PROJECT EXTENTS

LEGEND

- Study Intersection
- Segment 1
- Segment 2
- Segment 3

Three Corridor Segments

- Segment 1 (South): Court Street to D Street
- Segment 2 (Middle): D Street to Bliler Avenue
- Segment 3 (North): Bliler Avenue to Salem Parkway

2017 Winter-Maple
Pedestrian and Bicycle Study

DKS

CITY OF Salem AT YOUR SERVICE

Toole Design Group

Oregon Department of Transportation

PROJECT BACKGROUND

Project Goals

- Develop a streetscape to better accommodate multimodal circulation
- Improve safety for all modes
- Encourage a healthy lifestyle
- Support employment, schools, shopping, and parks adjacent to the proposed bikeway
- Provide a travel choice for bicyclists and pedestrians of all ages and abilities
- Serve as a model for implementing family-friendly bikeways in Salem

Previously Considered Bikeway

1980 Salem Bike Plan Alignment Options

- Front Street
- 4th Street
- Winter Street, Laurel Avenue, railroad tracks, and Cherry Avenue

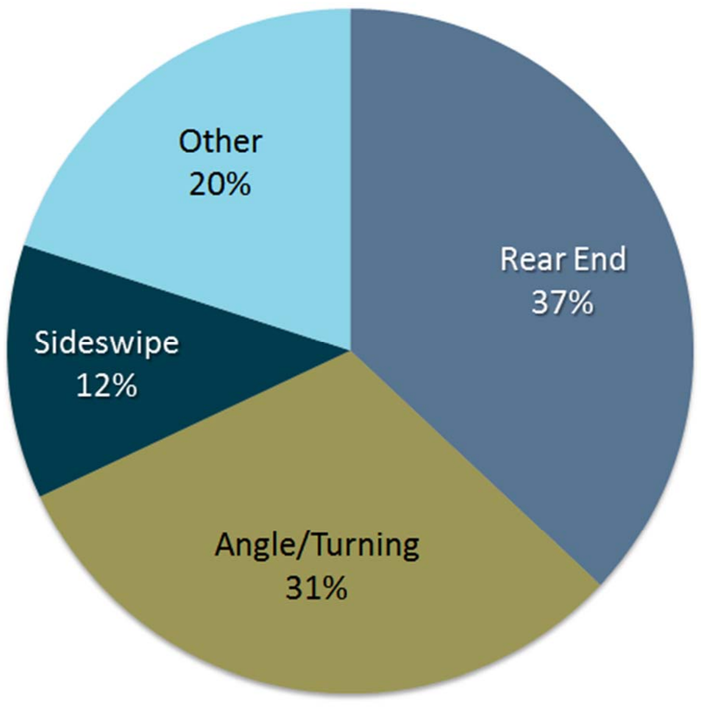
2009 Mid-Willamette Valley Council of Governments

Task	Description	Tentative Date
2D	TAC Meeting #2	1/19/2017
2E	PAC Meeting #2	1/25/2017
3: Conduct Public Workshops (February 2017 – May 2017)		
3A	**Public Workshop #1**	**3/7/2017**
3B	Proposed Conceptual Design	March 2017
3C	TAC Meeting #3	April 2017
3D	PAC Meeting #3	April 2017
3E	**Public Workshop #2**	**May 2017**
3F	TAC Meeting #4	May 2017
3G	PAC Meeting #4	May 2017
4: Prepare and Adopt Final Bikeway and Pedestrian Plan (BPP)		
4A	Draft Bicycle and Pedestrian Plan	July 2017
4B	TAC Meeting #5	July 2017
4C	PAC Meeting #5	August 2017
4D	Joint Planning Commission and City Council Work Session	August 2017
4E	Adoption Draft Bicycle and Pedestrian Plan	October 2017
4F	Planning Commission Public Hearing	November 2017
4G	City Council Public Hearing	November 2017
4H	**Final Bicycle and Pedestrian Plan**	**January 2018**

