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To	Mike Kuntz, Jackson County Jenna Marmon, ODOT
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Project	Rogue Valley Active Transportation Plan (RVATP)
Subject	Final Design Toolkit for Regional and Connector Routes

Introduction

The design toolkit for the Regional Active Transportation Plan:

- Identifies best practices in pedestrian and bicycle design
- Identifies potential facility types and intersection treatments for the regional and connector routes considering the types of people and trips we seek to attract
- Provides considerations for designing in constrained rights-of-way

Best Practices in Pedestrian and Bicycle Design

For walking and bicycling to be key forms of transportation, facilities must be comfortable, safe, convenient, and designed to be attractive to a wide range of potential users. To plan for walking and bicycling facilities that will be attractive to a wide range of potential users, The Rogue Valley Metropolitan Planning Organization (RVMPO) and its local agencies should consider the following best practices for bicycle and pedestrian facility design for the regional network:

1. Travelers must feel comfortable and safe while walking and bicycling on the system
   - Facilities must be sufficiently separated from motor vehicle traffic
   - Facilities must feel secure for travel at all times of the day
   - Facilities should create a network that connects seamlessly between jurisdictions, including White City and other unincorporated Jackson County and the incorporated cities of Medford, Phoenix, Talent, Eagle Point, Central Point, White City, Jacksonville, and Ashland
   - Projects must be prioritized to address barriers, fill existing gaps, and create a continuous and comfortable experience for all users independent of skill level or ages
2. Walking and bicycling must be a convenient way to travel
   - Provide wayfinding signage, particularly for neighborhood routes and key connections that are not on the arterial roadway system
   - Design direct routes between origins and destinations where possible

- Minimize delay for bicyclists or pedestrians at intersections and road crossings
- Provide secure bicycle parking at employment areas, commercial areas, schools, and transit hubs

3. Create facilities to serve a wide range of users
   - Within a 1 mile of schools, facilities should be designed to serve school-aged children walking and bicycling to school and should be consistent with safe routes to school action plans
   - Sidewalks and crossings throughout the RVATP area must be designed to serve persons with disabilities in accordance with the Americans with Disabilities Act (ADA)
   - In locations adjacent to senior centers or other similar facilities, design for slower walking speeds
   - Other parts of regional bicycling and walking network should be designed to serve the general population. In many cases, this will result in higher levels of separation from motor vehicles for bicyclists

Bicycle Facility Design

Bicycle facilities are the elements of the transportation system that enable people to bicycle safely and efficiently to all types of destinations including retail centers, employment centers, schools, recreation sites, and transit stops. People biking are able to reach their destinations more quickly compared to walking. As a result, good bicycle facilities can increase the range of destinations accessible to people without a vehicle. These facilities include protected bike lanes, buffered bicycle lanes, and shared-use paths. Safe crossing facilities are even more essential at intersections where crashes are most likely to occur. Protected intersection designs, leading intervals, bicycle boxes, bicycle signals, and protected bike lanes can be installed to increase the safety of people biking. Each facility plays an important role in developing a comprehensive bicycle system.

This section summarizes the types of bicycle facilities that could be implemented in the RVATP area to address gaps and deficiencies in the bicycle system and considering who you are trying to attract and accommodate.

Who Are We Designing For?

The RVATP is seeking to design streets and trails so that all ages and abilities of bicyclist will be able to use them. Our future designs should consider students who would like to bicycle to school, as well as our general population who may use bicycling for errands or work commutes. One common typology, created in 2006 by Jennifer Dill of Portland State University, categorizes people into four different groups, described below. An online survey, conducted during the months of October and November 2018, asked people in the Rogue Valley area to define what type of bicyclist they are based on these categories. Over 193 people responded and identified themselves. The results of this are shown in Figure 1 below.

"Strong and Fearless"

The "Strong and Fearless" riders are estimated at approximately fifteen percent of the study population. These riders are comfortable mixing with motor traffic and are comfortable riding in all conditions.

"Enthused and Confident"

"Enthused and confident" riders are estimated at approximately thirty-nine percent of the study population. These riders are comfortable sharing the roadway with motor vehicles in some contexts, however they prefer to use bike facilities that are separated from motor traffic.

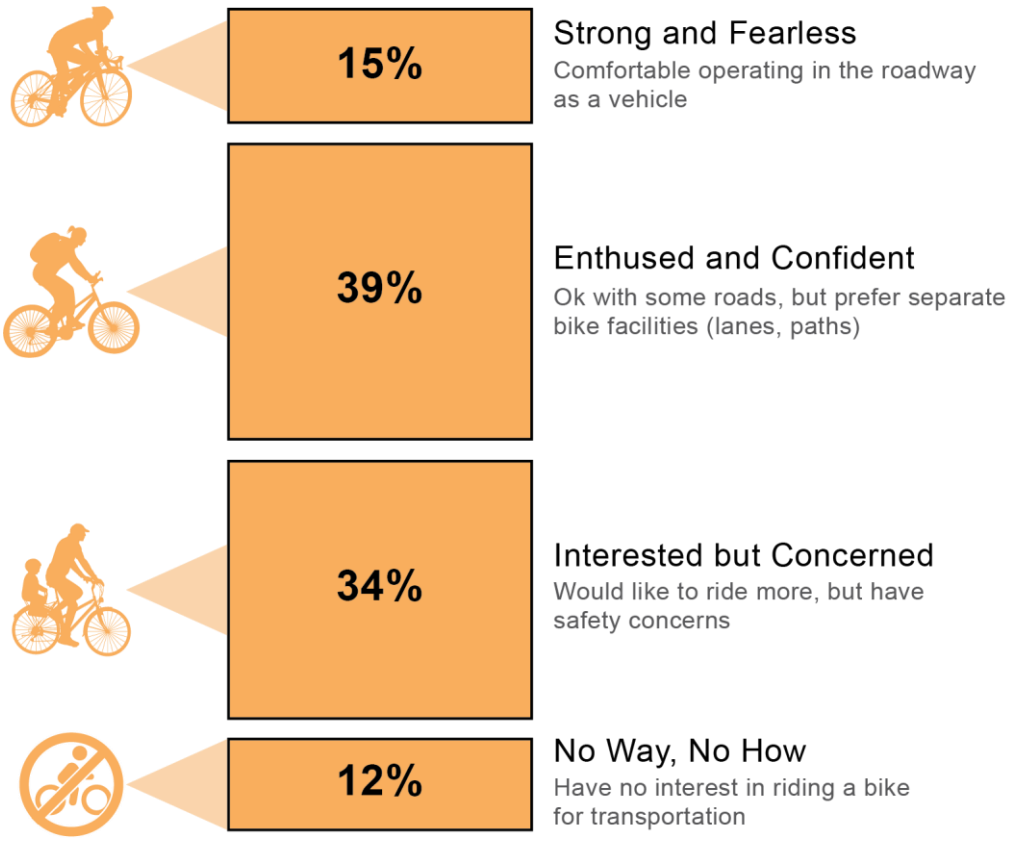
"Interested but Concerned"

"Interested but concerned" riders are estimated at approximately thirty-four percent of the study population. This population would like to ride more but is concerned about safety. This population needs slow motor traffic, low motor traffic volumes, and/or physical separation from motor traffic.

