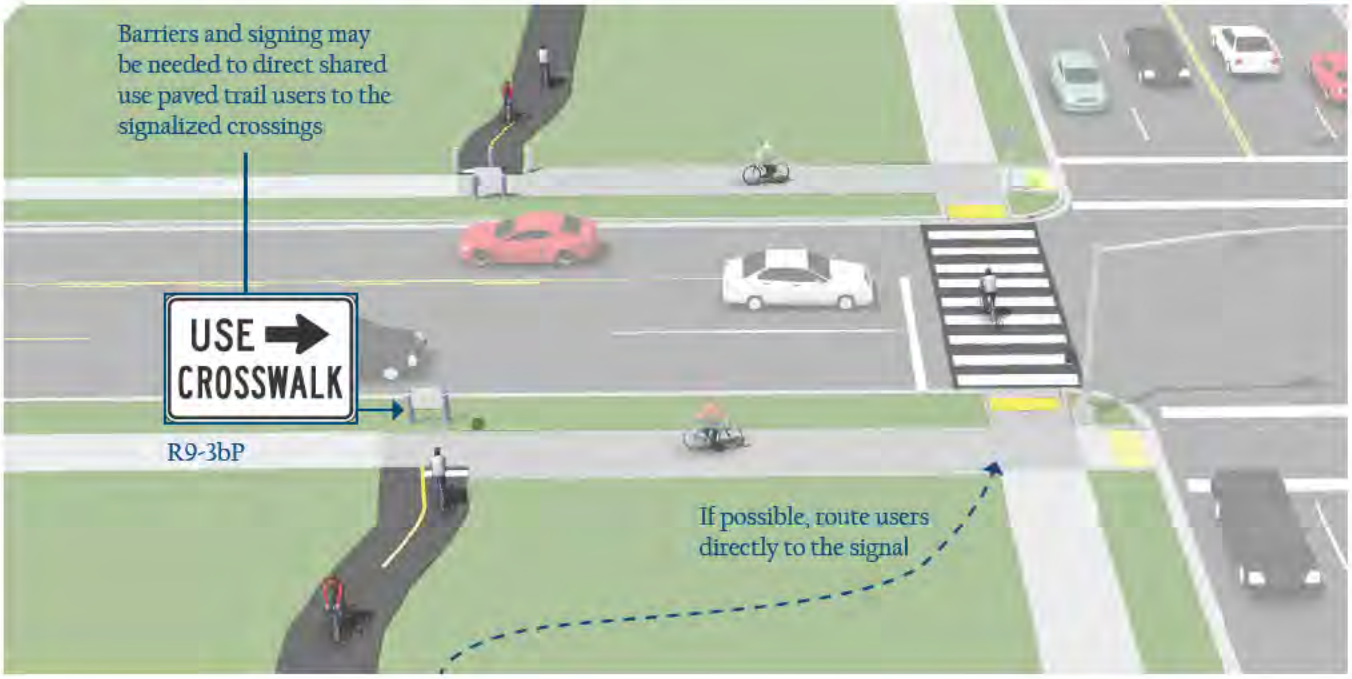
ROUTE USERS TO SIGNALIZED CROSSINGS

Description

Trail crossings within approximately 400 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection to avoid traffic operation problems when located so close to an existing signal. For this restriction to be effective, barriers and signing may be needed to direct trail users to the signalized crossing. If no pedestrian crossing exists at the signal, modifications should be made.

Guidance

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



Discussion

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities.* 2004.

Materials and Maintenance

If a sidewalk is used for crossing access, it should be kept clear of snow and debris and the surface should be level for wheeled users.

PEDESTRIAN HYBRID BEACON CROSSINGS

Description

Pedestrian hybrid beacons provide a high level of comfort for crossing users through the use of a red-signal indication to stop conflicting motor vehicle traffic.

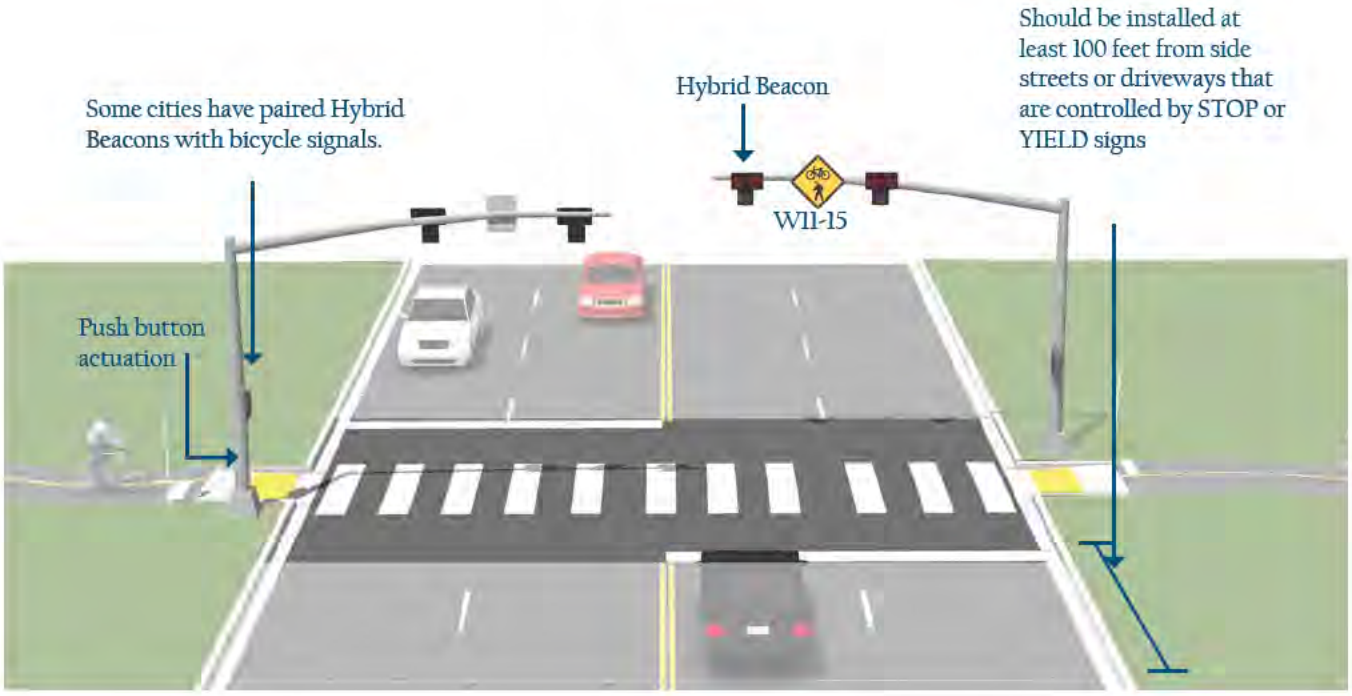
Hybrid beacon installation faces only cross motor vehicle traffic, stays dark when inactive, and uses a unique 'wig-wag' signal phase to indicate activation. Vehicles have the option to proceed after stopping during the final flashing red phase, which can reduce motor vehicle delay when compared to a full signal installation.

Guidance

Hybrid beacons (illustrated here) may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable trail crossings.

FHWA does not allow bicycle signals to be used with Hybrid beacons, though some cities have done so successfully.

To maximize safety when used for bicycle crossings, the flashing 'wig-wag' phase should be very short and occur after the pedestrian signal head has changed to a solid "DON'T WALK" indication as bicyclists can enter an intersection quickly.



Discussion

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

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

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

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

FULL TRAFFIC SIGNAL CROSSINGS

Description

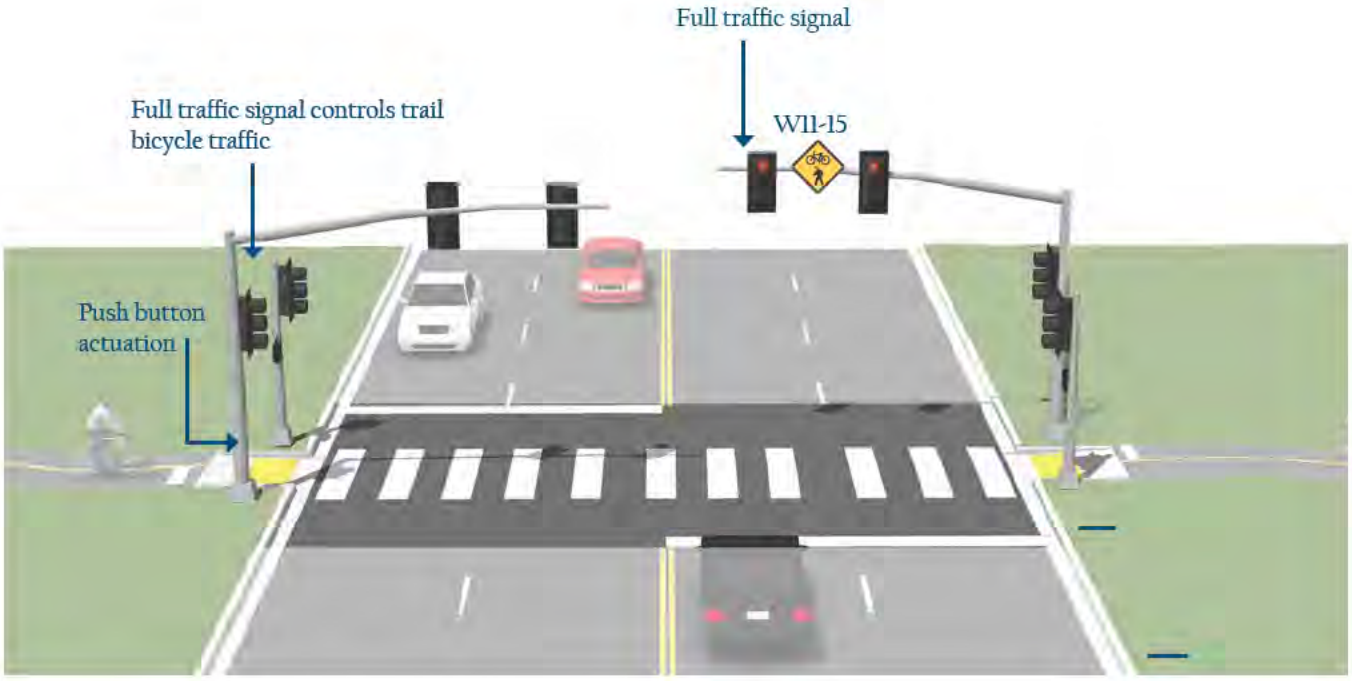
Signalized crossings provide the most protection for crossing trail users through the use of a red-signal indication to stop conflicting motor vehicle traffic.

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

Guidance

Full traffic signal installations must meet MUTCD pedestrian, school or modified warrants. Additional guidance for signalized crossings:

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



Discussion

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

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Traffic signals require routine maintenance. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.

UNDERCROSSINGS

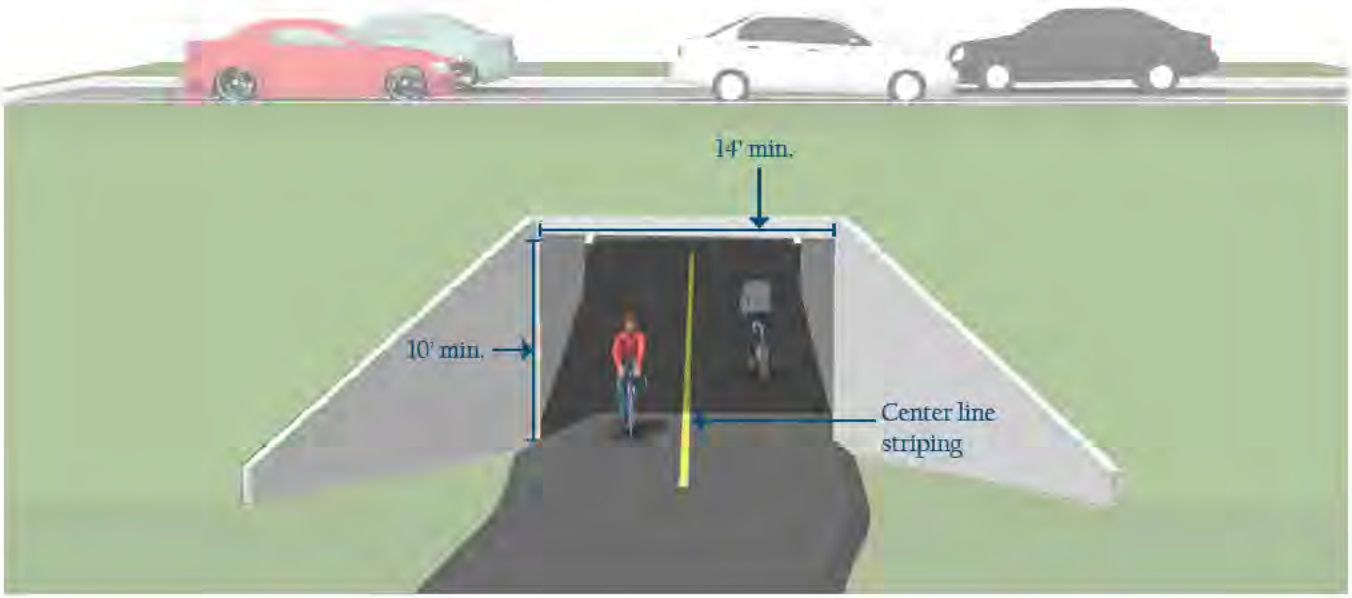
Description

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

There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group grade separation may be considered in many types of projects.

Guidance

- 14 foot minimum width, greater widths preferred for lengths over 60 feet.
- 10 foot minimum height.
- The undercrossing should have a centerline stripe even if the rest of the trail does not have one.
- Lighting should be considered during the design process for any undercrossing with high anticipated use or in culverts and tunnels.



Discussion

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities.* 2004.

Materials and Maintenance

14 foot width allows for maintenance vehicle access.

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

OVERCROSSINGS

Description

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

There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group grade separation may be considered in many types of projects.