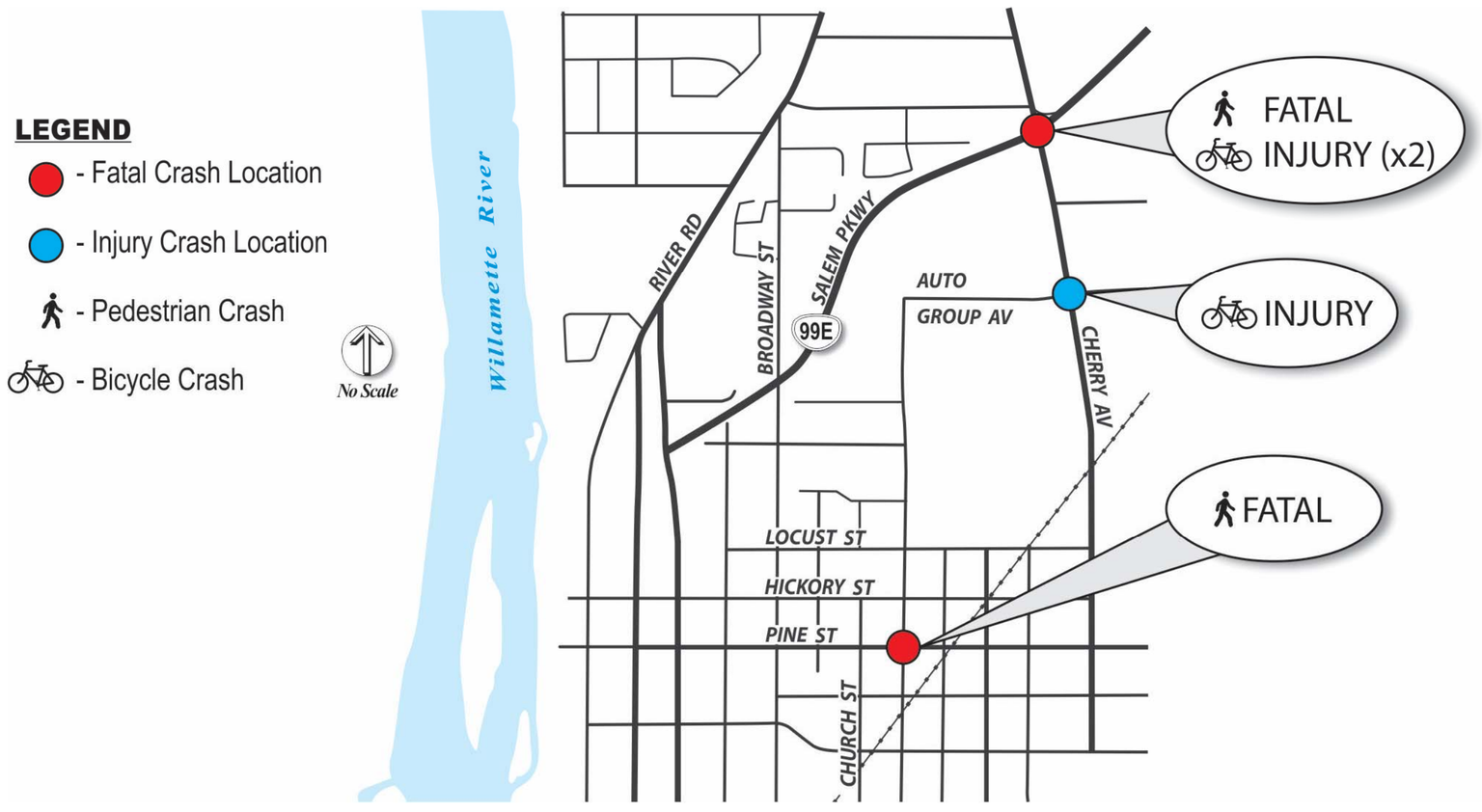
SAFETY PERFORMANCE

Crash Trends: Bicycle and Pedestrian

During the five-year study period (2011-2015) there were a total of 118 crashes along the proposed route, 3 of which involved a bicycle and 2 of which involved a pedestrian.

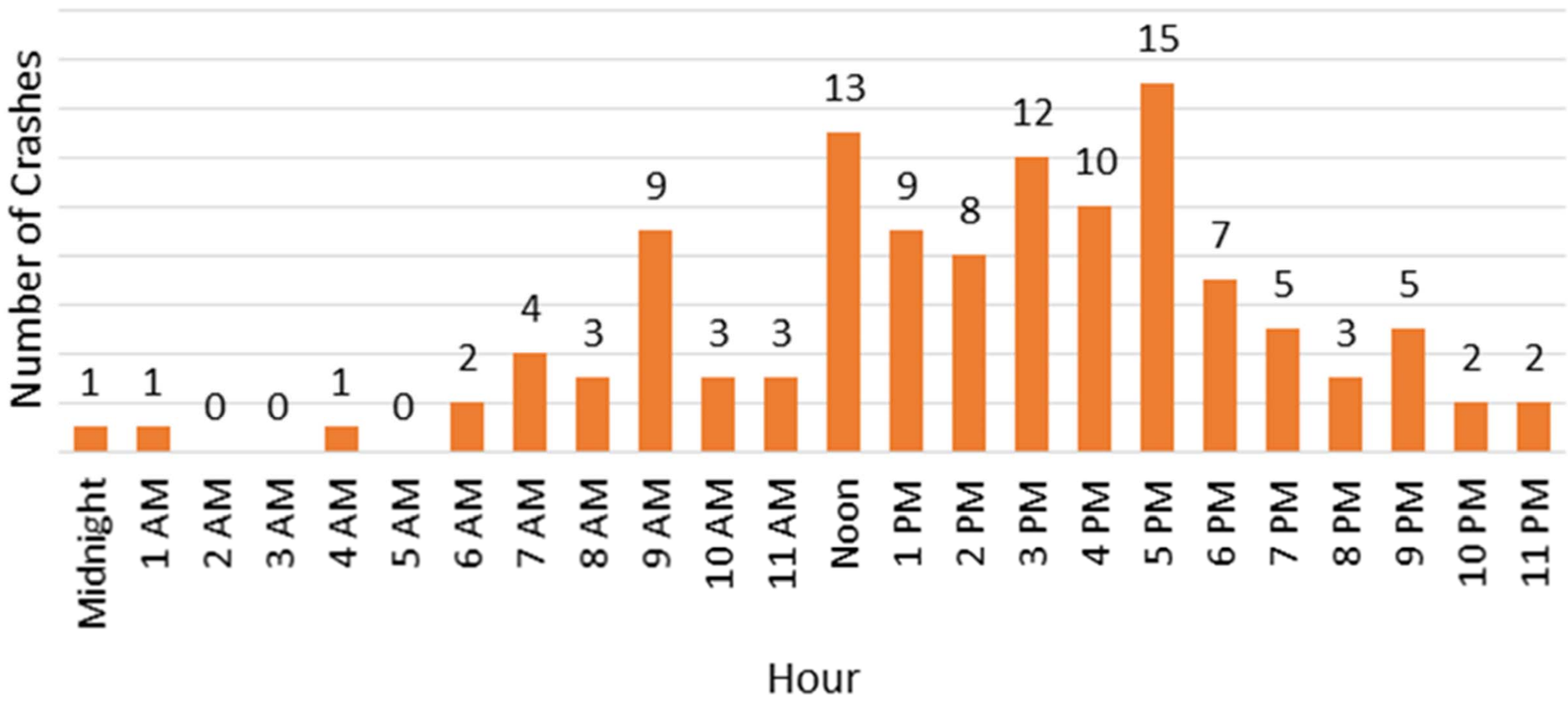


Crash Type Breakdown



Crash Trends: Time of Day

The highest frequency of crashes occurred during the peak travel time for businesses and schools (9am, noon, 3pm, and 5pm)



