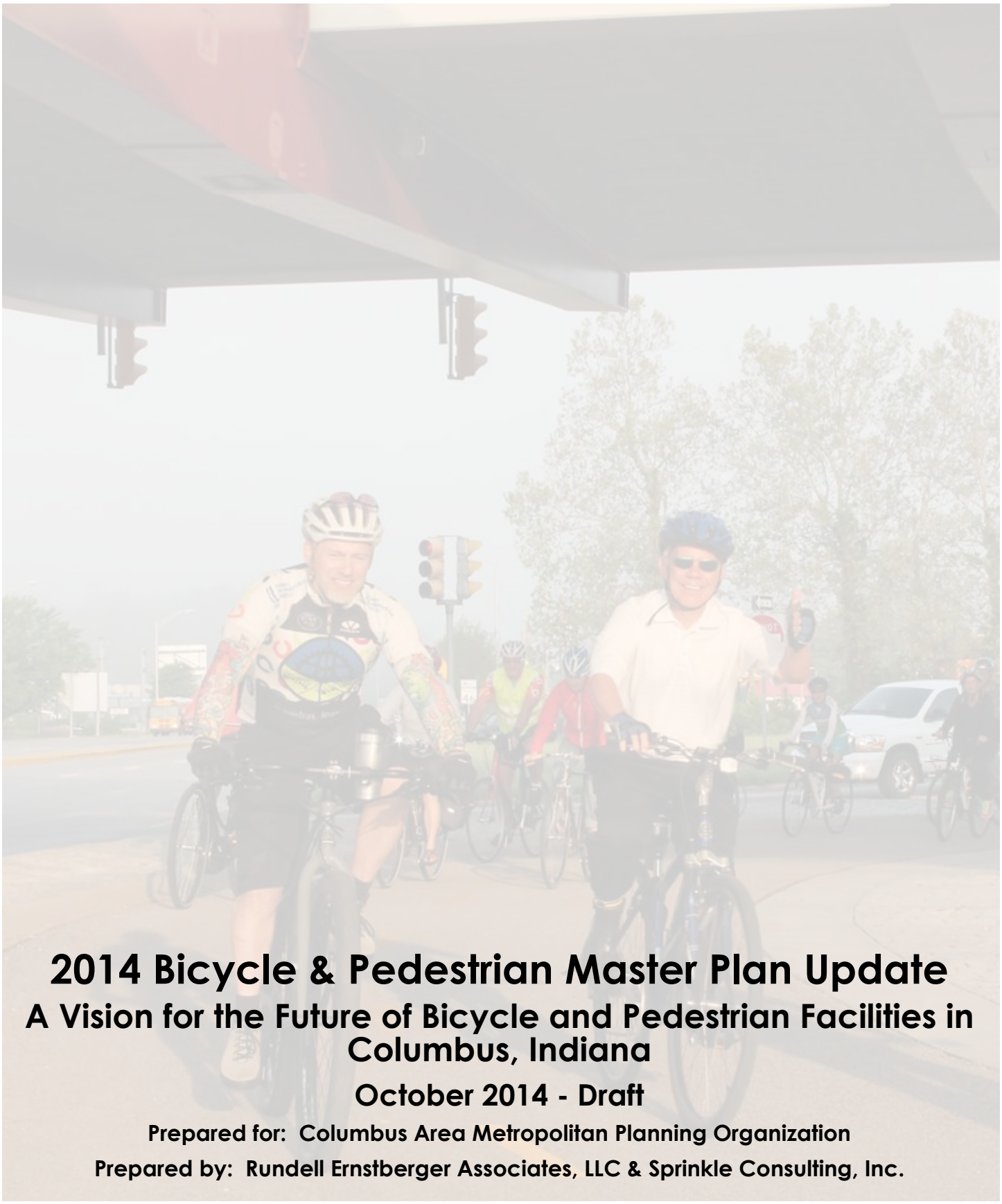

2014 Bicycle & Pedestrian Master Plan Update

A Vision for the Future of Bicycle and Pedestrian Facilities in Columbus, Indiana

October 2014 - Draft

Prepared for: Columbus Area Metropolitan Planning Organization

Prepared by: Rundell Ernstberger Associates, LLC & Sprinkle Consulting, Inc.

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Introduction | Overview

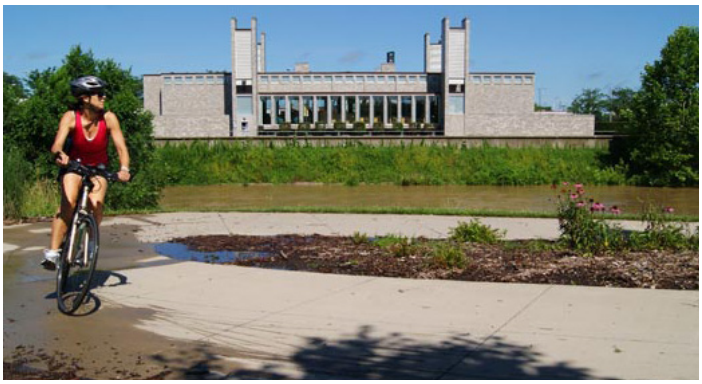
Columbus, Indiana is a city nationally recognized for its innovative architecture and design of public spaces and buildings. In keeping with this legacy, the City has, for many years, recognized the importance of multi-modal transportation options, including pedestrian and bicycling facilities.

In the mid-1980s, Columbus began to implement a system of trails and greenways known as the "Peoples Trails." In 2010, the City completed its first Bicycle and Pedestrian Master Plan with the intention of providing a guide for the future expansion of bicycle and pedestrian facilities throughout Columbus, including on-street bicycle facilities.

Having experienced much success with these facilities, the City and its partners now wishes to consider the "next generation" of facilities that will help garner Columbus national recognition as a bicycle-friendly community that is an attractive place in which to work, live, visit, and play.

With this overall goal in mind, the City, and the Columbus Area Metropolitan Planning Organization (CAMP0), commissioned the planning team of Rundell Ernstberger Associates, LLC and Sprinkle Consulting, Inc. to provide an update to the 2010 master plan.

This document is the result of that _____ month long exercise which included a review of the 2010 master plan, in-depth inventory and analysis of multi-modal transportation throughout Columbus, and recommendations for new facilities to further advance bicycle and pedestrian circulation throughout the community.



Photos courtesy of columbus.in.us

Introduction | Making the Case for Active Transportation

Benefits of Bicycling and Walking

Active transportation modes, including biking and walking, play important but often overlooked roles in an efficient, equitable, and healthy transportation system. Improved active transportation conditions and increased use of these modes provides a multitude of benefits, particularly when it substitutes for motor vehicle travel. Some of these benefits are obvious and widely recognized; others are less well known. This section describes various categories of the benefits. This information is useful for evaluating policies, programs, and infrastructure projects that support active transportation.

Increased bicycling and walking activity is the springboard that could enable these widespread benefits for the Columbus area. Many communities nationwide have found that the best way to increase non-motorized travel activity is by improving the bicycling and walking conditions in their transportation corridors through the provision of facilities such as those recommended in this plan.

Quality of Life

Being known as a bicycle and pedestrian friendly place is one of the indicators for the quality of life in a community. A high quality of life can influence young people to stay in Columbus to raise their families, and it can also convince entrepreneurs and large employers to locate their businesses in Columbus and help them attract and retain a talented workforce. Numerous quality of life indicators are enhanced by the ability to safely and comfortably bicycle and walk. Specifically, bicycle and pedestrian accommodation provides a greater variety of transportation choices, enables lifelong communities to be created in which residents of a particular place can comfortably progress through all stages of life, enhances and preserves the character of communities, helps maintain property values, and offers abundant recreational opportunities.

Public Health

In 2012, 31.4% of Indiana's adult population was obese, the eighth highest rate in the United States. The state's rates of diabetes, hypertension, and physical inactivity also rank among the highest in the nation. Thirty minutes of moderate exercise, five days a week, can significantly reduce risks for many illnesses including heart disease, high blood pressure,

arthritis, depression and obesity. Active transportation, created by providing a good network of bicycle and pedestrian facilities, is an ideal way for Columbus's residents to build the recommended amount of daily exercise into their lives. Such activity has the potential to play a key role in reversing the trend of increased obesity among children, adults, and senior citizens, as well as the associated chronic disease rates. Beyond the physical benefits, bicycling and walking activity can also improve mental health. These health improvements can lead to lower health care costs in Columbus - various studies indicate a median average health care cost savings of $128 per person per year compared to individuals who report a lack of recommended physical activity.

Air Quality

More people bicycling and walking instead of driving their cars leads to lower greenhouse gas emissions, thereby improving air quality for the area. The importance of this benefit is underscored by the fact that the short auto trips that bicycling and walking would replace are those that produce the highest level of emissions. Furthermore, shifting to active transportation modes helps reduce economic dependence on fossil fuels.

Transportation Mobility

For many Columbus residents, bicycling and walking are key elements of transportation mobility. This mobility can be realized by providing safe non-motorized access to schools and learning centers for

the area's youth, and by constructing new bicycle and pedestrian facilities in locations with significant senior, minority, and low-income populations. Improved biking and walking conditions provide basic mobility for people who do not have personal automobiles and provide access to public transit for longer trips.

Local Economy

Promoting and accommodating bicycling and walking can lead to significant local economic benefits. For example, new facilities (both on-road and off-road) can lead to bicycling-related tourism, particularly in connection to Columbus's architectural draw. Another economic benefit is that the decision to bike or walk to work can leave money used for fuel and other auto-related expenses in residents' pockets, which can then be re-invested in the local economy. Bicycle and pedestrian facilities create access to jobs for a portion of the population. Bicycle infrastructure, in particular, attracts a creative and highly educated working class that develops new business in the area.

Biking and walking infrastructure are explicitly cited by civic leaders from across the country as attributes they use to attract business investment and to help their existing businesses attract and retain workers. For example, Mayor R.T. Rybak of Minneapolis, Minnesota, recently said, "*…biking is definitely part of our strategy to attract and retain businesses to compete in a mobile world. We want young talent to come here and stay. And good biking is one of the least expensive ways to send that message.*"

Safety

Well-designed bicycle and pedestrian facilities promote safe bicycling and walking habits. This, in turn, reduces bicycle and pedestrian crashes. Crashes occur when an individual violates traffic law, and/or the expectation of other roadway users. Good design encourages legal and predictable behaviors. Designs that reduce motor vehicles speeds, or speeds at conflict points, are correlated with reduced crash rates and reduced crash severity. Bike boulevards typically reduce motor vehicle speeds along a roadway. Transitioning from one-way to two-way streets slows motor vehicles as well. Other designs eliminate conflicts almost entirely. These include blank-out turn prohibition signs and independent alignment trails.

Taken together, the recommendations of this Bicycle and Pedestrian Plan Update have the potential to greatly improve bicycle and pedestrian safety in Columbus and catalyze many of these associated benefits.

[1] *F as in Fat: How Obesity Threatens America's Future, Trist for America's Health and Robert Wood Johnson Foundation, 2013.*

[2] *Conserve by Bicycle Program Study, Florida Department of Transportation, 2007.*

[3] *The Economic Benefits of Bicycling Infrastructure Investments, League of American Bicyclists and Alliance for Bicycling and Walking, 2009.*

Introduction | Bicycle and Pedestrian Planning in Columbus

2010 Plan

The Columbus, Indiana Bicycle and Pedestrian Plan was adopted in May of 2010 as an element of the city's comprehensive plan. The primary vision for the plan has always been to ***"provide a road map for the creation of a system of bicycle and pedestrian facilities providing access to and connectivity between all areas of the City of Columbus."***

Additionally, the plan seeks to expand transportation options, connect amenities throughout the community, establish an active living lifestyle to attract new residents and businesses, encourage healthy living, provide tourism opportunities, establish regional bicycle connections, and to encourage sustainability and preservation of natural areas.

The plan begins with a brief history of trail's planning in Columbus, noting the desire to develop trails as early as the mid-1980s, and the development of the People Trail as a result of planning during that time. The value of the People Trail is noted as fostering economics, recreation, and tourism within the City of Columbus.

Public participation was an integral part of the development of the 2010 plan. An online survey was made available and two public workshops were held, attracting participants from all over the Columbus community. The survey and workshop provided the city with an understanding of who was using the trails and how they were using them, as well as the existing trail's assets and shortcomings. Key findings from the online survey and workshop included:

- most people travel more than two miles to work and school, and to recreate
- most people felt good pedestrian and bicycle facilities add to the value of the community
- perceived assets of the existing trails included convenience; healthy lifestyle; good scenery; family enjoyment; and a sense of safety
- perceived shortcomings included the need for more bicycle racks; better connections to schools, employers, parks, and existing sidewalks; the need for more facilities such as restrooms water fountains, benches, landmarks, and exercise stations; safety improvements to crosswalks, signage, and traffic signalization; and education on bicycle etiquette

Specifically, connections to downtown, big box retail, local schools, the airport, Mill Race and Noblitt Parks, the Donner Center, and grocery stores were suggested.

Through the inventory and analysis of the existing trail conditions, the public's desires, and projected needs, a suggested trail map was created.

Since the majority of existing trails within Columbus were multi-use paths at the time the 2010 report was completed, the report suggested additional bicycle and pedestrian facilities to better connect the community as a whole. These facility types included:

- additional multi-use paths
- bicycle lanes
- bicycle routes
- sidepaths
- sidewalks
- connectors

A description of each of these facility types was given, including design guidelines, and where each facility type would be appropriate. In addition, suggestions were made for how to improve intersections and street crossings, and where new bicycle parking should be located, as well as the design characteristics of good bicycle racks.

Other general plan recommendations included revisions to the municipal code and subdivision ordinances to encourage trail development, as well as ensuring accessibility to facilities by all user groups, and encouraging the consideration of bicycle facilities as other infrastructure projects occur within the community.

Many of the facility recommendations of the 2010 plan have been implemented and many more are in the planning and design stages.

Introduction | Planning Process

2014 Plan

Building on the framework established by the 2010 plan, the City began work on an update to the plan in 2013 focused on an expansion of the planned bicycle network to include more state of the art facilities that would further the goal of providing access and connectivity to all areas of Columbus.

Following a process similar to the 2010 master plan, this plan update began with an in depth inventory and analysis phase to review corridors throughout Columbus. Traffic and commuting patterns were reviewed, and destinations located, in order to gain a better understanding of where and how people within Columbus are traveling. On-site field inventories were conducted to evaluate corridors currently used by multi-modal traffic and to identify new corridors with potential to be used by multi-modal traffic. The corridors' were assigned a level of service taking into consideration their ability and/or potential to efficiently and safely transport automobiles, pedestrians, and bicyclists alike.

The planning team made a presentation of their findings to the general public and asked them to share their thoughts, goals, and concerns regarding the project. Public support of the project was evident and very specific suggestions regarding key corridors and intersections needing improvement were recorded. Additionally, specific routes for new facilities were suggested in order to improve connectivity throughout Columbus.

Additionally, the planning team met twice with the Bicycle and Pedestrian Implementation Committee, a group of individuals chosen by the City to help guide and influence the planning process. This group was comprised of actively involved individuals with an appreciation of the need for multi-modal transportation, and who would encourage and review development of bicycle and pedestrian facilities following the completion of the 2010 master plan.

Following the inventory, analysis, and assignment of levels of service to various corridors, the planning team prepared recommendations for new bicycle and pedestrian facilities throughout Columbus that would enhance the multi-modal transportation network. These recommendations, prepared in close partnership with CAMPO and the City's Engineer's Office, were presented to the public and the implementation committee. Feedback was recorded, revisions made, and the final recommendations are contained within this document.

July 2013 Implementation Workshop
Image Credit: Sprinkle Consulting

Existing Bicycle and Pedestrian Facilities in Columbus | Analysis

Existing Bicycling and Walking Conditions

An important element of any bicycle and pedestrian planning initiative is to gauge how well or how poorly the area's roadways accommodate users of the transportation system. While much of this information can be gleaned from input provided by the public, an objective, system-wide evaluation is also useful in identification and prioritization of facility improvements.

Accordingly, an evaluation of existing bicycling and walking conditions was conducted for a selected network of roads in the Columbus area using the Bicycle Level of Service Model and Pedestrian level of Service Model based on data collected in April 2013. The network consists of all arterial and collector roads in the urban and suburban areas, as identified in the City's 2010 Thoroughfare Map. This network, divided into 133 evaluation segments, consists of 124 centerline miles of roads. The Level of Service (LOS) models used, have been applied on tens of thousands of miles of roads throughout the United States, and are included in the national Highway Capacity Manual (HCM 2010). The following sections provide background information, model structures, and data descriptions for these evaluation tools.