"No Way, No How"

About 12% of the study population fall into the "No Way, No How" category. This group has no interest in bicycling due to a variety of reasons, which may include physical inability.

Figure 1: Four Types of Bicyclists in the RVATP Area[1]



What Facilities Do "Interested but Concerned" Riders Prefer?

To serve the general population, the RVATP will seek to provide facilities to address the needs of the "interested but concerned" population.

The RVATP survey participants had a lower percentage of "interested but concerned" cyclists than the national average and a greater percentage of "strong and fearless" and "enthused and confident" cyclists than the national average. Given that participants self-selected to take the survey, survey responses are likely to reflect an interest in bicycling. Based on the survey, 9 out of every 10 people are interested in riding a bike for transportation.

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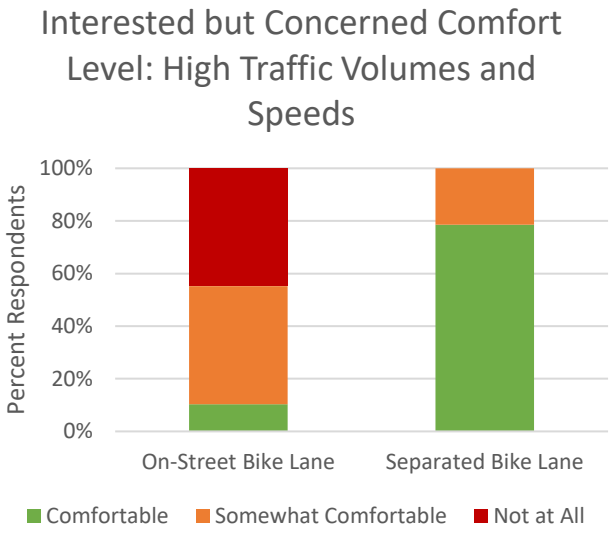
[1] The four types of cyclist and corresponding percentage breakdown are representative only of online open house survey participants responses; national averages for the "enthused and confident" are a greater percentage (50-60%) whereas the "enthused and confident" are a lower percentage (5-10%).

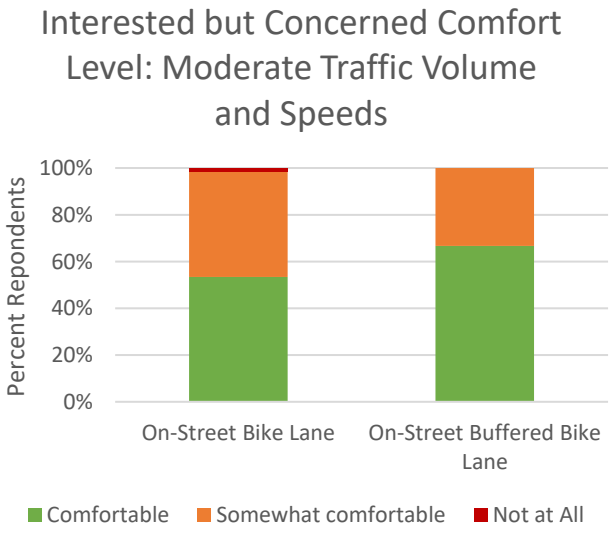
The survey asked respondents to share whether they would be comfortable bicycling on various facility types. Almost one-half of respondents identifying as "interested but concerned" would not feel comfortable riding on a standard bike lane on a road experiencing high motor traffic volume and speeds; however, the majority would be comfortable using protected bike lanes. Figure 2 and Figure 3 show that "interested but concerned" bicyclists feel more comfortable with greater separation from motor traffic and when motor traffic is moving at slower volume and speeds.

Figure 2: "Interested but Concerned" Cyclist Comfort Level in High Traffic Volume and Speeds



Almost half of "interested but concerned" cyclists in the survey would not feel comfortable traveling in an on-street bike lane given high motor traffic volume and speeds.

Figure 3: "Interested but Concerned" Cyclist Comfort Level in Moderate Traffic Volume and Speeds



Two-thirds of "interested but concerned" cyclists in the survey would feel comfortable travelling in an on-street buffered bike lane when there are moderate levels of motor traffic volume and speeds.

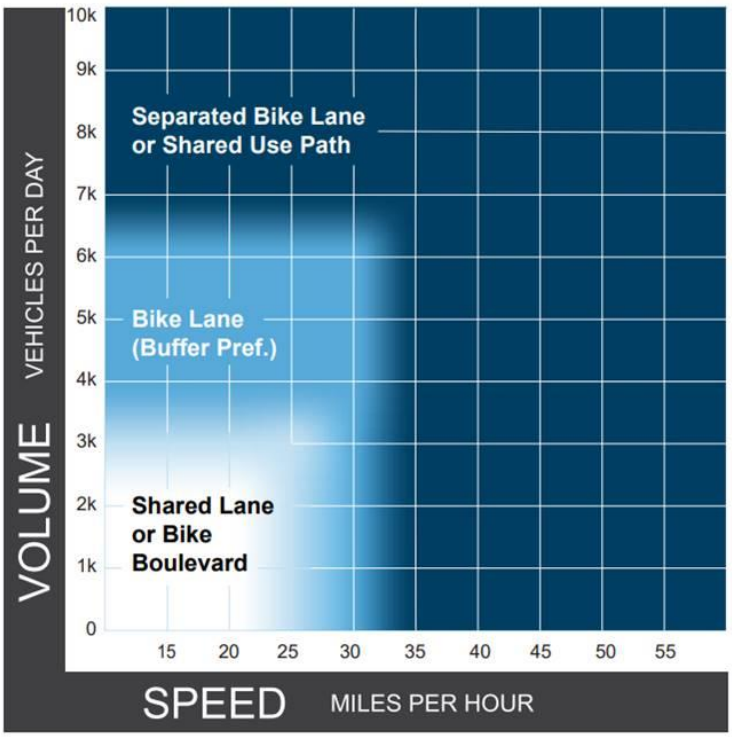
How Do We Choose the Right Bicycle Facilities for a Specific Location?