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

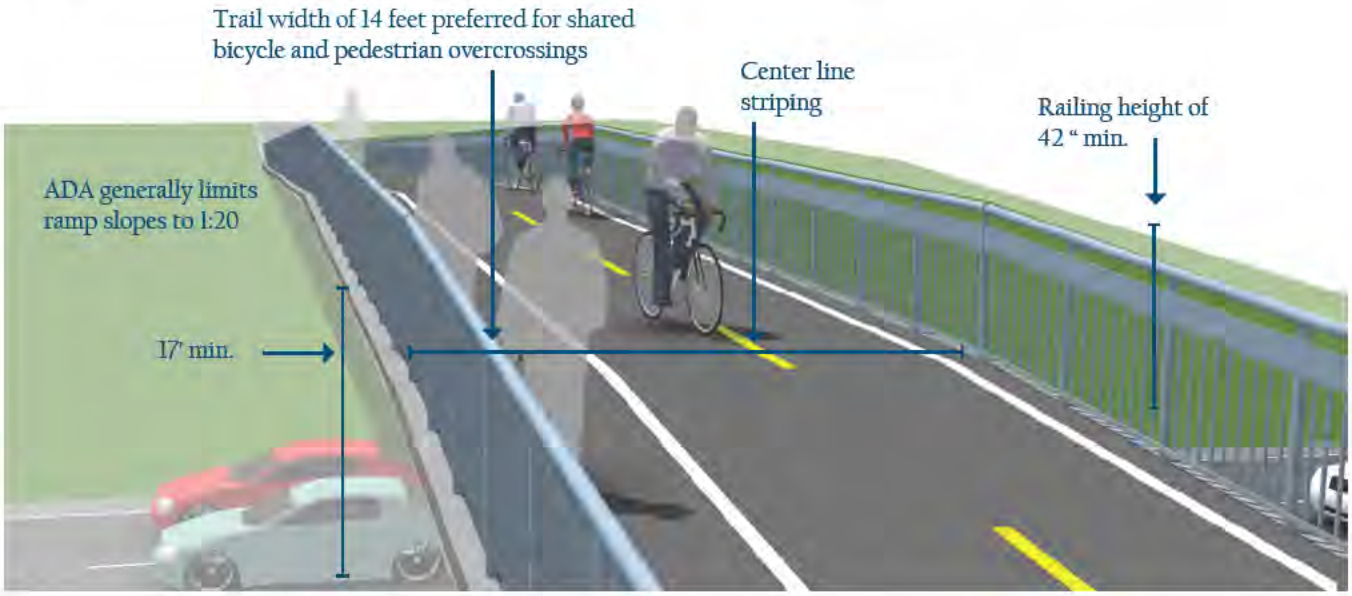
Guidance

- 8 foot minimum width, 14 feet preferred. If overcrossing has any scenic vistas additional width should be provided to allow for stopping. A separate 5 foot pedestrian area may be provided for facilities with high bicycle and pedestrian use.
- 10 foot headroom on overcrossing; clearance below will vary depending on feature being crossed

  Roadway: 17 feet

  Freeway: 18.5 feet

  Heavy Rail Line: 23 feet
- The overcrossing should have a centerline stripe even if the rest of the trail does not have one.



Discussion

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

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.

Materials and Maintenance

Potential issues with vandalism.

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


LANE
BIKE

BICYCLE FACILITY DESIGN

SHARED ROADWAYS

On shared roadways, bicyclists and motor vehicles use the same roadway space. Sharing may include side-by-side operation, or single lane in-line operation depending on the configuration.

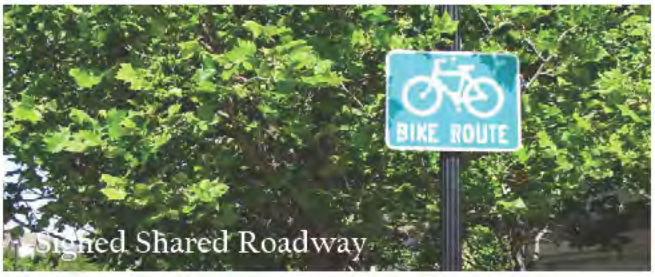
These facilities are typically used on roads with low speeds and traffic volumes, however they can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

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

Bicycle Boulevards

Bicycle boulevards are a special class of shared roadways designed for a broad spectrum of bicyclists. They are low-volume local streets where motorists and bicyclists share the same travel lane. Treatments for bicycle boulevards are selected as necessary to create appropriate automobile volumes and speeds, and to provide safe crossing opportunities of busy streets.


Rural Roads



Signed Shared Roadway


Marked Shared Roadway


Main Streets


Bicycle Boulevards

RURAL ROADS

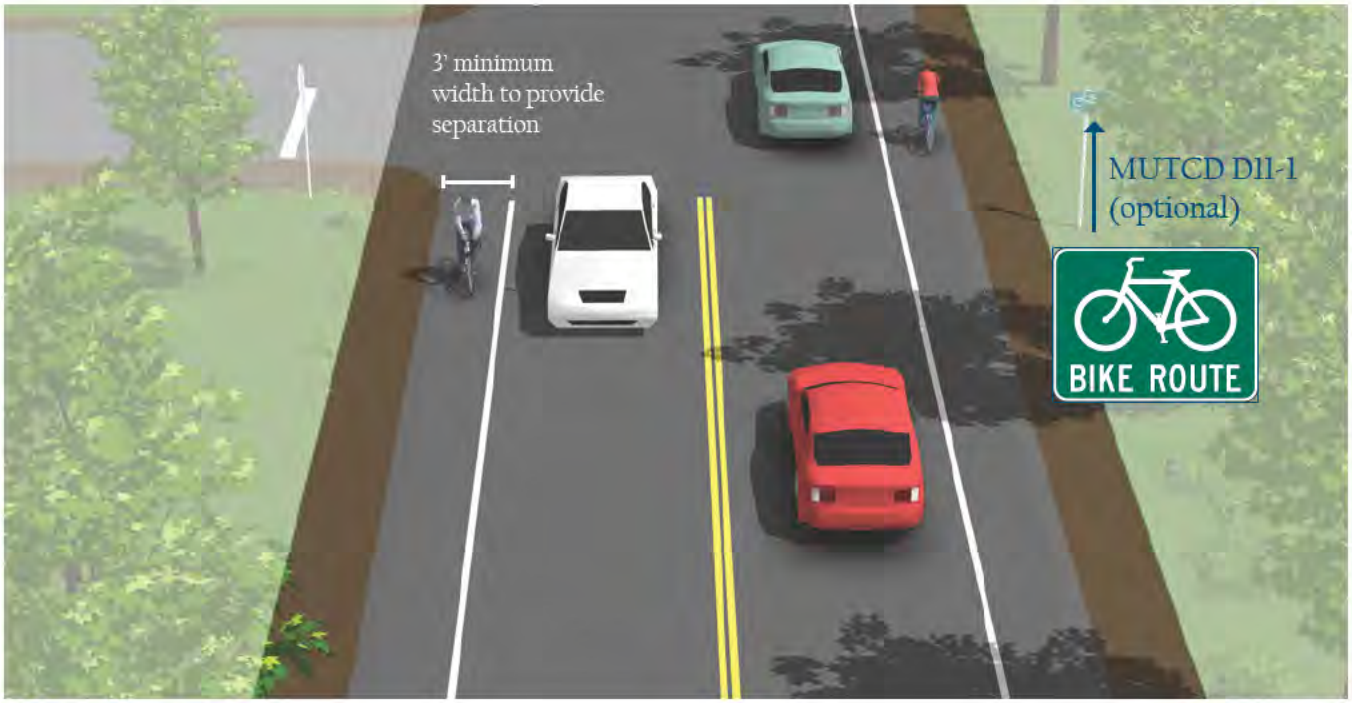
Description

Rural roads are often the primary routes connecting communities. These roads pass through less-dense areas, and are usually paved roadways with striped shoulders, but no curb and gutter. Sidewalk provision on rural roads is uncommon.

Shoulders wide enough for bicycle travel are the preferred type of bicycle facility on rural roads. Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway.

Guidance

- If 4 feet or more is available for bicycle travel, the full bike lane treatment of signs, legends, and a 6" bike lane line should be provided.
- If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.
- Rumble strips are not recommended on shoulders used by bicyclists unless there is a minimum 4 foot clear path. 12 foot gaps every 40-60 feet should be provided to allow access as needed.



Discussion

A wide outside lane may be sufficient accommodation for bicyclists on streets with insufficient width for bike lanes but which do have space available to provide a wider (14'-16') outside travel lane. Consider configuring as a marked shared roadway in these locations.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Shoulder bikeways should be cleared of snow through routine snow removal operations.

SIGNED SHARED ROADWAY

Description

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

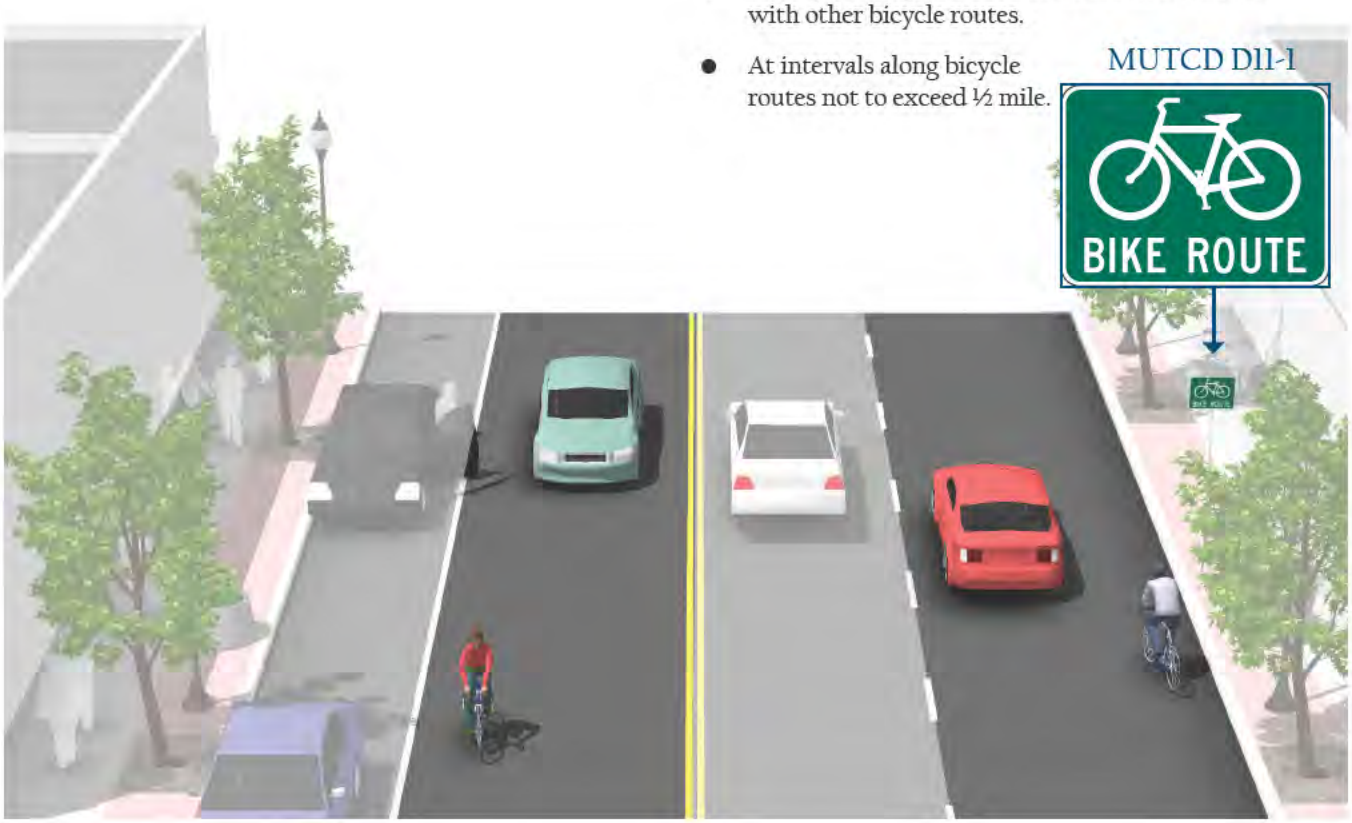
Guidance

Lane width varies depending on roadway configuration.

Bike route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed ½ mile.

MUTCD D11-1



Discussion

Signed Shared Roadways serve either to provide continuity with other bicycle facilities (usually bike lanes) or to designate preferred routes through high-demand corridors.

This configuration differs from a neighborhood greenway due to a lack of traffic calming, wayfinding, pavement markings and other enhancements designed to provide a higher level of comfort for a broad spectrum of users.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs, and will need periodic replacement due to wear.

MARKED SHARED ROADWAY

Description

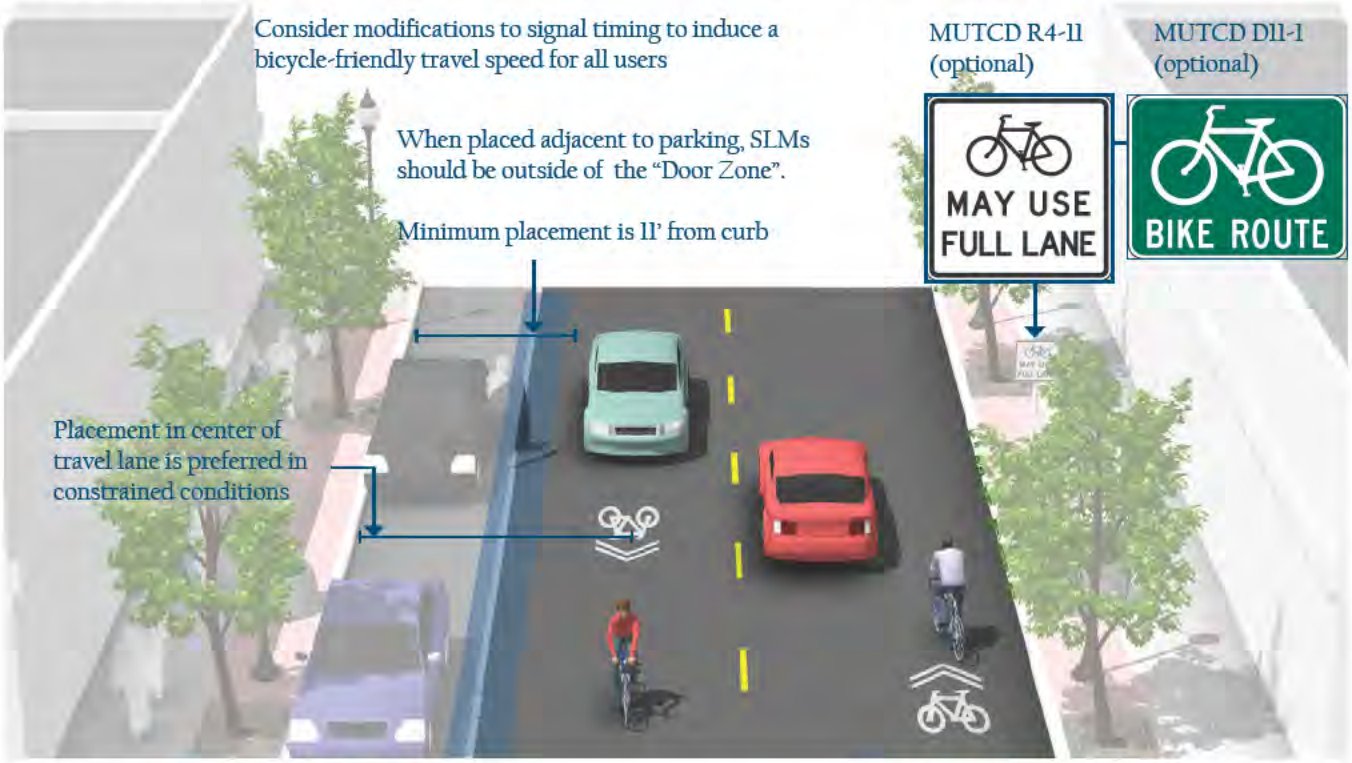
A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.

