



Bike and Pedestrian Steering Committee Recommendations to City Council

December 2014

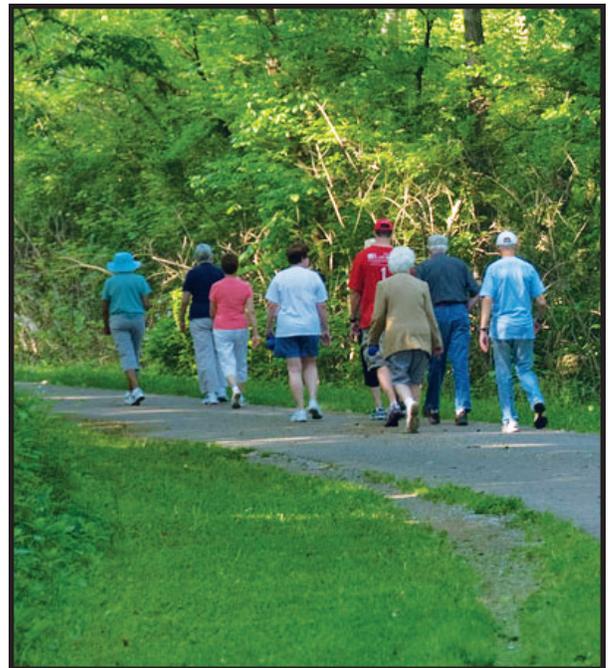
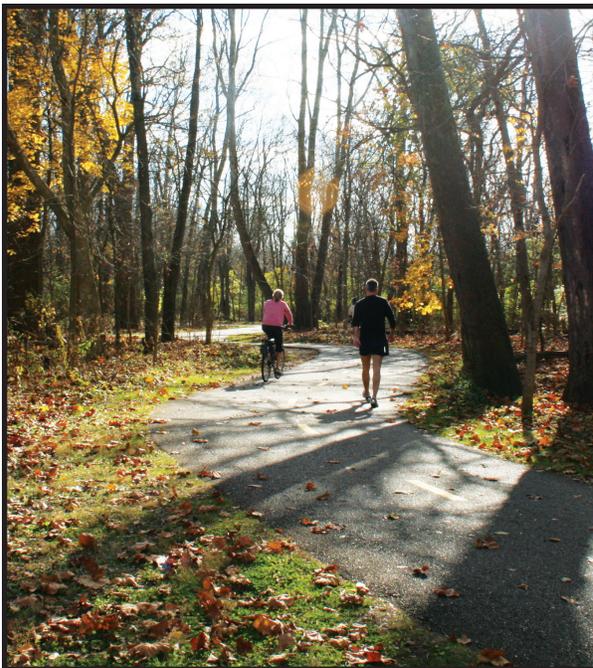


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Introduction

As a part of its retreat in the fall of 2012, the Worthington City Council created a goal of forming a Bike and Pedestrian Steering Committee with the direction to create a list of projects and recommendations that would help Worthington to be a more bike and pedestrian friendly community. City Manager Matthew Greeson asked staff to create the committee which would be representative of the entire community including key stakeholders.

The Steering Committee had their first meeting on September 11, 2013. The fifteen member Bike and Pedestrian Steering Committee set out with a primary goal of compiling a prioritized list of recommendations for City Council by the fall of 2014. The dedicated group committed to bi-weekly meetings on Wednesday nights in addition to homework and sub-committee meetings outside of the larger group meetings.

The City of Worthington provided the leadership for the Committee, with Council Members Rachael Dorothy and Doug Smith being a part of the group and Director Darren Hurley and Project Supervisor Celia Tincher representing Parks and Recreation and Lynda Bitar providing expertise from Planning and Building. The Committee selected resident Eugenia Martin as its Chair.

Committee Members:

Eugenia Martin, Chair	Duffy Horan
Anker Bell	Peggy LaRue
Lynda Bitar	Doug Smith
Mikel Coulter	Meredith Southard
Paul Dorothy	Jack Sutherland
Rachael Dorothy	Celia Tincher
John Hocter	Rob Wendling

While the work of the Bike and Pedestrian Steering Committee is important, it is intended to build on other City Planning initiatives already in place. Those include the City of Worthington's Comprehensive Plan, the Wilson Bridge Road Corridor Study and the City of Worthington Sidewalk Study.

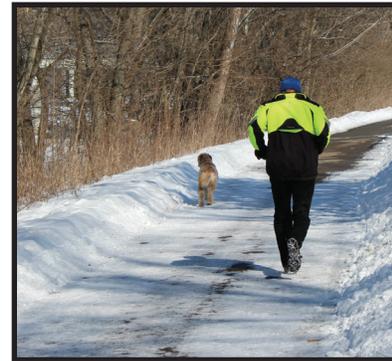
Background

There are countless documented studies indicating the importance of communities being bike and pedestrian friendly. While there is no shortage of opportunities for the City of Worthington to invest resources outside of bike and pedestrian projects, our committee feels investment in bike and pedestrian initiatives are critical in order to realize the following benefits:

A. Quality of Life

Worthington residents value their high quality of life. Better conditions for biking and walking add to the quality of life in many ways.

1. Biking and walking has been shown to increase social interactions as people are more accessible and engaged than in vehicles. We continually hear from Worthington residents the importance of knowing your neighbors and bike and pedestrian friendly streets contribute positively to this.
2. There are health benefits due to the exercise gained from walking and biking.
3. Safety is positively impacted as vehicular traffic can be reduced and solid bike and pedestrian infrastructure has been shown to encourage safer driving habits.
4. There are economic benefits because businesses invest in locations that have a high quality of life. Corporate employers have an easier time attracting highly skilled workers to these locations. Furthermore, according to the National Bicycle and Pedestrian Clearinghouse, trails and greenways can have a positive effect on the value of nearby properties. In communities where people can regularly be seen out bicycling and walking, there is a palpable sense that these are safe and friendly places to live and visit.



B. Health Promotion

As health related challenges mount across the country, bike and pedestrian improvements will help position the City to positively impact the health of residents and further the goals of the agencies in our community trying to improve the health of our residents. The Worthington Schools, Healthy Worthington, Sustainable Worthington, and the City of Worthington, among others, have been working to create healthier conditions and opportunities for our residents. The recommendations in this plan will provide physical improvements to our infrastructure as well as programs to encourage and educate residents about being more physically active and utilizing biking and walking opportunities.

C. Environmental Sustainability

Motor vehicles create a significant amount of air pollution. As the Central Ohio region continues to grow and the highway infrastructure continues to expand, the total number of vehicles in and around our community will continue to create more and more pollution in our air. In addition, motorized vehicles deplete non-renewable energy sources every day.

Worthington is a community that embraces sustainability and genuinely cares about the environment. Becoming a leader in bike and pedestrian opportunities fits into other efforts already underway throughout our community to further push sustainability and responsibility to our environment.



D. Economic Benefits

Worthington is in a very competitive environment when it comes to keeping and attracting new business. With the rapid growth of neighboring communities, we need every edge possible when it comes to being an attractive place for businesses and their employees. Studies show continued increases in emphasis by progressive businesses to want bike and pedestrian friendly resources close by for employees.

Bicycling is documented as a major tourism draw. A recent MORPC count of the Olentangy Trail estimated over 400,000 annual users of the trail. Improving connections from the trail to business centers in and throughout Worthington could provide significant tourism benefits to local businesses as the trail remains popular and is set to expand north to Highbanks Metro Park.

Themes

Early in the process, the committee identified some initial goals that would help drive the overall recommendations and specific projects.

1. **Data – Bike and Pedestrian Counts**
Gather baseline data and continue to monitor as strategies are employed.
2. **Connections**
Among all major corridors, particularly between the west side of Worthington and the rest of the city.
3. **Infrastructure Inventory**
Prioritize connections to community resources.
4. **Safe Routes to School**
Meet standards in recommendations where possible.
5. **Bicycle Friendly and Pedestrian Friendly Community Designation**
Meet standards in recommendations where possible.
6. **Public Information Materials**
Maps, pamphlets, websites, community interaction opportunities, etc.
7. **Way-finding and Promotion**
8. **Programs and Community Events**

Committee members attended a variety of community events during the spring and early summer to obtain feedback from the community. Two person teams set up a booth with a map of Worthington and asked for feedback on important bike and pedestrian corridors, specific ideas and projects, and general thoughts on how to improve access in Worthington. Committee members also obtained feedback at a Parks and Recreation Commission meeting. Here are some of the themes of the public feedback:

- a. Connectivity from the west side across S.R. 315
- b. Improved infrastructure for pedestrians including sidewalk connections
- c. Connections from neighborhoods to key community resources
- d. Safety and enforcement initiatives
- e. Improvements in bike and ped access along major corridors (e.g. High Street)

As the committee brainstorming was merged with feedback from the public, some clear themes emerged.

- **Connectivity:** Worthington values its small town feel and its ability to easily access community resources.
- **Safety:** In order for people to actively engage in bike and pedestrian activity, there must be an emphasis on safe infrastructure, policy, and enforcement.
- **Information:** In order to encourage bikers and pedestrians, there has to be a good system to communicate opportunities, such as web information, maps, and way-finding.

Strategies

This section contains a list of broad goals and strategies. In crafting our strategies, the advisory committee decided to divide them into categories known as the 5 E's. The 5 E's are recognized by other entities (such as the Complete Streets Program and the League of American Bicyclists) as a good way to assess and address community pedestrian and bicycle needs, while increasing safe travel by all modes of transportation. The philosophy behind the 5 E's is that while it is critical to build the right facilities, it is equally important to ensure that everyone understands how to use them and that traffic rules and regulations are enforced.

The 5 E's:

- **Engineering** refers to operational and physical improvements to the transportation infrastructure, such as building safer walkways or reducing speed limits along a certain corridor.
- **Education** is an important element to teach transportation users the appropriate traffic safety skills and to ensure that everyone understands the benefits and use of new facilities.
- **Enforcement** ensures that all roadway users obey traffic laws, behave safely, and share the road with one another. Partnering with local law enforcement is an important part of creating effective strategies that focus on the problems that are pertinent to the area. As such, enforcement programs can focus on speeding, non-yielding behaviors, or distracted driving and walking, among others.
- **Encouragement** refers to programs and strategies that create excitement and interest to utilize the built environment, such as a new path or transit line. Encouragement and education should be closely related.
- **Evaluation** is critical in understanding if the infrastructure changes or education or enforcement efforts are showing positive results. Regular monitoring and documenting outcomes and trends through the collection of data, including the collection of data before and after the intervention(s), is important to ensure a safe environment for everyone.

The committee divided into small groups which met independently to brainstorm the projects and create the following broad goals and strategies within each "E" category.

Engineering Goal: Greater Connectivity

Details

Provide safe and convenient access for bicyclists and pedestrians to public and commercial facilities, such as libraries, retail shops, community centers and parking facilities. Integrate community access points and facilities with both internal and connecting bike trails and sidewalks using trail and sidewalk extensions and appropriate street crossing mechanisms. Consider possible integration with facilities that support vehicle parking lots and public bus use.

Strategies

- Develop and identify metrics and a process to evaluate projects and their priority based on connectivity goals and community values, such as the City’s desire to enhance integration with school facilities and its commitment to provide safe access to public and commercial facilities by all members of the community.
- Identify areas that need better connectivity to other transportation modes, such as bus stops and “park and ride” parking facilities.
- Protect, ensure and enhance access to all public trail easements.
- Ensure equal access for all modes to activity centers such as schools, parks, public facilities (e.g. libraries, community centers), retail centers, major employment centers and concentrations of housing.
- Support the use of natural areas through improved and new trail systems, better connectivity to users, wayfinding, amenities for bikes and peds (e.g. bike racks, benches, service) and place making.
- Ensure continuous and ample sidewalks along arterial and collector roadways which are integrated with abutting land uses.
- Internal pedestrian and bicycle circulation systems shall be provided within and between existing, new or redeveloping retail, commercial or residential developments and other appropriate activity centers. This internal system shall conveniently connect to the roadway frontage pedestrian and bicycle systems.

Performance Measures

- Completion of a survey, mapping and documentation of existing Bicycle and Pedestrian facilities that are connected to important destination points throughout the City.
- Development of a prioritized needs list for implementation.
- Requirements for internal pedestrian and bicycle circulation associated with new or redeveloped properties.

Engineering Goal: Safety

Details

Promote safety for all modes of transportation through provision of adequate facilities, education and enforcement.

Encourage walking, jogging and biking by minimizing conflicts with motor vehicles and providing an environment where people have a sense of personal safety.

Strategies

- City staff should participate in assessment of injury crash locations using a multi-disciplinary team approach (Road Safety Audits).
- Ensure that pedestrian and bicycle crash data is recorded, accurately catalogued and analyzed to result in safer pedestrian and bicycle conditions.
- Annually examine the existing system for safety concerns and develop action plans to address identified items.
- Annually develop and update a high-risk location list and a high-risk behavior list in collaboration with community groups.
- Collect and investigate reports from users and community groups regarding potential safety issues for pedestrians and bicyclists.
- Consider pedestrian safety upgrades at high use locations and where vehicle/pedestrian conflicts are common.
- Better communicate the change in speed limit within the downtown core through the use of traffic calming techniques (e.g. raised crossings, raised intersections, curb extensions).
- Consider bicycle safety upgrades (e.g. bike boxes, bike lanes) to high use corridors and provide education and enforcement to reinforce these safety improvements.

Performance Measures

- Review annually road safety audit recommendations to determine what physical changes and educational efforts that had been previously implemented made a positive impact and lessened the incidence of bike/pedestrian/vehicle crashes or near crashes.
- Determine if the changes that were made need to be modified or possibly used at other locations.
- Creation of a pedestrian/bike crash database.
- Performance of annual safety study and identification of high-risk locations.
- Creation of methodology to collect and analyze citizen safety concerns.
- Implementation of traffic calming techniques to provide positive guidance to drivers.
- Implementation of bicycle safety upgrade in priority corridors.
- Fewer incidents of crashes.

Engineering Goal: Bicycle and Pedestrian Master Plan

Details

Create and maintain a bicycle and pedestrian Master Plan to address the recommendations accepted by City Council.

Strategies

- Develop a long range vision of a “Connected Worthington.”
- Develop pedestrian and bicycle linkages between neighborhoods and natural areas, recreation facilities and education centers and other connecting trails.
- Identify what improvements would be recommended along various paths understanding not everything will be needed along all pathways.
- Establish high need areas for restrooms (ADA and Family Oriented), air & simple tool stations, rest stops and parking.
- Assess the need for separation of paths in high traffic areas such as between Wilson Bridge Road and Antrim Park heading south:
 - a. High speed bike trail
 - b. Family or casual speed bike trail
 - c. Running trail
 - d. Dog walking trail
- Locate where bicycle racks may be needed adjacent to pocket parks, fishing or water access points, tennis courts, soccer fields, baseball/softball fields, etc.
- Identify and implement water stops.
- Develop an arterial plan coming from and leading to major bike/pedestrian pathways.