Bicycle Level of Service

The Bicycle Level of Service (Bicycle LOS) Model, a bicycling conditions performance measure, is a "supply-side" criterion. It is an objective measure of the bicycling conditions of a roadway which provides an evaluation of bicyclists' perceived safety and comfort with respect to motor vehicle traffic and roadway conditions. This widely used and nationally adopted criterion is classified as the quality or level of service (accommodation) for bicyclists that currently exists within the roadway environment. One of the greatest benefits of incorporating Bicycle LOS is the indication it provides regarding which network segments have the greatest needs. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. With statistical precision, the Bicycle LOS Model clearly reflects the effect on bicycling suitability or "compatibility" due to variations in the following factors:

- bike lane or paved shoulder width;
- outside lane width;
- traffic volume, speed, and type;
- pavement surface condition; and
- presence of on-street parking.

This method is not limited to merely assessing conditions; it can also serve as an important and effective analytical tool in the identification of restriping candidates, development of street cross-section performance guidelines, and planning of bicycle routes.

The bicycle level of service analysis produces an objective score and "grade" which measures bicycle accommodation on a particular section of roadway, as shown in Table 1. For example, a particular segment without any type of bicycle facility (given other roadway characteristics detailed above) may provide a level of service "D." Using this tool, it is possible to determine how much accommodation benefit would be achieved as a result of improvements. In the above example, adding a designated bike lane might improve the segment's level of service to "B." Through this process, it is possible to simply and objectively determine which facilities have the greatest needs relative to the rest of the network.

Table 1: Bicycle Level of Service Grades and Scores

Level of Service	Numerical Range
A	≤ 1.5
B	>1.5 and ≤ 2.5
C	>2.5 and ≤ 3.5
D	>3.5 and ≤ 4.5
E	>4.5 and ≤ 5.5
F	> 5.5

Pedestrian Level of Service

Similar to the evaluation procedure used for the bicycle mode, pedestrian level of service is an evaluation of pedestrians' perceived safety with respect to motor vehicle traffic. It identifies the quality of service for pedestrians that currently exists within the roadway environment and provides a measure of facility needs within the region's roadway network. The Pedestrian Level of Service (Pedestrian LOS) Model is used for the evaluation of walking conditions. This model is the most accurate method of evaluating the walking conditions within shared roadway environments. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. As the Bicycle LOS Model does for the bicycle mode, the Pedestrian LOS Model reflects the effect on walking conditions due to variations the following roadway characteristics:

- presence of a sidewalk (if a shared use path is present within the right-of-way, it is also considered);
- lateral separation between pedestrians and motor vehicle traffic (including outside lane width, paved shoulder width, buffer area width, and sidewalk width);
- traffic volume and speed; and
- presence of on-street parking.

The Pedestrian LOS Model, which uses the same numerical scale as the Bicycle LOS Model (see Table 1), is used by planners and engineers throughout the United States in a variety of planning and design applications. The Pedestrian LOS Model can be used to conduct a benefits comparison among proposed sidewalk/roadway cross-sections, to identify roadways that are candidates for reconfiguration for sidewalk improvements, and to prioritize and program roadways for sidewalk improvements. As with the Bicycle LOS Model, it clearly demonstrates the needs of pedestrian facilities among the area's evaluated roadways.

Existing Conditions Analysis Results

The collected data was used to perform these analyses of existing bicycling and walking conditions for nearly 200 directional network segments. While geometric data were collected for all network segments, the unavailability of necessary traffic data led to some segments being excluded from the full analysis.

The distribution of bicycle level of service grades is shown in Figure 1. At a distance-weighted network-wide level, ***the Columbus area was found to currently provide bicycling conditions that correspond to a bicycle level of service of 3.1 ("C")***, which is generally favorable compared with many other metropolitan areas.

The distribution of pedestrian level of service grades is shown in Figure 2. The distance-weighted network-wide walking conditions correspond to a ***pedestrian level of service of 3.6 ("D")***, which is generally typical compared to many other metropolitan areas.

Network-wide maps of the existing bicycling and walking conditions are shown in Figures 3 and 4, respectively, for segments without existing or programmed facilities.

In the limited cases where one direction of travel along a segment has a different level of service grade than the other direction of travel, these maps show the worse of the two grades.

Public Participation

During public and Implementation Committee meetings held early on in the planning process, participants were given base maps of the City's current bicycle and pedestrian transporation system and asked to mark them up. Participants placed dots and notes on the maps to locate and identify destinations throughout Columbus, as well as problem areas and potential facilities for improving them.

An analysis of these maps revealed:

- the need for improved connections to key destinations such as downtown, big box retailers, employers, neighborhoods, and cultural amenities such as the fairgrounds, schools, parks, etc.
- the need for improvements to key intersections throughout Columbus that currently prohibit the safe and efficient transportation of bicyclists and pedestrians.
- the need to upgrade current automobile-oriented corridors to better accommodate bicyclists and pedestrians using a variety of new facilities.
- the need to upgrade some current bicycle facilities that could benefit from improvements to pavements, markings, signage, or complete renovation into a new facility type.

Figure 1: Bicycle Level of Service Evaluation Results

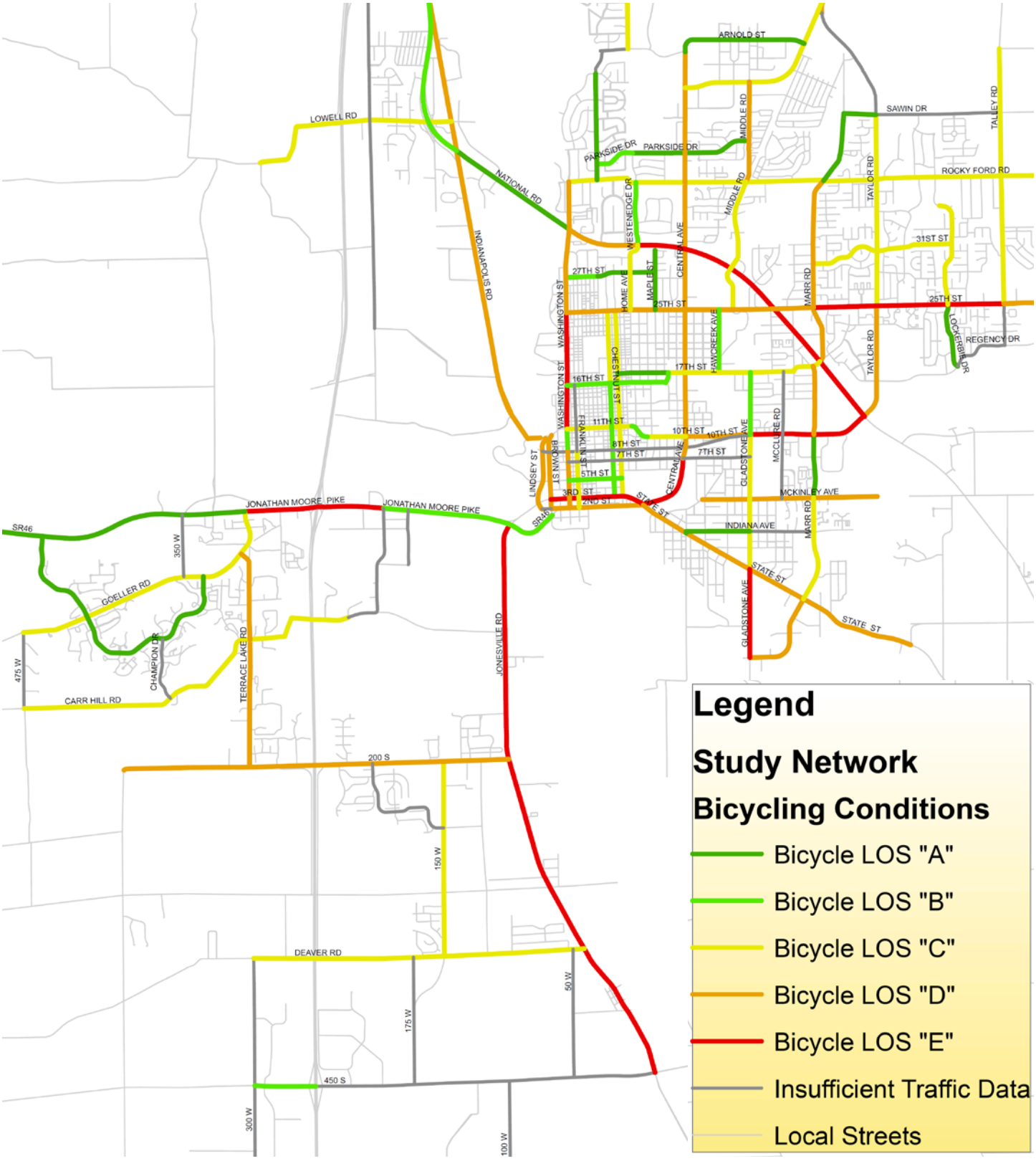
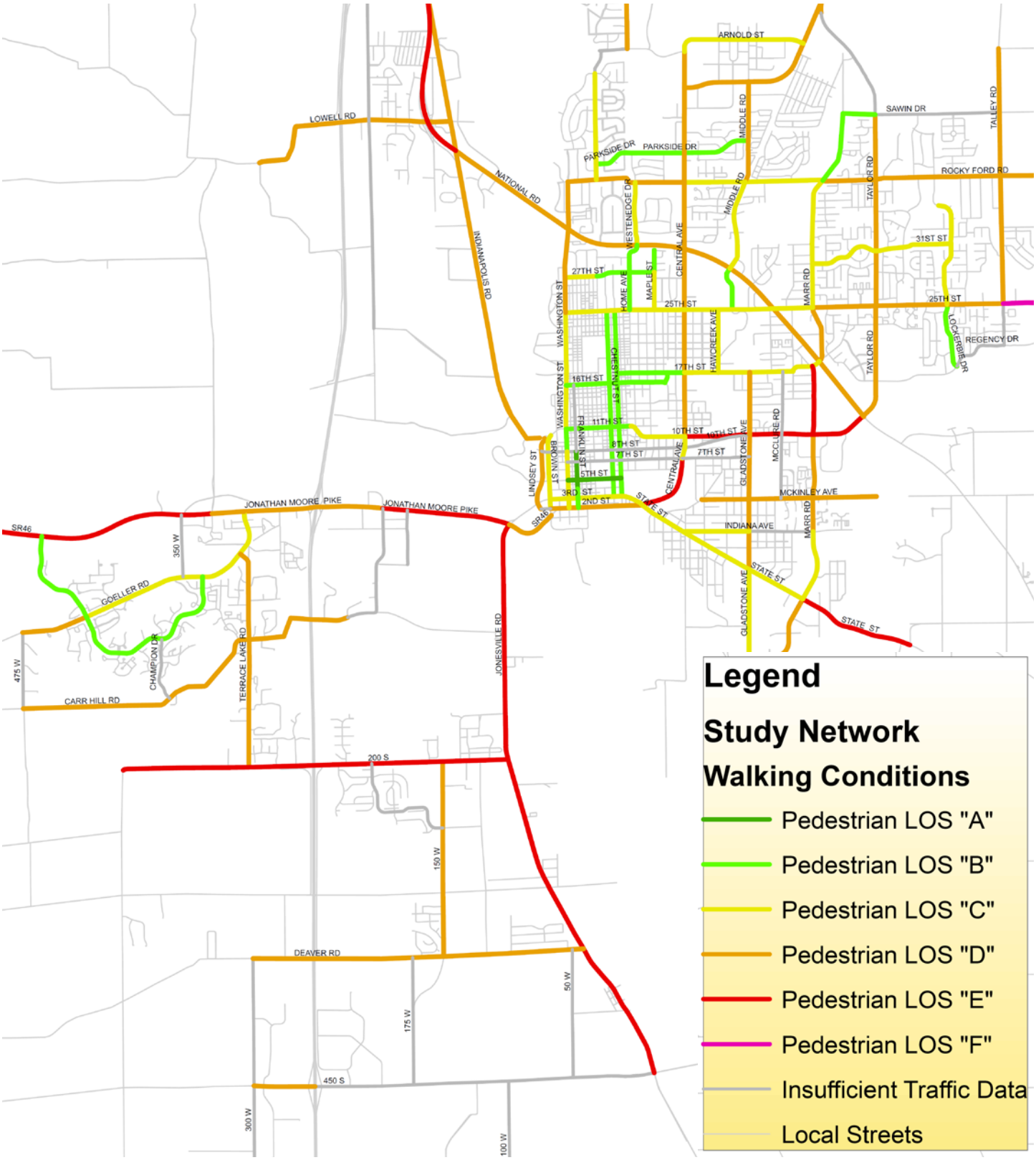


Figure 2: Pedestrian Level of Service



Level of Service (LOS) Improvements Upon Implementation of Suggested Improvements

This plan includes many specific facility improvement recommendations designed to better accommodate bicyclists and pedestrians in Columbus. Many of these improvements, if constructed, will yield a significant improvement in bicycle level of service. Such improvements typically involve the creation of bike lanes through roadway restriping, lane reduction, or construction of paved shoulders. Implementation of the recommended bicycle boulevards will also likely improve conditions by reducing speeds and, in some cases, creating additional separation through Shared Lane Markings. However, such improvements are less pronounced and all of the identified bike boulevard corridors already provide relatively good bicycling conditions (LOS "C" or better) because of their generally low traffic volumes and speeds. The table below shows some of the improvements that can be achieved by implementing the plan's recommendations and demonstrates the link between level of service and improved facilities.

Road	From-To	Facility Type	Existing LOS	Future LOS
Indiana Ave	State-Marr	Bike Lane (add shoulders)	0.72 (A)	0.00 (A)
10th St	Gladstone-US 31	Bike Lane (restripe)	4.81 (E)	3.85 (D)
Gladstone Ave	Marr-State	Bike Lane (add shoulders)	5.08 (E)	2.98 (C)
Gladstone Ave	State-10th	Bike Lane (add shoulders)	3.47 (C)	1.87 (D)
2nd St	Brown-State	Bike Lane (restripe)	4.08 (D)	3.44 (C)
California St	3rd-25th	Bike Lane (restripe)	2.73 (C)	2.73 (C)
27th St	Sycamore-Maple	Bike Lane (restripe)	0.53 (A)	0.00 (A)
Washington St	11th-25th	Bike Lane (lane reduction)	4.94 (E)	4.09 (D)
25th St	Central-Marr	Buffered BL (lane reduction)	3.51 (D)	0.00 (A)

Facilities Types | Overview

With a solid understanding of the exisiting conditions and needs for improved connectivity to the bicycle and pedestrian facilities in Columbus that was revealed through the inventory, analysis, and public participation phase, the City and the planning team began considering the next generation of facilities that would increase bicycle and pedestrian friendliness within the community and make Columbus a nationally recognized destination for multi-modal transportation.

Once implemented, these next generation facilities will form a multi-modal transportation network linking the cultural, economic, and social destinations throughout Columbus. The facilities that will make up this network include:

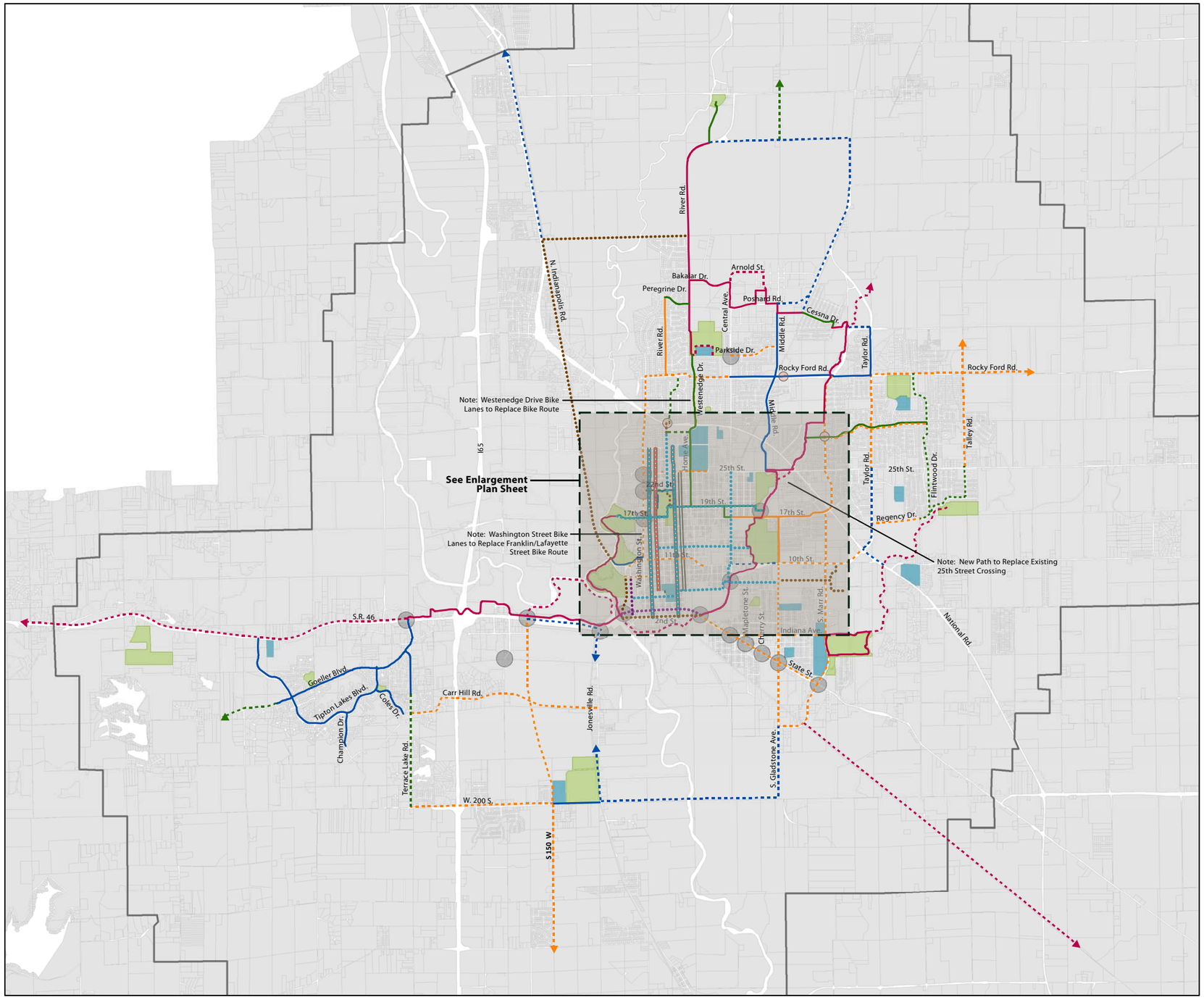
- Bicycle Lanes
- Contraflow Bicycle Lanes
- Protected Bicycle Lanes
- Bicycle Boulevards
- Cycle Tracks

The above-listed facilities are generally ordered in terms of their simplicity for implementation, with bicycle lanes being the easiest and least expensive facility to implement, and cycle tracks being the most complex, and thereby most expensive, facility type to implement.