When designing bicycle facilities along roadways, the appropriate design treatment varies depending on the context of the road. When adding new bicycle facilities to existing roadways on the regional and connector networks, local jurisdictions should seek to provide low-stress facilities that serves:

- School-age children on routes near schools or identified through Safe Routes to Schools action plans; and,
- The general population ("interested but concerned"), who may be interested in bicycling to access transit and other daily needs.

Figure 4 provides guidance for the types of designs able to achieve a low level of stress and attract the general population, including the "interested but concerned" riders. This general guidance accounts for the need to provide different treatments in different contexts, depending primarily on the speeds and volumes of motor vehicles. For example, on a street with approximately 8,000 vehicles per day, with average speeds of 35 mph, the general population would feel comfortable using a protected bike lane, but it is unlikely that they would feel comfortable using a standard bike lane. However, on a street with 1,500 vehicles per day and speeds of 20 mph, the general population would likely feel comfortable bicycling on the street in a shared lane, without needing a bicycle lane. In order to serve the general population, the RVMPO and local agencies should follow this design treatment guidance and consider buffered bicycle lanes on streets over 25 mph and further separation at higher speeds and motor traffic volumes.

Figure 4: Facility selection for "interested but concerned" Users



Notes:

1. ***Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed.***
2. ***Advisory bike lanes may be an option where traffic volume is <3K ADT.***
3. ***See guide for discussion of alternatives if the preferred bikeway type is not feasible.***

Source: Figure 4 – Preferred Bikeway Type for Urban, Urban Core, Suburban and Rural Town Contexts from FHWA Bikeway Facility Selection Guide

Facility Types

The following provides descriptions and design guidance for the urban and rural bicycle facility types that should be considered on the Regional and Connector route system.

Facility Type	Urban Example	Rural Example
Protected Bike Lanes Typically located on major arterials with high vehicular volumes, a protected bicycle lane is an exclusive space for bicyclists along or within a roadway that is physically separated from motor vehicles by vertical and horizontal elements. Protected bicycle lanes may be one or two-way facilities.		
Buffered Bicycle Lane/Shoulder Provides physical separation in the form of vertical flexible posts or paint. Buffered bicycle lanes are typically suggested for collector roadways with medium to high vehicular speeds and volumes.		
Bike Lane/Shoulder Designated exclusively for bicycle travel, bike lanes are separated from vehicle travel with striping and include pavement stencils. Bike lanes may include additional enhancements such as green paint. On rural facilities, rural bikeways or shoulders are appropriate and should be striped no smaller than 4-feet in width.		
Advisory Bike Lane/Shoulder Advisory shoulders, also known as "suggestion lanes," are bike lanes that motor vehicles can use to pass oncoming motor vehicles after yielding to bicyclists and pedestrians. Advisory shoulders are used in combination with a single center lane (without a centerline) for bi-directional motor vehicle travel on low-volume streets.		

Facility Type	Urban Example	Rural Example
Limited Shoulders Limited shoulders are areas provided along shared lane roadways to allow cyclists to move out of the vehicle travel lane to stop or allow faster-moving vehicles to pass. They include short pullouts to provide cyclists a place to stop and long pullouts that would allow cyclists to keep traveling while allowing motorists to pass. Bicycle pullouts can be applied to any roadway without shoulder bikeways or other bicycle treatments. They are intended to be provided on designated bikeways as a lower impact alternative to continuous shoulder bikeways in constrained areas. They are most applicable on uphill roadways or long stretches of roadways without passing opportunities for vehicles.	Not applicable	
Bicycle Climbing Lanes/Shoulder A bicycle climbing lane consists of a bicycle lane/shoulder on one side of a roadway in the uphill direction and a shared lane on the downhill side. It allows bicyclists to travel at slower speeds when going uphill without interfering with vehicle travel. Bicycle climbing lanes can be applied to any roadway in the study area and should be considered on designated bikeways as a lower impact alternative to shoulder bikeways or bike lanes in both directions in constrained areas.	Not applicable	
Mixed Traffic or Shared Lane Marking (sharrow) Typically located on neighborhood streets with low vehicular volumes and speeds, "sharrows" are pavement markings that remind motorists to expect bicyclists in the travel lane. Sharrows also provide wayfinding for bicyclists on neighborhood bicycle routes.		Not applicable

Intersection Treatments for Bicycles

Designing intersections for safe, comfortable, and accessible active transportation is an essential step forward in achieving low-stress bicycle networks. Successful intersection design can minimize delays, reduce the number of conflicts and decrease the severity of injuries resulting from crashes. Intersection design treatments vary for bicycles based on the context of the surrounding network. The following provides descriptions and design guidance for intersection treatments that should be considered on the Regional and Connector route system.

Intersection Treatment	Example
Protected Intersection Design Provides the highest level of comfort for bicyclists traveling through or turning at an intersection. Such designs are intended to minimize conflicts between bicyclists and vehicles by providing physical separation through the intersection. Where physical space is constrained, the design of the protected intersection may consider sharing space for people walking and biking.	
Bicycle Signals Provides protected and dedicated signal phase for bicyclists to eliminate the potential for vehicle conflicts. Prioritizes bicycle movements at intersections and may be programed to allow for leading bicycle intervals.	
Bicycle Boxes Provides a designated queuing space for bicyclists at signalized intersections between a set-back stop bar and the crosswalk. Allows bicyclists to queue in front of stopped vehicles to increase visibility and reduce turning conflicts. Application should be considered in full intersection context, including vehicle right-turn-on-red movements.	

Intersection Treatment	Example
Two-Stage Left-Turn Boxes Allows bicyclists to execute a left turn at multi-lane intersections from a right-side bicycle facility. Bicyclists arriving at a green light travel into the intersection and pull onto the two-stage turn queue box away from through moving bicycles.	
Pavement Markings Green paint used in "conflict zones" where vehicles and bicycles commonly cross paths at an intersection, driveway, or right-turn pocket.	
Traffic Diverters/Medians with Bicycle Access Designed to allow for bicycle movements while restricting through and left-turning movements for vehicles.	