SAFETY PERFORMANCE

Crash Trends: Critical Crash Rates

A crash rate, which represents the observed annual crash frequency per unit of traffic volume (one million entering vehicles for intersections, or 100 million vehicles for roadway segments), allows for relative safety comparisons between locations with differing levels of traffic volume. An observed crash rate that is higher than the corresponding critical crash rate indicates a potential safety issue and warrants further investigation.

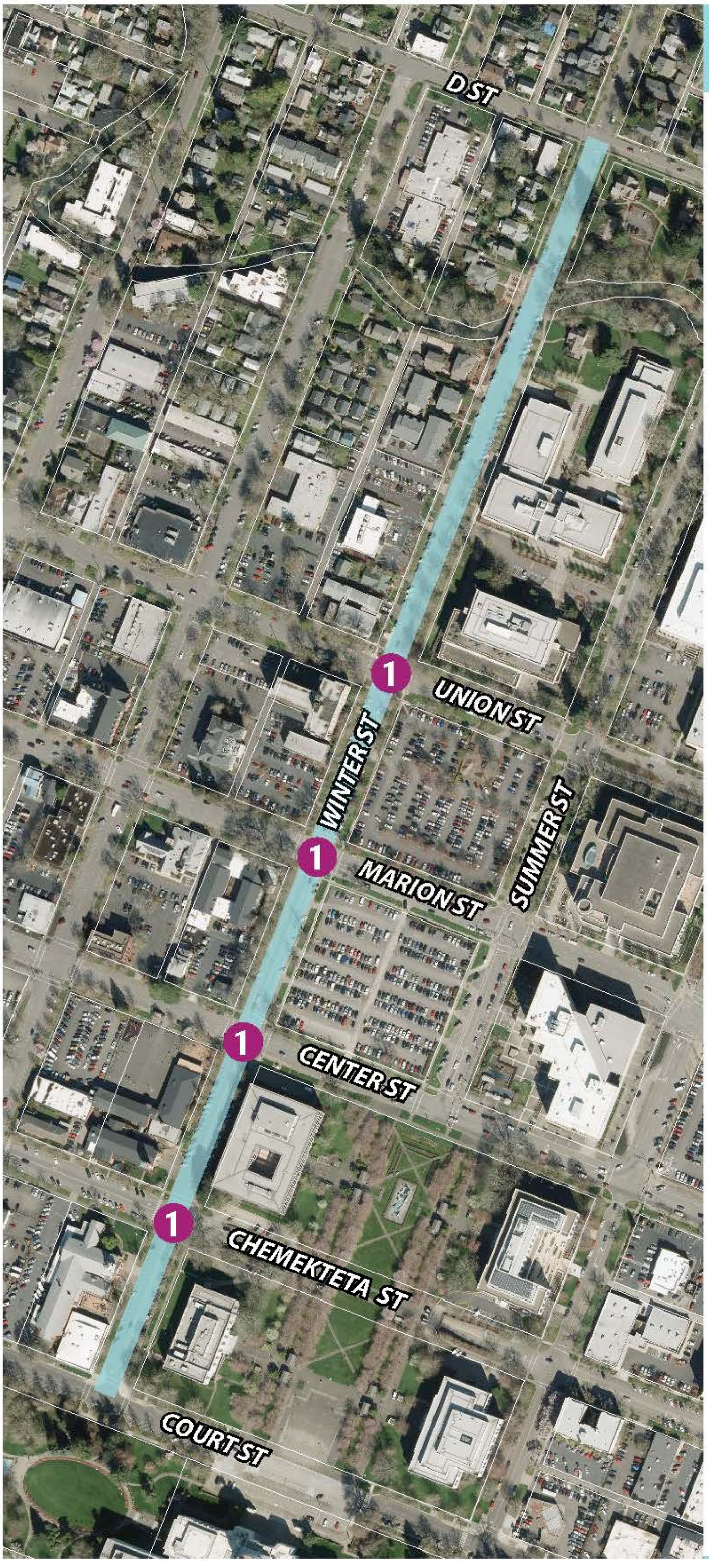
Intersection	Entering ADT	Observed Crash Frequency (2011-2015)			Critical Crash Rate Result
		Fatal	Injury	PDO	
Winter Street/ Market Street	10,720	0	3	1	**Below Critical Crash Rate**
Fairgrounds Road/Norway Street	7,320	0	2	2	
Fairgrounds Road /Jefferson Street/Winter Street [a]	7,380	0	3	2	
Maple Avenue/Pine Street	8,580	1	0	0	
Auto Group Avenue/Cherry Avenue	15,780	0	2	4	
Salem Parkway/Cherry Avenue	38,500	1	23	24	

[a] **Unique intersection configuration; no comparable critical crash rate available.**