In constrained conditions, the SLMs are placed in the middle of the lane to discourage unsafe passing by motor vehicles. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.

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

Guidance

- May be used on streets with a speed limit of 35 mph or under. Lower than 30 mph speed limit preferred.
- In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.
- Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.



Regular Lane Adjacent to Parking

Wide Lane without Parking

Discussion

If collector or arterial, this should not be a substitute for dedicated bicycle facilities if space is available.

Bike Lanes should be considered on roadways with outside travel lanes wider than 15 feet, or where other lane narrowing or removal strategies may provide adequate road space. SLMs shall not be used on shoulders, in designated bike lanes, or to designate bicycle detection at signalized intersections. (MUTCD 9C.07)

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

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

MAIN STREETS

Description

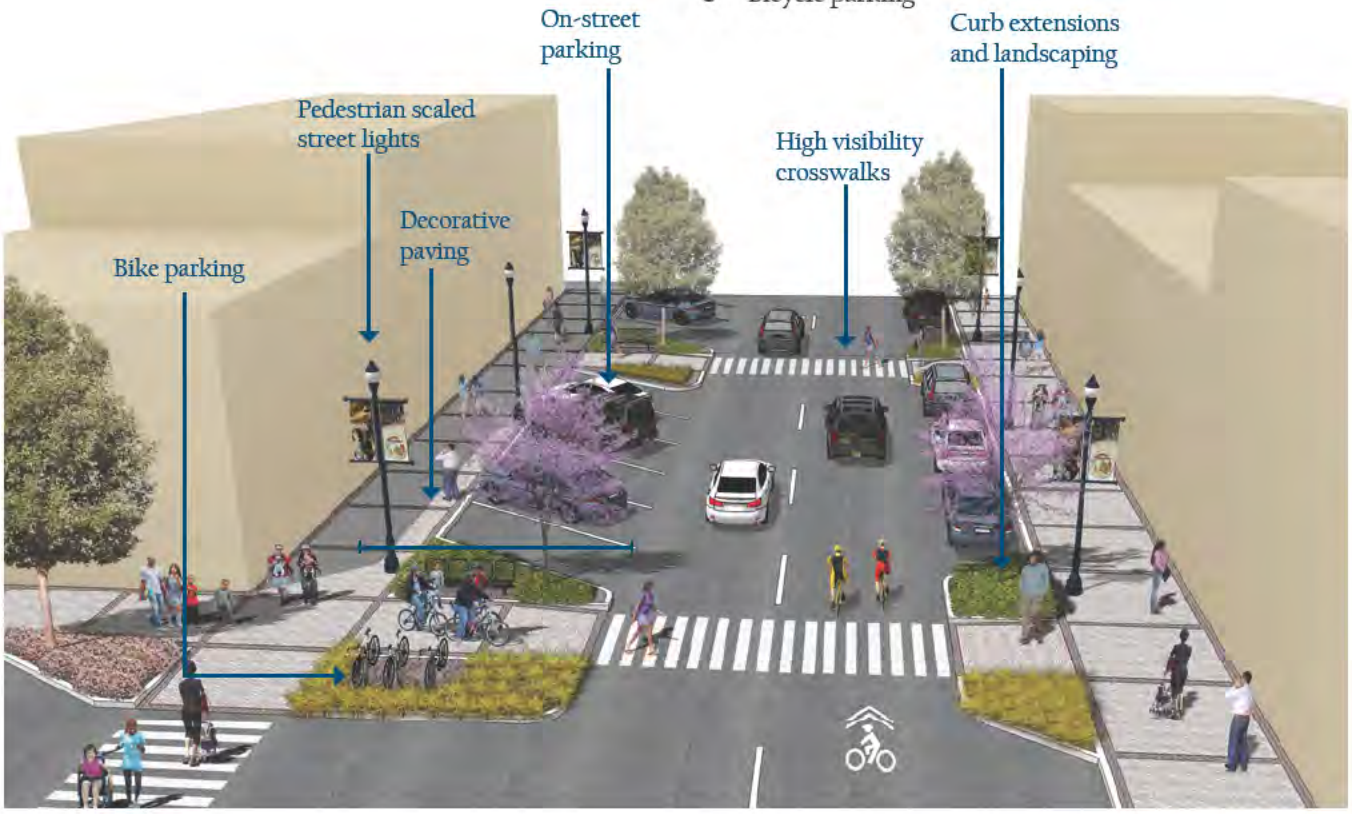
Inviting, walkable streets form the historic and cultural core of many communities. These streets are the primary streets through the middle of community "downtowns," and they serve many uses as a commercial hub, social space and transportation corridor.

Main streets should prioritize the needs of pedestrians through the urban form of land uses, the provision of on street parking and the calming of traffic to make street crossing opportunities frequent, safe, and comfortable.

Guidance

Main Streets have a variety of design characteristics in different communities, but they often include the following key components:

- Wide sidewalks
- Lighting and furnishings
- Parking between the sidewalk and lanes of travel
- Curb extensions
- Landscaping
- Decorative pavers
- High visibility crosswalks
- Bicycle parking



Discussion

If the main street area is configured as a couplet, these design elements should extend, at a minimum, to both ends of the couplet, and on both streets.

Other streets within a main street district can also benefit from improvements. If connecting streets have commercial uses or functions as a secondary gateway to the main street, they should at a minimum, have wide sidewalks, pedestrian lighting and street trees.

Additional References and Guidelines

ITE. *Designing Walkable Urban Thoroughfares.* 2010.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Street Design Guide.* 2013.

Materials and Maintenance

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

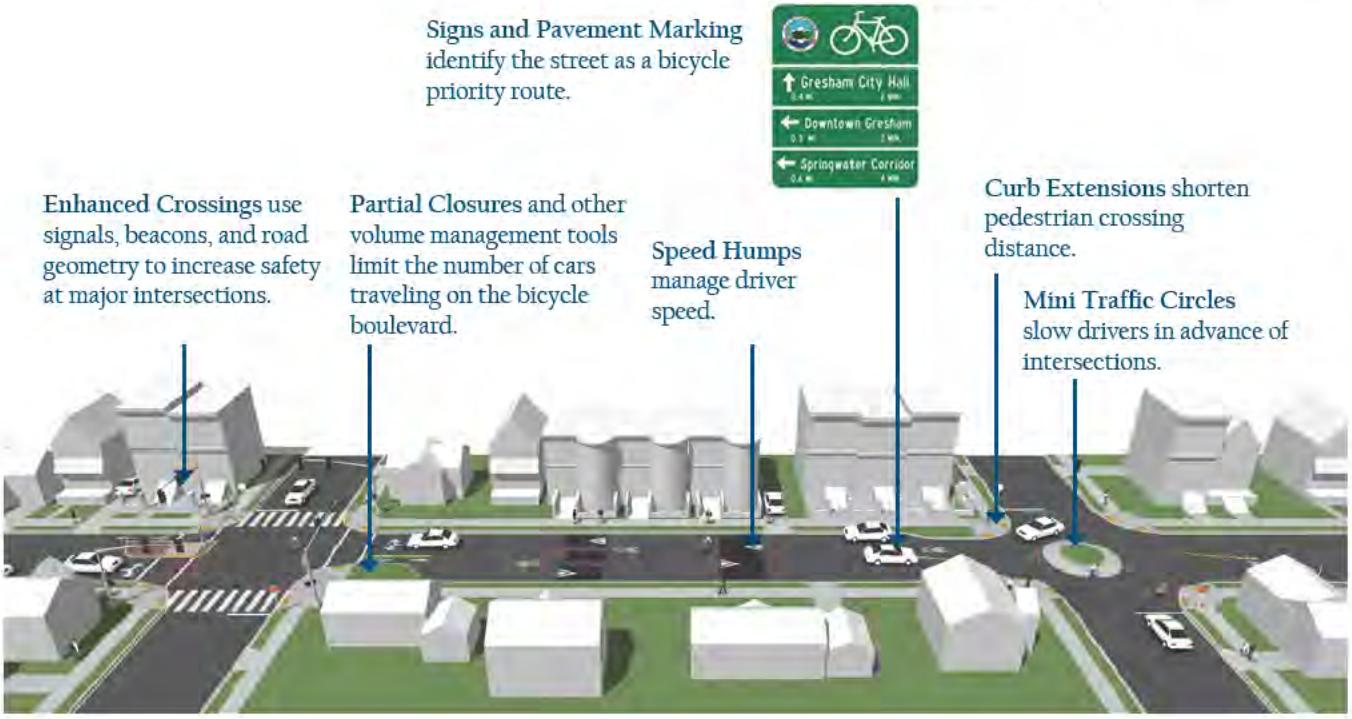
BICYCLE BOULEVARD

Description

Bicycle boulevards are low-volume, low-speed streets modified to enhance bicyclist comfort by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic.

Guidance

- Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard.
- Bicycle boulevards should have a maximum posted speed of 25 mph. Use traffic calming to maintain an 85th percentile speed below 22 mph.
- Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Target motor vehicle volumes range from 1,000 to 3,000 vehicles per day in most communities.
- Intersection crossings should be designed to enhance safety and minimize delay for bicyclists.



Discussion

Bicycle boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the bicycle boulevard and compromise safety.

Traffic calming can deter motorists from driving on a street. Anticipate and monitor vehicle volumes on adjacent streets to determine whether traffic calming results in inappropriate volumes. Traffic calming can be implemented on a trial basis. For more information see the *Traffic Calming* section in this guide.

Additional References and Guidelines

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. 2009.
BikeSafe. *Bicycle countermeasure selection system.*
Ewing, Reid and Brown, Steven. *U.S. Traffic Calming Manual.* 2009.

Materials and Maintenance

Vegetation should be regularly trimmed to maintain visibility and attractiveness.

SEPARATED BIKEWAYS

Description

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

Separated bikeways can increase safety and promote proper riding by:

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


Shoulder Bikeways


Bicycle Lanes


Buffered Bike Lanes


Cycle Tracks

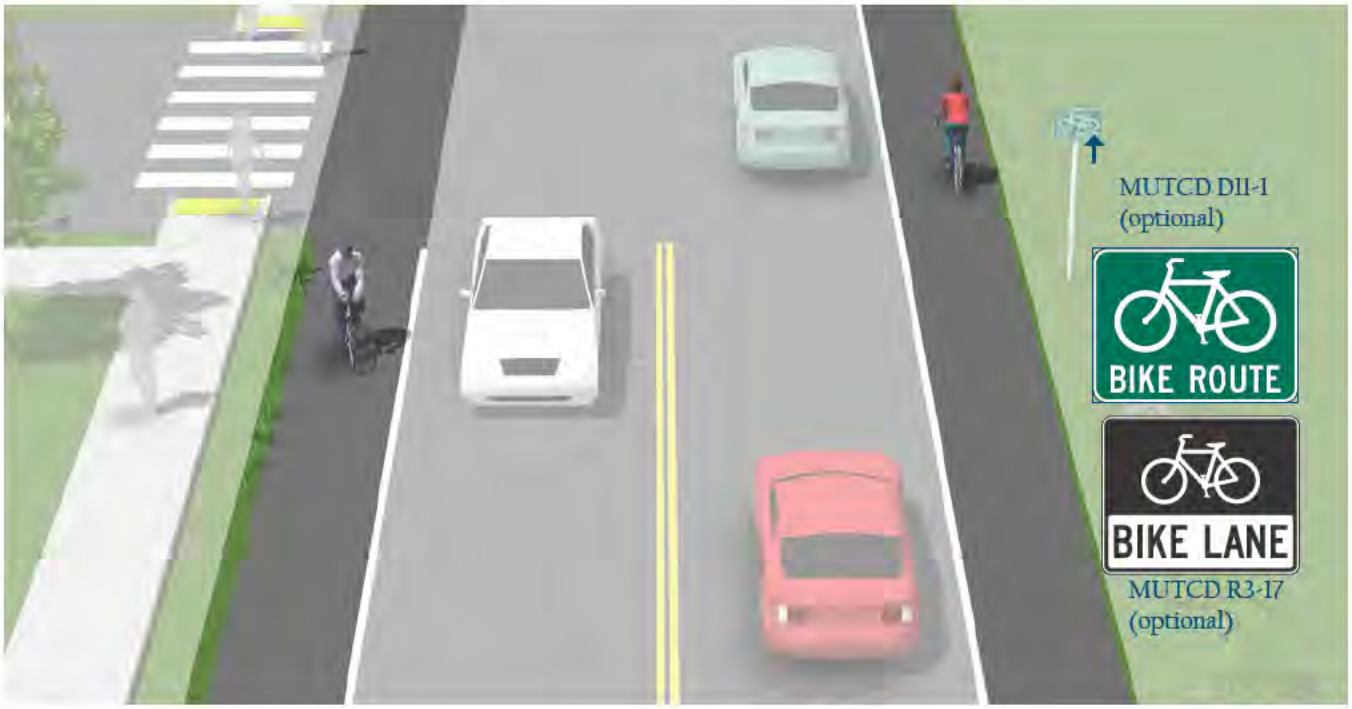
SHOULDER BIKEWAYS

Description

Typically found in less-dense areas, shoulder bikeways are paved roadways with striped shoulders (4'+) wide enough for bicycle travel. Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway. Shoulder bikeways should be considered a temporary treatment, with full bike lanes planned for construction when the roadway is widened or completed with curb and gutter. This type of treatment is not typical in urban areas and should only be used where constraints exist.

Guidance

- If 4 feet or more is available for bicycle travel, the full bike lane treatment of signs, legends, and an 8" bike lane line would be provided.
- If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.
- Rumble strips are not recommended on shoulders used by bicyclists unless there is a minimum 4 foot clear path. 12 foot gaps every 40-60 feet should be provided to allow access as needed.



Discussion

A wide outside lane may be sufficient accommodation for bicyclists on streets with insufficient width for bike lanes but which do have space available to provide a wider (14'-16') outside travel lane. Consider configuring as a marked shared roadway in these locations.