Performance Measures

- Increased usage of trails for a variety of levels and types of bike riders/walkers/runners.
- Fewer crash incidents.
- Bicycle and pedestrian Master Plan completed and adopted by Council.
- Creation of a standing Advisory Committee.



Engineering Goal: Complete Streets Policy

Details

Develop and adopt a Complete Streets Policy that supports implementation of the Bicycle and Pedestrian Master Plan. Complete Streets are roadways designed to safely and comfortably accommodate all users, including, but not limited to motorists, cyclists, pedestrians, transit and school bus riders, delivery and service personnel, freight haulers, and emergency responders.

Strategies

- Develop and adopt a Complete Streets Policy consistent with regional policy and federal and state design standards that accommodates all users and emphasizes the elements of context sensitive design in all projects.
- Evaluate the need for a committee or sub-committee to help develop a Worthington Complete Streets Policy.
- Review land use and zoning policies, and update project design standards and procedures to incorporate the Complete Streets Policy.
- Incorporate the Complete Streets Policy to the extent possible in all Capital Improvements projects, using the most appropriate design standards and procedures to implement the Bicycle and Pedestrian Master Plan recommendations. Examples of projects include new construction, reconstruction, rehabilitation, repair, maintenance or planning of roadways, trails and other transportation facilities.
- Train staff to adhere to the Complete Streets Policy.

Performance Measures

- Creation of a committee or sub-committee tasked with the development of a Worthington Complete Streets Policy.
- A Complete Streets Policy is adopted.

Engineering Goal: Bike & Pedestrian Friendly Community Designations

Details

Design pedestrian and bicycle facilities to meet bike & pedestrian friendly community evaluation standards.

Strategies

- Secure League of American Bicyclist Designated Bicycle Friendly Community
- Secure Walk Friendly Community designation
- Utilize designations to promote residential and commercial opportunities

Performance Measures

- Designations are secured.

Engineering Goal: Way Finding

Details

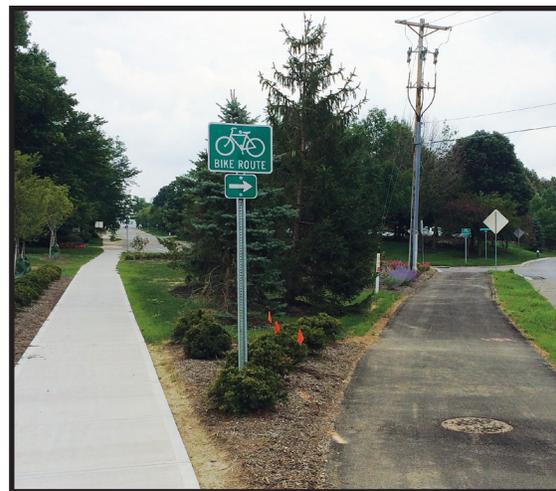
Create a network of on-road bicycle routes, multi-use trail routes and pedestrian routes that are well marked and signed to connect the bicycle and pedestrian system to points of interest and connections within Worthington and to provide clearly defined travel paths through neighborhoods.

Strategies

- Ensure the correct placement and installation of way-finding, regulatory and informational signage and pavement markings.
- Create “branding” and continuity for way-finding signage.
- Identify areas with safety concerns and install appropriate warning signs at roadway and trail intersections.
- Provide trail rules and courtesy guidelines along the trail system.
- Provide trail maps at kiosks at trailheads and major transit stops.
- Provide appropriate way-finding signage directing users from the Olentangy Trail to points of interest in Worthington.
- Review the current route and provide appropriate way-finding signage directing users along the Ohio to Erie Bicycle Trail.
- Provide large “You are Here” maps at major bike-pedestrian path entry ways:
 - a. Include distances and directions on how to get to other points of interest such as shopping, schools, library and swimming pool.

Performance Measures

- Creation of a Worthington Way-finding Plan: including branding, identified routes, prioritized projects and implementation strategy.



Engineering Goal: Infrastructure Revitalization

Details

Ensure that necessary capital improvements for pedestrian and bicycle facilities are explicitly considered during the City of Worthington's budgeting process, including consideration of a dedicated amount of the capital improvements budget.

Create and maintain an inventory of bicycle and pedestrian facilities. Utilize this inventory to leverage other public projects to improve the existing and missing bicycle and pedestrian facilities.

Strategies

- Annually examine the existing system for connectivity needs and develop processes to address identified items.
- Require coordination of all major road and sidewalk improvement activities with appropriate staff to ensure that the needs and requirements of bicyclists and pedestrians are accounted for during new construction.
- Provide for adequate roadway, pedestrian and bicycle connections in newly developing and redeveloping areas of the city, promoting both internal access and linkages with the rest of the city.
- Retain and develop undeveloped public right-of-way for public access and passive recreation where appropriate.
- Work with state and regional agencies to ensure consideration of all modes when planning, designing and constructing enhancements to infrastructure owned and maintained by agencies not directly controlled by the City of Worthington.
- Ensure non-motorized access and safety through and around all construction sites during new construction or maintenance activities.
- Annually update Worthington Bike & Pedestrian Plan.

Performance Measures

- Annual report presented to Council regarding shortfalls in the existing networks connectivity which includes ranked projects to address these shortfalls.
- Documented review of all capital improvement projects for bike and pedestrian impacts by appropriate City Departments.
- Written policy adopted by Worthington outlining review of undeveloped right-of-way and its potential use for public access and recreation.
- Written policy adopted by Worthington regarding non-motorized access and safety in work zones.

Engineering Goal: Design Standards

Details

Develop and adopt design standards that support implementation of the bicycle and pedestrian Master Plan.

Strategies

- Develop standards for high traffic crosswalks for bikes and pedestrians (how to signal, roadway material changes, visual cues, auditory cues).
- Provide planning input for ongoing or new road projects.
- Develop standard design criteria and standard drawings for different types of pedestrian and bicycle facilities and support infrastructure, including, but not limited to, bike lanes, bike boxes, multi-use trails, way-finding, pavement markings, pavement texture, pavement color, bicycle racks, benches, lighting and service facilities.

Performance Measures

- Standard design criteria and drawings adopted.



Engineering Goal: Maintenance

Details

Regularly evaluate and maintain the bicycle and pedestrian network and be responsive to citizen concerns regarding maintenance of the facilities.

Coordinate all city maintenance work to take advantage of potential opportunities to create a better bicycle and pedestrian environment.

Strategies

- Annually examine the existing system for safety concerns and general maintenance needs and develop processes to address identified items.
- Include routine maintenance items for bicycle and pedestrian facilities in the City's overall maintenance program including items such as potholes, overhanging vegetation and gravel.
- Prioritize snow removal for key bicycle and pedestrian routes.
- Require all street improvement projects to consider all users when determining solutions and not just vehicular traffic. Ensure that appropriate staff are involved in the decision making process.
- Require coordination of all major maintenance activities with appropriate staff to ensure that the needs and requirements of bicyclists and pedestrians are accounted for during construction.
- Require coordination of all major maintenance activities with appropriate staff to ensure that opportunities for bicycle and pedestrian facility improvements are realized.

Performance Measures

- Creation of methodology to collect and analyze citizen maintenance concerns. City maintenance work coordinated with all departments to implement improvements to bike and pedestrian pathways.



Education Goal: Safety Programs

Details

Safety programs offered in the community are limited and not well publicized. Current efforts are focused largely on outreach visits by the Worthington police to the schools, when invited. When encouraging alternative routes of transportation, promoting safe travel behaviors must be a priority.

Strategies

- Provide comprehensive safety education program between bikes, cars, and pedestrians.
- Address safety on the road and on multi-use trails:
 - Provide trail etiquette signage at trailheads and in promotional materials.
 - Utilize Village Green Signage throughout the year to promote awareness.
 - Emphasize importance of appropriate gear/reflective devices. Make sure bicycle ambassadors have and showcase these. Possibly seek donations from local businesses to provide safety gear to the public.
- Provide driving safety awareness campaign. Display banners, posters, promotions throughout the City.

Performance Measures

- Safety programs promoted and provided, and to be reviewed on an annual basis by advisory committee.



Education Goal: Bicycle & Walking Education Programs

Details

Provide bicycle and walking education programs for various ages and abilities.

Strategies

- Provide information (via website, pamphlets, Village Green Signs, etc.) about public programs for all ages, children through adults, on safety, preventing bike theft, bike maintenance, commuting to work or school, and more.
- Partner with the Parks and Recreation Department, Police Department, library, bike shops, and bicycle advocacy groups to provide information on:
 - Bicycle repair and maintenance.
 - Safe nighttime walking and biking.
 - How to register their bikes with the police department annually via Neighborhood Network during National Biking Month or during other community events.
- Partner with County, State, National or business healthy initiatives. For example:
 - “Walk with a Doc” for more educational walking events for citizens.
 - Safe Routes to School.
- Provide information for walking/biking tour of significantly important locations around Worthington.
 - Partner with community groups such as Historical Society, Old Worthington Business Association.
 - Provide seasonal walking events (trick or treat at businesses).
 - Help develop a City wide annual bicycle and or running/walking event.

Performance Measures

- Annually track events created, provided and or promoted.



Education Goal: Safe Routes to School

Details

Safe Routes to School (SR2S) is a National Program that encourages development of standardized non-motorized transportation to school. The City of Worthington can help foster and support development of SR2S in the school district to ensure that walking and biking around our schools is fun, easy, desirable, safe and healthy for students and their families.

Strategies

- Enlist support of all stakeholders.
- Provide family friendly maps of safe walking and bicycling routes to each Worthington school (consider neighborhood/school specific maps).
- Consider the implementation of traffic calming techniques along identified SR2S routes.
- Conduct walking and biking site walks with stakeholders (e.g. principal, parents, community advocates) to develop a prioritized list of potential improvements that could reduce barriers to walking and bicycling and increase safety around the school.
- Ensure that all students and their families have access to comprehensive transportation education.
- Grow and maintain a large constituency of diverse and engaged partners, volunteers and community stakeholders to better serve students and foster a SR2S program.
- Integrate SR2S guidelines into citywide comprehensive planning processes.
- Support the School District's Safe Routes to School (SR2S) program.

Performance Measures

- Safe Routes to School program identified and implemented.
- School representatives identified and members of the Worthington Bike & Pedestrian Advisory Committee.

Encouragement Goal: Maps

Details

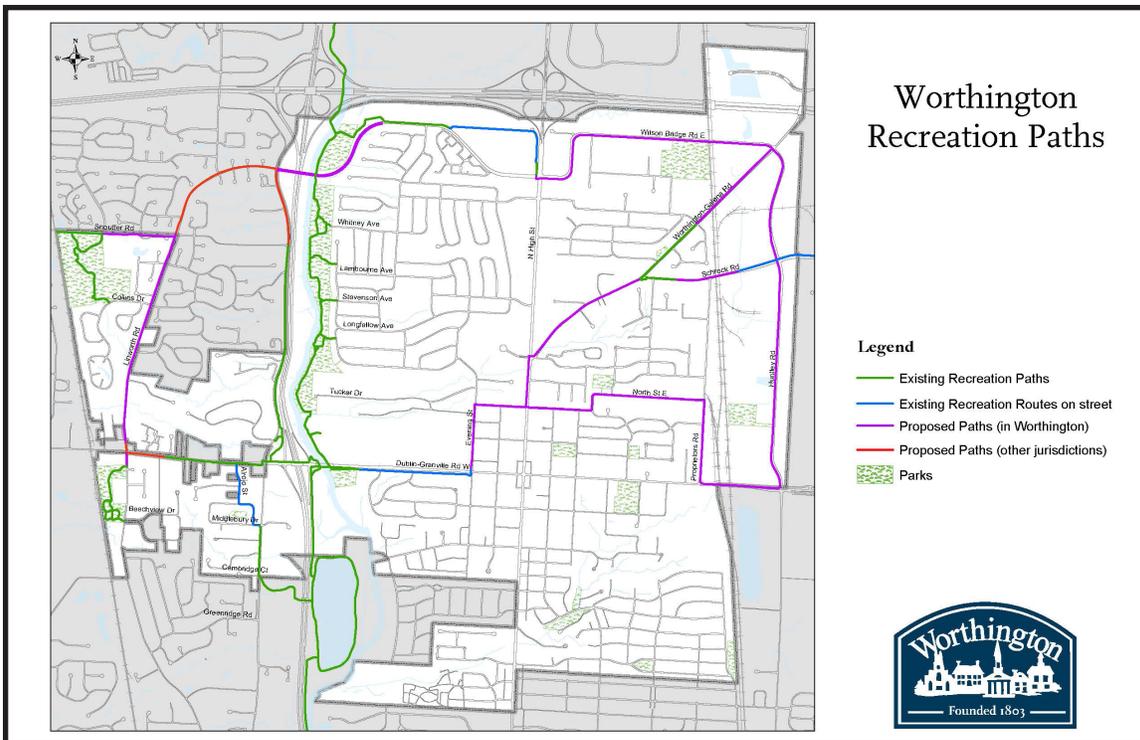
Provide a pedestrian and bicycle map which identifies bicycle routes, bicycle facility types and recommended connections on neighborhood streets as well as key destination points.

Strategies

- Develop a map that includes bicycle facilities, parks, bicycle racks, local business locations and other appropriate elements; share map with other Central Ohio bicycle map entities – ie. MORPC, Ohio State University, Ohio Erie Trails, Google (bicycle friendly routes). This could be a collaboration/partnership with Worthington Chamber of Commerce or other local entity.
- Distribute map widely (local businesses, organizations, nonprofits, at trailhead locations, etc.).
- Use map as an educational tool by incorporating education and safety information into the map.

Performance Measures

- Bicycle and pedestrian map is produced and distributed.



Encouragement Goal: Website Information

Details

Improve the City's dedicated multiuse trail web page with current information relevant to bicyclists and pedestrians.

Strategies

- Develop a web page which provides education materials, maps, info on routine bike maintenance, opportunities to provide feedback on maintenance and other relevant info (explore QR code* possibilities).
- Encourage bicycle registration with Police Department and online through City communications.
- Provide links to local bike organizations and other relevant web sites.
- Explore development of an app and web-based application for the map.

Performance Measures

- Annual review of website traffic and of bicycle registrations.

*QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode). A barcode is an optical label that can be read by smartphones and contains information about the item to which it is attached. The QR Code system has become popular due to its fast readability and greater storage capacity compared to standard UPC barcodes. Applications include product tracking, item identification, time tracking, document management, general marketing, and more.