Pedestrian Facility Design

Pedestrian facilities are the elements of the transportation system that enable people to walk safely and efficiently to retail centers, employment centers, and transit stops. These include facilities for pedestrian movement along key roadways (e.g., shoulders, sidewalks, shared-use paths) and for safe roadway crossings (e.g., crosswalks, crossing beacons, pedestrian refuge islands). Each facility plays an important role in developing a comprehensive pedestrian system.

This section summarizes the types of pedestrian facilities that could be implemented in the RVATP area to address gaps and deficiencies in the pedestrian system.

How Do We Choose Facilities That Enhance Pedestrian Comfort?

Based on the project survey, pedestrians in the RVATP area feel more comfortable travelling on buffered sidewalks and less comfortable when they are traveling near motor traffic moving in higher volumes and speeds, as shown in Figure 5 and Figure 6.

Figure 5: Pedestrian Comfort Level in High Traffic Volumes and Speeds

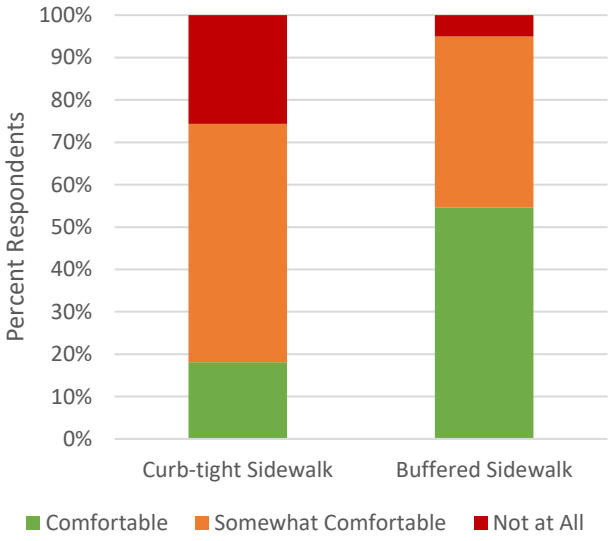
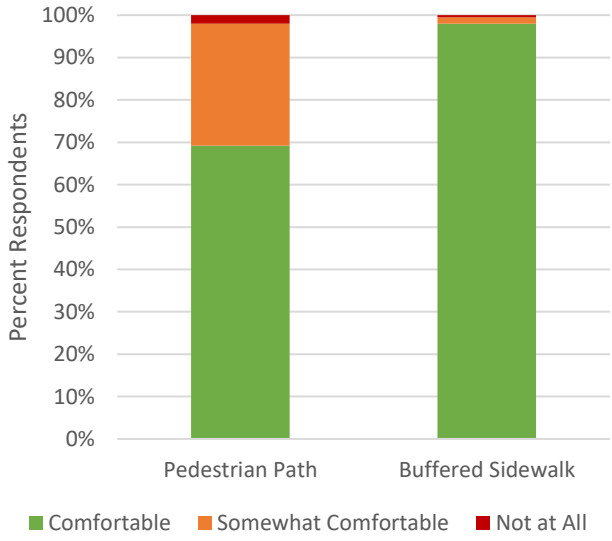


Figure 6: Pedestrian Comfort Level in Moderate Traffic Volume and Speeds



As illustrated in Figure 5, approximately one-quarter of the survey respondents would not feel comfortable traveling on curb-tight sidewalk in presence of high motor traffic volume and speeds. As illustrated in Figure 6, nearly all survey respondents would enjoy walking on buffered sidewalk in presence of moderate motor traffic volumes and speeds.

Facility Types

The following provides descriptions and design guidance for the urban and rural pedestrian facility types that should be considered on the Regional and Connector route system.

Facility Type	Urban Example	Rural Example
Sidewalk Sidewalks are the fundamental building blocks of the pedestrian system. They enable people to walk comfortably, conveniently, and safely from place to place. They also provide an important means of mobility for people with disabilities, families with strollers, and others who may not be able to travel on an unimproved roadside surface. Sidewalks are usually six- to eight-feet wide and constructed from concrete. They are also frequently separated from the roadway by a curb, landscaping, and/or on-street parking. Sidewalks are widely used in urbanized settings. Ideally, sidewalks are provided along both sides of the roadway in urban areas; however, some areas with physical or right-of-way constraints may require that sidewalk be located on only one side.	 	Not applicable.
Shoulder Walkways Shoulders on the edge of roadways in a rural context can be enhanced to serve as a functional space for pedestrians to travel in the absence of other facilities with more separation.	Not applicable	

Facility Type	Example

Shared-Use Path

Shared-use paths and trails are paved and unpaved facilities that serve pedestrians and bicyclists. When serving as a connection on the regional network they should be paved. Shared-use paths and trails can be constructed adjacent to roadways where the topography, right-of-way, or other issues do not allow for the construction of sidewalks and bike facilities. A minimum width of 10 feet is recommended for low-pedestrian/bicycle-traffic contexts; 12 to 14 feet should be considered in areas with moderate to high levels of bicycle and pedestrian traffic.[2] Shared-use paths and trails can be used to create longer-distance links within and between communities and provide regional connections. They play an integral role in recreation, commuting, and accessibility due to their appeal to users of all ages and skill levels. Shared-use paths are applicable in urban and rural settings.

Pedestrian Path (Side Path)

A pedestrian path is a hard-surface path adjacent to the roadway in lieu of a sidewalk in areas where other bicycle facilities exist, or bicyclists share the roadway. While similar to a shared-use path, pedestrian paths are narrower in width and generally do not invite bicycle travel.

[2] AASHTO Task Force on Geometric Design. "AASHTO Guide for the Development of Bicycle Facilities." American Association of State Highway and Transportation Officials, Washington, DC: 2012.

Enhanced Crossings

Enhanced pedestrian crossing facilities enable pedestrians to safely cross streets, railroad tracks, and other transportation facilities. Planning for appropriate pedestrian crossings requires the community to balance vehicular mobility needs with providing crossing locations along the desired routes of people walking and biking. The following provides descriptions and design guidance for enhanced crossing treatments that should be considered on the Regional and Connector routes system. The following section is broken into crossing facilities and treatments appropriate at intersections, mid-block crossings, and those appropriate for both intersections and mid-block crossings.