In addition, other design considerations are suggested in specific locations to improve multi-modal circulation and make corridors more conducive to the above mentioned facilities. Listed in no particular order, these include:

- One-way to Two-way conversions
- Lane Reductions
- Intersection Improvements
- Mid-Block Crossings

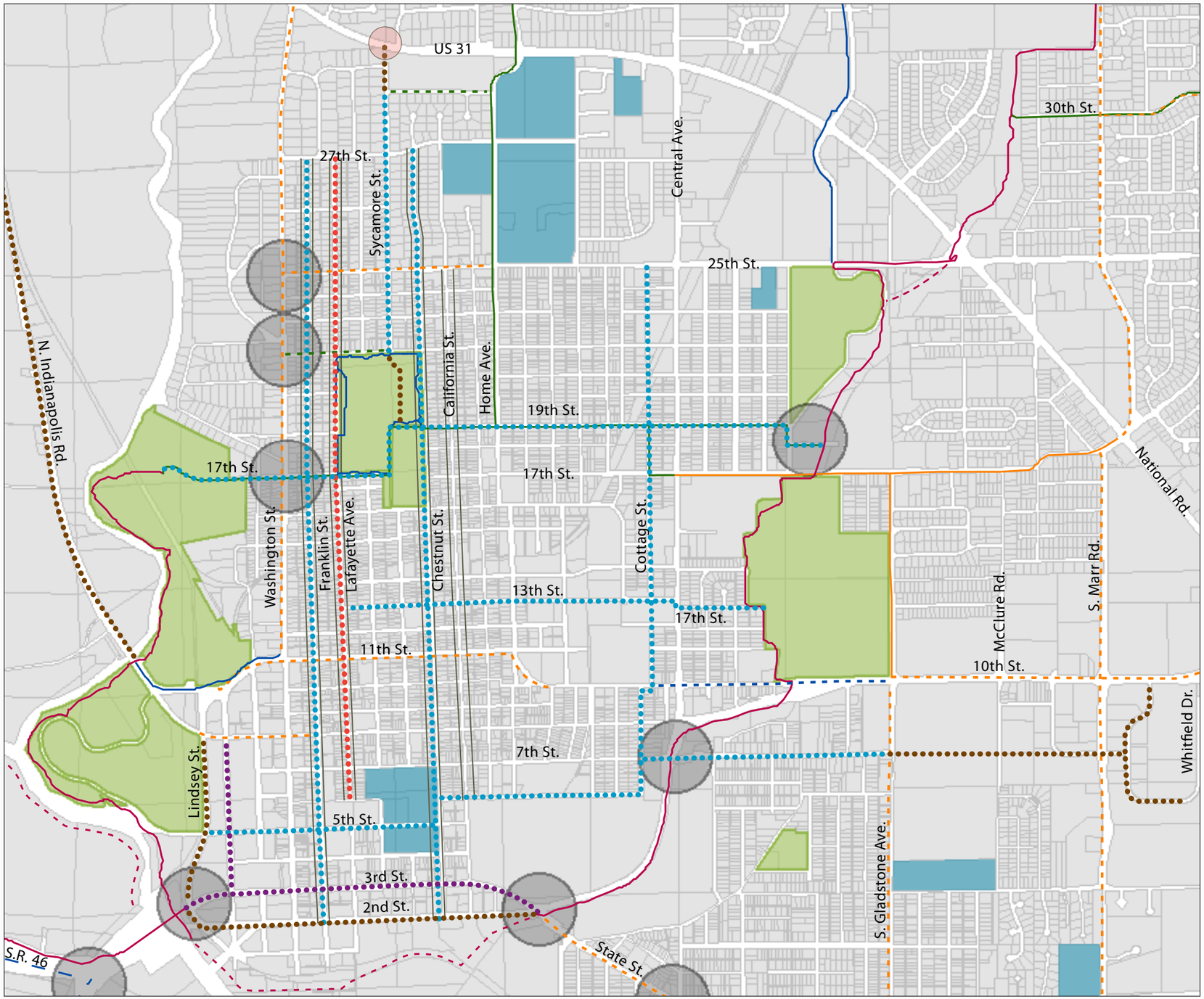
The corridors targeted for improvements are graphically depicted on the following maps. Additionally, a general description of each facility type is given in the following pages and more specific corridor improvements are discussed in Appendix A.



Bicycle & Pedestrian System Plan Map

- Proposed Multi-Use Path
- Existing Multi-Use Path
- Proposed Bicycle Lanes (p. 21)
- Existing Bicycle Lanes
- Proposed Bicycle Route
- Existing Bicycle Route
- Proposed Sidepath
- Existing Sidepath
- Proposed Cycle Track (p. 26)
- Proposed Bike Boulevard (p. 24)
- Proposed Contraflow Bike Lane (p. 22)
- Proposed Protected Bike Lane (p. 23)
- Proposed Off-Road Connector Path
- Proposed Conversion to 2-Way Street (p. 27)
- Proposed Mid-block Crossing (p. 28)
- Proposed Intersection Improvement (p. 28)
- Columbus Jurisdiction
- School Location
- Park Facility

Columbus, Indiana Bicycle & Pedestrian Plan



Bicycle & Pedestrian System Plan Enlarged Map

- Proposed Multi-Use Path
- Existing Multi-Use Path
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- School Location
- Park Facility

Columbus, Indiana Bicycle & Pedestrian Plan

Facilities Types | Bicycle Lanes

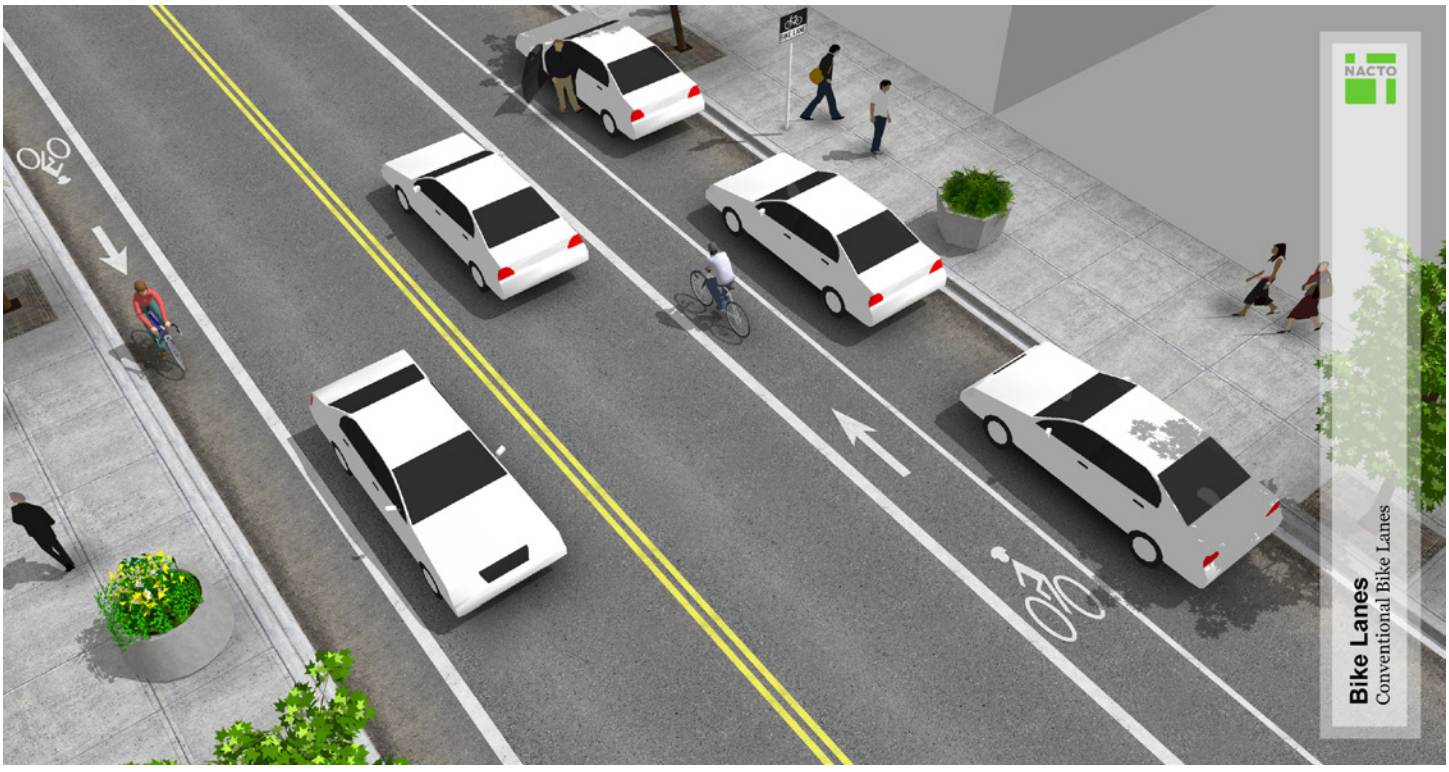
Description:
A bike lane is a portion of a roadway designated for use by bicyclists through striping, signage, and pavement markings. Typically, bike lanes occur within the street and flow in the same direction as automobiles. Often times, bike lanes are the most affordable type of bicycle facility to implement as they require the least restructuring of the street corridor.

Use:
For a given roadway fronted by development, 32 feet of right-of-way is considered the minimum to build two 10-foot lanes with two 4-foot bike lanes. This provides only 2 feet for construction and utilities and assumes sheet flow off the roadway and no swales. Thirty-two feet also precludes the inclusion of sidewalks in the future. To allow for sidewalks, 45 feet of right of way is needed (assumes AASHTO minimums of 10-foot lanes, 5-foot bike lanes to face of curb, 6-inch curb, and 6-foot sidewalks at the back of curb).

Corridors within Columbus that would benefit from bike lane facilities include:

- ***Gladstone Avenue***
- ***Indiana Avenue***
- ***10th Street***
- ***27th Street***
- ***8th Street***

**Reference Appendix A for a more detailed explanation of suggested improvements.*



Conventional Bike Lane model
Image Credit: NACTO

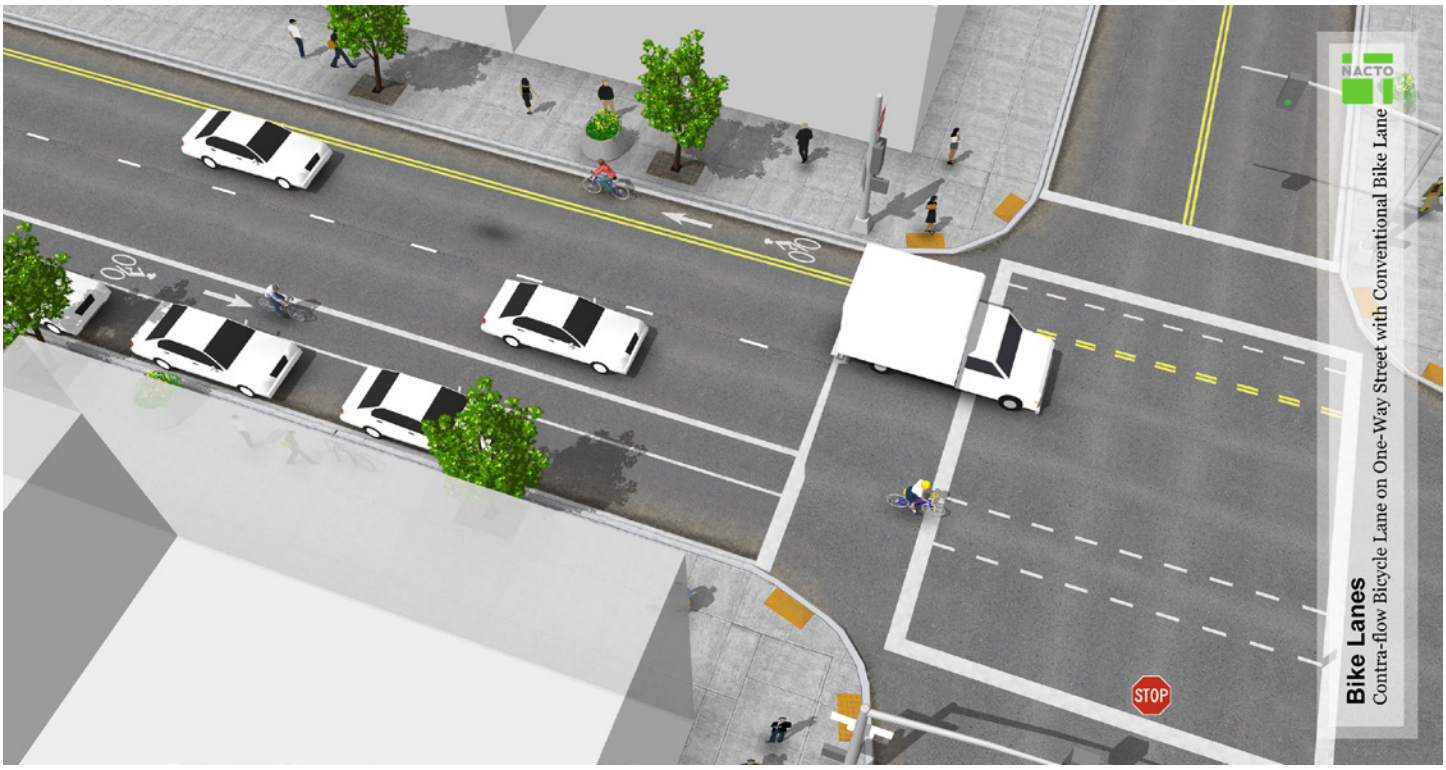
Facilities Types | Contraflow Bicycle Lanes

Description:
Contraflow bike lanes allow bicyclists to travel in the opposite direction of motorists on otherwise one-way streets. Contraflow bike lanes are useful for reducing trip distances for bicycles, in particular reducing the need to circle a block at the beginning or end of a trip.

Use:
Contraflow bike lanes are placed so that the bicyclists using it ride on the right side of the street, consistent with the rules of the road. They are separated from the opposing vehicular flows by a yellow centerline. When installed, all appropriate traffic control devices must be installed for the bicyclists; traffic signal heads and additional signs for the bike movements must be installed.

Corridors within Columbus that would benefit from contraflow bike lane facilities include:
- ***California Street***
- ***Lafayette Avenue***
- ***9th Street***

**Reference Appendix A for a more detailed explanation of suggested improvements.*



Contraflow Bike Lane model
Image Credit: NACTO

Facilities Types | Protected Bicycle Lanes

Description:
Protected bike lanes are simply bike lanes developed with enhanced buffering for users.

Use:
These facilities still occur within the roadway and at street level, but they utilize planters, curbs, parked, cars, and/or wider striped portions of the street to minimize potential conflict between automobiles, bicyclists, and pedestrians.

Protected bike lanes are typically more expensive to implement than standard bike lanes, but the added safety makes them attractive and more user-friendly.

Corridors within Columubus that would benefit from protected bike lane facilities include:
- ***Westenedge Drive***
- ***Home Street***
- ***2nd Street***
- ***Lindsey Street***

**Reference Appendix A for a more detailed explanation of suggested improvements.*

Protected Bike Lane
Image Credit: NACTO

Facilities Types | Bicycle Boulevards

Description:
A bicycle boulevard is a local street or series of contiguous street segments that have been modified to provide enhanced accommodation as a through street for bicyclists while discouraging through automobile travel.