Encouragement Goal: Alternative Transportation

Details

Provide strategies and incentives to encourage walking and bicycling as a form of transportation.

Strategies

- Encourage City Departments, when possible, to adopt bicycle and walkable friendly community policies.
- Recommend business education and incentive programs which encourage companies to promote biking and walking to work. For example, make this part of the City's wellness program.
- Provide incentives for individuals to ride bikes or walk to Worthington businesses and events, and expand offerings to those on bike and foot.
- Provide more walking and biking opportunities to large community events. Examine providing some or all of the following at each event:
 - Additional bike parking
 - Bike corrals
 - Pedicabs
- Identify bike and walking routes which are a part of snow removal areas.
- Expand existing donation program of abandoned and or used bikes to local co-ops.
- Work with police department to encourage more officers on bikes.
- Encourage group rides for cyclists with different experience levels. Columbus Outdoor Pursuits does some of this and may be a good partner.
- Evaluate the national Bike to Work Week program and recommend a process of implementation with Worthington.
- Identify key partnerships to assist in the formation of Worthington bike clubs and bicycle focused events.

Performance Measures

- By end of 2015 have pedicabs at one event.
- Increase business participation in wellness programs and record an increase of riders and walkers on an annual basis.

Encouragement Goal: Bicycle & Pedestrian Programs

Details

Programs other than the bike rodeo are not in place for educating and encouraging biking and walking.

Strategies

- Encourage the development of a bike share program.
 - Partner with COTA and COGO.
- Partner with regional programs, where appropriate, which serve to encourage and educate residents, corporate citizens and visitors about bicycling and walking. For example, Consider Biking, MORPC, City of Columbus, Historical Society, Franklin County, Convention and Visitor’s Bureau and Columbus Outdoor Pursuits.
- Develop a Bicycle Ambassador program (ideally gathering volunteers from among the City’s residents, schools, chamber, etc.). There are a variety of different styles of Bike Ambassador Programs used by communities, and these various formats can easily be researched on the web.
- Establish ongoing classes on biking safety, how-to’s, commuting, repairs (at bike stores, through Parks & Rec, etc.)
- Include bike education components in city programs and partner with school programs.
- Use community education offered through schools as an educational avenue for safety/riding techniques and share the road information.

Performance Measures

- Program creation and attendance.

Encouragement Goal: Safe Routes to School

Details

The Safe Routes to School Program advocates making walking and biking to school safe, easy and fun for students and families, which raises awareness of bicycling and walking as modes of transportation.

Strategies

- Should be initiated by schools—help raise awareness and build partnerships.
- Integrate SR2S guidelines into citywide comprehensive planning processes.
- Support the School District’s Safe Routes to School (SR2S) program.

Performance Measures

- Safe Routes to School program identified and implemented.
- School representatives identified and members of the Worthington Bike & Pedestrian Advisory Committee.

Enforcement Goal: Share The Road

Details

Basic laws and regulations need to govern bicycling and the rules of the road to ensure safety for all road users. A good set of laws and regulations treat bicyclists and pedestrians equitably within the transportation system. Law enforcement officers must understand these laws, know how to enforce them, and apply them equitably to ensure public safety. A good relationship between the cycling community and law enforcement is essential.

Strategies

- Create programs for the public that communicate five important goals:
 1. The rights of cyclists to operate legally on the roads.
 2. The rights of cyclists and pedestrians to utilize multi-use trails equally.
 3. The rights of cyclists and pedestrians against careless, reckless or dangerous drivers.
 4. The importance of cyclists and pedestrians themselves following the rules and operating safely, according to ordinances.
 5. The rights of pedestrians and bicyclists to the general public.
- Find venues for these programs, such as school assemblies, drivers ed programs, education tables at local events and newspaper articles.
- Work with Worthington Police to encourage bicycle registration as a means to discourage bike theft.

Performance Measures

- Bicycle and Pedestrian safety and enforcement programs are implemented.
- Bike registration is maintained by the City (for recovery for stolen bikes only, as identified by the League of American Bicyclists).



Enforcement Goal: Ordinances & Laws

Details

Worthington codes and ordinances should be routinely reviewed and amended, keeping current with Bicycle and Pedestrian trends.

- Example: Bike bells are required on all bikes by Ordinance 373.07- “No person shall operate a bicycle or motorized bicycle unless it is equipped with a bell or other device capable of giving a signal audible for a distance of at least 100 feet.”

Strategies

- Review and modernize bicycle and pedestrian Worthington City Code. Ensure that current ordinances and laws conform to progressive Bicycle and Pedestrian trends to encourage safe behaviors.

Performance Measures

- Regular review of bike and pedestrian laws, recommend additions and retractions.
- Possible alignment with designations such as Walk and Bike Friendly Community Designations.

Enforcement Goal: Safety Reviews

Details

As various incidents are reported and trouble areas are identified, develop recommendations to improve safety.

Strategies

- Review safety concerns identified in community survey or by other means and make Engineering and Police Departments aware to determine resolutions.
- Work with police to develop targeted education and enforcement, including location-based and type-of-crash based programs based on past crashes or other safety concerns.

Performance Measures

- Bicycle/Pedestrian Coordinator and Advisory Committee should coordinate with Parks and Recreation,
- Engineer and Police departments to share and problem solve all safety concerns.

Evaluation Goal: Bicycle and Pedestrian Advisory Committee

Details

The mission of this committee is to make community focused recommendations that encourage bike and pedestrian transportation throughout the City.

Strategies

- Create a centralized clearing house that would assist the City in planning, prioritizing, and surveying and which would pursue bicycle and pedestrian designations.

Performance Measures

- Pursue grants for specific projects.
- Recruit volunteers for MORPC bike/pedestrian counts in Worthington in May and September.
- Annually update prioritized list of projects and review map of bicycle/pedestrian facilities.
- Review annual surveys and conclusions compared to initial baseline and trend data conclusions.
- Prioritize infrastructure petitions.
- Report to City Council in support of recommendations, as required.



Evaluation Goal: Dedicated Staff Member

Details

Provide a dedicated City staff member to the Bike & Pedestrian Advisory Committee. This staff member will serve as a liaison to neighboring municipalities, act as a City wide contact point and focus on planning, prioritizing, administering, surveying, and pursuing designations to ensure City's place as a leading bike & ped friendly City.

Strategies

Create a liaison position to:

- Liaison to local neighboring city, municipal or township's point of contact.
- Annually evaluate the City's pedestrian and bicycle facilities against bicycle/pedestrian friendly community standards with the goal of obtaining bicycle/pedestrian friendly designations.
- Serve as a point of contact with Central Ohio bicycle/pedestrian initiatives and maintain awareness of state and federal initiatives.
- Staff the Worthington Bicycle and Pedestrian Committee.
- Focus on Central Ohio bicycle and pedestrian initiatives.
- Focus on state and federal initiatives effecting bicycle and pedestrian issues.
- Oversee infrastructure petitions and process.

Performance Measures

- Evaluate and prioritize infrastructure petitions.
- Pursue grants for specific projects.
- Pursue progressive City designations such as Complete Streets, Safe Routes to School, etc.
- Recruit volunteers for MORPC bike/pedestrian counts in Worthington in May and September.
- Review, compile, score and prioritize infrastructure petitions.
- Annually update prioritized list of projects and map of bike/pedestrian facilities.
- Gather and identify trends in statistics.
- Review all completed projects to determine changes in bicycle-pedestrian infrastructure.
- Administer and analyze annual surveys and compare to initial baseline develop conclusions.
- Prioritize snow removal for key bicycle and pedestrian routes.
- Oversee annual update of Bicycle and Pedestrian Master Plan.

Evaluation Goal: Statistical Information

Details

One of the greatest challenges facing the bicycle and pedestrian field is the lack of documentation on how many people are cycling and walking and what the demand for cycling and walking would be in various circumstances. Without accurate and consistent figures, it is difficult to measure the positive benefits of bicycle and pedestrian investments, especially when compared to other types of transportation such as the private automobile.

Strategies

- Conduct a semiannual trail count per MORPC standards (Spring/Fall) and the National Bicycle and Pedestrian Documentation Project.
- Develop a Bicycle & Pedestrian survey in conjunction with the bi-annual Worthington Community Satisfaction Survey.

Performance Measures

- Completed annual evaluations of Worthington street and trail use against National Bicycle and Pedestrian Documentation Project data for similar and surrounding communities.
- Annual evaluation “walk scores” in Worthington.
- Determine community interest in and support of bike/pedestrian activities by citizens:
 - Determine bike/pedestrian behaviors.
 - Identify safety concerns.
 - Gather basic demographics including section of the City.



Evaluation Goal: Infrastructure Petition Program

Details

The Bike/Pedestrian Infrastructure Petition Program provides citizens an opportunity to initiate recommended improvements that have not been identified by the Worthington Bike & Pedestrian Committee. It is primarily intended for streets in residential neighborhoods. Improvements along non-residential streets will be considered on a case by case basis.

Strategies

- Create a citizen driven reporting process for bike and pedestrian infrastructure requests (including sidewalks, crossings, bike racks, etc.).
- Serves as a prioritization tool for projects already in the bike plan, as well as new requests.

Performance Measures

- Implementation on City website.



Recommended Projects

After each sub-committee prepared a list of general recommendations and strategies, specific projects were identified and compiled. These were then combined with the other groups identified projects and all projects were prioritized for Council presentation. Each project was evaluated by individual committee members and given a score based on the following factors:

1. Portion of the community that benefits
2. Addresses specific goals/objectives
3. Improves community quality of life
4. Improves safety
5. Improves connectivity
6. Ease of implementation
7. Multiple benefit

After the projects were scored, results were compiled and the projects were listed in order based on the scores. The committee then met to review the results and make any adjustments based on majority of committee agreement.

The final outcome is the following prioritized list of bike and pedestrian improvement projects. The list is broken into four categories, with projects falling in Category 1 being highest priority, followed by Category 2, through Category 4. The projects are not ranked within each category, each project in Category 1, for example, is of equal importance with the idea that City Council and staff can implement from Category 1 as resources and opportunity presents as every project will require different levels and types of resources.

One of the highest priority (Category 1) recommendations is the establishment of an on-going Bike and Pedestrian Advisory Committee. Our committee anticipates this group would maintain this list of projects and re-prioritize annually as needed for Council consideration.



Category 1 Project Recommendations

	Project	Description
A-1	IC: High and Stafford	Have intersection assessed for potential improvements (e.g. signal warrants study, HAWK, etc.) to provide for a safer crossing. Add a budget item to pay for necessary improvements (see C-1).
B-1	Establish B&P Advisory Committee	Create a standing Bike and Pedestrian Advisory Committee that reports directly to City Council.
C-1	Provide a dedicated City staff member to BPAC (Bike Ped Advisory Committee)	Provide a dedicated City staff member with the responsibility of facilitating Bike and Pedestrian Improvements, being the liaison with the Bike and Pedestrian Advisory Committee, and ensuring appropriate coordination with staff and other agencies.
D-1	Dedicate a percentage of annual budget to bike/ped improvements	Bike and pedestrian projects need dedicated funding (and funding targets) to ensure improvements are made, and to create a sustainable, systematic approach.
E-1	Review downtown core for multimodal improvements	Study the downtown core to determine opportunities for new and improved methods to support a safer and more bike/ped friendly environment. In addition, study improvement of the pedestrian crossing at the South Village Green Drive to improve driver compliance with yielding to pedestrian right-of-way.
F-1	Update sidewalk policy	The policies regarding sidewalks would be reviewed, such as where and under what circumstances to construct; specifications (ie. from the current 4' to 5'); and process to request new sidewalks.
G-1	Develop wayfinding standards	Build on current wayfinding project to develop city standards and schedule for placement. Make sure this includes a system of simple route signs to identify key collectors within neighborhoods that serve as connections for bikes. Also identify official routes (e.g. Ohio to Erie Trail) and points of interest within the City.
H-1	Safe routes to school program	Create a safe routes to school program to develop a partnership between the Worthington School District, City of Worthington, neighborhoods, community organizations and agencies.
I-1	Take steps toward the development and adoption of Complete Streets policy	1. Require all street improvement projects to consider all users. 2. Develop and implement metrics for project evaluation that considers bike/ped issues. 3. Encourage City departments to adopt bike/ped friendly community policies. 4. Formal City adoption of the Complete Streets policy.
J-1	Require regular update of the Bike/Ped Master Plan	Create a steering committee of city staff and Standing Committee to review and update the Bike Ped Master Plan annually. Purpose is to review the Master Plan and to make recommendations and modifications to improve the plan. Should include budgeting, if needed, for any improvements.
K-1	Sidewalk analysis	Study existing sidewalk inventory and determine sidewalk needs (e.g. width, condition, missing connections, ADA compliance). Identify potential project packages and estimate capital requirements.

Category 1 Project Recommendations

	Project	Description
L-1	B&P Mapping	Create and install/distribute a Bike and Pedestrian map that can also be installed on wayfinding signs, website and cell phone apps. Include information for points of interest such as schools, recreation, shopping, library, medical aid, etc.
M-1	Olentangy Trail to Highbanks	In conjunction with City Council, support this connection in whatever way needed.
N-1	Safety audits and protocol	Develop a database and protocol for reviewing bike/ped safety concerns communicated to the City (including info from police crash reports) and developing necessary resolutions and conduct an annual study.
O-1	Citizen driven request process to collect safety concerns	Create a citizen driven request process for bike and pedestrian infrastructure requests including sidewalks, crossings and bike racks, and include capacity to identify safety concerns.
P-1	Comprehensive transportation safety program	Create a multimodal safety program (motorists, pedestrians, and cyclists) to promote safe travel behaviors.
Q-1	B & P web page	Create a bicycle and pedestrian web page on the City's website. Make sure to include links or info to related information, such as a list of community group rides.
R-1	Annually evaluate and update bicycle & pedestrian ordinances/ laws	Annual review of Worthington's pedestrian and bicycle related ordinances/ laws.
S-1	TC: Wilson Bridge Road— Olentangy Parklands to Perry Park	Develop a plan on how to get from Wilson Bridge Road to Perry Park, possibly along Snouffer Road.
T-1	High Street Speed Limit Study	Study speed limit reductions from downtown core to Wilson Bridge Road.
U-1	Bike Hub & Trail Head at Olentangy Parklands at Wilson Bridge Road	Create a bike hub and trail head to service users of the Olentangy Trail in the vicinity of Wilson Bridge Road.