Roadway Segment	Entering ADT	Observed Crash Frequency (2011-2015)			Analysis Result
		Fatal	Injury	PDO	
Winter Street: Court St. to Union St.	4,000	0	6	7	**Below Critical Crash Rate**
Winter Street: Union St. to Market St.	1,450	0	7	1	
Winter Street: Market St. to Norway St.	350	0	0	3	**Above Critical Crash Rate**
Norway Street: Winter St. to Cottage St.	2,000	0	0	0	**Below Critical Crash Rate**
Cottage Street: Norway St. to South St.	160	0	1	1	**Above Critical rash Rate**
Maple Avenue: South St. to Pine St.	390	0	0	2	**Below Critical Crash Rate**
Maple Avenue: Pine St. to Bliler St.	520	0	1	2	
Auto Group Avenue: Bliler St. to Cherry Ave.	3,870	0	0	0	
Cherry Avenue: Auto Group Ave. to Salem Pkwy.	10,430	0	1	2	

The two roadway segments that exceed the critical crash rate (Winter Street between Market Street and Norway Street, and Cottage Street between Norway Street and South Street) have a very low volume of traffic and short segment lengths, both of which can contribute to over-inflated crash rates. There is no apparent pattern in crash type, crash location, or crash cause on either segment.

NEEDS & OPPORTUNITIES



Segment 1: Court Street to D Street

Needs

- Separated space for bicyclists: Higher traffic volumes in this area contribute to lower comfort for less experienced bicyclists. Any type of designated bicycle space would create more continuity for bicyclists traveling the length of the corridor.
  - Current configuration with head-in angled parking presents sight-line issues for drivers backing out into bicyclists' path of travel.
- Shorter pedestrian crossing distances where cross street is ~60' wide.
  - At Union Street the northeast corner recedes, creating a longer crossing distance on the east leg than the west.

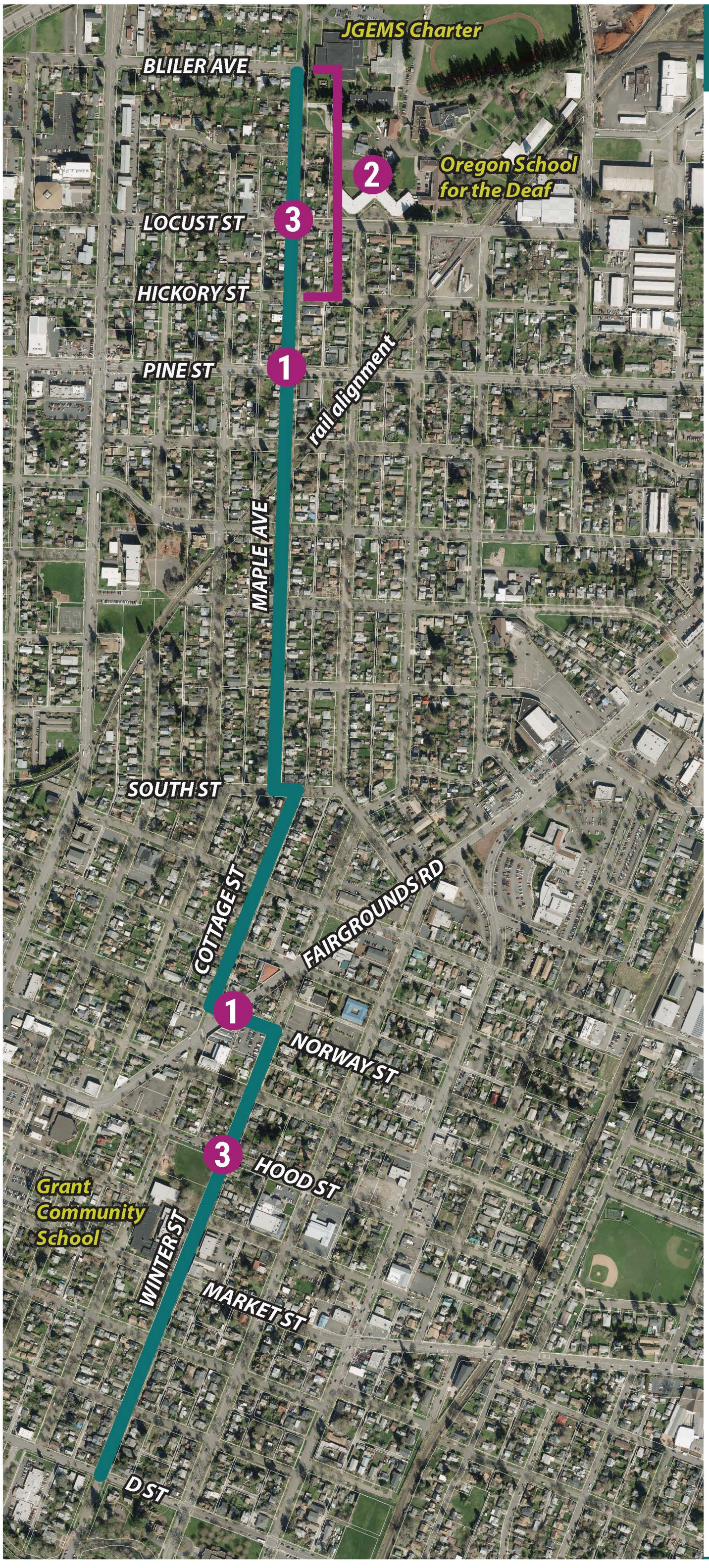
Opportunities

- Adequate space within the existing street cross-section to implement separated bike lanes if the parking configuration is changed.
- Parking impacts may be mitigated by the fact that there is abundant of off-street parking available in adjacent lots and garages.

Constraints

- Parking needs for adjacent offices may be greater than that available from off-street sources.
- The weekly Saturday Market may have greater parking needs than can be accommodated when parking lot is used for the market.
- Bus routes are located along this segment.