Facility Type/Treatment (Intersections)	Example
Leading Pedestrian Interval (LPI) This treatment provides pedestrians with a 2-5 second head start before a concurrent vehicle phase turns green to allow pedestrians to enter and occupy the crosswalk before vehicles begin to turn. This is typically used in areas where vehicle turning movements often interfere with pedestrian crossing movements and is only possible to implement when pedestrian signal faces are present.	
Auto Pedestrian Recall In urban settings with high pedestrian activity, pedestrian calls can be programmed into traffic signals phasing and timing to be automatic and do not require a person to activate the recall i.e. Auto-Recall. Auto pedestrian recalls and also be combined with leading pedestrian intervals if the context of the surrounding area is appropriate and pedestrian activity is reasonably high.	
High Visibility Crosswalk This treatment is the least protective and provides the lowest level of separation from vehicles. It consists of reflective roadway markings and accompanying signage and is generally used at intersections of arterials and collectors with other facilities. It can also be **applied at mid-block** crossing locations on smaller streets with low traffic volumes and speeds.	

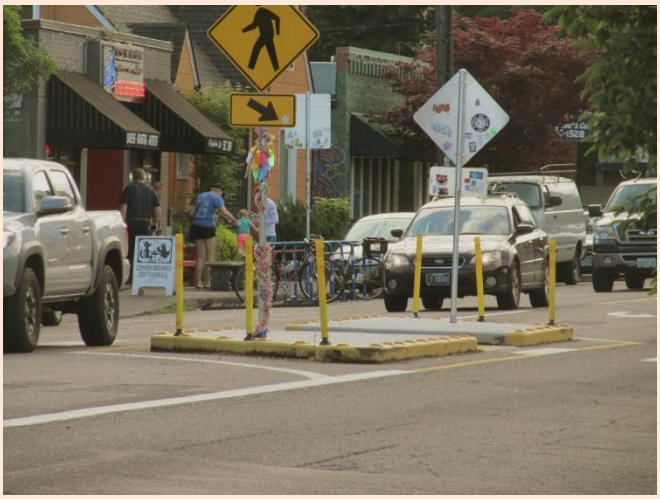
Facility Type/Treatment (Mid-Block)	Example

Rectangular Rapid Flash Beacon

Rectangular Rapid Flash Beacons (RRFBs) have a pedestrian activated strobe light that alerts motorists of pedestrians or bicyclists intending to cross a roadway. These are typically used at midblock crossings with medium to high pedestrian and bicycle demand and/or medium to high traffic volumes on roadways. RRFBs may not be as appropriate as pedestrian signals or pedestrian hybrid beacons on roadways wider than three lanes, unless a pedestrian refuge island is provided.

Crossing Island (Pedestrian Refuge)

This treatment provides a protected area for pedestrians to stop while crossing the street. They are typically used when crossing multi-lane streets, in areas with high levels of vulnerable pedestrian users. For example, crossing islands are used near schools or senior centers, and often applied in areas with medium to high traffic volumes and/or with pedestrian crash history.



Raised Pedestrian Crossing

This treatment brings the roadway even with the sidewalk and requires vehicles to slow. They are typically applied at mid-block crossings on two-lane roads where pedestrian volumes ≥ 50 pedestrians per hour and speed control is needed. Raised crosswalks may be provided at intersections where low-volume streets intersect with high-volume streets or where a roadway changes character (such as from commercial to residential). Raised crosswalks should not be used on transit routes or where there are steep grades or curves.

Facility Type/Treatment (Mid-block/Intersection)	Example

Grade Separated Crossing

Grade-separated crossings (undercrossings or overcrossings) provide the highest level of separation from motor vehicles. They are best suited for crossings of roads with high vehicle volumes and speeds or locations where a path is naturally located on a different grade than the road. Grade-separated crossings should be appropriately lighted to increase perceived safety and should use switchbacks or circular ramps to provide direct, accessible, and convenient access from the street. They should not require extensive out of direction travel.

Pedestrian Signal

Pedestrian signals provide the next highest level of separation and protection from motor vehicles. These are typically applied at mid-block crossings with high pedestrian or bicycle demand and/or high traffic volumes, or previously stop-controlled intersections where pedestrian volumes warrant a signal.

Pedestrian Hybrid Beacon

Sometimes called a HAWK signal, a pedestrian hybrid beacon remains dark when not in use. When activated, the HAWK signal provides drivers a yellow light to alert them to slow down followed by a solid red light while pedestrians cross the street. It is typically used for mid-block crossing locations with high pedestrian or bicycle use and/or high traffic volumes.

Bulb-out/Curb Extension

This treatment shortens the crossing distance for pedestrians and narrows the vehicle path to reduce vehicle speeds. They are typically applied midblock or at intersections on streets with on-street parking.

Pedestrian Priority Signal Timing

In addition to LPI, various signal timing strategies can increase priority for pedestrians:

- Timing that activates a pedestrian signal immediately after actuation, after completing the minimum green time for conflicting vehicles. This strategy minimizes pedestrian delay and can reduce vehicle delay as well (in cases where pedestrians use the push button, but then cross before the pedestrian signal is active due to excessive delay).
- Overall shorter cycle lengths at signals. Shorter signal lengths result in lower delays for pedestrians, since the pedestrian phase will come up more frequently.
- Exclusive pedestrian phasing, also known as a "pedestrian scramble," which provides an exclusive phase where all vehicles are stopped, and pedestrians can cross in any direction, including diagonally. This is appropriate for intersections with high pedestrian volumes in all directions.

Many of the treatments listed above can be applied together at one crossing location to further alert drivers of the presence of pedestrians in the roadway.

Crossing Distances Between Pedestrian Crossing Facilities

There are several tools, literature, and guidance documents that have been developed for evaluating the appropriateness and recommended spacing for pedestrian crossings at uncontrolled intersections. The following summarizes some of the guidance for spacing.

- ODOT recommends the following target pedestrian crossing spacing range (feet) based on the urban area type
  - Urban Mix[3]: 250-550 (1-2 blocks)
  - Commercial Corridor[4] 500-1,000
- Global Designing Cities Initiative is a program of the National Association of City Transportation Officials (NACTO) and recommends the following design guidance for pedestrian crossing spacing:
  - Provide level crossings every 80-100m (~262 – 328 feet) in urban environments[5].
  - Distances over 200m (656 feet) should be avoided, as they create compliance and safety issues.
  - If it takes a person more than three minutes to walk to a pedestrian crossing, he or she may decide to cross along a more direct, but unsafe route.
  - Pedestrian crossing spacing should be determined according to the pedestrian network, built environment, and desire lines. Designers should take into account both existing and projected crossing demand.
- The Portland Bureau of Transportation (PBOT) has developed Spacing Standards for Marked Pedestrian Crossings intended to identify gaps in the pedestrian network where additional

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[3] Mix of land uses with a **well-connected roadway network.** May extend long distances. Commercial uses front the street with residential neighborhoods on top or immediately behind land uses.