TC = Trail Connection; IC = Improved Crossing

Category 2 Project Recommendations

	Project	Description
A-2	TC: Indianola Avenue--SR 161 to Colonial Hills	Evaluate the feasibility of a multiuse path between the northern terminus of Indianola Avenue in Colonial Hills and SR 161, through the Harding Campus or along the existing railroad alignment.
B-2	TC: Bike accommodation on High Street	Study and evaluate methods to better accommodate bicycle travel on High Street (from Clintonville to I-270).
C-2	TC: SR 161 at SR 315	Study bicycle and pedestrian crossing within the SR 161/SR 315 interchange area to address demand and safety.
D-2	Develop targeted education and enforcement	Work with police to develop targeted education and enforcement, including location-based and type-of-crash based programs based on past crashes or other safety concerns, including more police officers on bikes.
E-2	TC: Worthington-Galena Road--High Street to Huntley to northeast	Evaluate the potential for a multi-use path along Worthington-Galena Road from High Street to Huntley to the northeast.
F-2	IC: High Street and Wilson-Bridge Road	Evaluate the feasibility of improving the crossing at High Street and Wilson Bridge Road to improve bicycle and pedestrian safety.
G-2	B & P safety awareness campaign	Provide Bike & Ped safety awareness campaign- to include banners, posters, promotions throughout the City.
H-2	Regional Partnerships	Partner with regional entities, where appropriate, which serve to encourage and educate residents, corporate citizens and visitors about bicycling and walking. For example: Consider Biking, MORPC, City of Columbus, Historical Society, Franklin County, Convention & Visitor Bureaus, Columbus Outdoor Pursuits.
I-2	IC: SR 161 and Linworth Road	Evaluate the feasibility of improving bicycle and pedestrian access at SR161 and Linworth Road to see what improvements need to be made to provide a safer crossing.
J-2	Support multiuse path along SR 161 to Sawmill Road	Actively support the planning and construction of a multiuse path to connect the existing Worthington trail systems westward toward the Sawmill Road corridor.
K-2	TC: High Street across to Crosswoods	Support the ODOT I-270/US 23 project plans that include bike and pedestrian facilities from Worthington to Crosswoods. Support improved bicycle and pedestrian circulation within the Crosswoods area.

TC = Trail Connection; IC = Improved Crossing

Category 2 Project Recommendations

	Project	Description
L-2	Develop and post trail etiquette, maps and promotional materials at trailheads.	Develop and post trail etiquette, maps and promotional materials at trailheads.
M-2	TC: Thomas Worthington High School to Evening Street	Evaluate the potential for a multiuse trail connection through Thomas Worthington High School campus, from the Flats to Evening Street creating a connection oriented toward the Library.
N-2	TC: Wilson Bridge Road--High to northeast	Design and construction of trail along Wilson Bridge Rd. in conjunction with corridor improvements and intersection of Wilson Bridge, Worthington-Galena and Huntley project.
O-2	Gathering statistical information	Develop a process for gathering statistical information and research on Bike and Pedestrian activity in the community. This should include a semiannual trail count per MORPC standards.
P-2	IC: SR 161 at Seabury	Evaluate the potential for improved bike and pedestrian crossing of SR 161 at Seabury.
Q-2	Olentangy Trail improvements	Conduct a review of the existing Olentangy Trail facilities within Worthington. Identify potential upgrades and estimate capital costs. One specific example is determining whether sections of the trail may benefit from separation of use (e.g. walkers/runner from bikes) based on a usage pattern study.
R-2	Annual B & P survey	Develop an annual Bicycle & Pedestrian survey in conjunction with the annual Worthington Community Satisfaction Survey
S-2	IC: Access to Linworth Park	Evaluate the feasibility of improving the crossing of Linworth Road at Linworth Park (from neighborhood to park) to improve bicycle and pedestrian safety.
T-2	Bike Hub: Olentangy Parklands at Flats	Create a bike hub to service users of the Olentangy Trail in the vicinity of the Flats.
U-2	TC: SR 161 Northside--Evening Street to SR 315	Evaluate the feasibility of a multiuse path along the north side of SR 161 from Evening Street to the SR 315 interchange to provide better bike/ped access to Thomas Worthington, Worthington Pools, the Flats and the Olentangy Trail.

TC = Trail Connection; IC = Improved Crossing

Category 3 Project Recommendations

	Project	Description
A-3	TC: Worthington-Galena Road--Huntley Road to Sancus Boulevard	Evaluate the possibility of a trail along Worthington-Galena Rd. Make certain bicycle and pedestrian travel is accommodated as part of the Wilson Bridge, Worthington-Galena, Huntley Rd. intersection project, and that improvements extend to Sancus Rd.
B-3	TC: Wilson Bridge Road-- Bridge Over High Street	Evaluate the feasibility and challenges of designing, budgeting and constructing a bridge over High Street at Worthington Place / Wilson Bridge Road.
C-3	TC: Snouffer Road-- Linworth Road to west	Evaluate the feasibility of providing bicycle and pedestrian access along Snouffer Road between Linworth Road and the railroad tracks on the west edge of the city.
D-3	TC: Potter's Creek to existing trails	Develop recommendations to connect Potter's Creek residents to existing trails via Wilson Bridge Road, Snouffer to Olentangy River Road, Perry Park to 161 and along the rail road tracks to Snouffer behind the ball fields.
E-3	TC: Schrock Road-- Worthington-Galena Road to Proprietors Road	Develop a plan to provide bicycle accommodation along Schrock Road from Worthington-Galena Road to Proprietors Road.
F-3	IC: United Methodist Church	Evaluate the feasibility of improving the crossing at United Methodist Church to improve bicycle and pedestrian safety.
G-3	Bike/Ped review policy for maintenance projects	Involve bike/ped committee in establishing maintenance standards for bike paths and bike/ped amenities.
H-3	Require Road Safety Audits for all bike/ped injury crashes	A road safety audit of any bicycle or pedestrian crash shall be completed to determine if upgrades to the location of the crash are warranted.
I-3	TC: Snouffer Road--Linworth Road to Olentangy River Road	Evaluate the feasibility of improving bicycle and pedestrian access along Snouffer Road between Linworth Road and Olentangy River Road. Ensure that treatment will tie into potential connections to the north and south.
J-3	Provide B & P specific programs	Create partnerships to provide bicycle and pedestrian specific programs to the community, including bike repair and maintenance, nighttime safety, bike registration, etc.
K-3	Bike Racks: all public facilities	Identify key public facilities that should be provided with bike racks, including parks. Perform a survey to inventory these facility based bike racks. Determine bike rack needs, quantity and style. Determine priorities and an implementation budget.

TC = Trail Connection; IC = Improved Crossing

Category 3 Project Recommendations

	Project	Description
L-3	TC: Proprietors Road--SR 161 to Schrock Road	Evaluate the feasibility of improving bicycle and pedestrian access along Proprietors Road from SR 161 to Schrock Road. Ensure that treatment will tie into potential connections to the north and south.
M-3	Prioritize snow removal for key bike/ped facilities	Identify key bike/ped corridors, create metrics for prioritizing corridors for snow removal, prioritize corridors, communicate priority corridors to community along with reasonable expectations.
N-3	TC: Wilson Bridge Road-- Bridge Over SR 315	Evaluate the feasibility of adding a bridge or modifying the current bridge over SR 315 to improve safety and connectivity.
O-3	Develop standard design for bike/ped facilities	Create Worthington design standards, criteria and standard drawings for bicycle and pedestrian facilities to better delineate requirements for the upgrading of existing and construction of new infrastructure, with a specific focus on safety.
P-3	TC: Linworth--Snouffer Road to SR 161	Evaluate the potential for a multi-use path along Linworth Road from Snouffer Road to SR 161.
Q-3	IC: SR 161 at Olentangy River Road	Evaluate intersection for potential improvements to allow pedestrians and bicyclists to cross the intersection on the south and east sides safely as well as improvements to the north and west sides.
R-3	TC: South Street to Olentangy Trail	Evaluate the feasibility of a new multiuse path connection from South Street to the Olentangy Trail.
S-3	Secure Walk Friendly Community Designation	Standing Bike/Ped committee to compile information and assist City Staff in applying for designation. Develop a plan to keep and improve status long term. Designation will provide marketing benefits to the community along with enhanced chances for grant funding.
T-3	Secure League of American Bicyclist Designated Bicycle Friendly Community	Standing Bike/Ped committee to compile information and assist City Staff in applying for designation. Develop a plan to keep and improve status long term. Designation will provide marketing benefits to the community along with enhanced chances for grant funding.

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Category 4 Project Recommendations

	Project	Description
A-4	TC: Linworth--SR 161 to Godown to Dog Park	Evaluate the potential for a multi-use path along Linworth Road from SR 161 to Godown to the existing Dog Park.
B-4	IC: Evaluate crossing at Worthington Christian	Evaluate improving the crossing of Worthington Galena Road for Worthington Christian School.
C-4	TC: Evening Street to Pioneer Court	Evaluate the feasibility of creating a multiuse path connection between Evening Street and Pioneer Court.
D-4	Incentives to ride bikes or walk to Worthington events	Provide incentives for individuals to ride bikes or walk to Worthington events, as well as expand offerings of businesses and restaurants to those on bike and foot. For example: satellite of Worthington Farmer's market, art festival and market day.
E-4	Healthy initiatives partnerships	Partner with County, State, National or business healthy initiatives. For example: Walk with a Doc, Safe Routes to School
F-4	Development of an app and web-based application for the map	Explore development of an app and web-based application for the map.
G-4	Support trail connections on Olentangy River Road--Antrim Park to SR 161	Support and recommend improved bicycle and pedestrian connection along Olentangy River Road between Antrim Park and SR 161 (that will tie into potential connections to the north and south).
H-4	Incentive programs which encourage biking and walking to work	Recommend business education and incentive programs which encourage companies to promote biking and walking to work. For example, make this part of City's wellness program.
I-4	Develop a volunteer Bicycle Ambassador program	Develop a volunteer Bicycle Ambassador program. For example, including reps from residents, schools, chamber, city, etc.
J-4	Bike Racks: Private Property	Review the locations of bike racks at privately owned locations through Worthington (e.g. Shops at Worthington Place) and recommend/support additional bike racks to suit the needs of riders. Consider safety and family friendly locations.
K-4	Pedestrian crossing upgrades	Upgrade pedestrian crossings and make improvements, such as countdown style heads.

TC = Trail Connection; IC = Improved Crossing

Category 4 Project Recommendations

	Project	Description
L-4	Bicycle registration	Work with Worthington Police to encourage bicycle registration as a means to discourage bike theft.
M-4	TC: Wilson Bridge Road--SR 315 to Olentangy Trail	Look at how a trail could be developed that would allow bike or ped traffic direct from Wilson Bridge Road down to or up from the Olentangy Trail.
N-4	City walking/biking tours	Provide information for walking/biking tour of significant locations around Worthington (historical, architectural, etc.)
O-4	TC: Proprietors Road--Schrock Road to Worthington-Galena Road	Evaluate feasibility of a bike/ped connection along west side of railroad tracks between Schrock and Worthington-Galena Rd.
P-4	B & P communication on Village Green	Utilize Village Green Signs throughout the year to advertise and promote B & P agenda
Q-4	Bike share program	Evaluate the development of a bike share program (partner with COTA and COGO)
R-4	Bike donation program	Expand existing donation program of abandoned and/or used bikes to local co-ops.
S-4	Consider partnership to improve connections through Rush Run Park	Partner with applicable entities to recommend a multiuse path connection from Walnut Grove Cemetery through Rush Run Park to the Olentangy Trail. Also suggest the creation of a system of separate walking and mountain bike trails through Rush Run Park.
T-4	Update policy to require powerwashing of utility markings at completion of proj.	Create a city policy that requires powerwashing of utility markings from bicycle and pedestrian facilities upon completion of a project.

TC = Trail Connection; IC = Improved Crossing

Bike and Pedestrian Steering Committee

Resource Information

User Types

Bicyclists and pedestrians can vary greatly in their ability and their level of comfort in using different types of facilities. Ideally, all types of bicyclists and pedestrians should be accommodated by the transportation system. AASHTO's Guide for the Development of Bicycle Facilities describes three types of bicyclists that should be considered in planning bicycle facilities, as follows:

Type A

Bicyclists are advanced or experienced riders who generally use their bicycles as they would a motor vehicle, often for commuting. They are riding for convenience and speed and want direct access to destinations with minimum detour and delay. They are typically comfortable riding with motor vehicle traffic; however, they need sufficient operating space on the travel way or shoulder to eliminate the need for either themselves or a passing motor vehicle to shift positions.

Type B

Bicyclists are basic or less confident adult riders who may also use their bicycles for transportation purposes (e.g., commuting) or for recreational purposes. They may prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width to allow easy overtaking by faster motor vehicles. Thus, basic riders are generally comfortable riding on neighborhood streets and shared use paths and prefer designated facilities such as bike lanes or wide shoulder lanes on busier streets.

Type C

Bicyclists include children, riding on their own or with their parents, who may not travel as fast as their adult counterparts but still require access to key destinations in their community, such as schools, convenience stores, and recreational facilities. Residential streets with low motor vehicle speeds linked with shared use paths and busier streets with well defined pavement markings between bicycles and motor vehicles can accommodate children without encouraging them to ride in the travel lane of major arterials.

Pedestrians

Pedestrians can range in a multitude of characteristics including age (e.g., children, adults, and the elderly), speed, ability (e.g., ambulatory or visual impairments), and purpose (e.g., recreational walking, running, commuting). These characteristics often dictate the type of facility a pedestrian is comfortable using. Wider, detached sidewalks with a landscaped or amenity zone buffer generally serve the greatest number of pedestrians by providing a buffer between the pedestrian and vehicular traffic and adequate space to accommodate passing and wheelchair use. Multi-use trails primarily serve recreational pedestrians.

Bicycle and Pedestrian Facility Types

Trails	
Shared Use Trail	A trail, typically a minimum of 10' wide, designed for use by a variety of users, including pedestrians and bicyclists, located off-road, usually in a park or linear trail system. Example: North Bentonville Trail.
Side Path Trail	A trail, typically a minimum of 8' wide, designed for use by pedestrians and recreational bicyclists located adjacent to a roadway as a means to connecting the trail system. Example: Moberly Lane.
Native Surface Trail	A natural surface trail used for walking, hiking, and mountain biking, typically located in areas that are environmentally sensitive, have limited development and contours with the natural topography.
On-road Bicycle Facilities	
Bicycle Lane	A portion of the roadway that has been designated by striping, signing, and pavement markings for the preferential and exclusive use of bicyclists.
Shared Lane	A traffic lane with pavement markings, typically a sharrow, that indicate the lane is on a bicycle route and is to be shared between both auto-drivers and bicyclists. The on-paving markings indicate to bicyclists the best way to occupy the road and notify the auto-driver of a higher level of bicycle traffic on that lane.
Pedestrian Connectors	
Sidewalk	Existing sidewalks that are used to make a pedestrian connection to the trail system.