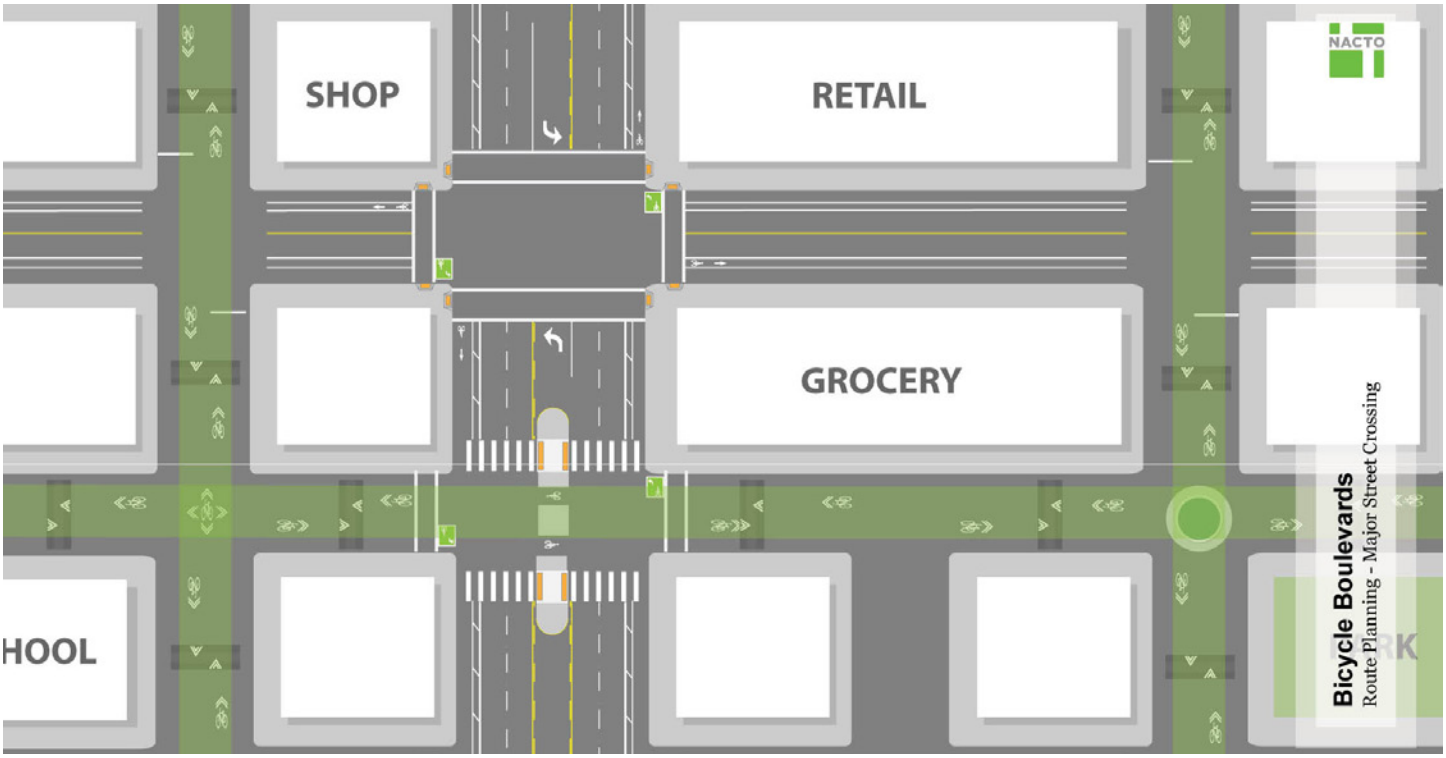
Use:
Bicycle boulevards often make use of low volume, very low speed, local streets. Frequently, streets are made more accommodating for bicyclists by significantly keeping motorists' speeds and volumes low. Often bike boulevards include bicycle friendly traffic calming treatments (speed pillows, mini traffic circles, chicanes with bike bypass lanes, etc.) to reduce speeds of motor vehicles along the roadway. While local motor vehicle traffic is maintained along the bike boulevard, motor vehicle traffic diverters may be installed at intersections to prevent through motor vehicle travel while having bypasses for bicyclists to continue on along the bike boulevard. Bike boulevards can also be facilitated by connecting the ends of cul de sac roadways with shared use paths. At intersections the bicycle boulevard should be given priority over side streets.

Corridors within Columbus that would benefit from bicycle boulevard facilities include:
- ***Chestnut Street***
- ***Cottage Avenue***
- ***Franklin Street***
- ***5th, 6th, 7th Streets***
- ***13th Street***
- ***17th/Sycamore/19th Streets***

**Reference Appendix A for a more detailed explanation of suggested improvements.*

Because of low motor vehicle speeds and volumes, bike lane markings are often not necessary along bike boulevards. SHARED LANE MARKINGS, shuch as sharrows, may be used along bike boulevards. Alternately, larger than normal bike symbols supplemented with the text BIKE BLVD have been used to designate bike boulevards.

In some communities, bike boulevard networks begin as a "one-off" system of bikeways; when a primary arterial roadway cannot be improved to a point where most cyclists feels safe and comfortable using the facility, a parallel roadway - often one street off the main road (or "one-off") - may be improved with bicycle facilities



Bike Only Access model
Image Credit: NACTO

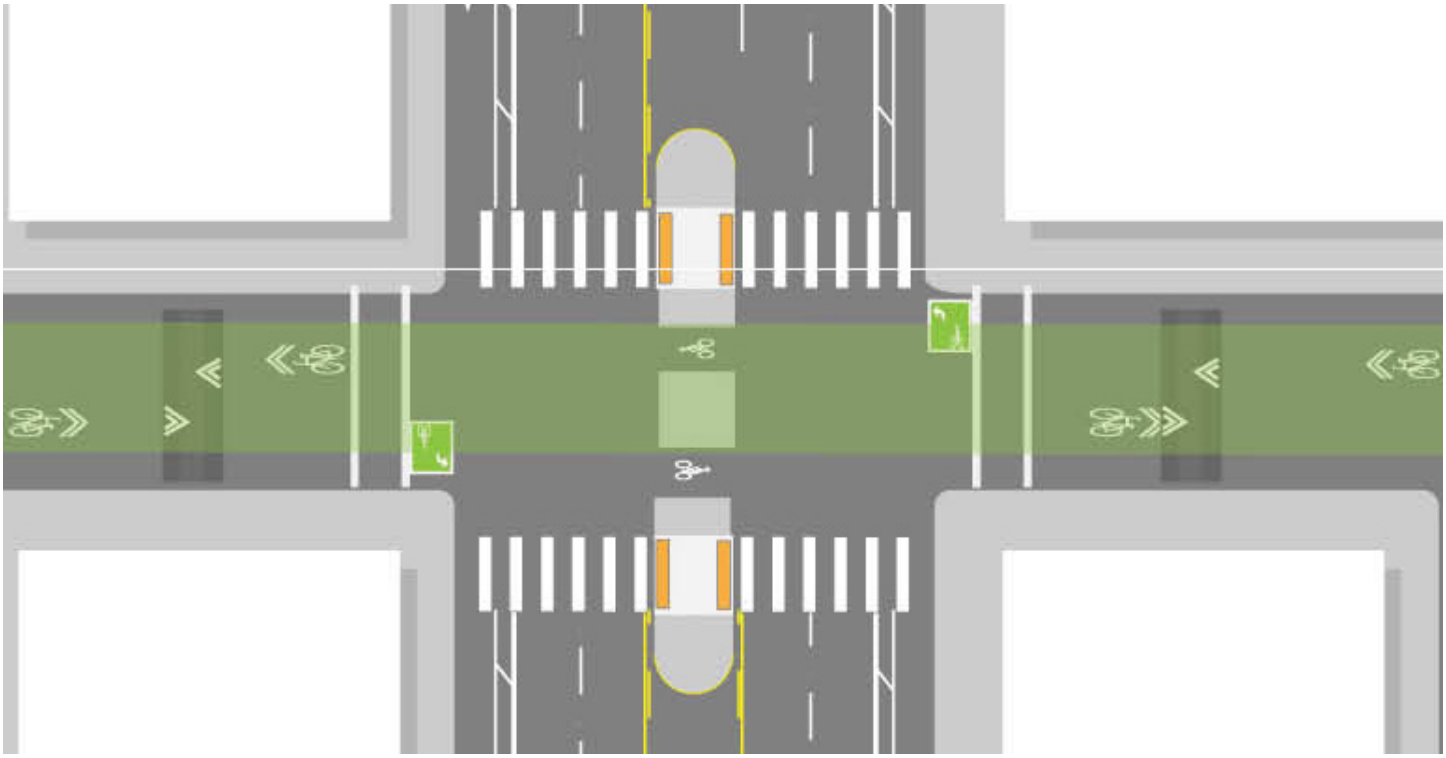
and traffic calming features to provide an enhanced cycling street. By paralleling the main road, the "one-off" network provides access to the businesses along the arterial using a pleasant cycling roadway. A "one-off" roadway can be improved in stages: initially with signage and shared lane markings and then into a bike boulevard by instituting more substantial features such as traffic calming and diverters.

The "one-off" system discussion should not be taken to mean that all bike boulevards must be parallel to an adjacent arterial. Certainly, direct routes that serve to shorten trip lengths make cycling more viable for many people. The number of bike boulevards in a network is limited only by the number of streets a community is willing to direct traffic from and calm. The more complete the grid network, the more practical a dense bike boulevard network becomes.

Since bike boulevards typically serve as bike routes, wayfinding signage should be provided. This signage should include destination, direction, and distance (or travel time) information to attractors throughout Columbus. Wayfinding adds to the utility of bike boulevards because it educates cyclists and would be cyclists that there are safe, comfortable ways of accessing Columbus by bike.

One potential obstacle to implementing bike boulevards is the crossing of major roadways. Improvements to signal timing and detection, or the provision of enhanced crossing treatments where no signals exist, will make a bike boulevard more appealing to cyclists. These enhanced crossings could include raised medians, activated flashing beacons, or even pedestrian hybrid beacons. It's fairly simple: make the bike boulevard more convenient to use, and more people will use it.

All existing traffic signal detector hardware should be tested to ensure it can detect bicycles. Any locations where bicyclists cannot be detected should be improved to ensure detection is possible. If necessary, BICYCLE SIGNAL ACTUATION signs (R10-22) and pavement markings should be installed to ensure bicyclists know where to place their bikes to receive a green signal.



One-Off System of Route Planning
Image Credit: NACTO

Facilities Types | Cycle Tracks

Description:
A cycle track is a designated bicycle pathway separated from pedestrian sidewalks, parking lanes, and vehicular travel lanes.

Use:
Cycle tracks are typically elevated and can be designed for one or two-way traffic. When higher speed streets are present with few interruptions, cycle tracks are recommended. Cycle tracks are also recommended where multiple travel lanes and high traffic volumes are present.

Where on-street parking is present, cycle tracks are located on the sidewalk side of the parking and are separated from the on-street parking by a buffer a minimum of three feet wide. Often times, the surface of the cycle track is visually distinct from surrounding pavements.

Bicycle symbols and lettering are provided at the beginning and ends of cycle tracks and at specific intervals between. In two-way applications "Do Not Enter" signs (with EXCEPT BIKES supplemental plaques) should be posted to minimize confusion and minimize automobile intrusion onto the cycle track. Additionally, traffic controls should be installed at intersections and oriented towards bicyclists traveling in the contra flow direction.

Where the buffer between cycle tracks and on-street parking is painted striping, solid white lane markings should be used with the area of the buffer being comprised of painted diagonal crosshatch.

Corridors within Columbus that would benefit from cycle track facilities include:
- ***3rd Street***
- ***Brown Street***

**Reference Appendix A for a more detailed explanation of suggested improvements.*

Cycle Tracks
Image Credit: NACTO

Facilities Types | Additional Design Considerations

One-Way to Two-Way Conversions

As a national trend, many streets were converted from two-way to one-way vehicular traffic during the 1960s and 1970s in an effort to reduce vehicular congestion and increase traffic speeds and more quickly move automobiles.

Although intentions were noble, it is now believed that this conversion decreased the pedestrian friendliness of many corridors through the increase in vehicular speed and the correlated decrease in driver awareness. Today, there is a renewed interest in returning these one-way corridors to two-way corridors in an effort to reduce traffic speed and increase pedestrian and bicycle friendliness.

Corridors within Columbus that would benefit from one-way to two-way conversion include:

- ***Lafayette Avenue***
- ***California Street***
- ***6th Street***
- ***9th & 10th Streets***
- ***16th & 17th Streets***
- ***2nd Street***

**Reference Appendix A for a more detailed explanation of suggested improvements.*

Columbus, Indiana 16th Street
Image Credit: Google Maps

Lane Reductions

Some streets have more lanes than are necessary to maintain an acceptable Level of Service. In these cases, reducing the number of traffic lanes will provide needed space in the right-of-way for bicycle facilities, shorten pedestrian crossing distances, and have an overall traffic calming effect.

Corridors within Columbus that would benefit from lane reduction include:

- ***Washington Street***
- ***25th Street***
- ***8th and 10th Streets***

**Reference Appendix A for a more detailed explanation of suggested improvements.*

Lane Reductions
Image Credit: www.people for bikes.org

Facilities Types | Additional Design Considerations

Intersection Improvements

Intersections are the confluence where multiple streets and modes of transportation meet. If properly designed and planned for, intersections facilitate the safe and efficient movement of various user groups that typically include automobiles, bicyclists, and pedestrians.

Some intersections do not accommodate all street users well. Wide intersections made up of streets with multiple lanes in each direction intimidate pedestrians and cyclists while being able to accommodate many cars at moderate to high speed. Improvements to such intersections may be as simple as paint striping or may require more substantial improvements, depending on the type of bicycle facility being planed for (i.e. bike lane, bike boulevard, cycle track, etc.)

Specific intersections within Columbus that would benefit from improvements include:

- ***Geller and Jonathon Moore Pike***
- ***3rd Street and Lindsey Street***

**Reference Appendix A for a more detailed explanation of suggested improvements.*

Intersection Improvements
Image Credit: Rundell Ernstberger Associates, LLC

Mid-Block Crossings

Typically, crosswalks for pedestrians and bicyclists occur at the intersections of two or more streets. Within cities and towns, these are typically logical locations that allow regular crossing of the street or corridor in a safe manner that is regulated by traffic signalization. In some cases, however, regular crossings do not occur for one reason or another, and a mid-block crossing may be necessary to connect bicyclists and pedestrians to destinations on opposite sides of the street.

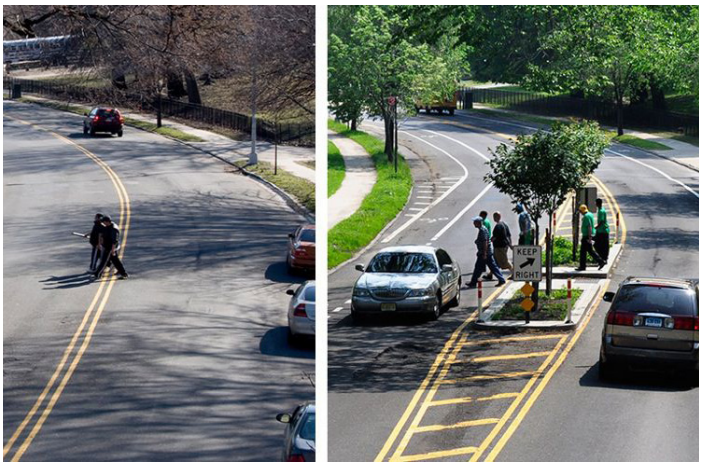
In theses cases, mid-block crossings can be implemented. Currently, there is not a nationally recognized standard for the treatment of mid-block crossings. The below recommendations for the implementation of mid-block crossings is based upon recommendations for Pinellas County, FL as developed by Sprinkle Consulting.

In general, mid-block crossings should occur at intervals of approximately 300 to 400 feet, or the length of a typical block, where pedestrians are permitted and desired. Mid-block crossings are often desirable at

Corridors within Columbus that would benefit from mid-block crossings include:

- ***State Street***
- ***15th Street***
- ***Rocky Ford Rd.. at Candle Light Drive***

**Reference Appendix A for a more detailed explanation of suggested improvements.*



Mid-Block Crossing
Image Credit: www.nacto.org

mid-block bus stops and where mid-block attractions occur as well.

Where mid-block crossings are desired, the first step is to determine whether the roadway or pedestrian/multi-use path should be given priority. This is typically determined by comparing the speeds, volumes, and relative importance of both the roadway and pedestrian/multi-use path. If roadway speeds are relatively low, 30 mph or less, and pedestrian/multi-use path volumes are higher than roadway volumes, the path is given priority. If roadway speeds exceed 30 mph and/or if roadway volumes are higher than pedestrian/multi-use path volumes, the path is given priority. Where roadways are comprised of four or more lanes, roadways are always given the priority.