[4] Mostly commercial and industrial uses with **large building footprints** and large parking lots set within **large blocks** and a **disconnected or sparse roadway network.**

[5] Jure Kostanjsek and Lipar,Peter, "Pedestrian crossings priority for pedestrian safety" (Paper presented at the 3rd Urban Street Symposium, Seattle, June 2007).

engineering analysis is required. Spacing standards are dependent on street classification and based on a 200-foot block module.

- Pedestrian Districts and Main Streets: For arterials and collectors within designated Pedestrian Districts (TSP pedestrian classification), and on Civic Main Streets and Neighborhood Main Streets (TSP street design classifications), the maximum spacing between marked pedestrian crossings is 530 feet. On a street with standard 200-foot blockfaces, this results in a marked and/or enhanced pedestrian crossing a minimum of every other block. Marked pedestrian crossings may be provided at greater frequency, particularly in Pedestrian Districts located in the Center City, where traffic signals are provided at every block[6]. Where blocks are longer than 530 feet, mid-block crossings should be provided.
- City Walkways: On designated City Walkways outside of and between Pedestrian Districts and Main Streets, the maximum spacing between marked pedestrian crossings is 795 feet. On a City Walkway with standard 200-foot blocks, this results in a marked and/or enhanced pedestrian crossing a minimum of every three blocks (compared with every two blocks in Pedestrian Districts and Main Streets). However, marked pedestrian crossings may be provided at greater frequency.
- Transit stops: Within the City of Portland, marked and/or enhanced crossings will be provided at all transit stops, regardless of street classification. Marked crossing requirements at transit stops may be implemented by providing new marked pedestrian crossings at existing transit stops, and/or by strategically relocating or consolidating transit stops such that they are located at existing marked crossings. Transit stop locations may determine marked crossing locations required to meet maximum spacing requirements in Pedestrian Districts and Main Streets and on City Walkways.

- The Washington County Pedestrian and Bicycle Plan and Washington County Approval Process for New Pedestrian Crossings at Mid-Block Locations and Uncontrolled Intersections provides guidance on pedestrian crossing spacing as well as street spacing standards that enhance pedestrian connectivity.
  - Within five acres or more of developable land, Washington County requires maximum block lengths for new development to be 530 feet and access ways are to be provided every 330 feet.
  - If an existing crosswalk or controlled road intersection is less than 300 feet from the proposed location, the applicant shall reroute pedestrians and crossing cyclists to that location or relocate the generator if feasible, demonstrate the viability of the proposed location, or propose a grade separation of the crossing.
- Metro 2018 Regional Transportation Plan (RTP) provides guidance on street spacing standards as it relates to multimodal connectivity.
  - The RTP sets some design standards that are relevant to pedestrian connectivity and crossing facility spacing including a standard for new street connections spacing at no more than 530 feet in specific areas, except where barriers prevent connectivity; narrower roadways and rights-of-way; and direction.

[6] PBOT practice is to mark crosswalks at all signalized intersections.

Crosswalk Closures

Crosswalks exist at all locations where crosswalk markings indicate a pedestrian crossing and at all intersections (whether marked or unmarked) unless closed by official action (ORS801.220). The absence of a marked crosswalk pavement markings at an intersection does not preclude ADA requirements for providing ADA accommodations such as adding or upgrading existing curb ramps to meet current ADA standards for all quadrants of an intersection unless a crosswalk has been closed by official action. If a crosswalk is closed, it must follow MUTCD and ADA guidelines to make sure that it is appropriately marked.

Washington County, OR provides several examples of when it may be appropriate to consider closing a crosswalk:

- When physical restriction on the opposite side of the roadway hinder pedestrian activity on that side of the roadway, closing the crosswalk is recommended. Typical examples of this condition include "T" intersections where directly behind the opposite side of the roadway is railroad right-of-way, drainage canal, or some other type of waterway where pedestrian activity is discouraged and/or prohibited. An exception will be when there are transit connections on the opposite side of the roadway.
- Where visibility (for pedestrians, motorists or bicyclists) is obstructed and the obstruction cannot be reasonably removed or otherwise reasonably mitigated and where the cost of signalization is disproportionate to the closing of the crosswalk.
- Where multiple legal crosswalks exist such that they conflict disproportionately with other modes. Examples include an arterial street with multiple offset or "T" intersections. Crosswalks at "T" and offset intersections should not be closed unless there is an alternative crossing within 300 feet of the closed crosswalk.
- Across the receiving leg of a dual right-turn lane at an intersection where an alternative accessible path is available
- Where an analysis shows that the pedestrian crossing at a signalization intersection would significantly impact the intersection operations and a reasonable alternative accessible path is available.

Within the Rogue Valley, it is recommended that local agencies develop their own crosswalk closure process with delegated authority. If the Local Agency does not have a process, it is suggested that the Local Agency provide an official letter to document where crosswalks are not intended, and what treatments are to be applied. Removing or closure of any crosswalk on Jackson County roadways should require the approval of the County Engineer through Design Exception documentation of the following:

- The potential or observed crashes, geometric design or operational concerns that adversely affects pedestrian safety
- An exhibit showing alternative ADA accessible path between the two points of the crossing that are being closed, demonstrating that the closure will not adversely impact accessibility.

Shared-use Paths and Trails

Shared-use paths and trails serve as transportation and recreational corridors, separated from motor vehicles by open space and physical barriers. Establishing shared-use path and trail systems can provide long distance, regional connections and contribute to the local economy by attracting tourists from outside the region. The RVATP recognizes the benefits of shared-use paths and trails as links to connect residential neighborhoods to employment centers and community destinations.

How Are Shared-use Paths and Trails Incorporated into the Walking and Bicycling Networks?

Shared-use paths and trails are part of the bicycle and pedestrian networks. These facilities play an integral role in recreation, commuting, and accessibility due to their appeal to users of all ages and skill levels.