Where feasible, roadway widening should be performed with pavement resurfacing jobs.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Shoulder bikeways should be cleared of snow through routine snow removal operations.

BICYCLE LANE

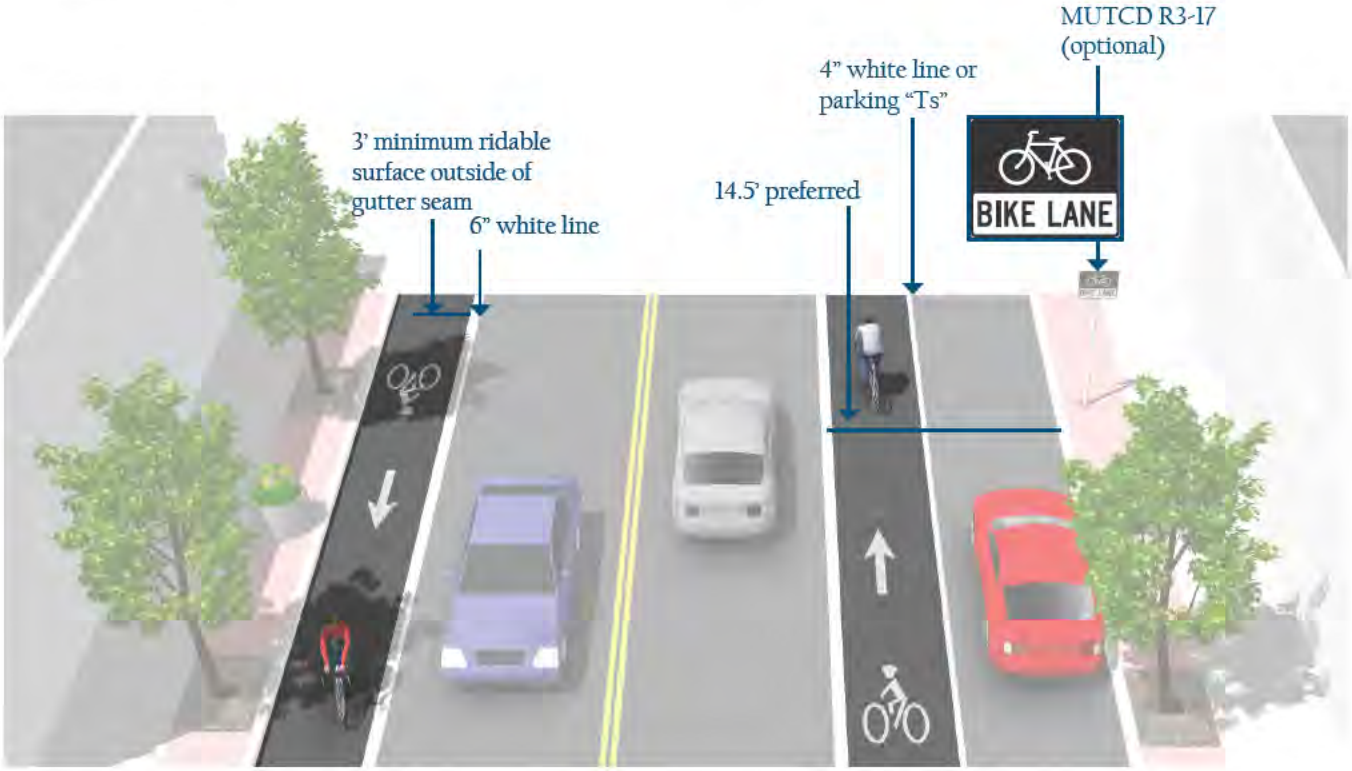
Description

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

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

Guidance

- 4 foot minimum when no curb and gutter is present.
- 5 foot minimum when adjacent to curb and gutter or 3 feet more than the gutter pan width if the gutter pan is wider than 2 feet.
- 14.5 foot preferred from curb face to edge of bike lane. (12 foot minimum).
- 7 foot maximum width for use adjacent to arterials with high travel speeds. Greater widths may encourage motor vehicle use of bike lane.



Discussion

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

BUFFERED BIKE LANE

Description

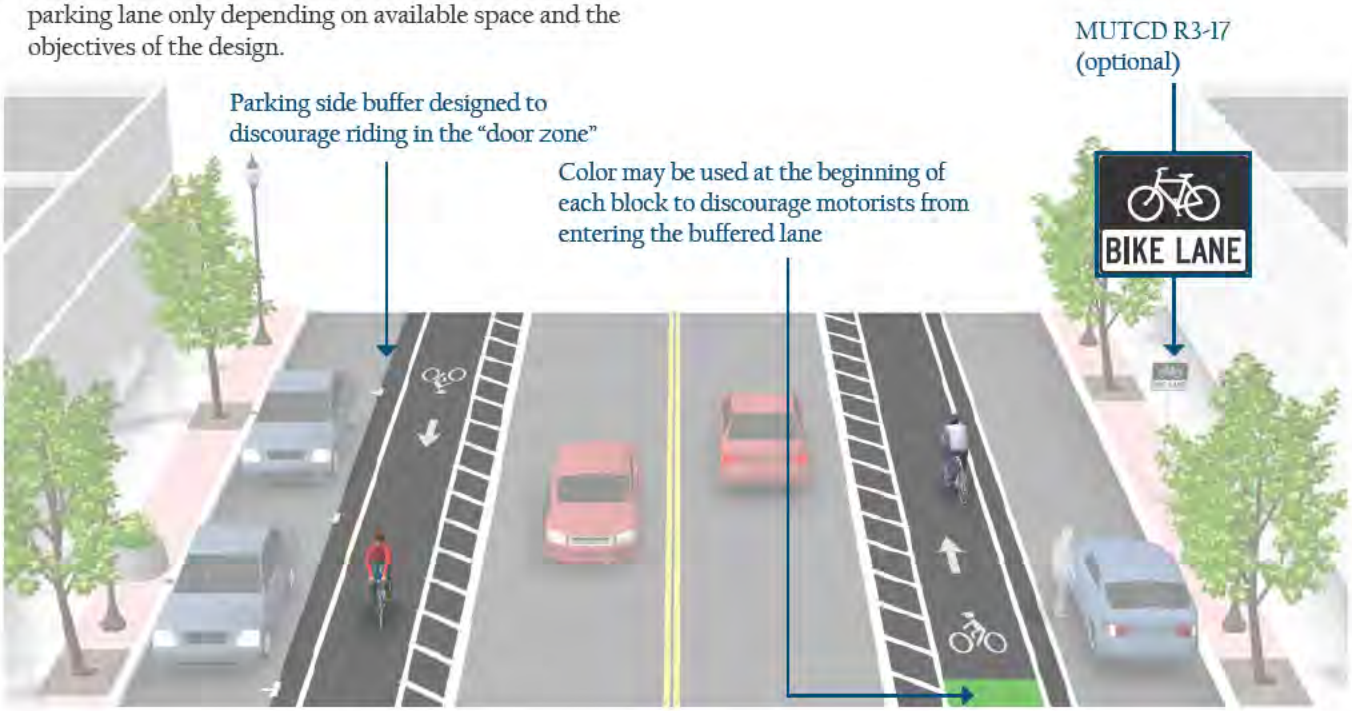
Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes follow general guidance for buffered preferential vehicle lanes as per MUTCD guidelines (section 3D-01).

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

Buffered bike lanes can buffer the travel lane only, or parking lane only depending on available space and the objectives of the design.

Guidance

- The minimum bicycle travel area is 5 feet wide.
- Buffers should be at least 2 feet wide. If 3 feet or wider, mark with diagonal or chevron hatching. For clarity at driveways or minor street crossings, consider a dotted line for the inside buffer boundary where cars are expected to cross.



Discussion

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices. (3D-01).* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

PROTECTED BIKE LANE / CYCLE TRACK

Description

A cycle track is an exclusive bike facility that combines the user experience of a separated trail with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used by bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.

Raised cycle tracks may be at the level of the adjacent sidewalk or set at an intermediate level between the roadway and sidewalk to separate the cycle track from the pedestrian area.

Guidance

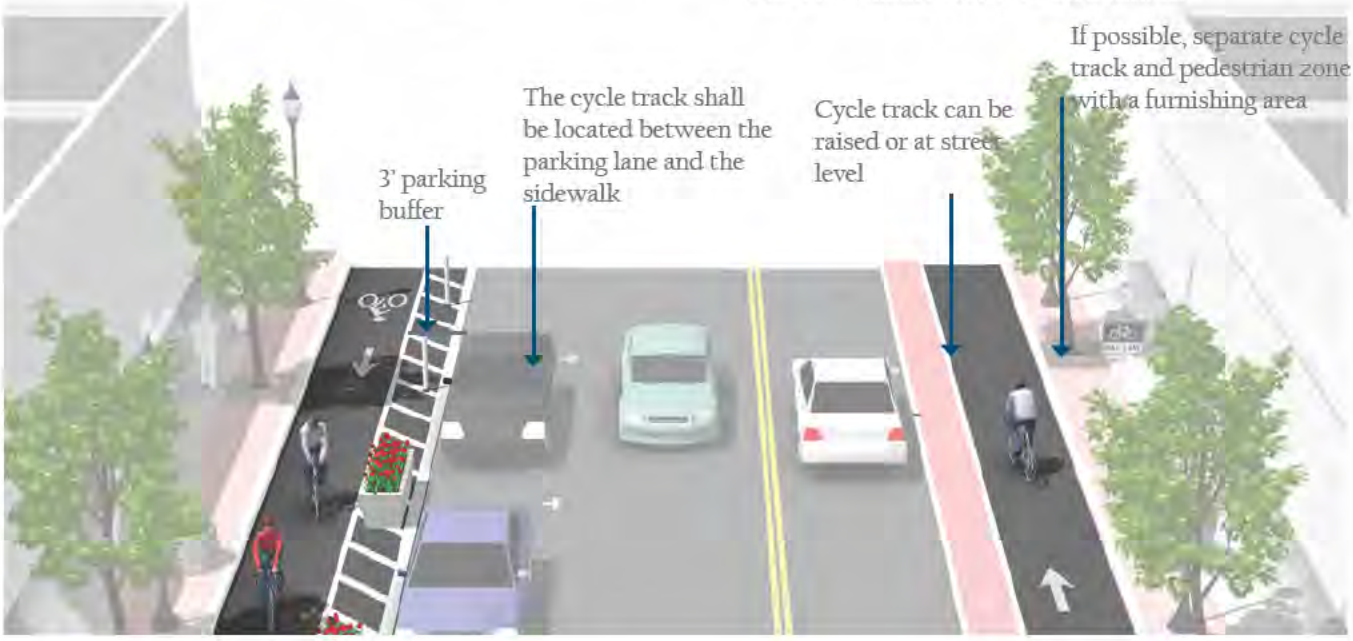
Cycle tracks should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles.

One-Way Cycle Tracks

- 7 foot recommended minimum to allow passing. 5 foot minimum width in constrained locations.

Two-Way Cycle Tracks

- Cycle tracks located on one-way streets have fewer potential conflict areas than those on two-way streets.
- 12 foot recommended minimum for two-way facility. 8 foot minimum in constrained locations



Discussion

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions. Driveways and minor street crossings are unique challenges to cycle track design. Parking should be prohibited within 30 feet of the intersection to improve visibility. Color, yield markings and "Yield to Bikes" signage should be used to identify the conflict area and make it clear that the cycle track has priority over entering and exiting traffic. If configured as a raised cycle track, the crossing should be raised so that the sidewalk and cycle track maintain their elevation through the crossing.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.

SEPARATED BIKEWAYS AT INTERSECTIONS

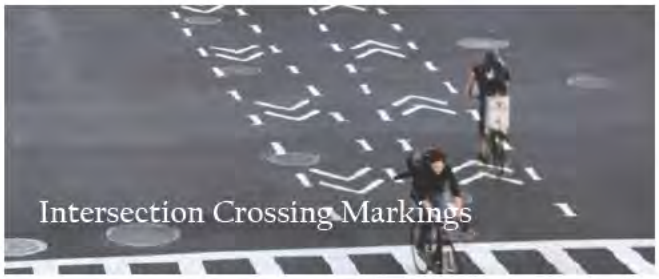
Intersections are junctions at which different modes of transportation meet and facilities overlap. An intersection facilitates the interchange between bicyclists, motorists, pedestrians and other modes in order to advance traffic flow in a safe and efficient manner. Designs for intersections with bicycle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

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


Bike Boxes


Bike Lanes at Right Turn Only Lanes


Colored Bike Lanes in Conflict Areas


Intersection Crossing Markings


Two Stage Turn Boxes


Single Lane Modern Roundabouts

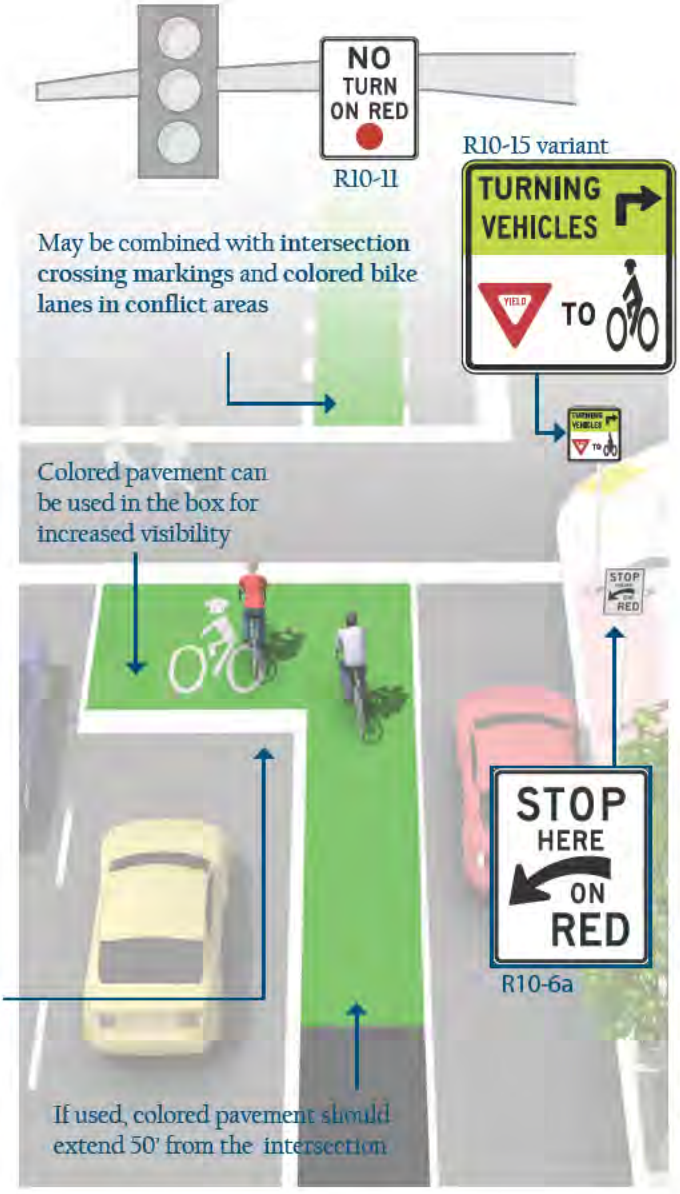
BIKE BOX

Description

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

Guidance

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



Discussion

Bike boxes are considered experimental by the FHWA.