Once the priority has been assigned, the most appropriate traffic control method should be implemented. As a general note, the traffic control method is seeking to:

- make pathway users and roadway users aware of the crossing conflict
- make users understand their obligations with regard to yielding
- clarify motorists obligations within the crossing itself

Traffic control methods can be divided into three categories, static signs, activated signs, and hybrid beacons, as described in the adjacent table. For more information of the specific components in each of the categories, reference the Manual of Uniform Traffic Control Devices (MUTCD). The most appropriate traffic control method is typically determined by the assigned priority, roadway width, and roadway user volumes.

The tables on the following page illustrate the proposed traffic control method that should be implemented based upon roadway traffic volumes. Also refer to the below general notes when applying the tables.

- Volumes in the title cells assume a daily to peak hour volume factor of .97
- Each column in the table represents a package of traffic control devices recommended for the specific crossing condition
- The designation of "YES" for the median assumes there is potential for installing a raised median at the crossing location and that one will be installed. Raised medians that can be used as refuges (6 feet wide minimum for pedestrians, greater than 8 feet recommended for shared use paths) will allow for less restrictive motor vehicle traffic controls to be used in conjunction with mid-block crossings.
- On roadways with two-way left turn lanes, refuge islands should be installed at crossing locations
- On multi-lane roadways with medians on the approach, crossing signs should be placed in the medians as well as on the side of the roadway
- When advance stop lines are used on the approach roadways, they should be used in conjunction with solid lane lines extending back the stopping sight distance from stop lines. This is to enable law enforcement officers to determine when a motorist fails to yield when he/she could have done so
- On larger than four-lane, undivided highways, strong consideration should be given to providing a grade-separated crossing of the roadway for pedestrians/trail users. Until this can be achieved, aggressive channelization should be sued to divert pedestrians/trail users to the nearest safe crossing.
- Lighting will need to be considered and provided where crossings are used at night

	Traffic Control Devices Teir		
Traffic Control Device	Static Signs	Activated Signs	Hybrid Beacon
Marked Crosswalks	✓	✓	✓
Trail Xing Sign (W11-15) w/ Arrow (W16-7p)[2] 	✓	✓	✓
Advance Stop Lines[5]	✓	✓	✓
Trail Xing Sign (advance) and TRAIL XING Pavement Marking	✓	✓	✓
Stop Here to Ped Signs (R1-5)[3,4] 	✓	✓	✓
RRFB crossing` Ped Xing Signs (W11-2) with rapid rectangular flashing beacons, and supplemental striping		✓	
Pedestrian Hybrid Beacon[7]			✓

Traffic Control Methods
Image Credit: Sprinkle Consulting

	Roadway Volume less than 475 vehicles per hour, vph (4,500 vehicles per day[1], vpd)												
	Lanes	2 lanes						4 lanes					
	Median	No			Yes			No			Yes		
	Speed	≤ 30 mph	35–40 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph
Taffic Control Devises Package	Static Signs	✓	✓	✓	✓	✓		✓			✓	✓	
	Rectangular Rapid Flashing Beacon						✓		✓	✓			✓
	Hybrid Beacon												

	Roadway Volume > than 475[1] vph (4,500 vpd) and < than 1,150 vph (12,000vpd)																	
	Lanes	2 lanes						*4 lanes*						6 lanes					
	Median	No			Yes			No			*Yes*			No			Yes		
	Speed	≤ 30 mph	35–40 mph	≤ 30 mph	35–40 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph	≥ 45 mph	≤ *30 mph*	*35–40 mph*	≥ *45 mph*	35–40 mph	≥ 45 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph
Taffic Control Devises Package	Static Signs	✓	✓		✓	✓					✓								
	Rectangular Rapid Flashing Beacon			✓			✓	✓	✓	✓		✓	✓				✓	✓	
	Hybrid Beacon													✓	✓	✓			✓

	Roadway Volume > than 1,150 vph (12,000vpd)																	
	Lanes	2 lanes						*4 lanes*						6 lanes					
	Median	No			Yes			No			*Yes*			No			Yes		
	Speed	≤ 30 mph	35–40 mph	≤ 30 mph	35–40 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph	≥ 45 mph	≤ *30 mph*	*35–40 mph*	≥ *45 mph*	35–40 mph	≥ 45 mph	≥ 45 mph	≤ 30 mph	35–40 mph	≥ 45 mph
Taffic Control Devises Package	Static Signs	✓	✓		✓	✓					✓								
	Rectangular Rapid Flashing Beacon			✓			✓	✓				✓	✓						
	Hybrid Beacon								✓	✓				✓	✓	✓	✓	✓	✓

Traffic Control Method Base on Traffic Volumes
Image Credit: Sprinkle Consulting

Wayfinding Systems

Wayfinding systems are the combination of signage and pavement markings that guide bicyclists and pedestrians along specific routes

Signage typically serves the function of indicating or marking the route, noting where the route makes directional changes, and noting distances to key destinations. Depending on the types of signs, they are lcoated on regular intervals along a route, at intersections, or at key locations or distances from a destination.

Pavement markings are also used as directional signage and often as a branding opportunity for specific routes or trails. Pavement markings are usually found along all facilities that are a part of a route.

Example Pavement Markings
Image Credit: Rundell Ernstberger Associates, LLC

All corridors and intersections suggested for improvements would benefit from wayfinding system improvements.
**Reference Appendix A for a more detailed explanation of suggested improvements.*

Example Wayfinding Signage for Bicycle Boulevards

Example Activation Sign

Facilities Recommendations | Bicycle Lanes

Indiana Avenue

State Street to Marr Road

Indiana Avenue from State Street to Marr Road has more than adequate right of way to construct bike lanes. Most of this section appears to be open shoulders. This means that paved shoulders may be able to be added to this section of Indiana Avenue with minimal reconstruction; resurfacing the entire street along Indiana Avenue park on graded shoulders. Modifications of the roadway should ensure that either this shoulder parking is eliminated or accommodated beyond the bike lanes.

10th Street

Gladstone Avenue to US 31

Tenth Street has more adequate right of way to be reconstructed with bike lanes. Given that it is a curb and gutter roadway, this would be a very expensive proposition. The speed limit on 10th Street (35 mph) and presence of signals along 10th street suggests that narrowing lanes may be an option. Reducing the lane widths to provide bike lanes should be considered. This would result in a cross section with two 10 foot lanes and a 4 foot bike lane.

Gladstone Avenue

Marr Road to 10th Street

Gladstone Avenue from Marr Road to 10th Street was also reviewed for the potential for installing bike lanes. However, right of way constraints would make it very difficult to install bike lanes. In the graphic for Gladstone Avenue, the yellow line represents where less than 45 feet is available and the red line represents where even 32 feet is unavailable.

8th Street

Lindsey Street to Washington Street

8th Street, from Lindsey Street to Washington Street, is recommended for construction of **bicycle lanes**. Throughout this section, three different conditions occur. Between Lindsey Street and Brown Street, two travel lanes are present, one eastbound and one westbound, that split at the intersection to become one through lane and one turning lane, essentially creating four lanes.

Between Brown Street and Jackson Street, two eastbound travel lanes are present and one westbound

Right-of-Way Restriction for Gladstone

travel lane is present. Between Lindsey Street and Jackson Street, the roadway is approximately 36 feet wide.

The block between Jackson Street and Washington Street contains two eastbound and two westbound travel lanes. This portion of the roadway is approximately 42 feet wide.

In the stretch of roadway between Brown Street and Washington Street, the recommendation is to create a seven feet wide, parallel parking lane adjacent to the north curb line. Immediately south of the lane would be a five feet wide westbound bicycle lane, a variable width, westbound vehicular travel lane, a variable width,east bound travel lane, and then a five feet wide, east bound bicycle lane.

The stretch of 8th Street between Lindsey Street and Brown Street could receive the same treatments as suggested above, but it would result in the loss of dedicated turning lanes. If the desire is to maintain the dedicated turning lanes, the suggestion would be to add SLMs to this stretch of roadway and otherwise leave it as it currently exists.

Potential Bicycle Lanes on 8th Street

Potential Bicycle Lanes on 8th Street with SLMs Provided in the Block Between Lindsey Street and Brown Street

17th Street

17th Street and Gladstone Avenue Intersection

17th Street currently contains bicycle lanes between Central Avenue on the west and National Road on the east. A particular area of concern exists near the intersection of 17th Street and Gladstone Avenue where the bicycle lane currently shifts north across the right-turn-only lane and into the center of east bound traffic. This condition creates a potential conflict zone between bicyclists and automobiles that could be better avoided. AASHTO, NACTO, and the National Committee of Uniform Traffic Control Devices Bicycle Technical Committee all urge against this treatment. The graphics on the following page illustrate several options for better handling this intersection.

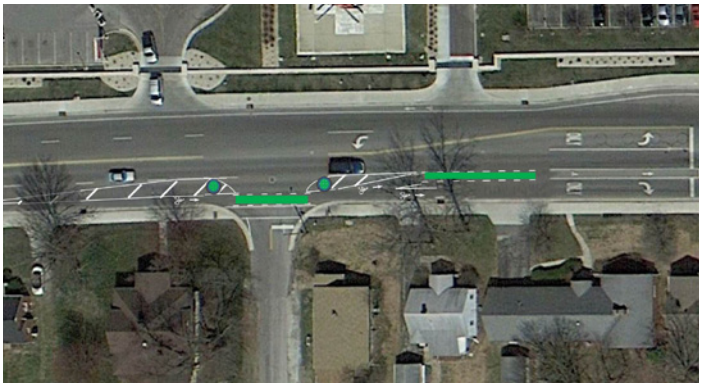
Potential Merge Before Intersection Option at 17th Street and Gladstone Avenue

Potential Merge Before Intersection Dashed Conflict Zones Option at 17th Street and Gladstone Avenue

Potential AASHTO Drop Lane Option at 17th Street and Gladstone Avenue

Potential AASHTO Drop Lane Option with Continuous Green Striping at 17th Street and Gladstone Avenue

Potential Separate Signalization for Bike Lane Option at 17th Street and Gladstone Avenue



Potential Merge Before Intersection with Green Striping Option at 17th Street and Gladstone Avenue

Facilities Recommendations | Contraflow Bicycle Lanes

Lafayette Avenue

If Lafayette Avenue is not converted to two-way operation, a **contraflow bike lane** should be included on the one-way section. Because Lafayette Avenue is 30 feet curb-to-curb, consideration should be given to eliminating parking on the east side of the road and providing a cross section (west to east) of a 8-foot parking lane, 6-foot southbound bike lane, 11-foot southbound through lane, and a 5-foot northbound bike lane. The wider bike lane on the east side provides space for the bicyclists to ride outside the door zone.

Potential Contraflow Bike Lane on Lafayette Avenue

California Street

If California Avenue is not converted to two-way operation, a **contraflow bike lane** should be included on the one-way section. Because California Street is only 24 feet curb-to-curb, the southbound movement would not be provided with a bike lane; SLMs could be provided for the southbound bicyclists. The resulting cross section would be 19 feet for southbound parking and a through lane and a 5-foot bike lane.

9th Street

Washington Street to California Street

Given that 9th and 10th Street between Washington and California Streets are not recommended to be converted to two-way operations, parking restrictions should be considered for the south side of 9th Street and a **contraflow bike lane** installed.

9th Street

16th and 17th Streets

If these roadways are not converted to two-way operations, **contraflow bike lanes** should be installed on them. This would still allow for on street parking on one side of each road.

Potential Contraflow Bike Lane on California Street

27th Street

Sycamore Street to Central Avenue

27th Street stretches from Washington Avenue to Central Avenue. Between Sycamore Street and Maple Street, 27th Street is approximately 36 feet wide. If parking can be eliminated along this section, **protected bike lanes** should be installed. If parking cannot be totally eliminated, consider restricting parking on one side and installing bike lanes on 27th Street.

Between Washington Avenue and Sycamore Street and between Maple Street and Central Avenue it is approximately 26 feet wide. Consequently, bike lanes are not appropriate for this section. However, if Sycamore to Maple cannot be restriped with bike lanes, SLMs should be installed on these sections.

2nd Street

Lindsey Street to State Street

2nd Street, from Lindsey Street to State Street, was reviewed for the potential for installing **protected bike lanes**. Currently, 2nd Street is three lanes of traffic traveling east. Each of the lanes exceeds twelve feet in width and there is generous tree lawns on both sides of the street. Vehicular traffic currently travels at a high rate of speed.

Reducing the lane widths to accommodate a protected bicycle lane should be considered. The street could be restriped to provide two 12 feet wide travel lines on the portion of the street with one 8 feet wide parking lane immediately adjacent to the southern travel lane. A 6 feet wide pedestrian refuge island/buffer and a 6' wide bicycle lane can then be created immediately adjacent to the southern curb line. New pedestrian signalization will also need implemented on this busy thoroughfare and coordination with INDOT will be required.

If 2nd Street is not revised to incorporate a protected bicycle lane, consideration should be given to converting it to two-way traffic as described on page 53.

Potential Protected Bicycle Lane on 2nd Street

Lindsey Street

8th Street to 3rd Street

Lindsey Street is three lanes south bound from 8th Street to 3rd Street. Where the roadway approaches 3rd Street, the two westernmost travel lanes become right-turn only lanes. All travel lanes are twelve feet wide and it is recommended that the western most travel lane be converted to a **protected bicycle lane**. This can be accomplished through striping a six feet wide bicycle lane and a six feet wide painted buffer area between the bicycle lane and the adjacent travel lanes.

At the northern end of this stretch near 8th Street, the protected bicycle lane can tie into the recommended 8th Street bicycle lane. Where Lindsey Street approaches 3rd Street, the protected bicycle lane would end and SLMs would be implemented to allow the westernmost right-turn only lane to be maintained and accommodate bicyclists at the same time.

Potential Protected Bicycle Lane on Lindsey Street

Franklin Street

*Franklin Street could serve as a **bicycle boulevard** from 2nd Street north to 27th Street. Changing Franklin from a **one-way roadway to a two-way roadway** should be considered.* From 2nd Street to 8th Street, SHARED LANE MARKINGS (SLMs) are recommended. North of 8th Street BIKE BLVD message markings would be more appropriate.

All traffic signals along Franklin Street and all the potential bike boulevards should be checked to ensure they are responsive to bicyclists. (This should actually be done for all signals in Columbus.)

2nd Street to 8th Street

Given the presence of on-street parking, and the character of the development in the area south of 8th Street, SHARED LANE MARKINGS (SLMs) are recommended through this section. Curb extensions should be considered on Franklin Street to create a more constrained (calmed) feeling along the roadway; however they would not be required. Hatched pavement markings could also be used to better define vehicular lanes. Converting the angled parking to parallel parking could, of course, be done but making it back-in angled parking for south-bound traffic would eliminate the need to make any modifications to the roadway other than adding a yellow centerline and the SLMs. If it is desired to maintain this section of Franklin Street as a one-way in the downtown area, Washington Street should be used as a southbound connector; similar curb extensions could be provided at this location. SLMs could be placed on 9th Street to move southbound cyclists to Washington Street.

The maximum spacing for SLMs is 250 feet. The SLMs shown in Figure 4 are spaced at approximately 125 feet. One marking was put at the beginning of the block to alert motorists entering the roadway of the desired position of bicyclists in the travel lane. An SLM was placed at the end of the block at the stop bar to encourage cyclists to maintain their position in the lane and thus help prevent "right hook" crashes. The third (directional) SLM was added midblock to provide at least one SLM every 250 feet. (San Francisco, where some of the most robust SLM research was performed, used approximately 150 foot spacing on its study sections.)

Sample Downtown Two-Way Conversion

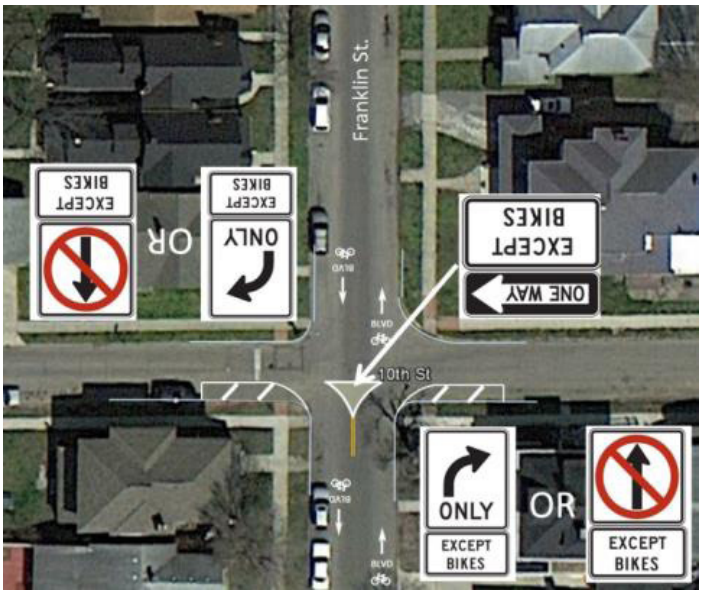
8th to 16th Street

Franklin Street from 8th Street to 16th Street should be considered for conversion to a two-way street. To better facilitate bicycle travel the roadway should be modified to discourage motor vehicle through travel. One such modification would be the prohibition of through movements at intermittent intersections.