Regional Trail Systems

Olentangy Trail

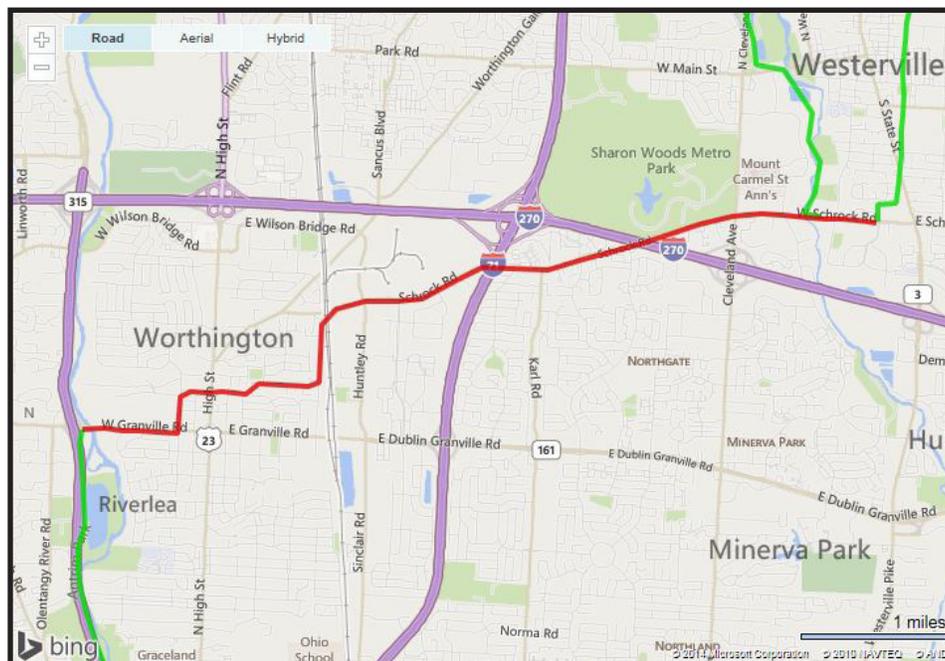
One of the most popular greenways in Ohio, this trail offers a seamless 13.75 mile route from Worthington Hills to downtown. The bikeway winds through several neighborhoods along the Olentangy River, with trailheads at several parks, including Antrim Park, Olentangy Park and Worthington Hills Park. The path also travels through the heart of the Ohio State University campus.

The Ohio to Erie Trail

The Ohio to Erie Trail spans the state from Cincinnati to Cleveland following lands formerly owned by railroads and canals. When complete, this trail will connect four of Ohio's metropolitan cities, a dozen large towns and numerous small villages – all done on easily accessible paved trails, that are completely separated from highways and automobiles. Of the 300-mile planned length of the Ohio to Erie Trail, 240 miles are completed.

Along the way, the trail passes through rural areas, farmlands, nature preserves, and regional parks giving the adventurous a hearty helping of nature's finest. At the metropolitan perimeter, meadows and woods give way to exciting urban centers, affording the traveler a contemporary taste of Ohio's culture and arts.

For the section from downtown Columbus to Westerville, the trail follows the Olentangy Trail. In Worthington, the route leaves the trail at SR-161, paralleling 161 on the frontage roads located to the south of the alignment. At Evening Street, the route turns north, crossing SR-161, and continues to North Street. Following North Street across High Street, the route continues east to Proprietors Road where it again turns north. At Schrock Road, the route turns east and exits Worthington.



Design Standards By Facility Type

Intent

The purpose of this discussion is to identify minimum standards for trail development. Those involved in designing, constructing, and the development of the master trail system should follow these minimum guidelines. The information provided should be used as a reference to assist in the implementation of the plan.

Paved Trails: Shared Use Trail

Use Case

Existing infrastructure such as drainage ways or railroad beds are available to locate Shared Use Trails along, while trails located along roadways are called Side paths. This trail type should not be employed along residential streets as they conflict with the existing scale and context. Instead consider a Bicycle Facility with Sidewalk. See the On-road Bicycle Facility section of this document for details.

Primary User

Shared use trails accommodate both pedestrians and bicyclists. This design solution should be used when the travel is expected to be primarily recreational as opposed to commuting. These users are expected to be at low and intermediate skill levels and therefore value safety, scenery, and ease of use over efficiency of travel.

Width

10'-14' depending on the design capacity. 10' is the minimum required width to accommodate bicyclists and pedestrians. A width of 12'-14' is recommended wherever possible and is required where medium or high use is expected such as near points of interest or in high density areas such as downtown. An exceptional width of 8' may be used only on trails that meet the following conditions: have less than 2 access points per mile, bicycle traffic is expected to be low at all times, pedestrian use is only occasional, sightlines are good, passing opportunities are provided, and typical grades are less than 3%.

Surface Type

Asphalt is preferred by most recreational users and should be used if a feasible maintenance schedule is included in the proposal. Compacted fine aggregate may be used in sensitive ecosystems, for its permeable nature, or on trails in remote or undeveloped areas if a feasible maintenance schedule is included in the proposal. Concrete may be used otherwise. Consider that concrete is not preferred by joggers and walkers. It is also often not preferred by bicyclists due to the frequent seams.

Grade

2% cross slope with 2' wide graded shoulders.

Edge Treatment

Trails are linear parks. Landscaping elements and features are crucial to this concept. Landscaping buffers, retaining walls, railings, or fences are required along trails where the adjacent terrain produces a hazardous drop off or adjacent land use (such as a rail line or high velocity roadway). When these elements are used they should also be used to create a sense of place and distinguish the trail from sidewalks. See Features: Landscape section of this document for details.



Special Conditions for Location in Floodplains

Shared use trails can be located along drainage ways, in floodway sand floodplains and sometimes directly adjacent to waterways.

Surface Type

Asphalt or another permeable surface should be used in these areas due to potential flooding, to reduce impact on the environment, and to preserve the natural context of these areas. Concrete is not recommended in sensitive riparian zones or where flooding is expected to occur due to its impermeability. Compacted Fine Aggregate is also not recommended in areas prone to flooding.

Grade

Special considerations for grading should be made to account for drainage in the likely event of flooding.

Edge Treatment

When using landscaping elements and features, environmental impact and context should be considered. Landscaping should reinforce and ideally, preserve and mitigate the natural ecosystem. Features should be used sparingly and incorporated into the natural context. Where a trail is directly adjacent to a waterway, edge barriers to prevent flooding and allow for drainage are necessary. Retaining walls and footing may also be necessary to preserve the integrity of the trail.



Special Considerations for Fitness Loops

Fitness loops are typically located in or around parks. Parks provide for a good size loop for on-foot recreational users. These loops are often not preferred by bicyclists for exercise or recreation, but may be used for travel from point to point. The primary user is expected to be on foot (i.e. joggers and runners). Asphalt should be used and striping is required only where usage is high and width is narrow. Landscaping and features along this trail type should be designed in conjunction with the overall design of the park.

Paved Trails: Side Path

Use Case

This trail type should be used only when all other types and locations for shared use trails are shown to be impossible and where installation of this trail will contribute to overall continuity and connectivity. Many bicyclists prefer the on-road bicycle facilities compared to the side path. Therefore, the on-road bicyclist facilities paired with a sidewalk is preferred to this trail type. Side Paths should only be used under the following conditions:

- There are not more than 8 roadway or driveway crossings per mile
- At-grade midblock crossings on arterial or collector streets can be avoided.

Primary User

Primarily pedestrians and recreational bicyclists that are of beginner or intermediate skill levels.

Width

10' preferable, but many existing side paths are 8'.

Surface Type

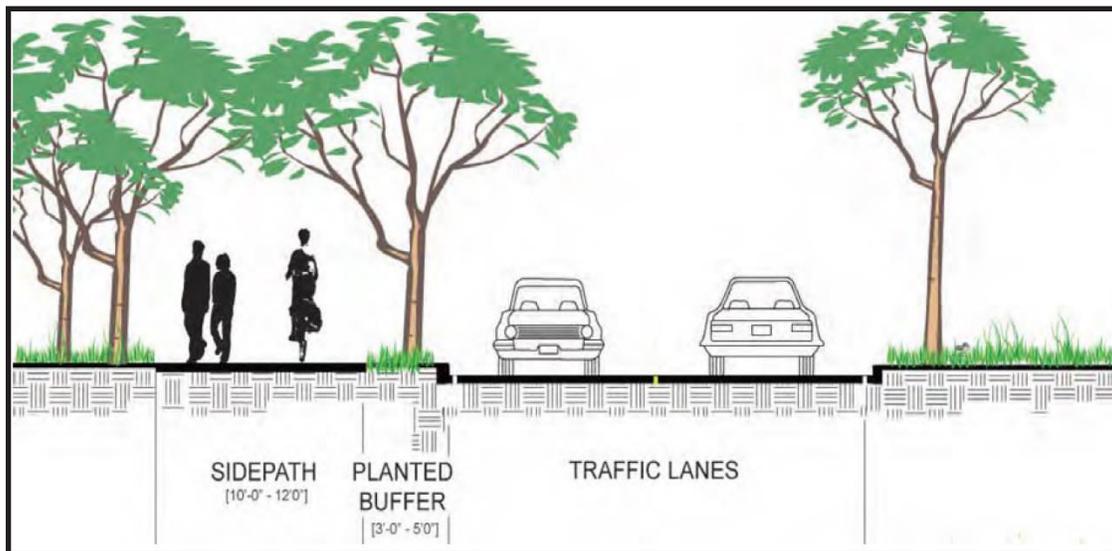
If concrete is used, continuous pavement markings such as striping should be used to distinguish trails from sidewalks.

Grade

Grading will be consistent with that of the adjacent roadway.

Edge Treatment

A landscaped buffer of at least 3' should be in place for at least 85% of the total length. A buffer of 6' or greater along its entire length is recommended.



Native Surface Trails: Mountain Biking & Hiking Trails

Use Case

This trail type should only be employed in natural environments, ideally with dynamic terrain. These trails are typically part of a larger system. Although the system itself may be divided by a roadway, the individual trails should be located and designed in such a way as to avoid all at-grade roadway crossings.

Primary User

This design solution should be used when the expected use is primarily active recreation, especially mountain bicyclers. However these trails should also be designed for hikers as well. These users are expected to be at high and intermediate skill levels and therefore can safely navigate more challenging terrain and constraints. A primary user should be designed for based on expected use. The accommodations for hikers and mountain bicyclists are often mutually exclusive. Additionally, if both uses are encouraged to the same extent, safety conflicts are more likely to arise. Where necessary, user types may be restricted for safety.

Width

A minimum width of 18" is required. 24" is recommended. A greater width may be required where there is an expected mix of user types or high use. The maximum allowable width is 3' to limit the impact on the environment. This maximum width should be maintained and repaired where wear and tear has widened the trail through use.

Surface Type

These trails must be native surfaces. They may require to be compacted. Alternative soft surface materials may be used where necessary to preserve the integrity of the trail. Natural drainage such as water bars should be used incrementally along the length of the trail to prevent erosion. Maintenance schedule should be considered in advance as these surface types can require considerably more maintenance than paved trails.



Grade

Grades on these trails should be appropriate for the environment. Exceptions to grade requirements may be necessary where the terrain or environment make grading impossible or not feasible. Every effort should be made to have as little impact on the environment as possible while designing for safety and challenge.

Edge Treatment

Landscaping should be entirely natural and should only be altered as necessary to produce an acceptable trail width. The terrain should be altered only to provide for allowable cross slopes and adequate drainage. The trail should be reinforced with a rock wall or other natural features to preserve the integrity of the trail where necessary. Features should only be used to enhance the level of challenge provided by the trail or to preserve the integrity of the trail. Amenities should be installed more for necessity and less for convenience. In the case of Nature Trails, landscaping should be thoughtfully maintained to emphasize natural elements. Rare species of flora should be encouraged and invasive species discouraged to preserve and enhance the natural ecosystem.

Special Considerations for Mountain Bike Trails

These trails are designed primarily for mountain bike use. They have a small footprint on the land and require the least amount of disturbance and support features of all types of trails. They are typically 18" – 24" wide and constructed using hand tools or low impact machinery to create a bare earth or leaf litter surface.

Special Considerations for Hiking Trails

Hiking trails are used primarily for pedestrians/hikers. They are typically 18" to 6' wide with a 9' vertical clearance and maximum slope of 5%. They are constructed of dirt, rock, soil, forest litter, wood chips, and crushed stone. Edging is needed on the low side of the trail, at steps and terraces. Water bars can be used to direct surface water off the trail and bedrock can help reduce erosion.

On-road Bicycle Facilities: Bicycle Lane

Use Case

On roadways with average daily traffic (ADT) counts of 3,000 or more and where the speed limit exceeds 35 MPH. Not suitable where there are a high number of commercial driveways. Suitable for 2-lane facilities and 4-lane divided facilities. Bicycle lanes are often considered the safest of accepted on-road bicycle facility types. They also have a high “perceived safety” by users, and encourage use of on-road facilities. They are located on both sides of the road, except one way streets, and carry bicyclists in the same direction as adjacent motor vehicle traffic.

Primary User

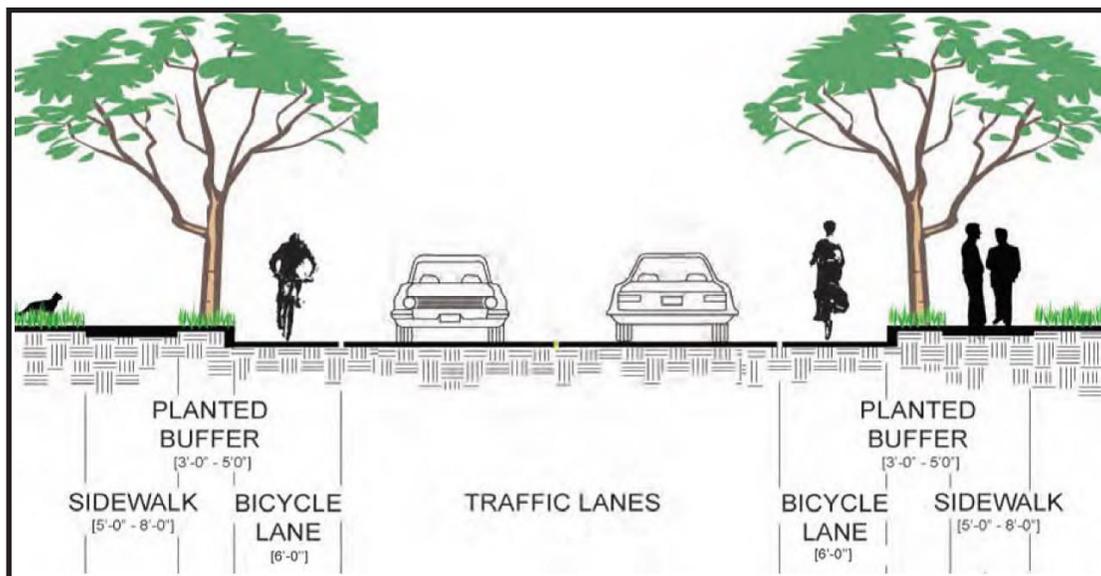
Intermediate to advance bicyclists. These bicyclists should have had some experience with on-road bicycling and/or attended bicycle education classes.