Benefits

Serves the needs of active transportation users in less space than separated facilities. Separation from vehicles attracts users of all levels and skill sets. Shared-use paths and trails can provide safe and accessible regional connections.

Constraints

Potential conflicts between bicycles and pedestrians due to shared space. May need to create enhanced crossing of major roadways. Isolated segments of shared-use paths and trails may introduce personal security concerns.

Typical Application

Medium to long-distance links within and between communities that also serve as recreational facilities. Parallel to roads in rural areas where sidewalks and on-street facilities are not present.

Design Considerations

A minimum width of 10 feet is recommended for areas with low pedestrian and bicycle volumes, 12 to 14 feet should be considered in areas with moderate to high levels of pedestrian and bicycle volume. The Oregon Department of Transportation standard for regional trails is 12 feet plus a 1-foot buffer on each side. Pavement markings can be used to indicate distinct space for pedestrians and bicycle travel while also serving as a wayfinding resource. Shared-use paths serving transportation functions should have lighting.

Crossing Treatments for People Walking and Biking

Building safe, comfortable and accessible walking and biking networks requires protected crossings and access to direct routes. The following describes approaches to providing crossing in different areas for people walking and biking.

How Do We Address Crossing Needs?

- Provide safe and convenient crossings between destinations. Consider that a crossing spaced 300' from a desired location adds 2.5 minutes of additional walking time. With the addition of signal delay, a few inconvenient crossings along a route can quickly add 10 minutes to someone's walk. For comparison, an intersection is considered to function at the worst "level of service" (LOS F), when people driving motor vehicles experience an average of 80 seconds or more of delay.
- On transit routes, provide crossings at transit stops (or locate transit stops at crossings)
- At mid-block, uncontrolled locations with pedestrian crossing demand, select treatments appropriate for the roadway characteristics
- At intersections and mid-block crossings near schools, provide ADA accessible crossings (and side-walk facilities) at all intersection legs

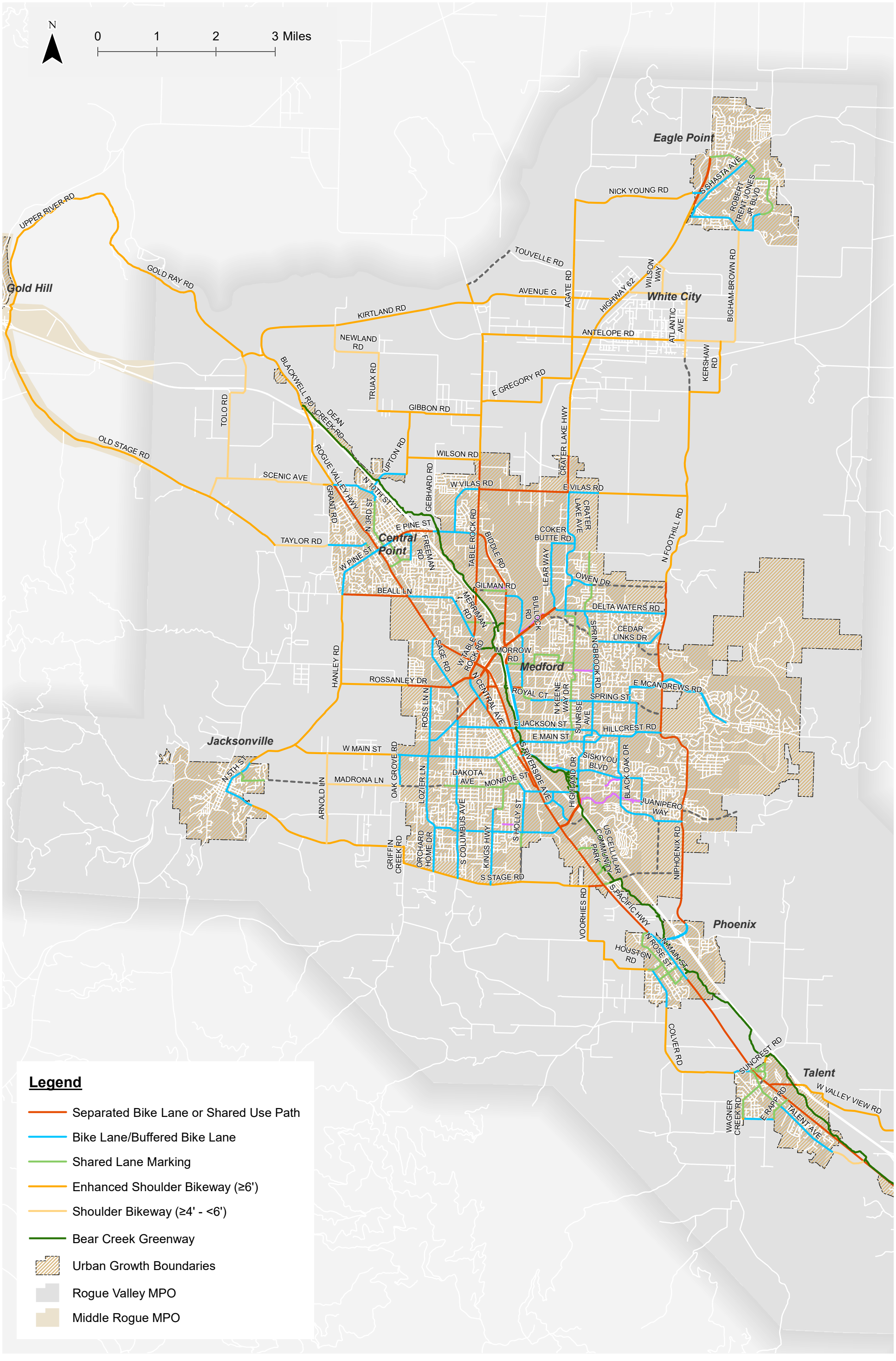
What Crossing Treatments are Appropriate?

The type of appropriate crossing depends on the characteristics of the roadway being crossed. Vehicle speed, number of lanes, width, and number of vehicles are among the characteristics that need to be considered when designing a crossing. Generally speaking, wide, high-speed roadways with many vehicles necessitate a higher level of separation or protection for crossing pedestrians. The following design guidance tools may be utilized to determine the appropriate level of crosswalk protection based on the roadway context and surrounding area:

- NCHRP Report 562: Improving Pedestrian Safety at Unsignalized Crossings
  - Based on vehicular volume, speed, yielding compliance, pedestrian volume, crossing distance
- FHWA: Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
  - Based on vehicular volume, speed, roadway configuration (number of lanes, raised median, etc.)