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

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
FHWA. Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10. 2011.

Materials and Maintenance

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

BIKE LANES AT RIGHT TURN ONLY LANES

Description

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

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

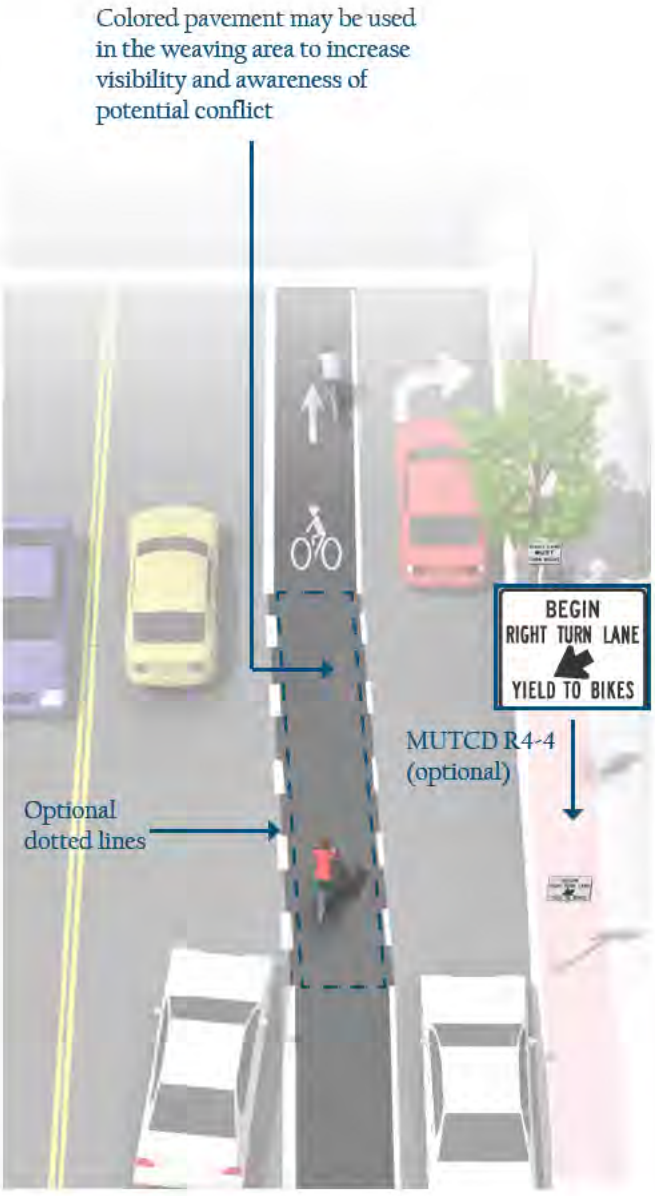
Guidance

At auxiliary right turn only lanes (add lane):

- Continue existing bike lane width; standard width of 5 to 6 feet or 4 feet in constrained locations.
- Use signage to indicate that motorists should yield to bicyclists through the conflict area.
- Consider using colored conflict areas to promote visibility of the mixing zone.

Where a through lane becomes a right turn only lane:

- Do not define a dotted line merging path for bicyclists.
- Drop the bicycle lane in advance of the merge area.
- Shared lane markings may be used to indicate shared use of the lane in the merging zone.



Discussion

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

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

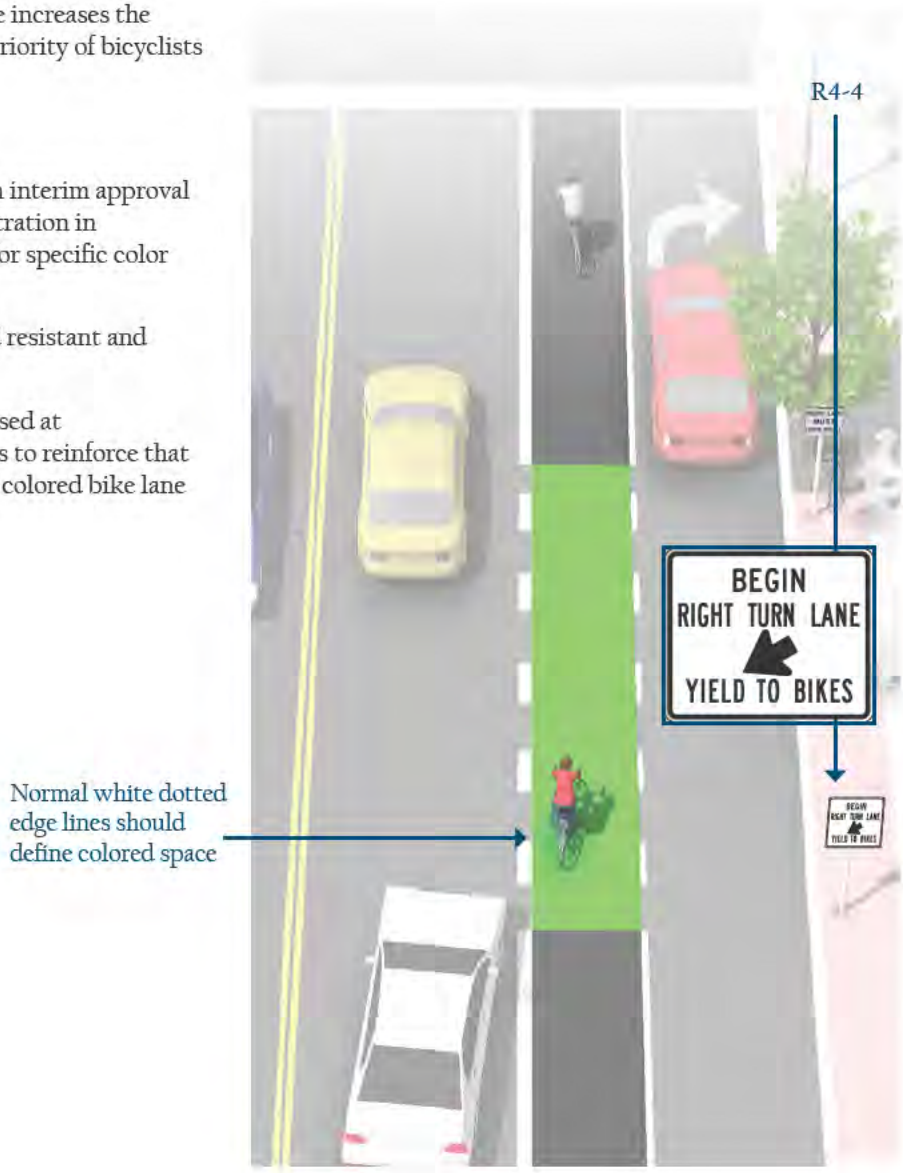
COLORED BIKE LANES IN CONFLICT AREAS

Description

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

Guidance

- Green colored pavement was given interim approval by the Federal Highways Administration in March 2011. See interim approval for specific color standards.
- The colored surface should be skid resistant and retro-reflective.
- A "Yield to Bikes" sign should be used at intersections or driveway crossings to reinforce that bicyclists have the right-of-way in colored bike lane areas.



Discussion

Evaluations performed in Portland, OR, St. Petersburg, FL and Austin, TX found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the application of the colored pavement when compared with an uncolored treatment.

Additional References and Guidelines

FHWA. Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10. 2011.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

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

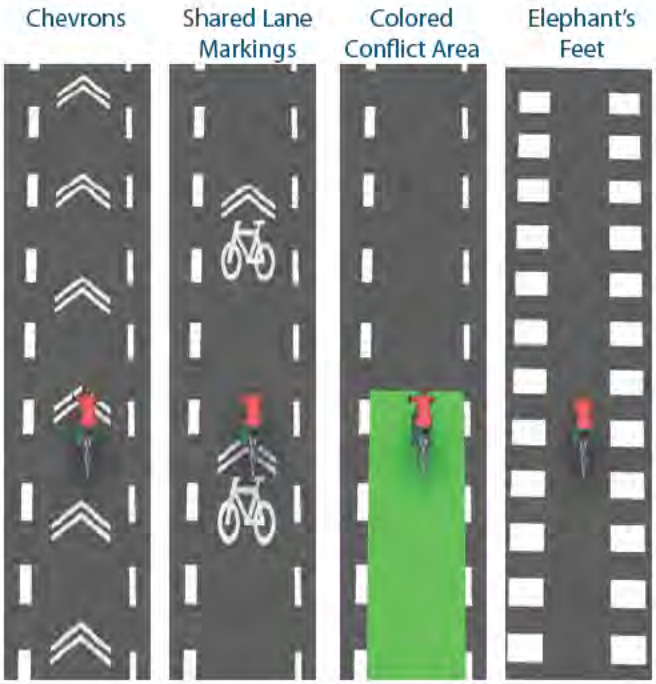
INTERSECTION CROSSING MARKINGS

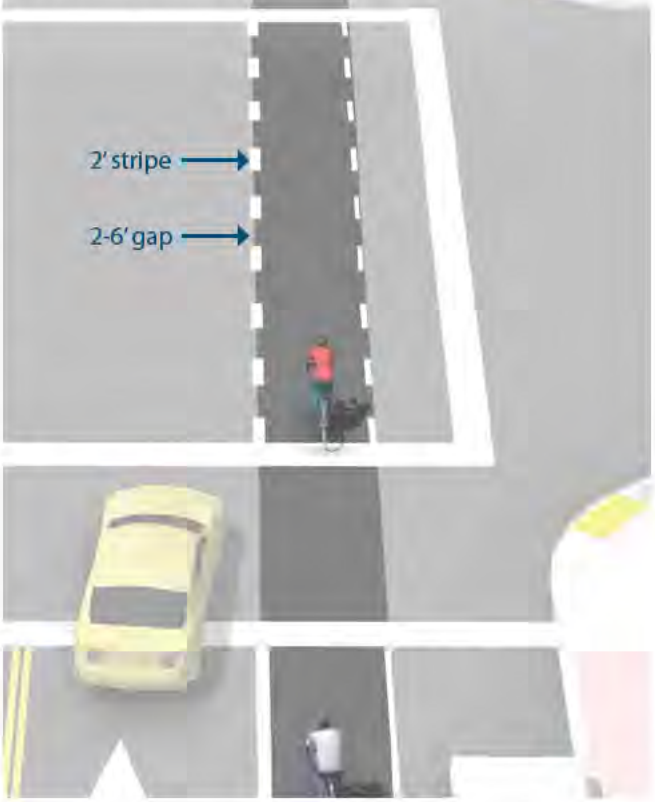
Description

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

Guidance

- See MUTCD Section 3B.08: "dotted line extensions"
- Crossing striping shall be at least six inches wide when adjacent to motor vehicle travel lanes. Dotted lines should be two-foot lines spaced two to six feet apart.
- Chevrons, shared lane markings, or colored bike lanes in conflict areas may be used to increase visibility within conflict areas or across entire intersections. Elephant's Feet markings are common in Europe and Canada.





Discussion

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices. (3A.06).* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

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

TWO-STAGE TURN BOXES

Description

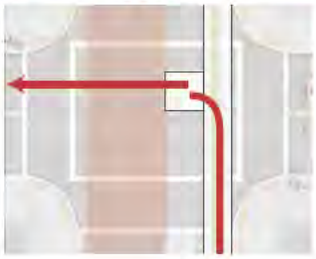
Two-stage turn queue boxes offer bicyclists a safe way to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane.

On right side cycle tracks, bicyclists are often unable to merge into traffic to turn left due to physical separation, making the provision of two-stage left turn boxes critical. Design guidance for two-stage turns apply to both bike lanes and cycle tracks.

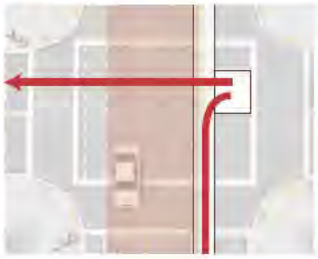
Guidance

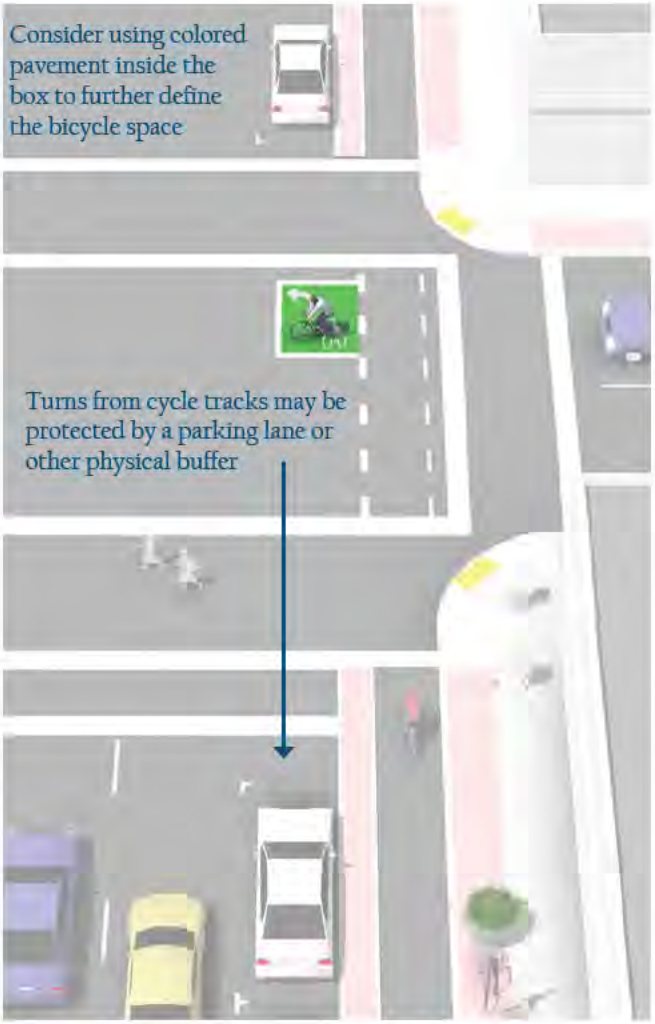
- The queue box shall be placed in a protected area. Typically this is within an on-street parking lane or cycle track buffer area.
- 6' minimum depth of bicycle storage area
- Bicycle stencil and turn arrow pavement markings shall be used to indicate proper bicycle direction and positioning.
- A "No Turn on Red" (MUTCD R10-11) sign may be installed on the cross street to prevent vehicles from entering the turn box.