Needs & Opportunities



Segment 2: D Street to Bliler Avenue

Needs

1. Safe crossings of major streets for bicyclists and pedestrians.
   - Especially pertinent at Pine Street and Fairgrounds Road.
   - Safe railroad crossing for bicyclists and pedestrians.
2. Pedestrian accommodation on Maple from Hickory Street to Bliler Avenue.
   - There is currently sidewalk on only the east side from Hickory to Locust, and no sidewalk from Locust to Bliler.
   - Periodic higher traffic volumes exist in this northern portion of the segment due to pick-up/drop-off at JGEMS and Oregon School for the Deaf.

Opportunities

- Traffic volumes and speeds are low along the alignment, with only two major unsignalized crossings.
- Sidewalks have good buffers from the street with mature trees.
- Major cross streets (Pine and Fairgrounds) have adequate space between the curbs for the addition of median crossing islands and/or diverters.

2. Adequate right-of-way appears to be available to construct sidewalks where none exist today.
3. Some traffic calming already exists in the form of mini-circles at the intersections of Winter and Hood, and Maple and Locust.

Constraints

- Bus route located along segment from D Street to Market Street.
- Pick-up/drop-off for Grant Community School occurs on Winter Street.
- Numerous mature trees are located in the area where sidewalk alignment would be on the west side of Maple Avenue between Hickory and Locust Streets.
- Additional plantings and fences appear to be located in the public right-of-way that would be used to add sidewalk between Locust Street and Bliler Avenue.
- The cost and complexity of adding a curb and gutter to construct a sidewalk on one or both sides of Maple Avenue north of Locust Street may be high.

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NEEDS & OPPORTUNITIES

Segment 3: Bliler Avenue to Salem Parkway

Needs

1. Improved lighting along the pathway: The shared-use path today has one light along its length.
- Pedestrian accommodation on the south side of Auto Group Avenue and east side of Cherry Street: No sidewalks exist in these locations.

2. More comfortable and safer crossing for pedestrians and bicyclists at Salem Parkway to access the Salem Parkway shared use path.
- More comfortable bicycle accommodation, such as an off-street path, along Cherry Avenue that will appeal to a wider range of bicyclists by providing greater separation from higher traffic volumes and speeds.

Opportunities

- Redevelopment of the parcel south of Auto Group Avenue may provide an opportunity to install a sidewalk or shared use path in the future.

1. The existing pathway connecting the end of Maple Avenue to Auto Group Avenue provides a through connection for pedestrians and bicyclists.
- The crossing of Van Ness Avenue is low volume and would present little opportunity for conflicts with pedestrians and bicyclists traveling along the east side of Cherry Avenue between Auto Group Avenue and Salem Parkway.

Constraints

3. The south side of Auto Group Avenue is currently used for an informal parking area toward the western end.
- Utilities on the east side of Cherry Avenue would need to be moved for installation of a sidewalk or sidepath.
- Parking in front of Wiltse's Towing and the two driveways for this business present potential conflicts with pedestrians and bicyclists.

4. High volume area at Home Depot driveway exit creates many turning conflicts

DESIGN TOOLBOX

CURB EXTENSION

Curb extensions are sections of the sidewalk that extend into the parking lane. They are located at intersections and mid-block crossings and may include pedestrian curb ramps.

Use in street segments or intersections where street width contributes to higher motor vehicle speeds, especially where on-street parking has a low rate of occupancy during most times of day.

BENEFITS

- Visually narrows the roadway.
- Reduces the width of the crosswalk, and bike and pedestrian crossing distances.
- Can be used to reduce or eliminate strop control at intersections.
- Extended sidewalk space can be used for plantings, street furniture, bicycle parking, artwork, or green stormwater infrastructure.

CONSIDERATIONS

- Must be designed to deflect motor vehicle traffic without forcing the bicycle path of travel to be directed into a merging motorist.
- Consider the turning radii of larger vehicles as appropriate, depending on design context.
- Landscaped curb extensions should use low growing shrubs to preserve sight distances.

COSTS

- $13,000 for 1 crossing (2 extensions, 6' wide): curb work, detectable warnings, concrete only (no plantings).

SPEED HUMPS

Speed humps are sections of roadway raised several inches above grade. They can be made from many materials but are most commonly made from asphalt. Speed humps are often used in a series typically spaced several hundred feet apart or less.

Speed humps can be designed with a variety of vertical profiles. Consider on roads with measured or observed speeding issues.

BENEFITS

- Highly effective method of slowing motor vehicles.
- Relatively inexpensive and easy to maintain.
- Minimal slowing for cyclists.

CONSIDERATIONS

- Speed humps impact bicyclist comfort and should be designed with sinusoidal or flat-topped approach profiles.
- Speed humps can slow emergency vehicles substantially. Consider speed cushions where emergency vehicle passage is a priority.
- Speed humps are typically designed with space between the hump and the curb for drainage.

COSTS

- $3,000 each (14' wide, includes chevron markings).

RAISED CROSSWALKS

Raised crosswalks are similar to speed humps, but are located at a crosswalk, have flat tops, and typically meet the curb. They can be raised to sidewalk height or slightly below.

Consider raised crosswalks at mid-block crossings with measured or observed speeding issues or where vehicles fail to yield to pedestrians; or at intersections to slow traffic turning on to the neighborhood greenway from a major street.

BENEFITS

- Highly effective method of slowing motor vehicles.
- In addition to the benefits of speed humps, raised crosswalks provide slowing and increased driver attention at conflict points with pedestrians.
- Can provide slowing where motor vehicles tend to take turns at high speeds.

CONSIDERATIONS

- Raised crosswalks impact bicyclist comfort and should be designed with sinusoidal or flat-topped approach profiles.

COSTS

- $10,000 each (includes high visibility crosswalk, will necessitate drainage and curbside work).