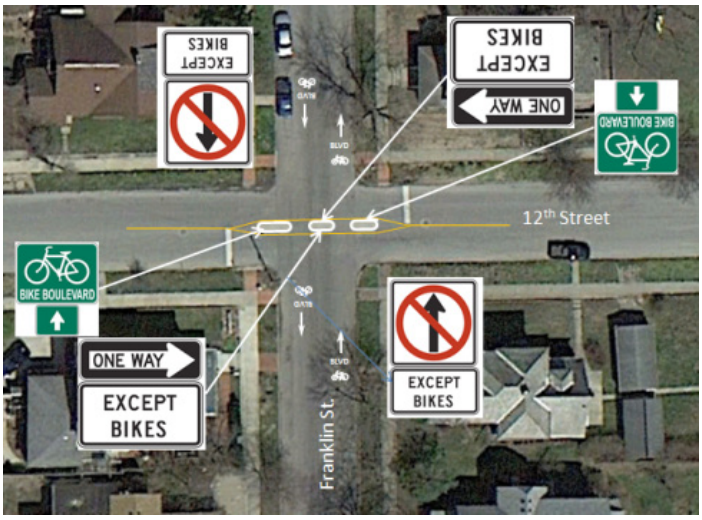
Prohibitions of motor vehicle through movements would be signed. Physical barriers would also have to be designed and installed at each intersection where through movements are prohibited. One such prohibition could occur at 10th Street. Tenth Street is an eastbound one-way street with parking allowed on the south side of the roadway. This allows for a diverter to be placed on the south side of the roadway without interfering with the through movement on 10th. This arrangement does not restrict any turning movements onto or off of Franklin Street from 10th.

Another opportunity to divert motor vehicle traffic from Franklin Street occurs at 12th Street. Twelfth is two-way and through traffic could be prohibited using a narrow traffic separator on 12th Street. The traffic separator would be in three sections to allow for through movement by bicyclists. The overall length of the traffic separator would have to allow for retaining the existing pedestrian crossings of 12th Street. Parking on 12th would need to be prohibited in the immediate area of the diverter. A similar diverter could be placed at 15th Street.

To make Franklin Street two-way, signal modifications would be required at 2nd and 4th Streets. Additional STOP signs would be needed at 5th, 7th, 11th, and 16th Streets. Numerous ONE-WAY signs would need to be removed from side streets.



Potential Diverter at 10th Street.



Potential Diverter at 12th Street.

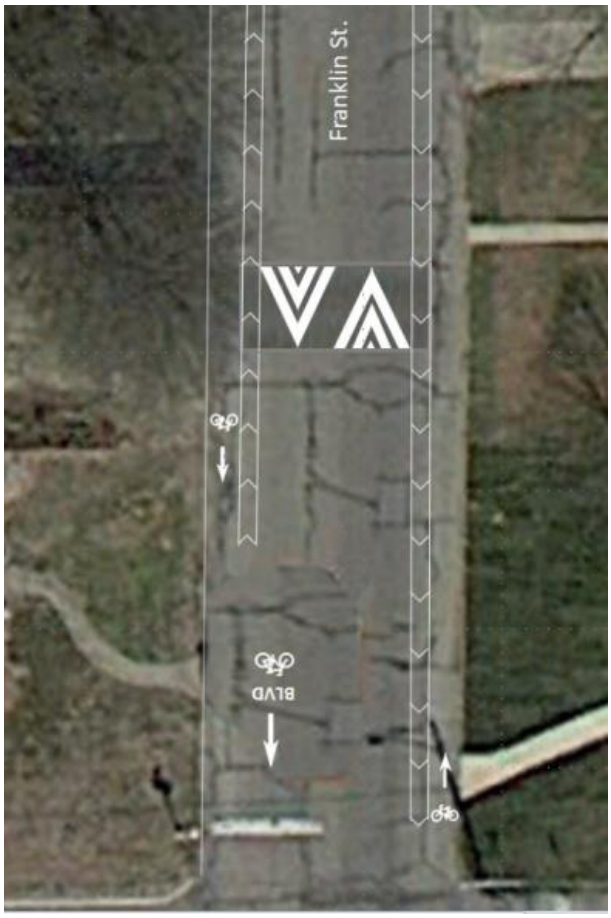
16th to 27th Street
At 16th Street, Franklin Street becomes a two-way roadway.

Between 16th Street and 18th Street there is approximately 30 feet of pavement face-of-curb to face-of-curb. This means that there is potential for bike lanes on this section if on-street parking is removed. The houses on this street have access to off-street parking; however, some on-street parking still occurs. If parking can be eliminated, 10-foot travel lanes coupled with bike lanes should be considered.

Between 18th Street and 19th Street, the roadway is a divided two-way roadway with each side of the road having approximately 16 feet of pavement face-of-curb to face-of-curb. On- street parking, while allowed, does not appear to be extensively used. Consequently, buffered bike lanes are a potential option on this section of Franklin Street.

North of 19th Street to 25th, Franklin Street widens to approximately 36 feet wide. The houses have access to off-street parking. Buffered bike lanes should be installed along Franklin Street through this area. Speed humps should be considered to control motor vehicle speeds along this section of Franklin. They should be designed so as not to extend into the buffered bike lanes. A median diverter should be installed at 22nd Street.

North of 25th Street, Franklin Street narrows to approximately 30 feet wide. While in theory bike lanes could be added on this section, they may feel constrained to bicyclists. An alternative is to slow traffic by installing speed pillows (sometimes referred to as speed lumps). Speed pillows are similar to speed humps except that they do not span an entire roadway.



Buffered Bike Lanes and Speed Hump on Franklin North of 22nd.


Speed Pillows
Photo Credit: Streetsblog.org

Chestnut Street

Chestnut Street, recommended for a **bicycle boulevard**, lies approximately one quarter mile east of Franklin Street. It spans the same distance as Franklin Street, from 2nd Street north to 27th Street. Chestnut passes along the northeast side of Donner Park. Parking is much less dense along Chestnut Street than on Franklin Street. Consequently, bike friendly traffic calming will need to be installed to reduce motorists speeds to make Chestnut a bike boulevard.

2nd Street to 4th Street

Chestnut Street, from 2nd Street to 4th Street, is a two-way street approximately 28 feet from curb to curb. SLMs are recommended for these two blocks. The blocks are fairly short (<350 feet long) so traffic calming will likely not be required along these blocks.

4th Street to 6th Street

From 4th Street to 6th Street, Chestnut Street is adjacent to two schools, St. Peter's Lutheran and Central Middle School. Parking is allowed on the east side of Chestnut Street. There is a curb ramp serving a potential crossing of Chestnut Street on the south side of 6th Street.

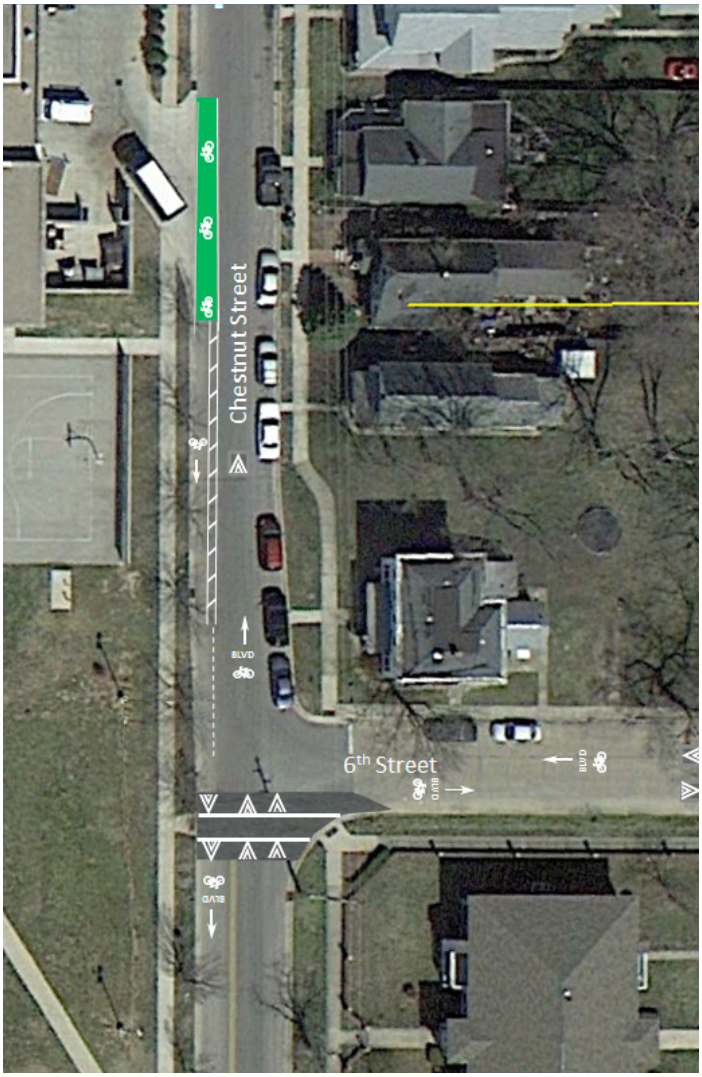
Bike boulelvard markings should be used and speed pillows should be installed through this section to control motor vehicle speeds. A raised crosswalk should be considered for the crossing of Chestnut at 6th.

6th Street to 27th Street

North of 6th Street, Chestnut Street becomes a one-way road northbound. To create a bike boulevard, this section should be converted to two-way operations.

Between 6th and 7th, the one-way operation may serve to enhance operations at the Central Middle School entrance. If this is the case, a contra-flow buffered bike lane should be installed through this block for southbound bicycle traffic.

North of 7th, two-way operations could be combined with traffic calming features and traffic diverters to facilitate a bike boulevard. At 8th Street, there is an all way STOP; consideration should be given to maintaining the STOP signs only on 8th Street. A median traffic diverter could be installed at 9th Street, 12th Street, 14th Street, and/or 22nd Street.



Contraflow Bike Lane North of 6th Street

At 19th Street there is a pedestrian crossing of Chestnut Street. This could be converted to a raised crossing or perhaps a raised intersection.

Cottage Avenue

Cottage Avenue is approximately one half mile east of Chestnut Street. It runs from 6th Street on the south to 25th Street on the north.

As with Chestnut, conversion of Cottage to a **bicycle boulevard** will require significant traffic calming measures to ensure a bike friendly corridor.

10th Street

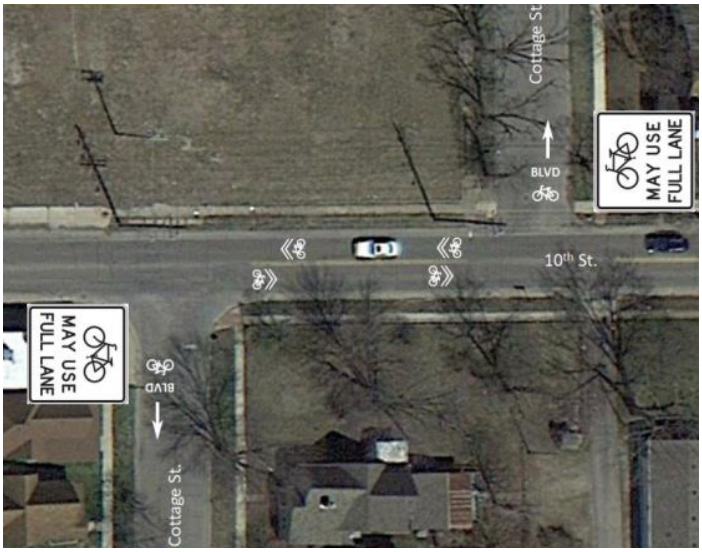
The intersection of Cottage Avenue and 10th Street is a staggered-Tee intersection. The challenge at this location is to provide a comfortable crossing of 10th Street. There are several options to help facilitate this crossing.

The first option is for no improvements. Bicyclists would be required to ride on 10th Street for approximately 125 feet. Signs could be added on 10th Street west and east of Cottage Avenue to inform motorists on 10th Street of the potential for entering bicycles. BIKE BOULEVARD, SHARE THE ROAD, or BIKES MAY USE FULL LANE signs would be appropriate for this location.

If space is available, widening 10th to provide shoulders for this 125-foot section could be an option. Improving the drive/alley to create a route with a direct crossing is another alternative. It may be possible to add paved shoulders to 10th Street but this would require removing curb and widening the pavement.

North of 10th Street

Traffic calming should be continued for the length of Cottage Avenue. In addition, median traffic diverters could be installed at 12th Street, 14th Street, 19th Street and/or 22nd Street.



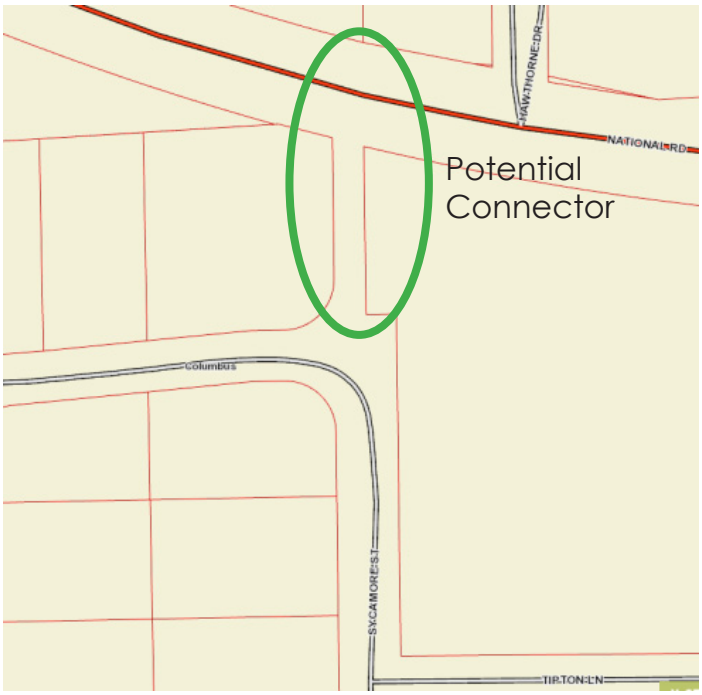
Potential Signs and Markings at Cottage and 10th Streets

Potential Improved Route

Sycamore Street

Sycamore Street stretches from Donner Park to within 150 feet of US 31 to the north. Of all the roadways in Columbus, Sycamore would probably be the easiest to turn into a **bicycle boulevard**. Motor vehicle traffic is already light and speeds are low. One potential improvement for this section is the realignment of STOP signs so that traffic (and thus bicyclists) on Sycamore is not required to stop at 24th Street.

At the north end of the section, Sycamore Street ends at Tipton Lane. However, the right-of-way continues through to US 31. This right-of-way should be explored for potential exploitation as a bicycle connection up to US 31. There appears to be adequate right-of-way available on the south side of US 31 to make a People Trail style connection across from Hawthorne Drive.



Property Lines Between Sycamore and US 31

Crossing 25th Street

The Franklin, Sycamore, and Chestnut bike boulevards have to cross 25th Street. Twenty-fifth Street is a four-lane undivided roadway. This roadway may be able to function as two-lane roadway with two-way left turn lanes (see Lane Reductions). In either event, during peak hours, 25th Street can present a significant obstacle to north-south bike boulevard bicycle traffic.

Most of the day, crossing 25th Street will not be a problem. Gaps will occur that allow crossing of the street. However, during peak periods gaps may be infrequent. Other cities with bike boulevards have installed pedestrian hybrid beacons that allow bicyclists to function as pedestrians when crossing major roadways. The hybrid beacon has an advantage for bicyclists because they would not be unduly delayed when they do not feel the need to use the hybrid beacon. If the roadway is two-laned and there is potential to install a traffic separator, rectangular rapid flashing beacons could be considered as pedestrian (and thus bicyclist) enhancements for these crossings.

5th-6th-7th Streets (Millrace Park/ Lindsay Street to Gladstone Avenue)

This **bicycle boulevard** is proposed to begin at Lindsey Street, cross the Franklin Street bike boulevard and follow 5th Street to the Chestnut Street bike boulevard. It would then jog along Chestnut to 6th Street where it would continue to the Cottage Avenue bike boulevard. It would then jog again to 7th Street and continue east to Gladstone Avenue.

Lindsey Street to the Franklin Street Bike Boulevard

This first challenge for this section is the crossing of Lindsey Street from Carl Miske Drive to 5th Street. There is a signal approximately ¼ mile north of 5th Street on Lindsey. This may create adequate gaps for bicyclists to cross over safely (a gap study should be performed to determine if this is the case). If gaps are inadequate for crossings of Lindsey Street, an improved pedestrian crossing that bicyclists could access should be provided. Given that Lindsey Street is three lanes southbound, a pedestrian hybrid beacon is recommended for this location.

The section of 5th Street from Lindsey Street to Franklin Street would not be significantly altered. Given the character of 5th Street through this area, SLMs should be installed along this section.