Target Facility Type for the Regional Network and Connectors

Figure 7 provides an overview of the bicycle facility type that is needed on the regional network and connector routes to provide a low level of stress for bicyclists and attract the general population, including the "interested but concerned" riders. This is based on the information in Figure 4.



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Bicycle Facility Design 7

Jackson County, OR

Coordinate System: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

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N

0 1 2 3 Miles

OWEN

DELTA WATERS RD

SPRINGBROOK RD

CEDAR LINKS DR

N FOOTHILL RD

E MCANDREWS RD

SPRING ST

HILLCREST RD

BLACK OAK DR

HIGHLAND DR

JUANIPERO WAY

N PHOENIX RD

U.S CELLULAR COMMUNITY PARK

S PACIFIC HWY

Phoenix

VOORHIES RD

COLVER RD

HOUSTON RD

N ROSE ST

S MAIN ST

SUNCREST RD

Talent

W MAIN ST

W RAPP RD

TALENT AVE

W VALLEY VIEW RD

S VALLEY VIEW RD

HIGHWAY 99 N

EAGLE MILL RD

OAK ST

FAIR OAKS AVE

N MAIN ST

HELMAN ST

LITHIA WAY

Ashland

S MOUNTAIN AVE

E MAIN ST

ASHLAND ST

SISKIYOU BLVD

CROWSON RD

HIGHWAY 66

Legend

- Separated Bike Lane or Shared Use Path
- Bike Lane/Buffered Bike Lane
- Shared Lane Marking
- Enhanced Shoulder Bikeway (≥6')
- Shoulder Bikeway (≥4' - <6')
- Bear Creek Greenway
- Urban Growth Boundaries
- Rogue Valley MPO

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Bicycle Facility Design

Jackson County, OR

7

Coordinate System: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

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A Performance-Based Design Approach for Constrained Multimodal Streets

In order to complete the pedestrian and bicycle systems to serve users of all ages and abilities using the treatments discussed in this toolkit, the RVATP will need to outline flexible design solutions, particularly in constrained areas. This approach, also referred to as performance-based design, has been developed through federal research and guidance, and is being incorporated into design guidance from ODOT. In developing solutions for streets that require redesign to implement the envisioned improvements, the RVATP's design approach includes the following considerations:

What are the key functions of this transportation corridor?

- **Transit** – Is there bus service? What is the aver-age level of ridership?
- **Motor Vehicles** – What is the Average Annual Daily Traffic (AADT)? What mobility and access needs are served?
- **Freight and Heavy Vehicles** – Is this a designated freight route? How many heavy vehicles use this route? What is the appropriate "design vehicle"?
- **Bicycles** – Is the roadway on the regional network or a connector route? What types of bicyclist are served and what destinations do they need to reach?
- **Pedestrians** – Is the roadway on the regional network or a connector route? What types of destinations are located on this corridor and how can access be provided?
- **Key Functions** – Are there other key functions, such as parking, stormwater management, street trees? Which, if any, of these key functions are well-served by alternate, parallel routes?

Based on the key desired functions, and the existing types and volumes of users on the roadway, the RVMPO and local agencies should consider flexibility for roadway design elements such as number of lanes, lane widths, design speed, turning radii, medians, shoulders, and on-street parking.

Design Speed

Motor vehicle speeds have an impact on safety performance for all modes and level of comfort for pedestrians and bicyclists. Lower vehicle speeds are correlated with lower crash risk and lower severity crashes. Selecting a design speed for streets should be based on the "target" speed for the street. Target speeds should be determined based on the key functions of the street and should typically fall in the range of 10 to 35 mph for multi-modal urban streets. Streets with speeds of 25 mph or less result in a smaller speed differential between bicyclists and motor vehicles, creating an environment where motorists and bicyclists can become more comfortable sharing the facility. The selected design speed impacts a number of different design elements:

- **Corner radii** – in urban areas, small corner radii are preferred to encourage slow turning speeds (15 mph or less). Corner radii dimensions should typically be 15 feet or less. Freight vehicles can still be accommodated through use of freight aprons, set-back stop bars, and designing to allow freight vehicles use of far receiving lanes.
- **Presence and width of shoulders or shy distance**– in urban areas, lower speed streets can be designed with minimal or no shoulders or shy distance between the travel lanes and curbs.
- **Traffic calming elements**, such as speed humps or bulb-outs, can be used to achieve lower target speeds.

- **Lane Widths** – for urban streets with target speeds of 35 mph or less, 10-foot lanes can be used, except where wider outside lanes are needed to accommodate transit or freight routes.

Lane Widths

There is no substantive decrease in urban street intersection capacity when through lane widths are narrowed from 12 feet to 10 feet, as long as all other geometric and traffic signalization conditions remain constant. Research has also shown that narrower lane widths in urban areas (10 or 11 feet) have equal or potentially improved safety performance over 12-foot lanes. The RVMPO and local agencies should consider narrowing travel lanes to 10 feet along facilities where posted speed limits do not exceed 35 mph to allow for the addition or widening of pedestrian or bicycle facilities. In transit or freight corridors, appropriate outside lane widths should be selected to accommodate transit and freight vehicles (11 feet or 12 feet).

Number of Lanes – The RVMPO and local agencies should consider reducing the number of vehicle travel lanes and reallocating street space to other modes or uses on a case-by-case basis. Typically, this type of redesign, often called a "road diet," is implemented by converting 4 travel lanes (two in each direction) to 3 travel lanes (one in each direction, and a center turn lane) and bike lanes. This type of conversion typically has minimal impacts on traffic operations on streets with less than 15,000 average daily vehicles (ADT). Streets with 15,000 to 25,000 ADT may have impacts to vehicle operations, but these effects should be studied for each specific case prior to implementation on higher ADT streets.

Parking – On-street parking should be considered for removal in order to add pedestrian or bicycle facilities in locations where:

- On-street parking is underutilized;
- On-street parking is utilized but adjacent off-street parking is available and underutilized; or,
- On-street parking does not fulfill a key function of the street (e.g. providing access to destinations; providing a physical buffer to enhance pedestrian or bicycle facilities; providing traffic calming)

Providing ADA Access – Best practices are evolving for providing ADA access at intersections, transit stops, on-street parking, and in conjunction with protected bicycle facilities. The RVMPO and local agencies shall continue to accommodate ADA access in all new street designs.