Cycle track turn box protected by physical buffer:



Bike lane turn box protected by parking lane:





Discussion

Two-Stage Turn boxes are considered experimental by FHWA.

While two stage turns may increase bicyclist comfort in many locations, this configuration will typically result in higher average signal delay for bicyclists due to the need to receive two separate green signal indications (one for the through street, followed by one for the cross street) before proceeding.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates.

BICYCLISTS AT SINGLE LANE MODERN ROUNDABOUTS

Description

Roundabouts are circular intersections designed with yield control for all entering traffic, channelized approaches, and geometry to induce desirable speeds. They are used as an alternative to intersection signalization.

Other circulatory intersection designs exist but they function differently than the modern roundabout. These include:

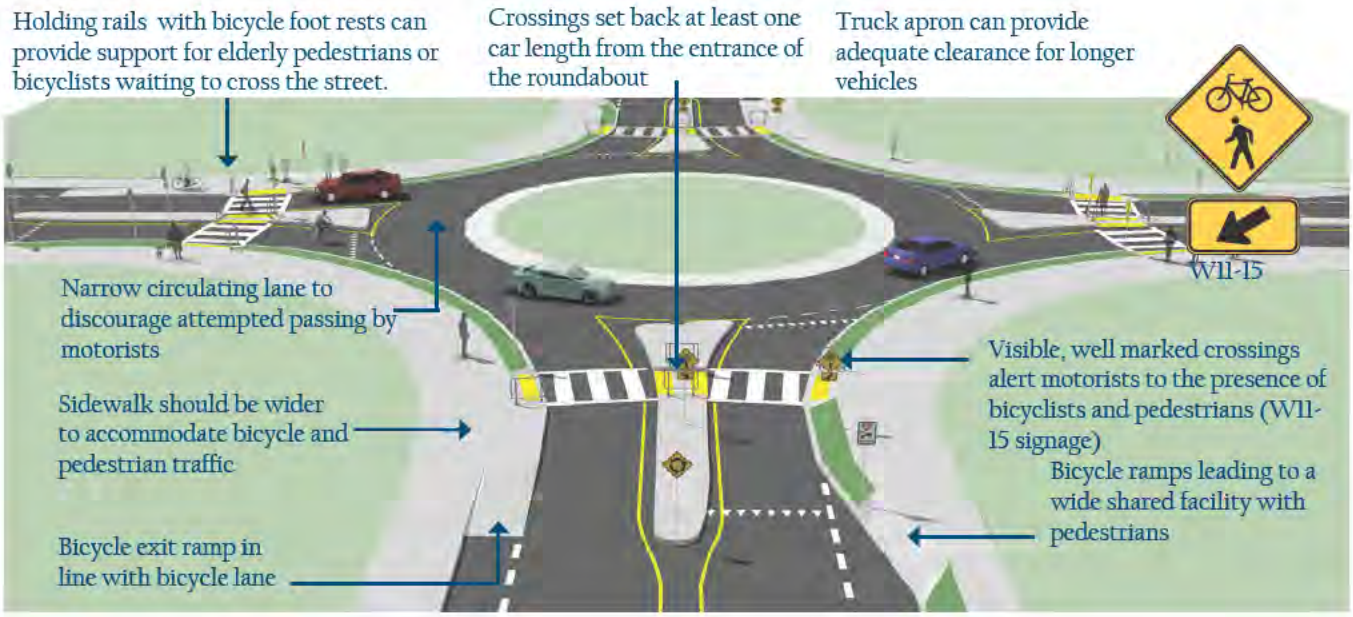
Traffic circles (also known as rotaries) are old style circular intersections used in some cities in the US where traffic signals or stop signs are used to control one or more entry.

Neighborhood Traffic Circles are small-sized circular intersections of local streets. They may be uncontrolled or stop controlled, and do not channelize entry.

Guidelines

It is important to indicate to motorists, bicyclists and pedestrians the right-of-way rules and correct way for them to circulate, using appropriately designed signage, pavement markings, and geometric design elements.

- 25 mph maximum circulating design speed.
- Design approaches/exits to the lowest speeds possible.
- Encourage bicyclists navigating the roundabout like motor vehicles to "take the lane."
- Maximize yielding rate of motorists to pedestrians and bicyclists at crosswalks.
- Provide separated facilities for bicyclists who prefer not to navigate the roundabout on the roadway.



Discussion

Research indicates that while single-lane roundabouts may benefit bicyclists and pedestrians by slowing traffic, multi-lane roundabouts may present greater challenges and significantly increase safety problems for these users.

On bicycle routes a roundabout or neighborhood traffic circle is preferable to stop control, as bicyclists do not like to lose their momentum due to physical effort required. At intersections of shared use paved trails, pedestrian and bicycle only roundabouts are an excellent form of non-motorized user traffic control.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
TRB. NCHRP 672 Roundabouts: An Informational Guide. 2010.
TRB. NCHRP Report 572 Roundabouts in the United States. 2007.
Hourdos, John et al. Investigation of Pedestrian/Bicyclist Risk in Minnesota Roundabout Crossings. 2012. TRB. NCHRP 674 Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities. 2011.

Materials and Maintenance

Signage and striping require routine maintenance.

BIKEWAY SIGNALIZATION

Bicycle signals and beacons facilitate bicyclist crossings of roadways. Bicycle signals make crossing intersections safer for bicyclists by clarifying when to enter an intersection and by restricting conflicting vehicle movements. Bicycle signals are traditional three lens signal heads with green, yellow and red bicycle stenciled lenses that can be employed at standard signalized intersections. Flashing amber warning beacons can be utilized at unsignalized intersection crossings. Push buttons, signage, and pavement markings may be used to supplement these facilities for both bicyclists and motorists.

Determining which type of signal or beacon to use for a particular intersection depends on a variety of factors. These include speed limits, Average Daily Traffic (ADT), anticipated bicycle crossing traffic, and the configuration of planned or existing bicycle facilities. Signals may be necessary as part of the construction of a protected bicycle facility such as a cycle track with potential turning conflicts, or to decrease vehicle or pedestrian conflicts at major crossings. An intersection with bicycle signals may reduce stress and delays for a crossing bicyclist, and discourage illegal and unsafe crossing maneuvers.


Bicycle Detection and Actuation


Hybrid Beacons (HAWK)

Bicycle Signal Heads

BICYCLE DETECTION AND ACTUATION

Description

Push Button Actuation

User-activated button mounted on a pole facing the street.

Loop Detectors

Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. This allows the bicyclist to stay within the lane of travel without having to maneuver to the side of the road to trigger a push button.

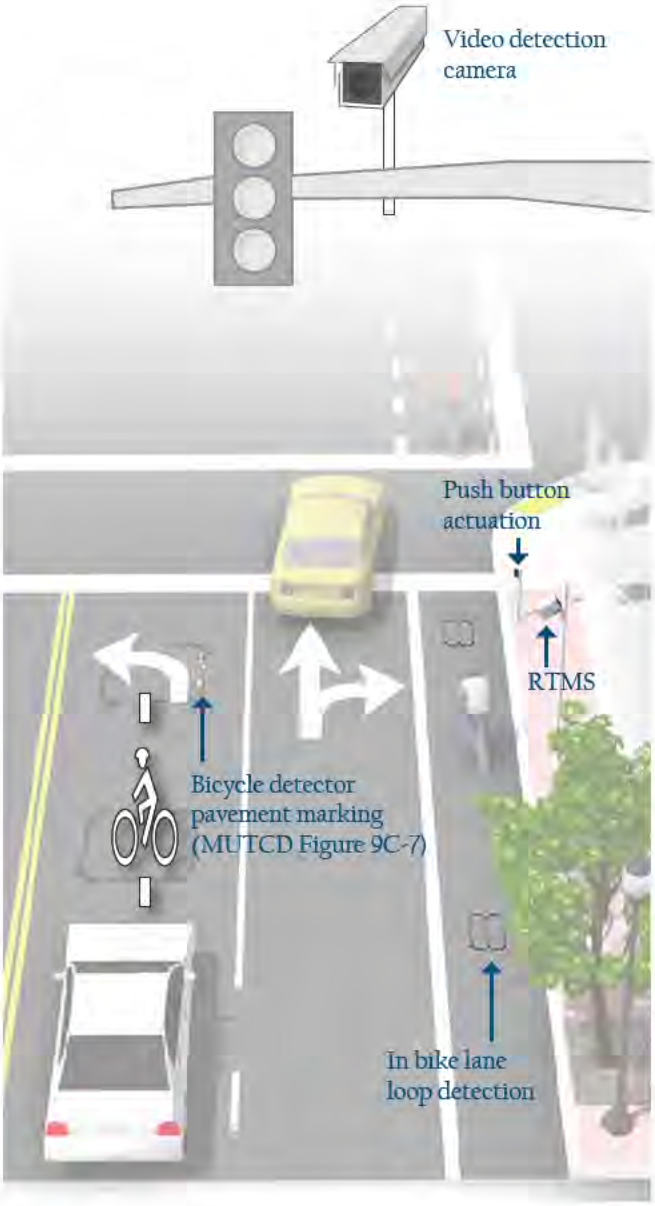
Loops that are sensitive enough to detect bicycles should be supplemented with pavement markings to instruct bicyclists how to trip them.

Video Detection Cameras

Video detection systems use digital image processing to detect a change in the image at a location. These systems can be calibrated to detect bicycles. Video camera system costs range from $20,000 to $25,000 per intersection.

Remote Traffic Microwave Sensor Detection (RTMS)

RTMS is a system which uses frequency modulated continuous wave radio signals to detect objects in the roadway. This method marks the detected object with a time code to determine its distance from the sensor. The RTMS system is unaffected by temperature and lighting, which can affect standard video detection.



Discussion

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

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

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Signal detection and actuation for bicyclists should be maintained with other traffic signal detection and roadway pavement markings.

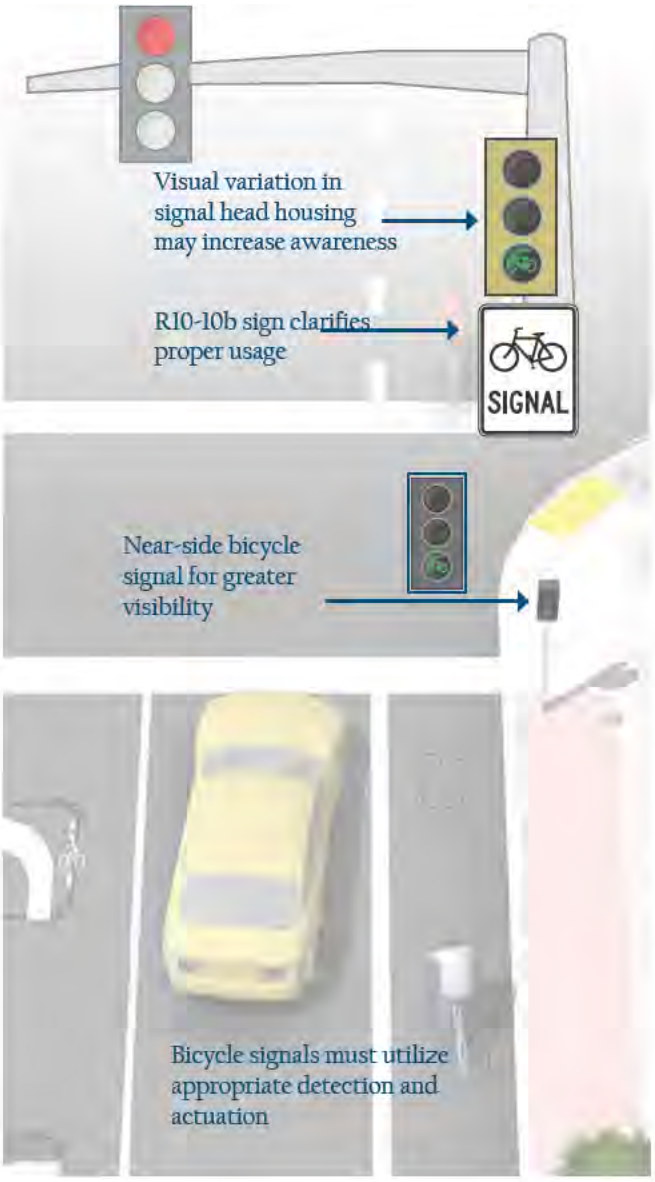
BICYCLE SIGNAL HEADS

Description

A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing traffic signal. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities. Bicycle signal heads may be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. Bicycle signals can be actuated with bicycle sensitive loop detectors, video detection, or push buttons.

Bicycle signals are typically used to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle-only movements).

FHWA currently limits the use of bicycle signal faces to where bicyclists would not be in conflict with any other vehicle movements, however many cities have successfully experimented with bicycle signals in other ways including the use of leading bicycle intervals.



Guidance

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

- Those with high volume of bicyclists at peak hours
- Those with high numbers of bicycle/motor vehicle crashes, especially those caused by turning vehicle movements
- At T-intersections with major bicycle movement along the top of the "T."
- At the confluence of an off-street bike trail and a roadway intersection
- Where separated bike paths run parallel to arterial streets

Discussion

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

Additional References and Guidelines

FHWA. *MUTCD - Interim Approval for Optional Use of a Bicycle Signal Face (IA-16).* 2013.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

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

BIKEWAY SIGNING

The ability to navigate through a city is informed by landmarks, natural features and other visual cues. Signs throughout the city should indicate to bicyclists:

- Direction of travel
- Location of destinations
- Travel time/distance to those destinations

These signs will increase users' comfort and accessibility to the bicycle systems.

Signage can serve both wayfinding and safety purposes including:

- Helping to familiarize users with the bicycle network
- Helping users identify the best routes to destinations
- Helping to address misperceptions about time and distance
- Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

A community-wide bicycle wayfinding signage plan would identify:

- Sign locations
- Sign type – what information should be included and design features
- Destinations to be highlighted on each sign – key destinations for bicyclists
- Approximate distance and travel time to each destination

Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards.

Wayfinding Sign Types

Wayfinding Sign Placement

WAYFINDING SIGN TYPES

Description

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. There are three general types of wayfinding signs:

Confirmation Signs

Indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route.

Can include destinations and distance/time. Do not include arrows.

Turn Signs

Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings.