Franklin Street to Chestnut Street

Fifth Street should receive BIKE BOULEVARD markings and bike sensitive traffic calming from Franklin Street to Chestnut Street. Consideration should be given to eliminating the Stop control for 5th Street at Lafayette Avenue. The pedestrian crossing at Sycamore Street should be converted to a raised crosswalk to facilitate traffic calming along this section.

Chestnut Street to Cottage Avenue

From Chestnut Street to Cottage Avenue, this bike boulevard would follow 6th Street. From Chestnut Street to California Street and from Maple Street to Cottage Avenue, BIKE BOULEVARD markings and traffic calming (likely speed pillows) should be installed. Between California Street and Maple Street there is on-street parking. However, there appears to be ample off-street parking to accommodate all those needing to park. Because this short stretch serves as truck access to the adjoining properties, traffic calming may not be appropriate. However, buffered bike lanes could be installed if on-street parking is removed.

There is a fading midblock crosswalk between Reeves Way and Maple Street. The southern terminus of this crosswalk is within a driveway access. This crosswalk should be several yards to the west. This would require removal of the drop curb on the north side of the street so proper curb ramps can be installed.

Crosswalk Relocation

Cottage Avenue to Irwin Drive

From Cottage Avenue to Central Avenue is a (slightly more than) 300-foot length of roadway that is largely within the functional area of the 7th Street/Central Avenue intersection. Central Avenue to Irwin Drive is (slightly more than) 600 feet of roadway containing left turn lanes for eastbound traffic and a dedicated right turn lane for westbound traffic to Pleasant Grove and a dedicated and free-flow right turn lane connecting Central Avenue to Pleasant Grove. 7th Street provides limited opportunities to cross the creek, as it is fairly busy at this location and opportunities for significant traffic calming are limited.

Consideration should be given to eliminating the dedicated lane for right turns onto Pleasant Grove. The eastbound departure lanes on 7th Street are fed by a signal controlled through lane, a protected-permissive left turn lane, and a through-right lane that allows for right turn on red. During peak periods, a significant amount of eastbound through traffic through the intersection drives directly into the right turn lane. Thus right turn on red motorists turning onto 7th from the south must be especially careful not to pull into the path of motorists who are shifting from the west approach eastbound through lane into eastern departure right turn lane as they drive through the intersection. Right turn-on-red motorists also have to

be wary of left turning motorists who may be turning directly into the right turn lane. The benefit of the right turn-on-red is also limited by the absence of a dedicated right turn lane from Central Avenue to 7th Street. If the right turn only lane is removed, the space could be used to provide bike lanes between Central Avenue and Pleasant Grove. Installation of a right turn slip lane island at 7th Street and Pleasant Grove will reduce the speeds of right turning motorists. A raised crosswalk for pedestrians would further calm these turning motorists' speeds.

Potential Revised striping at 7th Street and Pleasant Grove

Irwin Drive to Gladstone Avenue

Because of the lack of alternative east-west routes between Irwin Drive and Gladstone Avenue, it may not be possible to install traffic diverters at any of the intersections. While traffic calming will reduce motor vehicle speeds, it will not be able to significantly reduce motor vehicle volumes on 7th Street. Consequently, the bike boulevard combination of low-volume and low-speed may not be achievable on this portion of 7th Street; SLMs might be a more appropriate pavement marking the Bike Boulevard on this section of 7th Street.

A Potential Option

A preferable alignment to 7th Street would require negotiation with a private land owner. A People Trail connector could be considered between the intersection of 6th Street and Cottage Avenue and the intersection of 5th Street and Pleasant Grove. A pedestrian hybrid beacon across Central Avenue and a bridge across the creek would be required to implement this connection as well. From Pleasant Grove the bike boulevard would follow 6th Street to Gladstone Avenue.

Continuing East

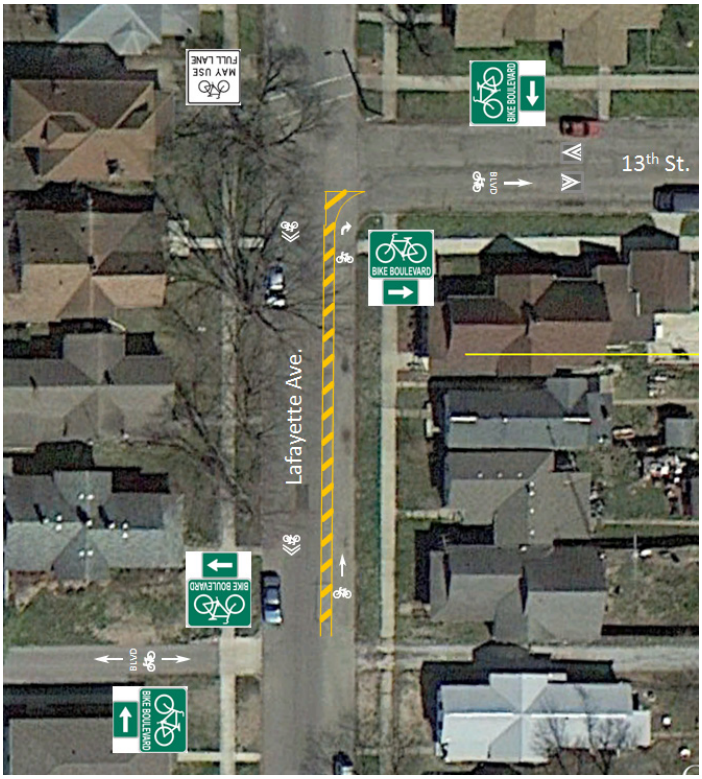
Gladstone Avenue boarders the Garland Brook Cemetery and creates a barrier to continuing eastward from Gladstone Avenue. Consideration should be given to requesting either one or two non-motorized access gates be installed for bicyclists (and pedestrians) to use the on-site circulating roads to cross Garland Brook Cemetery. Alternatively, a people trail connector could be considered for the south side of 10th Street between Gladstone Avenue and McClure Road or for the north side of the Cosmetology School. Route signs could then be installed to take bicyclists along McClure Road to 9th Street, to Schiner Drive, to Pavilion Drive. Bicyclists would then just have to cross Marr Road and they would have access to the ring road (Creekview Dr/Ct and Whitefield Dr) serving Kohl's and Wal-Mart.

13th Street

13th Street, recommended for a **bicycle boulevard** begins at Lafayette Avenue and goes to Central Avenue on the east where it jogs slightly and continues on to the People Trail on the east side of the Greenbelt Golf Course.

Franklin Street Bike Boulevard to 13th Street Bike Boulevard

Franklin Street, and thus the proposed Franklin Street Bike Boulevard, lies one block east of Lafayette Avenue. To connect the proposed 13th Street Bike Boulevard to the Franklin Street Bike Boulevard it will be necessary to sign and mark improvements to Lafayette Avenue and an alley (150 feet south of 13th Street) that connects Lafayette Avenue to Franklin Street.



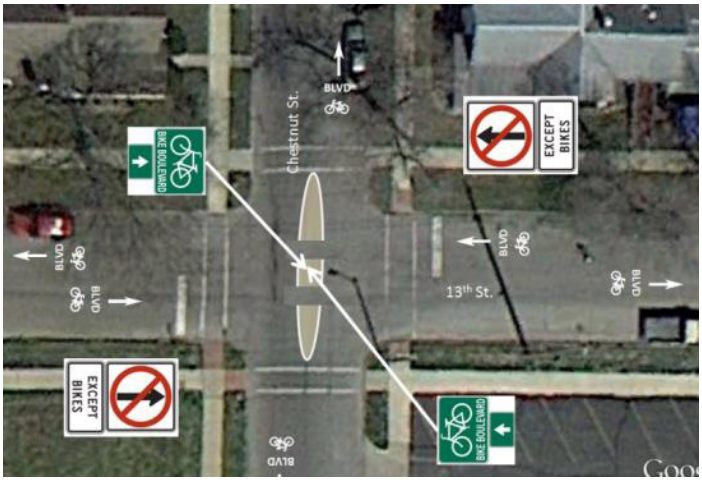
Bike Boulevard Connector on Lafayette Avenue

If Lafayette Avenue is converted from a one-way to two-way street (see Proposed One-Way to Two-Way Conversions), then minimal improvements will be needed on Lafayette Avenue. SLMs and BIKE BOULEVARD signs with directional arrows should be adequate.

If Lafayette Avenue is not converted to two-way operations, then two alternatives exist. The first option is to route the bike boulevard south to the alley 150 feet south of 13th Street and use a contraflow bike lane to make the eastbound connection. An alternative is to use two connectors. Connections from Franklin Street to 13th Lafayette eastbound would occur on the first alley north of 13th Street. Connections from 13th Street to Franklin westbound would occur on the first alley south of 13th Street. This second option is less desirable because by promoting bike traffic on two connectors, bicyclists may be inclined to use the shortest possible (as opposed to legal) route and thus ride against traffic on Lafayette Avenue.

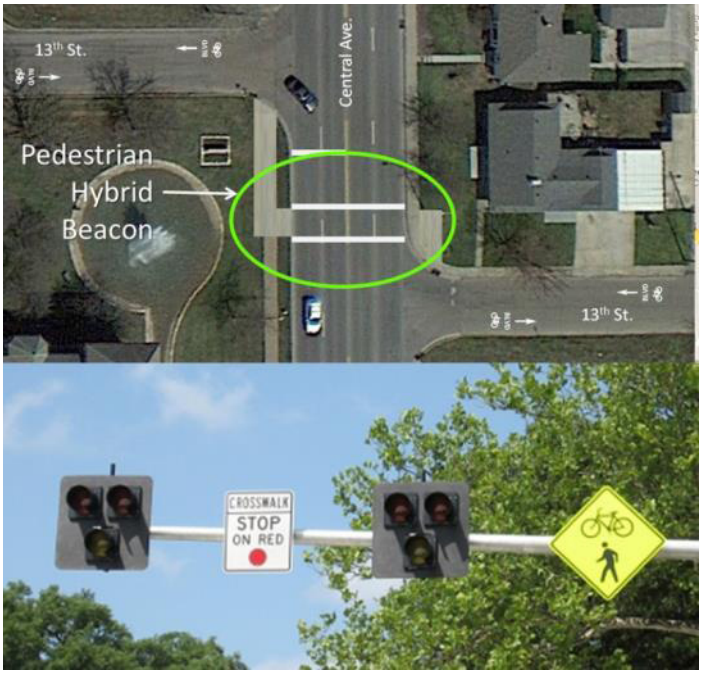
Lafayette Avenue to Central Avenue

From Lafayette Avenue east to Central Avenue BIKE BOULEVARD markings and traffic calming should be installed along 13th Street. A traffic diverter should be considered at Chestnut Street. Since Chestnut Street is not particularly wide at this location, the diverter would need to be contained within the intersection; a raised oval island such as the one shown in Figure 14 could be installed. Another could be installed at Grand Avenue. Consideration should also be given to removing the STOP signs at Pearl Street, Sycamore Street, California Street, Union Street, and Michigan Street and assigning stop control to the side streets.



Potential Diverter at Chestnut Street

Central Avenue creates a challenge to continuing this bike boulevard to the existing people trail on the west side of the Greenbelt Golf Course. One potential option at this location is to provide a mid-block crossing of Central Avenue. At this location short paths could be created to access a crossing just north of 13th Street. A Pedestrian Hybrid Beacon could be used to provide access across Central Avenue without unduly impacting traffic along Central Avenue.



Potential Crossing of Central Avenue

17th Street/Sycamore Street/19th Street

This **bicycle boulevard** is approximately 1/3 of a mile north of the proposed bicycle boulevard on 13th Street. It would connect Noblitt Park and People Trail on the west to Donner Park, then on to Lincoln Park and more of the People Trail on the east.

Noblitt Park to Sycamore Street

BIKE BOULEVARD markings and traffic calming (possibly speed humps with bypass space for bikes on the outside of the pavement or speed pillows) should be placed along 17th Street from the entrance to Noblitt Park to Sycamore Street. It is hoped that Washington Street (see Road Diets section) will become a two-lane roadway with a two-way left turn and possibly bike lanes in the future; this would make this intersection easier to cross that the current four-lane undivided cross section. In the event that Washington Avenue remains a four-lane undivided roadway, consideration should be given to installing designated crosswalks on both approaches to this intersection with activated rectangular flashing beacons included to provide real-time information to motorists as to the presence of pedestrians and bicyclists who are crossing the roadway.

The requirement for 17th Street to stop at Franklin Street should be removed. However, just changing the priority so Franklin will have to stop then delays bikes on the Franklin Street bike boulevard. One potential solution is to construct a mini-circle at this intersection. A mini-circle would serve as traffic calming for motorists but not require either direction to stop (YIELD signs would be installed for all approaches).

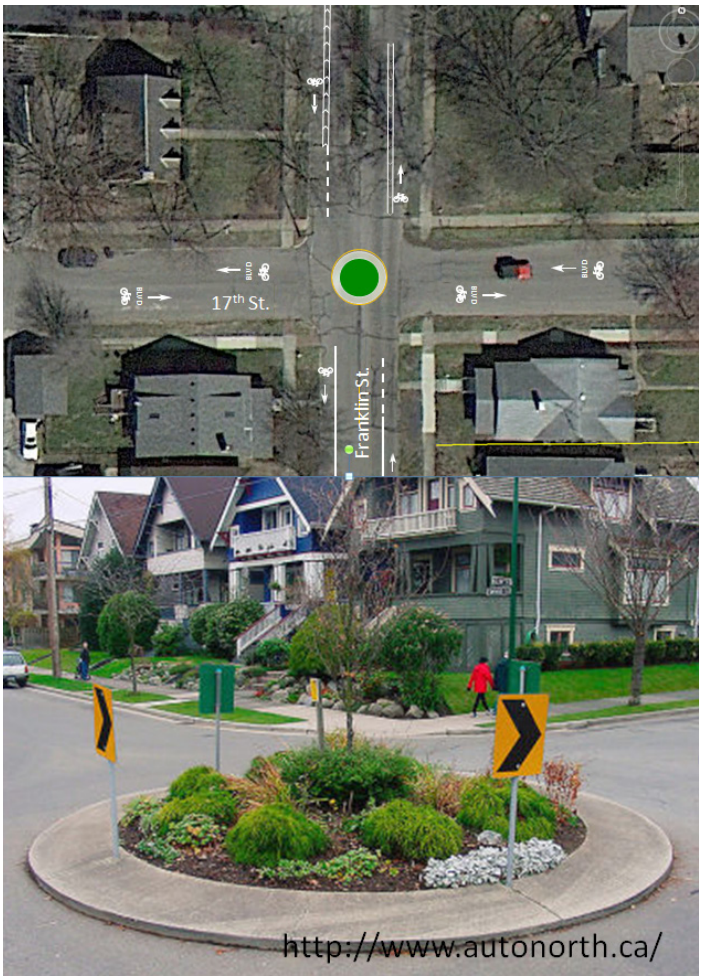
At Lafayette Avenue, priority should be changed so that Lafayette has STOP signs and 17th Street does not. This would provide an added benefit of requiring a stop on the approaches to the crosswalk across Lafayette Avenue at this location. This intersection could also be considered for conversion to a raised intersection to calm traffic.

Sycamore Street

Sycamore Avenue from 17th Street to 19th Street should have BIKE BOULEVARD markings and speed humps/pillows.

19th Street to Central Avenue

Nineteenth Avenue from Sycamore Avenue to Central Avenue should have BIKE BOULEVARD markings and traffic calming. Additionally, traffic diverters – such as those shown for the 13th Street and Chestnut Street intersection – should be considered for the intersections at Home Avenue and Maple Street.



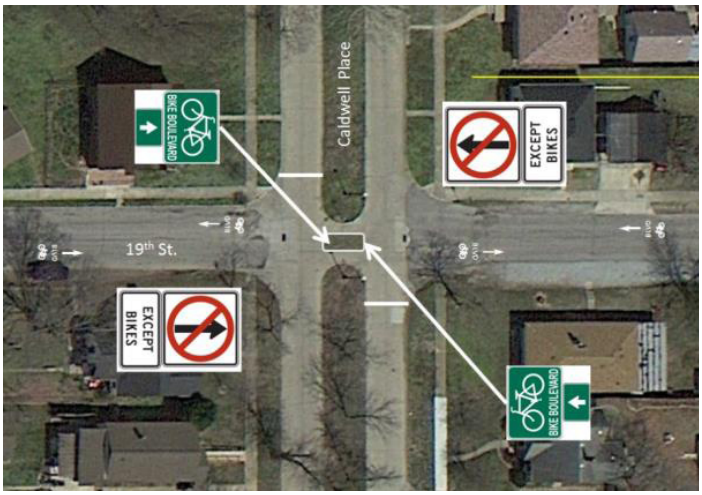
Potential Mini-Circle at 17th Street and Franklin Street

19th Street, Central Avenue to Lincoln Park

It would be desirable to place a diverter on 19th Street somewhere between Central Avenue and Hawcreek Avenue. The most obvious place is at Caldwell Place, halfway between Central and Hawcreek Avenues. Ideally the existing medians would be extended and a divider placed between the two median extensions.