Width

At least 40" of dedicated, usable space is required to accommodate a bicycle lane. This width can be often be achieved by narrowing existing road lanes. This is also a typical traffic calming device. This should be done at the discretion of engineering judgment in consideration of bicyclists and motorist use of the roadway.

Specifications

Install as per MUTCD and AASHTO. Shared Road Symbols should be installed at least every 200' along a route and immediately following an intersection.



On-road Bicycle Facilities: Shared Lane

Use Case

Shared Lanes should be used where lanes are too narrow for striping bicycle lanes and where the speed limit does not exceed 35 MPH. They can be used with or without on-street parking.

Primary User

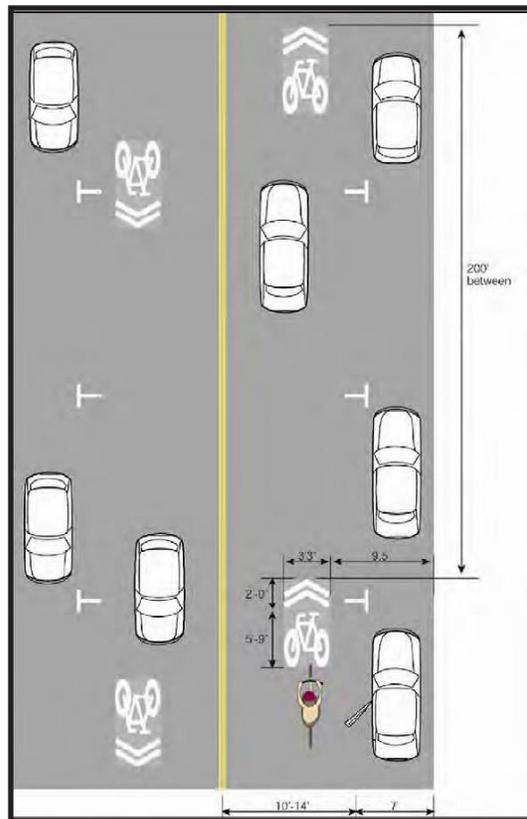
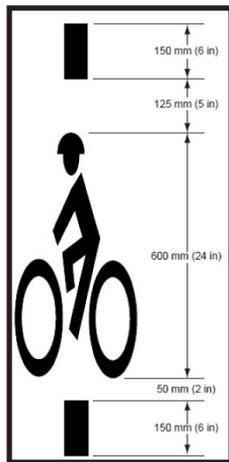
Advanced bicyclists.

Width

Apply engineering judgment to determine if adequate passing opportunities exist on alignment for motor vehicles.

Specifications

Install as per MUTCD and AASHTO. Shared Road Symbols should be installed at least every 250' along a route and immediately following an intersection.



Pedestrian Connector: Sidewalk

Use Case

Designed for pedestrians and often located in or adjacent to residential area, allowing those residents access to the trail system. While they are not considered a trail, they play a role in making connections to the system, often on a temporary basis until the trail system is complete. However, in downtown and more urban areas, sidewalks are an integral part of the trail system and a more long-term solution to pedestrian travel. Furthermore, all on-road bicycle facilities should be designed with a pedestrian connector component.

Primary User

Pedestrians and runners. Pedestrian connectors should not be used by bicyclists.

Width

Section 905 of the Codified Ordinances of Worthington sets the width for all sidewalks as a uniform width of four feet.

Surface Type

Concrete.

Edge Treatment

A welcoming, pleasant and safe environment will encourage the pedestrian use of sidewalks. To achieve a sense of safety and security, the sidewalk needs protection from vehicular traffic on the street. This can be achieved with a grass or landscaped space between the edge of the curb and the edge of the sidewalk. To bring the environment down to a human scale, street trees can provide some enclosure and signs and lighting need to be visible to the pedestrian.

Grade

Consistent with adjacent roadway.

Specifications

All sidewalk design and construction should be consistent with the Codified Ordinances of Worthington.

KEY TOPICS

Hybrid Pedestrian Beacon (HAWK)

The pedestrian hybrid beacon (also known as the High intensity Activated crossWalk or HAWK) is a pedestrian-activated warning device located on the roadside or on mast arms typically at midblock pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens.



How does the HAWK work?

- The HAWK is normally in an “off” position until it is activated by someone wanting to cross a busy street.
- When a pedestrian wishes to cross the street, they push a button, and the signal begins with a flashing yellow light that warns drivers approaching the crosswalk to slow down.
- The flashing yellow light is followed by a solid yellow light, telling drivers to prepare to stop.
- The signal then changes to a solid red for the drivers to stop at the stop bar, and the pedestrian gets a walk signal.
- The solid red signal converts to a flashing red after a few seconds, allowing drivers to proceed when safe to do so.

Midblock locations account for more than 70% of pedestrian fatalities. Vehicle travel speeds are usually higher at midblock locations, contributing to the higher injury and fatality rates at these locations. More than 80% of pedestrians die when hit by vehicles traveling at 40 mph or faster while less than 10% die when hit at 20 MPH or less.

The pedestrian hybrid beacon is a great intermediate option between the operational requirements and effects of a rectangular rapid flash beacon and a full pedestrian signal because it provides a positive stop control in areas without the high pedestrian traffic volumes that typically warrant the installation of a signal. In addition, the alternating red signal heads allows vehicles to proceed once the pedestrian has cleared their side of the travel lane, thus improving vehicle traffic flow.

Installation of the pedestrian hybrid beacon has been shown to provide the following safety benefits:

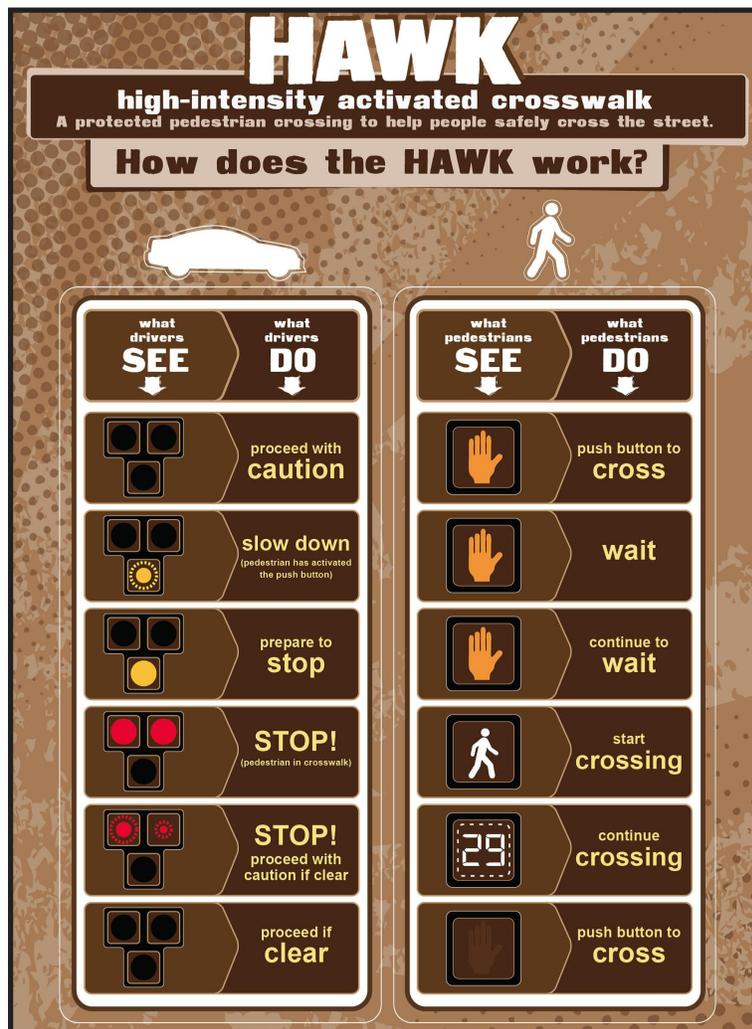
- Up to a 69% reduction in pedestrian crashes
- Up to a 29% reduction in total roadway crashes



Pedestrian hybrid beacons should only be used in conjunction with a marked crosswalk. In general, they should be used if gaps in traffic are not adequate to permit pedestrians to cross, if vehicle speeds on the major street are too high to permit pedestrians to cross, or if pedestrian delay is excessive. The Manual on Traffic Control Devices (MUTCD) contains a chapter on the pedestrian hybrid beacon, illustrating when and where it should be installed. While the MUTCD currently suggests that a HAWK not be installed within 100' of an intersection, this is likely to change in the updated version of the guidance. The proposed language for the new MUTCD states “If a pedestrian hybrid beacon is installed at or immediately adjacent to an intersection with a side road or driveway, vehicular traffic on the side road or driveway shall be controlled by STOP signs”

Since the pedestrian hybrid beacon is a traffic control device many people are not yet familiar with, effort should be made to perform outreach to the public before implementation so there is no confusion about how the beacon operates and what drivers and pedestrians should do when encountering it.

Pedestrian hybrid beacons are more expensive than traditional crosswalks, but remain an attractive option due to safety benefits. The average beacon costs from around \$75,000 to \$150,000, with signals suspended by span wire being less expensive, and signals attached to a mast arm being more expensive. Costs also vary depending on the characteristics of the particular location, road speeds, engineering constraints, and other factors.



Source: City of Scottsdale, AZ

AMENITIES

Bicycle Parking

Use Case

Public: Community Centers, Libraries, parks, civic institutions.

Private: restaurants, stores, other frequented retail. The following table can serve as a guide on bicycle parking needs.

Installation

A row of individual racks should be installed with 15" minimum between racks. Empty racks should not pose a tripping hazard for visually impaired pedestrians. Position racks out of the walkway's clear zone. When possible, racks should be in a covered area protected from the elements. They need to be located near enough to the trail that bicyclists do not tie bicycles up to posts or poles closer to the trail.

Specifications

The standard bike rack is 34" in height and 21.5" at its maximum width.

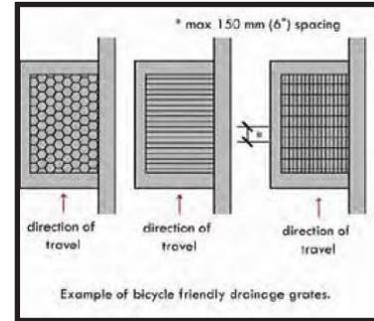
Use Category	Specific Use	Required Long-term Parking Spaces	Required Short-term Parking Spaces
Residential	Boarding houses	2, or 1 per ten sleeping rooms	None
	Hotels, motels	2, or 1 per 50 employees	None
Commercial / Industrial	Retail sales, service operations *	2, or 1 per 50,000 square feet of gross floor area	2, or 1 per 25,000 square feet of gross floor area
	Office buildings **	2, or 1 per 50,000 square feet of gross floor area	2, or 1 per 50,000 square feet of gross floor area
	Museums, libraries	2, or 1 per 50 employees	4, or 1 per 25,000 square feet of gross floor area
	Movie theaters	2, or 1 per 50 employees	4, or 1 per 50 seats
	Restaurants, ice cream shops, coffee shops	2, or 1 per 50 employees	4, or 1 per 50 seats
	Recreation centers	2, or 1 per 50 employees	4, or 1 per 25,000 square feet of gross floor area
	Major event entertainment (e.g., stadiums, arenas)	2, or 1 per 50 employees	8, or 1 per 500 seats
	Manufacturing	2, or 1 per 50 employees	None
	Warehousing	2, or 1 per 50 employees	None
Institutional	Medical centers	2, or 1 per 50 employees	2, or 1 per 25,000 square feet of gross floor area
	Transit park and ride lots	1 per 50 daily boardings	None

* Retail businesses below 3,000 square feet of gross floor area are exempt from bicycle parking requirements
 ** Office buildings below 10,000 square feet of gross floor area are exempt from bicycle parking requirements

Drainage Grates: Bicycle Friendly

Use Case

Drainage grates in the roadway are often located on the outer edge of the roadway where bicyclists typically travel in a bike lane or shared road. The right type of drainage grate can decrease the chance of bicycle damage or crashes from averting a grate.



Specifications

The honeycomb style, rows perpendicular to the direction of travel or a grid with 6" spacing are the preferred drainage grates on roadways and trails.

Fences and Railings

Use Case

Railing and fences are important features on bridges or in areas where there may be a hazardous drop-off or hazardous adjacent land uses (such as active rail lines). Local, state, and/or federal regulations and building codes should be consulted to determine when it is appropriate to install a railing.

Specifications

A pedestrian railing should be 42" above the surface. A bicyclist railing should be 54" above the surface. The middle railing functions as a "rub rail" for bicyclists and should be located 33" and 36" above the surface.

Landscaping

Use Case

Landscaping is recommended at trailheads, access points, destination signing, pocket parks, to enhance intersections, as part of a reclamation strategy along a trail, at water infiltration zones, to control erosion, and to enhance the sense of place along a trail where ever needed.

Design

- The following should be considered during the design process.
- Maintenance issues and irrigation needs
- Landscape features along trails should serve to preserved and rehabilitate existing adjacent habitats
- Low maintenance, native strategies should be employed where ever appropriate. Trees that drop debris and have aggressive roots should be avoided
- In urban setting where the existing landscaping is controlled additional landscaping should be as well
- Landscape features should avoid creating hiding places for offenders.

Play Features and Pocket Parks

Use Case

Should be considered on a case by case basis at trailheads, access points, along the trail at significant historical points of interest or as enhancement along the trail where passive recreation will reinforce trail use. Locations for these features shall be included in the Bicycle and Pedestrian Master Plan and reviewed during update processes.

Design

At the discretion of the Parks and Recreation Department and upon approval of City Council, on a case by case basis.

Public Art

Explore opportunities to include public art within the overall design of the trail system. Local artists can be commissioned to provide art for the trail system, making it uniquely distinct. Many trail art installations are functional as well as aesthetic, as they may provide places to sit and play on. According to American Trails,

“Art is one of the best ways to strengthen the connection between people and trails. Across America and elsewhere, artists are employing a remarkably wide range of creative strategies to support all phases of trail activities, from design and development to stewardship and interpretation. In particular, art can be an effective tool for telling a trail’s story compellingly and memorably.”

All Public Art installations must be approved by City Council before installation.