MINI-CIRCLE

Mini-circles are similar to roundabouts, and are typically constructed as a curb-level landscaped circular island.

Used at local intersections where street width contributes to higher motor vehicle speeds, or where an alternative to a stop- or yield-controlled intersection is desired.

BENEFITS

- Visually narrows the roadway.
- Cars must maneuver around the center circle, slowing traffic slightly.
- Can reduce bicycle delay.
- Opportunity for neighborhood greening.

CONSIDERATIONS

- Should be considered at local street intersections to prioritize the through movement of bicyclists without increasing motorists speeds.
- Unlike mini-roundabouts, mini-circles may use stop control if necessary.
- Mini-circles only slow traffic within about 100 feet of the intersection.

COSTS

- $15,000 for 1 curbed, planted, 16' diameter circle.

MEDIAN ISLAND

Median islands divide road crossings into two halves, providing a protected refuge in the middle of the roadway for pedestrians and cyclists to pause and wait for gaps in traffic. Median islands are typically raised concrete islands at curb level.

Consider use on wide roadways with multiple traffic lanes, especially ones with high traffic speeds.

BENEFITS

- Allows cyclists and pedestrians to cross wide roadways in multiple stages, shortening crossing distances.
- Visually narrows the roadway, providing traffic calming.
- Restricts left-turn movements by motor vehicles, reducing conflicts.

CONSIDERATIONS

- Provide sufficient space for multiple users and their bicycles at high-volume crossings. At least 8' - 10' width is preferred.
- The median may be located on just one side of the crosswalk, or may enclose the user on both sides.
- Consider angling the refuge so that the user faces towards oncoming traffic before crossing.

COSTS

- $20,000 - $40,000 each (6' wide, 8' long).

DESIGN TOOLBOX

BIKE DETECTION

Typical roadway signal activation loops may not detect cyclists waiting at red lights, which can lead to long delays and encourage cyclists to run red lights. Signal activation loops can be calibrated and located in the pavement in such a way that cyclists will activate them, calling up the green light.

Consider use where green lights require vehicle detection loops and motor vehicle volumes are low.

BENEFITS

- Reduces cyclist delay.
- Discourages cyclists from running red lights.

CONSIDERATIONS

- Detection loops are often marked with a bicycle detector symbol to alert cyclists to the bike detection and show them where to optimally position themselves to trigger it.
- Consider installing activation loops in advance of the intersection so that cyclists trigger it as they approach, further reducing delay.
- Left turn pockets may need their own detection loops.

COSTS

- $2,000 per approach (loop detector and modifications to signal box).

RE-ORIENTING STOP SIGNS

Cyclists are highly sensitive to delay. To reduce delay and create greater continuity for cyclists on neighborhood greenways, stop signs should be minimized. In locations where there is a two-way stop that gives right-of-way to the cross street, consider re-orienting the stop signs so that the greenway has right-of-way instead.

BENEFITS

- Reduces cyclist delay and provide more continuous route
- Reduces cyclist incentive to run stop signs

CONSIDERATIONS

- Re-orienting stop signs may increase motor vehicle speeds and volumes on neighborhood greenways. Where this is observed, consider using speed humps, and diverters for full or partial road closures.
- May require a traffic study

COSTS

- $300 per sign.

PEDESTRIAN HYBRID BEACON (PHB)

Pedestrian hybrid beacons (PHBs), also known as HAWK beacons, facilitate pedestrian and bicyclist crossings at unsignalized marked crosswalk locations. They consist of one yellow and two red lights that direct approaching motor vehicles to slow, yield, and stop for people crossing. Beacons are push button-actuated and remain dark when not activated.

Consider at major crossings where there are insufficient gaps for pedestrians and cyclists to cross.

BENEFITS

- Studies show very high motor vehicle compliance with PHBs, and reduced pedestrian and total roadway crashes.
- Minimal disruption to motorized vehicle traffic flow.
- Minimizes driver habituation to signal, since it is dark when pedestrians aren't present.

CONSIDERATIONS

- Always pair with a marked crosswalk.
- Beacons have been shown to be more effective with signage telling cars to stop on solid red signal.
- Educational outreach to explain beacon use and function is recommended.
- May require a traffic study.

COSTS

- $60,000 each (facing both directions of traffic, includes new poles, mast arms, and push buttons).

PUSH BUTTONS

Push buttons are similar to bike detection, except that cyclists must manually push a button located near the intersection in lieu of automatic detection.

Many intersections already have push buttons for pedestrians, but these are inconveniently located for cyclists. Bicycle push buttons should be located at the edge of the roadway so that cyclists can press the button without dismounting their bicycles.

BENEFITS

- Reduces cyclist delay.
- Discourages cyclists from running red lights.

CONSIDERATIONS

- Left turn pockets may need their own push buttons.
- At many intersections it may be appropriate to have both pedestrian and cyclist push buttons to serve both groups.

COSTS

- $1,000 per push button.

MINI-ROUNDABOUTS

Mini-roundabouts are small mountable circular islands placed at the center of low-volume intersections. They operate under yield control and slow traffic while eliminating the need for stop signs. They are typically hardscaped.

Consider at minor local intersections where street width contributes to higher motor vehicle speeds, especially where there is a desire to remove or decrease stop control.

BENEFITS

- Prioritize through-movement of cyclists without increasing motorist speeds.
- Reduce turning conflicts at intersections.
- Large vehicles can drive over the mountable surface.
- Can be alternatives to stop- or yield-controlled intersections.

CONSIDERATIONS

- Must be designed to deflect motor vehicle traffic without forcing the bicycle path of travel to be directed into a merging motorist.
- Speed reduction for motor vehicles limited to within about 100 feet of the intersection.
- Add modest delay for emergency vehicles.
- Consider using at constrained local intersections where truck or bus access is to be maintained.