Include destinations and arrows.

Decisions Signs

Mark the junction of two or more bikeways.

Inform bicyclists of the designated bike route to access key destinations.

Destinations and arrows, distances and travel times are optional but recommended.

Discussion

There is no standard color for bicycle wayfinding signage. Section 1A.12 of the MUTCD establishes the general meaning for signage colors. Green is the color used for directional guidance and is the most common color of bicycle wayfinding signage in the US, including those in the MUTCD.

See image at right for an example of a regional logo used for visual communication for the Razorback Regional Greenway.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

WAYFINDING SIGN PLACEMENT

Along a route to indicate a nearby destination.

Confirmation Signs

Every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g., within 150 ft of a turn or decision sign). Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs

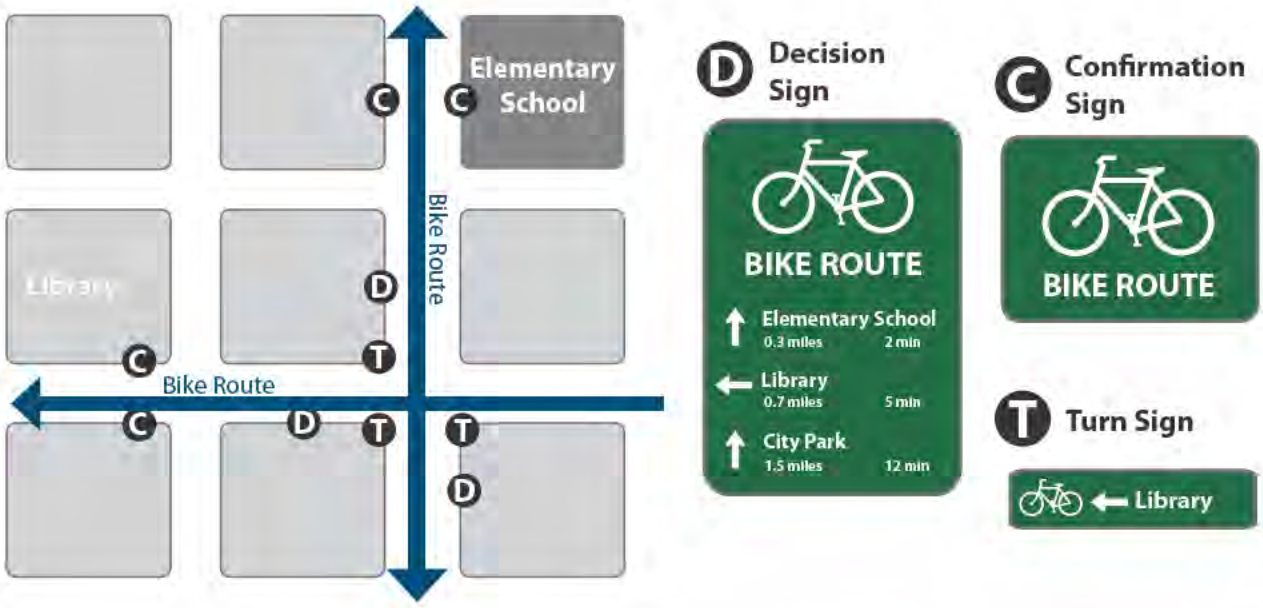
Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through). Pavement markings can also indicate the need to turn to the bicyclist.

Guidance

Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.

Decisions Signs

Near-side of intersections in advance of a junction with another bicycle route.



Discussion

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users throughout the area. A particular destination's ranking in the hierarchy can be used to determine the physical distance from which the locations are signed. For example, primary destinations (such as the downtown area) may be included on signage up to 5 miles away. Secondary destinations (such as a transit station) may be included on signage up to two miles away. Tertiary destinations (such as a park) may be included on signage up to one mile away.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

BICYCLE SUPPORT FACILITIES

Bicycle Parking

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of 2 hours or less, or long-term parking for employees, students, residents, and commuters.

Access to Transit

Safe and easy access to bicycle parking facilities is necessary to encourage commuters to access transit via bicycle. Providing bicycle access to transit and space for bicycles on buses and rail vehicles can increase the feasibility of transit in lower-density areas, where transit stops are beyond walking distance of many residences. People are often willing to walk only a quarter- to half-mile to a bus stop, while they might bike as much as two or more miles to reach a transit station.

Roadway Construction and Repair

Safety of all roadway users should be considered during road construction and repair. Wherever bicycles are allowed, measures should be taken to provide for the continuity of a bicyclist's trip through a work zone area.

Only in rare cases should pedestrians and bicyclists be detoured to another street when travel vehicle lanes remain open. Contractors performing work should be made aware of the needs of bicyclists and be properly trained in how to safely route bicyclists through or around work zones.


Bicycle Racks


Bicycle Corral


Bicycle Lockers


Secure Parking Areas

BICYCLE RACKS

Description

Short-term bicycle parking is meant to accommodate visitors, customers, and others expected to depart within two hours. It should have an approved standard rack, appropriate location and placement, and weather protection. The Association for Pedestrian and Bicycle Professionals (APBP) recommends selecting a bicycle rack that:

- Supports the bicycle in at least two places, preventing it from falling over.
- Allows locking of the frame and one or both wheels with a U-lock.
- Is securely anchored to ground.
- Resists cutting, rusting and bending or deformation.

Guidance

- 2' minimum from the curb face to avoid 'dooring.'
- Close to destinations; 50' maximum distance from main building entrance.
- Minimum clear distance of 6' should be provided between the bicycle rack and the property line.
- Should be highly visible from adjacent bicycle routes and pedestrian traffic.
- Locate racks in areas that cyclists are most likely to travel.

Discussion

Where the placement of racks on sidewalks is not possible (due to narrow sidewalk width, sidewalk obstructions, street trees, etc.), bicycle parking can be provided in the street where on-street vehicle parking is allowed in the form of on-street bicycle corrals.

Some types of bicycle racks may meet design criteria, but are discouraged except in limited situations. This includes undulating "wave" racks, schoolyard "wheel bender" racks, and spiral racks.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Use of proper anchors will prevent vandalism and theft. Racks and anchors should be regularly inspected for damage. Educate snow removal crews to avoid burying racks during winter months.

ON-STREET BICYCLE CORRAL

Description

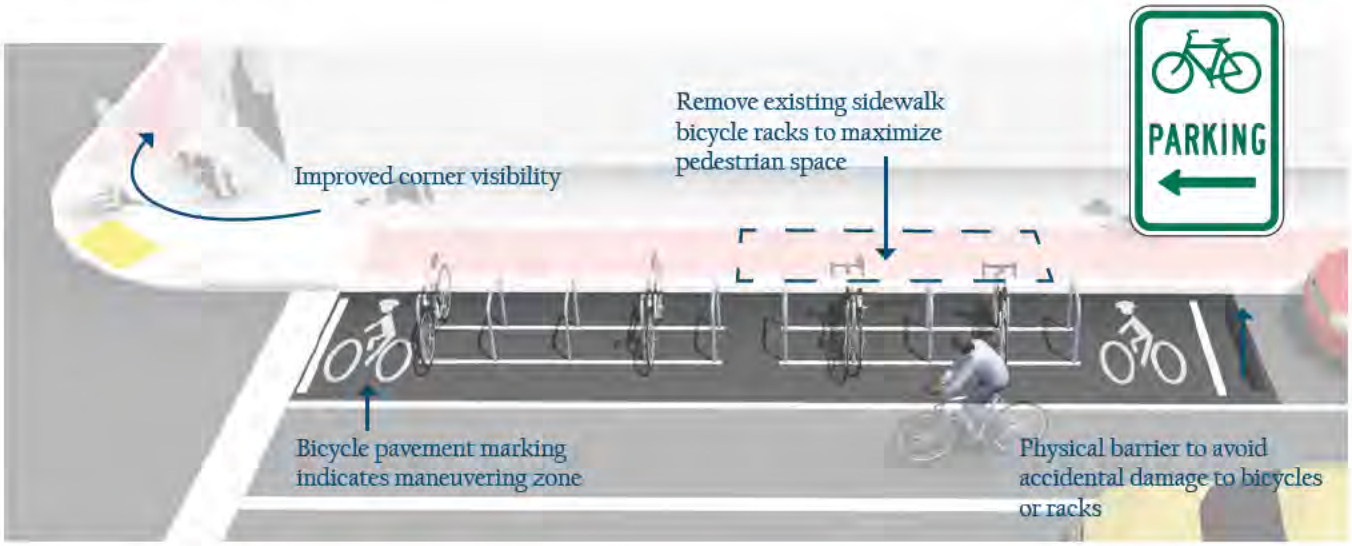
Bicycle corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

Bicycle corrals move bicycles off the sidewalks, leaving more space for pedestrians, sidewalk café tables, etc. Because bicycle parking does not block sightlines (as large motor vehicles would do), it may be possible to locate bicycle parking in 'no-parking' zones near intersections and crosswalks.

Guidance

See guidelines for sidewalk bicycle rack placement and clear zones.

- Bicyclists should have an entrance width from the roadway of 5' – 6'.
- Can be used with parallel or angled parking.
- Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.



Discussion

In many communities, the installation of bicycle corrals is driven by requests from adjacent businesses, and is not a city-driven initiative. In such cases, the city does not remove motor vehicle parking unless it is explicitly requested. In other areas, the city provides the facility and business associations take responsibility for the maintenance of the facility. Communities can establish maintenance agreements with the requesting business. Bicycle corrals can be especially effective in areas with high bicycle parking demand or along street frontages with narrow sidewalks where parked bicycles would be detrimental to the pedestrian environment.

Additional References and Guidelines

APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Physical barriers may obstruct drainage and collect debris. Establish a maintenance agreement with neighboring businesses. In snowy climates the bicycle corral may need to be removed during the winter months.

BICYCLE LOCKERS

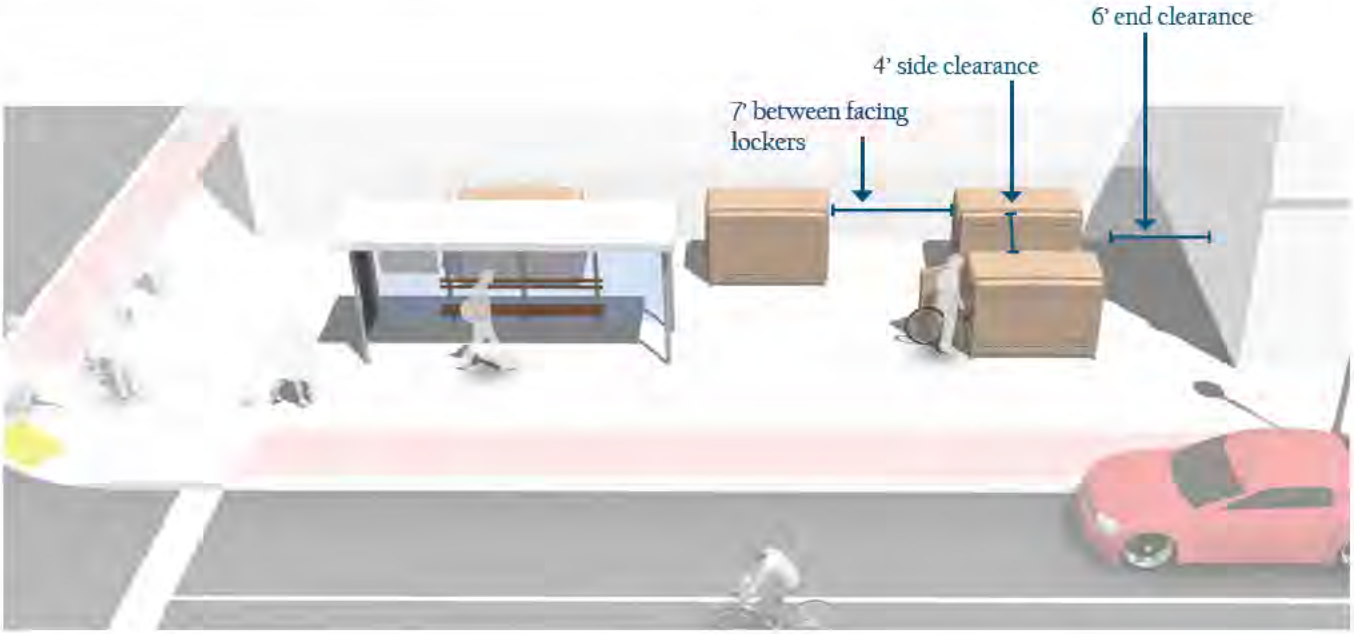
Description

Bicycle lockers are intended to provide long-term bicycle storage for employees, students, residents, commuters, and others expected to park more than two hours. Long-term facilities protect the entire bicycle, its components and accessories against theft and against inclement weather, including snow and wind-driven rain.

Bicycle lockers provide space to store a few accessories or rain gear in addition to containing the bicycle. Some lockers allow access to two users - a partition separating the two bicycles can help users feel their bike is secure. Lockers can also be stacked, reducing the footprint of the area, although that makes them more difficult to use.

Guidance

- Minimum dimensions: width (opening) 2.5'; height 4'; depth 6'.
- 4 foot side clearance and 6 foot end clearance.
- 7 foot minimum distance between facing lockers.
- Locker designs that allow visibility and inspection of contents are recommended for increased security.
- Access is controlled by a key or access code.



Discussion

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free. Potential locations for long-term bicycle parking include transit stations, large employers, and institutions where people use their bikes for commuting and not consistently throughout the day.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Regularly inspect the functioning of moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.