Restrooms and Water Fountains

Use Case

Full-service restrooms should be installed in areas where demand requires and where water and sewer connections are easily accessible. In areas where such utilities are not available, and there is a significant demand, compost toilets and container based drinking station may be considered on a case by case basis.

Design

These facilities shall conform in character to specifications to be determined by the Parks and Recreation Department.

Specifications

All restroom facilities should be buffered from adjacent land uses, picnic and rest areas. At least one restroom must meet ADA standards, which requires approximately 50 to 60 square feet. A locking feature should be available to secure the facility at night and during off-seasons.

Seating: Benches

Use Case

Benches should be installed on a case by case basis to compliment play features, pocket parks, trailheads and access points. Benches should also be installed in intervals along the trail such that approximately two seating opportunities per mile are provided.

Installation

Provide wheelchair access alongside benches, at least a 30" by 48" area for adequate maneuvering. If benches are next to each other (either side by side or face to face), allow 4' between them.

Specifications

These facilities shall conform to specifications to be determined by the Parks and Recreation Department.

Seating: Integrated

Use Case

Informal seating opportunities may exist along a trail or near at a trailhead. Seating can be integrated as part of a landscape feature design, pocket park or play feature.

Design

The proposed design of integrated seating must be included in any design proposal and approved before implementation. Consider that wheelchair access spacing recommendations apply to all seating

Stairs

Use Case

Stairways should only be used where there is no other alternative, due to challenging terrain or through sensitive wet areas and across small waterways. If stairways are used they should include gutters so that bicyclists can easily roll their bicycles up and down the incline.

Trail Lighting: Off Road

Use Case

Lighting for multi-use trails should be considered on a case-by-case basis in areas where 24-hour use is anticipated, with full consideration of the maintenance commitment lighting requires. Lighting should not be used where:

- Night usage is not desired or permitted
- It is not acceptable to residents living along or near the trail
- The area is a wildlife area
- There is little to no development

Lighting should be considered in the following locations

- Entrances and exits of bridges
- Public gathering areas along the trail
- Trail access points

Specifications

If possible use full cut-off, energy-efficient lighting that is IDA Approved Dark Sky Friendly to avoid excess light pollution and save costs

Trail Lighting: On Road

Use Case

Attention should be paid to crossings so that there is sufficient ambience for motorists to see pedestrians. To be most effective, lighting should be consistently and adequately spaced. In commercial or downtown areas and other areas of high pedestrian volumes, lower level, pedestrian-scale lighting with emphasis on crossings and intersections may be employed to generate a desired ambience. Ensure pedestrian walkways and crossways are sufficiently lit. Consider adding pedestrian level lighting in areas of higher pedestrian volumes, downtown, and at key intersections.

Specifications

It is important to note that every effort should be made to address and prevent light pollution.

Transit Stops – Bicycle and Pedestrian Treatments

Use Case

All transit stops in the city limits should be designed to adequately accommodate the pedestrian, by using marked crosswalks, curb ramps and adequate sidewalks widths. Major transit stops should also be equipped with bicycle racks and walking/bicycling route maps.

Design

The bicycle racks provided at transit stops should be consistent.

Trash Receptacles

Use Case

As needed to combat littering and preserve the natural environment. Should be placed along the trail near seating and at all trailheads.

Installation and Specifications

These facilities shall conform to specifications to be determined by the Parks and Recreation Department.

Potential Traffic Calming Treatments

This appendix contains examples of potential traffic calming treatments and is presented for informational purposes only, making no recommendations for implementation.

Lockwood in the Institute of Transportation Engineers (ITE) Journal defines traffic calming as “the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.” (Lockwood, July 1997) He further enumerates what common goals and objectives of traffic calming are:

Traffic calming goals include:

- increasing the quality of life;
- incorporating the preferences and requirements of the people using the area (e.g., working, playing, residing) along the street(s), or at intersection(s);
- creating safe and attractive streets;
- helping to reduce the negative effects of motor vehicles on the environment (e.g., pollution, sprawl); and
- promoting pedestrian, cycle and transit use.

Traffic calming objectives include:

- achieving slow speeds for motor vehicles,
- reducing collision frequency and severity,
- increasing the safety and the perception of safety for non-motorized users of the street(s),
- reducing the need for police enforcement,
- enhancing the street environment (e.g., street scaping),
- encouraging water infiltration into the ground,
- increasing access for all modes of transportation, and
- reducing cut-through motor vehicle traffic. (Lockwood, July 1997)

When used properly, traffic calming creates physical and visual cues that induce drivers to travel at slower speeds. Traffic calming is self-enforcing. The design of the roadway results in the desired effect, without relying on compliance with traffic control devices such as signals, signs, and without enforcement. While elements such as landscaping and lighting do not force a change in driver behavior, they can provide the visual cues that encourage people to drive more slowly.

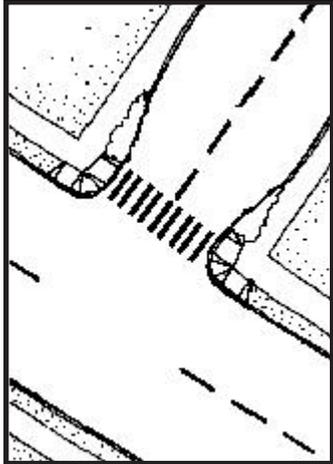
The reason traffic calming is such a powerful and compelling tool is that it has proven to be so effective. Some of the effects of traffic calming, such as fewer and less severe crashes, are clearly measurable. Others, such as supporting community livability, are less tangible, but equally important. Using the information presented on www.walkinginfo.org as a basis, typical traffic calming treatments were identified and key aspects of each evaluated.

Typical treatments include:

- Curb Extensions
- Choker
- Crossing Islands
- Chicanes
- Mini-Circles
- Speed Hump
- Speed Table
- Raised Intersection
- Raised Pedestrian Crossing
- Gateways
- Landscaping
- Specific Paving Treatments
- Serpentine Design
- Woonerf
- Road/Lane Narrowing

Curb Extensions

Curb extensions — also known as bulb-outs or neckdowns — extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the time that pedestrians are in the street.



Curb extensions placed at an intersection essentially prevent motorists from parking in or too close to a crosswalk or from blocking a curb ramp or crosswalk. Motor vehicles parked too close to corners present a threat to pedestrian safety, since they block sightlines, obscure visibility of pedestrians and other vehicles, and make turning particularly difficult for emergency vehicles and trucks. Motorists are encouraged to travel more slowly at intersections or midblock locations with curb extensions, as the restricted street width sends a visual cue to motorists. Turning speeds at intersections can be reduced with curb extensions (curb radii should be as tight as is practicable). Curb extensions also provide additional space for curb ramps and for level sidewalks where existing space is limited.

Curb extensions are only appropriate where there is an on-street parking lane. Curb extensions must not extend into travel lanes, bicycle lanes, or shoulders (curb extensions should not extend more than 6' from the curb). The turning needs of larger vehicles, such as school buses, need to be considered in curb extension design.

Purpose

- Improve safety for pedestrians and motorists at intersections.
- Increase visibility and reduce speed of turning vehicles.
- Encourage pedestrians to cross at designated locations.
- Prevent motor vehicles from parking at corners.
- Shorten crossing distance and reduce pedestrian exposure.

Considerations

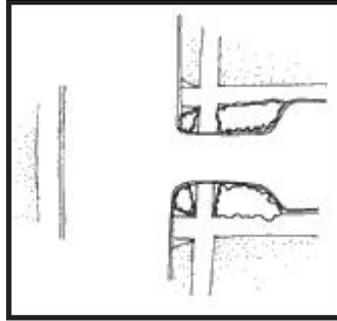
- Curb extensions can provide adequate space on narrow sidewalks for curb ramps and landings.
- Curb extensions should only be used where there is a parking lane, and where transit and bicyclists would be traveling outside the curb edge for the length of the street.
- Midblock extensions provide an opportunity to enhance midblock crossings. Care should be taken to ensure that street furniture and landscaping do not block motorists' views of pedestrians.
- Where intersections are used by significant numbers of trucks or buses, the curb extensions need to be designed to accommodate them. However, it is important to take into consideration that those vehicles should not be going at high speeds, and most can make a tight turn at slow speeds.
- It is not necessary for a roadway to be designed so that a vehicle can turn from a curb lane to a curb lane. Vehicles can often encroach into adjacent lanes safely where volumes are low and/or speeds are slow. Speeds should be slower in a pedestrian environment.
- Emergency access is often improved through the use of curb extensions if intersections are kept clear of parked cars. Fire engines and other emergency vehicles can climb a curb where they would not be able to move a parked car. At midblock locations, curb extensions can keep fire hydrants clear of parked cars and make them more accessible.
- Curb extensions can create additional space for curb ramps, landscaping, and street furniture that are sensitive to motorist and pedestrian sightlines; this is especially beneficial where sidewalks are otherwise too narrow.
- Ensure that curb extension design facilitates adequate drainage.

Estimated Cost

Curb extensions cost from \$2,000 to \$20,000 per corner, depending on design and site conditions. Drainage is usually the most significant determinant of cost. If the curb extension area is large and special pavement and street furnishings and planting are included, costs would also be higher. Costs can go up significantly if something major, such as a utility pole or controller box, is moved.

Curb Extensions: Chokers

Chokers are curb extensions that narrow a street by widening the sidewalks or planting strips, effectively creating a pinch point along the street. Chokers can be created by bringing both curbs in, or they can be done by more dramatically widening one side at a midblock location. They can also be used at intersections, creating a gateway effect when entering a street.



Chokers can have a dramatic effect by reducing a two-lane street to one lane at the choker point (or two narrow lanes), requiring motorists to yield to each other or slow down. In order for this to function effectively, the width of the travelway cannot be wide enough for two cars to pass: 16' is generally effective (and will allow emergency vehicles to pass unimpeded). This kind of design is usually only appropriate for low-volume, low-speed streets.

Purpose

- Slow vehicles at a mid-point along the street.
- Create a clear transition between a commercial and a residential area.
- Narrow overly wide intersections and midblock areas of streets.
- Add room along the sidewalk or planting strip for landscaping or street furniture.

Considerations

- If two travel lanes are maintained on a two-way street and/or the travel-lane widths are unchanged (at the location of the choker), it will have a minimal effect on speed.
- Consult with local fire and sanitation departments before setting minimum width.
- Ensure that bicyclist safety and mobility are not diminished.

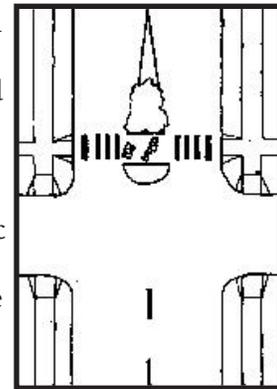
Estimated Cost

\$5,000 to \$20,000, depending on site conditions and landscaping. Drainage may represent a significant cost.

Crossing Islands

Crossing islands also known as center islands, refuge islands, pedestrian islands, or median slow points are raised islands placed in the center of the street at intersections or midblock to help protect crossing pedestrians from motor vehicles.

Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. Where midblock or intersection crosswalks are installed at uncontrolled locations (i.e., where no traffic signals or stop signs exist), crossing islands should be considered as a supplement to the crosswalk. They are also appropriate at signalized crossings. If there is enough width, center crossing islands and curb extensions can be used together to create a highly improved pedestrian crossing. Detectable warnings are needed at cut-throughs to identify the pedestrian refuge area. This kind of facility has been demonstrated to significantly decrease the percentage of pedestrian crashes. The factors contributing to pedestrian safety include reduced conflicts, reduced vehicle speeds approaching the island (the approach can be designed to force a greater slowing of cars, depending on how dramatic the curvature is), greater attention called to the existence of a pedestrian crossing, opportunities for additional signage in the middle of the road, and reduced exposure time for pedestrians. Curb extensions may be built in conjunction with center crossing islands where there is on-street parking. Care should be taken to maintain bicycle access. Bicycle lanes (or shoulders, or whatever space is being used for bicycle travel) must not be eliminated or squeezed in order to create the curb extensions or islands.



Purpose

- Enhance pedestrian crossings, particularly at unsignalized crossing points.
- Reduce vehicle speeds approaching pedestrian crossings.
- Highlight pedestrian crossings.

Considerations

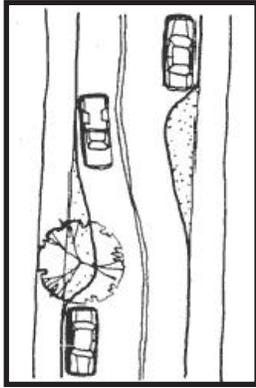
- Do not squeeze bicycle access.
- Illuminate or highlight islands with street lights, signs, and/or reflectors to ensure that motorists see them.
- Design islands to accommodate pedestrians in wheelchairs. A cut-through design such as depicted in the diagram works best if the pedestrian refuge area is identified by detectable warnings.
- Crossing islands at intersections or near driveways may affect left-turn access.

Estimated Cost

Costs range from \$4,000 to \$30,000. The cost for an asphalt island or one without landscaping is less than the cost of installing a raised concrete pedestrian island with landscaping.

Chicanes

Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive depending on the design.



Diverting the Path of Travel. Shifting a travel lane has an effect on speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths may be as much as half of what is suggested in traditional highway engineering.

Shifts in travelways can be created by shifting parking from one side to the other (if there is only space for one side of parking) or by building landscaped islands (islands can also effectively supplement the parking shift).

Diversion Plus Restriction (Angled Slow Points). Diverting the path of travel plus restricting the lanes (as described under “Chokers”) usually consists of a series of curb extensions, narrowing the street to two narrow lanes or one lane at selected points and forcing motorists to slow down to maneuver between them. Such treatments are intended for use only on residential streets with low traffic volumes. If there is no restriction (i.e., the number of lanes is maintained), chicanes can be created on streets with higher volumes, such as collectors or minor arterials.

Purpose

- Reduce vehicle speeds.
- Add more green (landscaping) to a street.

Considerations

- Chicanes may reduce on-street parking.
- Maintain good visibility by planting only low shrubs or trees with high canopies.
- Ensure that bicyclist safety and mobility are not diminished.

Estimated Cost

Costs for landscaped chicanes are approximately \$10,000 (for a set of three chicanes) on an asphalt street and \$15,000 to \$30,000 on a concrete street. Drainage and utility relocation often represents the most significant cost consideration.

Mini Circles

Mini-circles are raised circular islands constructed in the center of residential street intersections (generally not intended for use where one or both streets are arterial streets). They reduce vehicle speeds by forcing motorists to maneuver around them. Mini-circles have been found to reduce motor vehicle crashes by an average of 90% in Seattle, WA. Signs should be installed directing motorists to proceed around the right side of the circle before passing through or making a left turn. Mini-circles are commonly landscaped (bushes, flowers, or grass), most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through specific pavement materials.