Traffic calming should be continued on Lincoln Park Drive to provide comfortable access to the

interior of the park and to the People Trail connector approximately 1000 feet into the park.



Potential Diverter at Caldwell Place

Southern Connector

There is a proposed People Trail section planned to connect the terminus of the People Trail at the cable stay bridge across the river to the People Trail terminus at Central Avenue and 3rd Street. Layfette Avenue between the boat ramp and the cell tower could provide a temporary link for this People Trail connector, thus requiring approximately ½ mile less connector be constructed to make the initial southern connection.

Facilities Recommendations | Cycle Tracks

3rd Street

3rd Street is a candidate for two-way, elevated **cycle track** improvements between State Street on the east and Lindsey Street on the west. 3rd Street, also SR 46 through town, is a one-way street traveling west and currently is comprised of three travel lanes and high traffic volumes with a posted speed limit of 30 mph.

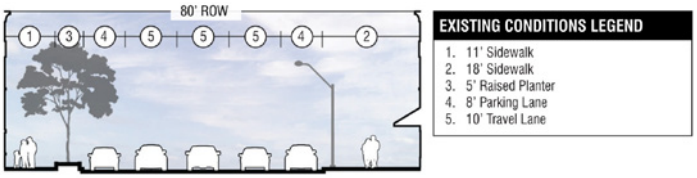
In the downtown, on-street parking is currently available between Brown and Franklin Streets on both the north and south sides of the street.

Recommendations for creating a cycle track on 3rd Street include removing the northern travel lane and on-street parking lane where applicable, as well as existing curbs, sidewalks, and associated amenities. While this may shift the travel lane striping throughout the entire affected corridors, the southern curb line will remain unchanged, minimizing expense for construction.

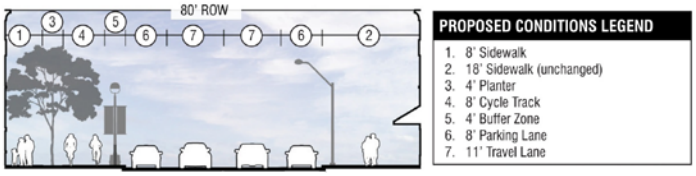
Construction of the improvements will include an eight-foot wide sidewalk immediately adjacent the northern right-of-way. Near intersections, pavements will become visually distinct and a designated pedestrian curb ramp will be present for crossing streets. Adjacent the sidewalk, a four-foot planter will include colorful plantings, shade trees, lighting, signage and other amenities.

Immediately south of and adjacent to the planter will be the two-way cycle track. Recommended to be eight feet wide, the cycle track will be constructed with a visually distinct surface. The centerline of the cycle track will also be visually distinct as will the perimeter of the path. Appropriate markings, symbols, and signage will be located along the path. Near intersections, the pavement pattern will change and be comprised of striping running perpendicular the traffic flow. Additionally, the cycle track will shift closer to the curb line in order to raise vehicular awareness of bicyclists.

Through intersections, the cycle track will maintain a visually clear path of travel. New traffic controls will be installed oriented towards the bicyclist and pedestrian. Where driveways and parking lot entrances occur, the cycle track will remain elevated giving precedence to the cyclist.



Existing 3rd Street Cross Section



Proposed 3rd Street Cross Section

Proposed 3rd Street Improvements

Immediately south of and adjacent to the cycle track, a four-foot buffer zone will be present. This will allow for the safe separation of the cycle track and adjacent on-street parking and creates an amenity zone for lighting, signage, meters, etc. Near the intersections where the cycle track shifts, the four-foot buffer and adjacent on-street parking will cease and the creation of a stormwater planter will be possible. (Stormwater planters are often used to retain water during rain events and use native plantings to transpire water and minimize stormwater outflow into conventional stormwater systems.)

Within the roadway, an eight-foot wide parking lane will be maintained on the north and south curb lines, except near intersections as mentioned above. Two, eleven-foot wide travel lanes will be striped allowing for the efficient transfer of vehicular traffic through town. Within intersections, a unique pavement surface and pattern should be utilized to increase awareness for vehicular traffic, cyclists, and pedestrians alike.

Brown Street

8th Street to 2nd Street

It is recommended that Brown Street be considered for a two-way, buffered **cycle track** between 8th Street and 2nd Street. In this area, the existing road is comprised of two conditions. North of 4th Street, the road is striped for three northbound travel lanes. South of 4th Street, the roadway is striped for two northbound travel lanes and an on-street parking lane on the western curb line.

Each of the travel lanes is at least twelve feet wide and traffic volumes do not currently mandate the need for three travel lanes. A buffered cycle track can be implemented by restriping the two westernmost travel lanes to twelve feet, striping a five feet wide buffer/ pedestrian refuge area, and striping one five feet wide southbound cycle track lane and one five feet wide northbound cycle track lane.

This restriping will work in conjunction with the already established pedestrian crosswalks and will provide pedestrian islands that will increase the safety of pedestrians crossing the roadway.

Potential Cycle Track on Brown Street

Lafayette Avenue

Noblitt Park to Sycamore Street

South of 8th Street, it appears that Lafayette Avenue is functioning as a drop-off facility for Central Middle School. Without significant modifications to the drop-off, it may be impractical for this section of Lafayette Avenue to be **converted to two-way** operation.

North of 8th street, appears Lafayette Avenue has sufficient width to be converted to two-way operation as well. Lafayette Avenue from 8th Street to 16th Street is 30 feet wide and on-street parking is allowed. On-street parking is, however, sporadic and thus could likely be limited to one side of the street.

California Street

6th Street to 25th Street

From 6th Street to 25th Street, California Street is approximately 24 feet wide (a short section, less than a block north of 14th is wider), wide enough for two-way operation. However, on-street parking is present (although sporadic) along this section of California Street. If parking can be removed, California Street could be **converted to two-way** operation. However, removal of on-street parking and conversion to two-way traffic could increase speeds along California Street. Union Street, one block to the east, is two-way and allows curbside parking. When two cars are parked opposite one another on the roadway, opposing flows on the roadway must take turns. This would result in lower speeds and a more bicycle and pedestrian friendly environment.

6th Street

Washington Street to Franklin Street

This is a one-block section of 6th street that is discontinuous with other east-west roads. Why it would have become a one-way roadway is unclear. Unless there are compelling reasons to retain the one-way operation, it should be **converted to two-way** operations.

9th and 10th Streets

Washington Street to California Street

These roads form a one-way pair between Washington Street and California Street. A review of the pavements widths shows that 10th Street is less than 20 feet wide through this section. Consequently, **one-way operation should be maintained**.

16th and 17th Streets

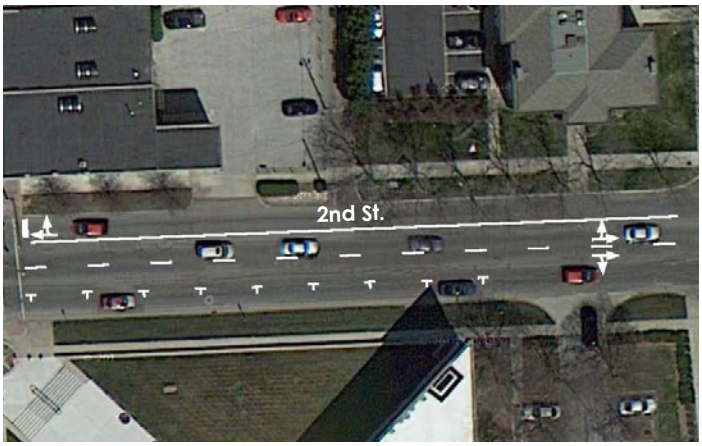
A one-way pair is formed by 16th and 17th Streets between Chestnut Street and Orinoco Avenue (17th Street is one-way from Orinoco Ave to Chestnut Street. Consideration should be given to converting both of these roadways to **two-way operations**.

2nd Street

Lindsey Street to State Street

As described on page 37, 2nd Street, from Lindsey Street to State Street, is recommended for improvements including travel lane reduction and implementation of a protected bicycle lane. If a protected bicycle lane is not constructed on 2nd Street, it is suggested the street be **converted to two-way** traffic in order to calm traffic and reinvigorate the street.

It is suggested that the northern most travel lane be converted to a twelve feet wide west bound travel lane and that two 12 feet wide east bound travel lanes be maintained immediately south of the west bound lane. Additionally, a nine feet wide on-street parking lane can be maintained.



Potential 2nd Street Two-Way Conversion

Washington Street

11th Street to 25th Street

The section of Washington Street from 11th Street to 25th Street presents a significant barrier to bicyclists and pedestrians travelling in the east-west directions. One of the proposed bike boulevards crosses Washington Street on this section of the roadway.

Traffic volumes on Washington Street vary from 8,700 to 15,200 vehicles per day. A review of the Highway Capacity Manual's Exhibit 16-14 Generalized Daily Service Volumes for Urban Street Facilities reveals that, depending on the peak hour to daily traffic ration (K-factor), Washington Street could operate at a level of service D if reduced to two lanes. This suggests that the roadway could be **converted to a two-lane** roadway with a two-way left turn lane. A review of the hourly counts for Washington Street show peak hourly traffic to be less than a K-factor of slightly less than 0.1 with a peak hourly volume of approximately 1,450 vehicles per hour. Peak saturation flow rate for a two lane divided roadway is approximately, 1,530 vehicles per hour. The report also notes that traffic volumes have been decreasing along this roadway. Thus there is potential for a lane reduction project while maintaining an level of service D on Washington Street. . The generalized tables trend toward the conservative, however. A more detailed analysis would better determine the potential for a lane reduction project on this section. Intermittent raised medians could be installed to provide opportunities for midblock crossings or vegetative materials. Given existing 42 -45 foot cross section along this section of Washington Street, bike lanes can be accommodated in a two-lane cross section.

The critical intersection on this section appears to be at 11th Avenue and Street. This intersection should be analyzed to determine its capacity with a single left turn lane for the western approach.

25th Street

Washington Street to Marr Road

Another roadway that could potentially be **reduced to two-lanes** is 25th Street. Volumes between Washington Avenue and Central Avenue are approximately 11,400 vehicles per day. A two-lane roadway should have more than enough capacity to carry this volume. Between Central Avenue and Marr Road, volumes increase to 14,800 vehicles per day; making it more of a challenge, but still potentially a candidate for reducing lanes. For the section between Central and Marr, a detailed operational analysis should be conducted to determine if the roadway will be able to operate at an acceptable level of service if reduced to two-lanes.

8th & 10th Streets

Central Avenue to Gladstone Avenue

These roads constitute a one-way pair between Central Avenue and Gladstone Avenue. Each road has two one-way lanes. There is approximately 25 feet of available pavement on 8th Street, only 23 feet of pavement is available on 10th Street. The volumes on these roadways are such that removing a lane to install bike facilities is not practical. Consequently, bike lanes cannot be added to these roadways without reconstruction. Given that the cross section of the roadway continues across the bridges, this would be an expensive proposition.

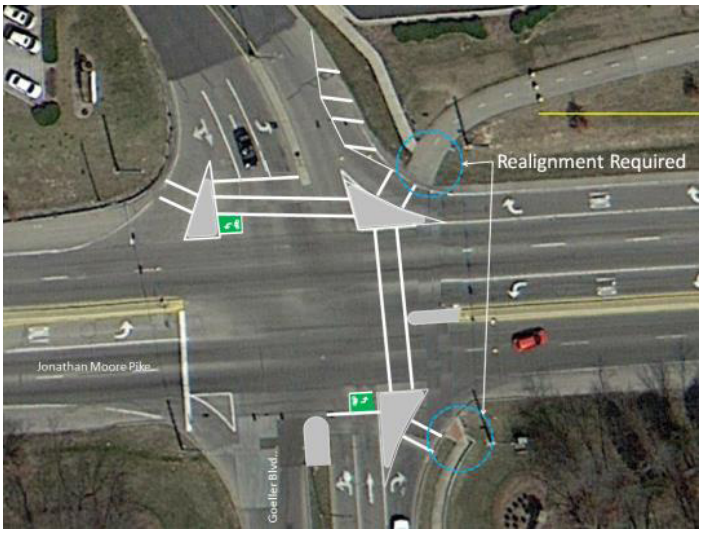
Goeller and Jonoathon Moore Pike

The People Trail terminates on the northeast corner of the Goeller and Jonathan Moore Pike intersection. Access to the People Trail from south Goeller Boulevard is via a crosswalk. The west to northbound movement at this crosswalk is signal controlled but since if flows into its own lane, it is essentially a free-flow right turn.

The free flow right turn creates a potentially serious conflict for pedestrians and bicyclist who need to cross either Goeller Blvd. or Jonathan Moore Pike. The right turn movement is controlled by a traffic signal and theoretically motorists stop, ensure they have yielded to anyone in the crosswalk, and only then proceed. However, the design encourages violations of these requirements. Two primary options are proposed for this movement. Both include modifying the markings (at least) to eliminate the "to-an-exclusive-lane" condition. This creates a point at which motorists are required to yield prior to making a right-on-red. This often does not occur. The first option is to install NO RIGHT TURN blank-out signs activated by People Trail users. Blank out signs have been shown to have much higher rates of compliance than static signs and dramatically reduce the adverse impacts of a constant no right-on-red.

A second option involves installing yield control right turn slip lanes with raised islands. While motorists may still not stop, their speeds will be reduced and there will be no signal across the right turn to tell pedestrians (possibly incorrectly) motorists are going to stop and wait for them. If more than a combined BICYCLE/ PEDESTRIAN (W11-15) sign is deemed necessary, a yield line and rectangular rapid flashing beacon could be placed in advance of the crosswalk to the slip lane island.

Secondary issues at this intersection include transition from the people trail to south on Goeller Blvd. and accessing the People Trail from eastbound Jonathan Moore Pike. Bicyclists travelling from the People Trail south on Goeller are currently encouraged to use the crosswalk and then either ride on the sidewalk or cross Goeller against traffic to turn into the southbound travel lanes. Two-stage turn boxes could be added to the southbound approach to the intersection to allow

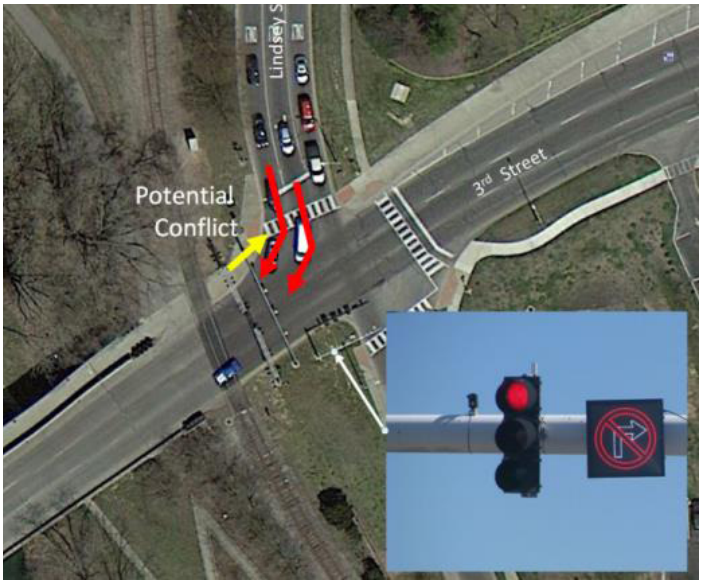


Potential Slip Lane Option for the Goeller Boulevard and Jonathon Moore Pike Intersection

bicyclists to proceed across Goeller on the north side, realign their bikes, and then cross the intersection within the southbound lanes. A second two-stage left turn box could be added to help bicyclists riding eastbound on Jonathan Moore Pike turn left and access the People Trail. Raised slip lane islands would help to better define the movements at this intersection and provide space for a crosswalk across the north approach to the intersection. Some realignment of the People Trail and the sidewalk curb ramp on the southeast corner of the intersection would be required.

3rd Street and Lindsey Street

The people trail parallels 3rd Street on the north side into downtown. At the in intersection with 3rd, Lindsey has a signalized double right turn at which right turn-on-red movements are allowed. This results in a significant number of reported right turn-on-red conflicts between motorists and bicyclists at this intersection. However, full time prohibition of the right turn-on-red would adversely impact operations at this intersection. It is recommended that a blank out no right-on-red sign be installed at this location. A blank out sign is an electronic sign that would only be illuminated when called for by a people trail user pressing the walk button to cross Lindsey Street.



Potential Conflicts and Blank Out Sign

Rocky Ford Road and Candlelight Drive

A bus transit stop is located on the south side of Rocky Ford Road between Middle Road and Marr Road. This stop receives regular use by transit users who live in the community to the north. Currently, no mid-block crossing exists and users are forced to cross four lanes of vehicular traffic and one turning lane.

It is recommended that the city conisder restriping the road to reduce the width of the travel lanes and provide a raised, landscaped median, to act as a half-way point for patrons traveling across the roadway. Additionally, crosswalk striping should be installed and some pedestrian signalization may need considered.

Existing Condition at Rocky Ford Road and Candlelight Drive

Example Proposed Condition at Rocky Ford Road and Candlelight Drive
Image Credit: www.communityremarks.com