SECURE PARKING AREAS (SPA)

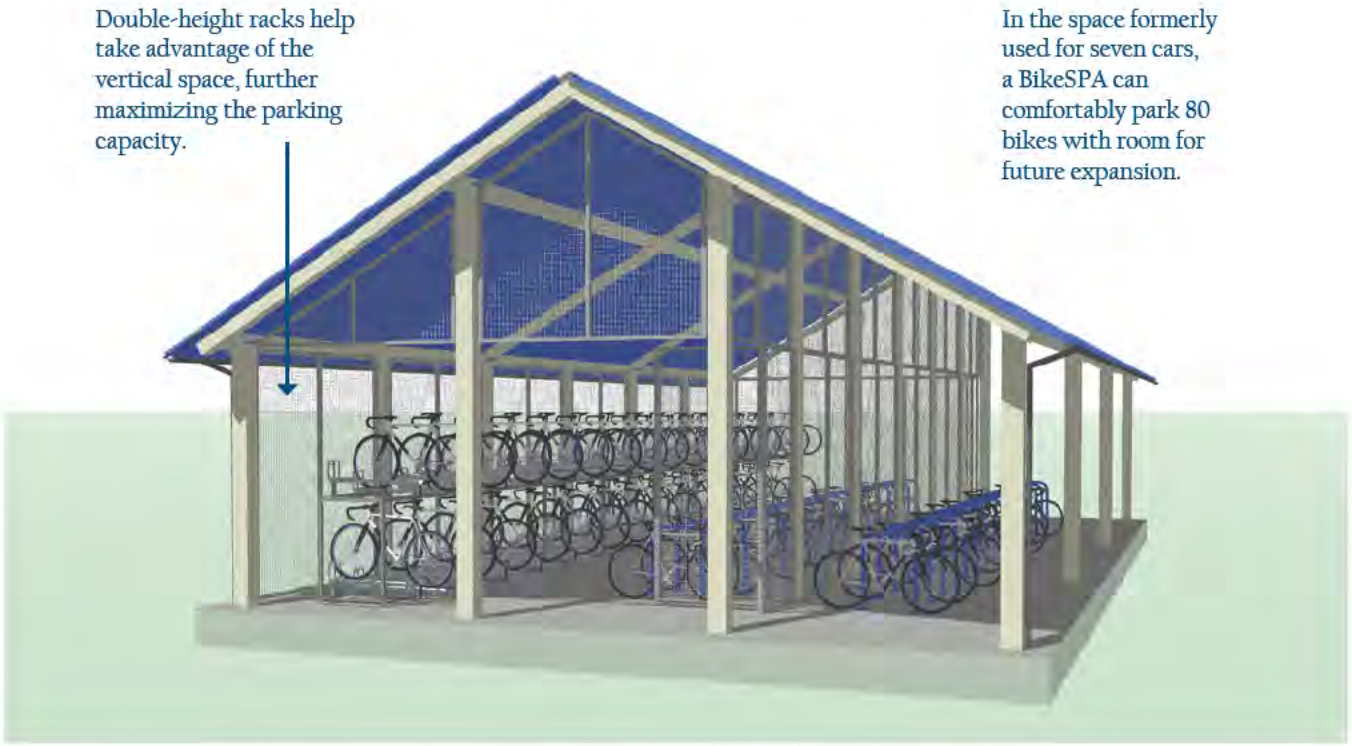
Description

A Secure Parking Area for bicycles, also known as a BikeSPA or Bike & Ride (when located at transit stations), is a semi-enclosed space that offers a higher level of security than ordinary bike racks. Accessible via key-card, combination locks, or keys, BikeSPAs provide high-capacity parking for 10 to 100 or more bicycles. Increased security measures create an additional transportation option for those whose biggest concern is theft and vulnerability.

Guidance

Key features may include:

- Closed-circuit television monitoring.
- Double high racks & cargo bike spaces.
- Bike repair station with bench.
- Bike tube and maintenance item vending machine.
- Bike lock "hitching post" – allows people to leave bike locks.
- Secure access for users.



Discussion

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free. BikeSPAs are ideal for transit centers, airports, train stations, or wherever large numbers of people might arrive by bicycle and need a secure place to park while away.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Regularly inspect the functioning of moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.

BIKEWAY MAINTENANCE

Regular bicycle facility maintenance includes sweeping, maintaining a smooth roadway, ensuring that the gutter-to-pavement transition remains relatively flat, and installing bicycle-friendly drainage grates. Pavement overlays are a good opportunity to improve bicycle facilities. The following recommendations provide a menu of options to consider to enhance a maintenance regimen.

Recommended Walkway and Bikeway Maintenance Activities

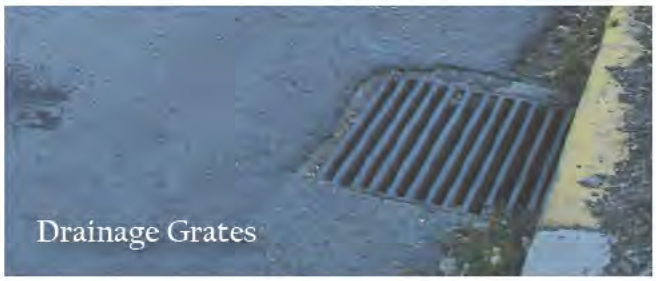
Maintenance Activity	Frequency
Inspections	Seasonal – at beginning and end of Summer
Pavement sweeping/ blowing	As needed, with higher frequency in the early Spring and Fall
Pavement sealing	5 - 15 years
Pothole repair	1 week – 1 month after report
Culvert and drainage grate inspection	Before Winter and after major storms
Pavement markings replacement	As needed
Signage replacement	As needed
Shoulder plant trimming (weeds, trees, brambles)	Twice a year; middle of growing season and early Fall
Tree and shrub plantings, trimming	1 – 3 years
Major damage response (washouts, fallen trees, flooding)	As soon as possible

This Section Includes:

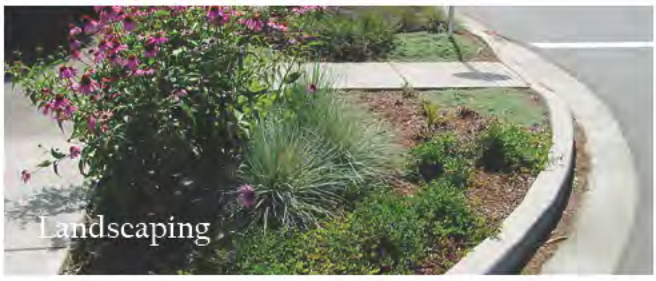
- Sweeping
- Signage
- Roadway Surface
- Pavement Overlays
- Drainage Grates
- Gutter to Pavement Transition
- Landscaping
- Maintenance Management Plan


Sweeping


Roadway Surface


Drainage Grates


Gutter to Pavement Transition

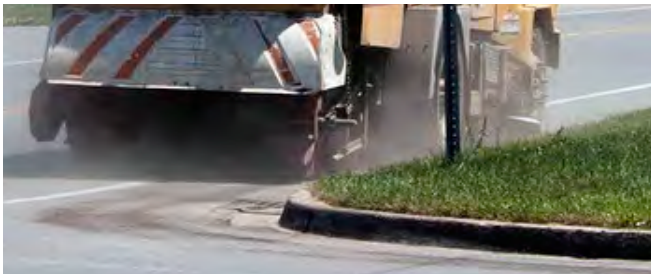

Landscaping


Maintenance Management Plan

SWEEPING

Description

Bicyclists often avoid shoulders and bike lanes filled with gravel, broken glass and other debris; they will ride in the roadway to avoid these hazards, potentially causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface), nor should debris be swept from the sidewalk onto the roadway. A regularly scheduled inspection and maintenance program helps ensure that roadway debris is regularly picked up or swept.



Guidance

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility.
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders.
- Pave gravel driveway approaches to minimize loose gravel on paved roadway shoulders.
- Perform additional sweeping in the Spring to remove debris from the Winter.
- Perform additional sweeping in the Fall in areas where leaves accumulate .

SIGNAGE

Description

Bike lanes, shared shoulders, Bicycle Boulevards and trails all have different signage types for wayfinding and regulations. Such signage is vulnerable to vandalism or wear, and requires periodic maintenance and replacement as needed.

Guidance

- Check regulatory and wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear.
- Replace signage along the bikeway network as-needed.
- Perform a regularly-scheduled check on the status of signage with follow-up as necessary.
- Create a Maintenance Management Plan.

ROADWAY SURFACE

Description

Bicycles are much more sensitive to subtle changes in roadway surface than are motor vehicles. Various materials are used to pave roadways, and some are smoother than others. Compaction is also an important issue after trenches and other construction holes are filled. Uneven settlement after trenching can affect the roadway surface nearest the curb where bicycles travel. Sometimes compaction is not achieved to a satisfactory level, and an uneven pavement surface can result due to settling over the course of days or weeks. When resurfacing streets, use the smallest chip size and ensure that the surface is as smooth as possible to improve safety and comfort for bicyclists.

Guidance

- Maintain a smooth pothole-free surface.
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼".
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- If chip sealing is to be performed, use the smallest possible chip on bike lanes and shoulders. Sweep loose chips regularly following application.
- During chip seal maintenance projects, if the pavement condition of the bike lane is satisfactory, it may be appropriate to chip seal the travel lanes only. However, use caution when doing this so as not to create an unacceptable ridge between the bike lane and travel lane.

PAVEMENT OVERLAYS

Description

Pavement overlays represent good opportunities to improve conditions for bicyclists if done carefully. A ridge should not be left in the area where bicyclists ride (this occurs where an overlay extends part-way into a shoulder bikeway or bike lane). Overlay projects also offer opportunities to widen a roadway, or to re-stripe a roadway with bike lanes.

Guidance

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge.
- If the shoulder or bike lane pavement is of good quality, it may be appropriate to end the overlay at the shoulder or bike lane stripe provided no abrupt ridge remains.
- Ensure that inlet grates, manhole and valve covers are within ¼ inch of the finished pavement surface and are made or treated with slip resistant materials.
- Pave gravel driveways to property lines to prevent gravel from being tracked onto shoulders or bike lanes.

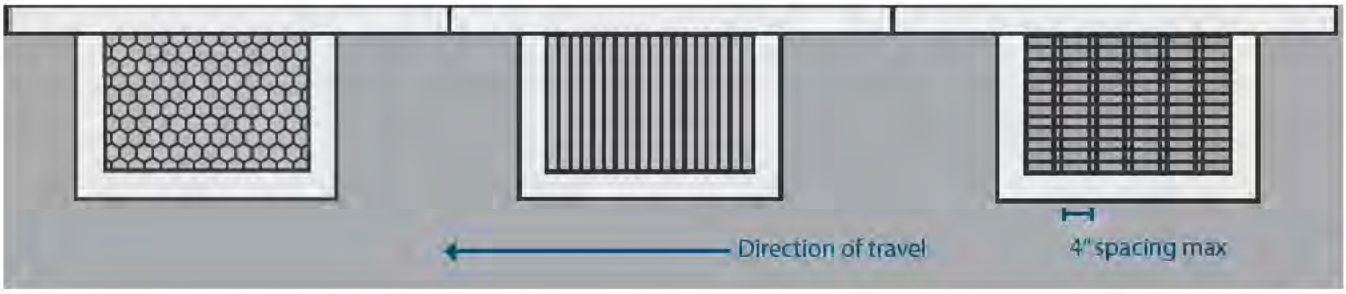
DRAINAGE GRATES

Description

Drainage grates are typically located in the gutter area near the curb of a roadway. Drainage grates typically have slots through which water drains into the municipal storm sewer system. Many older grates were designed with linear parallel bars spread wide enough for a tire to become caught so that if a bicyclist were to ride on them, the front tire could become caught in the slot. This would cause the bicyclist to tumble over the handlebars and sustain potentially serious injuries.

Guidance

- Require all new drainage grates be bicycle-friendly, including grates that have horizontal slats on them so that bicycle tires and assistive devices do not fall through the vertical slats.
- Similarly, tree grates that are in the path of travel for bicycles and assitive devices should also have slats that are perpendicular to the direction of travel.
- Create a program to inventory all existing drainage grates, and replace hazardous grates as necessary – temporary modifications such as installing rebar horizontally across the grate should not be an acceptable alternative to replacement.



GUTTER TO PAVEMENT TRANSITION

Description

On streets with concrete curbs and gutters, 1 to 2 feet of the curbside area is typically devoted to the gutter pan, where water collects and drains into catch basins. On many streets, the bikeway is situated near the transition between the gutter pan and the pavement edge. This transition can be susceptible to erosion, creating potholes and a rough surface for travel.

The pavement on many streets is not flush with the gutter, creating a vertical transition between these segments. This area can buckle over time, creating a hazardous condition for bicyclists.

Guidance

- Ensure that gutter-to-pavement transitions have no more than a ¼" vertical transition.
- Examine pavement transitions during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- Provide at least 3 feet of pavement outside of the gutter seam.

LANDSCAPING

Description

Bikeways can become inaccessible due to overgrown vegetation. All landscaping needs to be designed and maintained to ensure compatibility with the use of the bikeways. After a flood or major storm, bikeways should be checked along with other roads, and fallen trees or other debris should be removed promptly.

Guidance

- Ensure that shoulder plants do not hang into or impede passage along bikeways
- After major damage incidents, remove fallen trees or other debris from bikeways as quickly as possible

MAINTENANCE MANAGEMENT PLAN

Description

Bikeway users need accommodation during construction and maintenance activities when bikeways may be closed or unavailable. Users must be warned of bikeway closures and given adequate detour information to bypass the closed section. Users should be warned through the use of standard signing approaching each affected section (e.g., "Bike Lane Closed," "Trail Closed"), including information on alternate routes and dates of closure. Alternate routes should provide reasonable directness, equivalent traffic characteristics, and be signed.

Guidance

- Provide fire and police departments with map of system, along with access points to gates/bollards
- Enforce speed limits and other rules of the road
- Enforce all trespassing laws for people attempting to enter adjacent private properties

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Appendix

Funding Opportunities Sources:

1. https://www.transportation.gov/fastact
2. http://chi.streetsblog.org/2013/11/11/a-new-pot-of-funding-is-available-for-illinois-safe-routes-programs/
3. http://dnr.state.il.us/ocd/newoslad1.htm
4. http://www.recovery.gov/arra/About/Pages/The_Act.aspx
5. http://www.dot.gov/tiger
6. 19 of 50 US states (38%) currently have a dedicated bicycle/pedestrian funding source. From: Advocacy Advance. "State revenue sources that fund bicycling and walking projects". http://www.in.gov/indot/files/LRP_FutureNeedsReport_041513.pdf, pg. 112.
7. http://www.cmap.illinois.gov/mobility/walking-and-bicycling/funding-sources
8. http://www3.illinois.gov/PressReleases/PressReleasesListShow.cfm?RecNum=11992
9. http://www.dnr.illinois.gov/programs/Pages/GreenwaysandTrailsCouncil.aspx
10. http://www.cmap.illinois.gov/mobility/walking-and-bicycling/funding-sources
11. http://dnr.state.il.us/ocd/newoslad1.htm
12. http://www.cmap.illinois.gov/mobility/walking-and-bicycling/funding-sources
13. http://www2.illinois.gov/dceo/mainstreet/Pages/default.aspx
14. http://www.advocacyadvance.org/docs/StateRevenueSources_June2014.pdf
15. http://mobikefed.org/2012/01/how-peoria-made-its-transportation-planning-and-funding-process-far-more-bicycle-and-pedestr
16. http://www.tricountyrpc.org/files/Application___ExistingRoadway__1_.pdf
17. http://www.tricountyrpc.org/files/Application___NewRoadway.pdf
18. http://www.tri-co.org/
19. http://www.tricountyrpc.org/files/Envision_HOI_FINAL.pdf

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