COSTS

- $50,000 - $100,000 for one roundabout (16' diameter, stamped or stained concrete construction).

DESIGN TOOLBOX

WARNING

Warning signs alert cyclists and drivers alike to notable or changing conditions such as upcoming traffic calming features and traffic control devices. Warning signs also alert drivers to bike and pedestrian crossings.

BENEFITS

- Alert drivers to the presence of cyclists and pedestrians, and encourage slowing, especially at crossings.
- Give advanced warning to roadway users when traffic calming or traffic control devices are present.

CONSIDERATIONS

- Warning signs are a standard or even required component of many traffic calming and crossing safety features.
- Even where not required, research suggests that warning signs make traffic calming and crossing safety features more effective.
- The MUTCD, AASHTO, NACTO, and other guides give guidance on when to use warning signs.

COSTS

- $300 each for diamond warning signs.

PAVEMENT MARKINGS

Pavement markings are an important part of neighborhood greenway wayfinding and legibility. Markings identify the route and indicate turns in the route and connections to other greenways or bike routes.

Different cities use different markings. Precedents include shared lane markings, medallions, or other bike-related pavement markings with directional arrows.

BENEFITS

- Alerts drivers to presence of bicyclists sharing the road.
- Alerts bicyclists to turns in the route or connections to other bicycling routes.
- Encourages bicyclists to ride in the travelway instead of near parked cars.

CONSIDERATIONS

- Markings should be spaced frequently enough that cyclists don't worry that they've "lost the trail."
- Place markings after each intersection, and near high volume driveways and other conflict points.
- Use on streets with existing lower traffic volume and speed or where traffic calming measures are implemented concurrently.

COSTS

- $4,200 per mile for shared lane markings spaced at 250'.

BUFFERED BIKE LANES

Buffered bike lanes are conventional bike lanes paired with a designated buffer space separating the bike lane from the adjacent motor vehicle travel lane and/or parking lane to increase the comfort of bicyclists.

While buffers provide greater horizontal separation from automobile traffic, some bicyclists may still not be comfortable in them adjacent to higher speed traffic. Striped buffers still allow automobiles to enter or cross the buffered bike lane.

BENEFITS

- Further separates bicyclists from adjacent automobile traffic.
- When buffer is located next to parking, encourages bicyclists to ride outside the reach of an opening car door.

CONSIDERATIONS

- Buffers can be striped on either the travel lane or parking lane side depdending upon which poses a greater risk to bicyclists. Buffers on the parking side are recommended in areas of high parking turnover.
- When implemented by removing an entire travel lane, consider buffering on both sides to reinforce lane is no longer for automobiles.

COSTS

- Approximately $40,000 per mile

LIGHTING

Street lighting is an important safety feature on neighborhood greenways, increasing pedestrian and cyclist visibility and creating comfortable and safe spaces for travel after dark.

BENEFITS

- Increases cyclist and pedestrian visibility, and visibility of signs, obstacles, and traffic calming features.
- Increases cyclist and pedestrian safety and comfort.

CONSIDERATIONS

- Pedestrian-scale lighting is particularly desirable, and has placemaking benefits as well as providing identity branding opportunities.
- It is particularly important that traffic calming features be well lit, since they require cars and cyclists to maneuver around them.

COSTS

- $5,000 per Salem standard street light.

BIKE LANES

A conventional bike lane is a portion of a street designated for the exclusive use of bicycles distinguished from traffic lanes by striping, signing and pavement markings.

Bike lanes are a comfortable facility for most riders when they are located on streets with three or fewer lanes and speed limits of 30 mph or less. Bike lanes are typically implemented through road or lane diets when added through retrofit.

BENEFITS

- Provides exclusive space for bicyclists to travel along roads instead of sharing a lane with automobiles.

CONSIDERATIONS

- When located next to a narrow (7-foot) or high turnover parking lane, a wider bike lane of 6 to 7 feet should be considered so as to allow bicyclists to ride outside the reach of opening card doors, but within the bike lane.
- Lanes should be continued all the way to intersections.
- Dashed markings through intersections can help mitigate conflicts.

COSTS

- Approximately $20,000 per mile

SEPARATED BIKE LANES

Separated bike lanes (SBLs) are an exclusive bikeway that combines the user experience of a sidepath with the on-street infrastructure of a conventional bike lane. They are physically separated from motor vehicle traffic and distinct from the sidewalk.

SBLs are comfortable for nearly all bicyclists to use. The vertical separation from automobile traffic provides perceived and actual safety from adjacent vehicles.

BENEFITS

- Nearly all bicyclists are comfortable in an SBL.
- Provide opportunity to continue high-comfort bike routes onto streets with higher traffic volumes and speeds.
- Can be implemented in phases with lower-cost pilot materials (striping , flexposts) transitioning to higher-quality (curbs, planted medians) over time.

CONSIDERATIONS

- Directional one-way SBLs located adjacent to travel lanes in the same direction are preferred to a two-way SBLs. The one-way situation provides more rational traffic patterns.
- Sight lines for bicyclists and drivers must be kept clear at driveways and intersections where automobile traffic crosses the SBLs.