Mini-circles are an intersection improvement as well as a traffic-calming device and can take the place of a signal or four-way stop sign. Many unwarranted four-way stop signs are installed because of the demand for action by the community.

Mini-circles must be properly designed to slow vehicles and benefit pedestrians and bicyclists. Right-turning vehicles are not controlled at an intersection with a mini-circle, potentially putting pedestrians and bicyclists at risk. Therefore, short curb radii should complement this treatment to discourage fast right-turn maneuvers. Traffic circles with cuts in splitter islands make crossing easier for pedestrians, especially wheelchair users, and control vehicle movements entering the intersection, but require more space. Pedestrians with vision impairments will find fewer cues to identify a gap to cross when traffic does not stop.

The occasional larger vehicle going through an intersection with a traffic circle (e.g., a fire truck or moving van) can be accommodated by creating a mountable curb in the outer portion of the circle.

Purpose

- Manage traffic at intersections where volumes do not warrant a stop sign or a signal.
- Reduce crash problems at the intersection of two local streets.
- Reduce vehicle speeds at the intersection.

Considerations

- Do not make generous allowances for motor vehicles by increasing the turning radii — this compromises pedestrian and bicyclist safety.
- Larger vehicles that need access to streets (e.g., school buses and fire engines) may need to make lefthand turns in front of the circle.
- Use yield, not stop, controls.
- Mini-circle landscaping should not impede the sight distance.
- Treat a series of intersections along a local street as part of a neighborhood traffic improvement program.

Estimated Cost

The cost is approximately \$6,000 for a landscaped traffic mini-circle on an asphalt street and about \$8,000 to \$12,000 for a landscaped mini-circle on a concrete street.

Speed Hump

Speed humps are paved (usually asphalt) and approximately 3" to 4" high at their center, and extend the full width of the street with height tapering near the drain gutter to allow unimpeded bicycle travel. Speed humps should not be confused with the speed “bump” that is often found in mall parking lots. There are several designs for speed humps. The traditional 12' hump has a design speed of 15 to 20 MPH, a 14' hump a few miles per hour higher, and a 22' table has a design speed of 25 to 30 MPH. The longer humps are much gentler for larger vehicles.

Purpose

- Reduce vehicle speeds. Raised measures tend to have the most predictable speed reduction impacts.
- Enhance the pedestrian environment at pedestrian crossings.

Considerations

- Do not use if on a sharp curve or if the street is on a steep grade.
- If the street is a bus route or primary emergency route, the design must be coordinated with operators. Usually, some devices are acceptable if used prudently — one device may be appropriate and may serve the primary need (e.g., if there is a particular location along a street that is most in need of slowing traffic and improving pedestrian conditions).
- The aesthetics of speed humps and speed tables can be improved through the use of color and specialized paving materials.
- Noise may increase, particularly if trucks use the route regularly.
- May create drainage problems on some streets.
- Speed humps and tables should be properly designed to reduce the chance of back problems or other physical discomfort experienced by vehicle occupants.

Estimated Cost

The cost for each speed hump is approximately \$1,000. Speed tables are \$2,000 to \$15,000, depending on drainage conditions and materials used.



Speed Table

A “speed table” is a term used to describe a very long and broad speed hump, or a flat-topped speed hump, where sometimes a pedestrian crossing is provided in the flat portion of the speed table. The speed table can either be parabolic, making it more like a speed hump, or trapezoidal, which is used more frequently in Europe. Speed tables can be used in combination with curb extensions where parking exists.



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Raised Intersection

A raised intersection is essentially a speed table for the entire intersection. Construction involves providing ramps on each vehicle approach, which elevates the entire intersection to the level of the sidewalk. They can be built with a variety of materials, including asphalt, concrete, stamped concrete, or pavers. The crosswalks on each approach are also elevated as part of the treatment to enable pedestrians to cross the road at the same level as the sidewalk, eliminating the need for curb ramps. Use detectable warnings to mark the boundary between the sidewalk and the street.



Purpose

- Reduce vehicle speeds.
- Enhance the pedestrian environment at the crossings.

Considerations

- Don't use if on a sharp curve or if the street is on a steep grade.
- May not be appropriate if the street is a bus route or emergency route. One device may be necessary and serve the primary need. Several raised devices may be disruptive, so other measures should be considered.
- Speed tables and raised crosswalks and intersections can be an urban design element through the use of special paving materials.
- Detectable warning strips at edges enable pedestrians with vision impairments to detect the crossing.
- Care must be taken to manage drainage.

Estimated Cost

Raised crosswalks are approximately \$2,000 to \$15,000, depending on drainage conditions and material used. The cost of a raised intersection is highly dependent on the size of the roads. They can cost from \$25,000 to \$75,000.

Raised Pedestrian Crossing

A raised pedestrian crossing is also essentially a speed table, with a flat portion the width of a crosswalk, usually 10' to 15'. Raised intersections and crosswalks encourage motorists to yield. On one street in Cambridge, MA, motorists yielding to pedestrians crossing at the raised devices went from approximately 10 percent before installation of the project to 55% after installation.

Purpose

- Reduce vehicle speeds.
- Enhance the pedestrian environment at the crossings.

Considerations

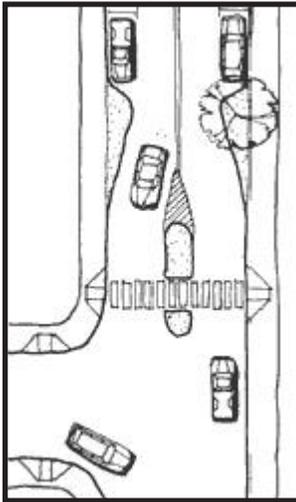
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Gateways

A gateway is a physical or geometric landmark that indicates a change in environment from a higher speed arterial or collector road to a lower speed residential or commercial district. They often place a higher emphasis on aesthetics and are frequently used to identify neighborhood and commercial areas within a larger urban setting. Gateways may be a combination of street narrowing, medians, signing, archways, roundabouts, or other identifiable feature. Gateways should send a clear message to motorists that they have reached a specific place and must reduce speeds. This can help achieve the goal of meeting expectations and preparing motorists for a different driving environment. Gateways are only an introduction and slower speeds are not likely to be maintained unless the entire area has been redesigned or other traffic-calming features are used.



Purpose

- Create an expectation for motorists to drive more slowly and watch for pedestrians when entering a commercial, business, or residential district from a higher speed roadway.
- Create a unique image for an area.

Considerations

- Traffic-slowing effects will depend upon the device chosen and the overall traffic-calming plan for the area.

Estimated Cost

Varies widely depending on the measures chosen.

Landscaping

The careful use of landscaping along a street can provide separation between motorists and pedestrians, reduce the visual width of the roadway (which can help to reduce vehicle speeds), and provide a more pleasant street environment for all. This can include a variety of trees, bushes, and/or flowerpots, which can be planted in the buffer area between the sidewalk or walkway and the street. The most significant issue with any landscaping scheme is ongoing maintenance. Some communities have managed effectively by creating homeowners associations to pay for landscape maintenance or through the volunteer efforts of neighbors. Others have found them to be unreliable and budget for public maintenance instead. Consider adding irrigation systems in areas with extensive planting. Choosing appropriate plants, providing adequate space for maturation, and preparing the ground can help ensure that they survive with minimal maintenance, and don't buckle the sidewalks as they mature. The following guidelines should be considered: plants should be adapted to the local climate and fit the character of the surrounding area — they should survive without protection or intensive irrigation; and plant's growth patterns should not obscure signs or pedestrians' and motorists' views of each other.

Purpose

- Enhance the street environment.
- Calm traffic by creating a visual narrowing of the roadway.

Considerations

- Maintenance must be considered and agreed to up-front, whether it is the municipality or the neighborhood residents who will take responsibility for maintenance.
- Shrubs should be low-growing and trees should be trimmed up to at least 8' to 10' to ensure that sight distances and head room are maintained and personal security is not compromised.
- Plants and trees should be chosen with care to match the character of the area; be easily maintained; and not create other problems, such as buckling sidewalks.

Estimated Cost

Opportunities for funding landscaping are often more flexible than for major street changes. For example, the cost of the actual landscaping may be paid for by the corresponding neighborhood or business groups. Often, municipalities will pay for the initial installation and homeowners associations, neighborhood residents, or businesses agree to maintain anything more elaborate than basic tree landscaping.

Specific Paving Treatments

Paving materials are important to the function and look of a street, both in the road and on the sidewalk. Occasionally, paving materials in and of themselves act as a traffic-calming device (e.g., when the street is paved in brick or cobblestone). However, some of these materials may be noisy and unfriendly to bicyclists, pedestrians, wheelchairs, or snowplow blades. In particular, cobblestones should not be used in the expected pedestrian or bicycle path, although they may be used as aesthetic elements in a streetscape design. Smooth travel surfaces are best for all pedestrians.

The pedestrian walkway material should be firm, planar, and slip-resistant. Concrete is the preferred walking surface. A different look can be achieved by using stamped concrete or concrete pavers, which are available in a variety of colors and shapes; however, jointed surfaces may induce vibration, which can be painful to some pedestrians. They can also be used on the top of raised devices.



It is important to ensure crosswalk visibility. High visibility markings are often best. Textured crosswalks should be marked with reflective lines since these types of crosswalks are not as visible, especially at night or on rainy days.

Colored paving can often enhance the function of portions of the roadway, such as a colored bicycle lane. This can create the perception of street narrowing, in addition to enhancing the travel facility for bicyclists.

Purpose

- Send a visual cue about the function of a street.
- Create an aesthetic enhancement of a street.
- Delineate separate space for pedestrians or bicyclists.

Considerations

- Slippery surfaces, such as smooth granite and paint, and uneven surfaces, such as cobblestones and brick, should not be used in the primary pedestrian or bicycle travel paths. Bumpy surfaces may be especially uncomfortable for wheelchair users and a tripping hazard for all pedestrians.
- Coordinate choice and placement of materials with maintenance agencies.
- Design and maintenance must ensure crosswalk visibility over time.
- Using materials such as bricks and cobblestones may increase the cost of construction and maintenance.

Estimated Cost

Variable; materials requiring hand labor (cobblestones or pavers) have a higher cost.

Serpentine Design

Serpentine design refers to the use of a winding street pattern with built-in visual enhancements through a neighborhood, which allow for through movement while forcing vehicles to slow. The opportunities for significant landscaping can be used to create a park-like atmosphere.

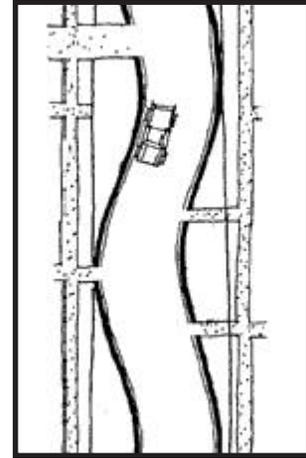
Such designs are usually implemented with construction of a new neighborhood street or during reconstruction of an existing street corridor. This type of design can be more expensive than other traffic-calming options and needs to be coordinated with driveway access.

Purpose

- Change to the entire look of a street to send a message to drivers that the road is not for fast driving.

Considerations

- Where costs are a concern, lower cost, equally effective traffic-calming strategies may be preferable.
- Most cost-effective to build as a new street or where a street will soon undergo major reconstruction for utility or other purposes.



Estimated Cost

The cost can be high (\$60,000 to \$90,000 per block) to retrofit a street, but may be no extra to build a new street with this design if adequate right-of-way is available.

Woonerf:

“Woonerf” (“street for living”) is a Dutch term for a common space created to be shared by pedestrians, bicyclists, and low-speed motor vehicles. They are typically narrow streets without curbs and sidewalks, and vehicles are slowed by placing trees, planters, parking areas, and other obstacles in the street. Motorists become the intruders and must travel at very low speeds below 10 MPH. This makes a street available for public use that is essentially only intended for local residents. A woonerf identification sign is placed at each street entrance. Consideration must be given to provide access by fire trucks, sanitation vehicles and other service vehicles (school buses and street sweepers), if needed.

Purpose

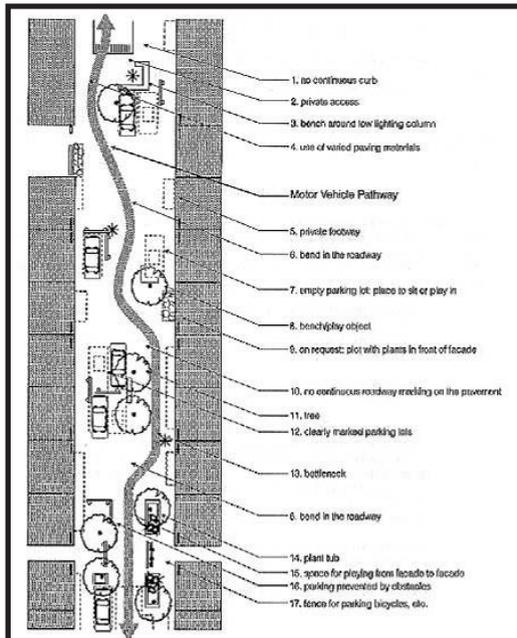
- Create a very low automobile volume, primarily on local access streets.
- Create a public space for social and possibly commercial activities and play by area children.

Considerations

- A woonerf is generally not appropriate where there is a need to provide nonresident motorists with access to services or through travel.
- The design needs to keep vehicle speeds very low in order to make the streets safe for children.

Estimated Cost

The cost to retrofit a woonerf may be quite high, but there would be no extra cost if designed into the original construction.



Roadway Narrowing:

Roadway narrowing can be achieved in several different ways:

- Lane widths can be reduced (10' or 11') and excess asphalt striped with a bicycle lane or shoulder.
- Travel lanes can be removed.
- The street can be physically narrowed by extending sidewalks and landscaped areas, or by adding on-street parking within the former curb lines.

This can reduce vehicle speeds along a roadway section and enhance movement and safety for pedestrians. Bicycle travel will also be enhanced and bicyclist safety improved when bicycle lanes are added.

Purpose

- Multiple benefits of lower vehicle speeds, increased safety, and redistributing space to other users.

Considerations

- Bicyclists must be safely accommodated. Bike lanes or wide curb lanes are needed if motor vehicle volumes and/or speeds are high.
- Road narrowing must consider school bus and emergency service access, and truck volumes.
- Evaluate whether narrowing may encourage traffic to divert to other local streets in the neighborhood.

Estimated Cost

Adding striped shoulders or on-street bike lanes can cost as little as \$1,000 per mile if the old paint does not need to be changed. The cost for restriping a kilometer of street to bike lanes or reducing the number of lanes to add on-street parking is \$5,000 to \$10,000 per mile, depending on the number of old lane lines to be removed. Constructing a raised median or widening a sidewalk can cost \$100,000 or more per mile.