COSTS

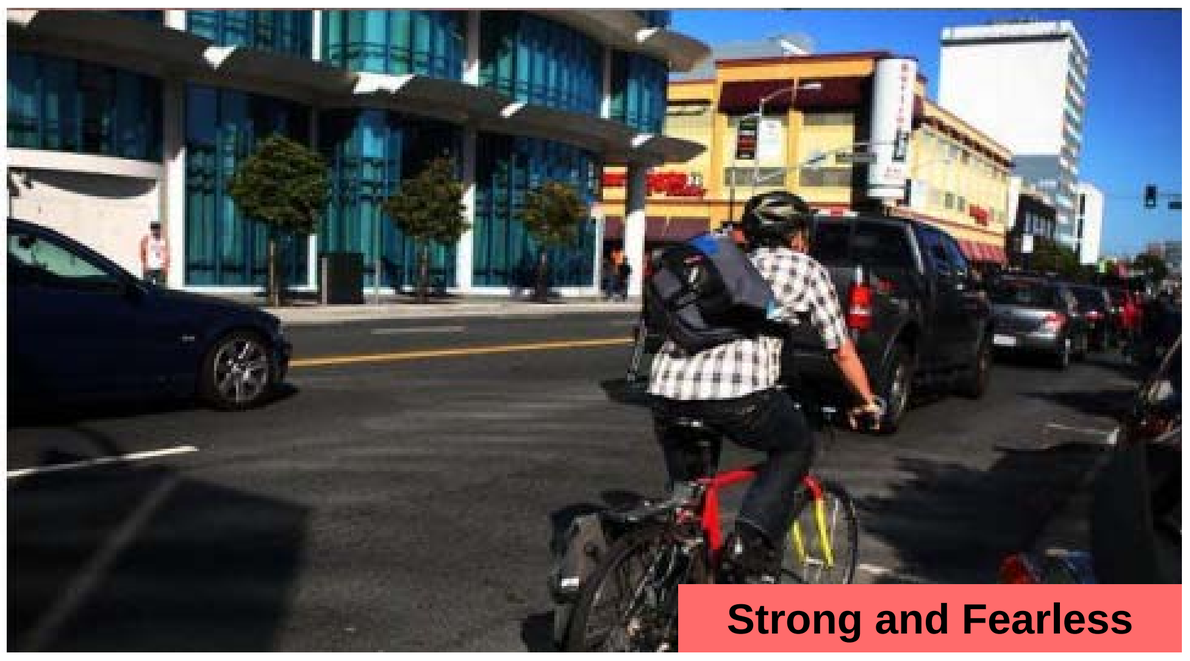
- Varies widely based on separation type.

What Kind of Cyclist are You?

No Way, No How

Interested but Concerned

Enthused and Confident



Strong and Fearless

Cyclist Comfort Level	Description	Your Comfort Level
Strong and Fearless *“I’ll ride anywhere!”*	• Very comfortable without bike lanes	
Enthused and Confident *“I’ll ride as much as I can but will stay on roads with bike lanes”*	• Very comfortable with bike lanes	
Interested but Concerned *“I’d like to bike more but I’m not very comfortable riding in traffic.”*	• Not very comfortable, interested in biking more • Not very comfortable, currently cycling for transportation but not interested in cycling more	
No Way, No How *“I cannot or will not ride a bike, because I am unable, uncomfortable or uninterested.”*	• Physically unable • Very uncomfortable on paths • Not very comfortable, not interested, not currently cycling for transportation	

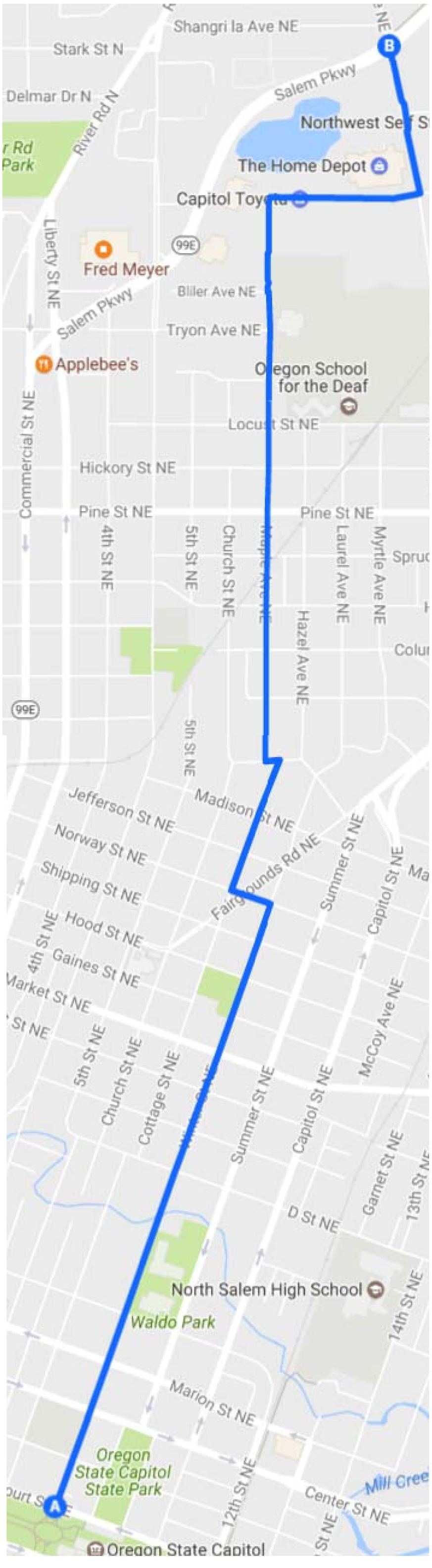
YOU BE THE DESIGNER!

Many cities give their neighborhood greenways special identities through branding signage. These signs are placed along the route and can also be used at entrances to neighborhood greenways or on wayfinding signs.

<u>Write your suggestion(s) for the name of the bicycle/pedestrian route:</u>

YOU BE THE DESIGNER!

Have ideas or concerns? Describe them below!



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